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Review of the state of world marine fishery resources

2025

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ABSTRACT

Marine fisheries are crucial to the food security and nutrition, economy and overall well-being of coastal communities. Maintaining the long-term prosperity and sustainability of marine fisheries is therefore not only ecologically significant, but has social, economic and political importance. The aim of this report is to provide FAO Members, national and regional policymakers, academia, civil society, fishers and managers of world fishery resources with a comprehensive, objective and global review of the state of the living fishery resources of the oceans.

This document updates the regular reviews of the state of the world's marine fishery resources, based on stock assessments and complementary information up to 2023, and official catch statistics through to 2021. The introductory and methodology chapters provide the wider context in which this updated edition of the *Review of the state of world marine fishery resources* was prepared, highlighting evolutions in the landscape of fisheries and stock assessment capacities since the previous edition of this report in 2011. The methodology section gives a detailed overview of the updated FAO process for providing the state of stocks index, which involved a highly participatory and transparent process (including 19 regional workshops and consultations, with around 650 in-person experts representing 92 countries and 200 organizations). Importantly, the total number of stocks in the assessments included in this report has significantly increased to 2 570. Discussions on major trends and changes at the global level are explored in a dedicated global overview chapter, while more detailed information on the status of stocks for each of the FAO Major Fishing Areas is set out in dedicated regional chapters. Special sections address the global issue of tunas and tuna-like species, and other high-profile fisheries such as deep-sea fisheries in areas beyond national jurisdiction, and highly migratory sharks. Summary tables are provided for each species grouping used in this assessment, indicating the number of stocks included, their sustainability classification between overfished, maximally sustainably fished, and underfished categories, and the number of stocks classified into tiers based on the availability and quality of information and thus the assessment methods used.

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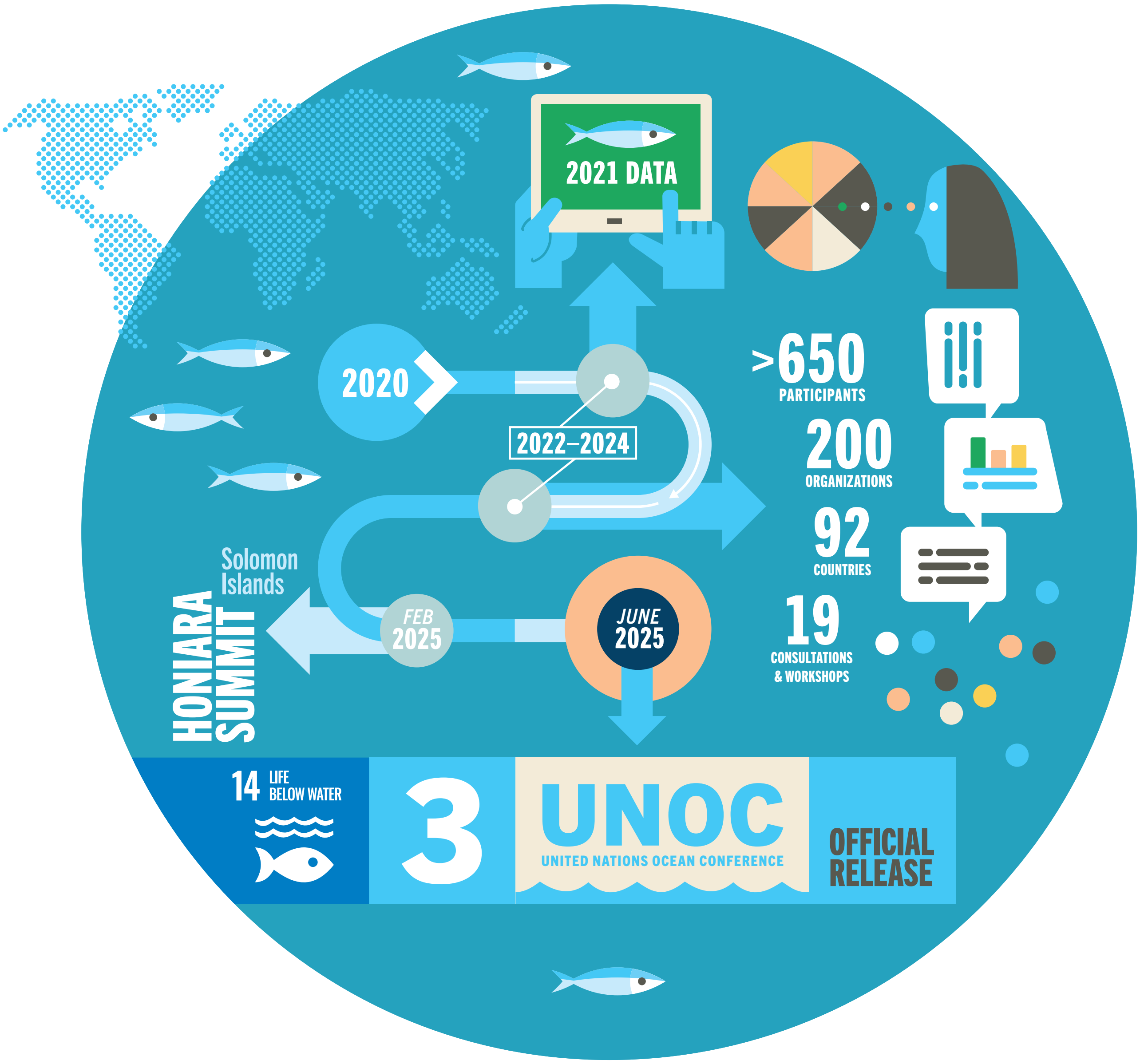

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FOREWORD

With only five years left to achieve the 2030 Agenda for Sustainable Development, it is becoming increasingly clear that many of the goals set forth by the global community remain out of reach. Pervasive hunger and malnutrition, worsening impacts from climate change, and political conflicts remain significant challenges. These realities underscore the urgent need to manage our natural resources more effectively and efficiently. Currently, Sustainable Development Goal (SDG) 14 is among the least-funded Goals, and achieving SDG 14.4 – which calls for the regulation of harvesting, the elimination of overfishing and illegal, unreported, and unregulated (IUU) fishing, and the implementation of science-based management plans to effectively manage and restore fish stocks – appears increasingly uncertain. Nonetheless, global efforts have continued to push forward towards achieving sustainable fisheries. This report aims to provide a critical foundation for ongoing dialogue and action needed to achieve effective fisheries management.

The *Review of the state of world marine fishery resources* reports have become vital tools for informing policy and management at multiple levels, from international frameworks such as the United Nations SDGs and the United Nations Fish Stocks Agreement to climate negotiations, biodiversity conventions and agreements, and potentially global trade agreements like the World Trade Organization Agreement on Fisheries Subsidies. They serve as a resource for decision-makers across the FAO Committee on Fisheries (COFI) and other key institutions, helping to drive evidence-based discussions and strategies.

The origin of this report traces back to 2020, when the need for a more participatory and transparent approach to collating and reporting global fisheries assessments became apparent. In response, a tiered assessment approach was developed, incorporating extensive stakeholder engagement and scientific rigour to ensure a comprehensive and inclusive process. Initial consultations were conducted virtually in 2022, followed by the first in-person meetings later that year. Between 2022 and 2024, more than 650 participants from 200 organizations across 92 countries contributed their expertise through 19 consultations and workshops. By December 2024, the final workshop had been conducted, and in early 2025, a prelude of the report was delivered at the Honiara Summit on SDG 14 (24–27 February 2025, Solomon Islands), leading up to the official global release at the third United Nations Ocean Conference (UNOC) in June 2025.

This updated analysis indicates that the proportion of marine fishery stocks fished within biologically sustainable levels was 64.5 percent in 2021. While these global results are close to previous estimates, regional results show a diverse degree of differences compared to the previous approach, a consequence of using a more representative list of assessed stocks than previously. When weighted by their production levels, stocks classified as biologically sustainable accounted for 77.2 percent of the total landings in 2021.

Beyond its technical contributions, this initiative has served as a platform for building stronger personal and professional networks across the global fisheries community. It has facilitated collaboration between experts, institutions and policymakers, fostering a deeper commitment to improving fisheries assessments and management and building capacities. This comprehensive community engagement approach has ensured that knowledge and expertise from national to regional – and ultimately global – levels has been leveraged.

Every effort has been made to conduct a thorough and rigorous assessment through the application of the new methodological approach. Nevertheless, as better data and information become available in the future, there will be opportunities for improvement and refinement. These will be addressed in future iterations, and we encourage the global community to build upon and sharpen this work.

This report represents, without a doubt, the most comprehensive, evidence-based, community-built assessment of global fish stocks to date, providing a strong foundation for informed management policies. If used effectively, it can help us accelerate efforts to ensure that 100 percent of stocks are placed under effective management as called for by FAO's Blue Transformation vision, and achieve the ambitious goals of the 2030 Sustainable Development Agenda and beyond.

The development of this report would not have been possible without the dedication and collaboration of countless experts, institutions and stakeholders who have contributed their knowledge, time and expertise. Their collective efforts have been instrumental in shaping a more transparent and science-driven approach to fisheries sustainability monitoring. As we move forward, it is imperative that we build on this momentum, ensuring that the health of our oceans, the livelihoods of millions, and the future of marine resources remain at the forefront of global decision-making.

Manuel Barange

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We extend our deepest appreciation to the more than 650 experts whose valuable contributions and active participation in the consultations and workshops were instrumental in this effort.

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The report was reviewed internally by **Dr Manuel Barange** and **Dr Vera Agostini**, as well as the editorial board.

ABBREVIATIONS

ABF	Angola-Benguela Front
ABNJ	areas beyond national jurisdiction
AC	Advisory Council
ACE	annual catch entitlement
ALB	albacore tuna
AO	Atlantic Ocean
AOE	Eastern Atlantic Ocean
AON	North Atlantic Ocean
AOS	South Atlantic Ocean
AOW	Western Atlantic Ocean
ASFIS	Aquatic Sciences and Fisheries Information System
AUCFZ	Argentinian-Uruguayan Common Fishing Zone
BBNJ Agreement	Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (under UNCLOS)
BCC	Benguela Current Commission
BCLME	Benguela Current Large Marine Ecosystem
B_{CURR}	current biomass
BET	bigeye tuna
BFT	Atlantic bluefin tuna
B_{lim}	limit reference point for spawning stock biomass
B_{MSY}	biomass for the maximum sustainable yield
BNS	Bonaerensis-North Patagonian stock (of Argentine shortfin squid in Area 41)
B_{pa}	precautionary reference point for spawning stock biomass
CASAL	C++ Algorithmic Stock Assessment Laboratory
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCAS	Convention for the Conservation of Antarctic Seals
CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDF	cumulative distribution function
CECAF	Fisheries Commission for the Eastern Central Atlantic
CFP	Common Fisheries Policy (of the EU)
CITES	Convention on International Trade in Endangered Species
CMM	conservation and management measure
CMS	Convention on Migratory Species
COM	catch-only model
CoP	Conference of the Parties
COREP	Gulf of Guinea Regional Fisheries Commission
CPC	cooperating non-contracting party
CPPS	Permanent Commission for the South Pacific
CPUE	catch per unit effort
CTMFM	Joint Technical Commission of the Maritime Front
DCO	double control target
DG MARE	Directorate-General for Maritime Affairs and Fisheries (of the European Commission)
DFAD	drifting fish aggregating devices
DFO	Department of Fisheries and Oceans
DWFN	distant water fishing nation
EAC	East Australian Current
EEZ	exclusive economic zone
ENSO	El Niño-Southern Oscillation
EPO	Eastern Pacific Ocean
EU	European Union

FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
FCWC	Fisheries Commission for the West Central Gulf of Guinea
FMP	fishery management plan
FRA	Fisheries Restricted Area
FRRA	Fisheries Resources Reconciliation Agreement
FSB	female stock spawning biomass
F_{MSY}	fishing mortality at maximum sustainable yield
GDP	gross domestic product
GFCM	General Fisheries Commission for the Mediterranean
GSA	geographical subarea (of the GFCM)
HCR	harvest control rule
HCS	Humboldt-Peru eastern boundary current system
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
INCOPESCA	Costa Rican Institute of Fisheries and Aquaculture
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
IPHC	International Pacific Halibut Commission
IPOA	International Plan of Action
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
ISSCAAP	International Standard Statistical Classification of Aquatic Animals and Plants
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated (fishing)
IWC	International Whaling Commission
JABBA	Just Another Bayesian Biomass Assessment
LME	large marine ecosystem
LRP	limit reference point
MPA	marine protected area
MSC	Marine Stewardship Council
MSE	management strategy evaluation
MSY	maximum sustainable yield
MULTIFAN-CL	Multivariate Length Frequency Analysis
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	North East Atlantic Fisheries Commission
NEAS	Northeastern Arabian Sea
NOAA	National Oceanic and Atmospheric Association
NPAFC	North Pacific Anadromous Fish Commission
NPFC	North Pacific Fisheries Commission
NPOA	National Plan of Action
NSW	New South Wales
OHF	Ocean Hauling fishery
OMP	Operational Management Procedure
OTF	Ocean Trawl fishery
PBF	Pacific bluefin tuna
PO	Pacific Ocean
PON	North Pacific Ocean
POS	South Pacific Ocean
ppt	parts per thousand
PSMA	Port States Measures Agreement
QMA	quota management area
QMS	quota management system
RECOFI	Regional Commission for Fisheries
RFB	regional fisheries body
RFMO	regional fisheries management organization

SAC	Scientific Advisory Committee for Fisheries (of the GFCM)
SAFS	Status of Australian Fish Stock reports
SAM	State-space Assessment Model
SBS	Southern Brazil stock (of Argentine shortfin squid in Area 41)
SBT	southern bluefin tuna
SCRS	Standing Committee on Research and Statistics (of ICCAT)
SDG	Sustainable Development Goal
SEAFO	South East Atlantic Fisheries Organization
SEAS	Southeastern Arabian Sea
SIDS	Small Island Developing States
SIOFA	Southern Indian Ocean Fisheries Agreement
SKJ	skipjack tuna
SoMFi	*The State of Mediterranean and Black Sea Fisheries*
SOFIA	*The State of World Fisheries and Aquaculture*
SPC	Pacific Community
SPICT	Stochastic Production Model in Continuous Time
SPRFMO	South Pacific Regional Fisheries Management Organisation
SPS	South Patagonian stock (of Argentine shortfin squid in Area 41)
SRA	stock reduction analysis
SRAplus	stock reduction analysis plus
SRFC	Subregional Fisheries Commission
SS	stock synthesis
SSB	spawning stock biomass
SSS	Summer Spawning stock (of Argentine shortfin squid in Area 41)
STAR	Stock Assessment Results (database of the GFCM)
SWAO	Southwest Atlantic Ocean
SWIO	Southwest Indian Ocean
SWIOFC	Southwest Indian Ocean Fisheries Commission
TAC	total allowable catch
TAE	total allowable effort
TRO	total reproductive output
TYL	total yield limit
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UNGA	United Nations General Assembly
USR	upper stock reference
USSR	Union of Soviet Socialist Republics
VMS	vessel monitoring system
VPA	virtual population analysis
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WECAFC	Western Central Atlantic Fisheries Commission
WGBS	Working Group on the Black Sea (of the GFCM SAC)
WGSA	Working Groups for Stock Assessment (of the GFCM SAC)
YFT	yellowfin tuna
YSLME	Yellow Sea Large Marine Ecosystem

KEY MESSAGES

THE UPDATED STATE OF STOCKS: A MAJOR MILESTONE IN FISHERIES ASSESSMENT

- Since the early 1970s, recognizing the importance of assessing the biological sustainability and long-term production potential of marine fisheries, FAO has been providing **regular updates of the state of marine fishery resources,** initially through periodic reviews, and eventually as part of the biennial FAO *The State of World Fisheries and Aquaculture* reports.
- This report provides the **most comprehensive, reliable and participatory assessment of the status of global fisheries resources to date,** involving over **650 experts** from more than **200 institutions** across **92 countries,** making use of the best available data and information and using 2021 as the base year.
- In this analysis **2 570 disaggregated stocks were assessed,** compared to around 450 aggregated stocks used in previous FAO assessments. This expansion and disaggregation in the reference list of stocks provides a **more representative and granulated coverage,** including 778 stocks from the Indian Ocean, 828 from the Atlantic Ocean, the Mediterranean and the Black Seas, 903 from the Pacific Ocean, and 15 from the Antarctic region. In addition, 46 stocks of highly migratory tunas and sharks are included. This provides better information to monitor the state of resources at regional and sub-regional level, for example in areas like the Indian Ocean, where the number of assessed stocks has increased tenfold, and the Central Pacific, which sees a fivefold increase in coverage.
- The analysis includes **fish stocks responsible for 74.2 percent of all marine fishery landings** in the base year and is thus an appropriate proxy of the state of global fisheries resources.
- Transparency is central to the analysis, which applies a **tiered approach** to the representation of stocks across FAO Major Fishing Areas:
  - **TIER 1:**
    Stocks with formal numerical assessments conducted at national or regional levels (1 519 stocks).
  - **TIER 2:**
    Stocks without formal stock assessments, but where enough data and information are available to infer status using surplus-production model approaches (566 stocks).
  - **TIER 3:**
    Data-poor stocks, whose assessments can only be determined applying **weight-of-evidence methods** and approaches (485 stocks).

  Future iterations may expand the reference list of stocks and/or make adjustments between tiers, depending on data availability and methodological improvements, further enhancing accuracy and coverage.

- While this updated estimate of the sustainability of marine fish stocks is a **major milestone,** improving accuracy and granularity, nonetheless **gaps in data and information persist in some regions**. The report highlights where **further investment in data collection and assessments are needed** to ensure representativeness and completeness in future evaluations.
- The updated analysis also provides a **significant degree of harmonization** in the criteria used for the assessment. FAO's analyses have always been based on the principles laid out in the **United Nations Convention on the Law of the Sea,** which calls for States to **maintain or restore populations of harvested species at levels which can produce their maximum sustainable yield (MSY).** To account for uncertainties in biomass estimation and natural fluctuations in stock sizes, this analysis considers that a stock is **overfished** if its biomass is below 80 percent of the biomass that allows maximum sustainable yield (B_{MSY}), and **underfished** if its biomass is above 120 percent of B_{MSY}, be that for deliberate management action or because the fishery has not reached its potential. However, sustainability thresholds differ in some regions, and this is explained where appropriate.
- With increased coverage, higher-resolution data, and a new tiered approach, this analysis will help the community **to better understand and communicate the state of fishery resources, inform national, regional and global policy dialogues, and facilitate discussions on fisheries strategies and sustainable use of marine living resources.** Furthermore, the analysis provides information in support of **indicator 14.4.1 of the Sustainable Development Goals,** which measures the proportion of fish stocks exploited within biologically sustainable levels.

PROGRESS AND CHALLENGES IN FISHERIES SUSTAINABILITY

- The proportion of **marine stocks fished within biologically sustainable levels** was estimated to be **64.5 percent for the base year (2021), with 35.5 percent of stocks classified as overfished. The proportion of overfished stocks continues to increase** at a rate of approximately 1 percent per year in recent times, which is a significant concern. This underscores the urgent need, aligned with the goals of FAO's Blue Transformation Roadmap, to strengthen effective management **across all fisheries.**
- **The results also indicate that a larger number of commercially fished stocks are reported as underfished** compared to previous assessments. This may be due to the expansion in the reference list of stocks and the availability of finer scale information for some stocks, but also the result of deliberate **precautionary measures** being implemented in the management of some stocks.
- When weighed by their production levels, approximately **77.2 percent of the fishery landings in the base year (2021) were estimated to be from biologically sustainable stocks.** This could indicate that, on average, stocks with larger landings tend to be more sustainably managed, highlighting how **effective management supports the recovery and long-term sustainability** of fishery resources.
- The analysis presented focuses on the widely used objective of **maximizing long-term sustainable yields** of fishery resources. While this may not be the preferred management objective everywhere, the results should inform policy dialogues that attempt to **balance conservation objectives with food security, economic development and livelihood objectives.**

FAO MAJOR FISHING AREAS HIGHLIGHTS

- **At a regional level,** and despite large variability, differing assumptions and uncertainties, some **high-level patterns emerge:**
  - In Areas with strong management systems in place, such as the **Northeast Pacific** (Area 67) and **Southwest Pacific** (Area 81) sustainability rates (92.7 percent and 85.5 percent, respectively) were higher than in other areas.
  - The semi-enclosed **Mediterranean and Black Seas** (Area 37), and the **Southeastern Pacific** (Area 87), still face challenges, with only about 35.1 percent and 46.4 percent of fish stocks in the respective Areas considered to be sustainably exploited, despite significant progress being observed in recent years.
  - In the **Eastern Indian Ocean** (Area 57), around 72.7 percent of stocks were estimated to be sustainably exploited. However, caution is required in interpreting this result as some vulnerable species may not have been included in the list of stocks due to the unavailability of data.
  - In the **Eastern Central Atlantic** (Area 47), management efforts, including to reduce bycatch, have resulted in 33.3 percent of fish stocks being assessed as underfished. However, these underfished stocks accounted for just 5.9 percent of the Area's total landings, thus having little impact on the overall sustainability of fishery landings in this region.

KEY SPECIES HIGHLIGHTS

- **Of the top ten species** by declared landings – anchoveta, Alaska pollock, skipjack tuna, Pacific chub mackerel, Atlantic herring, yellowfin tuna, Pacific sardine, European pilchard, blue whiting, and Atlantic cod – **60.0 percent of the stocks were considered to be biologically sustainable,** partly reflecting the number of overfished cod stocks, while **85.8 percent of their landings, were estimated to be from biologically sustainable stocks.**
- **The status of tunas and tuna-like species** demonstrated the impact of strong management action, with **87.0 percent of stocks considered sustainable in 2021 and 99.3 percent of landings coming from biologically sustainable stocks.** This is particularly due to the implementation of effective management plans by fishing nations through **regional fisheries management organizations.**
- Deep-sea fisheries continue to face challenges. Given their long lifespans, these species are particularly vulnerable. **Only 29 percent of deep-sea stocks were sustainably fished,** except in the **Antarctic Area where 100 percent of exploited stocks were estimated to be sustainably exploited.**
- Highly migratory sharks face ongoing pressures. These sharks are mostly caught as bycatch in longline fisheries, though some are targeted. **About 56.5 percent of these stocks were considered sustainable.** These highly migratory shark species have cross-jurisdictional ranges that require international cooperation to implement management measures and secure their conservation and sustainable use.

PART A

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Part A

INTRODUCTION

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1. BACKGROUND AND CONTEXT

Marine fisheries represent a critical source of food and nutrients, livelihoods, culture and well-being to billions of people worldwide. According to FAO (2024), aquatic animal foods contributed to at least 20 percent of the per capita protein supply from all animal sources to 3.2 billion people in 2021. Moreover, the high value of aquatic foods as a source of micronutrients and omega-3 fatty acids provides an opportunity to address important nutrient gaps, including for vulnerable communities who depend on aquatic foods for their diet (Hicks *et al.,* 2019, Basurto *et al.,* 2025). Furthermore, aquatic food systems play a crucial role in supporting the livelihoods of many coastal communities, with FAO (2022) estimating that 600 million people rely, at least partially, on the aquatic food sector (e.g. for direct consumption, employment, and trade or export revenue). Yet, aquatic foods are threatened by climate change, pollution, biodiversity loss, and unsustainable practices, including overexploitation and illegal, unreported and unregulated (IUU) fishing. These threats also present a challenge for science, contributing to uncertainty in data, assessments and thresholds for interpreting results, and therefore, to properly inform management decisions.

Fisheries production is strongly influenced by oceanographic conditions, which affect the distribution and productivity of fish stocks, the availability of nutrients, and the overall health of marine ecosystems. Ocean circulation redistributes heat and water across the globe, influencing local climates. Ocean currents transport larvae and support fish migration, and play a vital role in the availability of nutrients (**FIGURE A.1**), particularly in upwelling areas where nutrient-rich deep water is brought to the surface, supporting high biological productivity and ultimately the growth and abundance of fish and other marine organisms (Barange *et al.,* 2018).

Changes in oceanographic conditions, such as those related to climate change, can have significant consequences for fisheries, potentially leading to shifts in the distribution and productivity of fish populations and thus impacting the food security, nutrition and livelihoods of coastal communities (IPCC, 2019).

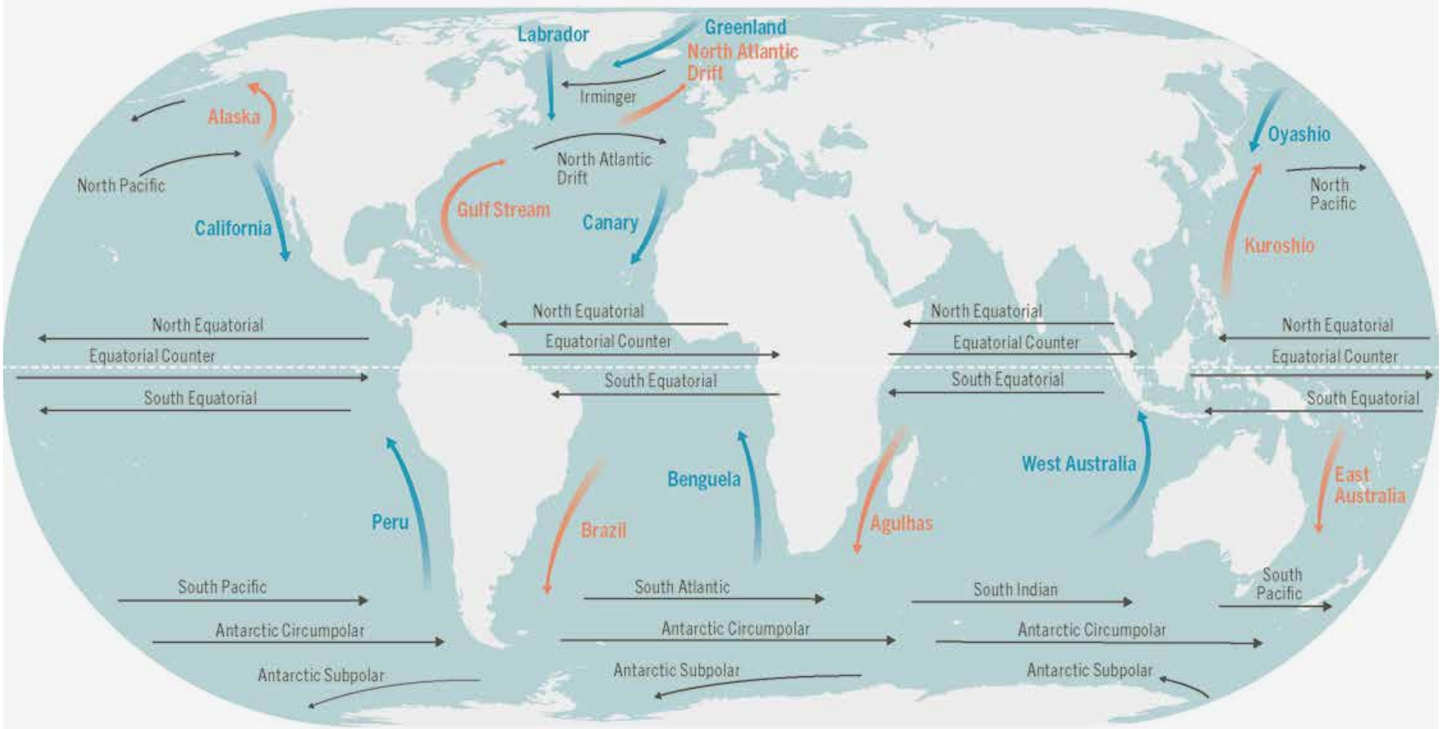
Evidence shows that when fisheries are properly managed with specific objectives to maximize benefits and avoid the risk of overfishing, their stocks are consistently found to be close to abundance levels leading to maximum yield in a sustainable way (also known as maximum sustainable yield, MSY) (Hilborn *et al.,* 2020; FAO, 2022; FAO, 2024). This highlights what can be achieved with adequate management actions, to ultimately support the rebuilding of fishery stocks (Sharma, 2023). Stock assessments are a cornerstone of effective management, providing critical data and knowledge for informed decision-making. For example, when weighted by their production levels, an estimated 77.2 percent of the 2021 landings from FAO-monitored stocks (i.e. stocks that are in the updated reference list which includes 2 570 stocks that are being used as indicators for sustainability) were from stocks classified as sustainable (maximally sustainably fished or underfished), which is significantly higher than the world average of 64.5 percent when assessed by number of stocks.

Maintaining fish stocks at or above, or restoring them to, levels that can produce MSY is mandated by many international agreements and frameworks, including the United Nations Convention on the Law of the Sea (UNCLOS, 1982), the United Nations Fish Stocks Agreement (UNFSA [UN, 1995]), and the FAO Code of Conduct for Responsible Fisheries (FAO, 1995). To monitor progress towards meeting the objectives of these international frameworks and agreements, as well as to ensure the long-term sustainability of and benefits from fisheries resources, assessments of the state of fish stocks must be undertaken to support effective policies and management strategies. As the UN agency with a mandate for fisheries, FAO – in partnership with Members, i.e. countries – is committed to providing the international community with the most accurate and reliable information on the state of exploitation of marine fishery resources (FAO, 2011).

1.1 Background on FAO's review of the state of world marine fishery resources

For over half a century, FAO has regularly provided an overview of the global and regional state of marine fishery resources to support policy formulation, decision-making and the long-term sustainability of fishery resources. The first assessment was published by FAO in a seminal study by John Gulland in 1971. From 1974 to 1997, the analysis of the state of stocks was regularly updated through Fisheries Circulars, and subsequently became the object of several Fisheries Technical Papers – *Review of the state of world marine fishery resources* – published in 1994, 2005 and 2011. Since 1997, the assessments of the state of world fisheries resources have also been updated biennially in FAO's flagship report: *The State of World Fisheries and Aquaculture (SOFIA)*.

FIGURE A.1
MAJOR OCEAN CURRENTS AROUND THE WORLD



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Sources: FAO. 2015. FAO Major Fishing Areas for Statistical Purposes (without insets) Version 2. https://openknowledge.fao.org/handle/20.500.14283/az126e. Adapted from https://worldoceanreview.com/en/wor-1/climate-system/great-ocean-currents/ [accessed on 20 February 2025].

Over time, the statistics and information provided in these reports have become a global reference in discussions on the status and trends of stocks in global and regional fisheries. Currently, the biennial updates on the status of fishery resources, included in *SOFIA* reports, constitute the most authoritative global and regional analysis of the state of exploitation of marine fish stocks around the world, ranking among the most frequently cited references in fisheries (Branch and Linnell, 2016) and consolidating *SOFIA*'s reputation as one of FAO's most impactful publications. To promote consistency and comparability across time, FAO's analyses of the state of fish stocks have been based on two pillars since the start of the series: (1) a reference list of fishery resources (e.g. aggregated stocks) used as a proxy to track the state of fisheries around the world, and (2) a defined methodology for classifying individual fish stocks into one of several categories of state of exploitation. Both of these, with the exception of minor adjustments, have remained consistent since 2011 (FAO, 2011). Data, statistics, and information included in this flagship report series have been helping scientists, policy- and decision-makers, and stakeholders whose livelihoods depend on the sector to improve the sustainability of fisheries (Ovando *et al.,* 2021).

However, over the years, significant changes have occurred in the rapidly evolving landscape of world fisheries, especially with regard to the tools available to assess and monitor marine ecosystems, and the requirements for estimating and presenting global information. These include changes in how society values fishery resources at national and regional levels, as well as ways in which fish stocks are targeted and harvested. Moreover, the data and tools available for assessing the exploitation status of fish stocks have continued to improve, and now often rely on a variety of data sources (including Indigenous and traditional knowledge). New computationally intensive estimation methods, machine learning and the use of decision-support tools, as well as more sophisticated empirical approaches suited for data-limited fisheries, have also enabled a substantial increase in the number of stocks that are and can be assessed. Finally, rethinking what "sustainable fisheries" means in different fisheries management contexts from the perspective of inclusion, agency and local participation in decision-making has influenced the procedures and requirements for estimating and reporting on global information on the state of fisheries.

The development of additional monitoring processes under international, regional, national and local frameworks has also resulted in the need for more efforts to improve alignment and transparency between FAO and these initiatives. For instance, the Sustainable Development Goal (SDG) indicator 14.4.1 (Proportion of fish stocks within biologically sustainable levels) has generated its own national monitoring and reporting requirements. As such, it is important for FAO to ensure that the list of stocks considered in this review both nationally and globally, as well as the approaches and methods to classify fish stocks into the different categories of state of exploitation, are as consistent as possible with these other initiatives, that these monitoring processes are well connected, and that related information is readily available. Improved access to publicly available information has enabled high-impact FAO reports like *SOFIA* to reach ever-larger audiences, increasing their influence on the discourse surrounding the sustainability of marine resources.

1.2 Updated methodology

Recognizing the dynamic nature of fisheries resources and the fisheries sector as well as the need to ensure that relevant knowledge from regions is used in the assessment process, FAO has undertaken an in-depth review of its methodology to estimate and report on the state of exploitation of marine fishery resources. The aim of this review is to improve knowledge about stock status and reduce information gaps, and thus support more effective regional and global policies.

The updated methodology provides more representative, comprehensive and complete indices, as they are calculated on a wider set of disaggregated stocks (2 570 stocks) that are considered to be the most important in the current social, economic and ecological context of fisheries across the world (**APPENDIX II**, pp. 415). The updated approach allows for a higher-resolution assessment of the state of resources in each region, and enables continued improvement through identification of potential gaps in assessment and facilitation of actions to address them. The methodological update expands the scope of available information and increases its alignment with SDG reporting initiatives, thereby strengthening the evidence base for decision-making in the sector.

The updated methodology also represents a paradigm shift towards a more open, transparent and participatory analysis and reporting format, while maintaining the integrity of the FAO index time series. Recognizing the crucial role of regional, national and local fisheries experts in the provision of advice to fisheries management, including the determination of the exploitation status of fish stocks, this updated methodology involves the development and improvement of capacities of local, national and regional fisheries institutions to assess the exploitation state of the stocks, particularly those with limited information. This approach aims to encourage and facilitate greater participation by these institutions, so their regular analyses can be considered in the FAO global and regional analyses, consistent with national reporting on SDG indicator 14.4.1. The methodology is therefore not only a better tool for assessing the overall status of exploited fish stocks, but also acts as a catalyst for empowering national and regional institutions and communities responsible for delivering sustainable fisheries to more effectively monitor and assess their fishery resources.

The updated methodology's more accurate understanding of the status of fishery stocks of interest, both globally and regionally, will enable governments and other decision-makers to better address issues related to assessment and the management of fisheries in their jurisdiction. It will therefore support global efforts to increase the contribution of sustainable fisheries to food security and nutrition while respecting ecological boundaries. This effort aligns with FAO's Blue Transformation vision, the objectives of which include achieving the effective management of 100 percent of marine and inland fisheries (FAO, 2022).

2. PURPOSE OF THE REPORT

This document updates the FAO Fisheries and Aquaculture Technical Paper No. 569, *Review of the state of world marine fishery resources* (2011), as well as expanding and complementing the information provided in relevant fisheries sections from the more recent *SOFIA* reports. The main objective of this report is to provide a full update on the state of marine fishery resources at the global and regional levels since the last comprehensive review published in 2011 (FAO, 2011). The report provides a detailed description of the methods used for preparing, calculating and reporting on the state of world fish stocks, and a comparison with the results obtained using the previous methodology. The organization and presentation of the document closely follows the previous major reviews, but several changes have been introduced in response to suggestions provided by readers of previous editions and reviewers of the current document.

This report comprises five main sections. After the introduction, the second section details the methodology used in the current analysis. The second section provides a global overview of the exploitation status of marine fishery resources; and the third section provides regional overviews of marine fisheries resources. The latter is organized into 16 sub-sections, each corresponding to a FAO Major Fishing Area for Statistical Purposes, that summarize information on major trends and changes in the status of key fishery resources, as well as stock assessment efforts supporting fisheries management. The fourth section of the report focuses on special topics requiring in-depth analysis, including tuna and tuna-like species, deep-sea fisheries and highly migratory sharks . Finally, the document includes a comprehensive list of tables, detailing stocks analysed and their status based on the updated methodology, as well as the methodology used for estimating landings of assessed species not mapped to FAO FishStat database.

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PART B

Illustration © Jana Kleineberg

Part B

METHODOLOGY

PROCESS, ASSESSMENT PROCEDURES, AND MAIN DIFFERENCES BETWEEN THE METHODOLOGY ADOPTED IN THIS REPORT AND IN THE PREVIOUS EDITIONS

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Since its first publication of the global review of marine fish stocks in 1971 (Gulland, 1971), the Food and Agriculture Organization of the United Nations (FAO) has been regularly assessing and reporting on the state of world marine fish resources with the aim of supporting policy formulation and decision-making for the long-term sustainability of marine fisheries at a global level. This section describes the methodology used to produce the results presented in this report, with a particular focus on the modifications to the methods used since the last update to the methodology in 2011 (FAO, 2011).

1. THE PROCESS

Over a period of two and a half years (2022–2024), FAO developed and implemented an updated methodology for assessing and reporting on the state of fish stocks. This process was participatory, decentralized and inclusive, engaging national and regional institutions and experts. It enabled a more comprehensive and high-resolution assessment that includes most of the regional and local assessments in the world, and that is better aligned with regional management needs. This undertaking involved 19 regional workshops and online consultations, with around 650 in-person experts representing some 90 countries and 200 organizations.

This broad dialogue with fisheries institutions from FAO Members and regional fisheries bodies (RFBs) was critical to defining key elements of the updated methodology. For instance, it supported the identification of what can be considered separate stocks based on local ecological, social and economic contexts, as the reference list of stocks upon which the global assessment is based was also revised. The process for updating the methodology was designed with capacity development as its core feature, especially benefiting data- and capacity-limited regions. Engaging with national and regional institutions early in the process strengthened their capacity to actively contribute to the state of stocks assessment and supported future streamlining and standardization of the assessment process. This more collaborative and transparent approach conveys greater legitimacy to the FAO stock status methodology and increases confidence in the results.

2. ASSESSMENT PROCEDURES

2.1 FAO index of the state of exploited marine fishery resources

FAO reports on the state of marine fishery resources in a given FAO marine region using a basic index of the overall condition of the marine resources, as originally proposed by Gulland (1971). This index is an estimate of the number of stocks in a particular category or state as a fraction compared to the total number of stocks in the area being assessed. The category or state is the current biomass of the stock as a fraction of the biomass giving maximum sustainable yield (MSY). This fraction is known as B_{MSY}. The estimate is calculated on a non-random sample of the stocks exploited in a specific area, selected to include the stocks currently of commercial importance, and thus more likely to be managed. This sample is denominated the "reference list" for the index in that region. The formula below summarizes the index:

$$p_i = \frac{N_i}{N}$$

where p_i is the proportion of stocks in the reference list that are in the category of state of exploitation i, N_i is the number of stocks in the reference list that are classified into that same category, and N is the total number of stocks in the reference list from the area.

Some of the stocks used in the calculation constitute a much larger proportion of the total catch, and therefore aquatic foods, than others. To account for the difference in relative contribution of stocks to the overall fisheries production, the index is also calculated in terms of the declared landings, as:

$$q_i = \frac{W_i}{W}$$

where q_i is the proportion of the total declared landings allocated to stocks in the reference list that is allocated to stocks classified into the category of state of exploitation i, W_i is the sum of the declared landings allocated to stocks in the reference list that are classified into that same category, and W is the total declared landings allocated to stocks in the reference list of stocks from the area. Sometimes, species assessed had no recorded landings in the FAO FishStat database; in those cases, the global not elsewhere included (NEI) categories was allocated to those groups using a proportional ratio-based algorithm of the assessed stocks.[1] The coverage of assessed landings refers to the proportion of total declared landings that are assigned to assessed stocks, relative to the total declared landings in a given area or globally. For this analysis, the declared landigns used to calculate coverage include highly migratory species, such as sharks, tunas, bonitos and billfishes, even though these species are excluded from the analysis of stock status presented in the area-specific chapters, as they are addressed separately in Part E on Special topics.

This index is calculated for 18 of the 19 marine FAO Major Fishing Areas for Statistical Purposes (hereafter, FAO Major Fishing Areas or Areas) (**FIGURE B.1**) – Area 18 is not included because the available data for this region was insufficient. Moreover, the index for Areas 88, 48 and 58 is reported as aggregated because all these Areas are under the jurisdiction of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). An Area is a geographically defined region used by FAO to organize the collection and analysis of statistics on global fishing activities; their boundaries were determined in consultation with international fishery agencies taking into account, to the extent possible, various considerations (e.g. natural boundaries, existing national practice and boundaries, the distribution of aquatic fauna, resources, environmental conditions, areas of competence of existing fishery commissions) (FAO, 2015). The limits of the Areas were set in the 1950s and have not been revisited since. It must be noted that some Areas – such as Areas 41, 51, 57, 71, 77 and 87 – are too large to have natural boundaries, and have been defined based mostly on statistical convenience.

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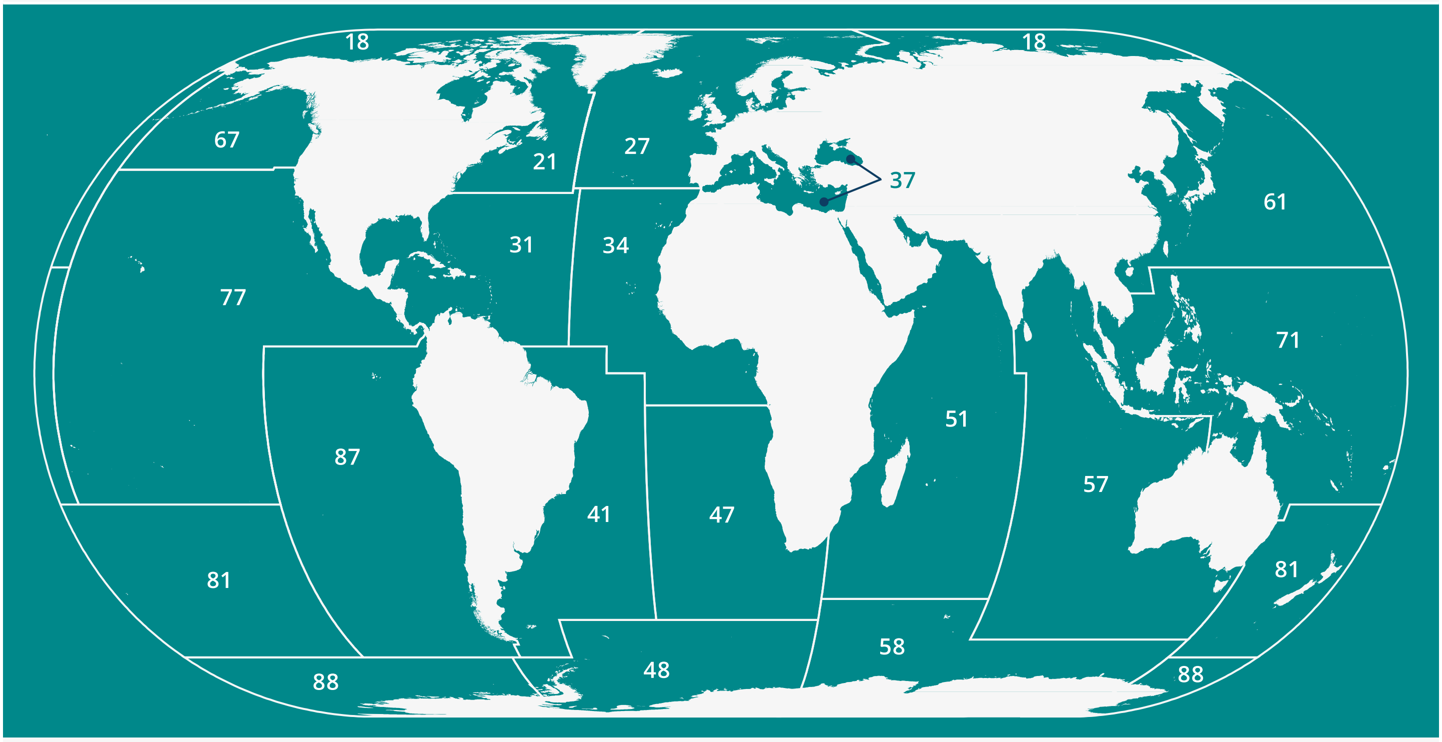
1 See **APPENDIX I** for the methodology for estimating landings of assessed species not mapped to FAO FishStat database.

While the formula for the index itself is simple, defining what exactly a stock is, which stocks should be included in the reference list from a particular region, and how they should be classified into categories of state of exploitation are complex, value-laden, context-specific decisions filled with uncertainty. As such, the assessment procedures for estimating and reporting on the FAO state of stocks have been organized into the following steps, facilitating a clear understanding of decisions taken at each juncture:

a. Defining the criteria for determining the state of exploitation.
b. Defining the categories of state of exploitation.
c. Defining the criteria for classifying stocks into each category (of state of exploitation).
d. Defining the reference list (i.e. the sample of assessment units (stocks) to be classified for each Area considered in this work).
e. Collecting/collating data and information relevant to the classification of stock status for the assessment units (stocks) included in the reference list agreed in step (c), per the criteria defined in step (d).
f. Classifying the assessment units (stocks) included in the reference list (step d) using criteria in step (c) into the different categories of stock status (step b).
g. Estimating the value of the FAO state of the stocks index (i.e. the percentage of stocks classified into each category of stock status, based on either the number of stocks or the weight of catch by stock) for the world and for each relevant Area, based on the outcomes of the classification of stocks in the reference list for each Area.
h. Building the time series of the FAO state of the stocks index for the world and for each relevant Area.

FIGURE B.1
FAO MAJOR FISHING AREAS FOR STATISTICAL PURPOSES



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: **FAO.** 2015. FAO Major Fishing Areas for Statistical Purposes (without insets) Version 2. https://openknowledge.fao.org/handle/20.500.14283/az126e

2.2 Defining the criteria for determining the state of exploitation

The state of exploitation of a fish stock is normally assessed based on the relationship between stock abundance and productivity, and particularly referring to the concept of MSY. It is useful to note that the fishery productivity (yield) of a stock is around zero if unexploited and maximal when its biomass reaches B_{MSY}. If exploitation continues to increase above MSY, then the stock biomass will decline below B_{MSY} as well as the fishery productivity.

MSY remains a guiding principle of fisheries management. For example, the United Nations Convention on the Law of the Sea (UNCLOS, 1982), the United Nations Fish Stocks Agreement (UN, 1995) and the FAO Code of Conduct for Responsible Fisheries (FAO, 1995) require fish stocks to be maintained at levels that can produce MSY or to be restored to such levels. There are several MSY definitions in practice, including equilibrium definitions that were commonly used when UNCLOS was signed to more recent ones that are based on the average yield from a fixed F and with inclusion of uncertainties or variation in production (e.g. determined through simulation). Keeping stocks at or above a level that is able to produce the maximum production also corresponds to maximizing the sustainable production of aquatic foods from these stocks, and is therefore in line with FAO's mandate. It is important to note that MSY is a single species construct, which does not necessarily apply to management in a mixed stock complex; this is intricately connected with biodiversity in a system. In such fisheries, realistic multi-species targets need to be determined that may conflict with the single species MSY construct (Fulton *et al.,* 2022).

Fisheries science indicates that the stock can be harvested (i.e. yield taken) continuously without affecting its sustainable yield (MSY) depending on the abundance of the stock relative to its B_{MSY}. The sustainable yield is low when there are very low or very high levels of abundance (and natural productivity is very low), and it is maximum (MSY) at some intermediate level (where natural productivity is highest). The actual catch depends on the stock and tends to vary naturally around its long-term average. The exploitation state of a fish stock is defined on the basis of its level of abundance relative to B_{MSY} (i.e. on whether its abundance is lower, equal or higher than the current B_{MSY}).

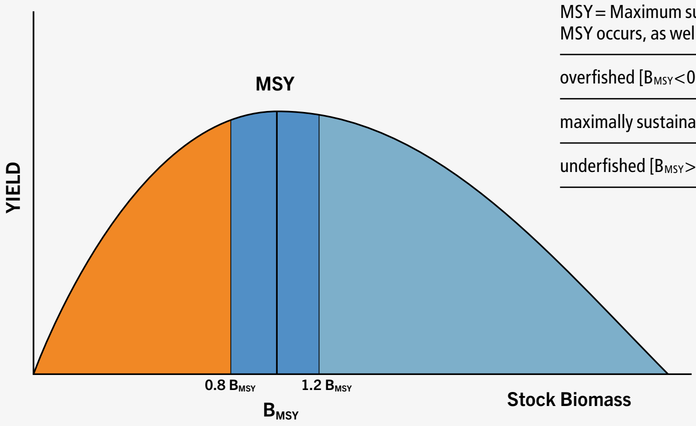
FAO recognizes that while fish stocks are often managed to extract the maximum, average production of food from them in a sustainable manner, management objectives related to livelihoods, cultures and wellbeing, as well as biodiversity conservation and nature-for-nature values, are important and are also pursued in certain fisheries jurisdictions. Many other stocks are already managed with economic (e.g. to maximize sustainable revenue) or environmental (e.g. to minimize impact on ecosystems) objectives, thus aiming at targets other than B_{MSY}, both resulting in yields lower than MSY. In some management contexts, "sustainability" has been interpreted to mean having a low risk of collapse, and if this interpretation is used, a fish stock can be fished down to levels of biomass below MSY and still be "sustainable" in the long term, provided its capacity to replenish itself is not compromised (this is often referred to as the limit reference point [Haddon, 2011]). These scenarios recognize that fisheries management often involves multiple objectives that are not always related just to maximising yields.

This work will not consider these multiple views or the desirability of alternative measures of state of exploitation. For consistency with previous works and with FAO's mandate, it considers only the abundance of the stocks relative to their single species B_{MSY}, using this as the yardstick to measure the state of exploitation of the marine fishery resources of the world. This primarily comes out of UNCLOS, where fishing occurs above MSY and not beyond the point where reproduction is threatened, and is thus used for evaluation purposes here.

2.3 Defining the categories of state of exploitation

Exploited fish stocks whose abundance is above or close to the biomass that produces the optimal MSY (BMSY), in line with UNCLOS, are classified by FAO as "maximally sustainably fished", while those with abundance well below BMSY are labelled "overfished" and those with abundance well above BMSY are classified as "underfished". The classification as "underfished" implies that the stocks could produce more catch if fishing was increased. The classification of "overfished" refers to stocks that could generate greater yields if allowed to recover, and is therefore relevant from a food production point

FIGURE B.2
YIELD AS A FUNCTION OF STOCK BIOMASS SHOWING MAJOR REFERENCE POINTS.



MSY = Maximum sustainable yield; B_{MSY}: biomass at which MSY occurs, as well as the ranges for stock status classification

overfished [B_{MSY}<0.8],	ORANGE
maximally sustainably fished [0.8<B_{MSY}<1.2]	BLUE
underfished [B_{MSY}>1.2]	LIGHT BLUE

Source: modified from **Hilborn, R. & Walters, C.J.** 1992. *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty.* London, Chapman & Hall. https://doi.org/10.1007/978-1-4615-3598-0

of view. While it is possible to subdivide each of these three levels into sublevels, based on considerations such as the trend in the estimates of biomass or fishing mortality, this subdivision is very uncertain for most fish stocks; as such, since 2011, FAO only uses these three categories of state of exploitation (underfished [U], maximally sustainably fished [M], and overfished [O]) (**FIGURE B.2**).

2.4 Defining the criteria for classifying stocks into each category (of state of exploitation)

The classification of the state of exploitation of fishery stocks refers to the method by which stocks are classified into the different categories of exploitation, designated in this report as underfished, maximally sustainably fished, and overfished.

The estimation of the exploitation level of a fish stock, and thus its classification into one of the three categories of state of exploitation, is very difficult to carry out with precision and accuracy, not only because it is difficult to estimate the biomass of fish stocks, but also because the precise value of B_{MSY} will fluctuate as a consequence of variability in the natural environment. Taking into consideration this uncertainty, FAO applies a buffer of 20 percent of uncertainty around the estimate of B_{MSY} to define the "maximally sustainably fished" state. Thus, any stock for which the estimation of the ratio between current biomass (B_{CURR}) and B_{MSY} (B_{CURR}/B_{MSY}) is between 0.8 and 1.2 is classified as "maximally sustainably fished" (**FIGURE B.2**). Consequently, only stocks for which the estimate of this ratio is above 1.2 are classified as "underfished", and those for which the estimate is below 0.8 are classified as "overfished".

FAO Members are also interested in understanding the patterns and trends in the sustainability of exploited fish resources. Therefore, this work also reports on the evolution of the estimated percentage of sustainable stocks across time. Related initiatives, such as SDG indicator 14.4.1 that define "biologically sustainable stock" as "a stock of which abundance is at or greater than the level that can produce [MSY]", don't explicitly consider natural variability of B_{MSY} values and uncertainty in their estimates; for the purposes of this report, a range of abundance values, from 0.8 B_{MSY} to 1.2 B_{MSY}, is considered for the stock to be classified as "maximally sustainably fished". Accordingly, the estimator for the proportion of biologically sustainable stocks for a given Area is the proportion of stocks classified as either "maximally sustainably fished" or "underfished" in a subset of stocks from that region that were assessed for state of exploitation.[2]

[2] https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1441-fish-stocks-sustainability/en

However, there are some exceptions to this. Some national and regional fisheries organizations use a classification system that is not directly based on B_{MSY} and the thresholds described above, but rather on other reference points. These differences, and the implications they have for attempts to compare stock status between regions, are discussed in more detail in the chapters for these Areas.

2.4.1 Updated methodology: A three-tiered approach to classifying stock status

Given that availability and quality of data and information vary greatly among regions, FAO's classification methodology should capture these differences. In some regions, data and knowledge are relatively abundant for most stocks, enabling the use of more information-intensive, data-rich stock assessments. In other regions, experts may only have access to reported landings for almost all stocks, restricting assessments to data-poor methods.

To address some of these challenges, FAO has updated its methodology for classifying fish stocks. A tiered approach to classification was introduced that is more flexible, transparent and replicable, and that maximizes the use of available information. Each of the

TABLE B.1
THE CRITERIA FOR ASSESSMENT UNIT (STOCK) CLASSIFICATION INTO TIERS

Tier	Definition
TIER 1 Formal assessments	**Tier 1 includes stocks where formal, "traditional" computational assessments are available (either publicly or upon request) that are considered scientifically sound and reliable.** The data and analysis have been scrutinized for validity using clear pre-agreed criteria. If no serious flaws were found in either the data or the analysis, the stock status was derived directly from the assessment report (i.e. no reanalysis of the data was performed). If, by contrast, serious flaws were found, the stock was placed into one of the other two tiers and its status was classified using the corresponding methods. A Tier 1 assessment should use a reliable methodology and verifiable data, and should currently be used by a jurisdiction for direct fisheries management. The assumption used for Tier 1 is that there is a review process either at a regional or national level that ensures that the assessment is reliable. The reference list used in the current assessment includes 1 519 stocks that fall into this category.
TIER 2 Surplus-production model approaches	**Tier 2 includes stocks for which a formal assessment has not been conducted or deemed sufficiently reliable** (e.g. assessments that may be outdated or not peer-reviewed), but a reliable time series of catches is nonetheless available, accompanied by sufficient auxiliary information (e.g. external data on landings with abundance indices, standardized catch per unit effort [CPUE], expert-driven priors for depletion), which can be used to infer stock status by fitting a model based on surplus production (e.g. stock reduction analysis plus [SRAplus]). These stocks were assessed collaboratively by FAO and regional and national experts using surplus production model type approaches to infer stock status in dedicated regional workshops. The data and information available were screened using a clear set of criteria in order to establish that auxiliary information was sufficiently reliable to proceed with model-based assessments. The reference list used in the current assessment includes 566 stocks that fall into this category.
TIER 3 Data-limited approaches	**Tier 3 includes stocks where there are no formal assessment nor sufficient information to apply a standardized production model-based approach like in Tier 2.** Instead, stock status is assessed with indirect indicator-based methods, such as weight-of-evidence approaches which may rely on trends in CPUE or length-based indicators. These types of assessments make use of all available qualitative/semi-quantitative data, knowledge and information, and are often accompanied by a peer-review process. The reference list used in the current assessment includes 485 stocks that fall into this category.

three tiers encompasses variable types of data and information, which are associated with specific and distinct stock assessment methods.

Fish stocks were sorted into tiers based on the type of assessment, data and information available for the stock, using a clear decision matrix. All stocks were placed in the highest possible tier given the data and information available. **TABLE B.1** and **FIGURE B.3** set out the criteria for the decision matrix for each tier.

TIER 1
CRITERIA FOR CLASSIFICATION OF FISH STOCK STATUS

To fit the criteria for "traditional" stock assessment, the following forms of analysis were considered: age-structured (Stock Synthesis, SS[3]), length-structured (MULTIFAN-CL,[4] CASAL,[5] SS), integrated assessments and/or surplus production approaches using Bayesian techniques and random effects (JABBA,[6] SPICT,[7] SAM[8]) (Nielsen and Berg, 2014; Berg and Nielsen, 2016) or specific models developed to suit the life-history and specifics of the species being assessed that were built using programming languages like ADMB,[9] TMB[10] and R.[11] Tier 1 assessments were made based on more than 20 years of data on landings along with either a survey or a standardized CPUE series, and age/length data if available.

The assessments in this class should normally undergo a peer review process as adopted at some of the tuna regional fisheries management organizations (RFMOs) or in national and other fisheries advisory institutions with a long history in dealing with large stocks in developed countries (e.g. ICES, the Northwest Atlantic Fisheries Organization [NAFO], the North Pacific Fisheries Commission [NPFC]). However, the review process varies in terms of rigour from a data-rich to a data-poor context which generates assessments that do not necessarily have similar review processes, yet are still used to provide the best available scientific advice required by UNCLOS on the status of the stock and the type of management to be followed.

TIER 2
CRITERIA FOR CLASSIFICATION OF FISH STOCK STATUS

The criteria for sufficient auxiliary data for Tier 2 assessments adopted in the updated methodology are that a minimum of 20 years of catch landings data are used along with other supplementary information like effort, CPUE and/or survey time series for a period associated with the landings (ideally for the entire series but at least for 10–15 years overlapping with the landing information). In order to classify stocks into different categories of state of exploitation, FAO uses the software SRAplus[12] (Ovando *et al.,* 2021) using datasets that include catch and effort/survey/CPUE series. Over the last decade, FAO explored the possibility of using time series of officially declared catches to assess the state of fish stocks using catch only models (COMs). Although the COMs were initially considered a promising approach, recent detailed studies have shown that results tend to be influenced by model structure, priors and other assumptions rather than by the catch data itself, and/or conditioned by management actions rather than represent true stock status (Sharma *et al.,* 2021; Ovando *et al.,* 2021). They require significant volumes of high-quality additional data and information such as CPUE or comparable metrics, to provide acceptably precise estimates on the level of "depletion" (current abundance relative to unexploited state). In most cases this type of data is not available, so they are not able to produce better or more reliable status estimations compared to expert opinions. Therefore, the solution for an improved assessment is to generate better auxiliary data for inference.

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3 Statistical age-structured population modelling framework

4 Length-based, age and spatially-structured model for fisheries stock assessment

5 C++ Algorithmic Stock Assessment Laboratory

6 Just Another Bayesian Biomass Assessment

7 Stochastic Surplus Production Model in Continuous Time

8 State-space Assessment Model

9 AD Model Builder, or ADMB, is a statistical application that implements AD using C++ classes and a native template language.

10 Template Model Builder, or TMB, is an R package that implements AD using C++ templates.

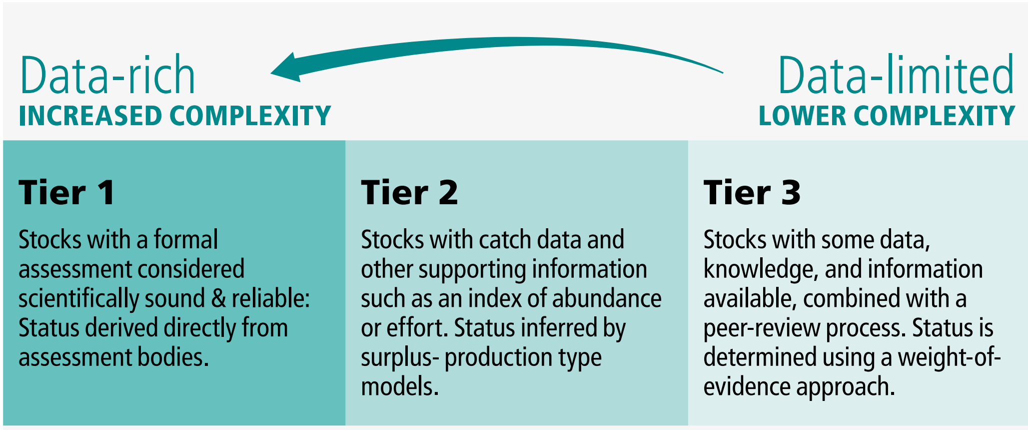
11 R is a language and environment for statistical computing and graphics.

12 Stock reduction analysis plus (SRAplus) includes options to estimate depletion based on external covariates.

TIER 3
CRITERIA FOR CLASSIFICATION OF FISH STOCK STATUS

If the amount of detail and/or quality of data were found to be insufficient for either Tier 1 or Tier 2 approaches, the stocks were assessed with Tier 3 methods. The status of stocks in this tier was categorized by applying a 'weight-of-evidence' approach that uses all available sources of data or information that can provide evidence on the exploitation state of fish stocks, from complex integrated models to expert knowledge, in a documented process validated by a clear algorithm and decision support system. The weight-of-evidence approach is an approach used to support evidence-based decision-making (Stobutzki *et al.*, 2015).

FIGURE B.3
TIERS IN STOCK ASSESSMENTS



2.4.2 Uncertainty

In this report, uncertainty is assessed at two levels: at the level of each individual stock and at the level of each FAO Major Fishing Area.

The uncertainty at the level of individual stocks describes how certain we are about the classification of that stock into a given category of exploitation state. In other words, it communicates the level of confidence in the assessment based on expert knowledge about data, information sources, assessment model reliability, or the trustworthiness of the assessment process itself – for example, the frequency, independence and rigour of the peer-review process. In general, the more detailed the peer review, the more confident (less uncertain) we are about the results of the classification of that stock.

The uncertainty at the level of each FAO Major Fishing Area refers to how certain we are about the proportions of stocks in the reference list in the Area estimated and reported. This is related to the overall uncertainty of the assessments of the stocks in the reference list, and is in turn associated with the overall quality of the information available and the capacity to analyse it.

In general, uncertainty is aligned with the type of assessment (Tiers 1–3). Where data are sufficient to support a full stock assessment, uncertainty is considered low. Where an index-based approach is used, current status is less clear and uncertainty is usually medium unless there is more information supporting a more precise stock status. Finally, high uncertainty is usually associated with poor assessments such as from Tier 3.

This evaluation considers integrated assessments and index-based assessments that have well-defined reference points as having low uncertainty.

2.5 Defining the reference list of stocks

To promote consistency and comparability across time, FAO has updated the reference list only occasionally since the beginning of the time series in 1974. Moreover, the set of stocks was determined by aggregation patterns in the data on landings that were reported to the FAO Statistics Office (now FAO Statistics Division), resulting in lists that did not necessarily reflect societal values. The most recent (minor) update to the reference list was made in 2011 (FAO, 2011).

Nevertheless, the relative socioeconomic and cultural importance of different fisheries resources has changed appreciably over the last few decades. For many of the FAO Major Fishing Areas, the stocks in the 2011 version of the reference list needed to be updated to better reflect evolved biological knowledge, management arrangements, reporting expectations and socioeconomic values. A more transparent and representative reference list was therefore needed, as well as a process for revising the list periodically for it to remain up-to-date. This revised methodology for determining the status of stocks index therefore includes a significant update to the reference list.

The reference list used in this work was selected through a participatory process with local, national and regional experts to increase the representativeness of the stocks most relevant to the fisheries of each Area (for more information, see **PART C, GLOBAL OVERVIEW**, pp. 20). The methodology for developing this updated and more comprehensive reference list involved a desk search of published and grey literature on stock assessments or descriptions of fisheries, combined with consultations with fisheries institutions and experts from relevant countries and non-governmental organizations in each Area to identify stocks of national or regional importance. These consultations were integrated into the broader regional and national consultations held as part of the overall process for updating the full methodology (see section 1 of this chapter).

The new assessment units identified through this process were then reconciled with those in the 2011 reference list by using the finest level of resolution to obtain a more comprehensive reference list for each Area (stock and species lists were aggregated in the past, while the update uses stock-specific units). The criteria for inclusion of a stock in the reference list are as follows:

- **Assessment units or stocks with a formal assessment.** The main stocks with a recent formal assessment were included and the existence of such assessments is a clear indicator of the importance of these stocks.
- **Assessment units or stocks included in national reports for SDG indicator 14.4.1.** A selection of stocks included in national reports for SDG indicator 14.4.1 were included based on expert advice for the region.
- **Assessment units or stocks of national or regional importance,** as indicated by the level of declared landings or by literature (published and grey literature).
- **Other stocks, selected based on expert advice,** to improve the representativeness of the reference list as a sample of all the exploited fish stocks in each Area.

The updated reference list has grown from fewer than 150 in 1974, to 590 aggregated[13] species-based assessment units in 2011 (FAO, 2011), to 2 570 assessment units in this report (**APPENDIX II**, pp. 415). The increase in the recent report largely corresponds to management units within exclusive economic zones of countries or transboundary stock units. This change was largely a result of a shift in the means by which assessment units are identified. Previously, the reference list primarily consisted of species groups. Within a species, there may have been one unit or ten management units, but the entire group of units was classified based on the dominant one (i.e. the one with the largest catch). Thus, there was often a mismatch between the group assessment by FAO aggregates and the

[13] Aggregate means that even if a number of distinct management units are available, only one species was assessed as a whole.

actual status of the different management units within that group. Now, the updated methodology has increased the resolution of stocks being assessed so that assessment units are more likely to correspond to management units and assessment and management initiatives at national or regional level.

With this updated approach to developing the reference list, this report also aims to more closely align with other monitoring processes (importantly, including national reports on SDG 14.4.1 [**BOX B.1**], if agreed to by the peer review group at the consultative workshops). Indeed, over the last decades, monitoring processes have multiplied as the ocean has increasingly been brought to the forefront of global conversations. Improving consistency across these reporting frameworks will improve confidence in the results.

2.6 Collecting and collating data and information relevant to the classification of stock status for the assessment units (stocks) included in the reference list

To collect and collate data and information to classify the stock status for each assessment unit in the reference list, FAO combined the knowledge of FAO experts (including regional experts such as technical secretaries of RFBs) with that of experts from national and regional institutions. The involvement and active participation of local, national and regional institutions in the process for data collation and analysis was vital for ensuring that locally available knowledge and information was used in the calculation of the FAO status of stocks index for the different FAO Major Fishing Areas. The deep involvement of these experts also broadened the range of knowledge and representativeness of information compared to previous global assessments. This consultation process was accompanied by internal protocols designed to ensure the objectiveness of the FAO analysis. The final decisions on the individual classifications and the overall status, however, are those of FAO.

2.7 Classifying the assessment units (stocks) included in the reference list into the different categories of stock status

Once the data were compiled, each stock in the reference list was classified (Tier 1) or assessed and classified (Tiers 2 and 3) into one of the three categories of state of exploitation by applying the methodologies defined for each tier. FAO brought all the data and assessments to the regional expert workshops, where the experts reviewed the work and were able to suggest modifications and improvements. This was followed by an internal

BOX B.1
INDICATOR 14.4.1 PROPORTION OF FISH STOCKS WITHIN BIOLOGICALLY SUSTAINABLE LEVELS

14 LIFE BELOW WATER

This indicator measures the sustainability of the world's marine capture fisheries by their abundance. A fish stock of which abundance is at or greater than the level that can produce the maximum sustainable yield (MSY) is classified as biologically sustainable. In contrast, when abundance falls below the MSY level, the stock is considered biologically unsustainable. The indicator will measure progress towards SDG Target 14.4.

TARGET 14.4

By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

Source: https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1441-fish-stocks-sustainability/en

(FAO) and external peer-review process to perform the quality assurance and finalize the results presented in this report.

2.8 Estimating the value of the FAO state of the stocks index

Once the stocks in the reference list were classified into the corresponding categories of state of exploitation, FAO staff and experts applied the simple formulas for the index to compute the proportion of stocks (in number and in weight) classified into each category in the reference lists for each Area. The proportions calculated for the reference lists were used as the estimates for each Area and for the world as a whole.

2.9 Building the FAO state of stocks index time series

To build the time series of the estimates of the state of exploitation of fish stocks for each Area, the values estimated for the last year of data were appended to the previous ones, now making a time series from 1970 to 2021.

While there have been appreciable changes in the detailed methodology used to compute the index across time, this has not changed its nature as an estimator of the proportion of the exploited fish stocks in each category of state of exploitation, even though the set of stocks assessed changed with time and the methodology was updated. FAO considers the accuracy of the estimator have been increasing along the time series, as a result of improvements in the methodology, and particularly having a more representative reference list of stocks used to compute the estimates of these proportions.

Starting with fewer than 150 different species groups in 1974, the reference list used to calculate the index has grown almost twenty-fold to 2 570 in 2021, as individual stock units are now used, some of which were previously aggregated in a species grouping. The improvement in granularity since the last update is substantial. It is now possible for FAO to build a more accurate representation of the current state of global fisheries compared to the past, and relate status to fishery management. In particular, the quality of the estimator will have improved more forthose Areas with weak representation in the past due to representation in the past due to limitations of data and capacity. This gives a more comprehensive view of the state of exploitation of global marine fishery resources.

The FAO index is a proportion, and each edition of the global assessment was based at the time on the best available and data-driven estimate of the state of exploited fishery resources. However, the resolution has moved from an aggregate species basis to a higher stock resolution. There have been some changes in the status categorization by Areas, arising mostly from a more complete reference list. However, comparisons with the year 2021, using both the previous and updated approach, showed that the global estimate of status over time has been reasonably consistent. This provides some assurance that the improvements in the methodology did not significantly compromise the integrity of the time series. However, it is important to note that some individual Areas have experienced substantial changes, and that the distribution of maximally sustainably fished and underfished stocks have also changed.

3. MAIN DIFFERENCES BETWEEN THE METHODOLOGY ADOPTED IN THIS REPORT AND IN PREVIOUS EDITIONS

Prior to 2011, the methods used to classify the state of exploitation of fishery stocks were more dependent on the information readily available to the experts analysing the information and data and their decisions, and methods were not standardized. In 2011, the method for classifying stocks into categories became more standardized (**TABLE B.2**). The following four indicators in the classification of stock status were used: (1) stock abundance, (2) spawning potential, (3) catch trend, and (4) size/age composition. The ability to use these indicators varied according to the availability of data (FAO, 2011). Indeed, for a large bulk of unassessed stocks in the Global South, catch trends and substantiated expert opinions were used to classify the stocks. Alongside the four suggested categories of classification indicators, the 2011 methodology also included an approach for estimating and reporting uncertainty, organized in three categories (low, intermediate and high), reflecting the robustness of the data and methods used. This uncertainty score was meant to help determine how best to make use of assessment results (FAO, 2011).

The updated methodology for assessing the state of fishery resources is more responsive to local values and management efforts, while striving to maintain, as much as possible, the consistency of the time series. The methodology is based on a devolved and collaborative model of scientific research, while strengthening capacity, trust, and agency among countries and RFBs.

As the methodology is more transparent and replicable, assessments can be more easily verified. In addition, the assessments are more representative of the likely status of stocks on the ground. Numerous unassessed/data poor stocks have been added in this state-of-stocks index and so the sample size and representativeness has increased, but these stocks have also increased the level of uncertainty. Nonetheless, accuracy has improved because of the assessment methodology has improved; the range of models used, their level of sophistication, and the number of experts involved better reflect the details of activities on the ground.

Notwithstanding the widespread consultation and the efforts to standardize the methodology, there are still differences in the quality and coverage of information across regions, as well as in some of the assumptions made. Caution should therefore be exercised in attempting to compare stocks' status across regions using this methodology.

A key intention of applying this updated methodology is to decentralize a significant part of the work that goes into multiple global assessments, in favour of more transparent bottom-up approaches valuable for local management contexts, while informing policies and regional decision-making in an objective manner. The aim is for these improvements to continue in future iterations of this report, as the commitment of the global community of experts whose time, wisdom and effort made this new collaborative methodology possible.

TABLE B.2
CATEGORIES OF STATE OF EXPLOITATION USED IN FAO REPORTS

<table>
<tr><th></th><th>Categories pre-2001</th><th>Categories 2011–2018</th><th>Categories since 2018</th><th>Sustainability of exploitation</th></tr>
<tr><td rowspan="6">Categories of state of exploitation</td><td>Underexploited</td><td rowspan="2">Underexploited</td><td rowspan="2">Underfished (U)</td><td rowspan="3">Sustainably exploited</td></tr>
<tr><td>Moderately exploited</td></tr>
<tr><td>Fully exploited</td><td>Fully exploited</td><td>Maximally sustainably fished (M)</td></tr>
<tr><td>Overexploited</td><td rowspan="3">Overexploited</td><td rowspan="3">Overfished (O)</td><td rowspan="3">Not sustainably exploited</td></tr>
<tr><td>Depleted</td></tr>
<tr><td>Recovering</td></tr>
</table>

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PART C

Part C

GLOBAL OVERVIEW

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The 2025 *Review of the state of world marine fishery resources* was developed over the course of three years, 2022–2025. It follows the same overall approach as the previous editions of this report, but with some important changes to the methodology and process that are described in detail in the previous section (PART B, METHODOLOGY, PP.6).

The main modifications to the process were:

a. an increase in the participation of national and regional experts in the assessment, with around 650 experts globally (480 in person and 170 online), 200 national institutions, regional institutions and non-government research organizations, and 92 countries (**FIGURE C.1**);

b. an important update and expansion of the reference list of stocks to be assessed (from 584 aggregated stocks in 2011 to 2 685 disaggregated stocks[1] in 2025, of which 2 570 were assessed in this report, **APPENDIX II**, pp. 415); and

c. the explicit splitting of the reference list of stocks into three "tiers" (**TABLE C.1**, **FIGURE C.2**), based on the best data and information available and methods used to classify them into one of the three categories of state of exploitation: "underfished", "maximally sustainably fished" or "overfished". These categories were based on similar thresholds as in 2011, with stocks considered "overfished" if the biomass was estimated to have fallen below 80 percent of the level expected to maximize long-term yield (i.e. $B/B_{MSY} < 0.8$ or the level that regional experts considered equivalent if the estimates of B_{MSY} were not available).

1. STATUS AND TRENDS OF RESOURCES

1.1 Global status and trends

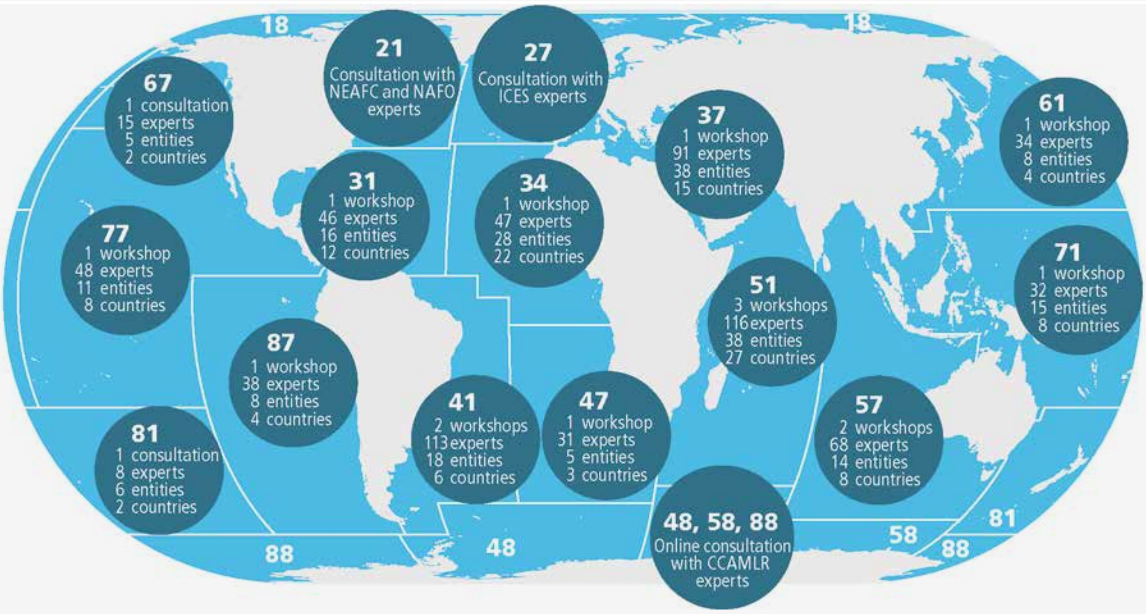
Results from the updated analyses indicate that the percentage of fishery stocks classified to be within biologically sustainable levels (i.e. not "overfished") in 2021 (latest data available) was 64.5 percent (**TABLE C.2**, **FIGURE C.3**). While these global results are close to previous estimates – 64.6 percent in 2019 and 65.8 percent in 2017 – regional estimates show a diverse degree of discrepancies from the previous approach (**TABLE C.3**). It is worth noting that these calculations treat all fishery stocks equally, regardless of abundance, declared landings or the level of uncertainty in assessments. When weighted by their production levels, 77.2 percent of assessed stocks were classified as biologically sustainable in 2021.

Of the total number of assessed stocks classified as biologically sustainable in 2021, those classified as maximally sustainably fished and underfished accounted for 41.6 percent and 22.9 percent of the total number of assessed stocks in 2021, respectively, and for 50.7 percent and 26.5 percent of stocks when weighted by landings, respectively. The recent increase in underfished and decrease in maximum sustainably fished stocks is due to the large number of extra species added into the reference list of stocks from Areas that previously reported few species (e.g. Areas 51, 57 and 71); overall, these did not impact the estimate for the portion of sustainable stocks. However, this does not mean that there is large potential to exploit more in these Areas, as effort has likely exceeded optimal capacity level in these regions.

As a result of the application of a more accurate and granular methodology for estimating coverage, assessed stocks accounted for 74.2 percent of total landings in 2021.

[1] Some of the disaggregated stocks were sub-stocks of aggregated species examined in 2011 and subsequent analysis.

FIGURE C.1
FAO MAJOR FISHING AREA WORKSHOPS: PARTICIPATION BY NUMBER OF EXPERTS, ORGANIZATIONS AND COUNTRIES



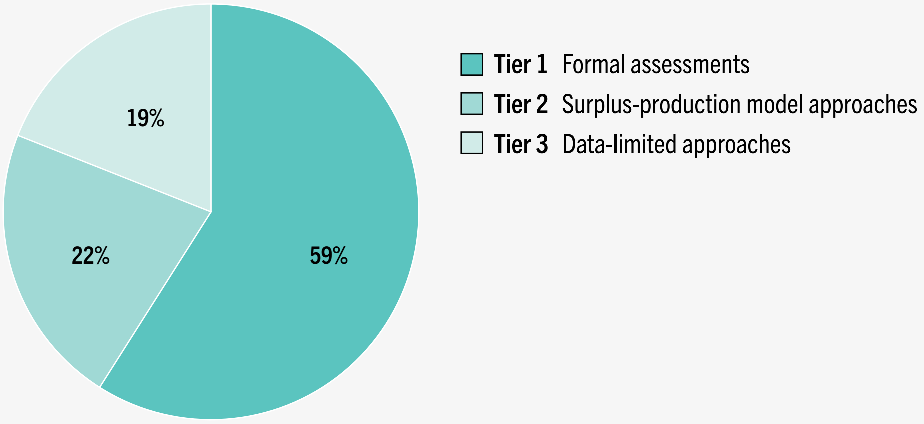
Notes: (1) A total of 19 workshops and consultations, involving around 650 experts, 200 entities and 92 countries, were held from 2022 to 2024. (2) Refer to the disclaimer on page ii for the names and boundaries used in this map.

TABLE C.1
NUMBER OF STOCKS INCLUDED IN THE STATUS OF THE STOCKS INDEX AND TIER BY FAO MAJOR FISHING AREA IN 2021

Analysis group		Tier 1 Formal assessment	Tier 2 Surplus-production model approaches	Tier 3 Data-limited approaches	Total
Area 21		148	0	2	**150**
Area 27		177	0	1	**178**
Area 31		58	45	0	**103**
Area 34		77	56	0	**133**
Area 37		114	0	0	**114**
Area 41		46	23	0	**69**
Area 47		39	36	6	**81**
Area 51		153	133	184	**470**
Area 57		193	96	19	**308**
Area 61		56	36	0	**92**
Area 67	excluding Pacific salmon	110	0	0	**110**
	Pacific salmon (Area 67)	85	0	0	**85**
Area 71		23	51	189	**263**
Area 77		47	43	1	**91**
Area 81		71	17	77	**165**
Area 87		68	23	6	**97**
Area 48, 58, 88		11	4	0	**15**
Highly migratory sharks		20	3	0	**23**
Highly migratory tunas		23	0	0	**23**
Global		**1 519**	**566**	**485**	**2 570**

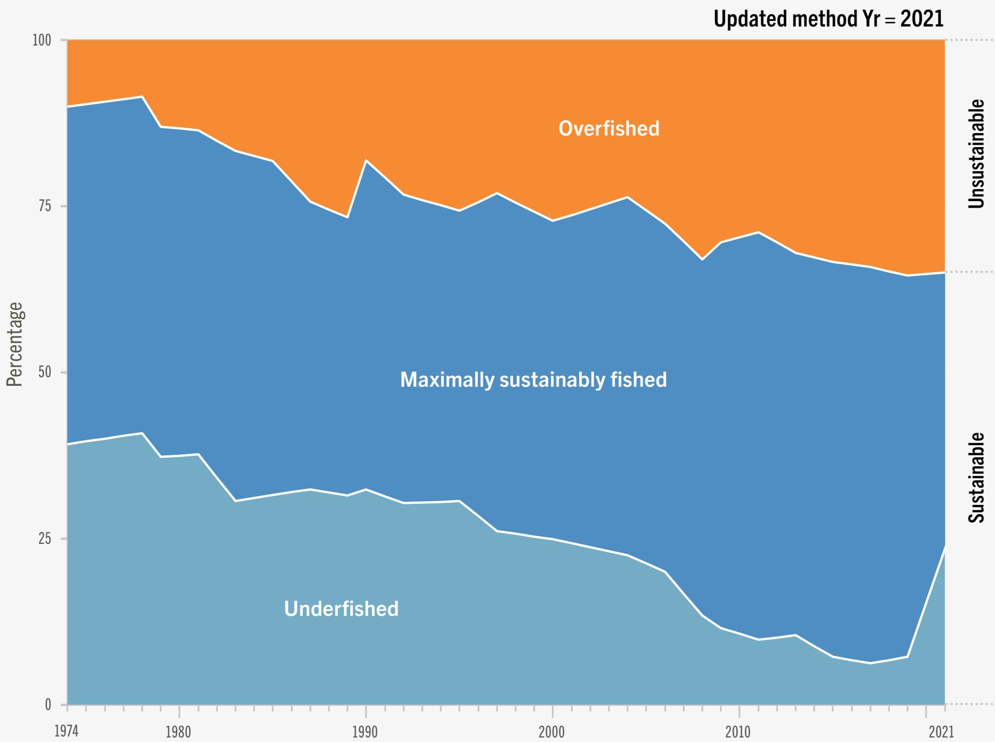
Source: FAO estimates.

FIGURE C.2
SHARE OF ASSESSED STOCKS BY TIER IN 2021



Source: FAO estimates.

FIGURE C.3
GLOBAL TRENDS IN THE STATE OF THE WORLD'S MARINE FISHERY STOCKS BY NUMBER, 1974–2021



Note: The updated values of the state of the world marine fishery stocks in 2021 show that the integrity of the trends remains uncompromised by the updated methodology.
Source: FAO estimates.

TABLE C.2
NUMBER OF STOCKS INCLUDED IN THE REFERENCE LIST FOR THE STATE OF THE STOCKS INDEX AND THEIR DISTRIBUTION ACROSS THE CATEGORIES OF STATE OF EXPLOITATION BY FAO MAJOR FISHING AREA (REFERENCE YEAR 2021)

Area		No. of stocks	Underfished (%)	Maximally sustainably fished (%)	Overfished (%)	Sustainable (%)	Unsustainable (%)
21		150	10.7	52.7	36.7	**63.3**	**36.7**
27		178	10.1	65.7	24.2	**75.8**	**24.2**
31		103	37.9	24.3	37.9	**62.1**	**37.9**
34		133	16.5	30.8	52.6	**47.4**	**52.6**
37		114	7.9	27.2	64.9	**35.1**	**64.9**
41		69	14.5	43.5	42.0	**58.0**	**42.0**
47		81	33.3	24.7	42.0	**58.0**	**42.0**
51		470	22.1	40.9	37.0	**63.0**	**37.0**
57		308	23.4	49.4	27.3	**72.7**	**27.3**
61		92	31.5	31.5	37.0	**63.0**	**37.0**
67	excluding Pacific salmon	110	51.8	40.9	7.3	**92.7**	**7.3**
	Pacific salmon (Area 67)	85	30.6	36.5	32.9	**67.1**	**32.9**
71		263	23.2	29.7	47.1	**52.9**	**47.1**
77		91	36.3	33.0	30.8	**69.2**	**30.8**
81		165	9.7	75.8	14.5	**85.5**	**14.5**
87		97	18.6	27.8	53.6	**46.4**	**53.6**
48, 58, 88		15	80.0	20.0	0.0	**100.0**	**0.0**
Highly migratory sharks		23	26.1	30.4	43.5	**56.5**	**43.5**
Highly migratory tuna		23	56.5	30.4	13.0	**87.0**	**13.0**
Global		**2 570**	**22.9**	41.6	35.5	**64.5**	**35.5**

Notes: (1) In Area 67, Pacific salmon stocks were excluded from the analysis for the Area, as they are small in terms of biomass and managed as a distinct unit. When accounting for Pacific salmon stocks in the Area, 20.5 percent of the stocks were estimated to be unsustainably fished in 2021. (2) As they are genetically distinct ecologically significant units and are managed by stock by the relevant nations they are accounted for and evaluated for the global analysis. (3) More information is available in **SECTION 2.3** in this chapter and in **CHAPTER D.11** on Area 67, pp. 228. (4) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE C.3
NUMBER OF STOCKS INCLUDED IN THE REFERENCE LIST FOR THE STATE OF THE STOCKS INDEX AND THEIR DISTRIBUTION ACROSS THE CATEGORIES OF STATE OF EXPLOITATION, NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS, BY TIER AND FAO MAJOR FISHING AREA (REFERENCE YEAR 2021)

TIER 1 Formal assessments

Area		No. of stocks	No. of ASFIS species	No. of ISSCAAP groups	No. U	No. M	No. O	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
21		148	56	17	16	79	53	10.8	53.4	35.8	64.2	35.8
27		177	49	9	18	117	42	10.2	66.1	23.7	76.3	23.7
31		58	35	9	27	12	19	46.6	20.7	32.8	67.2	32.8
34		77	38	7	12	32	33	15.6	41.6	42.9	57.1	42.9
37		114	39	13	9	31	74	7.9	27.2	64.9	35.1	64.9
41		46	34	12	5	20	21	10.9	43.5	45.7	54.3	45.7
47		39	33	12	13	11	15	33.3	28.2	38.5	61.5	38.5
51		153	76	11	39	44	70	25.5	28.8	45.8	54.2	45.8
57		193	109	15	71	51	71	36.8	26.4	36.8	63.2	36.8
61		56	27	10	18	14	24	32.1	25.0	42.9	57.1	42.9
67	excluding Pacific salmon	110	65	13	57	45	8	51.8	40.9	7.3	92.7	7.3
	Pacific salmon (Area 67)	85	6	1	26	31	28	30.6	36.5	32.9	67.1	32.9
71		23	18	7	9	11	3	39.1	47.8	13.0	87.0	13.0
77		47	34	10	16	22	9	34.0	46.8	19.1	80.9	19.1
81		71	38	12	11	49	11	15.5	69.0	15.5	84.5	15.5
87		68	55	12	13	25	30	19.1	36.8	44.1	55.9	44.1
48, 58, 88		11	4	2	10	1	0	90.9	9.1	0.0	100.0	0.0
Highly migratory sharks		20	5	1	5	5	10	25.0	25.0	50.0	50.0	50.0
Highly migratory tunas		23	7	1	13	7	3	56.5	30.4	13.0	87.0	13.0
Total		**1 519**	**584**	**24**	**388**	**607**	**524**	**25.5**	**40.0**	**34.5**	**65.5**	**34.5**

ASFIS – Aquatic Sciences and Fisheries Information System
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants
U = Underfished, M = Maximally sustainably fished, O = Overfished
Note: Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE C.3 (CONTINUED)

TIER 2 Surplus-production model approaches

Area	No. of stocks	No. of ASFIS species	No. of ISSCAAP groups	No. U	No. M	No. O	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
31	45	25	11	12	13	20	26.7	28.9	44.4	**55.6**	**44.4**
34	56	40	10	10	9	37	17.9	16.1	66.1	**33.9**	**66.1**
41	23	20	8	5	10	8	21.7	43.5	34.8	**65.2**	**34.8**
47	36	36	7	14	7	15	38.9	19.4	41.7	**58.3**	**41.7**
51	133	133	18	27	65	41	20.3	48.9	30.8	**69.2**	**30.8**
57	96	96	19	1	85	10	1.0	88.5	10.4	**89.6**	**10.4**
61	36	31	12	11	15	10	30.6	41.7	27.8	**72.2**	**27.8**
71	51	48	9	8	7	36	15.7	13.7	70.6	**29.4**	**70.6**
77	43	34	11	17	7	19	39.5	16.3	44.2	**55.8**	**44.2**
81	17	14	9	0	13	4	0.0	76.5	23.5	**76.5**	**23.5**
87	23	23	11	4	0	19	17.4	0.0	82.6	**17.4**	**82.6**
48, 58, 88	4	1	1	2	2	0	50.0	50.0	0.0	**100.0**	**0.0**
Highly migratory sharks	3	3	1	1	2	0	33.3	66.7	0.0	**100.0**	**0.0**
Total	**566**	**405**	**26**	**112**	**235**	**219**	**19.8**	**41.5**	**38.7**	**61.3**	**38.7**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants
U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Ten FAO Major Fishing Areas had Tier 2 assessments. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TIER 3 Data-limited approaches

Area	No. of stocks	No. of ASFIS species	No. of ISSCAAP groups	No. U	No. M	No. O	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
21	2	2	2	0	0	2	0.0	0.0	100.0	**0.0**	**100.0**
27	1	1	1	0	0	1	0.0	0.0	100.0	**0.0**	**100.0**
47	6	6	4	0	2	4	0.0	33.3	66.7	**33.3**	**66.7**
51	184	130	12	38	83	63	20.7	45.1	34.2	**65.8**	**34.2**
57	19	18	7	0	16	3	0.0	84.2	15.8	**84.2**	**15.8**
71	189	94	11	44	60	85	23.3	31.7	45.0	**55.0**	**45.0**
77	1	1	1	0	1	0	0.0	100.0	0.0	**100.0**	**0.0**
81	77	50	10	5	63	9	6.5	81.8	11.7	**88.3**	**11.7**
87	6	4	4	1	2	3	16.7	33.3	50.0	**50.0**	**50.0**
Total	**485**	**277**	**20**	**88**	**227**	**170**	**18.1**	**46.8**	**35.1**	**64.9**	**35.1**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants
U = Underfished, M = Maximally sustainably fished, O = Overfished

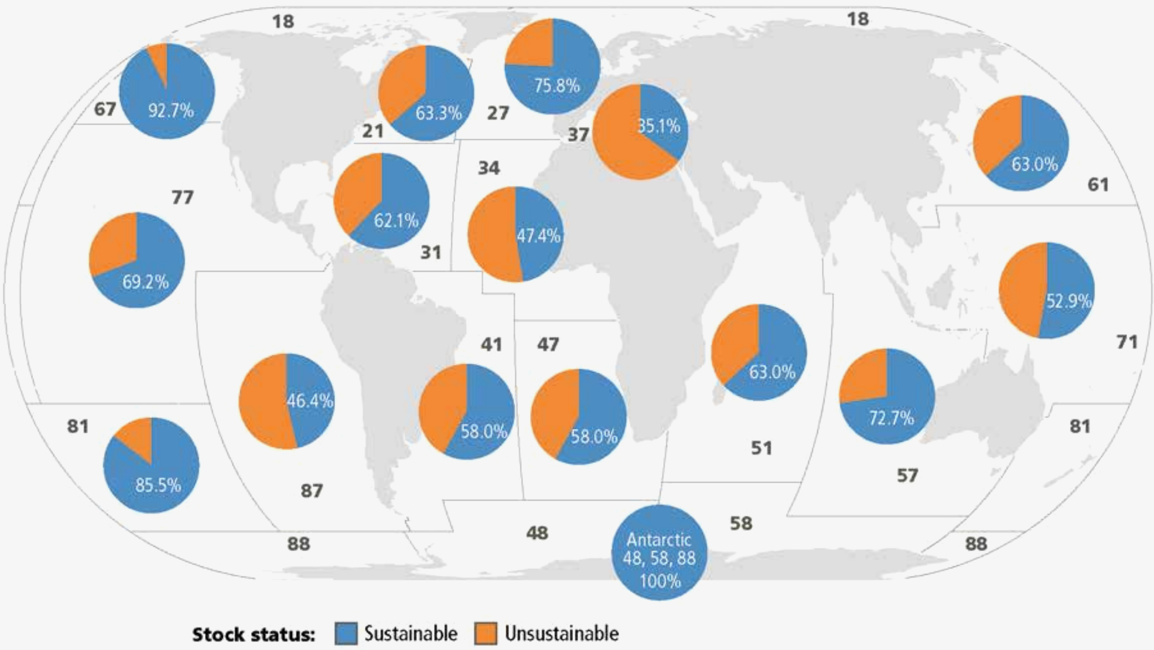
Notes: (1) Seven FAO Major Fishing Areas had Tier 3 assessments. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

1.2 Major trends by FAO Major Fishing Areas

In 2021, among the 18 marine FAO Major Fishing Areas reviewed (**FIGURE C.4**), the updated analysis shows that the Antarctic Area (Areas 48, 58, 88), Northeast Pacific[2] (Area 67), Northeast Atlantic[3] (Area 27) and Southwest Pacific (Area 81) had the highest proportion (100–75.8 percent) of stocks classified as fished at sustainable levels. In contrast, the Mediterranean and Black Sea (Area 37) had the lowest proportion of stocks classified as sustainably fished (35.1 percent), followed by the Southeast Pacific (Area 87) with 46.4 percent, the Eastern Central Atlantic (Area 34) with, 47.4 percent, and the Western Central Pacific (Area 71) with 52.9 percent. Other Areas varied between 58.0 percent and 72.7 percent (**TABLE C.3**, **FIGURE C.3**). Declared landings vary greatly among FAO Major Fishing Areas (**TABLE C.5**, **FIGURES C.5** and **C.6**), therefore the significance of each Area for the weighted sustainability of global fisheries depends on its proportional contribution.

FIGURE C.4
PERCENTAGES OF BIOLOGICALLY SUSTAINABLE AND UNSUSTAINABLE FISHERY STOCKS IN 2021, BY FAO MAJOR FISHING AREA

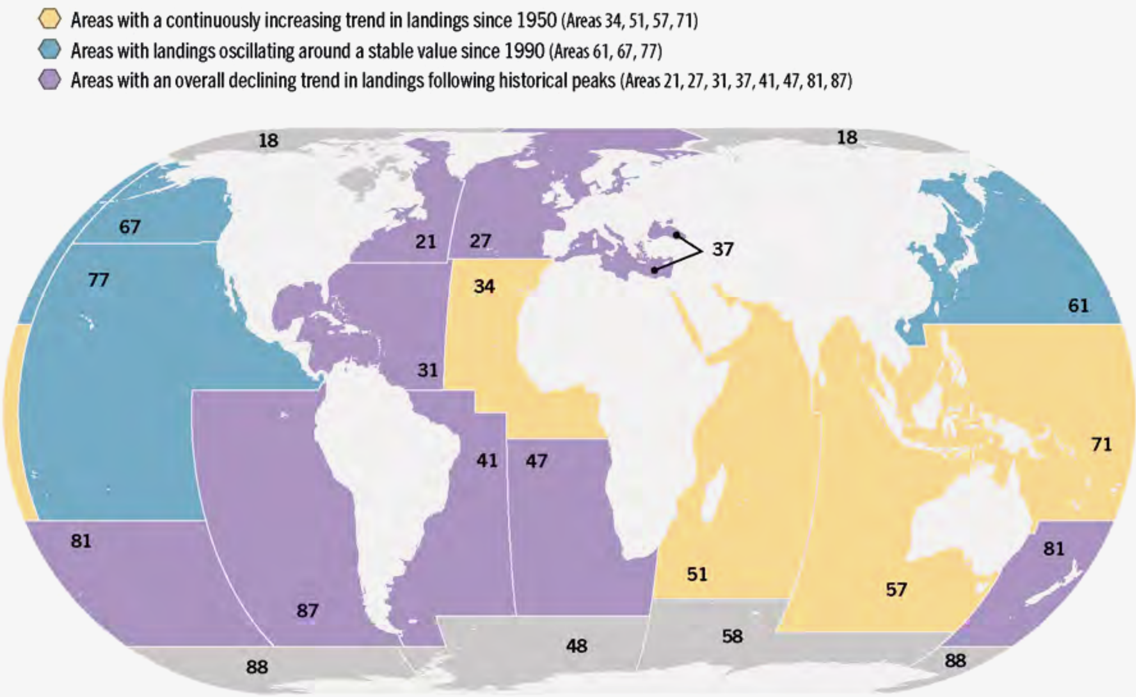


Notes: (1) The percentages represent the proportion of sustainable stocks. Notwithstanding the widespread consultation and the efforts to standardize the methodology, there are still differences in the quality and coverage of information across regions, as well as in some of the assumptions made. Caution should therefore be exercised when attempting to compare stock status across regions using this methodology. (2) Highly migratory sharks and tunas, as well as Area 67 Pacific salmon stocks, are excluded in this representation. (3) Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: FAO estimates.

2 In Area 67, when accounting for Pacific salmon stocks, 79.5 of the stocks were biologically sustainably fished in 2021. Pacific salmon stocks are small in terms of biomass and each is managed as a distinct unit.

3 The International Council for the Exploration of the Sea (ICES) uses B_{pa} as the reference point for management considering it as a proxy for B_{MSY}. The ICES estimates are used here and shown in Figure C.4. However, an analysis done by Winker and Cardinale (ICES, 2022) demonstrates this is more akin to B_{lim} (the point at which the stock reproduction is threatened).

FIGURE C.5
LANDING TRENDS FOR FAO MAJOR FISHING AREAS, 1950–2021



Notes: (1) Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0 .

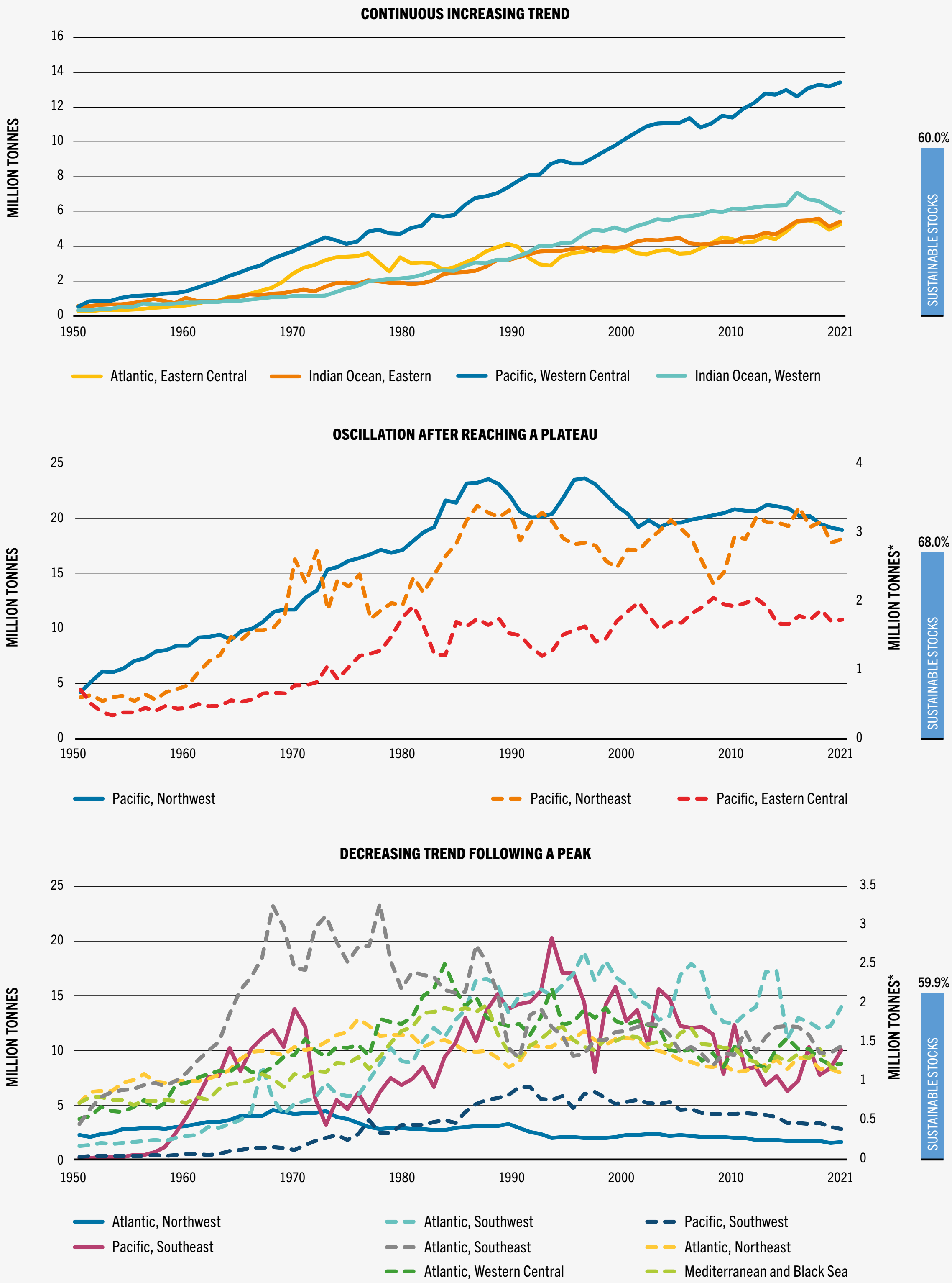
The temporal pattern of the declared total and stock-specific landings for a specific Area often reveals information about its ecological productivity, fishery development and management stage, as well as fishery stock status. In general, after excluding Arctic and Antarctic areas, which have minor landings, three groups of patterns can be observed (**FIGURES C.5** and **C.6**): (i) Areas with a continuously increasing trend in landings since 1950 (Grainger and Garcia, 1996); (ii) Areas with landings oscillating around a stable value since 1990, associated with the dominance of pelagic, short-lived species; and (iii) Areas with an overall declining trend in landings following historical peaks.

FAO Major Fishing Areas 34, 51, 57 and 71 can be classified into the first group; while Areas 61, 67 and 77 are classified into the second group; and the remaining Areas 21, 27, 31, 37, 41, 47, 81 and 87 are considered as belonging to the third group.

An increasing trend in landings (first group) may signal growing fishing activity and/or (less frequently) a growing stock biomass as well as a change in species composition. If these are not new fisheries, it may mask the overfishing of some stocks. On the other hand, a declining trend in landings (third group) typically indicates either a deterioration in the abundance of fishery stocks, socioeconomic changes that reduce demand, or the enforcement of stringent management measures. According to the results of the analyses presented here, the first (increasing landings) and third (declining landings) groups of Areas have the lowest percentage of stocks classified as being at biologically sustainable levels (59.0 and 60.6 percent respectively), while the second (stable or fluctuating landings) group has the highest (75 percent).

Landings statistics by FAO Major Fishing Area for the last three years, as well as marine landings in recent decades, are presented in **TABLE C.5**.

FIGURE C.6
THE THREE TEMPORAL PATTERNS IN FISHERIES LANDINGS, 1950–2022



Notes: (1) Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Live weight equivalent.

Source: FAO. 2023. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

TABLE C.4
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS BY FAO MAJOR FISHING AREA

Analysis group	Assessed landings			Weighted percentage by landings		
	U (Mt)	M (Mt)	O (Mt)	U (%)	M (%)	O (%)
Area 21	0.21	1.01	0.22	14.8	69.9	15.4
Area 27	0.26	6.08	0.98	3.6	83.0	13.4
Area 31	0.53	0.084	0.17	67.4	10.6	22.0
Area 34	1.20	1.01	1.16	35.6	29.9	34.4
Area 37	0.042	0.42	0.35	5.2	51.7	43.1
Area 41	0.039	1.11	0.53	2.3	66.1	31.6
Area 47	0.078	0.50	0.74	5.9	37.9	56.2
Area 51	0.89	1.56	1.02	25.7	44.9	29.4
Area 57	0.34	2.68	0.62	9.3	73.6	17.1
Area 61	3.67	5.20	3.17	30.5	43.2	26.3
Area 67	0.68	1.73	0.024	27.9	71.1	1.0
Area 71	1.01	1.04	2.50	22.2	22.8	55.0
Area 77	0.57	0.49	0.25	43.4	37.8	18.8
Area 81	0.0081	0.28	0.013	2.7	93.0	4.3
Area 87	1.62	5.81	1.74	17.7	63.4	18.9
Area 48,58,88	0.38	0.0047	0	98.8	1.2	0.0
Highly migratory sharks	0.048	0.052	0.022	39.6	42.4	18.0
Highly migratory tunas	4.12	0.84	0.036	82.5	16.8	0.7
Total	**15.77**	**30.18**	**13.58**	**26.5**	**50.7**	**22.8**

U = Underfished, M = Maximally sustainably fished, O = Overfished, Mt = million tonnes

Notes: (1) Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Pacific salmon are also excluded.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

TABLE C.5
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS BY FAO MAJOR FISHING AREA

FAO Major Fishing Area code	Fishing Area name	Production (average per year)				Production			Share by ocean in 2021 total (%)	Ranking by landings in 2021
		1980s	1990s	2000s	2010s	2019	2020	2021		
		(thousand tonnes, live weight equivalent)								
21	Atlantic, Northwest	2 908	2 333	2 219	1 846	1 785	1 573	1 623	7.9	11
27	Atlantic, Northeast	10 439	10 391	9 814	8 653	8 314	8 350	8 089	39.2	4
31	Atlantic, Western Central	2 015	1 826	1 553	1 351	1 232	1 133	1 162	5.6	13
34	Atlantic, Eastern Central	3 199	3 557	3 758	4 750	5 374	4 918	5 167	25.0	7
37	Mediterranean and Black Sea	1 841	1 499	1 536	1 320	1 416	1 194	1 136	5.5	14
41	Atlantic, Southwest	1 783	2 250	2 146	1 899	1 677	1 724	2 014	9.8	9
47	Atlantic, Southeast	2 318	1 556	1 543	1 539	1 364	1 370	1 460	7.1	12
	Total Atlantic Ocean and Mediterranean	**24 501**	**23 412**	**22 569**	**21 358**	**21 161**	**20 262**	**20 650**	**100**	
51	Indian Ocean, Western	2 369	3 675	4 236	4 877	5 597	5 134	5 481	48.2	6
57	Indian Ocean, Eastern	2 672	4 131	5 481	6 394	6 605	6 253	5 887	51.8	5
	Total Indian Ocean	**5 042**	**7 806**	**9 717**	**11 271**	**12 202**	**11 388**	**11 369**	**100**	
61	Pacific, Northwest	20 955	21 797	19 969	20 608	19 526	19 215	19 079	39.9	1
67	Pacific, Northeast	2 743	2 982	2 790	3 053	3 169	2 851	2 914	6.1	8
71	Pacific, Western Central	5 941	8 511	10 800	12 509	13 442	13 240	13 498	28.2	2
77	Pacific, Eastern Central	1 622	1 441	1 811	1 872	2 051	1 984	1 959	4.1	10
81	Pacific, Southwest	568	820	689	535	469	425	388	0.8	15
87	Pacific, Southeast	10 232	14 897	13 104	8 324	7 815	8 463	10 040	21.0	3
	Total Pacific Ocean	**42 062**	**50 449**	**49 162**	**46 900**	**46 473**	**46 179**	**47 877**	**100**	
48, 58, 88	**Total Antarctic**	**481**	**191**	**141**	**267**	**389**	**477**	**387**		**16**
	Total marine Areas	**72 086**	**81 858**	**81 589**	**79 796**	**80 225**	**78 305**	**80 282**		

Note: (1) Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) FAO Major Fishing Area 18 (Arctic Sea) is not included in this table.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

1.3 Status and trends by major species

1.3.1 TOP TEN SPECIES

The top ten species in terms of declared landings in 2021 were anchoveta (Peruvian anchovy,[4] *Engraulis ringens*), Alaska pollock[5] (walleye pollock, *Gadus chalcogrammus*), skipjack tuna[6] *(Katsuwonus pelamis),* Pacific chub mackerel[7] *(Scomber japonicus),* Atlantic herring *(Clupea harengus),* yellowfin tuna[8] *(Thunnus albacares),* Pacific sardine[9] *(Sardinops sagax),* European pilchard (sardine, *Sardina pilchardus*), blue whiting[10] *(Micromesistius poutassou)* and Atlantic cod[11] *(Gadus morhua)* (**TABLE C.6**). In 2021, the landings from 85.8 percent of these species were classified as biologically sustainable. However, when measured by the number of stocks, this figure drops significantly to 60.0 percent of the stocks classified as biologically sustainable, partly due to the significant number of overfished cod stocks.

These highly productive and economically valuable species are, on average, in better condition than other species globally. They are also more likely to be accurately assessed, as they tend to be more abundant and of greater commercial importance. Still, some stocks, such as Pacific chub mackerel, Atlantic cod and Alaska pollock, were overfished in 2021. Most of these are Tier 1 stocks, meaning they were formally assessed at the national or regional level using traditional stock assessment models suited for data-rich stocks.

1.3.2 HIGHLY MIGRATORY TUNAS

Across the seven species of major commercial tuna, 23 stocks are assessed (six albacore tuna [*Thunnus alalunga*], four bigeye tuna [*Thunnus obesus*], four bluefin tuna [representing three species *Thunnus thynnus, Thunnus orientalis* and *Thunnus maccoyii*], five skipjack tuna [*Katsuwonus pelamis*] and four yellowfin tuna [*Thunnus albacares*] stocks) by tuna regional fisheries management organizations (RFMOs), with all their member countries participating in the scientific review process.

Declared landings of the main commercial tuna species[12] were 5.2 million tonnes in 2021, a 10 percent decrease from 2019. Fifty-eight percent of the catch was skipjack tuna, followed by yellowfin (30 percent), bigeye (7 percent) and albacore (4 percent) in 2021. Bluefin tuna accounted for just 1 percent of the global tuna catch by weight in 2021, but it is a very valuable species, both culturally and commercially.

Globally, 87.0 percent of tuna stocks were classified as sustainably fished, and 14 percent were classified as overfished in 2021.[13] By weight, 99.3 percent of the total catch came from biologically sustainable tuna stocks in terms of yield (the remainder was from overfished bluefin tuna stocks and one albacore stock).

The tuna RFMOs have been making a concerted effort to use management strategy evaluations to provide advice for rebuilding and keeping stocks at biomass levels above the maximum sustainable yield (MSY), with encouraging results.

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4 Peruvian anchovy has been constantly among the most-caught species in all years apart from 1983 and 1984.

5 Alaska pollock and Atlantic herring have been constantly among the most-caught species with highest declared catches, 1974–2021.

6 Skipjack tuna made it to the top ten in 1978 and has remained there since 1983.

7 Pacific chub mackerel has been among the most-caught species in all years apart from 1991, 1992, 2000 and 2001.

8 Yellowfin tuna was among the most-caught species in the 1989–1994 period, 1998 and since 2001.

9 Pacific sardine was among the most-caught species, 1974–2000, 2010–2011 and from 2020.

10 Blue whiting is consistently among the top landed species.

11 Atlantic cod was among the top ten caught species in the 1974–1997 period, 2011–2019 and again in 2021.

12 After World War II, global tuna catches were dominated by large, long-lived temperate species. Over time, as total tuna catches increased, these species declined, and catches shifted toward shorter-lived, more productive tropical tuna species, which now make up a larger share of the catch.

13 ISSF (2023), which uses a different definition for the proportion of stocks considered to be sustainably fished, reports that 61 percent of tuna stocks are sustainably fished, 17 percent are overfished and 22 percent are in an intermediate stage. Also according to ISSF (2023), 85 percent of the total tuna catch comes from healthy stocks.

TABLE C.6
TOP TEN SPECIES IN DECLARED LANDINGS IN MARINE FAO MAJOR FISHING AREAS IN 2021 AND STATUS OF STOCKS OF EACH SPECIES

Species	Landings 2021*	No.			%			Sustainable (%)	Unsustainable (%)
		U	M	O	U	M	O		
Anchoveta, *Engraulis ringens*	5 876	1	2	1	25.0	50.0	25.0	**75.0**	**25.0**
Alaska pollock, *Gadus chalcogrammus*	3 484	6	5	2	46.2	38.5	15.4	**84.6**	**15.4**
Skipjack tuna,*Katsuwonus pelamis*	2 990	5	0	0	100.0	0.0	0.0	**100.0**	**0.0**
Pacific chub mackerel, *Scomber japonicus*	1 708	2	4	2	25.0	50.0	25.0	**75.0**	**25.0**
Atlantic herring, *Clupea harengus*	1 628	0	13	6	0.0	68.4	31.6	**68.4**	**31.6**
Yellowfin tuna, *Thunnus albacares*	1 570	2	2	0	50.0	50.0	0.0	**100.0**	**0.0**
Pacific sardine, *Sardinops sagax*	1 412	7	1	7	46.7	6.7	46.7	**53.3**	**46.7**
European pilchard, *Sardina pilchardus*	1 363	3	7	8	16.7	38.9	44.4	**55.6**	**44.4**
Blue whiting, *Micromesistius poutassou*	1 146	0	1	0	0.0	100.0	0.0	**100.0**	**0.0**
Atlantic cod, *Gadus morhua*	1 145	0	5	18	0.0	21.7	78.3	**21.7**	**78.3**
Total	**22 322**	**26**	**40**	**44**	**23.6**	**36.4**	**40.0**	**60.0**	**40.0**

*Landings in thousand tonnes, live weight equivalent; U = Underfished, M = Maximally sustainably fished, O = Overfished
Source: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

1.3.3 HIGHLY MIGRATORY SHARKS

Historically, many directed shark fisheries have experienced patterns of overharvest, rapid stock decline, collapse, and limited recovery (Bonfil, 1994). Total reported landings peaked at over 868 000 tonnes in 2000 and have since declined to approximately 605 000 tonnes in 2021. Landings of highly migratory species (UNCLOS Annex I) remained high (approximately 250 000 tonnes) until 2012, before declining to around 170 000 tonnes by 2021.

This report examined 23 pelagic shark stocks covering 7 species (porbeagle [*Lamna nasus*], blue shark [*Prionace glauca*], shortfin mako [*Isurus oxyrinchus*], oceanic whitetip shark [*Carcharhinus longimanus*], silky shark [*Carcharhinus falciformis*], thresher [*Alopias vulpinus*] and pelagic thresher shark [*Alopias pelagicus*]). Overall 56.5 percent of the stocks were at biologically sustainable levels in 2021, while 43.5 percent were overfished. When weighted by landings, 82.0 percent of the landings were from stocks assessed at biologically sustainable levels in 2021. While large pelagic stocks are generally considered sustainably fished and managed under the tuna RFMOs, small pelagic stocks such as the oceanic whitetip shark, shortfin mako and porbeagle continue to exhibit a poor stock status.

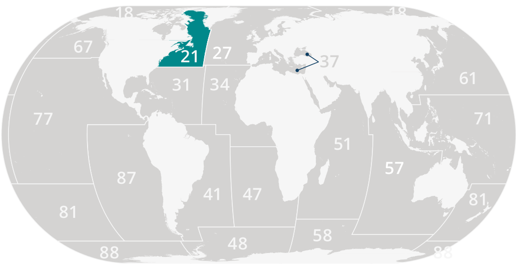
Progress in species-specific data collection and reporting has significantly improved scientific research, bycatch mitigation, and stock assessments for several shark species, including blue shark, silky shark and oceanic whitetip shark (Rice and Harley, 2012, 2013; Rice *et al.,* 2013; Rice and Sharma, 2015). The International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) has fostered international cooperation, with the greatest advancements observed in areas beyond national jurisdictions (ABNJ), fisheries managed by RFMOs and nations with strong monitoring systems. Complementary international agreements such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS) have strengthened protections. Notably, all sawfish *(Pristidae)* are listed under CITES Appendix I, and species like the oceanic whitetip shark, hammerheads (*Sphyrna* spp.), silky shark, manta rays *(Rajiformes),* wedgefishes (*Rhynchobatus* spp.), giant guitarfishes *(Rhinobatos* spp.) and the shortfin mako have been added to Appendix II. CITES continue to play a central role in regulating trade and promoting sustainable management of sharks.

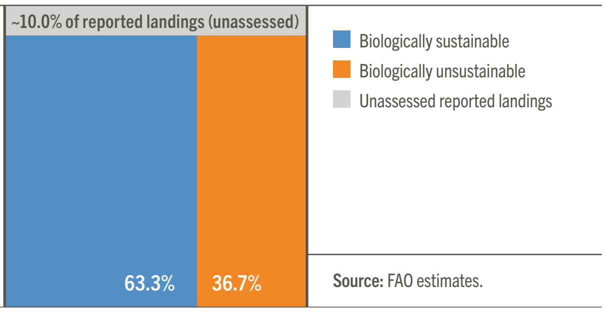
2. STATUS AND TRENDS BY FAO MAJOR FISHING AREA

2.1 Atlantic Ocean (Areas 21, 27, 31, 34, 41, 47) and the Mediterranean and Black Sea (Area 37)

Northwest Atlantic
FAO MAJOR FISHING AREA 21

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



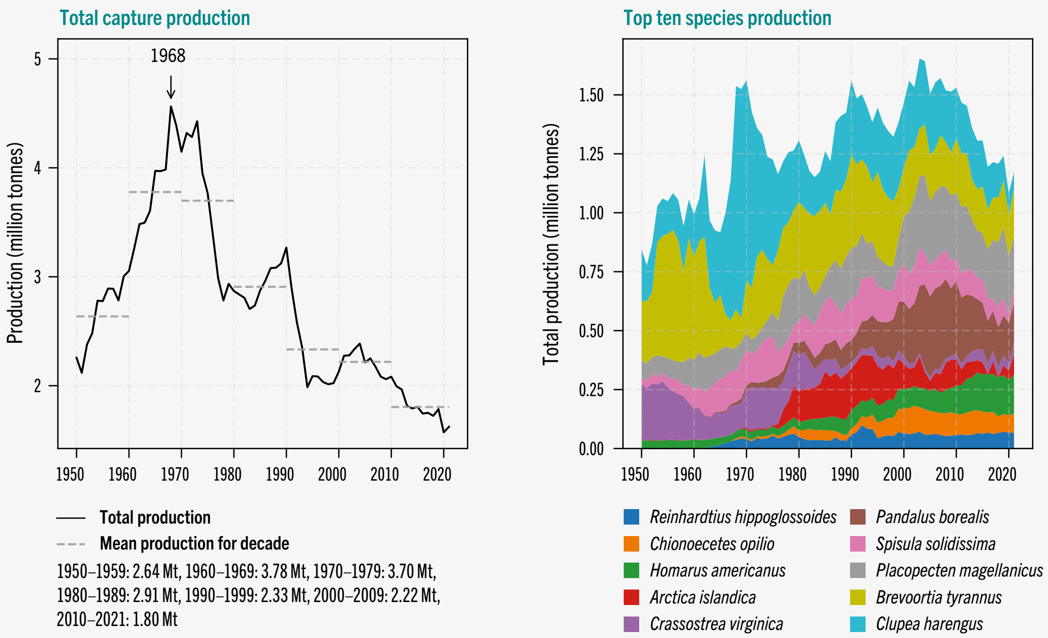


Source: FAO estimates.

Considering total declared landings in 2021, the Northwest Atlantic (FAO Major Fishing Area 21) was the eleventh-most productive Area, with 1.6 million tonnes. Average landings declined by 16.8 percent in the 2010s compared to the 2000s, which was a steeper fall than the 4.9 percent decline witnessed over the previous decade (2000s compared to 1990s).

The Northwest Atlantic produced an average of 1.7 million tonnes of fish per year during the

FIGURE C.7
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 21



Area 21 had its peak in capture production in 1968, with total landings of 4.56 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 43.31 percent.

The top ten species accounted for 72.31 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top twelve species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

period 2017–2021, continuing a decreasing trend from its peak of 4.6 million tonnes per year in the late 1960s. The top ten species groups have remained stable for the last 20 years (**FIGURE C.7**).

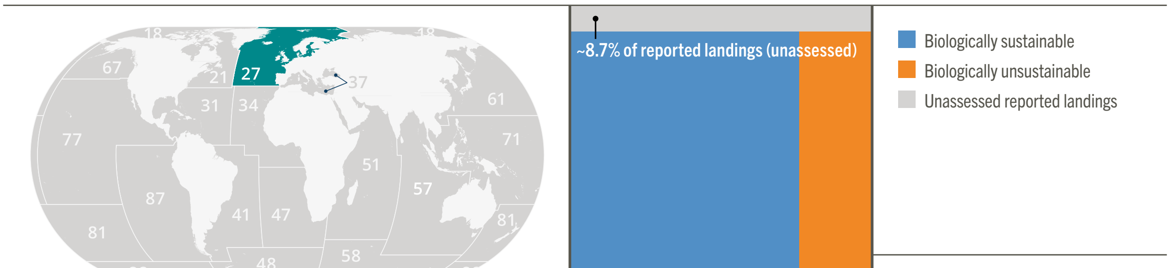
With the new assessment,[1] 63.3 percent of the assessed stocks in the Northwest Atlantic were classified as being within biologically sustainable levels in 2021. Stocks classified as biologically sustainable accounted for 84.6 percent of the total declared landings for Area 21.

Landings from stocks of historically very important species – like Atlantic cod *(Gadus morhua),* silver hake *(Merluccius bilinearis),* white hake *(Urophycis tenuis),* haddock *(Melanogrammus aeglefinus),* American plaice *(Hippoglossoides platessoides),* winter flounder *(Pseudopleuronectes americanus)* and yellowtail flounder *(Limanda ferruginea)* – have not made a good recovery. These species landings amounted to about 100 thousand tonnes since the mid-1990s, a 95 percent decrease since the peak of 2.3 million tonnes in 1968. Overall, in 2021 invertebrate stocks were generally in better condition than finfish stocks.

For more information on Area 21, please refer to **PART D, CHAPTER 1**, pp. 68.

Northeast Atlantic
FAO MAJOR FISHING AREA 27

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

Considering total declared landings for 2021, the Northeast Atlantic (FAO Major Fishing Area 27) was the fourth-most productive Area, with a total of 8.1 million tonnes.

Total landings reported from this Area reached a peak of 12.9 million tonnes in 1976, then dropped. They recovered slightly in the 1990s, but the overall trend has been decreasing since the late 1970s (**FIGURE C.8**). Species trends have changed over the last 75 years, with Atlantic cod *(Gadus morhua)* and Atlantic herring *(Clupea harengus)* clearly dominating in 1950, while increasingly high shares of blue whiting *(Micromesistius poutassou)* and Atlantic mackerel *(Scomber scombrus)* are present today.

On a decadal scale, landings have declined from an average of 10.4 million tonnes per year in the 1980s to the 2010s average of 8.7 million tonnes per year (**TABLE C.5**, **FIGURE C.6**). The declared landings in 2021 were approximately 0.2 million tonnes lower than those for 2019.

In the Northeast Atlantic,[1] 75.8 percent[2] of the stocks in the reference list were classified as being at biologically sustainable levels in 2021. In terms of landings, 86.6 percent were from sustainable stocks in 2021. The estimate of the percentage of fish stocks at biologically sustainable levels in the Northeast Atlantic has been increasing since 2007, when total allowable catches (TACs) were implemented in the region.

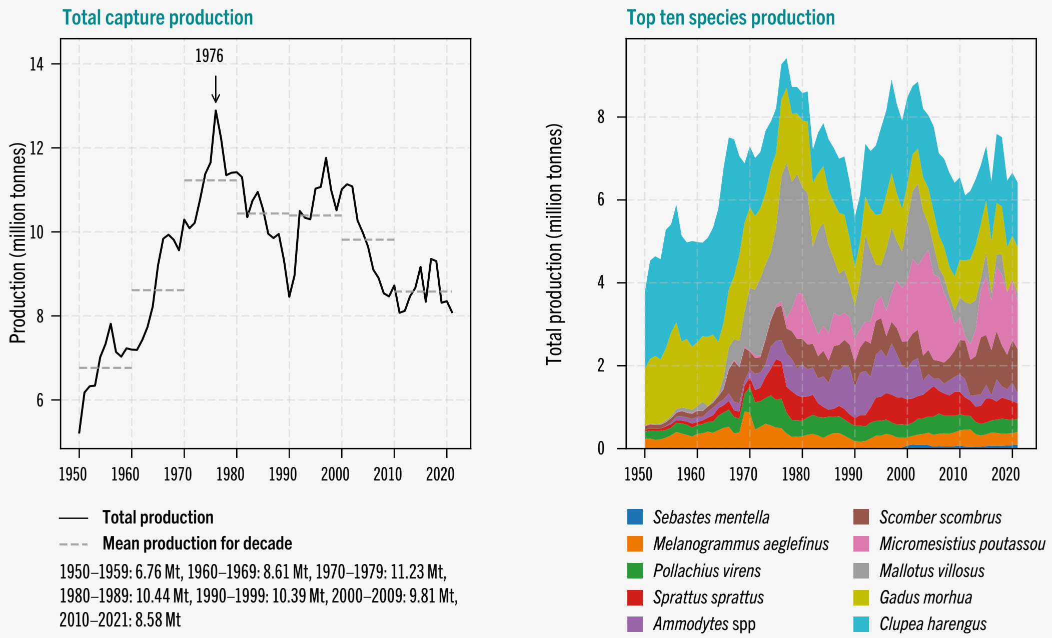
Recovery was reported for Atlantic mackerel *(Scomber scombrus)*, turbot *(Scophthalmus maximus)*, European plaice *(Pleuronectes platessa)*, Arctic cod *(Boreogadus saida)* and Atlantic cod in the 2000s, and for whiting *(Merlangius merlangus)* and common sole *(Solea solea)* in the late 2010s. Some important stocks such as North Sea Atlantic cod, Irish and Celtic Sea whiting, and beaked redfish *(Sebastes mentella)* were overfished in 2021.

For more information on Area 27, **PART D, CHAPTER 2**, pp. 82.

[1] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

[2] ICES uses B_{pa} as the reference point for management considering it as a proxy for B_{MSY}. However, an analysis done by Winker and Cardinale (ICES, 2022) demonstrates this is more akin to B_{lim}.

FIGURE C.8
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 27



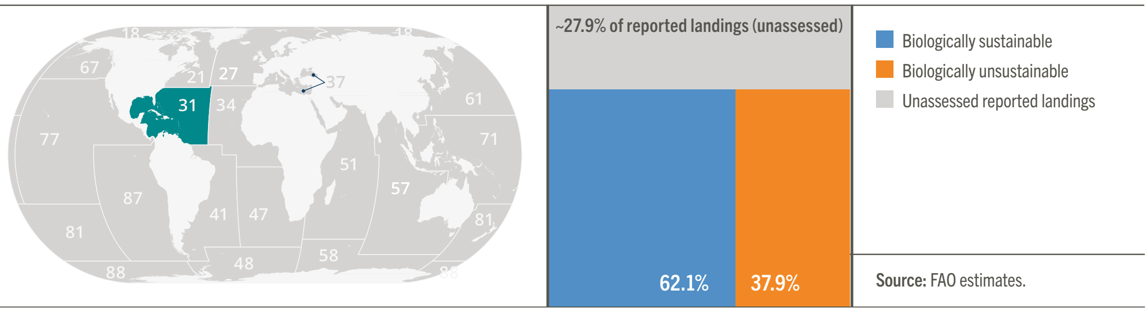
Area 27 had its peak in capture production in 1976,with total landings of 12.89 million tonnes. The greatest change in mean production for the decade occured between 1960–1969 and 1970–1979, with an increase of 30.37 percent.

The top ten species accounted for 79.35 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top eight species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Western Central Atlantic
FAO MAJOR FISHING AREA 31

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

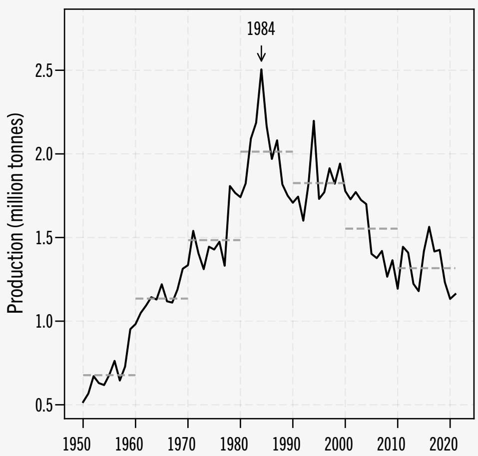
With 1.2 million tonnes of landings in 2021, this tropical area ranks thirteenth among FAO Major Fishing Areas in terms of landing volume, making it relatively unproductive. However, it holds significant importance for its biological diversity.

In terms of total landings, there has been a gradual decline on a decadal scale from 1.8 million tonnes in the 1990s to 1.6 million tonnes in the 2000s to 1.4 million tonnes in the 2010s, a fall of 9–15 percent each decade (**TABLE C.5**, **FIGURE C.9**).

Total declared landings in Area 31 reached a high of 2.5 million tonnes in 1984, then declined gradually to reach a low of 1.2 million tonnes in 2014 (**FIGURE C.9**).

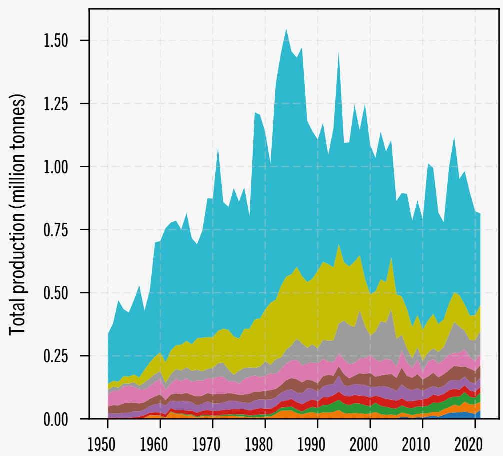
In 2021, small pelagic fishes represented around 39.1 percent of total landings. Of the two

FIGURE C.9
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 31



1950–1959: 0.68 Mt, 1960–1969: 1.14 Mt, 1970–1979: 1.48 Mt, 1980–1989: 2.01 Mt, 1990–1999: 1.83 Mt, 2000–2009: 1.55 Mt, 2010–2021: 1.32 Mt

Area 31 had its peak in capture production in 1984, with total landings of 2.51 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 67.67 percent.



The top ten species accounted for 70.06 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top thirteen species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

main species, Gulf menhaden *(Brevoortia patronus)* was classified as underfished in 2021, while round sardinella *(Sardinella aurita)* was classified as maximally sustainably fished. The latter two species have been stable over the time series. Other species like yellowfin tuna *(Thunnus albacares)*, white shrimp *(Penaeus setiferus)* and crabs *(Callinectes* spp.) remained important in the region in 2021.

Overall in this assessment,[3] 62.1 percent of the stocks in this region were classified as being within biologically sustainable levels in 2021. In terms of landings, 78.0 percent were from sustainable stocks in 2021.

Medium-sized pelagic fishes such as king mackerel *(Scomberomorus cavalla)* and Atlantic Spanish mackerel *(Scomberomorus maculatus)* were classified as maximally sustainably fished, while the Serra Spanish mackerel *(Scomberomorus brasiliensis)* was classified as overfished in 2021.

Snappers and groupers are among the most highly valued and intensively fished species in the region. Several stocks, especially of groupers, continued to be classified as overfished in 2021.

Highly-valued stocks of invertebrate species – such as penaeid shrimps in the Gulf of Mexico and along the Guianas-Brazil shelf in northeastern South America – were for the most part classified as underfished or maximally sustainably fished in 2021.

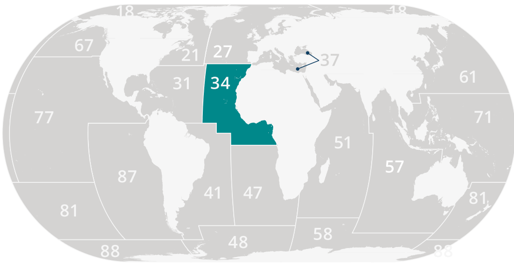
In 2021, stocks of other highly appreciated coral reef invertebrate species, such as the Caribbean spiny lobster *(Panulirus argus)*, were classified as maximally sustainably fished or overfished depending on location, whereas several stocks of queen conch *(Lobatus gigas)* in the Caribbean Sea were classified as overfished.

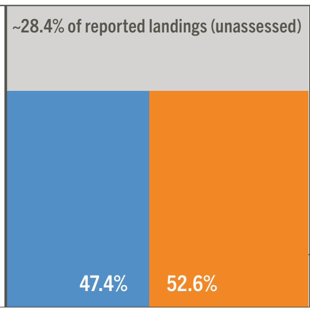
For more information on Area 31, please refer to **PART D, CHAPTER 3**, pp. 98.

[3] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Eastern Central Atlantic
FAO MAJOR FISHING AREA 34

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY





Biologically sustainable
Biologically unsustainable
Unassessed reported landings

Source: FAO estimates.

In 2021, landings from Area 34 reached 5.2 million tonnes, continuing an upward trend that began in the 1950s. This made it the seventh-highest FAO Area in terms of total landings globally.

Landings in Area 34 have steadily increased over the past three decades – from an average of 3.6 million tonnes in the 1990s, to 3.8 million tonnes in the 2000s, and 4.8 million tonnes in the 2010s. Although there have been occasional dips, the overall long-term trend remains upward (**FIGURE C.10**). Capture production in the Area peaked in 2018, reaching 5.5 million tonnes.

The Eastern Central Atlantic is characterized by a high biological diversity. The exploited resources include different groups with different bioecological characteristics and socioeconomic importance. These include coastal and offshore pelagic resources and coastal and deep demersal resources.

Coastal pelagic resources are the most abundant and, in 2021, constituted more than 59 percent of declared landings, with the dominant species being sardines *(Sardina pilchardus)*, sardinellas *(Sardinella aurita* and *Sardinella maderensis),* Atlantic chub mackerel *(Scomber colias), Trachurus* spp. and bonga shad *(Ethmalosa fimbriata).* Sardines and sardinellas accounted for 34.2 percent of the total declared landings in 2021 (and 57.3 percent of the declared landings in the northern part of this zone). Demersal resources included fish, crustaceans and cephalopods.

The overall composition of the species in landings has remained fairly consistent over time, with the small pelagic species (sardines and sardinellas) making the largest contributions.

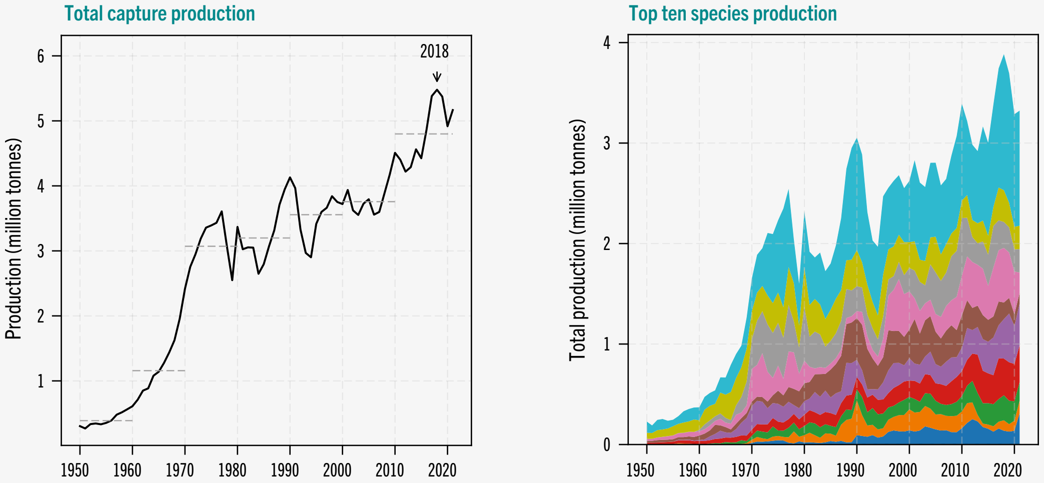
In this assessment,[4] 52.6 percent of stocks were classified as overfished in 2021 (47.4 percent sustainable), a worsening situation compared with the previous assessment in 2019 in which 40.0 percent of the stocks were assessed as overfished, indicating a potential risk to food security in the Area. In 2021, 65.6 percent of the landings were from biologically sustainable stocks.

The northern part of Area 34 hosts diverse fisheries targeting small pelagic fish like sardine, sardinella, and cephalopods, alongside species such as hake and shrimp. Sardines *(Sardina pilchardus)* are sustainably managed, while sardinella species *(Sardinella aurita* and *Sardinella maderensis)* face overfishing concerns requiring urgent measures. Cephalopods, particularly octopus, are key fisheries, with Dakhla's stock sustainably fished in 2021, though overfishing persists elsewhere. Black hake *(Merluccius senegalensis)* and white hake *(Urophycis tenuis)* were overfished in 2021, with black hake suffering high bycatch. Deep-water rose shrimp *(Parapenaeus longirostris)* stocks also faced sustainability challenges in 2021. In the south, small pelagic fish such as sardinella, bonga shad and anchovy dominated the landings in 2021. Sardinella was largely overfished in 2021, while anchovy stocks varied by region. Shrimp fisheries, including southern pink shrimp *(Penaeus notialis)* and deep-water rose shrimp *(Parapenaeus longirostris)*, showed mixed stock health, with the latter overfished throughout 2021. Despite ongoing regulatory efforts, resource status remained variable in 2021.

More details on Area 34 can be found in **PART D, CHAPTER 4**, pp. 116.

[4] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.10
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 34



— Total production
- - - Mean production for decade

1950–1959: 0.39 Mt, 1960–1969: 1.16 Mt, 1970–1979: 3.07 Mt, 1980–1989: 3.20 Mt, 1990–1999: 3.56 Mt, 2000–2009: 3.76 Mt, 2010–2021: 4.80 Mt

Area 34 had its peak in capture production in 2018, with total landings of 5.48 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 197.47 percent.

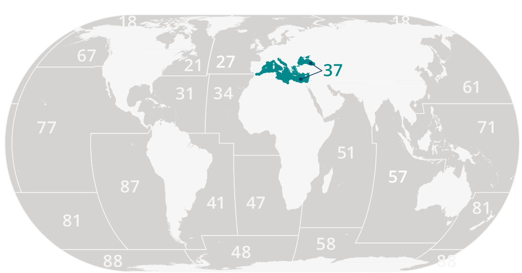
Sardinella maderensis
Engraulis encrasicolus
Katsuwonus pelamis
Ethmalosa fimbriata
Scomber colias
Sardinella aurita
Sardinella spp
Trachurus spp
Actinopterygii
Sardina pilchardus

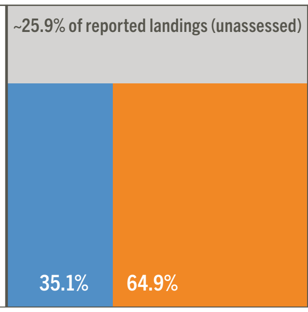
The top ten species accounted for 64.32 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top eighteen species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Mediterranean and Black Sea
FAO Major Fishing Area 37

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY





Biologically sustainable
Biologically unsustainable
Unassessed reported landings

Source: FAO estimates.

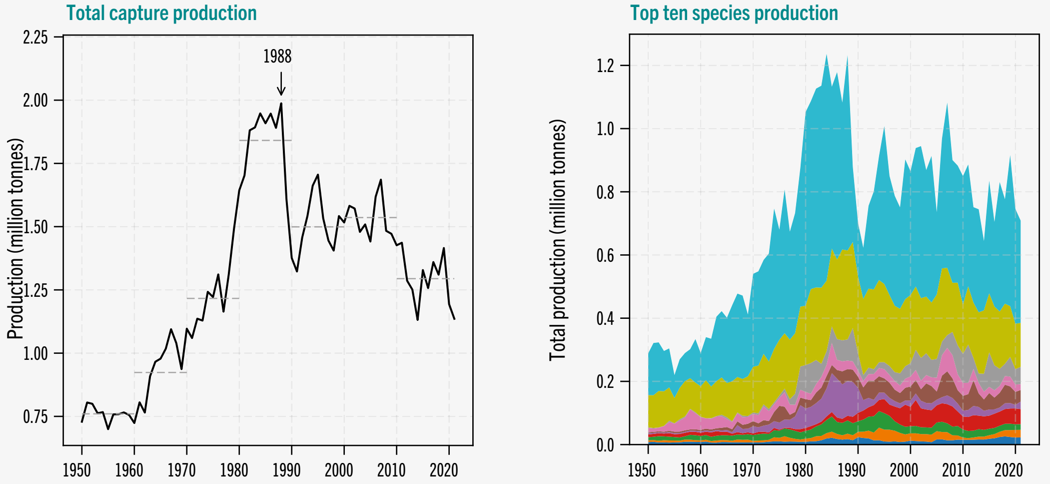
Total landings in the Mediterranean and Black Sea (Area 37) were approximately 2 million tonnes in the mid-1980s, but they gradually declined by 47 percent over the subsequent decades, reaching a low of 1.1 million tonnes in 2014. A modest recovery followed, with reported landings reaching 1.4 million tonnes in 2019. However, they declined again to around 1.1 million tonnes in both 2020 and 2021 (**FIGURE C.11**). In 2021, this was among the lowest landing volumes globally, ranking fourteenth worldwide.

Landings in recent decades have remained fairly stable at an average of 1.5 million tonnes, though in the 2010s this declined to an average of 1.3 million tonnes (a decline of around 14 percent).

In this assessment,[5] 35.1 percent of the stocks were classified as being at biologically sustainable levels in 2021, a similar value to the 36.6 percent

[5] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.11
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 37



Total production
Mean production for decade

1950–1959: 0.76 Mt, 1960–1969: 0.92 Mt, 1970–1979: 1.22 Mt, 1980–1989: 1.84 Mt, 1990–1999: 1.50 Mt, 2000–2009: 1.54 Mt, 2010–2021: 1.29 Mt

Area 37 had its peak in capture production in 1988, with total landings of 1.99 million tonnes. The greatest change in mean production for the decade occured between 1970–1979 and 1980–1989, with an increase of 51.34 percent.

Parapenaeus longirostris, *Thunnus thynnus*, *Merluccius merluccius*, *Sardinella* spp, *Trachurus mediterraneus*, *Chamelea gallina*, *Trachurus* spp, *Sprattus sprattus*, *Sardina pilchardus*, *Engraulis encrasicolus*

The top ten species accounted for 62.40 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top twenty-two species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

reported in 2019.[6] In 2021, 56.9 percent of the landings in the Area were from sustainable stocks.

The European anchovy *(Engraulis encrasicolus)* and European pilchard (also known as sardine, *(Sardina pilchardus)* continue to be priority species throughout the Mediterranean and Black Sea regions. In the Black Sea, anchovy stocks accounted for 63.2 percent of reported landings in 2021. European pilchard stocks, often fished alongside anchovy, showed greater vulnerability, with half classified as overfished in 2021. Round sardinella *(Sardinella aurita)* is a major species in the eastern Mediterranean but was assessed as overfished in 2021.

In the Black Sea, European sprat *(Sprattus sprattus)* was the second most landed species and was sustainably fished in 2021. Among demersal species, European hake *(Merluccius merluccius)* remained overfished across all assessed stocks in 2021, though some showed early signs of recovery. Red mullet *(Mullus barbatus)* stocks have improved in some areas due to management measures, but over half remained overfished in 2021. Common sole *(Solea solea)* in the Adriatic recovered to a sustainable level in 2021, while turbot *(Scophthalmus maximus)* in the Black Sea showed biomass increases but remained overfished in 2021.

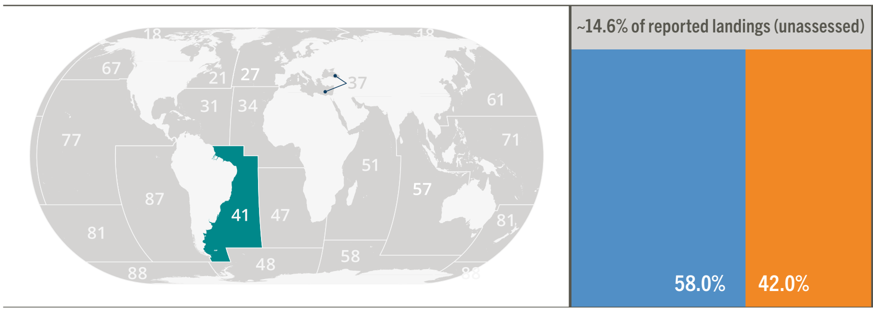
Deep-water red shrimps *(Aristeus antennatus, Aristaeomorpha foliacea)* were among the most heavily exploited crustaceans, with nearly all assessed stocks overfished in 2021. Similarly, deep-water rose shrimp *(Parapenaeus longirostris)* landings increased significantly, though most stocks were overfished in 2021. Norway lobster *(Nephrops norvegicus)* remains a high-value species in the Adriatic but was classified as overfished in 2021, with recent assessments aiming to refine its stock status.

For more information on Area 37, please refer to **PART D, CHAPTER 5**, pp. 130.

[6] The percentage of stocks at biologically sustainable levels reported here is based, with small modifications, on the assessments carried out by the General Fisheries Commission for the Mediterranean (GFCM), which has been providing information on stock status in Area 37 since 2008 within its report on the State of the Mediterranean and Black Sea Fisheries (FAO, 2023). The GFCM estimate for 2021 is 42 percent of stocks at biologically sustainable levels, nearly double what was reported in 2012 (22 percent).

Southwest Atlantic
FAO MAJOR FISHING AREA 41

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY

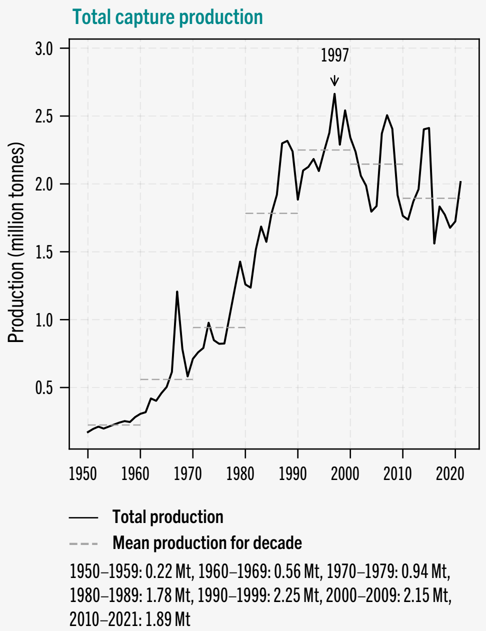


Source: FAO estimates.

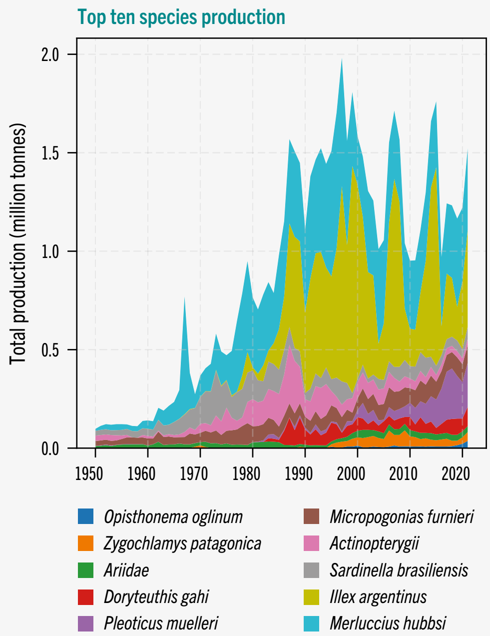
With 2.0 million tonnes in 2021, the Southwest Atlantic was the ninth-largest Area in terms of landings worldwide. The peak of production occurred in 1997, followed by a declining trend (**TABLE C.5**, **FIGURE C.12**). Decadal production has decreased by approximately 10 percent per decade but with considerable inter-annual variability (2.2 million tonnes in the 1990s, 2.1 million tonnes in the 2000s, and 1.9 million tonnes in the 2010s).

Hake, squid and shrimp have remained the mainstay of these fisheries for a long time, accounting for close to 50 percent of the total catch in recent years. Landings of red shrimp stocks have increased significantly (approximately fivefold) since the late 2000s.

FIGURE C.12
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 41



Area 41 had its peak in capture production in 1997, with total landings of 2.66 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 149.87 percent.



The top ten species accounted for 75.62 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top ten species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

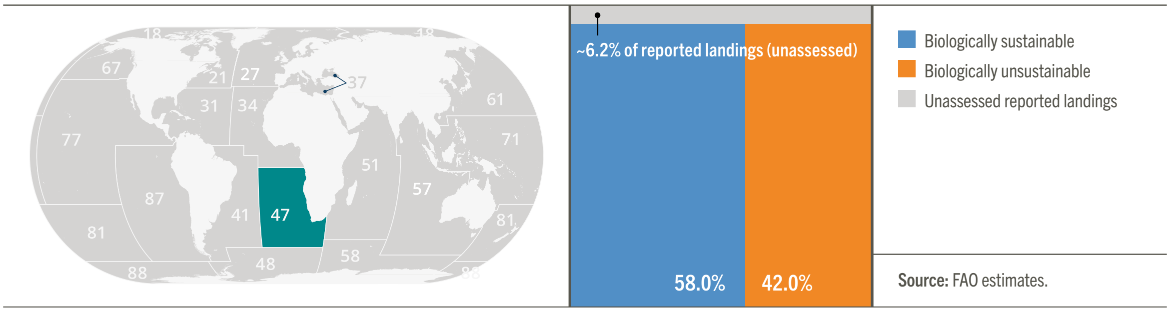
In the Southwest Atlantic,[7] 58.0 percent of the assessed stocks were classified as being at biologically sustainable levels in 2021. Similarly, in 2019, 60 percent of the assessed stocks were classified as being at biologically sustainable levels. In 2021, 68.4 percent of the landings were from sustainable stocks.

The Argentine hake *(Merluccius hubbsi)* is a key commercial species in the Southwest Atlantic, with three major stocks identified for management. While one Patagonian hake stock showed signs of recovery, two other stocks remained overexploited in 2021. The shortfin squid *(Illex argentinus)* supports one of the world's largest squid fisheries, though landings have fluctuated significantly due to environmental factors and fishing pressure. The whitemouth croaker *(Micropogonias furnieri)* was sustainably fished within the Argentina–Uruguay Common Fishing Zone (AUCFZ) in 2021, but was overfished in other areas. Similarly, the striped weakfish *(Cynoscion guatucupa)* was facing high exploitation rates, though it remained sustainably fished in the AUCFZ in 2021. The Argentine anchovy *(Engraulis anchoita)* landings remained a small fraction of available biomass in 2021. The Brazilian sardinella *(Sardinella brasiliensis)* has undergone major population declines, likely due to overfishing and environmental shifts. The red shrimp *(Pleoticus muelleri)* is highly valued in the international market, with increasing landings in Argentina, and a critical trawl fishery in southern Brazil. However, climate change and habitat alterations pose long-term threats to its abundance.

More information on Area 41 can be found in **PART D, CHAPTER 6**, pp. 150.

Southeast Atlantic
FAO MAJOR FISHING AREA 47

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

The Southeast Atlantic had the twelfth-largest landings in the world. Area 47 has shown a decreasing trend in landings since the late 1960s, from a total of 3.3 million tonnes in 1968 and 1978 to 1.5 million tonnes in 2021 (**FIGURE C.13**).

The peak of production was in the late 1970s. Decadal production has stayed stable at around 1.5 million tonnes since the 1990s. In 2021, landings were dominated by small pelagic fish, including horse mackerels (Cape horse mackerel [*Trachurus capensis*]), Cape hakes *(Merluccius capensis, Merluccius paradoxus)*, sardinellas (round sardinella [*Sardinella aurita*] and flat sardinella [*Sardinella maderensis*]), Southern African anchovy *(Engraulis capensis)* and Cunene horse mackerel *(Trachurus trecae)*. Distributions of landings of the top ten species have remained relatively stable over the last 30 years.

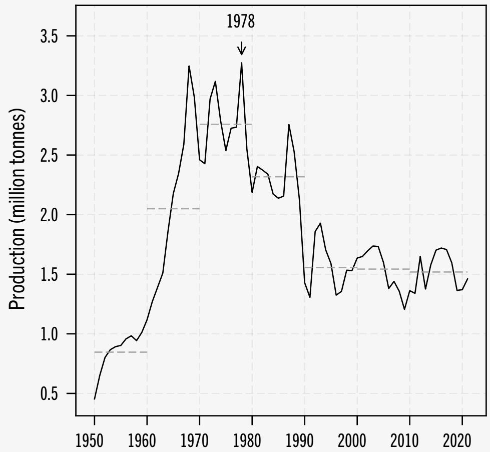
In this assessment,[7] 58.0 percent of the assessed stocks in the Southeast Atlantic were classified as being within biologically sustainable levels in 2021, somewhat lower than the 64.7 percent in 2019. In terms of landings, 43.8 percent came from sustainable stocks in 2021.

Recent stock assessments for hake stocks *(Merluccius capensis, Merluccius paradoxus)* in South Africa showed a steady increase in spawning biomass, and these stocks were classified as being at biologically sustainable levels in 2021, while in other regions in Area 47 hake resources were overfished in 2021. In South Africa, the relative abundance and catch of small pelagic resources – sardine *(Sardinops sagax)* and

[7] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.13
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 47

Total capture production

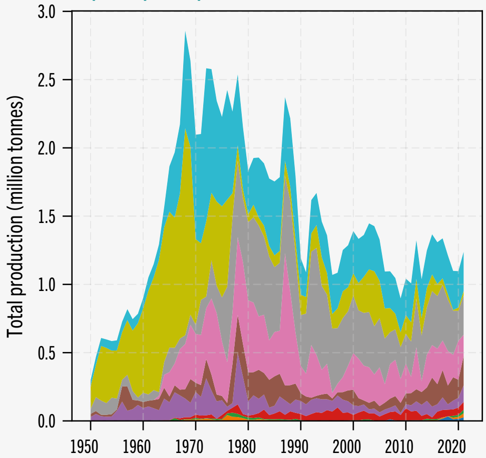


— Total production
- - - Mean production for decade

1950–1959: 0.85 Mt, 1960–1969: 2.05 Mt, 1970–1979: 2.76 Mt, 1980–1989: 2.32 Mt, 1990–1999: 1.56 Mt, 2000–2009: 1.54 Mt, 2010–2021: 1.52 Mt

Area 47 had its peak in capture production in 1978, with total landings of 3.27 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 142.16 percent.

Top ten species production



Pleuronectiformes
Dentex macrophthalmus
Trichiurus lepturus
Etrumeus whiteheadi
Trachurus trecae
Sardinella spp
Engraulis capensis
Trachurus capensis
Sardinops sagax
Merluccius capensis, M. paradoxus

The top ten species accounted for 84.87 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top six species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

anchovy *(Engraulis capensis)* – remained low and the stocks were classified as overfished in 2021. The stock of West Coast rock lobster *(Jasus lalandii)* in South Africa was classified as overfished, with an estimated spawning biomass in 2021 at 5.3 percent of pre-1910 levels. In Namibia and Angola, the stock of red crab *(Chaceon maritae)* was classified as being at biologically sustainable levels in 2021. Horse mackerels (Cape horse mackerel [*Trachurus capensis*] and Cunene horse mackerel [*Trachurus trecae*]) support large fisheries in the region; these stocks recovered to biologically sustainable levels following good recruitment and strict management measures in Namibia and South Africa.

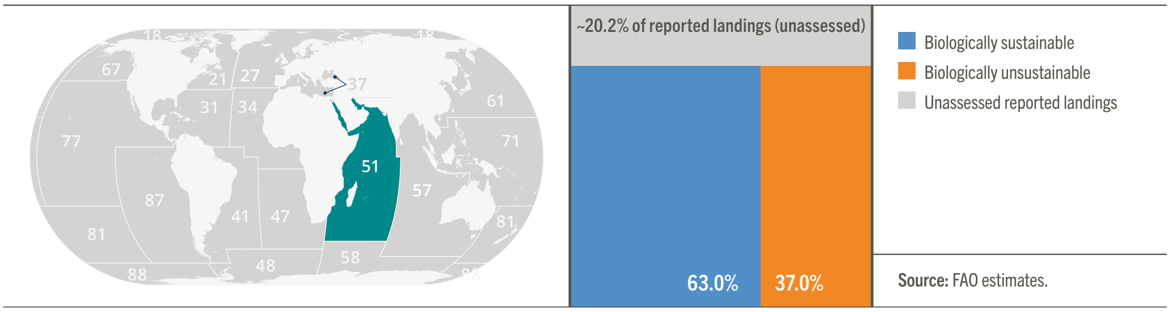
Stock assessments for Cape monk *(Lophius vomenirus)* suggested that they were sustainably fished in the waters of Namibia and South Africa in 2021. There are two species of sardine in the Area *(Sardinops ocellatus and Sardinops sagax)*, one was classified as overfished and the other as maximally sustainably fished in 2021. Stocks of sardinella *(Sardinella aurita* and *Sardinella maderensis)* – very important in Angola, and to some extent in Namibia – were classified as being at biologically sustainable levels in 2021. Most of the locally important stocks of South African line fishes were sustainably fished in 2021. Snoek *(Thyrsites atun)*, yellowtail *(Seriola lalandi)* and carpenter seabream *(Argyrozona argyrozona)* were classified as being at biologically sustainable levels in 2021, but some important stocks such as silver kob *(Argyrosomus inodorus)* were still classified as overfished. Updated assessments for perlemoen abalone *(Haliotis midae)* indicated that the stock continued to be overfished in 2021.

For more information on Area 47, please refer to **PART D, CHAPTER 7**, pp. 168.

2.2 Indian Ocean (Areas 51, 57)

Western Indian Ocean
FAO MAJOR FISHING AREA 51

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

Total landings in the Western Indian Ocean continued to increase and reached approximately 5.5 million tonnes in 2021, making it the sixth-largest Area in the world in terms of landings (**FIGURE C.14**).

Landings continued to increase each decade from 3.7 million tonnes in the 1990s to 4.2 million tonnes in the 2000s to 4.9 million tonnes in the 2010s. This represented a 15 percent increase from the 1990s and a 15 percent increase from the 2000s to the 2010s.

In 2021, tunas and tuna-like species continued to contribute the most in terms of landings and value, followed by small pelagic fishes and mixed (mainly reef-associated) fishes. Penaeid shrimps and cephalopod molluscs contributed similar and relatively small amounts to the overall landings in 2021. Pelagic fishes contributed around 55 percent of total landings in 2021. The relative contributions of the key resources have remained stable for the last few decades.

The updated assessment[8] indicated that 63.0 percent of the stocks assessed were within biologically sustainable levels in 2021, a similar result to the estimate of 62.5 percent obtained in 2019. In terms of landings, 70.6 percent were from sustainable stocks in 2021.

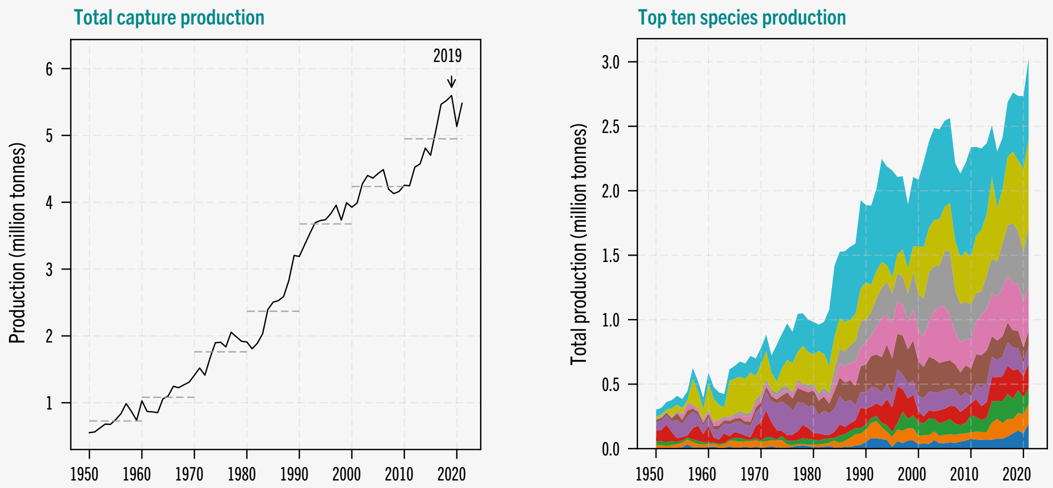
In 2021, tuna stocks remained at biologically sustainable levels, while shrimp species were overfished. FAO Major Fishing Area 51 spans multiple Large Marine Ecosystems, from the Arabian Gulf to the Southwest Indian Ocean (SWIO), supporting diverse fisheries and species. Small pelagic and neritic resources in the Arabian Gulf appeared healthier than in the SWIO, likely due to lower fishing pressure. Across the Arabian Sea – including Iran, Pakistan, and India – fisheries were generally in better condition than those in SWIO. Neritic tuna were sustainably fished in 2021, but Indian mackerel *(Rastrelliger kanagurta)* and scads *(Decapterus* spp.) were overfished, while squid fisheries remained at biologically sustainable levels in 2021.

The Indian oil sardine *(Sardinella longiceps)* is vital for food and fishmeal production, significantly contributing to India's economy, though its population fluctuates due to environmental changes and overfishing. Indian mackerel, a key commercial species, shows resilience to climate change due to its reproductive strategy. The Bombay duck *(Harpadon nehereus)*, primarily found in the northeast Arabian Sea, is crucial for regional fisheries but faces climate-related pressures. Hairtails *(Trichiuridae* spp.), cutlassfish and ribbonfish play essential ecological and economic roles, though overfishing is a growing concern. Indian squid *(Uroteuthis duvaucelii)* is widely exploited for food and bait, while prawns and shrimp, highly valued commercially, remain vulnerable to overexploitation and climate change. These species are integral to marine ecosystems, fisheries, and the livelihoods of coastal communities.

For more information on Area 51, please refer to **PART D, CHAPTER 8**, pp. 182.

[8] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.14
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 51



— Total production
--- Mean production for decade

1950-1959: 0.73 Mt, 1960-1969: 1.08 Mt, 1970-1979: 1.76 Mt, 1980-1989: 2.37 Mt, 1990-1999: 3.68 Mt, 2000-2009: 4.24 Mt, 2010-2021: 4.95 Mt

Area 51 had its peak in capture production in 2019, with total landings of 5.60 million tonnes. The greatest change in mean production for the decade occured between 1960-1969 and 1970-1979, with an increase of 62.83 percent.

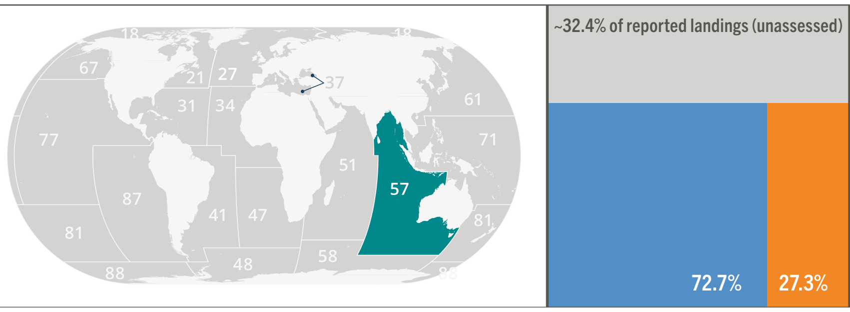
Caranx spp, *Clupeiformes (=Clupeoidei)*, *Trichiuridae*, *Rastrelliger kanagurta*, *Natantia*, *Sciaenidae*, *Thunnus albacares*, *Katsuwonus pelamis*, *Sardinella longiceps*, *Actinopterygii*

The top ten species accounted for 55.25 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top twenty-five species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Eastern Indian Ocean
FAO MAJOR FISHING AREA 57

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

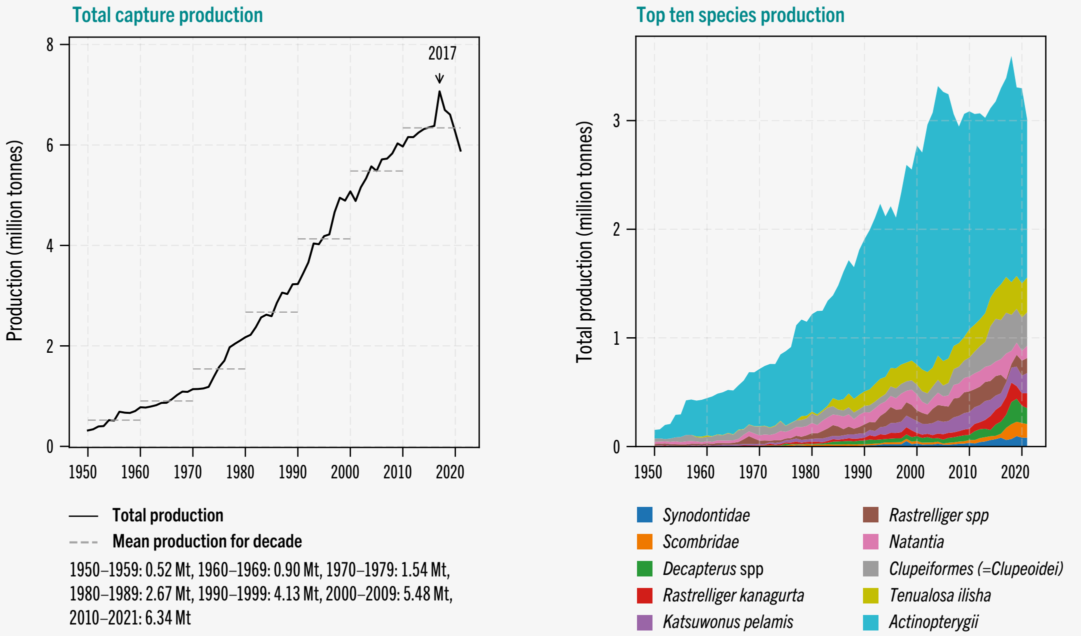
Source: FAO estimates.

With 5.9 million tonnes in landings in 2021, the Eastern Indian Ocean (Area 57) is the fifth-most productive FAO Major Fishing Area globally. Landings have increased from 4.1 million tonnes in the 1990s to 5.5 million tonnes in the 2000s, and then to 6.4 million tonnes in the 2010s (**TABLE C.5**).

Reported landings in the Eastern Indian Ocean have displayed a consistent upward trend over the past decades, surging to over 7 million tonnes in 2017 before leveling off at around 5.9 million tonnes in recent years (**FIGURE C.15**).

Hilsa shad *(Tenuolosa ilisha)* and shrimp showed over 10 percent increase in production from 2020 to 2021. Notably, stocks of small pelagic fish, including sardinellas and anchovies, exhibited marked fluctuations in production, although they remained in the top ten species over time.

FIGURE C.15
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 57



1950–1959: 0.52 Mt, 1960–1969: 0.90 Mt, 1970–1979: 1.54 Mt, 1980–1989: 2.67 Mt, 1990–1999: 4.13 Mt, 2000–2009: 5.48 Mt, 2010–2021: 6.34 Mt

Area 57 had its peak in capture production in 2017, with total landings of 7.07 million tonnes. The greatest change in mean production for the decade occured between 1970–1979 and 1980–1989, with an increase of 73.41 percent.

The top ten species accounted for 51.17 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top thirty-three species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

The updated assessment[9] indicated that 72.7 percent of the stocks were within biologically sustainable levels in 2021, an increase from 65.3 percent in 2019. In terms of landings, 82.9 percent of landing volumes were from sustainable stocks in 2021.

Pelagic fisheries in Area 57 are dominated by small pelagic fishes (anchovies, sardines and herrings), forming the second-largest group in terms of landings. These species play a vital role in coastal ecosystems as forage fish, linking plankton to larger predators. While catches are generally resilient to fishing, they fluctuate annually due to environmental changes. Tunas, bonitos and billfishes contributed 11 percent of the landings in 2021, with tuna fisheries accounting for the majority. Although overfishing was noted in some regions, these species were mainly sustainably fished in 2021.

Demersal fisheries, including coastal and miscellaneous demersal fishes, accounted for 12 percent of the total landings in 2021, with some stocks under pressure from overfishing, particularly in the Bay of Bengal. Squids, cuttlefishes and octopuses, though a smaller component of the landings, showed mixed stock statuses in 2021. Crustaceans like shrimp and prawns accounted for 4.8 percent of the landings in 2021, but many stocks were overfished in certain subareas. Molluscs and diadromous fishes such as Hilsa shad were also significant in terms of landings in 2021, with the latter vulnerable to environmental changes. Elasmobranchs (sharks, skates and rays) were sustainably fished overall in 2021, but some species faced localized overfishing. Lastly, the "marine fish NEI" group comprised 26 percent of the total landings in 2021, often consisting of bycatch and juvenile commercial species, typically used for local consumption or fishmeal.

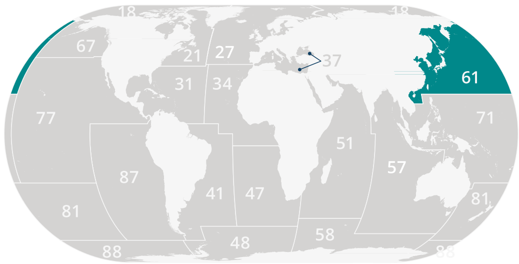
More information on Area 57 can be found in **PART D, CHAPTER 9**, pp. 198.

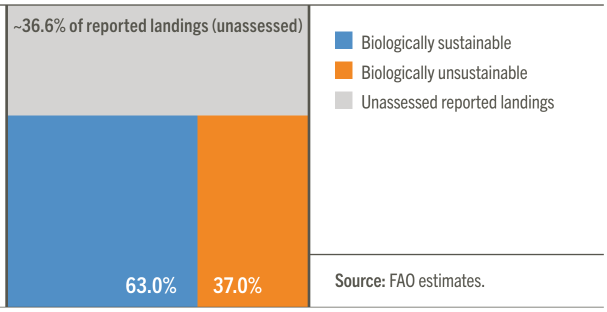
[9] For the purpose of this analysis, highly migratory tunas and sharks were excluded and assessed under Part E of this report on Special topics.

2.3 Pacific Ocean (Areas 61, 67, 71, 77, 81, 87)

Northwest Pacific
FAO MAJOR FISHING AREA 61

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



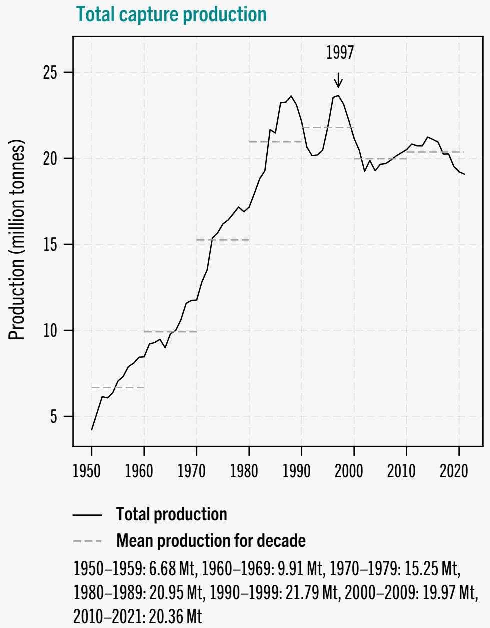


Source: FAO estimates.

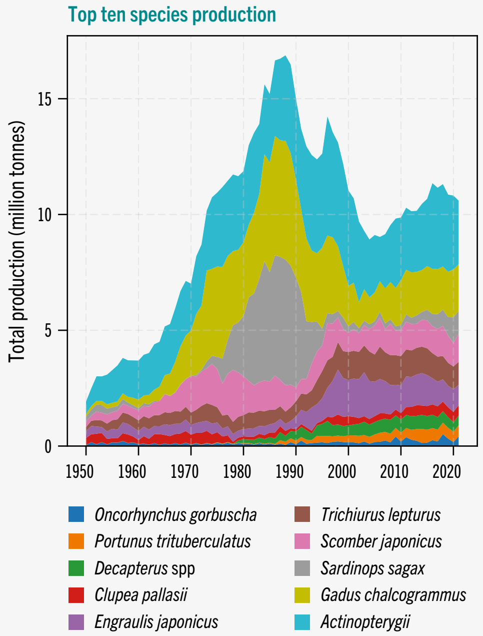
The Northwest Pacific (Area 61) has the highest declared production among all FAO Major Fishing Areas. Landings declared for this Area in 2021 (19.1 million tonnes) accounted for 23.8 percent of global landings. Landings have declined since the 1990s from an average of 21.8 million tonnes to 20.0 million tonnes in the 2000s and 20.6 million tonnes in the 2010s. This is roughly a 10 percent decline since the peak in the 1990s.

Landings from 2020 to 2021 were relatively stable at around 19.1 million tonnes (**TABLE C.5**, **FIGURE C.16**). Most of the oscillation in landings in the Area over the years is due to the fluctuation of the Pacific sardine *(Sardinops sagax)*,

FIGURE C.16
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 61



Area 61 had its peak in capture production in 1997, with total landings of 23.65 million tonnes. The greatest change in mean production for the decade occured between 1960–1969 and 1970–1979, with an increase of 53.89 percent.



The top ten species accounted for 55.56 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top twenty-two species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

classically a highly variable pelagic species. Alaska pollock *(Gadus chalcogrammus)* remained the largest reported landing with around 2 million tonnes in 2021. Historically, this species was also the most productive in Area 61, peaking in 1986 at 5.2 million tonnes. Japanese pilchard *(Sardinops melanostictus)* was another historically productive species with a peak at 5.4 million tonnes in 1988; this species is now reported by Japan as Pacific sardine, and data for 2021 indicated landings of 988 000 tonnes. The second-most productive species in 2021 was Pacific chub mackerel *(Scomber japonicus)* (1 213 000 tonnes), followed closely by largehead hairtail *(Trichiurus lepturus)* (996 000 tonnes) and Japanese anchovy *(Engraulis japonicus)* (878 000 tonnes). Among the analysed species, Pacific chub mackerel *(Scomber japonicus)*, largehead hairtail *(Trichiurus lepturus)* and Japanese anchovy have had the biggest increases in landings since 1990.

Among the 94 stocks analysed, Alaska pollock, Japanese pilchard, Pacific chub mackerel and largehead hairtail remain as the dominant species. Landings of these stocks have remained proportionally stable over the time series. These stocks remained the largest contributors over the last three decades and accounted for 54 percent of the overall production in the region in 2021.

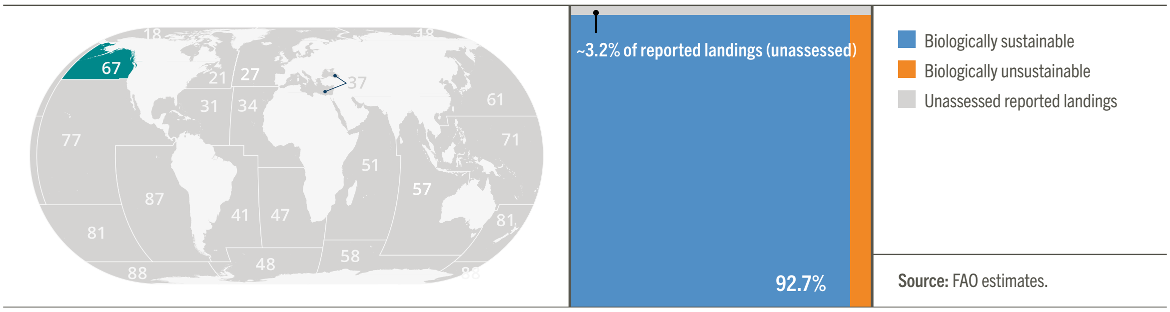
Overall in this assessment,[10] 63.0 percent of assessed stocks were classified as being within biologically sustainable levels in 2021, as compared to 55 percent in 2019. In terms of landings, biologically sustainable stocks represented 73.7 percent of the landings in 2021. In Area 61, small pelagic fishes like Japanese anchovy, Japanese pilchard, Pacific sardine and Pacific herring *(Clupea pallasii)* contribute significantly to the landings, comprising about 12.1 percent of the total yield in 2021. China, Japan and the Republic of Korea have varying assessments of these stocks, with some considered overfished and others maximally sustainably fished in 2021. Largehead hairtail, gazami crab *(Portunus trituberculatus)*, Pacific chub mackerel, and seerfishes also form important fisheries in the area, with mixed stock assessments ranging from maximally sustainably fished to overfished in 2021. Yellow croaker *(Larimichthys polyactis)* and Japanese jack mackerel *(Trachurus japonicus)* showed declining trends in landings in 2021, and their stock statuses are also varied. Alaska pollock, one of the biggest fisheries globally, is primarily fished by the Russian Federation, Japan and China, with two stocks being overfished in the Area in 2021. Pacific cod *(Gadus macrocephalus)*, a key species in the North Pacific, has seen fluctuations in landings, and two of the seven stocks were overfished in 2021.

Overall, the fisheries in Area 61 exhibited a range of stock statuses in 2021, indicative of the diverse fishing practices, management strategies, and environmental conditions across the region.

For more information on Area 61, please refer to **PART D, CHAPTER 10**, pp. 214.

Northeast Pacific
FAO MAJOR FISHING AREA 67

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

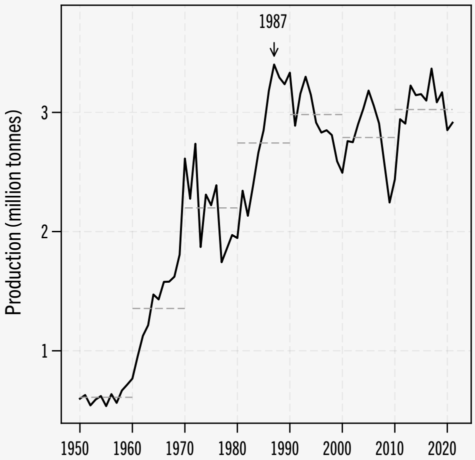
The Northeast Pacific (Area 67) is the eighth-largest in terms of landings, producing around 2.9 million tonnes per year in the last three decades (**TABLE C.5**, **FIGURE C.17**).

Total allowable catches are limited in the region by a cap on Alaska pollock *(Gadus chalcogrammus)*, which ensures that other stocks in the mixed stock fishery remain well above B_{MSY} (the biomass that is expected to produce the maximum sustainable yield), hence in terms of sustainability, the region is performing better than other parts of the world. Alaska pollock

10 For the purpose of this analysis, highly migratory tunas and sharks were excluded and assessed under Part E of this report on Special topics.

FIGURE C.17
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 67

Total capture production

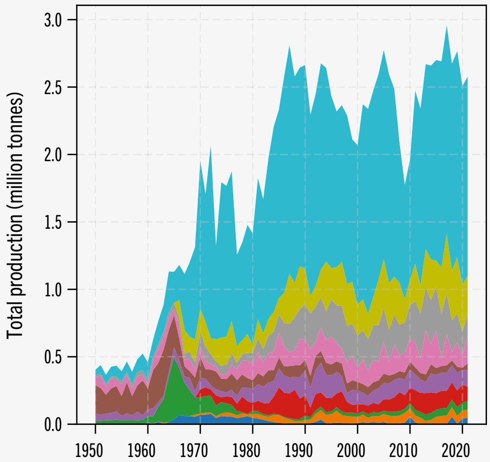


— Total production
--- Mean production for decade

1950–1959: 0.61 Mt, 1960–1969: 1.35 Mt, 1970–1979: 2.20 Mt, 1980–1989: 2.74 Mt, 1990–1999: 2.98 Mt, 2000–2009: 2.79 Mt, 2010–2021: 3.02 Mt

Area 67 had its peak in capture production in 1987, with total landings of 3.40 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 122.21 percent.

Top ten species production



Actinopterygii
Pleurogrammus monopterygius
Sebastes alutus
Limanda aspera
Oncorhynchus nerka
Clupea pallasii
Oncorhynchus gorbuscha
Gadus macrocephalus
Merluccius productus
Gadus chalcogrammus

The top ten species accounted for 88.41 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top five species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

contributed about 50.6 percent of the landings in the region in 2021. Other dominant species were hake, salmon and multiple species of groundfish. Pacific cod *(Gadus microcephalus)*, hakes and soles were also major contributors to the landings in 2021. These dominant species have remained fairly stable over the last three decades.

Depending on how stocks of salmon[11] are accounted for, the overall stocks status[12] in the Area were either 82.0 percent (with salmon) or 92.7 percent (without salmon) sustainably fished in 2021. This is among the highest estimates of sustainability globally. Compared with results for 2019, when 86.2 percent of the stocks were sustainably fished, the updated results for 2021 represent a drop of 4.2 percent (as salmon were also included in the 2019 assessment). When weighted by their production level, 99.0 percent of landings in 2021 (without salmon) were from biologically sustainable stocks.

Most stocks in this region were within biologically sustainable levels in 2021. However, some stocks of Pacific salmon in southerly states (British Columbia in Canada and the states of Washington, Oregon and California in the United States of America) were overfished in 2021, and some stocks of Pacific herring *(Clupea pallasii)*, king crab and yelloweye rockfish *(Sebastes ruberrimus)* were also overfished in 2021, although this may also be due to climate change effects as recruitment collapsed due to warmer average temperatures in the Gulf of Alaska and Bering Sea. Recruitment failures of the Bering Sea snow crab *(Chionoecetes opilio)*, linked to climate change, are a cause for concern, potentially signalling long-term changes in these areas.

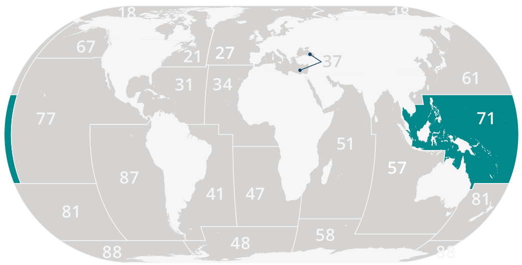
More information on Area 67 can be found in **PART D, CHAPTER 11**, pp. 228.

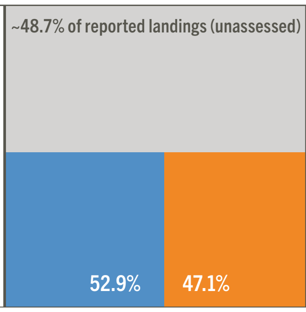
[11] In Area 67, there are 85 stocks of salmon, of which 30.6 percent were assessed as underfished, 36.5 percent as maximally sustainably fished and 32.9 as overfished in 2021. These stocks were very small in terms of landings in 2021.

[12] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Western Central Pacific
FAO MAJOR FISHING AREA 71

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY





Biologically sustainable
Biologically unsustainable
Unassessed reported landings

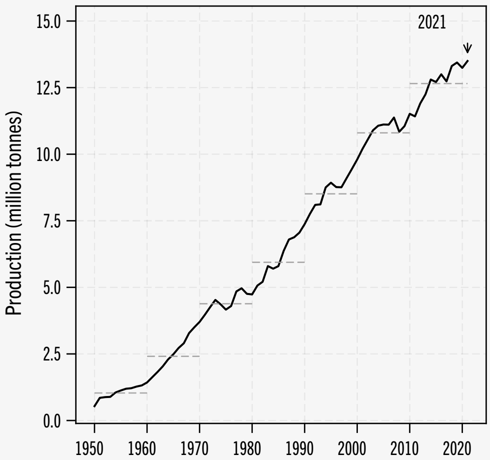
Source: FAO estimates.

In 2021, the Western Central Pacific (Area 71) recorded the second-largest declared landings globally, totaling 13.5 million tonnes (approximately 16.8 percent of total global landings). Tunas, small pelagic species and neritic tunas are the largest groups in this Area. Landings, averaged by decade, have continuously increased from 8.5 million tonnes in the 1990s to 10.8 million tonnes in the 2000s to 12.5 million tonnes in the 2010s (**TABLE C.5**, **FIGURE C.18**). This represents a 27 percent increase from the 1990s to the 2000s and a 15.8 percent increase from the 2000s to the 2010s.

Many fish species were landed in 2021, however, landings were not always categorized by species. Instead, landings were often grouped into broad, generic categories such as "marine fishes not elsewhere included (Actinopterygii)", "sharks, rays, skates", etc. These general categories constituted 57 percent of the region's total landings in 2021. Tuna

FIGURE C.18
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 71

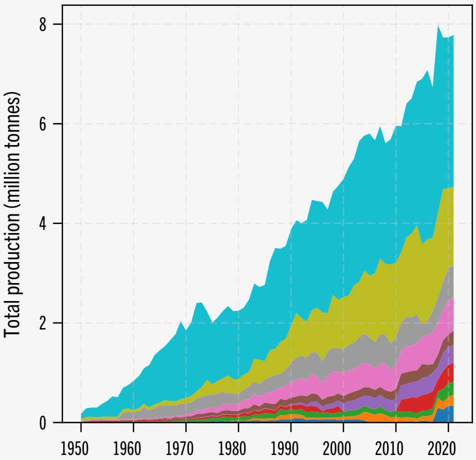
Total capture production



Total production
Mean production for decade
1950–1959: 1.03 Mt, 1960–1969: 2.41 Mt, 1970–1979: 4.38 Mt, 1980–1989: 5.94 Mt, 1990–1999: 8.51 Mt, 2000–2009: 10.80 Mt, 2010–2021: 12.65 Mt

Area 71 had its peak in capture production in 2021, with total landings of 13.50 million tonnes. The greatest change in mean production for the decade occured between 1950–1959 and 1960–1969, with an increase of 133.26 percent.

Top ten species production



Sardinella lemuru
Thunnus tonggol
Carangidae
Scombriformes (Scombroidei)
Cephalopoda
Loligo spp
Thunnus albacares
Decapterus spp
Katsuwonus pelamis
Actinopterygii

The top ten species accounted for 57.66 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top twenty-five species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

and tuna-like species were important, contributing around 27 percent of total landings. Small pelagic species such as sardines, anchovies and scads were also significant, making up 13.7 percent. These have remained fairly stable over time, but the significant reporting of species groupings as "not elsewhere included" due to the absence of species-specific information remains an issue for this region.

With this assessment,[13] 52.9 percent of stocks were classified as sustainable in 2021, a drop of about 27 percent compared to 79.6 percent in 2019. This is primarily attributed to the adoption of finer-scale stock assessments and the discontinuation of less reliable catch-trend methodologies. When weighted by their production levels, 45.0 percent of landings were from biologically sustainable stocks in 2021.

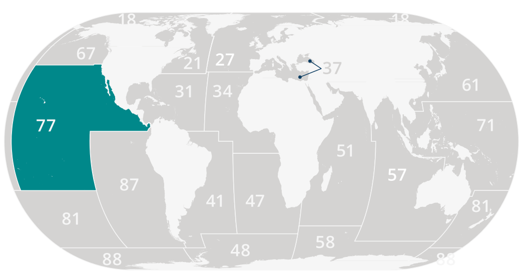
In Area 71, tunas are a key species for both commercial and artisanal fisheries, with species like skipjack *(Katsuwonus pelamis)*, yellowfin *(Thunnus albacares)*, bigeye *(Thunnus obesus)* and albacore *(Thunnus alalunga)* being highly valued. Despite well-organized management under the Western and Central Pacific Fisheries Commission (WCPFC), local depletion of species like skipjack and yellowfin is common in Southeast Asia, primarily due to overfishing and overcapacity. Small pelagic fishes such as anchovies, sardines and herrings are critical for local communities, especially in Southeast Asia, where they support diets and livelihoods. However, they face growing threats from pollution, habitat loss and overfishing, with some stocks showing signs of depletion due to unregulated fishing practices.

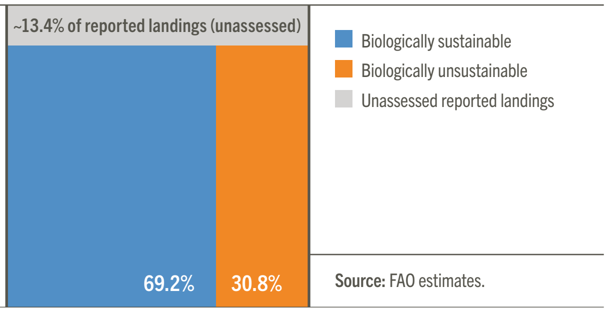
Elasmobranchs (sharks, skates and rays) are also vulnerable to overfishing, particularly in Southeast Asia and the Pacific islands, where many species have experienced significant declines. Challenges related to data availability and enforcement capacity continue to affect effective fisheries management in the region. Finally, coastal and coral-reef species are vital for food security and livelihoods in Southeast Asia and the Pacific, but overexploitation, along with the impacts of climate change, pollution and coastal degradation, is leading to the decline of many key species, such as sea cucumbers, groupers and snappers. There is an urgent need for improved management to protect these essential resources.

More information on Area 71 can be found in **PART D, CHAPTER 12**, pp. 248.

Eastern Central Pacific
FAO MAJOR FISHING AREA 77

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY





Source: FAO estimates.

The Eastern Central Pacific is the tenth-largest Area in terms of landings, with 2.0 million tonnes in 2021. Landings have varied between 1.4 million tonnes in the 1990s, 1.8 million tonnes in the 2000s, and 1.9 million tonnes in the 2010s (**FIGURE C.19**). This represents an increase of 25.7 percent between the 1990s and 2000s, but only a 3.3 percent increase after that (2000s–2010s).

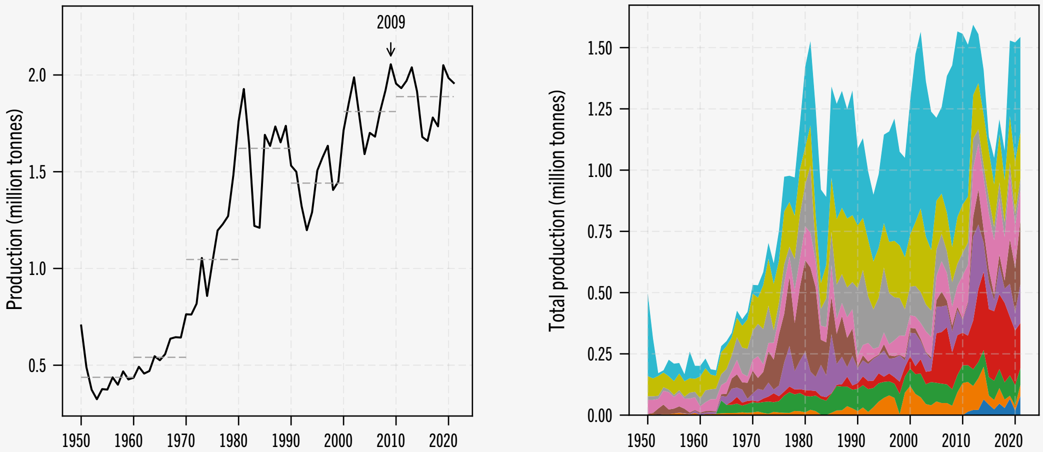
This region's landings predominantly consist of tunas, small to medium-sized pelagic fishes, and locally squids and shrimps. These species are socially important and economically valuable, which are inherently susceptible to interannual variations in oceanographic conditions and can present oscillations in landings despite sustainable exploitation rates. These groups remain fairly stable over time, however, the magnitude of the total abundance depends mainly on pelagic species and shrimps.

The assessment[13] indicated that 69.2 percent of the stocks in the Eastern Central Pacific were at biologically sustainable levels in 2021. This is 16 percent lower than the previous assessment in 2019, when 85.7 percent of the stocks were

[13] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.19
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 77

Total capture production | Top ten species production



— Total production
- - - Mean production for decade

1950–1959: 0.44 Mt, 1960–1969: 0.54 Mt, 1970–1979: 1.05 Mt, 1980–1989: 1.62 Mt, 1990–1999: 1.44 Mt, 2000–2009: 1.81 Mt, 2010–2021: 1.89 Mt

Area 77 had its peak in capture production in 2009, with total landings of 2.06 million tonnes. The greatest change in mean production for the decade occured between 1960–1969 and 1970–1979, with an increase of 93.47 percent.

Stomolophus meleagris, *Doryteuthis opalescens*, *Thunnus obesus*, *Opisthonema libertate*, *Cetengraulis mysticetus*, *Engraulis mordax*, *Katsuwonus pelamis*, *Actinopterygii*, *Thunnus albacares*, *Sardinops sagax*

The top ten species accounted for 78.81 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top nine species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

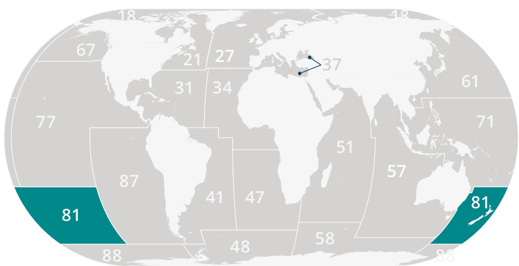
at sustainable levels. In terms of production volumes, 81.2 percent of the landings were from biologically sustainable stocks in 2021.

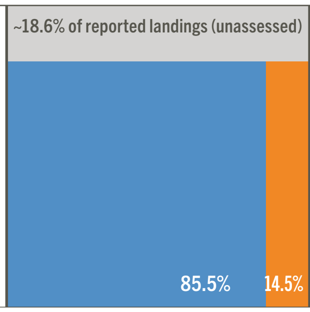
Important stocks of California sardine *(Sardinops caeruleus),* northern anchovy *(Engaulis mordax),* Pacific anchoveta *(Cetengraulis mysticetus),* Pacific thread herring *(Opisthonema libertate)* and jumbo flying squid *(Dosidicus gigas)* were at sustainable levels in 2021. However, coastal resources of high-value species, including groupers, snappers and shrimps, were still overfished in 2021.

For more information on Area 77, please refer to **PART D, CHAPTER 13**, pp. 264.

Southwest Pacific
FAO MAJOR FISHING AREA 81

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



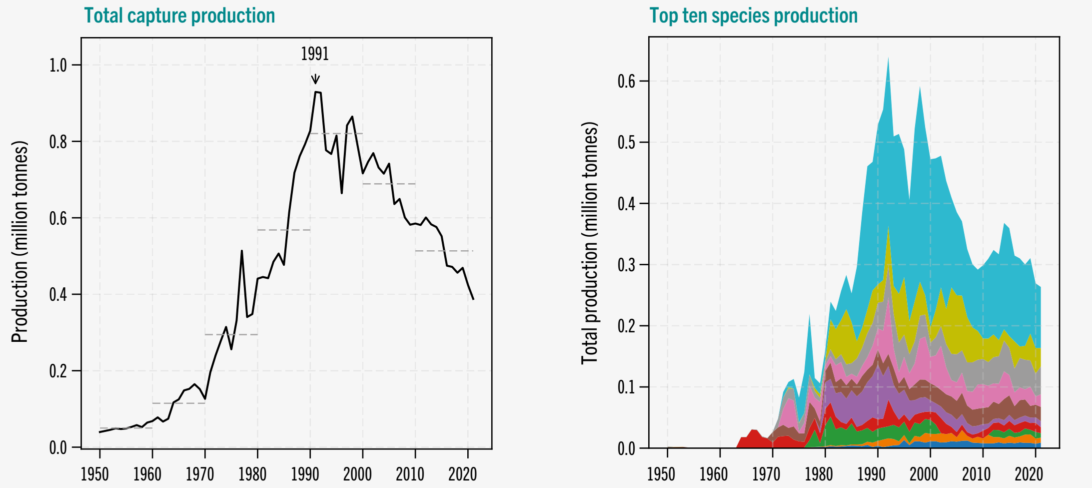


Biologically sustainable
Biologically unsustainable
Unassessed reported landings

Source: FAO estimates.

The Southwest Pacific is among the smallest globally in terms of landings, with 0.4 million tonnes in 2021. Landings have been declining steadily since 1991. Landings averaged 0.8 million tonnes

FIGURE C.20
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 81



— Total production
--- Mean production for decade

1950–1959: 0.05 Mt, 1960–1969: 0.11 Mt, 1970–1979: 0.29 Mt, 1980–1989: 0.57 Mt, 1990–1999: 0.82 Mt, 2000–2009: 0.69 Mt, 2010–2021: 0.51 Mt

Area 81 had its peak in capture production in 1991, with total landings of 0.93 million tonnes. The greatest change in mean production for the decade occured between 1960–1969 and 1970–1979, with an increase of 156.63 percent.

Seriolella punctata
Scomber australasicus
Oreosomatidae
Thunnus alalunga
Hoplostethus atlanticus
Leionura atun
Micromesistius australis
Trachurus spp
Nototodarus sloanii
Macruronus novaezelandiae

The top ten species accounted for 67.91 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top fifteen species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

in the 1990s, 0.7 million tonnes in the 2000s and 0.5 million tonnes in the 2010s. This represents a 22.3 percent decline in the 2010s and a 16 percent decline in the 2000s (**FIGURE C.20**).

The declared landings in the Area include a high diversity of species. Major species are blue grenadier *(Macruronus novaezelandiae)*, followed by squids, pelagic mackerel and orange roughy *(Hoplostethus atlanticus)*, which accounted for around 47 percent of the total landings in 2021. Southern blue whiting *(Micromesistius australis)*, snoek *(Thyrsites atun)* and pink cusk-eel *(Genypterus blacodes)* are also significant in the region. Species compositions of declared landings have remained relatively stable over the time series observed.

Overall in this assessment,[14] 85.5 percent of assessed fishery stocks in the Southwest Pacific were at biologically sustainable levels in 2021, as compared to 76.9 percent in 2019. When weighted by production levels, 95.7 percent of the declared landings in 2021 were from stocks classified as biologically sustainable.

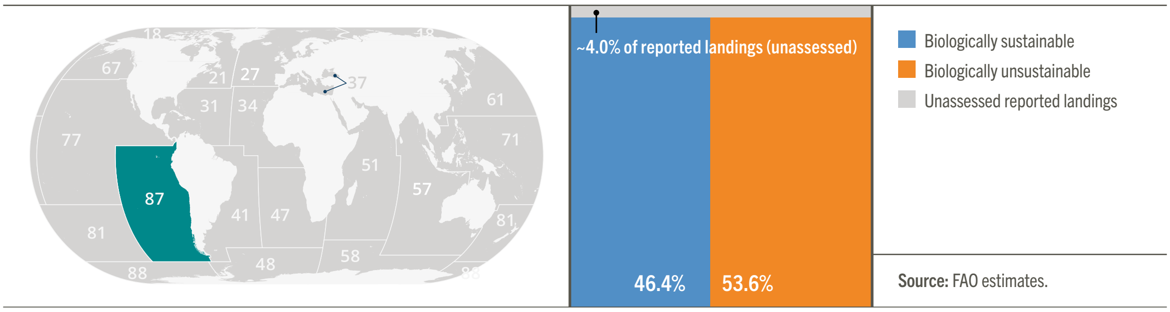
Orange roughy, abalone, scallops and blue cod *(Parapercis colias)* have been overfished over the last few decades. Most other species were either maximally sustainably fished or underfished in 2021, as catches have been reduced to ensure sustainable management of resources in this Area.

More information on Area 81 can be found in **PART D, CHAPTER 14**, pp. 282.

14 For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Southeast Pacific
FAO MAJOR FISHING AREA 87

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



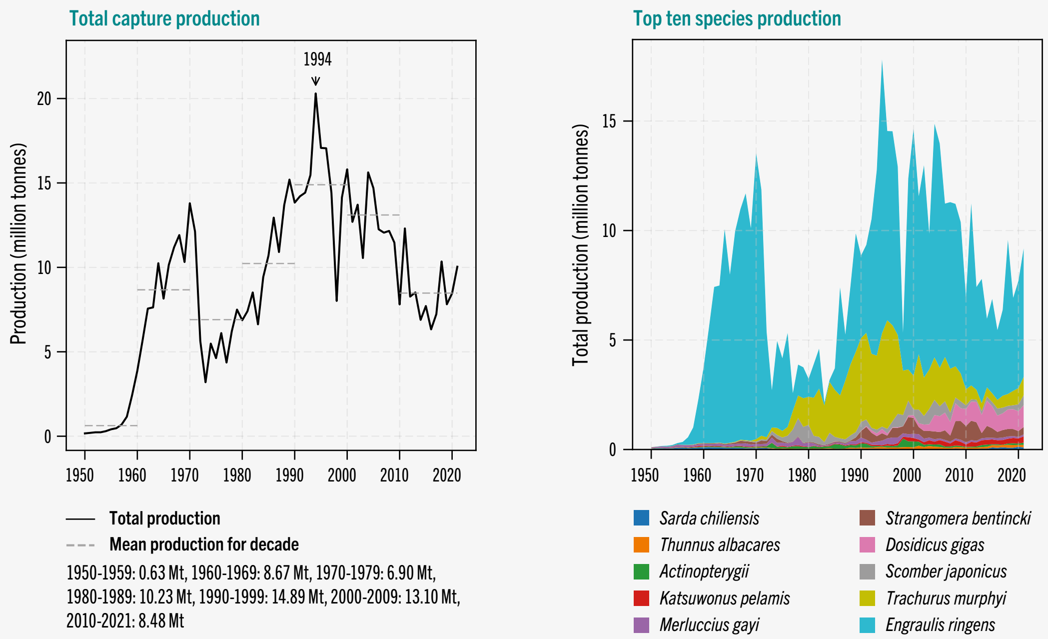
Source: FAO estimates.

The Southeast Pacific was the third-most important Area in terms of declared landings in 2021, contributing about 12.5 percent of global landings with 10.0 million tonnes. Landings have declined from a peak of 20.3 million tonnes in 1994, and, by decade, dropped from 14.9 million tonnes in the 1990s, to 13.1 million tonnes in the 2000s, to 8.3 million tonnes in the 2010s. The decline in catches has accelerated from 12 percent to 37 percent over the last decades.

The clear decreasing trend in declared landings from the early 1990s to 2016 has recently reversed (**FIGURE C.21**), primarily due to increases in landings of Peruvian anchoveta *(Engraulis ringens)*.

Anchoveta and jumbo flying squid *(Dosidicus gigas)* were the two most-represented species in the

FIGURE C.21
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREA 87



1950-1959: 0.63 Mt, 1960-1969: 8.67 Mt, 1970-1979: 6.90 Mt, 1980-1989: 10.23 Mt, 1990-1999: 14.89 Mt, 2000-2009: 13.10 Mt, 2010-2021: 8.48 Mt

Area 87 had its peak in capture production in 1994,with total landings of 20.30 million tonnes. The greatest change in mean production for the decade occured between 1950-1959 and 1960-1969, with an increase of 1280.33 percent.

The top ten species accounted for 91.56 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top three species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

declared landings in 2021, with almost 5.9 million tonnes and nearly 1 million tonnes, respectively. Other dominant species in the Area are Pacific chub mackerel *(Scomber japonicus)*, Chilean jack mackerel *(Trachurus murphyi)*, Araucanian herring *(Strangomera bentincki)*, Skipjack tuna *(Katsuwonus pelamis)* and yellowfin tuna *(Thunnus albacares)*. The jumbo flying squid has become a major fishery since the 2000s.

Overall in this assessment,[15] 46.4 percent of Area 87's assessed stocks were classified as being within sustainable levels in 2021, as compared to 33.3 percent in 2019. In terms of landings, 81.1 percent were from biologically sustainable stocks in 2021.

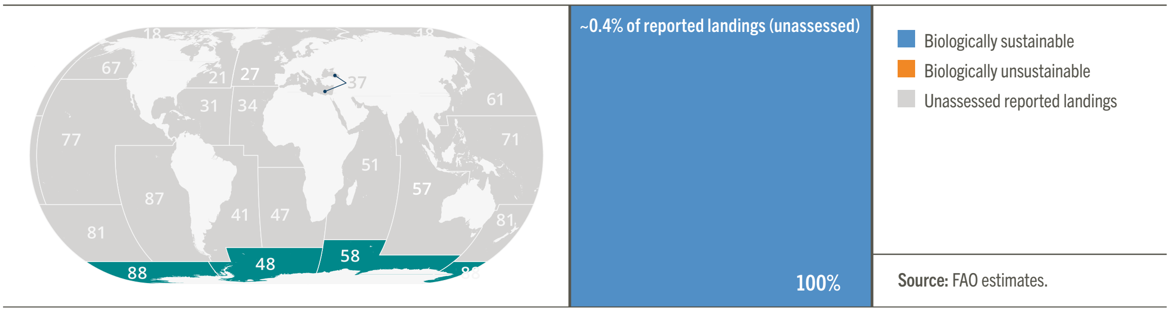
While the stock of anchoveta, constituting a large share of total landings, was classified as being within biologically sustainable levels in 2021, the stock of jumbo flying squid was classified as overfished. The stock of araucaria herring *(Strangomera bentincki)* was also classified as being within biologically sustainable levels in 2021. In contrast, the stocks of South American pilchard *(Sardinops sagax)*, South Pacific hake *(Merluccius gayi)*, southern hake *(Merluccius australis)* and Patagonian toothfish *(Dissostichus eleginoides)* were all classified as overfished in 2021. Stocks of Pacific chub mackerel *(Scomber japonicus)* have recovered and were classified as being at biologically sustainable levels in the region in 2021.

For more information on Area 87, please refer to **PART D, CHAPTER 15**, pp. 300.

2.4 Antarctic Area (Areas 48, 58 and 88)

Antarctic Area
FAO MAJOR FISHING AREAS 48, 58 AND 88

STOCK STATUS ASSESSMENT | UPDATED METHODOLOGY



Source: FAO estimates.

With less than 0.4 million tonnes in 2021, the Antarctic Area, represented by Areas 48, 58 and 88 combined, had the lowest landings among FAO Major Fishing Areas in 2021. Landings were 0.2 million tonnes in the 1990s, 0.1 million tonnes in the 2000s and 0.3 million tonnes in the 2010s (**FIGURE C.22**).

Areas 48, 58 and 88 combined had their peak in capture production in 1982, with total landings of 0.7 million tonnes. Large-scale fishing for finfish began in the Antarctic Area in the late 1960s, targeting species such as mackerel icefish *(Champsocephalus gunnari)*, marbled rockcod *(Notothenia rossii)* and Patagonian rockcod *(Patagonotothen guntheri)*. By the late 1970s some species were overfished in some places, and their fisheries have been closed since the late 1980s.

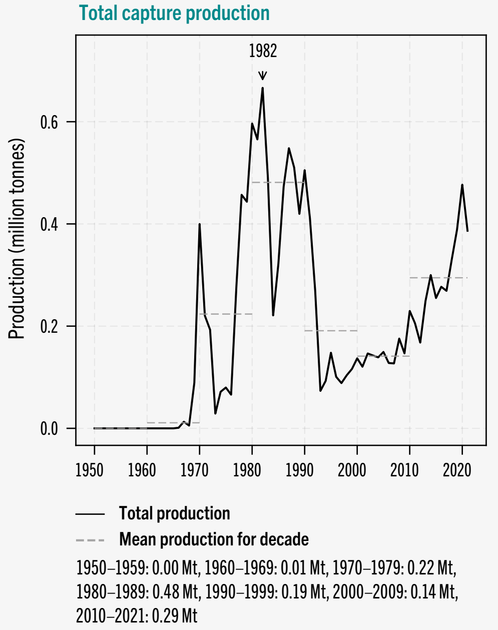
The assessment[15] indicated that 100 percent of the stocks in the Antarctic Area were classified as being at biologically sustainable levels in 2021. There were no equivalent estimates with the previous methodology.

Toothfish stocks *(Dissostichus mawsoni* and *Dissostichus eleginoides)* were maximally sustainably fished or underfished in 2021. Icefish stocks *(Champsocephalus gunnari)* were classified as underfished with a low level of uncertainty in 2021. The krill fishery *(Euphausia superba)* in Area 48 was classified as underfished in 2021; however, additional measures are under consideration to avoid ecosystem impacts that may result from localized depletion of krill.

More information on Areas 48, 58 and 88 can be found in **PART D, CHAPTER 16**, pp. 316.

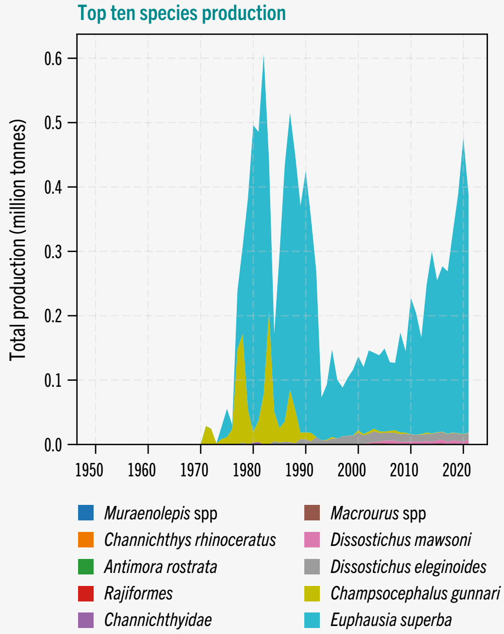
[15] For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

FIGURE C.21
CAPTURE PRODUCTION AND DOMINANT SPECIES IN AREAS 48, 58 AND 88, ANTARCTIC AREA



1950–1959: 0.00 Mt, 1960–1969: 0.01 Mt, 1970–1979: 0.22 Mt, 1980–1989: 0.48 Mt, 1990–1999: 0.19 Mt, 2000–2009: 0.14 Mt, 2010–2021: 0.29 Mt

Area 48, 58, 88 had its peak in capture production in 1982, with total landings of 0.67 million tonnes. The greatest change in mean production for the decade occured between 1960–1969 and 1970–1979, with an increase of 1961.13 percent.



The top ten species accounted for 99.97 percent of total capture production in 2021. Seventy-five percent of the total capture production is covered by the top one species.

Note: Aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

3. PROGESS TOWARDS ACHIEVING GLOBAL OBJECTIVES

3.1 Prospects of achieving the Sustainable Development Goal target on fisheries

Under the United Nations Sustainable Development Goal 14 (SDG 14), FAO is mandated to monitor global progress toward the sustainable use of fishery resources. SDG 14 (*Conserve and sustainably use the oceans, seas and marine resources for sustainable development*) includes Target 14.4 aimed at ending overfishing by 2020.

In 2021, 64.5 percent of the stocks of the world's marine fisheries were fished within biologically sustainable levels. The continuously decreasing global trend in the proportion of sustainably fished stocks (**FIGURE C.2**) is a cause for concern in the international community. Urgent concrete rebuilding plans and management efforts are needed to achieve sustainable fisheries. However, there are also positive signals in the assessment from some regions of the world like the North Atlantic, Northeast Pacific and Southeast Pacific, which demonstrate that effective fisheries management can make an impact and enhance fisheries sustainability. In other parts of the world, change is underway, for example in Southeast Asia, fisheries management is improving, particularly in Thailand where effort controls and a buyback programme are being implemented. Similarly, Indonesia is working to reduce its total allowable catch (TAC) and fishing effort across its waters. In West Africa, management is also progressing, especially in the Gulf of Guinea and the Benguela Current Commission (BCC) region. However, some fish stocks remain significantly overfished in certain areas. Unfortunately, the pace of these improvements remains slower than the timeline required to meet the SDGs.

Recent studies show that intensively managed stocks have seen, on average, their abundance increasing or stabilising at or around target levels; while in contrast, regions with less developed fisheries management tend to have excessively higher harvest rates, and consequently stocks with lower abundance and sustainability with regards to target levels (Hilborn *et al.*, 2020). This underscores the urgent need to replicate and adapt successful policies and regulations in fisheries in regions where effective management is lacking, while also developing innovative mechanisms to promote sustainable use of marine resources globally. These efforts align with FAO's Blue Transformation objective of bringing 100 percent of fisheries under effective management (FAO, 2022).

Overfishing not only reduces the supply of aquatic animals for human consumption but negatively impacts biodiversity and ecosystem functions, leading to adverse social, cultural and economic consequences. Ye *et al.* (2013) showed that rebuilding overfished stocks to the biomass that enables them to deliver maximum sustainable yield (MSY) could increase fisheries production globally by 16.5 million tonnes and annual revenues by USD 32 billion. Other studies estimated that poor fisheries management results in foregone revenues of more than USD 83 billion annually due to overfishing (World Bank, 2017). In addition, overfishing and underfishing in many regions of the world exacerbate food insecurity and undermine livelihoods (Hilborn *et al.*, 2025). Better management would also significantly increase the contribution of marine fisheries to the food security, nutrition, economic development and well-being of coastal communities.

3.2 Food security implications

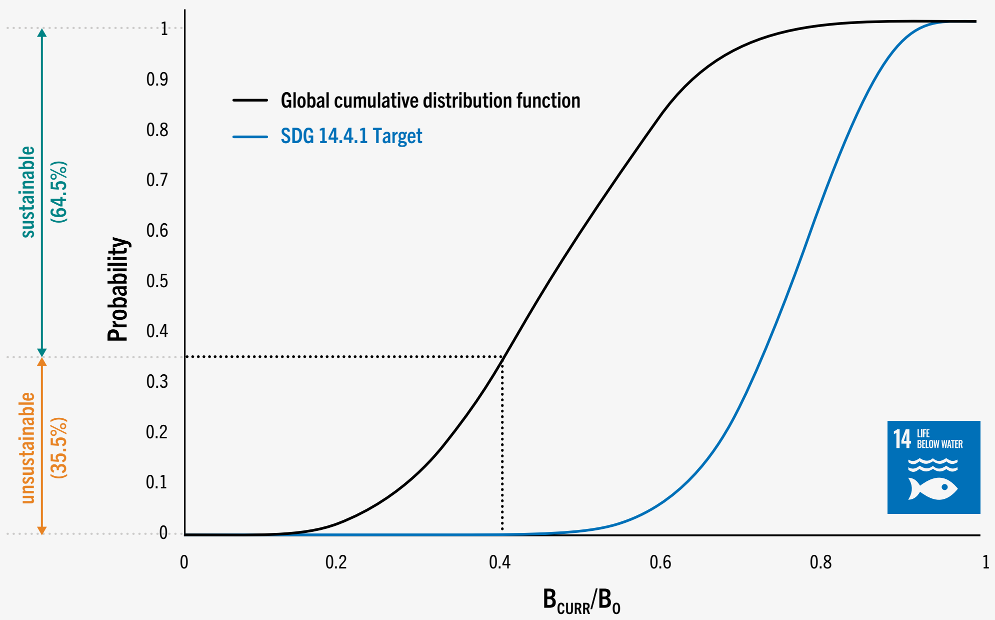
In FAO's current approach, the term "maximally sustainably fished" typically refers to stocks that are, on average, maintained at 40–60 percent of their unfished biomass level (B_0). B_{MSY} is estimated as a percent of their unfished biomass level, because B_{MSY} is usually 40–60 percent of B_0. The default value for B_{MSY} is 50 percent of B_0. In this context, FAO considers stocks above 60 percent of the unfished biomass to be classified as underfished, and those under 40 percent as overfished (**PART B, METHODOLOGY**, pp. 6). This definition originated from the concept of surplus production of fish stocks, and assumes that MSY is the goal of fishery management (UN, 1982, 1995; FAO, 1995).

However, the biomass associated with MSY (B_{MSY}) varies due to species differences, data uncertainties and model selection – and, from year to year, with local climatic conditions. While there is no global consensus on what sustainable fisheries targets should be or precise estimates of suitable thresholds for defining status of stocks and associated reference points, it is clear that single species B_{MSY} may lie within a range of such values (Hilborn, 2010).

The global cumulative distribution function (CDF) of 2 570 stocks (**FIGURE C.23**) illustrates the impact of considering different biomass reference points on the perception of overfishing. MSY normally tends to occur at or around 50 percent B_{MSY} assuming a Schaeffer production function. Selection of more stringent criteria for sustainability increases the proportion of stocks classed as being overfished. Based on the FAO approach where the reference point is 40 percent of B_0, equivalent to 80 percent of B_{MSY}, and gives 35 percent of stocks as being overfished.

However, if we use B_{MSY} (0.5 B_0) as the threshold, the proportion of overfished stocks increases to 59.7 percent. Further tightening the target with a threshold at 0.6 B_0 or 1.2 B_{MSY} results in an estimated 81.8 percent of stocks being overfished. Note that the 80 to 120 percent buffer on B_{MSY} was designed to deal with uncertainty in B_{MSY} in general and relative to B_0.

FIGURE C.23
GLOBAL CUMULATIVE DISTRIBUTION FUNCTION (CDF) OF ASSESSED STOCKS



Note: A beta distribution is used to estimate the scale and shape of the relationship between the biomass ratio and the probability of occurrence, producing a sigmoidal shape function as shown in the graph above. Note that B_{CURR}/B_0 represents the ratio of the current estimated biomass of a fish stock (using 2021 as reference year) to its unfished (virgin) biomass.

Source: FAO estimates.

The blue curve represents a theoretical distribution aligned with SDG Target 14.4, which calls for 100 percent of fish stocks to be above the B_{MSY} target (implied here to be over 0.4 B0 accounting for uncertaintyin the estimates of B_{MSY}). The persistent and widening gap between the observed distribution and this target indicates that achieving SDG 14.4 by 2030 is increasingly unlikely. This reflects a core challenge as the target may not be realistically attainable in all regions, and failure to meet it could have serious implications for global food security, particularly in vulnerable coastal areas with limited fisheries management capacity. There have been notable local management successes, but overall progress remains insufficient and without decisive and coordinated action the gap is likely to persist. Addressing this issue will require significant investment and bold policy interventions to avoid potentially severe social, economic and ecological consequences.

Moreover, in a natural system characterized by high process variability and imperfect management, maintaining fish stocks at overly precautionary levels (effectively shifting the population toward the right-hand side of the CDF) may unintentionally constrain fishery yield. This approach implicitly interacts with the underlying production function, where yield is not necessarily maximized at biomass levels approaching B_0 (the unfished or carrying capacity). Consequently, such a conservative strategy may lead to suboptimal harvest outcomes, particularly when biomass levels exceed those associated with maximum sustainable yield B_{MSY}. As illustrated by the blue curve, such an approach could reduce overall fish production, thereby increasing food insecurity, and thus hampering FAO efforts and policies to reduce malnutrition and food insecurity.

4. GENERAL METHODOLOGICAL NOTES

The updated analysis adopts a more comprehensive and participatory approach than in previous editions, providing a more accurate representation of the state of the fish stocks at global and regional level while matching the resolution used by local fisheries managers. It took over two years to compile the data and analysis for 2 570 stocks, and involved 19 Area-based workshops and consultations with around 650 experts from all regions.

The approach followed is evidence-based, transparent and participatory. It was designed to build regional capacity, and its consultative in-depth regional peer-review process is endorsed by regional experts. While for several Areas there are rigorous assessment reports for all major exploited stocks, the updated approach expands coverage, enabling the state of the stocks classification where local data and capacity for full stock assessment is limited. In cases where good-quality catch and effort data was available, local or area-based assessments using surplus production models were performed. And where it was not possible to run model-based stock assessments, alternative methods that synthesize a variety of quantitative and qualitative knowledge were employed.

While the resolution at the stock level has increased almost five-fold across all regions, it has increased almost tenfold in data-limited regions of the Indian and Pacific Oceans. This higher resolution will enable improved (in terms of signal vs. noise) monitoring of stocks in the FAO Major Fishing Areas (Areas 31, 34, 41, 51, 57, 61, 71, 77 and 87) that are dominated by multi-species and multi-gear small-scale fisheries, for which species-specific data (quantity and quality) and knowledge are limited. The quality of any analysis is inherently dependent on the accuracy and completeness of the underlying data and knowledge – an ongoing challenge for both data-rich and data-poor stocks.

This update marks a significant improvement in the resolution of the global status of fishery stocks and enhances the previous methodology, particularly in relation to standardization, while also introducing new challenges. For example, if the updated baseline for stocks becomes saturated with small pelagic species that tend to be more resilient, the overall overfishing estimate would present an overoptimistic view (Area 57, for example). Similarly, less-resilient groups may be overlooked because they have already been depleted and have lower chances of being assessed due to a lack of information. Often, these groups may be aggregated (for example, sharks and rays) and hence have less influence by number on estimating an overfishing index when compared to stocks of more resilient and productive species subjected to intense monitoring. In addition, some small stocks that are often targeted by small-scale fisheries might not be considered important in terms of fish production, but are critically important for food and nutrition security and livelihoods for coastal communities (FAO, Duke and Worldfish, 2023; Basurto *et al.*, 2025). The need to counterbalance this tendency and increase the resolution of less-productive species and smaller stocks in the index will be a high priority in the future, and will require additional resources.

HIGHLY MIGRATORY TUNAS

Tunas are generally more productive than other species, and so estimated B_{MSY} values tend to be much lower than the traditional expectation of 50 percent of unfished biomass (B_0) (Maunder and Deriso, 2013). Some tuna stocks may be most productive when reduced to a quarter of their unfished stock size, i.e. their B_{MSY} is 25 percent of B_0. Such stocks would, under the circumstances, only be considered overfished under the FAO classification (80 percent of B_{MSY}) if reduced to less than a fifth of their original stock level (B_0) or 20 percent of B_0.

HIGHLY MIGRATORY SHARKS

In previous assessments, this group was not assessed as a separate group. Progress in species-specific data collection and reporting has significantly improved scientific research, bycatch mitigation, and stock assessments for several shark species, including blue shark (*Prionace glauca*), silky shark (*Carcharhinus falciformis*) and oceanic whitetip shark (*Carcharhinus longimanus*) (Rice and Harley, 2012, 2013; Rice *et al.,* 2013; Rice and Sharma, 2015).

AREA 27

In Area 27, the B trigger (B_{trig}) and B precautionary (B_{pa}) reference points used for management are substantially lower than B_{MSY} (ICES, 2022). This may contribute to an overly optimistic perception of stock status in Area 27, particularly in comparison to other FAO Areas where assessments were based on the more precautionary benchmark of 80 percent of B_{MSY}.[1] The International Council for the Exploration of the Sea (ICES) is considering this issue within its Working Groups, and modifications to the assessment approach might be reflected in subsequent analysis. However, for consistency purposes, this report retains the original approach, as B_{trig} and B_{pa} were also used as the basis for the previous FAO assessments. Area 27 stock resolution went from 34 species groupings to 178 stocks assessed, from the 235 monitored by ICES. The remaining 57 stocks may be added in future iterations.

AREA 51

In Area 51, there are 32 countries and commissions, and some like the Regional Commission for Fisheries (RECOFI) as well as India and Pakistan, reported a substantial number of new stocks, contributing to a significant increase of the overall coverage. The number of stocks assessed in this region increased from 32 species groupings in previous assessments to 470 disaggregated stock in 2021. In addition to the estimate of sustainability for this Area (reported in section 2.2 in this chapter), an alternative estimate could be generated that weighs the assessments according to they tiers (i.e. Tier 1 has twice the weight of Tier 2, and Tier 2 has twice the weight of Tier 3). In addition, the Indian Ocean Tuna Commission (IOTC) regularly updates the status of tuna and tuna-like species, while the Southwest Indian Ocean Fisheries Commission (SWIOFC) strives to assess the other main regional stocks in areas beyond national jurisdiction using data-poor methods.

AREA 57

In Area 57, the number of stocks assessed has increased from 52 species groupings in previous assessments to 308 disaggregated stocks in 2021. The region's assessment substantially improved the coverage from the Bay of Bengal countries that were missing in the past. For the first time, some species were assessed with models more reliable than the catch-only models and trend-based approaches used in the past. In addition, there has been a substantial increase in smaller units and stocks of cultural and socioeconomic importance as part of

[1] ICES uses B_{pa} as the reference point for management, considering it as a proxy for B_{MSY}. However, an analysis performed by Winker and Cardinale (ICES, 2022) demonstrates this is more akin to B_{lim}.

the new baseline, giving a better, more relevant picture of resources than before. However, one of the limitations of this update is that species that are currently assessed appear to be in a better state than the less-resilient species that are no longer seen in the landings or are no longer assessed due to some stocks having declined to levels below commercial interest or collapsing entirely – and are hence missing from the FAO index. Similar to Area 51 and to deal with the challenges identified for Area 57, a weighted estimate by tier could be produced using the same methodology as for Area 51.

AREA 61

In Area 61, 63.0 percent of assessed stocks were within biologically sustainable levels in 2021. This differs from the previously used approach that reported 44.0 percent as sustainable in 2021. The most likely reason for this difference is the increase in assessed species, rising from 25 aggregate species in previous assessments to 92 disaggregated stocks in 2021. A significant portion of these stocks came from the Republic of Korea, China and the Russian Federation, where their status was, on average, better than in previous aggregated assessments for the region. In addition to the estimate of sustainability for this Area (reported in section 2.3 in this chapter), an alternative estimate was generated that weighs the assessments according to they tiers (i.e. Tier 1 has twice the weight of Tier 2, and Tier 2 has twice the weight of Tier 3).

AREA 67

In Area 67, two separate indices to assess the status of the stocks were produced (one accounting for salmon stocks and another one without them) to assess the overall dynamics in this region. Previous estimates only assessed Pacific salmon at species level not stock level. Now, there are 85 salmon-specific assessments and 110 other assessments, and a total of 195 assessments in 2021 from the region. With salmon included in the calculations, 82 percent of stocks were classified as sustainable in 2021, as compared to 76.5 percent under the previous approach using the same reference year, which assessed only 34 aggregated species/stocks. However, if salmon is assessed separately as a group, 67.1 percent of salmon stocks were classified as biologically sustainable in 2021, while 92.7 percent of the remaining non-salmon stocks were sustainable in 2021, presenting a significantly different perspective on this region. This positive performance of stocks other than salmon can be attributed to the policy of prioritizing stability over maximum yield in Alaska pollock. By maintaining a consistent total allowable catch (TAC), associated species within the pollock-centered fishery are managed at biomass levels well above their B_{MSY}, contributing to overall sustainability.

AREA 71

In Area 71, under the updated approach, 52.9 percent of stocks were classified as sustainable in 2021, compared to 65.2 percent under the previous methodology for the same year. This decrease is likely attributable to the use of more robust baseline information for assessed stocks, along with a more detailed and rigorous examination of stock status. The updated approach assessed 263 stocks in 2021 whereas the previous method relied on catch trends to categorize 46 species groups. In addition, the updated approach now includes a considerable number of stocks from the Pacific islands and Southeast Asian countries, assessed using Tier 3 approaches, thereby enhancing the information base for this region. In 2021, over 80 percent of the Tier 1 stocks in this region were sustainable, whereas the figures are 30 percent and 50 percent for Tiers 2 and 3, respectively. The decline can thus be attributed to smaller, non-assessed stocks that were excluded from the previous analysis.

AREA 77

In Area 77, estimates suggest that approximately 69.2 percent of the stocks were harvested at biologically sustainable levels in 2021, compared to 84.2 percent under the previous approach with the same reference year. Notably, this is likely due to the increased resolution for this region, with the number of assessed groups rising from 19 to 91 disaggregated stocks from Central America. Importantly, stocks of California sardine *(Sardinops caeruleus*), anchovy *(Engaulis mordax*), Pacific anchoveta (*Cetengraulis mysticetus*), Pacific thread herring (*Opisthonema libertate*) and jumbo flying squid *(Dosidicus gigas*) were currently assessed as being at biologically sustainable levels in 2021. However, coastal resources of high-value species, including groupers, snappers and shrimps, were still overfished in 2021. These coastal resources are now a substantial part of the baseline compared to the previous analysis.

AREA 81

In Area 81, under the updated approach, about 85.5 percent of assessed fishery stocks in the Southwest Pacific were at biologically sustainable levels in 2021, compared to 75.9 percent for the same year with the previous approach. This difference is primarily due to the fact that Australia and New Zealand included 165 stocks, compared to the previous approach which used only 29 species or stock groups.

AREA 87

In Area 87, although the majority of the landings were from stocks at biologically sustainable levels (approximately 81 percent, because of Peruvian anchoveta [*Engraulis ringens*]), just 46.4 percent of the assessed stocks in the Area were within sustainable levels in 2021, compared to 33.3 percent using the previous approach. Stock resolution improved from 12 species aggregates to 97 disaggregated stocks/species.

OTHER AREAS

AREAS 21, 31, 34, 37, 41 AND 47

Areas 21, 31, 34, 37, 41 and 47 have not been discussed under separate headings in this section as the differences in 2021 under the updated assessment and previous approaches are relatively minor. However, in each of these Areas, the updated methodology has increased the resolution of assessments by assessing more disaggregated stocks.

In **AREA 21**, the number of stocks increased from 42 aggregated species groups in previous assessments to 150 disaggregated stocks in 2021. The estimated proportion of biologically sustainable shock changed slightly, from 64.3 percent with the previous methodology to 63.3 percent with the updated methodology for the same reference year.

In **AREA 31,** the number of stocks increased from 50 aggregated species groups in previous assessments to 103 disaggregated stocks in 2021, with biologically sustainable stocks increasing from 58.0 percent under the previous methodology to 62.1 percent using the updated methodology for the same year.

In **AREA 34**, the number of stocks increased from 39 aggregated species groups in previous assessments to 133 disaggregated stocks in 2021, while the proportion of biologically sustainable stocks declined slightly from 48.7 percent with the previous methodology to 47.4 percent with the updated methodology for the same year. In addition to the estimate of sustainability for this Area (reported in section 2.1 in this chapter), an alternative estimate could be generated that weighs the assessments according to they tiers (i.e. Tier 1 has twice the weight of Tier 2, and Tier 2 has twice the weight of Tier 3). This weighted estimate by tier for Area 34 is 51.0 percent.

In **AREA 37**, the number of stocks increased from 40 aggregated species groups in previous assessments to 114 disaggregated stocks in 2021, with a decline in biologically sustainable stocks from 37.5 percent with the previous methodology to 35.1 percent with the updated methodology for the same reference year.

In **AREA 41** the number of assessment units increased from 17 species groups in previous assessments to 69 disaggregated stocks in 2021, with a slight decrease in biologically sustainable stocks from 58.8 percent with the previous methodology to 58.0 percent with the updated methodology for the same year. In addition to the estimate of sustainability for this Area (reported in section 2.1 in this chapter), an alternative estimate could be generated at the request of the countries that weighs the assessments according to they tiers (i.e. Tier 1 has twice the weight of Tier 2, and Tier 2 has twice the weight of Tier 3).

In **AREA 47**, the number of stocks increased from 37 species groups in previous assessments to 81 disaggregated stocks in 2021, with the proportion of biologically sustainable stocks decreasing from 59.5 with the previous methodology to 58.0 percent with the updated methodology for the same year.

AREAS 48, 58 AND 88

Finally, **AREAS 48, 58 AND 88**, which have not been reported in previous assessments, were included for the first time, and all the 15 stocks assessed in these Areas were found to be at biologically sustainable levels in 2021.

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PART D

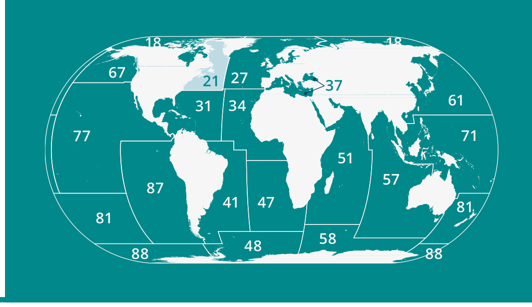
Illustration © Jana Kleineberg

Part D

REGIONAL OVERVIEW

Part D shows 16 sub-sections summarizing information on major trends and changes in the status of key fishery resources, as well as stock assessment efforts supporting fisheries management, at the regional level.

Illustration © Jana Kleineberg



Part D, Chapter 1 (D.1)

NORTHWEST ATLANTIC
FAO MAJOR FISHING AREA 21

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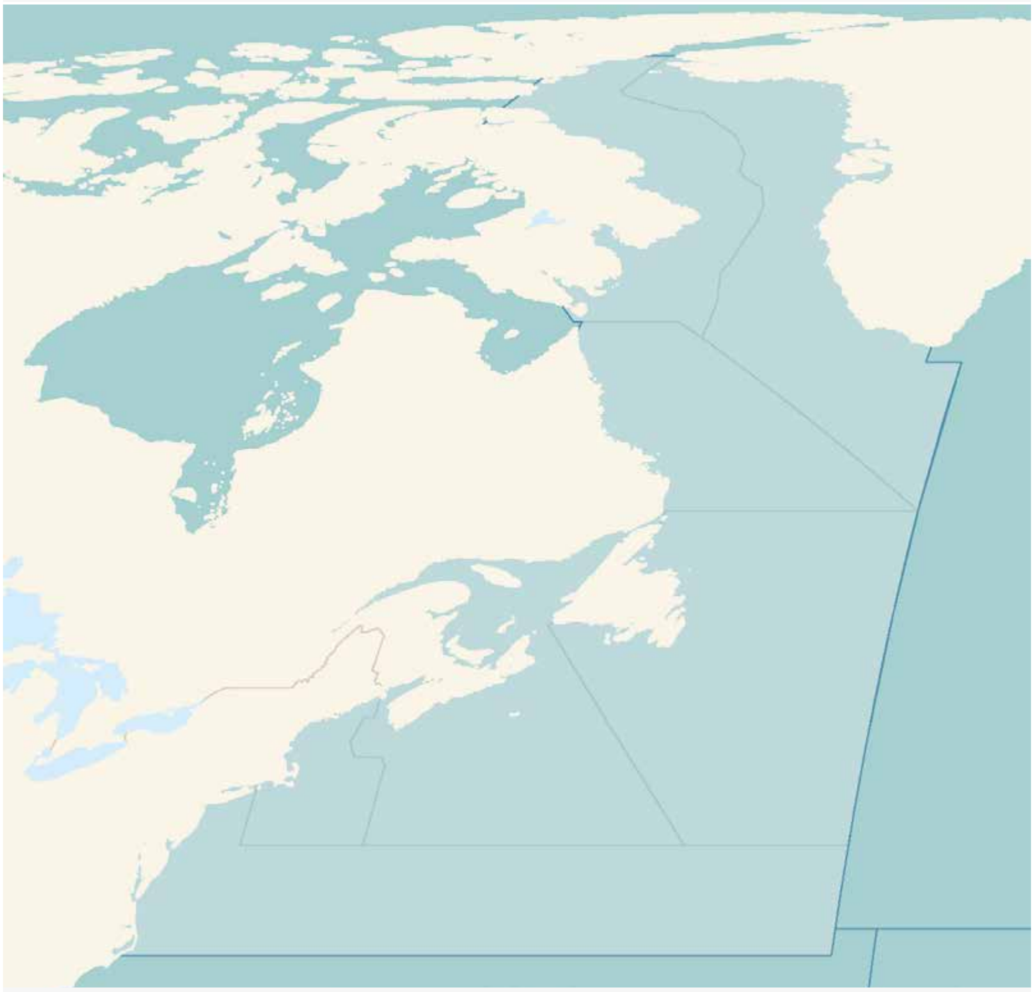
1. OVERVIEW

The Northwest Atlantic, designated by FAO as Major Fishing Area 21 (hereafter, Area 21), extends from Cape Hatteras in North Carolina in the south, to Baffin Bay, between Canada and Greenland, in the north (**FIGURE D.1.1**). It covers a total surface area of about 6.5 million km^2 and encompasses the exclusive economic zones (EEZs) of Canada, Greenland, Saint Pierre et Miquelon (France), and the United States of America (hereafter, the United States). The continental shelf is wide in this region. Nutrients primarily come from offshore slope waters, which mix with shelf waters, boosting primary production.

FIGURE D.1.1
FAO MAJOR FISHING AREA 21: THE NORTHWEST ATLANTIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

The West Greenland Current moves Atlantic waters into the Arctic, then down into the Labrador Sea and back, carrying cold water south. Further south, the Gulf Stream carries warm water from the Gulf of Mexico passing as close as 30 km from the shore off Cape Hatteras before moving east to form the North Atlantic Current. On Greenland's west coast, cold waters flow from the north while the warmer Irminger Current, branching from the North Atlantic Current, cycles round to join the Labrador Current off the southern tip of Greenland. Melting freshwater from Greenland's ice sheet contributes to rising sea levels – a growing concern with global climate change.

Climate change predictions suggest that the Northwest Atlantic Shelf is one of the fastest-warming ocean areas globally. A shift in warm, saline currents in 2009–2010 impeded the volume of oxygen-rich waters from the Labrador Current reaching the shelf (Gonçalves Neto, Langan and Palter, 2021), likely having a significant impact on fishery productivity and species distribution. Climate change is posing increasing risks to fisheries and fishing communities through warming water, rising sea levels, and meteorological changes such as more frequent and severe storms. The possible secondary impacts include changes in species movements leading to longer fishing trips and higher costs.

Area 21 has a long history of Indigenous fisheries dating back millenia; these remain important, particularly in Canada and Greenland. Alongside coastal shellfish and groundfish, Atlantic salmon *(Salmo salar),* in particular, plays a vital role in the culture of coastal communities. Harvests vary significantly across the region, with communities in colder climates historically being more dependent on marine mammals. Industrial fisheries in this Area began early, with distant-water fleets targeting cod fishing grounds since the sixteenth century (Lear, 1998). Initially, the fishery exploited Atlantic cod *(Gadus morhua)* almost exclusively, but later expanded to other groundfish and pelagic species. Catches in Area 21 had two sharp declines in the mid-1970s and in the early 1990s (**FIGURE D.1.2**), primarily driven by declines in stock sizes of groundfish and some pelagics. Recreational fisheries are also important in this region.

Important stocks, including Atlantic cod, white hake *(Urophycis tenuis),* haddock *(Melanogrammus aeglefinus)* and silver hake *(Merluccius bilinearis),* remain depleted, with landings at about 0.1 million tonnes since the late 1990s – only 5 percent of their historical peak in 1965. Environmentally driven productivity changes have likely contributed to the slow recovery of some stocks, such as Atlantic cod, American plaice *(Hippoglossoides platessoides),* winter flounder *(Pseudopleuronectes americanus)* and yellowtail flounder *(Limanda ferruginea).* In contrast, invertebrate stocks have generally fared better and continue to support major fisheries. In 2021, the Northwest Atlantic produced around 1.6 million tonnes of fisheries landings, down from a peak of about 4.6 million tonnes in 1968.

Several conservation organizations were set up to recover and sustain the vital fish and shellfish stocks in the area. The North Atlantic Salmon Conservation Organization (NASCO) was established to prioritize the slowing of the decline of salmon stocks and the rebuilding of wild populations to sustainable levels. The Northwest Atlantic Fisheries Organization (NAFO) is an intergovernmental fisheries science and management body set up to oversee the long-term sustainability and conservation of the fishery resources in the NAFO regulatory area, which covers 2.7 million km^2 of Area 21. The organization regulates the fisheries of several species including shrimp, groundfish and pelagic redfish and includes the United States, Canada and Greenland. There is currently a moratorium on the fisheries of pelagic redfish and shrimp.

2. FISHERY PROFILES

2.1 The United States of America

Currently, the most valuable fisheries for the United States in Area 21 include mixed-species groundfish, American lobster *(Homarus americanus)* and American sea scallop *(Placopecten magellanicus).* Modern fisheries utilize various fishing gears, such as otter trawls for mixed groundfish and flatfish, dredges for American sea scallops, and pots for lobsters. New Bedford, Massachusetts, boasts the highest value of catch landings in the United States, with 52 000 tonnes valued at USD 376.6 million, of which sea scallops account for 84 percent of the value and 26 percent of the volume (NMFS, 2022). Other valuable crustaceans and bivalve molluscs include Atlantic surfclams *(Spisula solidissima)* and ocean quahogs *(Arctica islandica),* which are federally managed; and blue crabs *(Callinectes sapidus),* oysters, blue mussels *(Mytilus edulis)* and Northern quahog (also known as hard clams, *Mercenaria mercenaria*), which are managed by individual states in inshore waters.

Principal groundfish and flounders in the northeast United States, particularly cod, haddock *(Melanogrammus aeglefinus)* and yellowtail flounder *(Limanda ferruginea),* were previously overfished, reaching record low spawning stock biomass levels in 1993–94, but have been increasing towards target levels in recent years. Dogfish and skates, which increased in abundance as groundfish and flounders declined in the 1970s, now constitute a substantial fraction of fish biomass on Georges Bank.

Most fisheries in the northeast region of the United States are governed through fishery management plans (FMPs), as required by the Magnuson-Stevens Fishery Conservation and Management Act. Overexploitation of some species has continued to occur despite the introduction of FMPs, and subsequent efforts to rebuild have generally not fully restored all depleted stocks. The most common fishing controls are catch limits, but other measures are taken where appropriate (e.g. limiting days at sea, imposing moratoria on new entrants, and gear requirements). Closures of portions of Georges Bank since December 1994 have supported the recovery and protection of both scallops and groundfish. Currently, the United States also works with the NAFO to coordinate management of fisheries resources shared with other nations.

Recreational fishing has grown significantly in Area 21, and now contributes greatly to tourism and leisure activities in coastal areas of the northeast United States, as well as on inland lakes and rivers. These fisheries primarily use rod-and-line. The United States reports the highest recreational landings in Area 21, where they form a substantial part of the catch in some fisheries. For example, recreational catches of bluefish *(Pomatomus saltatrix)* have considerably exceeded commercial catches since 1985, and recreational catches were the main factor limiting the speed of rebuilding from their low point in 2018. Due to its significance, recreational fishing is regulated through licensing, bag limits and size restrictions. Conservation organizations and anglers promote catch-and-release practices to reduce fishing pressure, though catching to eat still constitutes a considerable part of recreational fishing activity.

Finally, fishing by Indigenous communities has been taking place along the Northwest Atlantic coast for millennia. Although it does not represent a significant proportion of landings today, a renewed interest in Indigenous practices, alongside modern scientific research into ecology, has broadened understanding of how to manage marine resources and has led to changes in management principles (Reid *et al.,* 2021).

2.2 Canada

Groundfish have historically dominated the eastern Canadian fishing industry. From 1950 to 1990, cod, Atlantic herring *(Clupea harengus),* redfishes (*Sebastes* spp.), American plaice *(Hippoglossoides platessoides),* American sea scallop and haddock saw the largest landings. The cod stocks subsequently collapsed and catches also declined for hake, walleye pollock (also known as Alaska pollock, *Gadus chalcogrammus*), redfishes and flatfishes since the early 1990s, with overall catches having reduced by more than 50 percent.

Atlantic cod *(Gadus morhua)* in the NAFO divisions in the Northwest Atlantic, commonly known as Northern cod, was once one of the largest fisheries in the world. However, in the early 1990s, the stock plummeted by over 90 percent and a moratorium on fishing for cod in Newfoundland and Labrador was imposed. This was officially lifted in 2023, 32 years later. There was a 46 percent increase in permitted catch from 13 000 tonnes in 2022 to 18 000 tonnes in 2023, and the population was re-labelled as being in the "cautious" zone following years of being classified as "critical". Nonetheless, the total allowable catch (TAC) remains very low compared to historical catches. The effect of the moratorium on coastal communities has been immense: it put more than 30 000 people out of work, and ultimately led to a 10 percent decline in the province's population as young residents left to find work elsewhere (Schrank, 2005). The continued recovery of the stock remains highly uncertain (DFO, 2024).

Currently, Canada has around 120 assessed stocks which support a range of fisheries, including trawl fisheries for the iconic Atlantic cod and other groundfish and flatfish stocks, as well as pot fisheries for shellfish such as American lobster and queen crab *(Chionoecetes opilio),* and shrimp trawls for northern prawn *(Pandalus borealis).* Atlantic herring is currently the largest pelagic fishery.

Indigenous populations in the maritime provinces of Canada have a long history of fishing, particularly for cod and other sea life. Traditional practices include using weirs and traps to catch fish in rivers and coastal waters (Castañeda *et al.,* 2020). While traditional rights are recognized in Canada, progress towards integrating First Nations fishing into national governance processes has been limited (Denny and Fanning, 2024). Today, the Canadian cod TAC allocates 5 percent of the catch for Indigenous fisheries, which represents about 15 tonnes.

2.3 Greenland

The Greenlandic economy is heavily dependent on fishing. With a population of only 56 500 people, Greenland has a rich history of fisheries and harvesting marine resources. Hunting seals and other large animals was a major economic focus into the twentieth century. However, declining markets for these products, increased human populations and reduced seal populations led to a rise in the commercial finfish fishing industry. Cod and halibut became increasingly important fisheries through Norwegian, British and Portuguese vessels. Industrialization began in the 1950s, with the main focus being on expanding the shrimp and cod fisheries (Rasmussen and Valdemarsvej, 2001).

Historically, fisheries included distant-water fleets using handlines, longlines or trawls to target cod and take the majority of the catch (Horsted, 2000). Today, fisheries are predominantly conducted by domestic fleets. Denmark heavily invested in the fishing industry, particularly in the cod fishery, which collapsed in the late 1980s due in part to inadequate management response to environmental changes. Moratoria were imposed on major groundfish fisheries in the early 1990s to facilitate stock rebuilding, which also had an associated impact on the economy. The cod catch limits have now returned to historical levels (ICES, 2022).

The most important current domestic Greenlandic fisheries are offshore trawl fisheries for northern prawn, Greenland halibut *(Reinhardtius hippoglossoides),* Atlantic cod and redfish, and inshore gillnet fisheries for Greenland halibut, cod and lumpfish *(Cyclopterus lumpus).* In 2021, total landings were around 171 000 tonnes. Offshore vessels have been consolidated to a fleet of around 25 larger industrial vessels able to fish for prawns, groundfish and pelagics. Many of the inshore fleet of around 2 000 active vessels are small open boats operating at subsistence levels. Inshore fisheries mainly occur in the coastal waters of western Greenland rather than off the more exposed east coast. The Greenland Fisheries Act requires at least 25 percent of domestic offshore shrimp and Greenland halibut to be landed in Greenland for processing (Cappell and Macfadyen, 2019).

Other species harvested include salmon, catfish, chars, Greenland cod *(Gadus ogac),* Atlantic halibut *(Hippoglossus hippoglossus),* capelin *(Mallotus villosus),* Greenland shark *(Somniosus microcephalus),* Iceland scallop *(Chlamys islandica)* and snow crab *(Chionoecetes opilio).* Indigenous seal hunting and whaling are also carried out, and fishing by Indigenous and local communities continues to be important in Greenland. All fishing and hunting are limited by catch numbers and regulations to sustain target populations.

3. RESOURCE STATUS

3.1 Reference list of stocks

This report uses a reference list of stocks which comprises 150 assessment units, covering 57 different species (**TABLE D.1.1** and **APPENDIX II, TABLE 1**, pp. 415). These cover a very wide range of fisheries and stocks, reflecting the diverse nature of Area 21 fisheries. Under the previous methodology, only 42 stocks were assessed; these largely corresponded to species and species groups rather than fish stocks, although the evaluation was still based on individual stock assessments. For example, the status of American lobster *(Homarus americanus)* was reported as a single unit but now it is reported based on separately managed areas. This gives a much more comprehensive measure of status across these fisheries. Nonetheless, under the updated methodology used in this report, some stocks are still reported in groups (e.g. redfish [*Sebastes* spp.]). This can be due to a variety of reasons, such as reported catches not being separated, or populations being poorly defined and thus stocks being managed together. All stocks may be combined or further separated in the future based on scientific research and as the understanding of the biology and ecology of these populations improves.

TABLE D.1.1
SUMMARY OF ASSESSED STOCKS IN AREA 21 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	148	56	17
3 Data-limited approaches	2	2	2
Total	**150**	**57**	**17**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

3.2.1 METHODOLOGY

The United States has a requirement to monitor status relative to maximum sustainable yield (MSY), and therefore reference points are couched in these terms. The determination is usually based on integrated stock assessment models that incorporate a stock–recruitment relationship as a paradigm rather than a function fitted empirically. This approach allows estimation of the stock size compared to an unexploited state even where that state is not observed. Because recruitment, and hence productivity, are affected by climate change, assessments may only use recent recruitments to reflect the current state. Given expected recruitment, stock status can then be reported as a ratio compared to an estimate of unexploited spawning stock biomass (SSB_0), and interpreted relative to 32 percent SSB_0, below which a stock is overexploited, and 48 percent SSB_0, over which it is not fully exploited, assuming 40 percent SSB_0 is a reasonable proxy for MSY. So, a stock is maximally sustainably harvested with spawning biomass between 80 percent and 120 percent of the MSY level. For some stocks that are considered more productive, a 35 percent SSB_0

MSY proxy may be used. In other cases, a stock–recruitment relationship can be estimated that a scientific working group considers reliable enough to use to estimate biomass for MSY (B_{MSY}), so this can be used directly in the same way.

While evaluating stock status relative to B_{MSY} is recognized as most desirable, in many cases this direct evaluation is not possible and there is only an evaluation relative to fishing mortality at MSY (F/F_{MSY}) or an accepted biomass limit. This is often due to the lack of information that would allow an acceptable B_{MSY} reference point to be established. Where there is only a fishing mortality estimate, values for F/F_{MSY} of less than 50 percent are considered underfished and of more than 100 percent overfished for the purposes of this report. Where only a biomass limit reference point is available, any biomass below the limit is considered overfished, while it is considered underfished if it is above three times the limit.

In Canada, the approach used is a little different. A precautionary risk-based method is applied, which sets a limit reference point (LRP) and an upper stock reference (USR) point that define three zones along the abundance or biomass axis. A risk-based approach allows the inclusion of other information besides the strict stock assessment results. A stock below the LRP might be considered at high risk of recruitment overfishing. If a stock is in this critical zone, it is considered overfished for this report. Using this method in determining when a stock is not fully exploited is more difficult. The zone between the LRP and USR is the "cautious" zone, and effectively indicates a trigger point when management action may be required to avoid the stock falling below the LRP. As a result, it does not indicate that a stock is less than fully exploited. Unless there is specific evidence otherwise, in this report stocks were assumed to be maximally sustainably fished rather than underfished. This is often supported by observing that many stocks are below or close to the USR or have dipped below the USR in the recent past.

A few stocks in Canada are managed through advice from the International Council for the Exploration of the Sea (ICES) and from NAFO. ICES applies its own approach (**PART B, METHODOLOGY**, pp. 6) that is similar to the Canadian approach described above, but, where possible, it is linked to explicit MSY references. However, ICES does not generally reference unexploited biomass states when determining status as it does not rely on default stock–recruitment relationships. Where NAFO is dealing with stocks solely in international waters, they are data-limited and the advice is quite general; it still indicates stock status, but with higher uncertainty.

For the purposes of this evaluation, integrated stock assessments and index-based assessments that have well-defined reference points were both treated as having low uncertainty. The index-based methods are in general more uncertain than integrated models as they depend on fewer sources of information on stock state. The United States fisheries advice has often adopted an index-based approach where the integrated model has been rejected in the independent review process. Index-based methods are often difficult to evaluate and include more untestable assumptions, so will tend to underestimate uncertainty. However, in some cases, particularly for sedentary shellfish, a survey can obtain a reasonable precautionary absolute abundance estimate and can be used to recommend harvest level. In general, other index-based methods have been broadly evaluated, and well evaluated in specific cases, such that they have been shown to be robust in the management context. Therefore, these differences in uncertainty are not sufficiently far apart to warrant different classification within the broad determinations in this review.

3.2.2 STOCK STATUS AND CLASSIFICATION BY TIER

An estimated 63.3 percent of stocks are considered sustainably fished in Area 21, representing 52.7 percent maximally sustainably fished and 10.7 percent underfished (**TABLE D.1.2**). When weighted by landings, the percentage of sustainable stocks increases to 84.6 percent, indicating that larger stocks are overall more sustainable (**TABLE D.1.3**). Most of the stocks in Area 21 are considered Tier 1 assessments according to the updated FAO methodology. However, it is important to note that, of the 148 Tier 1 stocks, the associated uncertainty is higher for 58 stocks which use biomass dynamic model approaches.

TABLE D.1.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 21 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	148	10.8	53.4	35.8	64.2	35.8
3 Data-limited approaches	2	0.0	0.0	100.0	0.0	100.0
Total	**150**	**10.7**	**52.7**	**36.7**	**63.3**	**36.7**

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE D.1.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 21 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1.45	**14.8**	**69.8**	**15.4**	**84.6**	**15.4**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) Percentages might not add up to a total of 100 due to rounding.
Sources: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 21 (**FIGURE D.1.2**).

4.1 Cods, hakes, haddocks

Area 21 has several separately assessed Atlantic cod *(Gadus morhua)* stocks, which are all subject to some management, although their status is not known precisely in all cases. Index-based methods are used to apply harvest control rules aimed at maintaining high yield in the longer term.

The stock assessment model used to assess the abundance of Newfoundland/Labrador Atlantic cod was updated in 2024 to include survey data of inshore and juvenile cod starting in 1954, among other data (DFO, 2024). Recent stock assessment results suggest that the productivity of the cod population was lower than previously thought, altering expected population growth and yield. Northern cod productivity is linked to capelin *(Mallotus villosus)* abundance, which collapsed in 1991. Capelin stock size is expected to remain around 10 percent of pre-collapse levels in the short term, impeding cod stock growth. Most of the cod stocks in Area 21 are still classified as overfished, and capelin stocks are now maximally sustainably fished.

Despite low catches, ecosystem conditions are such that there is overall low productivity, including low levels of phytoplankton and zooplankton, and low abundance of key forage species such as capelin and shrimp. These conditions have likely negatively impacted cod productivity, so rebuilding has been very slow.

Haddock *(Melanogrammus aeglefinus)* and hake are in a similar situation to cod, whereas silver hake *(Merluccius bilinearis)* has probably recovered as exploitation was reduced. These stocks have benefited from the reduction in fisheries targeting cod because they are caught at the same time. Overall, the majority of haddock and hake stocks are overfished, with silver hake sustainably fished.

There is currently no directed fishery for polar cod *(Boreogadus saida),* which is considered an important prey species in the Arctic marine ecosystem and is likely to be affected by climate change. Under the ecosystem approach to management, a fishery on this species may require biomass reference points rather than the default alternatives.

4.2 Herrings, sardines, anchovies

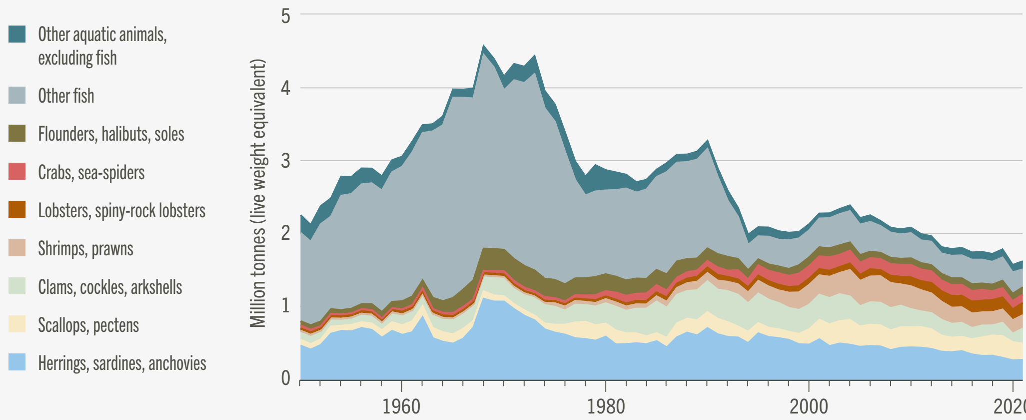
The main species in ISSCAAP group 35 relevant to Area 21 is Atlantic herring *(Clupea harengus)*. There are several spawning components of Atlantic herring grouped into management areas. Components are also split into spring or autumn spawners. Herring is predominantly found in Canadian waters. As with other fish stocks in Canadian Atlantic waters, recent environmental changes may have impacted stock productivity, so fishing mortality-based harvest strategies are put in place that adapt to changing recruitment. Overall, half of the stocks of herring in Area 21 are considered overfished and the other half are maximally sustainably fished.

The large Atlantic menhaden *(Brevoortia tyrannus)* stock is caught along the entire East Coast of the United States, extending out of Area 31 into Area 21, with the main assessments for it included in the former.

4.3 Lobsters, spiny rock lobsters

Lobster landings in Area 21 are dominated by American lobster *(Homarus americanus).* Lobster fisheries are primarily managed by fishing effort limits, and by using local initiatives such as "v-notching" where lobsters are released alive with a small notch in their tail based on various criteria (e.g. berried female or soft shelled). V-notched lobsters are discarded when caught again until the notch disappears, which occurs through moulting.

FIGURE D.1.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE NORTHWEST ATLANTIC (AREA 21) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

For the larger lobster coastal populations in the United States in Area 21, two management units are assessed: the Maine stock and the New England stock. Overall, all lobsters assessed in Area 21 were maximally sustainably fished.

4.4 Flounders, halibuts, soles

A significant expansion in the catches of flatfish occurred in the 1960s, followed by a decline, particularly in American plaice *(Hippoglossoides platessoides)*. However, in international waters (NAFO Division 3M) the stock has probably now recovered to the levels of the mid-1990s, when the fishery was closed; however, the fishery remains closed for precautionary reasons. There is a similar mixed picture for witch *(Glyptocephalus cynoglossus)*, winter *(Pseudopleuronectes americanus)* and yellowtail *(Limanda ferruginea)* flounders.

Catches of American plaice, winter flounder and yellowtail flounder in Division 4T (Southern Gulf of St. Lawrence) are very low, taken as bycatch in the fisheries directed at witch flounder and Greenland halibut *(Reinhardtius hippoglossoides)*. Despite this, the rebuilding prospects are low because of the current high level of natural mortality. Therefore, although most of the stocks in this region are designated as overfished, it is possible that the ecosystem has simply shifted to a new equilibrium and will not support a fishery until the environmental situation changes.

Catches have, to some extent, been compensated for by Greenland halibut, which does not appear to be overexploited. However, the Gulf of St. Lawrence stock is in the "cautious" zone, and its status is expected to worsen as environmental changes could lead to negative effects on the productivity of Greenland halibut.

Otherwise, the number of flatfish stocks being assessed has significantly increased. These species are mostly caught in demersal trawls where they may not be a target, but USA National Standards still requires that they are not overfished. In general, stock status results are mixed and these stocks remain vulnerable to being overexploited as bycatch.

Overall, stocks of flatfish in Area 21 are considered a mix of maximally sustainably fished and overfished.

4.5 Scallops, pectens

Catches are dominated by American sea scallop *(Placopecten magellanicus)*, although significant catches are taken of Iceland scallop (*Chlamys islandica*) in some places. Scallops are managed by areas. While adult scallops can move to some extent, they are effectively sedentary once pelagic larvae have settled. It is likely that recruitment in different areas is connected through the pelagic stage. The United States conducts a coastwide stock assessment, whereas Canada tends to manage smaller areas and collects advice based on those areas. In these different areas, Canada applies specific management regimes (e.g. closed areas). Overall, scallop stocks in Area 21 are considered maximally sustainably fished.

4.6 Clams, cockles, arkshells

Clam fisheries are conducted using dredges, including hydraulic dredges or hand tools while diving or on foot, depending on availability, water depth and distribution. Management is usually by area, some of which are quite small. There is a minimum landing size, and a target harvest rate (proportion of area or stock size captured) and abundance monitoring by catch per unit effort or survey, depending on the stock size. Catches are usually reported as meat weight which is usually around 5–15 percent of the live weight depending on species, season and age. The meat quantities are relatively small compared to finfish landings. Landings in this group are marked by a particularly rapid expansion in landings of ocean quahog *(Arctica islandica)* in the late 1970s. This is a long-lived species, with low natural mortality and hence vulnerable to overexploitation. Nonetheless, clam stocks in Area 21 are currently considered maximally sustainably fished.

5. KEY FINDINGS

Fisheries in Area 21 are highly developed and diverse, with significant catches dating back centuries. Mechanized trawls have been in operation for many decades, and the resources experienced extreme fishing pressures in the late 1970s and early 1980s. Since then, countries have decreased fishing pressure, allowing many stocks to rebuild. However, rebuilding has been hampered due to significant changes in productivity of some stocks, such as Atlantic cod *(Gadus morhua)* and American plaice *(Hippoglossoides platessoides),* and yellowtail flounder *(Limanda ferruginea)* in the Gulf of St. Lawrence, which has been linked to environmental effects. Although catches may be very low, so that over-fishing is not occurring, these stocks are still considered overfished because they have not recovered to past levels due to low recruitment and high natural mortality. In general, the invertebrate fisheries are in a better state than finfish fisheries, where the abundance of American lobster *(Homarus americanus),* for example, is generally increasing in contrast to many finfish resources.

Most stocks in the Northwest Atlantic obtain their scientific advice from the United States or Canadian scientific authorities, although a few West Greenland stocks obtain ICES advice. There is some cooperation between Canada and the United States over shared stocks. Stocks are generally assessed on a regular 1–5-year cycle, with the more frequent assessments reserved for high-pressure stocks. Out of the 150 assessed stocks, 63.3 percent are sustainably fished, with 10.7 percent estimated to be underfished and 52.7 maximally sustainably fished.

When comparing the previous and current methodology, the portion of sustainably fished stocks and of stocks in each category of exploitation remains very similar (**TABLE D.1.4**). This indicates that the coverage in the previous analysis was already quite extensive, even though granularity has nonetheless improved the accuracy of the results. Current coverage in Area 21 is about 90 percent, compared to 66 percent under the previous methodology. When weighted by production, the volume of landings from sustainably fished stocks increases significantly under both the previous and current methodologies (**TABLE D.1.5**), indicating that larger stocks are more sustainably fished.

To conclude, while catches have declined in recent decades, stock status has generally been improving, so catches are likely to stabilize and perhaps somewhat increase as many stocks recover productivity.

TABLE D.1.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 21 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
150	10.7	52.7	36.7	63.3	36.7	42	9.5	54.8	35.7	64.3	35.7

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE D.1.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 21 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
14.8	69.8	15.4	84.6	15.4	4.2	85.5	10.3	89.7	10.3

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Sources: FAO estimates.

FAO MAJOR FISHING AREA 21

ATLANTIC, NORTHWEST

AREA 21

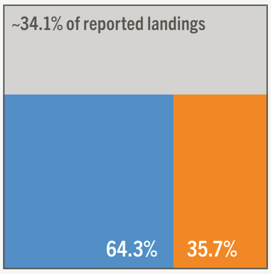
KEY MESSAGES

- Area 21 is one of the oldest commercial fisheries in the world, and has some of the longest data and information timeseries.
- Fishing for groundfish stocks has decreased, and some historically important stocks (e.g. Northern cod) have not recovered.
- The economic value of shellfish stocks has increased, which are largely taken by small vessels, using pots and traps. However, these fisheries are very sensitive to environmental changes and climate change.

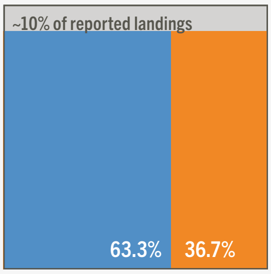
STOCK STATUS

FAO estimates, 2021

PREVIOUS METHODOLOGY



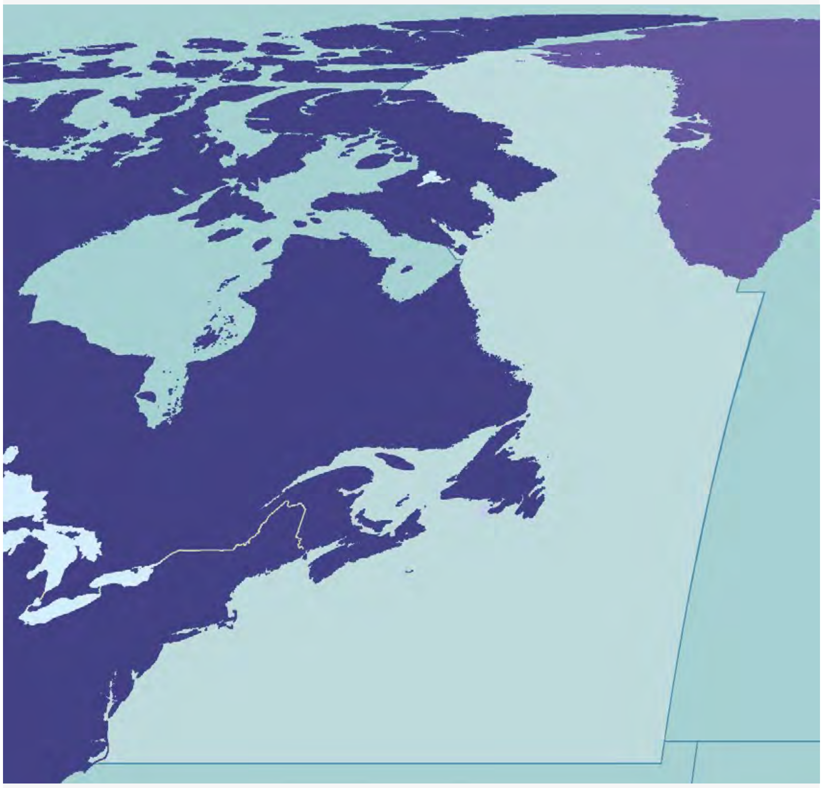
UPDATED METHODOLOGY



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



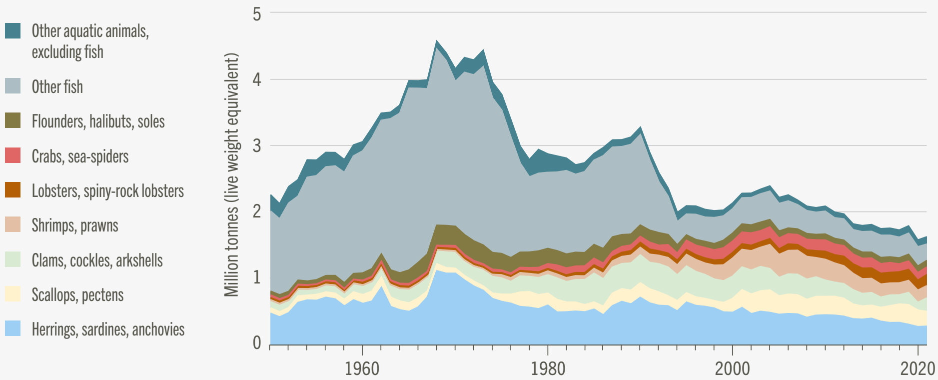
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | <1% | 1–5% | 5–10% | 10–20% | >20%

SPECIES COMPOSITION

FAO data, 1950–2021

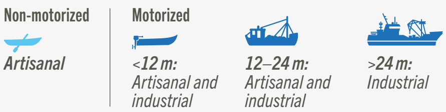


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~29 000



Non-motorized: 0%
Motorized: 100%

LANDINGS

FAO data, 2021

Reported landings ~1.6 million tonnes

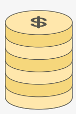
Unidentified: 5%
Identified at species group level: 95%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~USD 5.8 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~73 000

Male: 4%
Unspecified: 96%
Female: 0%

= 100 000 PEOPLE

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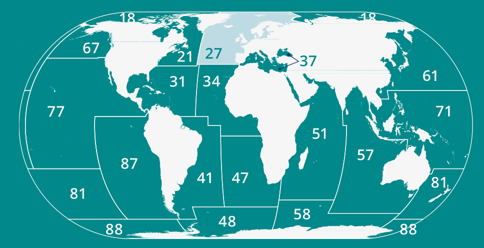
FIGURE D.1.3 *(previous page)*
AREA 21 – DATA AT A GLANCE

Illustration © Jana Kleineberg



Part D, Chapter 2 (D.2)

NORTHEAST ATLANTIC
FAO MAJOR FISHING AREA 27

Paul A. Medley
Food and Agriculture Organization of the United Nations

1. OVERVIEW

The Northeast Atlantic, designated by FAO as Major Fishing Area 27 (hereafter, Area 27), encompasses the exclusive economic zones (EEZ) of western European and eastern Atlantic Arctic countries,[1] extending from the high seas between Greenland and the Azores in the west to the brackish waters of the Baltic Sea in the east (**FIGURE D.2.1**). It covers a total area of 14.3 million km^2, of which 2.7 million km^2 is continental shelf. The main oceanographic

FIGURE D.2.1
FAO MAJOR FISHING AREA 27: THE NORTHEAST ATLANTIC

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

[1] Countries in Area 27 include Belgium, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Kingdom of the Netherlands, Norway, Poland, Portugal, the Russian Federation, Spain, Sweden, and the United Kingdom of Great Britain and Northern Ireland.

features are a subpolar and a subtropical gyre, which are driven predominantly by the North Atlantic Current originating from the Caribbean. Other key features include the extended shelf area off northern Europe, the semi-enclosed Baltic Sea, and the summer upwellings off the coast of Spain and Portugal. Circulation of waters separated by temperature, salinity and density results in warmer water moving across from the Caribbean via the British Isles on to Iceland and then Greenland. This circulation affects water temperature and primary production (e.g. phytoplankton), driving large-scale changes in fisheries' productivity. The Northeast Atlantic is the fourth-most-productive marine fishing area in the world, accounting for over 10 percent of global catches, and has had an important social and economic impact on European history and development. The "Fish Revolution" of the 1500s led to a 15-fold increase in cod supplies and tripled overall supplies of fish input to the European market (Holm *et al.,* 2022). The fisheries of the Northeast Atlantic expanded rapidly in the nineteenth and early twentieth centuries as fishing became increasingly industrial and more advanced technology was applied. Since the 1950s, the Northeast Atlantic has seen a significant reduction in the number of vessels and people employed in the sector, but there has been a corresponding increase in the fishing power of vessels, so the overall fishing pressure on marine ecosystems increased in many fisheries until the twenty-first century. Since then, fisheries have been recovering slowly over the last 30 years through improved management.

Most landings in the Area are from industrial fisheries, but inshore small-scale fisheries still operate traps, gillnets and small trawls over most of the coastline. In addition, Indigenous Peoples in the Northeast Atlantic have utilized marine resources and have fished in the region for thousands of years, mainly using a variety of traps, nets, and hooks-and-lines in coastal and inland waters. Total annual marine captures have increased from an average of around 6.7 million tonnes in the 1950s to an average of about 10.7 million tonnes during the period 1970–2000, with a peak of around 13 million tonnes in 1976. Total marine captures have fallen to between 8 million tonnes and 10 million tonnes since 2005 (**FIGURE D.2.3**).

Within the total marine catch, the composition of species has changed over time. Declines in fisheries for traditional species such as Atlantic cod *(Gadus morhua),* haddock *(Melanogrammus aeglefinus)* and Atlantic herring *(Clupea harengus)* have been compensated for by the development of fisheries for formerly lower-valued species such as blue whiting *(Micromesistius poutassou).* In addition, some stocks which had previously been depleted have now recovered.

Unlike in most other regions, the fisheries in Area 27 tend not to be managed on a strict country-by-country basis; instead, management reflects broad environmental divisions as well as historical access to resources as described in the next section. This is the result of early recognition that most of the main fisheries were shared between nations. Traditional fishing grounds for some countries were often within the waters adjacent to other nations, and fish routinely migrate through waters adjacent to several nations within the region.

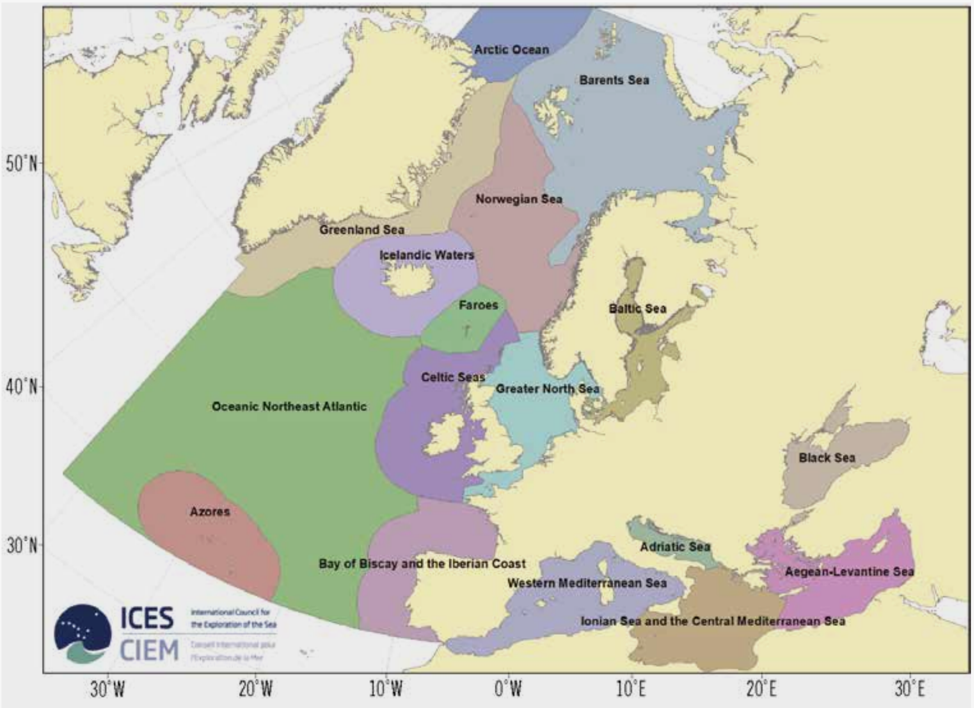
2. FISHERY PROFILES

This section begins by setting out the overall profile of fisheries in Area 27 at the regional level, and then explores more specific profiles according to subareas of the International Council for the Exploration of the Sea (ICES) (**FIGURE D.2.2**).

2.1 Regional governance and management

The North East Atlantic Fisheries Commission (NEAFC) is the regional fisheries management organization (RFMO) for the Northeast Atlantic. However, the declaration of 200 nautical miles (nm) EEZs in 1982 and the establishment of the European Union Common Fisheries Policy (CFP) resulted in a reduction of NEAFC's area of responsibility. With regards to fish stocks occurring exclusively within the jurisdiction of coastal states, the relevant countries or the European Union manage the resource, and this applies to most stocks in the region. This means that NEAFC is primarily responsible for managing fisheries in high seas regions within Area 27, its role largely confined to shared stocks that occur in international waters such as beaked redfish (*Sebastes mentella*), Atlantic mackerel (*Scomber scombrus*), spring-spawning Atlanto-Scandian herring (*Clupea harengus*) and blue whiting (*Micromesistius poutassou*). NEAFC adopts management and control measures to ensure management objectives are met, including an objective to protect the marine ecosystem from potential negative fisheries impacts.

FIGURE D.2.2
MAIN ICES ECOREGIONS



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: Adapted from **ICES.** 2023. Definition and rationale for ICES ecoregions. *General ICES Advice guidelines.* Report. https://doi.org/10.17895/ices.advice.23634480.v1

At the regional level, ICES – an intergovernmental marine science organization – provides fisheries management advice for stocks within Area 27. NEAFC recommends and coordinates measures to maintain the rational exploitation of fish stocks in its Convention Area, using scientific advice from ICES. Most fisheries are managed using stock-specific total allowable catches (TACs); therefore, ICES is typically requested to provide catch advice on a stock-by-stock basis.

For countries that are members of the European Union, competence for fisheries management lies with the European Commission and is administered by the Directorate-General for Maritime Affairs and Fisheries (DG MARE). The CFP, the governing framework for fisheries management within the European Union, was set up with the intention of reducing overfishing and building long-term sustainable management of fisheries stocks. This fisheries governance has largely translated into an ecosystem approach to fisheries management, which aims to integrate the protection of the marine ecosystem as a whole with the sustainable fishing of its resources. Countries outside the European Union have policies that are broadly aligned with the CFP, but independently control access to fishery resources. In most cases TACs are used to control harvest and quotas are distributed among nations through negotiation. There are currently seven Advisory Councils (ACs, previously Regional Advisory Councils), which were established after the revision of the CFP in 2002 (EU, 2004; EU, 2007). The objective of the ACs is to work towards integrated and sustainable management of fisheries, based on the ecosystem and precautionary approaches. They provide a way for stakeholders to discuss issues and develop management plans.

2.2 The Baltic Sea

The Baltic Sea (ICES subarea 3) is the second-largest semi-enclosed brackish-water sea in the world (the Black Sea is the largest). It is characterized by a perennial vertical stratification and seasonal sea ice. The topography of the Baltic Sea consists of deep basins that assist in moving saltier water with higher quantities of oxygen in, while a freshwater current flows closer to the surface and out into the North Sea (HELCOM, 2023). The Baltic Sea is therefore divided into two strata with limited mixing. The oxygen-rich inflows cause an infrequent flushing event that is vital to removing pollutants, reducing the concentrations of nutrients and increasing the oxygen content of the water. The saltwater incursions in the south generate unique environmental conditions that impact fisheries management strategies. Deeper water can have large volumes with low oxygen levels, which has a direct impact on the ecosystem.

The Baltic Sea region includes nine countries, with many historic trade routes passing across the sea.[2] The area has a rich and complex history of fishing spanning thousands of years. Around 85 million people live in the Baltic Sea drainage basin, with the majority living south of the coast. Pollution from inland and marine sources is an important concern in the area. Bycatch of seabirds and marine mammals remains a problem, particularly in static gear such as gillnets. Climate change is also causing higher water temperatures and reducing sea ice, with related changes to the hydrological cycle (Meier *et al.,* 2022).

More than 50 species are caught within the Baltic Sea but only 12 of these, covering around 20 stocks, are assessed. Overall fishing activities decreased by 50 percent between 2004 and 2012, and landings have continued to decline (ICES, 2022a). Cod *(Gadus morhua),* herring and European sprat *(Sprattus sprattus)* make up 95 percent of the total catch. Midwater trawling targets herring and sprat, whereas demersal trawling targets cod and flatfish. Total landings have generally been decreasing since the 1970s. Since 2003, total landings have stabilized, although fishing effort has decreased. The region has significant small-scale coastal fleets, and more than 4 000 full-time jobs continue to rely on the Baltic Sea fisheries sector (HELCOM, 2023). Recreational fishing is common and targets a variety of species, although landings are mainly cod, sea trout *(Salmo trutta)* and salmon. Management of these stocks is made complicated by environmental conditions, which have a significant impact on stock productivity and make it difficult to predict changes in stock status.

2.3 Arctic, Barents, Norwegian, Icelandic, Faroes and Greenland Seas

The area of the Northeast Atlantic that lies within the Arctic Circle includes Iceland and the Faroes Grounds, the Barents Sea, the Norwegian Sea, Svalbard, the Bear Island and Northeast Greenland (ICES subareas 1, 2 and 5). The Arctic region of the Northeast Atlantic continues the deep ridges up from the south, with sea ice occurring seasonally in the north and contributing to higher variations in light and temperature. The water movement is dominated by warmer water moving north into the east of the region, while cooler water sinks and flows south through the Denmark Strait between Greenland and Iceland. The Norwegian Sea is a zone of transition for warmer, saline waters from the Atlantic and colder Arctic waters. However, the last two decades have seen an increase of Atlantic waters moving into this region (Tsubouchi *et al.,* 2021).

[2] These countries include Estonia, Denmark, Finland, Germany, Latvia, Lithuania, Poland, the Russian Federation and Sweden.

Despite a low human population of around 2.6 million, this region has high fisheries productivity. The Norwegian Sea, the Icelandic Grounds and the Barents Sea lead in terms of landings. Fisheries are a vital industry, contributing a relatively high proportion to regional gross domestic product (GDP), albeit this is in decline as countries diversify their economies through sectors including renewable energy production, tourism and aquaculture.

The largest harvested fish stocks are pelagic – Norwegian spring-spawning herring, mackerel and blue whiting – but there is also a significant demersal fishery, primarily on Atlantic cod. The Barents Sea is one of the most productive regions worldwide, and has had the largest catch in the Arctic area (Troell *et al.,* 2017). Overall, six fish species are the main contributors to the fishing industry: Atlantic cod, saithe *(Pollachius virens),* haddock *(Melanogrammus aeglefinus),* blue whiting, herring and capelin *(Mallotus villosus),* with spawning grounds along the Nordic coast. Fisheries also exist for introduced species such as queen crab *(Chionoecetes opilio),* a recent arrival first observed in 1996, and red king crab *(Paralithodes camtschaticus)* that were introduced from the Pacific by the Union of Soviet Socialist Republics (USSR, now the Russian Federation) in the 1960s.

Fisheries are primarily managed using quotas, and habitats are protected by closing various areas to particular gear types. However, the Faroes demersal fishery (mainly for haddock and cod) is managed using effort quotas (fishing days) rather than catch quotas. More than 60 percent of the Faroe Plateau is no longer accessible to bottom-fishing for at least some of the year to protect biodiversity and spawning stocks (ICES, 2024b). Fisheries on stocks shared between Norway and the Russian Federation are managed through the Norwegian–Russian Fishery Commission.

Climate change has impacted water temperatures, sea levels and salinity (ICES, 2024c). The Barents Sea has reported the warmest decade on record, with several species moving north. Warming waters have also been linked to reduced stock numbers and changed distribution of several cold-water species. Impacts to the ecosystem of the region also come from underwater noise and marine traffic, pollutants and invasive species.

2.4 Greater North Sea and Celtic Seas

The Greater North Sea and Celtic Seas (ICES subareas 4, 6 and 7), including Skagerrak, the eastern English Channel, the Irish Sea, the Celtic Sea, the west of Scotland and the North Sea, lie on the continental shelf surrounding the British Isles and the nearby European coast. The North Sea itself is a semi-enclosed relatively shallow sea, connected to the Baltic Sea in the east and the Atlantic in the north and west. Water from the Atlantic enters from the south through the Celtic Sea and up through the Irish Sea. The Celtic Seas ecoregion extends along to the western coast of Britain and includes semi-enclosed seas and part of the Atlantic continental shelf. This ecoregion is significantly affected by the Gulf Stream, which carries warmer water up from the Caribbean.

The area's fisheries have a long history of industrialization and production, with large quantities of cod and herring being produced from England, Scotland and Ireland by the end of the nineteenth century (Smed and Ramster, 2002), leading to concerns of overfishing. This local depletion led to significant expansion in fishing areas for these fleets, culminating in the 'Cod Wars' between the United Kingdom of Great Britain and Northern Ireland (hereafter, the United Kingdom) and Iceland in the 1970s. With regards to herring, long-term data shows significant changes in commercial fish stocks since 1902, resulting in less productivity, damage to ecosystems, and conflicts between fishing communities (Fock, Kloppmann and Probst, 2014). Agreed policies and regulations have improved these fisheries, although issues still arise over stresses on the marine environment, quota allocation, and catches with mixtures of species. Overall, many stocks are recovering, or have recovered from decades of overfishing, but fisheries make a significantly smaller contribution to local economies than they did in the twentieth century. Nevertheless, many communities remain dependent on small-scale fishing, mainly for shellfish.

Today, trawling is responsible for most of the landings in the North Sea and Celtic Seas, although a wide range of gears operate including drift nets, pots, hooks and lines, and dredges. Significant fisheries continue for cod, herring and mackerel, as well as many other species caught in smaller quantities but popular in markets such as common sole *(Solea solea)* and turbot *(Scophthalmus maximus)*. Larger-scale fisheries are heavily centralized and supply an international market.

There are more than 50 stocks present in the North Sea that are assessed by ICES, with several stocks having a distribution beyond the North and Celtic Seas. Important stocks in terms of landings include mackerel, herring, Atlantic cod, haddock, saithe and European plaice *(Pleuronectes platessa)*. There is also a relatively large trawl and pot fishery for Norway lobster *(Nephrops norvegicus)*. European seabass *(Dicentrarchus labrax)*, common sole, turbot, common shrimp *(Crangon crangon)*, cockles, European lobster *(Homarus gammarus)* and edible crab *(Cancer pagurus)* have significant catches, which are important in local fisheries and markets. Fisheries in the area are susceptible to various environmental and human-induced impacts, including those resulting from climate change, industrial and agricultural pollution, extraction of sand and gravel, offshore wind turbine construction, and shipping traffic.

2.5 Bay of Biscay, the Iberian coast and the Azores

Waters in the lower west half of Area 27 flow down the coasts of France, Portugal and the southern edge of Spain and then westward into the Atlantic towards the Azores (ICES subareas 8, 9, 10 and 12). The region consists of the relatively shallow coast of Spain, Portugal and France, out over the continental shelf running down beside the Iberian Peninsula and into the Atlantic Ocean. Within the large open ocean ecosystem lie the Azores, composed of nine islands straddling the Mid-Atlantic Ridge. This area of the Atlantic is a highly productive and complex ecosystem with extensive fishing interests. The main ecological areas are the upwelling off the Iberian Peninsula and oceanic waters around the Azores north to Iceland and Greenland.

The Iberian coast and the Bay of Biscay have a high diversity of fish and cephalopods, creating excellent fishing grounds. The productivity of this region is due to upwelling and additional nutritional input from rivers. The most common fishing gears are demersal otter trawls targeting demersal species, but the highest landings are from midwater trawls catching European pilchard *(Sardina pilchardus)*, European anchovy *(Engraulis encrasicolus)* and Atlantic horse mackerel *(Trachurus trachurus)*. The area also supports marine and coastal aquaculture as well as capture fisheries.

Different fish species are targeted by French and Spanish vessels. The French fleet tends to target species lower on the trophic levels such as sardine and anchovy, while the Spanish fleet tends to target more higher trophic level species (mackerel, blue whiting, seabass, whiting *[Merlangius merlangus]* and European hake *[Merluccius merluccius]*), but not exclusively (Corrales *et al.*, 2022). The main demersal fisheries of the Iberian region are hake, whiting, anglerfish *(Lophius piscatorius)* and megrim *(Lepidorhombus whiffiagonis)*. European hake is a limiting species in the demersal fishery, and is considered at maximum harvest level.

The Azores have their own 200 nm EEZ. The archipelago consists of nine islands and a further 461 seamounts within the EEZ that support diverse types of fisheries. Smaller vessels target a large variety of species, including pelagics such as blue jack mackerel *(Trachurus picturatus)* and blackspot seabream *(Pagellus bogaraveo)*, and demersal fish such as the high-value groupers, blacktail comber *(Serranus atricauda)* and dusky grouper *(Epinephelus marginatus)*. The diverse grouper fishery uses handlines, gillnets and longlines, and is managed locally. Demersal trawling is banned in the area. As well as fishing, the islands are at risk from impacts from tourism, marine litter and marine transport. Waters around the Azores have been warming in recent years, with the plankton community shifting towards smaller taxa and the rate of detection of non-indigenous species increasing (ICES, 2024a). There are important habitats for cold-water corals also at risk from ocean warming and acidification.

The open ocean fisheries catches, which encompass those in the high seas, include tuna (**PART E.1, GLOBAL TUNA FISHERIES**, pp. 330), beaked redfish *(Sebastes mentella)* and blue whiting, particularly further north, and predominantly with pelagic trawls (ICES, 2024d). Deeper-water species such as ling *(Molva molva),* blue ling *(Molva dypterygia),* tusk *(Brosme brosme),* roughsnout grenadier *(Trachyrincus scabrus)* and alfonsinos *(Beryx* spp.) are caught with longlines and trawls, but fishing in deeper water may also have a high bycatch of sharks and other vulnerable deep-water species, which makes them more difficult to manage. Many of these smaller demersal fisheries take place on or near seamounts and overlap with other ecoregions.

3. RESOURCE STATUS

3.1 Reference list of stocks

The updated reference list of stocks expands the number of stocks assessed in Area 27 from 34 assessment units to 178 stock units, representing 49 species (**TABLE D.2.1** and **APPENDIX II, TABLE 2**, pp. 418). This increase is mainly linked to the updated approach (**PART B, METHODOLOGY**, pp. 6) whereby the resolution has increased through a focus on individual fish stocks rather than only species. For example, under the previous methodology, all common sole *(Solea solea)* stocks in Area 27 were treated as a group within "Other flounders, halibuts, soles", whereas in the updated assessment they have been separated into ten different units as identified by ICES. For a few Northeast Atlantic-wide stocks, such as blue whiting *(Micromesistius poutassou)* and Atlantic mackerel *(Scomber scombrus),* the evaluation remains the same.

TABLE D.2.1
SUMMARY OF ASSESSED STOCKS IN AREA 27 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	177	49	9
3 Data-limited approaches	1	1	1
Total	**178**	**49**	**9**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

Stock units for Area 27 are now much more precise than referenced previously, given that ICES strives to define stocks as separate populations that are self-recruiting. In practice though, some stocks are defined with reference to the way fisheries operate and are managed, and some stocks are still considered in groups. For example, although Atlantic salmon *(Salmo salar)* from different rivers have separate spawning components and could be considered to be separate stocks, in this report they are combined into a few stock complexes, since mixed catches of these stocks are taken when they are caught at sea. Furthermore, scientific research may split or combine other stock definitions as understanding of the biology and ecology of these populations improves.

It is important to note that not all stocks, species and populations for Area 27 are included in this assessment. Indeed, of the total number of stocks in the Area (235 stocks), only 178 are assessed stocks, meaning that 57 stocks remain unassessed. This does not include the many inshore stocks whose stock assessments are not accessible or published. These stocks may also not have been consistently assessed and may only represent relatively small landings, so have been excluded. However, it is possible that smaller inshore stocks could be included in the future if assessments are published. In addition, the stocks to be assessed by ICES vary; although the most important "pressure" stocks, such as many of the Atlantic cod *(Gadus morhua)* stocks, are assessed each year, those stocks for which there is little data and which are bycatch may be assessed less frequently.

3.2 Classification of the status of stocks

3.2.1 METHODOLOGY

The resource status described in this chapter is primarily based upon 2022 and 2023 ICES advice (published on the ICES website). The default ICES approach to providing advice attempts to integrate the precautionary approach with the objective of achieving maximum sustainable yield (MSY) (Annex 2 of the United Nations Fish Stocks Agreement [UN, 1995]), unless otherwise requested. ICES's interpretation of MSY is maximizing the average long-term yield from a given fish stock while maintaining the productivity of the stock. However, ICES considers that the MSY reference points it uses are valid only in the short and medium term (generally up to five to ten years), because of unknowable longer-term changes that are occurring, such as climate change. As a result, ICES does not generally measure stock status against some inferred unexploited state. Rather, advice is usually focused on fishing mortality or harvest rate that should maximize long-term yield, while setting a lower limit on spawning stock biomass above which no decline in recruitment is expected (or detectable).[3]

Within territorial waters many fisheries are managed through local systems, which will not necessarily be based on a stock assessment. In most cases, these local fisheries do not get advice from ICES. For example, shellfish such as oysters, mussels, cockles and clams are primarily managed through area-based management that limits the take based on traditional access arrangements, or that operates using habitat enhancements such as ropes. For these stocks, there may not be traditional stock assessments, but surveys may be carried out annually that collect stock abundance data. Instead of optimizing these fisheries to harvest them at MSY, the management aim is to maintain the fisheries by applying limits that sustain them. Although landings from such inshore stocks may not be large, quantities are still considerable and important for local fishing communities.

3.2.2 STOCK STATUS AND CLASSIFICATION BY TIERS

Estimates of stock status have generally improved; currently, about 75.8 percent of assessed stocks are thought to be fished within sustainable levels (**TABLE D.2.2**), where "sustainable" is defined relative to MSY or its proxies. Most of the traditional fishery resources of the Northeast Atlantic are maximally sustainably fished or overfished. There have been notable improvements in the status of some larger stocks, such as Northeast polar cod *(Boreogadus saida)*, Northeast Arctic haddock *(Melanogrammus aeglefinus)*, mackerel *(Scomber scombrus)*, and the Atlantic herring *(Clupea harengus)* stocks. Other stocks, such as North Sea cod, are still in recovery, which is made more difficult by the nature of the mixed demersal fisheries operating in the North Sea. Specifically, about 10.1 percent of assessed stocks are considered underfished, 65.7 percent are considered maximally sustainably fished, and 24.2 are overfished. Almost all assessed stocks in Area 27 are considered Tier 1, given that ICES uses them as the basis for formal advice in the region.

When weighted by their production level, an estimated 86.6 percent of the 2021 landings were from biologically sustainable stocks (**TABLE D.2.3**), a similar result to the percentage of marine stocks fished within biologically sustainable levels by number (**TABLE D.2.4**).

[3] ICES uses precautionary reference points for spawning stock biomass B_{pa} as the reference point for management considering it as a proxy for biomass for the maximum sustainable yield B_{MSY}. However, an analysis done by Winker and Cardinale (ICES, 2022b) demonstrates this is more akin to the limit reference point for spawning stock biomass B_{lim}.

TABLE D.2.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 27 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	177	10.2	66.1	23.7	76.3	23.7
3 Data-limited approaches	1	0.0	0.0	100.0	0.0	100.0
Total	**178**	**10.1**	**65.7**	**24.2**	**75.8**	**24.2**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.2.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 27 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
7.33	**3.6**	**83.0**	**13.4**	**86.6**	**13.4**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED GROUPS AND SPECIES

The main species in terms of landings for Area 27 (**FIGURE D.2.3**) are Atlantic herring *(Clupea harengus),* blue whiting *(Micromesistius poutassou),* Atlantic cod *(Gadus morhua),* Atlantic mackerel *(Scomber scombrus),* European sprat *(Sprattus sprattus),* saithe *(Pollachius virens),* haddock *(Melanogrammus aeglefinus),* sandeels NEI *(Ammodytes* spp.), capelin *(Mallotus villosus),* beaked redfish *(Sebastes mentella)* and Atlantic horse mackerel *(Trachurus trachurus).*

4.1 Atlantic cod

Catches of Atlantic cod consistently made the largest contribution to the total of cods, hakes and haddocks until 1998, when they were exceeded by blue whiting landings. A persistent downward trend in cod catches is evident from the peak in the late 1960s, although the lower catches in recent years can be attributed in part to the ongoing rebuilding programme for North Sea cod. Importantly, larger cod fisheries in Iceland and the Arctic (ICES areas 1 and 2) have sustained high catches at full exploitation. Most other significant cod stocks are overfished and need to be rebuilt. Because they are caught in mixed fisheries, and because other environmental factors such as climate change may be affecting recruitment, rebuilding has proved difficult to achieve. A rebuilding plan for North Sea cod achieved some success from 2005 to 2017 but was ended prematurely, and the spawning stock has returned to low levels in recent years, while rebuilding has had to be restarted.

Western and Eastern Baltic cod (ICES subareas 22–24 and 25–32) appeared overfished in 2009. Both stocks, but particularly the Eastern Baltic cod, have been through periods of prolonged depletion. Western Baltic cod appears to be recovering, but Eastern Baltic cod may not be. In addition, the Baltic cod fishery has had considerable problems with monitoring and control, particularly under-reporting of catches 1993–1996 and 2000–2007; and more recently, Eastern Baltic cod has been impacted by environmental effects impacting growth and mortality. This makes assessment and management of this stock more difficult.

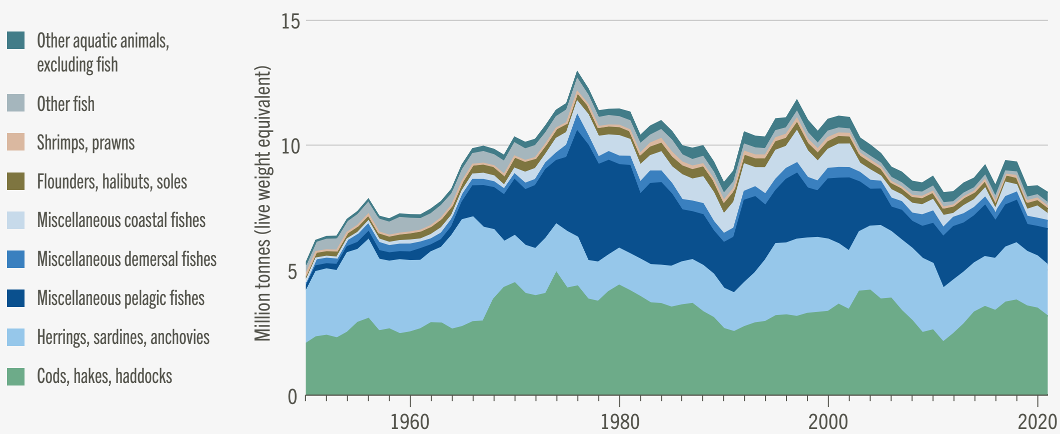
Cod stocks form most of the landings in Area 27. West of Scotland, Irish Sea and Celtic Sea cod are considered to have reduced reproductive capacity. Only the status of Rockall cod remains unknown. Catches of the small Rockall stock appear to have declined without management intervention.

4.2 Mackerel

Atlantic mackerel now makes the largest contribution to ISSCAAP group 37 in Area 27. The average catch between the mid-1970s and the mid-2000s was around 600 000 tonnes/year, and since 2006 has been around 1 million tonnes/year. Atlantic mackerel is assessed as a single stock for the Northeast Atlantic, although it is made up of several spawning components. The spawning stock biomass (SSB) has increased from a low of 2 million tonnes in 2003 to around 3.7 million tonnes in 2019. This is despite catches considerably exceeding scientific advice, with the sustained level of the spawning stock instead being the fortunate result of strong recruitment. Although the stock as a whole is at full reproductive capacity, the North Sea component is still depleted and catches in the North Sea are prohibited at appropriate times to encourage its recovery.

Mackerel is a highly mobile species and shoals have moved to different areas, changing fishing opportunities for different countries. Recent international management problems are partly due to the summer mackerel distribution extending further northwards in recent decades so that the stock is being commercially fished in areas where it was previously not fished, particularly in the Icelandic EEZ.

FIGURE D.2.3
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE NORTHEAST ATLANTIC (AREA 27) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.3 Herring

Atlantic herring is a demersal spawner, usually spawning on gravel beds, and its stock structure is generally complex. Populations may mix but then spawn separately at different times of year and in different areas. For example, the main North Sea herring stock, the autumn-spawning North Sea herring, consists of a number of spawning components, landings from which cannot be separated and are therefore treated as a single stock. Herring may suffer from periods of poor recruitment, which makes it vulnerable to overfishing if there is no proportionate and timely management response. The largest populations of Norwegian spring spawners and North Sea autumn spawners are maximally sustainably fished, but other populations in the Baltic and west of the United Kingdom are currently overfished. The West of Ireland and Scotland herring stock recently changed from overfished to maximally sustainably fished. There are some other small spring-spawning herring stocks associated with gravel beds and river estuaries, which are managed locally.

4.4 Lobsters

Catches of lobsters (ISSCAAP group 43), which include the valuable Norway lobster (*Nephrops norvegicus*) fisheries, have increased since the early 1950s, stabilizing at current levels since the 1990s. Norway lobster is managed primarily in "functional units", which are separate areas of the burrowed mud that the species inhabits. These units are primarily managed through monitoring length and sex composition, and conducting remote observation vehicle surveys to obtain hole density. These separate sources of information allow management to set sustainable harvest rates for each unit. On the whole, sustainable harvest rates are achieved by limiting access and controlling fishing activity rather than by a specific TAC applied to each unit, although TACs are set across units. Most units are maximally sustainably fished, while some show densities below target levels and may need rebuilding. There is generally insufficient information to determine the status of populations outside these designated units.

European lobster (*Homarus gammarus*) represents only a small proportion of the catch volume, albeit it is important for small inshore fisheries. Generally, the stock status is not known, and it is managed through precautionary interventions, mainly trap limits, minimum sizes and techniques like "V-notching". V-notching, usually in the tail, is used to mark individual lobsters that have been returned to the sea because of their small size or because they have eggs. Fishers agree to return the lobster to the sea if it is caught again until the notch disappears through moulting, which protects a proportion of the stock. These initiatives are usually promoted where it is believed that these inshore populations are at risk of overexploitation.

5. KEY FINDINGS

The majority of stocks that have been assessed for Area 27 are at maximum sustainable levels of harvest, but significant numbers of stocks are still either overfished or their status is unknown. There has been an expansion of stocks where advice has been requested, and in many cases further data collection and research is required before their status can be determined. Nonetheless, the largest important stocks have sufficient data so that they can be assessed quite accurately. Some stocks are considered underfished, but these are often part of mixed fisheries, so opportunities to increase harvest may still be limited. For example, in the North Sea demersal fisheries the limiting stock is cod, and in Iberian waters it is hake. This also means that management controls, when implemented, may affect the status of a wide range of stocks, not only because of constraints on fishing opportunities, but also due to rationalization of fleets to improve economic performance.

The number of stocks being assessed in Area 27 has significantly increased under the new methodology, going from 34 to 178 stocks. Overall, landings of assessed stocks in Area 27 represented 91.3 percent of total landings reported in 2021, an increase from 84.2 percent covered by the previous methodology. There has been a general trend in the Area to assess more stocks as more data have become available, assessment methods have improved and assessments for high-priority stocks have matured, freeing up ICES technical working groups' time for other stocks. The level of sustainability of stocks has stayed similar, with 75.8 percent of assessed stocks considered sustainable under the updated methodology, compared to 79.4 percent under the previous methodology (**TABLE D.2.4**). When weighted by their production level, an estimated 86.6 percent of the 2021 landings were from biologically sustainable stocks (**TABLE D.2.5**).

In terms of fisheries management performance, control over fisheries has shown a positive trend. There have been notable improvements in the status of some larger stocks, such as Northeast polar cod *(Boreogadus saida)*, Northeast Arctic haddock *(Melanogrammus aeglefinus)*, mackerel *(Scomber scombrus)*, and the larger herring *(Clupea harengus)* stocks. Other stocks, such as North Sea cod, are still in recovery, made more difficult by the nature of the mixed demersal fisheries operating in the North Sea.

For the Oceanic Northeast Atlantic, Greater North Sea, Celtic Seas and Baltic Seas ICES ecoregions, there has been a declining mean fishing mortality for stocks over the last two decades, although in many cases the current fishing mortality still remains higher than the target level. For pelagic stocks, fishing mortality has been fluctuating with no clear trend and has periodically risen above the MSY level. For the Norwegian Sea, Barents Sea and Greenland Sea ecoregions, overall fishing mortality has been more stable for both demersal and pelagic stocks. For Icelandic waters, larger demersal stocks show a clear reduction in fishing mortality across fisheries over the last decade, while smaller stocks show a stable or shallow increase over much of the same period with a recent decline to the target level based on management intervention for these species. For pelagics, fishing mortality has also approached the target level for the main species.

Finally, the issue of reference points for assessing the state of exploitation of stocks in Area 27 is being debated by the ICES Scientific Working Group; depending on its decision, there may be implications for estimating the sustainability of fish stocks for Area 27 in the future.

TABLE D.2.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 27 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
178	10.1	65.7	24.2	75.8	24.2	34	14.7	64.7	20.6	79.4	20.6

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.2.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND CURRENT METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 27 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
3.6	83.0	13.4	86.6	13.4	2.8	79.0	18.2	81.8	18.2

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

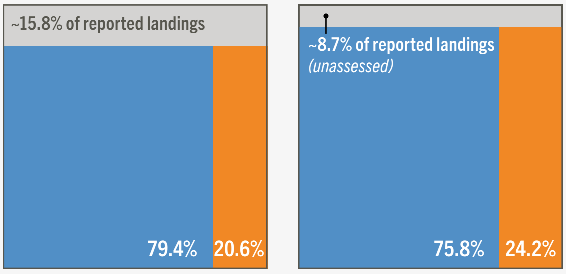
ATLANTIC, NORTHEAST

KEY MESSAGES

- Following decades of improved management, fish stocks and habitats are generally recovering and overfishing is declining.
- Climate risk can lead to conflicts over resources as important commercial stocks shift ranges or suffer declines.
- Albeit generally fishing constitutes only a small fraction of the GDP in the region, it is still economically important to Iceland, the Faroe Islands and Greenland. Fisheries are socially and culturally important in the wider region.
- Many local and Indigenous communities depend on fishing (culturally, economically and in terms of food security).

STOCK STATUS

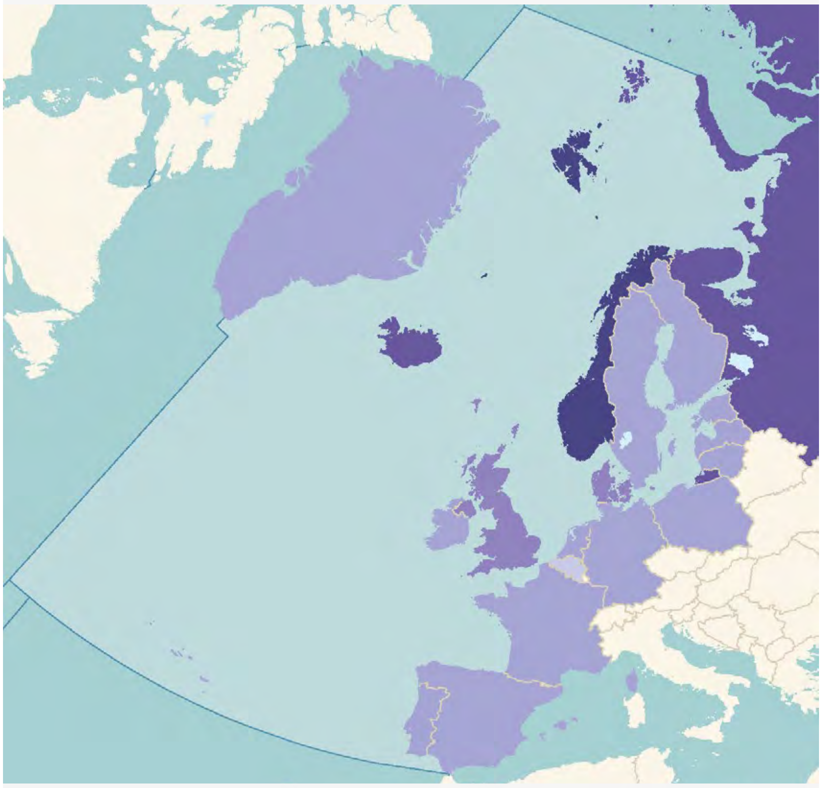
FAO estimates, 2021



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021

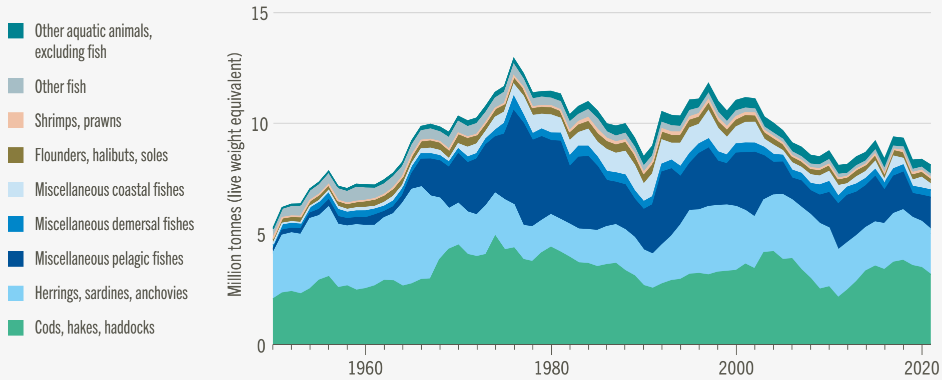


Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES
n/a | < 1 % | 1 – 5 % | 5 – 10 % | 10 – 20 % | > 20 %

SPECIES COMPOSITION

FAO data, 1950–2021

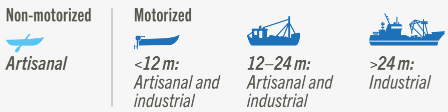


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~43 000



Non-motorized: 6%
Motorized: 94%

LANDINGS

FAO data, 2021

Reported landings ~8 million tonnes

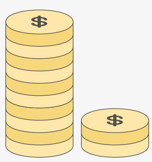
Unidentified: 0%
Identified at species group level: 100%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~USD 11.5 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~79 000

Male: 63%
Unspecified: 34%
Female: 3%

= 100 000 PEOPLE

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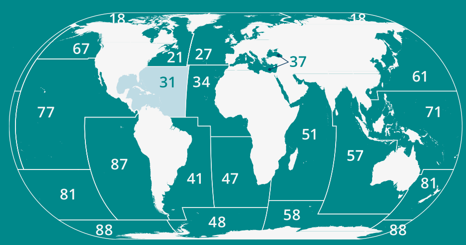
FIGURE D.2.4 *(previous page)*
AREA 27 – DATA AT A GLANCE

Illustration © Jana Kleineberg



Part D, Chapter 3 (D.3)

WESTERN CENTRAL ATLANTIC
FAO MAJOR FISHING AREA 31

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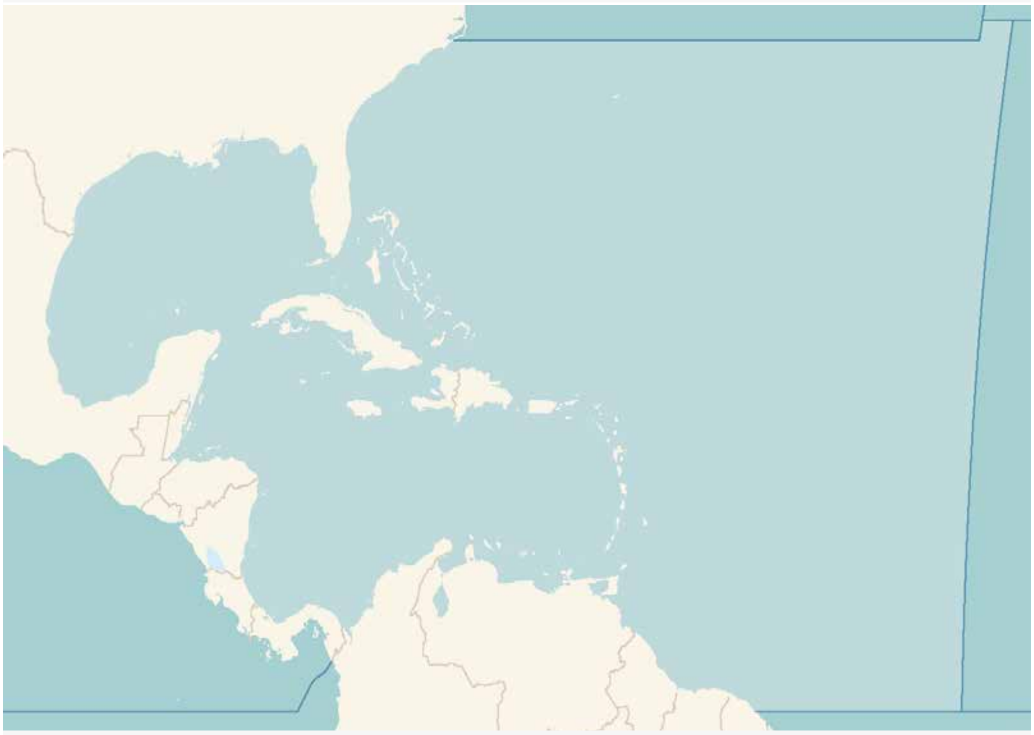
1. OVERVIEW

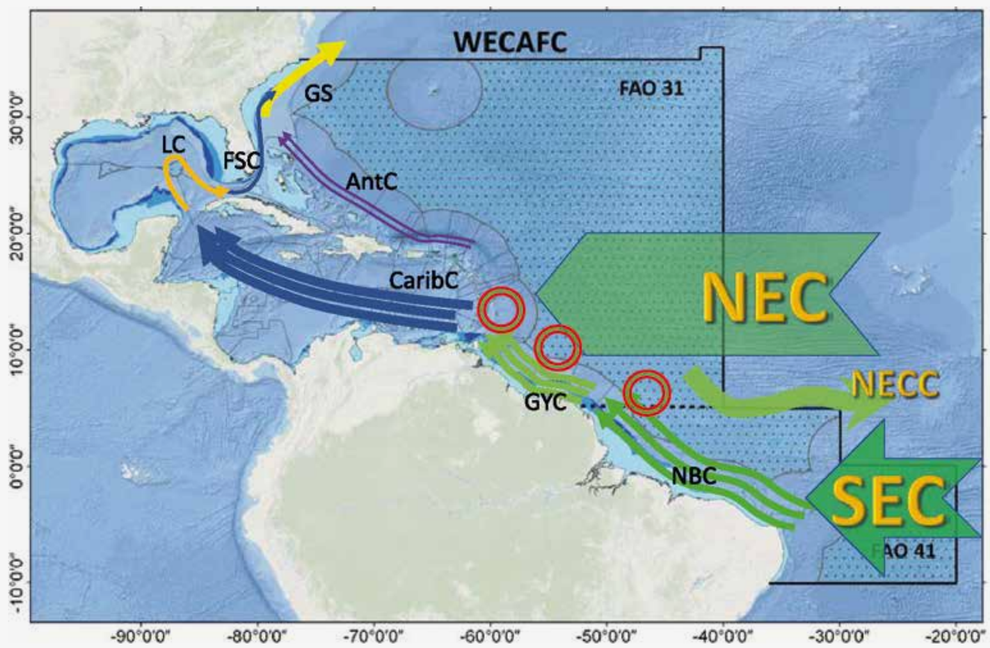
The Western Central Atlantic, designated as FAO Major Fishing Area 31 (hereafter, Area 31) (**FIGURE D.3.1**), includes approximately 14.7 million km^2 of marine areas extending from Cape Hatteras in the state of North Carolina, United States of America (hereafter, United States) (at 35° north), along the eastern coast of the Americas to French Guiana in the south (at 5° north). Eastwards it extends to 40° west longitude in the high seas (FAO, 2024a). Area 31 covers the southeastern coast of the United States, the Gulf of Mexico, the Caribbean Sea and the northeastern coast of South America, with an estimated continental shelf area of 1.4 million km^2. Small-scale, semi-industrial and industrial fisheries harvested around 1.2 million tonnes of fish and invertebrate species in 2021 (FAO, 2024b).

FIGURE D.3.1
FAO MAJOR FISHING AREA 31: THE WESTERN CENTRAL ATLANTIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

FIGURE D.3.2
MAIN FEATURES OF THE OCEANIC CIRCULATION IN THE WESTERN CENTRAL ATLANTIC



NEC (North Equatorial Current), NECC (North Equatorial Counter Current), SEC (South Equatorial Current), NBC (North Brazil Current), GYC (Guyana Current), CaribC (Caribbean Current), AntC (Antilles Current), LC (Loop Current), Florida Straits Current (FSC), Gulf Stream (GS).

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Source: Adapted from **Arocha, F., Narvaez, M. & Mendoza, J.** 2024. *Review of biological data, spatial distribution of the stocks and ecological connectivity between areas beyond national jurisdiction and exclusive economic zones in the Western Central Atlantic Fishery Commission region.* Rome, FAO. **https://doi.org/10.4060/cc9103en**

Area 31 is notably heterogeneous in geographic, ecological, political, economic and cultural terms. It encompasses the exclusive economic zones (EEZs) of 27 countries,[1] of which 16 are small island developing states (SIDS), and 19 are overseas territories of France, the Kingdom of the Netherlands, the United Kingdom of Great Britain and Northern Ireland (hereafter, the United Kingdom), and the United States.[2]

The oceanographic circulation in the Western Central Atlantic is dominated by the westward flow of the North Equatorial Current and the Antilles Current to the north, and the Guianas Current and the Caribbean Current to the south. A recurrent feature is the presence of anticyclonic gyres (North Brazil Current rings) that enter the Caribbean region through the Lesser Antilles and may help deliver waters with relatively low salinity and high nutrient levels into the marine environment of this island chain (Fratantoni and Glickson, 2002; Aroucha *et al.,* 2020). The Caribbean Current enters the Gulf of Mexico through the Yucatan Channel to form the Loop Current, which exits through the

[1] Antigua and Barbuda, Bahamas, Barbados, Belize, the Bolivarian Republic of Venezuela, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, France, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

[2] Anguilla, Aruba, Bermuda, Bonaire, Saint Eustatius and Saba, British Virgin Islands, Cayman Islands, Curaçao, French Guiana, Guadeloupe, Martinique, Montserrat, Puerto Rico, Saint Barthélemy, Saint Martin (French part), Sint Martin (Dutch part), Turks and Caicos Islands, and the United States Virgin Islands.

Straits of Florida as the Florida Straits Current, and which then merges with the Antilles Current to form the Gulf Stream (**FIGURE D.3.2**).

The Western Central Atlantic, especially the Caribbean Sea, harbours the highest species diversity in the Atlantic Ocean and represents a global hotspot of marine biodiversity (Roberts *et al.,* 2002; Miloslavich *et al.,* 2010). The productivity of Area 31 is relatively heterogeneous; the most productive regions are related to riverine input and upwelling systems, especially in the Gulf of Mexico and along the northeastern shelf of South America. In addition, coral reefs, coastal lagoons, mangrove forests and seagrass beds are highly productive and sustain important fishery resources.

2. FISHERY PROFILES

Given the regional geopolitical complexity of the Western Central Atlantic in terms of countries and overseas territories, this section addresses the fishery profiles of the region from the perspective of the large marine ecosystem (LME) concept (Sherman and Hempel, 2008). The Western Central Atlantic encompasses four LMEs: the northern half of the North Brazil Shelf LME, the Caribbean Sea LME, the Gulf of Mexico LME and the Southeast United States Continental Shelf LME. Additionally, towards the northern limit of Area 31 is located the Bermuda marine ecoregion, which represents the northernmost limit for coral reef ecosystems in the Atlantic Ocean; however, given that this region is only a small part of Area 31 and is more relevant for open ocean areas beyond national jurisdiction, it is not addressed in this chapter and is instead covered in the chapter on deep-sea fisheries (**PART E.2, DEEP-SEA FISHERIES**, pp. 377).

2.1 The Southeast United States continental shelf large marine ecosystem

The Southeast United States continental shelf LME extends from Cape Hatteras, North Carolina, to the Straits of Florida. This LME covers around 273 000 km^2, with an extensive continental shelf covering approximately 131 000 km^2 and containing around 0.27 percent of the world's coral reefs. There are an important number of estuarine ecosystems, including the Albemarle-Pamlico Sound in North Carolina which is the second-largest estuary in the United States. This LME is considered a moderately productive ecosystem, with yearly primary production ranging 150–300 g/cm^2 (Aquarone, 2008). Recreational and commercial fisheries exploit coastal pelagic species such as common dolphinfish *(Coryphaena hippurus)*, king mackerel *(Scomberomorus cavalla)* and Atlantic Spanish mackerel *(Scomberomorus maculatus),* as well as highly migratory species such as swordfish *(Xiphias gladius)*, albacore *(Thunnus alalunga)*, Atlantic sailfish *(Istiophorus albicans),* and various shark species. Among the most abundant invertebrate species exploited are the northern white shrimp *(Litopeaneus setiferus),* northern brown shrimp *(Penaeus aztecus)* and blue crab *(Callinectes sapidus).*

2.2 The Gulf of Mexico large marine ecosystem

The Gulf of Mexico is the largest semi-enclosed area in the Western Atlantic. It is bordered by the United States, Mexico and Cuba, and has an area of approximately 1.5 million km^2. The continental shelf of this LME is the most extensive in Area 31, with a total surface area of around 570 000 km^2. It comprises around 0.6 percent of the world's coral reefs, mainly along the southwestern coast of Florida. The primary productivity in the Area is considered moderate, with yearly values usually less than 300 g/cm^2, and is highly influenced by freshwater and nutrient inputs from rivers and extensive estuaries, especially the Mississippi-Atchafalaya basin, as well as upwelling along the edge of the Loop Current (Heileman and Rabalais, 2008). Recreational, small-scale, semi-industrial and industrial fisheries exploit important stocks of fish and invertebrates. The Gulf menhaden *(Brevoortia patronus)* industrial purse seine fishery is the largest fishery in the Western Central Atlantic in terms of landings, while industrial trawl fisheries for northern white, northern brown and northern pink *(Penaeus duoraru)* shrimps are the largest shrimp fisheries in Area 31. Other important fisheries include the exploitation of red grouper *(Epinephelus morio)* and northern red snapper *(Lutjanus campechanus)*, the small-scale and semi-industrial fisheries for common octopus *(Octopus vulgaris)* aand Mexican four-eyed octopus *(Octopus maya)*, as well as the estuarine-associated small-scale fisheries for blue crab and American cupped oyster *(Crassostrea virginica)*.

2.3 The Caribbean Sea large marine ecosystem

The Caribbean Sea is a tropical body of water bounded by the continental landmass of the Americas to the west and south, the Greater Antilles to the north and the Lesser Antilles to the east. This LME is the largest in the region. It covers around 3.3 million km^2 and contains about 7 percent of the world's coral reefs. The total shelf area is around 518 000 km^2, with main areas corresponding to the Honduras-Nicaragua rise in Central America, the northern and northeastern coasts of South America along Colombia and the Bolivarian Republic of Venezuela, and around the Bahamas and Cuba. Overall, annual primary productivity is moderate (150–300 g/cm^2), but given the extent and characteristics of this LME it is very heterogeneous, with areas of high productivity associated with the deltas and plumes of major rivers (e.g. the Orinoco and the Magdalena), estuarine areas (e.g. Lake Maracaibo), upwelling areas along the coasts of Colombia and the Bolivarian Republic of Venezuela, and coastal and insular habitats (coral reefs, mangroves and seagrass beds) (Heileman and Mahon, 2008). Around 75 percent of the waters of this LME are deeper than 1 800 m. Considering the extent of coral reef areas and the endemic nature of most associated species, the Caribbean Sea LME is an important global biodiversity hotspot (Miloslavich *et al.*, 2010). The fisheries of the Caribbean LME are mainly small-scale, with relatively small industrial (mostly trawlers and longliners) and recreational sectors. Significant fisheries resources include reef-associated species such as the Caribbean spiny lobster *(Panulirus argus)*, queen conch *(Aliger gigas)* and reef fishes (snappers and groupers), small coastal pelagics such as round sardinella *(Sardinella aurita)*, highly migratory species such as tunas and billfishes, as well as continental shelf demersal fishes (especially from the family Sciaenidae) and invertebrates (penaeid shrimps and blue crab).

2.4 The North Brazil Shelf large marine ecosystem

Area 31 includes the northern half of the North Brazil shelf LME. This corresponds largely with what is known as the Guianas marine ecoregion (Spalding *et al.*, 2007), which mainly includes the waters of French Guiana, Guyana, Suriname, and Trinidad and Tobago. This ecoregion extends from the Gulf of Paria between the Bolivarian Republic of Venezuela and the island of Trinidad, to the limits between French Guiana and Brazil around 4°12′ north latitude. The ecoregion extends over about 136 000 km^2, of which approximately 97 percent is continental shelf area. Primary productivity is relatively high, with annual values above 300 g/cm^2. This high productivity is related to an influx of nutrient-rich waters from the Amazon River to the south, as well as inputs from smaller local rivers such as the Maroni, Corentyne, Demerara and Essequibo. The fishing fleet is mainly small-scale, but there is an important industrial sector composed mostly of shrimp trawlers. Major exploited groups include groundfish such as several species of weakfishes (family Sciaenidae), sea catfishes (family Ariidae) and southern red snapper *(Lutjanus purpureus)*, penaeid shrimp species, especially the Atlantic seabob *(Xiphopenaeus kroyeri)*, and coastal pelagic fishes such as king mackerel and Serra Spanish mackerel *(Scomberomorus brasiliensis)*.

3. RESOURCE STATUS

3.1 Reference list of stocks

In Area 31, FAO has traditionally evaluated the status of 40 species or species groups, which include around 50 individual stocks. The status of these stocks is discussed at the biennial meetings of the Western Central Atlantic Fishery Commission (WECAFC), after review and comments from the Scientific Advisory Group.

In this report, the reference list of stocks for Area 31[3] has been updated according to the updated methodology to cover 51 species or species groups and 103 stock units (**TABLE D.3.1** and **APPENDIX II, TABLE 3,** pp. 421).

TABLE D.3.1
SUMMARY OF ASSESSED STOCKS IN AREA 31 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	58	35	9
2 Surplus-production model approaches	45	25	11
Total	**103**	**51**	**13**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

Overall, of the 103 stocks assessed for Area 31, 62.1 percent are sustainably fished while 37.9 percent are unsustainably fished. More specifically, 37.9 percent are considered underfished, 24.3 percent are considered maximally sustainably fished, and 37.9 percent are considered overfished (**TABLE D.3.2**). When weighted by landings, the percentage of sustainably fished stocks increases to 75.8 percent.

TABLE D.3.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 31 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	58	46.6	20.7	32.8	67.2	32.8
2 Surplus-production model approaches	45	26.7	28.9	44.4	55.6	44.4
Total	**103**	**37.9**	**24.3**	**37.9**	**62.1**	**37.9**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

The stocks for Area 31 have also been classified by tiers, according to the updated methodology.[4] For the stocks classified as Tier 1, the information gathered covered 35 species and 58 stock units. The results from the Tier 1 stock assessments indicated that 12 stocks

[3] This reference list was validated and endorsed during a regional workshop held 15–17 November 2022 at the Cooperative Institute for Marine and Atmospheric Studies (CIMAS), University of Miami, Miami, United States.

[4] Future revisions may include new Tier 3 stocks.

were maximally sustainably fished, 19 overfished and 27 underfished. Hence, 67.2 percent of Tier 1 stocks were sustainably fished and 32.8 percent were not sustainably fished.

A total of 25 species representing a total of 45 assessed stocks were identified for Tier 2. Most of these stock units were defined by the jurisdictional waters of the reporting countries. Of the 44 stocks analysed in Tier 2 using production models (SRAplus),[5] 13 were maximally sustainably fished, 12 were underfished and 20 were overfished. Hence, for Tier 2 stocks in Area 31, about 55.6 percent were sustainably fished and 44.4 percent were not sustainably fished.

Overall, landings of Tier 1 and Tier 2 assessed stocks in Area 31 represented approximately 72.1 percent of total landings reported in the Western Central Atlantic in 2021 (**TABLE D.3.3**), a slight increase from 69.9 percent coverage by previous coverage. Total landings of non-assessed stocks were estimated to represent about 27.9 percent of total landings reported in Area 31 in 2021.

TABLE D.3.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 31 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
0.79	67.4	10.6	22.0	78.0	22.0

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Sources: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

The early years of the series (1950s to 1970s) reflect the period of development for most commercial fisheries in Area 31, during which landings increased more or less constantly from around 500 000 tonnes in 1950 to peak at around 2.5 million tonnes in 1984; since then, landings have shown a more or less decreasing overall trend, reaching around 1.2 million tonnes in 2021 (**FIGURE D.3.3**). Most of the variability observed in the data is associated with ISSCAAP group 35 (herrings, sardines and anchovies), which made up on average 44 percent of total landings during the period 1950–2021 (FAO, 2024a).

4.1 PELAGIC FISH

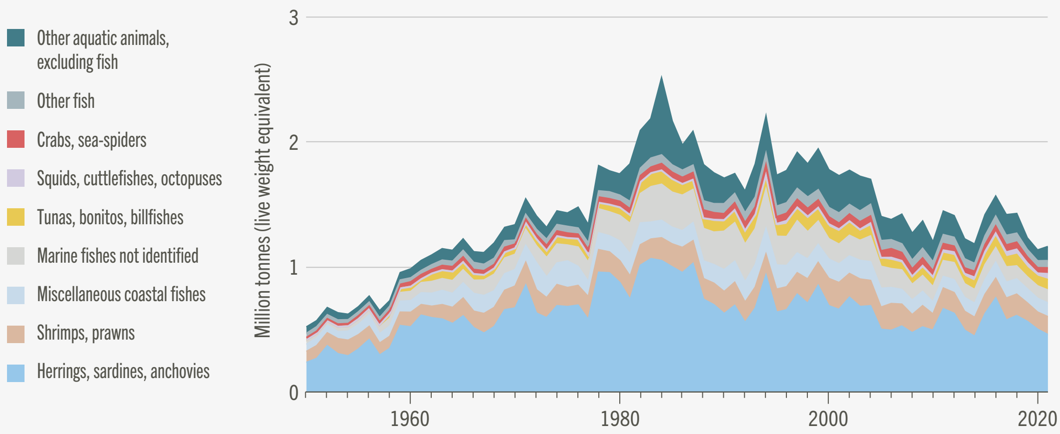
Pelagic fisheries are the most important fisheries in terms of landed catch in the Western Central Atlantic. These include species of finfish of the families Clupeidae (sardines, menhadens and herrings), Scombridae (tunas, mackerels and bonitos), Carangidae (jacks, scads and pompanos) and Istiophoridae (billfishes), among others. Small pelagic fishes are caught mainly with purse seines and beach seines, while large and medium-sized pelagics are caught with purse seines, pelagic longlines, handlines, pole and line, and surface gillnets.

4.1.1 Small pelagic fish

The main small pelagic fishes are Gulf menhaden *(Brevoortia patronus)* and round sardinella *(Sardinella aurita)*. The fishery for Gulf menhaden is an industrial purse seine fishery in the northern Gulf of Mexico. The United States is the only country that reports

[5] https://github.com/DanOvando/sraplus

FIGURE D.3.3
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE WESTERN CENTRAL ATLANTIC (AREA 31) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

landings of this species, which is used mainly for fishmeal, oil and, to a much lesser extent, fish bait. This is the single most important fishery in Area 31, and reached maximum landings of around one million tonnes in 1984. Since then, landings have decreased significantly, reaching about 361 000 tonnes in 2021. The decrease in landings is mainly related to economic factors, given that the stock is not overfished nor giving indications of overfishing (SEDAR, 2018).

Traditionally, the Bolivarian Republic of Venezuela has been the main producer of round sardinella in the Western Central Atlantic, with more than 99 percent of total landings in 2021. The fishery is a coastal artisanal fishery operating with beach seines and purse seines. National legislation establishes that landings are exclusively for human consumption; they reached a maximum of around 200 000 tonnes in 2004. Since then, landings have decreased substantially, and total landings in 2021 were estimated to be 90 000 tonnes.

In the eastern Caribbean, there is a traditional fishery that mainly targets the four-wing flyingfish *(Hirundichthys affinis)* using surface gillnets and other accessory gears (fish aggregating devices and handheld dip nets). Flyingfish are primarily used for human consumption and as bait fish. Reported landings of flyingfish NEI peaked in 1988 at around 6 000 tonnes, and had decreased to just over 250 tonnes in 2021, with Barbados as the major producer. The recent reduction in landings has been associated with reduced catchability due to Sargassum influxes (Ramlogan *et al.*, 2017; Oxenford *et al.*, 2019). The population of flyingfish in the eastern Caribbean is considered a unit stock, but adequate data are lacking to determine stock status (CRFM, 2019).

The status of these stocks range from underfished to overfished, with stocks in the southern part of Area 31 overfished and maximally sustainably fished in the Gulf of Mexico.

4.1.2 Large and medium pelagic fish

In many countries of the region, small-scale fisheries and semi-industrial fisheries, using longlines, trolling and surface gillnets, target large and medium pelagic fish species. Large highly migratory species such as blue marlin *(Makaira nigricans)* and Atlantic sailfish

(Istiophorus albicans) are frequently caught as bycatch in tuna longline fisheries, while swordfish *(Xiphias gladius)* is targeted by a directed longline fishery. In the Greater and Lesser Antilles, moored fish aggregating devices are used by small-scale fishers to enhance the catch of large and medium pelagic fishes (Wilson *et al.,* 2020).

A total of 14 countries, mainly from the Lesser Antilles, reported landings of Atlantic sailfish, but the main producers in 2021 were the Bolivarian Republic of Venezuela, Panama and the Dominican Republic. Landings for this species peaked in 2006 at around 1 700 tonnes and have since declined, reaching 787 tonnes in 2021. Around 16 countries reported landings of blue marlin in 2021, of which France (including Guadeloupe and Martinique) and Saint Lucia were the main producers. Landings of this species have shown a decreasing trend since a recent maximum of around 1 900 tonnes in 2008, reaching about 532 tonnes in 2021. A total of 17 countries reported swordfish landings in 2021, of which the main producers were the United States and Spain. Reported landings for swordfish have declined steadily since a recent maximum in 2007 of around 5 000 tonnes, amounting to around 1 070 tonnes in 2021.

Tuna species are mainly exploited by longline, purse seine, and pole and line industrial fisheries in the Western Central Atlantic region. There are also semi-industrial and small-scale vessels that target tuna species using longlines, handlines and surface gillnets. Twenty-nine countries report landings of yellowfin tuna *(Thunnus albacares)* in the Western Central Atlantic, of which Brazil, the Bolivarian Republic of Venezuela, Trinidad and Tobago, and Grenada are the main producers. After peaking at about 40 000 tonnes in 2018, reported landings decreased to about 32 000 tonnes in 2021. The increase observed since 2012 is mainly due to reported landings by Brazil, which has become the major producer in the region. For bigeye tuna *(Thunnus obesus)* landings have increased significantly since 2010: after peaking at about 9 200 tonnes in 2016, landings reached approximately 8 200 tonnes in 2021, mainly due to reports from Brazil and, to a lesser extent, China, Colombia, Panama, Taiwan Province of China and the Republic of Korea. The contribution from skipjack tuna *(Katsuwonus pelamis)* has decreased significantly from a maximum of around 21 000 tonnes in 1984 to less than 3 700 tonnes in 2021, mainly from Brazil and the Bolivarian Republic of Venezuela. Landings of blackfin tuna *(Thunnus atlanticus)* have also decreased significantly after peaking in 1992 at around 5 500 tonnes, reaching about 910 tonnes in 2021, with Cuba and Saint Lucia as the major producers. Reports for albacore *(Thunnus alalunga)* reached a maximum of around 11 000 tonnes in 2001 and later decreased to about 3 600 tonnes in 2021, with Taiwan Province of China, the Dominican Republic and China as major producers.

Migratory coastal pelagic species are exploited commercially mainly by semi-industrial and small-scale fisheries using handlines and surface gillnets. King mackerel *(Scomberomorus cavalla)* is exploited in the southeastern United States, the Gulf of Mexico, the southeastern Caribbean along the coasts of the Bolivarian Republic of Venezuela, Trinidad and Tobago, the Guianas-Brazil shelf, and to a lesser extent in the eastern Caribbean, especially in Dominica. Total reported landings reached around 13 000 tonnes in 2004 and have subsequently decreased to 4 100 tonnes in 2021. In decreasing order, the main producers are the United States, the Dominican Republic, Trinidad and Tobago, the Bolivarian Republic of Venezuela, and Mexico. Atlantic Spanish mackerel *(Scomberomorus maculatus)* is mainly exploited along the southeast Atlantic coast of the United States and across the entire extent of the Gulf of Mexico. Landings showed a recent peak of about 11 000 tonnes in 2018 and then decreased to 3 800 tonnes in 2021, with Mexico as the main producer (around 54 percent of total landings). The Serra Spanish mackerel *(Scomberomorus brasiliensis)* is exploited mainly by Trinidad and Tobago and the Bolivarian Republic of Venezuela. Reported data show a continuous decline from around 7 500 tonnes in 1991 to around 1 600 tonnes in 2021. Common dolphinfish *(Coryphaena hippurus)* is exploited throughout the Western Central Atlantic, with reported landings from 21 countries. The main producers are France (including Guadeloupe and Martinique), the Dominican Republic, Saint Lucia and Barbados. Landings show a continuous increase until 2011 when around 7 000 tonnes were reported, and a subsequent decline to 3 200 tonnes in 2021.

Large and medium pelagic stocks in Area 31 are primarily maximally sustainably fished.

4.2 DEMERSAL CONTINENTAL SHELF SPECIES

4.2.1 Invertebrates

Different species of penaeid shrimps are the target of industrial trawl fisheries in Area 31, and to a lesser extent of small-scale trawl and fyke net fisheries in coastal areas. The most important fisheries are found in the Gulf of Mexico and along the Guianas-Brazil shelf. Northern brown shrimp *(Penaeus aztecus)* is reported by Mexico and the United States, the latter representing 70 percent of total landings in 2021. Reported landings for this species peaked in 1990 at around 79 000 tonnes and have declined to approximately 44 700 tonnes in 2021. Northern white shrimp *(Litopenaeus setiferus)* is reported by the United States, as the major producer (representing 97.7 percent of catches), and Mexico. Landings of this species show a declining trend in recent years from around 67 000 tonnes in 2006 to about 51 000 tonnes in 2021. Northern pink shrimp *(Penaeus duorarum)* is reported to FAO by the United States, Mexico and Cuba. Landings peaked in the late 1970s and early 1980s at above 20 000 tonnes; they have since decreased to about 6 900 tonnes in 2021. Atlantic seabob *(Xiphopenaeus kroyeri)* is reported by Guyana, Suriname, Mexico, the Bolivarian Republic of Venezuela, Colombia and the United States, with Guyana and Suriname as the main producers with around 90 percent of total landings. After a sharp increase during the 1980s and 1990s, landings of Atlantic seabob reached a recent maximum above 30 000 tonnes between 2016 and 2018. However, they have since declined to about 18 000 tonnes in 2021. Other penaeid shrimps are reported by 10 countries from the Western Central Atlantic, specifically from the Gulf of Mexico, Central America (Honduras and Nicaragua) and the Guianas ecoregion (French Guiana, Guyana, Suriname, and Trinidad and Tobago). Landings of penaeus shrimps NEI in Area 31 reached more than 60 000 tonnes in the early 1970s, but since then have shown a sharp decline to just above 4 300 tonnes in 2021.

Assessed stocks of demersal continental shelf invertebrates in Area 31 are primarily sustainably maximally fished or underfished.

4.2.2 Groundfishes

Weakfishes, drums and croakers are members of the family Sciaenidae that are abundant and widely distributed along the continental shelves of Area 31. Weakfishes NEI (Cynoscion spp.) include several species that are mainly reported by French Guiana, Mexico and the Bolivarian Republic of Venezuela. This group reached a peak in 1995 of around 20 000 tonnes, subsequently declining steadily to less than 3 200 tonnes in 2021. The whitemouth croaker *(Micropogonias furnieri)* is reported only by the Bolivarian Republic of Venezuela, and landings peaked in the early to mid-1990s at around 7 000 tonnes. In recent years, landings have decreased to less than 3 000 tonnes. The spotted weakfish *(Cynoscion nebulosus)* is reported mainly by Mexico and, to a much lesser extent, by the United States. Landings peaked in the late 1990s at 6 700 tonnes, and have since declined significantly to around 400 tonnes in 2021. Landings of sea catfishes in Area 31 reached a maximum of around 27 000 tonnes in 1995, but have declined significantly since 2006 and were at less than 8 500 tonnes in 2021. Most of the landings in recent years have been reported by Mexico and the Bolivarian Republic of Venezuela, representing about 95 percent of the total. Overall, the groundfishes in Area 31 range from maximally sustainably fished to overfished, with most being overfished.

4.3 REEF-ASSOCIATED SPECIES

4.3.1 Invertebrates

The most valuable invertebrate resources exploited in reef-associated habitats in the Western Central Atlantic are the Caribbean spiny lobster *(Panulirus argus)* and the queen conch *(Aliger gigas)*. Fisheries for these species are small-scale, semi-industrial or industrial using free diving, or diving with SCUBA or Hookah diving gear. Traps and "casitas" (artificial dwellings) are also used for the capture of Caribbean spiny lobster.

The Caribbean spiny lobster is reported by 26 countries and overseas territories in Area 31. Landings peaked in 1999 at about 36 000 tonnes and have since declined to about 23 400 tonnes in 2021. The Bahamas, Cuba, Honduras, Nicaragua, the Dominican Republic and the United States accounted for 88 percent of total reported landings in 2021. These stocks are primarily underfished and maximally sustainably fished, with one stock unit overfished.

Queen conch landings are reported by 21 countries in the Western Central Atlantic. Total reported landings reached approximately 40 000 tonnes in 1994 and have decreased to around 36 000 tonnes in 2021. Antigua and Barbuda, the Bahamas, Belize, the Dominican Republic, Honduras, Jamaica, Nicaragua and the Turks and Caicos Islands are the main regional producers, accounting for 90 percent of total regional landings in 2021. Mainland associated stocks are about equally distributed between underfished, maximally sustainably fished and overfished, while most Caribbean islands stocks are underfished.

4.3.2 Finfishes

Finfish species associated with coral reef habitats are highly appreciated and valuable fish for human consumption. Relevant species are members of the families Lutjanidae (snappers and jobfishes) and Serranidae (groupers, seabasses and hinds), among others. These are mainly exploited by small-scale and semi-industrial fisheries using hook and line gear (demersal longlines and handlines) and traps. Some species are also caught as bycatch of the industrial shrimp trawl fisheries in the region.

Around 26 countries report individual species or species groups of snappers in the Western Central Atlantic, with total landings for this taxonomic group reaching a maximum of around 41 000 tonnes in 1994 and fluctuating around 28 000 tonnes in recent years (2017–2021). Among the most important species, the northern red snapper *(Lutjanus campechanus)* is reported by Mexico and the United States. Landings have increased since 2012 and in recent years (2018–2021) have been around 8 500 tonnes. Yellowtail snapper *(Ocyurus chrysurus)* is reported by 13 countries in Area 31, of which the main producers are Mexico, the United States and the Dominican Republic. Landings of yellowtail snapper have decreased in recent years from 5 400 tonnes in 2018 to about 2 200 tonnes in 2021. Landings of vermilion snapper *(Rhomboplites aurorubens)* are reported mainly by Mexico, the United States and the Bolivarian Republic of Venezuela; they have been increasing since the early 2000s, reaching approximately 3 800 tonnes in 2021. The southern red snapper *(Lutjanus purpureus)* is reported mainly by Cuba, the Dominican Republic, Guyana, Suriname and the Bolivarian Republic of Venezuela, with total landings estimated at around 5 000 tonnes in 2021. Lane snapper *(Lutjanus synagris)* is reported by seven countries in Area 31, of which Cuba is the main producer. Landings of this species peaked in the early 1970s at approximately 4 600 tonnes, and in recent years (2018–2021) have remained relatively stable at around 1 400 tonnes.

Landings of the family Serranidae, which includes groupers, hinds and seabasses, are reported by 20 countries and overseas territories in Area 31. Landings of this taxonomic group reached a maximum of about 33 000 tonnes in 1981 and have since decreased, reaching around 17 400 tonnes in 2021. The red grouper *(Epinephelus morio)* is one of the main species of groupers landed in the Western Central Atlantic. However, only the United States, including the United States Virgin Islands, and the Dominican Republic make specific reports for it, with the United States accounting for 93 percent of the total. Landings in recent years have decreased from 3 000 tonnes in 2014 to around 1 700 tonnes in 2021. Mexico also supports a large fishery for red grouper in the southern Gulf of Mexico. However, landings are likely reported in the groupers NEI denomination that reached around 6 000 tonnes in 2021.

Overall, reef-associated finfishes in Area 31 range from maximally sustainably fished to overfished, with most being overfished.

4.4 RECREATIONAL FISHERIES

In the Caribbean Sea and the Gulf of Mexico, marine recreational fisheries are an important component of the leisure and tourism industries. However, except for in the United States where data are systematically collected, information on the ecological, social and economic impacts of recreational fisheries is rather limited.

Recreational fisheries are particularly important in the Gulf of Mexico and along the southeastern coast of the United States. Activities related to recreational fisheries generated around 224 000 jobs in 2018 in the United States, representing 48 percent of all marine recreational fisheries jobs for the country (National Marine Fisheries Service, 2021). The state of Florida is where most of this activity occurs, with more than 126 000 jobs created. In 2018, there were an estimated 193.5 million marine recreational fishing trips in the United States, and 68 percent of them were made in Area 31. The estimated total economic impact associated with marine recreational fisheries on the southeast coast and in the Gulf of Mexico of the United States was USD 49.5 billion.

The total harvest of finfishes by marine recreational fisheries in the United States in FAO Major Fishing Area 31 was 82 000 tonnes in 2021 (NOAA Fisheries, 2025). A selection of pelagic species – including blackfin tuna, yellowfin tuna, little tunny *(Euthynnus alletteratus),* Atlantic bonito *(Sarda sarda),* king mackerel, Atlantic Spanish mackerel, cero *(Scomberomorus regalis),* common dolphinfish, bluefish *(Pomatomus saltatrix),* greater amberjack *(Seriola dumerili),* crevalle jack *(Caranx hippos),* blue runner *(Caranx crysos),* barracudas *(Sphyraena* spp.) and wahoo *(Acanthocybium solandri)* – made up a recreational harvest of about 25 000 tonnes in 2021. The recreational harvest of pelagic species such as Atlantic Spanish mackerel, common dolphinfish, bluefish, and little tunny was greater than the reported commercial landings of the same species for all countries in the Western Central Atlantic in 2021. On the other hand, selected demersal species such as the common snook *(Centropomus undecimalis),* grunts (Haemulon spp.), hogfish *(Lachnolaimus maximus),* black drum *(Pogonias cromis),* red drum *(Sciaenops ocellatus),* flathead grey mullet *(Mugil cephalus),* white mullet *(Mugil curema),* Gulf kingcroaker *(Menticirrhus littoralis),* spotted weakfish, snappers and groupers contributed to a total harvest by marine recreational fisheries in Area 31 of around 24 000 tonnes in 2021.

Shallow-water (or "flats") recreational fisheries, mainly for species such as bonefish *(Albula vulpes),* permit *(Trachinotus falcatus)* and tarpon *(Megalops atlanticus),* have significantly developed in the region. For example, the flats fishery for bonefish in the state of Quintana Roo, Mexico, attracted around 6 000 anglers in 2019 and their activity generated approximately USD 45 million in that year's fishing season (Palomo and Perez, 2021). In the Bahamas in 2018, it was estimated that around 31 000 anglers practised bonefish fishing. This fishery generated around USD 169 million in total benefits for the Bahamas and created some 8 000 full-time jobs. Expenditures related to flats fishing amounted to approximately 7 percent of total tourist expenditures in the Bahamas in 2018 (Fedler, 2019).

In the eastern and southern Caribbean, recreational fishing is mainly associated with deep-water fishing for large and medium-sized pelagic fishes. Data for recreational fisheries is sparse, and most of the information is associated with international gamefish tournaments. In the eastern Caribbean, target species include blue marlin and Atlantic white marlin *(Kajikia albida),* Atlantic sailfish, yellowfin tuna, blackfin tuna, king mackerel, Atlantic Spanish mackerel and common dolphinfish, among others (Mohammed, 2012). In a recent study in Dominica, Grenada, Saint Lucia, Saint Kitts and Nevis, and Saint Vincent and the Grenadines, it was estimated that a total of 9 168 recreational fishing trips took place annually, which generated expenditures of about USD 6.8 million (OECS, 2020).

5. KEY FINDINGS

Over the years, there have been some important changes in the species composition of landings and the relative importance of different fisheries in Area 31. For example, Atlantic menhaden *(Brevoortia tyrannus)* and the calico scallop *(Argopecten gibbus)* no longer make a significant contribution to landings in the Area. On the other hand, species that were not originally considered for assessing the status of fisheries in the region – such as the common octopus *(Octopus vulgaris)* and Mexican four-eyed octopus *(Octopus maya),* or sea cucumbers – have developed into regionally important fisheries. Hence, a methodological update was needed to better reflect the current situation for fisheries and exploited stocks in Area 31. The quality of landings data in the region varies among countries. Taxonomic resolution or adequate coverage of different fleet components may depend on the importance of fisheries to national economies, the resources allocated for their monitoring, and the available technical capacities. Given the difficulties often associated with implementation of sampling programmes for small-scale fisheries, data from industrial fisheries is likely to be more reliable than data from small-scale fisheries. Also, data on valuable, export-oriented fisheries resources, such as Caribbean spiny lobster *(Panulirus argus)* and queen conch *(Aliger gigas),* is also likely to be more reliable than fisheries data for less valuable species. Nevertheless, there have overall been improvements through the years in the taxonomic resolution of species landed. For example, the volume of landings reported to FAO as marine fishes NEI (not elsewhere included) has decreased from over 320 000 tonnes in the early 1990s to around 104 000 tonnes in 2021, while there has been an increase in the number of individual species reported (FAO, 2024a). For adequate assessments of Tier 2 stocks, the quality of landings data provided to FAO, along with the availability of reliable estimates of effort or an index of abundance (catch per unit effort or surveys), are key for unbiased estimates using production-type models.

Overall, the results on the resource status for stocks in Area 31 indicate that, in 2021, 62.1 percent of stocks were sustainably fished (that is, with biomass above 80 percent of their estimated B_{MSY} values) and 37.9 percent were not sustainably fished. These results, which cover a larger proportion of the stocks and fisheries in Area 31 than previously assessed, reflect an improved stock status when compared results from the previous methodology that indicated that 58 percent of stocks were sustainably fished and 42 percent were not sustainably fished in 2021 (FAO, 2024c). When weighted by landings, the proportion of sustainably fished stocks increases significantly to 78.0 percent. However, compared to the results under the previous methodology, the percentage of sustainably fished stocks weighted by landings has decreased due to the addition of a number of new assessment units (**TABLE D.3.5**).

In Area 31, Tier 1 stocks represent around 46.3 percent of total landings, which is similar to percentages reported at the global level (Hilborn *et al.,* 2020). An improvement with the new approach is the increase in the total volume of landings evaluated, representing 72.1 percent of total landings reported for Area 31 compared to 69.9 percent under the previous methodology. Results also indicate that Tier 1 shows a smaller percentage of overfished stocks (32.8 percent) when compared to Tier 2 stocks (44.4 percent), which is indicative of better management practices for assessed stocks (Hilborn *et al.,* 2020). Many of the stocks in Area 31 are shared (Arocha *et al.,* 2024); as such, increased and more efficient international cooperation is necessary to improve the status of stocks in the region.

To conclude, the fisheries sector and marine habitats in the Western Central Atlantic are under pressure from diverse sources, including the deterioration of coral reef habitats from, among other factors, fisheries exploitation, coastal runoff, viral diseases, and ocean warming (Jackson *et al.,* 2014; Shantz *et al.,* 2020; Harms-Tuohy, 2021; Souter *et al.,* 2021; UNEP-CEP, 2021; Alvarez-Filip *et al.,* 2022; Bove *et al.,* 2022); and the economic and environmental impact of Sargassum influxes that have been occurring regularly since 2011 (Wang *et al.,* 2019; WECAFC, 2023). Additionally, pressures from illegal, unreported and unregulated fishing (FAO, 2021), as well as coastal and marine pollution including marine litter and microplastics (UNEP-CEP, 2019; UNEP-CEP, 2020), also impact the fisheries sector. These issues, as well as the transboundary nature of many of the regional fishery resources, need to be better integrated into the national and regional management of marine fisheries in the Western Central Atlantic within the context of an ecosystem approach to fisheries management.

TABLE D.3.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 31 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
103	37.9	24.3	37.9	62.1	37.9	50	10.0	48.0	42.0	58.0	42.0

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE D.3.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 31 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
67.4	10.6	22.0	78.0	22.0	58.4	31.4	10.2	90	10.2

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Sources: FAO estimates.

FAO MAJOR FISHING AREA 31
ATLANTIC, WESTERN CENTRAL

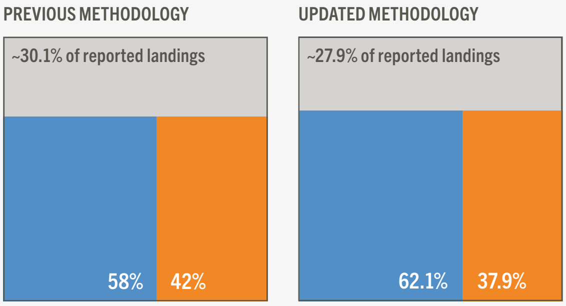
AREA
31

KEY MESSAGES

- Area 31 is notably heterogeneous in geographic, ecological, political, economic and cultural terms.
- The Western Central Atlantic, especially the Caribbean Sea, harbours the highest species diversity in the Atlantic Ocean and represents a global hotspot of marine biodiversity.
- Many Small Island Developing States depend on fisheries for national and local income, and for food security.
- This Area is experiencing more frequent and severe extreme events (e.g. higher intensity hurricanes) due to ocean warming.

STOCK STATUS

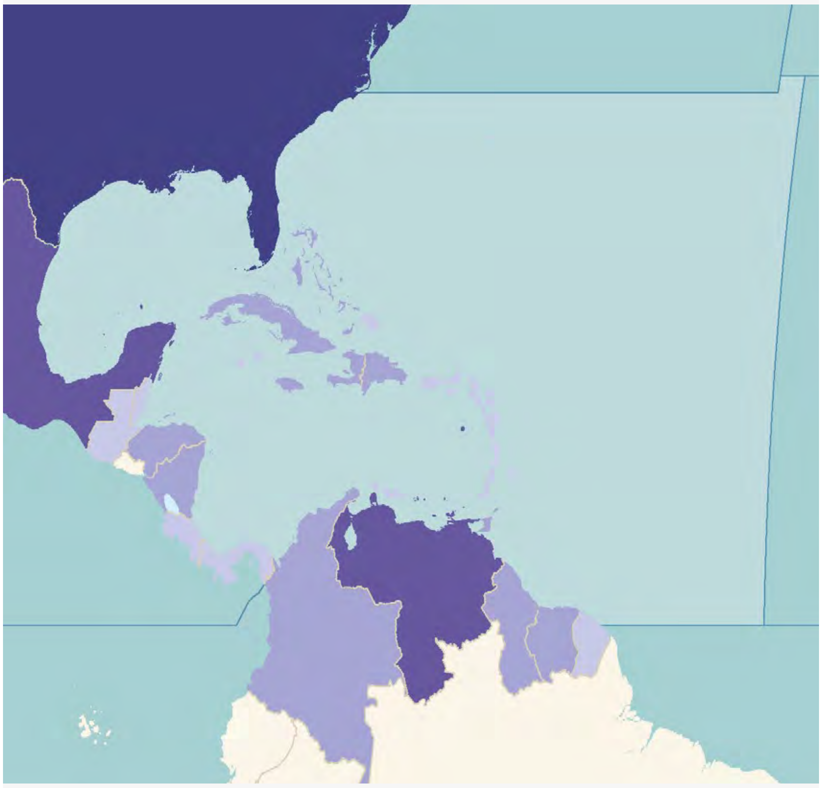
FAO estimates, 2021



- Biologically sustainable
- Biologically unsustainable
- Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

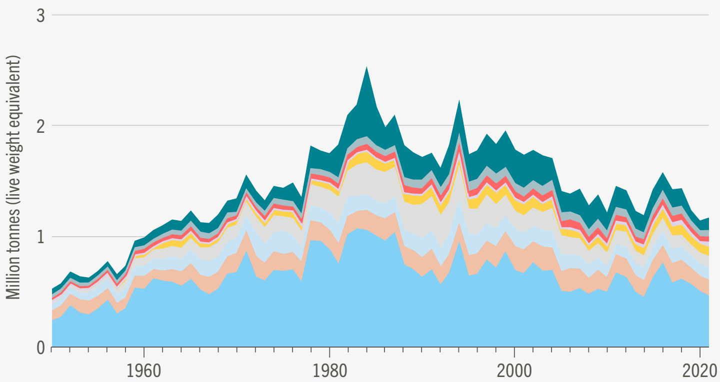
LANDINGS / MILLION TONNES

n/a | < 1% | 1–5% | 5–10% | 10–20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

- Other aquatic animals, excluding fish
- Other fish
- Crabs, sea-spiders
- Squids, cuttlefishes, octopuses
- Tunas, bonitos, billfishes
- Marine fishes not identified
- Miscellaneous coastal fishes
- Shrimps, prawns
- Herrings, sardines, anchovies



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 112 000

Non-motorized | Motorized

Artisanal | *<12 m: Artisanal and industrial* | *12–24 m: Artisanal and industrial* | *>24 m: Industrial*

- Non-motorized: 17%
- Motorized: 83%

LANDINGS

FAO data, 2021

Reported landings ~ 1.2 million tonnes

- Unidentified: 14%
- Identified at species group level: 86%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 2.6 billion

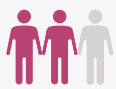
= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 320 000

- Male: 57%
- Unspecified: 33%
- Female: 11%



= 100 000 PEOPLE

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FIGURE D.3.5 *(previous page)*
AREA 31 – DATA AT A GLANCE

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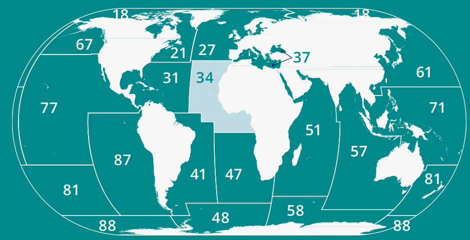

EASTERN CENTRAL ATLANTIC
FAO MAJOR FISHING AREA 34

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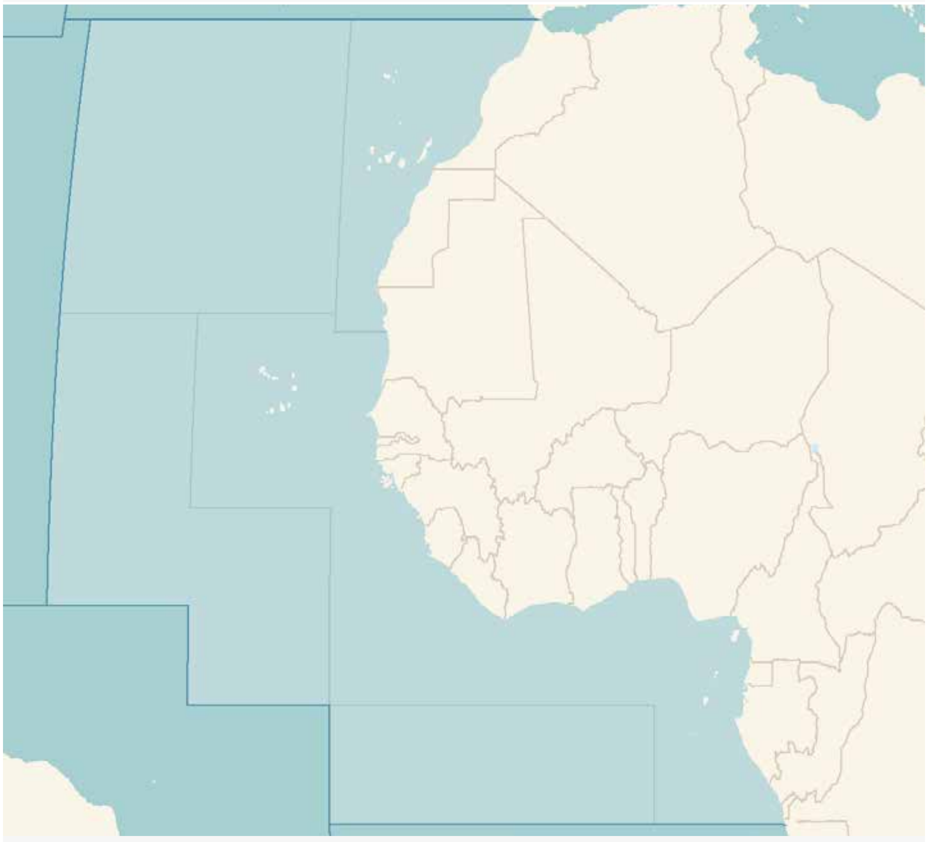
1. OVERVIEW

The Eastern Central Atlantic, designated by FAO as Major Fishing Area 34 (hereafter, Area 34), includes waters off the west coast of Africa, from Cape Spartel to the Congo River, and covers 14.2 million km^2, of which 0.65 million km^2 are shelf area, with exclusive economic zones (EEZs) of 24 countries and territories (FAO, 2024a). The region encompasses temperate, tropical and equatorial waters, lagoons and mangroves, as well as oceanographic features such as major currents, upwellings and equatorial convergence. More than 550 species were reported in fisheries landings taken by coastal states and by

FIGURE D.4.1
FAO MAJOR FISHING AREA 34: THE EASTERN CENTRAL ATLANTIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

distant-water fishing fleets from 57 nations operating in the Area in the period 1950–2021 (FAO, 2024c). The fleets operating in the Area are very diverse, including industrial and artisanal boats of different types (e.g. trawlers, longliners, seiners, dugout canoes) operating in coastal and offshore areas and using multiple types of gears (e.g. nets, lines, traps). It is estimated that more than 400 000 vessel units operate in the Area.The fisheries in Area 34 are diverse, and many of them are typically multispecies, thus posing several challenges for assessment and management. Since the 1950s, these fisheries have evolved considerably. Although small pelagic species dominate the landings, representing over 40 percent of total nominal catches in 2021 (FAO, 2024c), the region also hosts a range of important demersal resources. In terms of capture production, the 2021 catches continued the upward trend observed since the 1970s, mainly due to the increase in catches of sardine (also known as European pilchard, *Sardina pilchardus).* The highest catches are taken in the northern part of Area 34 (north of Guinea-Bissau), with Morocco and Mauritania as the main producers. These two countries are also among the world's top 25 capture fisheries producers (FAO, 2024b).

To cope with emerging changes, ensure sustainable management of these resources and respond to Area 34 countries' request for sustainable use of marine resources, FAO established a regional fishery advisory body in 1967, the Fisheries Committee for the Eastern Central Atlantic (CECAF) (FAO, 1968). The CECAF mandate is to promote the sustainable utilization of living marine resources through a science-based approach to fisheries management frameworks and fishing operations (FAO, 2022a). The CECAF is supported by a Scientific Sub-Committee. The main function of the Scientific Sub-Committee is to provide appropriate science-based advice to the Committee for fisheries management decisions. For this purpose, five working groups collate and improve data and information about the fisheries resources and conduct assessments to analyse the state of fisheries and fish stocks.

2. FISHERY PROFILES

The Eastern Central Atlantic accounted for 6.4 percent of global marine capture fisheries production in 2021 (80.3 million tonnes) (FAO, 2024b). The landings from Area 34 have gradually increased since the 1950s, peaking in 2021 (at around 5.2 million tonnes) after some fluctuation in the 1990–2009 period (Figure 2; FAO 2024b,c). Over the last decade, the average landings were around 4.8 million tonnes per year. While Angola officially falls under Area 47, Angola's landings are included in this figure because some stocks are shared with countries to the north and are therefore jointly assessed under CECAF. The exploited fisheries resources include coastal and offshore pelagic resources, as well as shelf, slope and deep-sea demersal resources, with different bioecological characteristics and socioeconomic importance. Coastal pelagic resources are the most abundant and constituted over 50 percent of landings in 2021, with the dominant species being sardine *(Sardina pilchardus),* sardinellas (including round sardinella [*Sardinella aurita*] and flat sardinella [also known as Madeiran sardinella, *Sardinella maderensis*]), Cunene horse mackerel *(Trachurus trecae)* and bonga shad *(Ethmalosa fimbriata).* The catch in the north of Area 34 is generally larger than in the south (from Guinea-Bissau to the mouth of the Congo river), and Morocco and Mauritania are among the largest producers. The proportion of catches originating from artisanal fisheries has varied over time and by subregion. Data provided by the CECAF working groups indicate that the percentage of catches originating from artisanal fisheries is lower in the north than in the south (FAO, 2022b, 2023a,b, 2024d).

Distant-water fishing nations have been operating in Area 34 since the early 1950s, with peaks in catches recorded in the 1970s and in the late 1980s–1990s. Subsequently, market forces and changes in management regimes resulted in a reduction in the activities of some distant-water fleets that were mainly targeting small pelagic fish, which in turn led to a considerable drop in catches. Since 1996, fishing effort by foreign fleets on small pelagics has increased in the northwest portion of Area 34. Although there have been some fluctuations, catches have remained relatively stable since that time. Other foreign fleets are also active in Area 34, targeting shrimp, cephalopods and demersal fish. Coastal states have steadily developed their national fisheries, increasing their contribution from less than 50 percent to over 80 percent of total catches in Area 34 between the 1970s and the 2020s. In part, this trend can also be associated with the reflagging of some foreign vessels under the national flags. Since 2003, coastal states have contributed between 75 percent and 80 percent of the reported catches (FAO, 2011).

A lack of adequate fisheries-related and biological data is a matter of concern in the region. The CECAF assessment working groups that operate under the Scientific Sub-Committee highlight that for several of the stocks assessed, a lack of adequate data make it hard to assess the state of stocks using standard methods. In particular, for several artisanal/small-scale fisheries and semi-industrial fisheries, time series of catch and effort or more detailed information (e.g. biological data, length/age data) are not available, thus limiting the assessments of stocks that are exploited by such fleets (FAO, 2022b). In addition, while some of the large industrial fisheries have high-quality catch information on target species, non-target species are poorly recorded. Moreover, for many stocks, fisheries-independent data are missing or scattered over time and it is difficult to define a reliable series of catch per unit effort to use as an index of abundance.

In consequence, scientific advice in support of the management of most stocks is based on a precautionary approach, in line with the high uncertainty in data and assessment results. In recent years, CECAF has therefore started exploring the use of alternative, more flexible tools, including tools for data-poor fisheries, in order to improve scientific advice and management recommendations.

3. RESOURCE STATUS

This review is based on the results of the most recent assessments of the state of the main fisheries resources undertaken by CECAF working groups. The list of stocks assessed by CECAF was complemented with the results of a regional consultation organized by FAO (Banjul, the Gambia, 16–19 May 2023) which aimed to provide a more comprehensive overview of the status of fisheries resources in Area 34 (**APPENDIX II, TABLE 4**, pp. 424), following the revised methodology adopted for the global stock status overview (**PART B, METHODOLOGY**, pp 6). The updated methodology classifies stocks into tiers based on the availability and quality of information for each stock (Tier 1, Tier 2 or Tier 3). Information on the status of 133 stocks was compiled for Area 34 (**TABLE D.4.1**), representing a total of 63 species.

TABLE D.4.1
SUMMARY OF ASSESSED STOCKS IN AREA 34 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	77	38	7
2 Surplus-production model approaches	56	40	10
Total	**133**	**63**	**11**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

Of the stocks assessed, 77 are classified as Tier 1 (assessed using formal stock assessments through CECAF working groups) and 56 are classified as Tier 2 (stocks for which CECAF working groups could not provide any information and the status of which was inferred through catch data and auxiliary effort data) (**TABLE D.4.2**). No stock from Area 34 currently falls under Tier 3 (stocks for which data is insufficient for Tier 1 or Tier 2 and whose state is categorized using a model-free approach, based on indicators derived from scientific and non-scientific information [e.g. expert consultations, market data or local knowledge]). Overall, landings of Tier 1 and Tier 2 assessed stocks in Area 34 represented 71.6 percent of total landings reported in Area 34 in 2021, an increase from 64.1 percent covered by the previous methodology.

While CECAF uses a specific terminology for stock status classification, for the sake of harmonization across the chapters of this report, the stock status terminology refers to "overfished" (instead of overexploited), "maximally sustainably fished" (instead of fully exploited) and "underfished" (instead of non-fully exploited).

The revised list of stocks and their respective status show that the majority of the stocks analysed in Area 34 were found to be overfished (52.6 percent). The proportion of stocks that are maximally sustainably fished is 30.8 percent, with 16.5 percent underfished.

TABLE D.4.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 34 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	77	15.6	41.6	42.9	57.1	42.9
2 Surplus-production model approaches	56	17.9	16.1	66.1	33.9	66.1
Total	**133**	**16.5**	**30.8**	**52.6**	**47.4**	**52.6**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.4.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 34 IN 2021

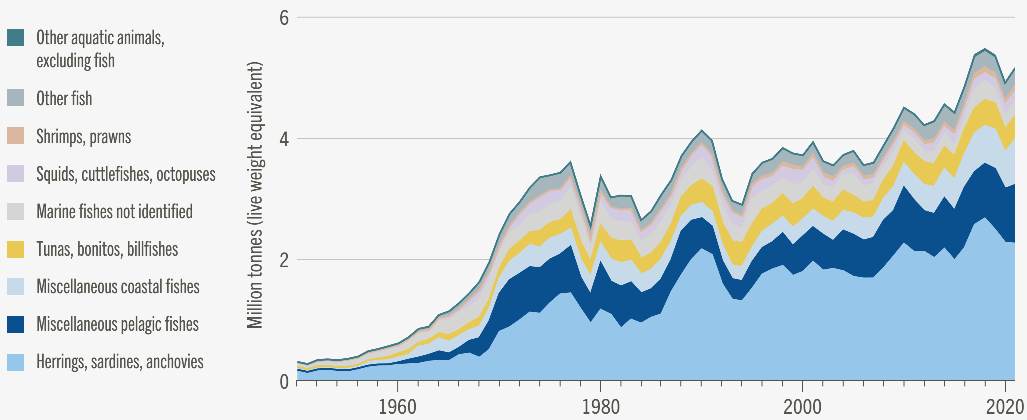
Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
3.37	**35.6**	**29.9**	**34.4**	**65.6**	**34.4**

Mt = Million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

FIGURE D.4.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE EASTERN CENTRAL ATLANTIC (AREA 34) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

The FAO CECAF working groups on demersal resources and on small pelagic fish conduct assessments and report on stock status by subareas – Area 34 North and South[1] – based on what scientific advice for management is provided and which recommendations for future research are formulated. The sections below provide an overview of the stock status for selected key species or species groups by subareas from the 2022 CECAF working groups on stock assessment, and reported in the latest *The State of World Fisheries and Aquaculture* (SOFIA) report (FAO, 2024b).

4.1 Small pelagic fish – Area 34 North

Sardine *(Sardina pilchardus)* is one of the most important small-pelagic fisheries resources in the northern part of Area 34, where three stocks are considered: the northern, the central and the southern stocks. Furthermore, the Canary Islands stock is considered as a separate unit from the West African stocks. The catch from the southern stock represents over 52 percent of the total. As regards the northern and central stocks, more than 99 percent of the fishing is carried out by Moroccan purse seiners, with landings by foreign coastal purse seiners targeting sardines limited to less than 1 percent. The southern stock is exploited by a Moroccan fleet composed of purse seiners, RSW[2]-type pelagic trawlers, and by a foreign fleet composed of pelagic freezer trawlers and RSW-type trawlers. The three sardine stocks (with north and central assessed jointly) and the southern stock were found to be maximally sustainably fished in 2021, with a medium to low level of uncertainty. In Mauritania, sardine is fished by the artisanal fleet, Mauritanian purse seiners and foreign fleets.

Round sardinella *(Sardinella aurita)* and Madeiran sardinella *(Sardinella maderensis)* are often caught together and aggregated under "sardinella" in catch reporting because of species identification issues. However, disaggregated data available indicate that catches of Madeiran sardinella were relatively stable until 2019 and have shown fluctuations since

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[1] Subarea North: From the northern extent of CECAF to the northern border of Guinea-Bissau; subarea South: from the northern border of Guinea-Bissau to the southern extent of CECAF.

[2] Refrigerated sea water.

then. Catches of round sardinella have shown an overall decreasing trend since 2014. Overall, the fishing effort of industrial fleets has decreased, whereas that of artisanal fleets has increased in recent years.

Both round and flat sardinella stocks undergo intense fishing effort and are in a critical state, with very low biomass levels. Management arrangements have been put in place by some countries, but it is too early to see the impacts on the state of the stocks. Scientists have been persistently calling for the design and implementation of drastic management measures, such as a substantial reduction in fishing effort and a prohibition on the use of sardinellas for fish meal, combined with measures to improve the biological productivity of the stock, such as the protection of spawning and recruitment phases of both species (since they are exploited together).

4.2 Cephalopods – Area 34 North

The main cephalopod species landed in this area are common octopus *(Octopus vulgaris),* cuttlefish *(Sepia* spp., mainly common cuttlefish [*Sepia officinalis*], giant African cuttlefish [*Sepia hierredda*], and African cuttlefish [*Sepia bertheloti*]) and European squid *(Loligo vulgaris),* with octopus being the dominant species in the landings.

North of Cape Blanc, the octopus fishery has evolved since the 1960s. Initially led by a Spanish fleet, Moroccan fishing developed alongside the Spanish fleet during the 1970s and 1980s. Nowadays the fleet is exclusively Moroccan, including freezer trawlers (that conduct fishing trips of 45–50 days), coastal fresh fishing trawlers (storing fish under ice for 5–6 days during the fishing trips), and small-scale artisanal boats (operating on a day-trip basis). The artisanal fishery uses mainly passive gears (pots and jigs). The stock sustaining the fishery in this area is referred to as the Dakhla octopus stock, and it is considered maximally sustainably fished by CECAF.

In Mauritania, octopus fishing was historically carried out by both foreign and local units. Since 2012, it has been reserved for national segments, with a management strategy updated in 2016 focusing on quotas and concessions. The artisanal fishery consists mainly of small boats (<14.5 m length overall and <150 hp engines) fishing with pots. In Senegal and the Gambia, cephalopods are targeted by both industrial and artisanal multi-species fisheries. The industrial fleet includes national trawlers, while the artisanal fleet (Senegal) uses jiggers, traps and trammel nets, mainly for octopus and cuttlefish. While some of the octopus stocks in the Area are overfished, cuttlefish was found to be underfished in 2021.

4.3 Hake – Area 34 North

In this Area, hake comprises mainly two groups of species: black hakes (Senegalese hake [*Merluccius senegalensis*] and Benguela hake [(*Merluccius polli*]) and white hake (also known as European hake, *Merluccius merluccius*). European hake, a temperate species, is generally abundant in the north of the CECAF zone, but is not normally observed south of Cap Boujador. South of Cap Blanc, hake catches can be attributed almost exclusively to black hakes, mostly Senegalese hake and Benguela hake.

Overall, in Area 34 North, hakes are caught by industrial vessels (trawlers and longliners) from coastal and foreign fleets in offshore waters. The Moroccan fleet exploiting white hake is made up of coastal trawlers, longliners, cephalopod freezer boats and artisanal boats. About 10 percent of the artisanal fleet (15 000 boats) fish for white hake, using longlines, bottom gillnets and handlines. White hake is exclusively exploited by the coastal fleet operating in the north of the country, whereas black hake is exploited by all the units, usually together with other species (e.g. cephalopods). In Mauritania, black hake is targeted by several foreign fleets. In addition, these species constitute a non-negligible part of bycatch, mainly for pelagic and demersal trawlers, as well as for cephalopod fishers, shrimp trawlers, and other fleets (black hake bycatch can reach up to 50 percent of the catches). In Senegal, the fleets exploiting black hake comprise a very limited number of foreign “glacier” trawlers (vessels preserving their catch in ice), mainly from Spain. In recent years, three or four Senegalese fishing vessels (freezers and “glaciers”) have started fishing for black hake. In the Gambia, only three foreign freezer trawlers are currently authorized to exploit black hake, but they are not active throughout the year. Some of the hake stocks in Area 34 are considered overfished.

4.4 Shrimps – Area 34 North

The exploitation of crustaceans along the western coast of Africa, from Morocco to southern Senegal, involves both coastal and deep-water shrimp species. Key species include the southern pink shrimp *(Penaeus notialis),* the deep-water rose shrimp *(Parapenaeus longirostris),* and the striped red shrimp *(Aristeus varidens).* Other species like a few Caramote prawn *(Penaeus kerathurus),* the blue and red shrimp *(Aristeus antennatus),* and Plesionika shrimps *(Plesionika* spp.) are also caught but are less abundant.

In Morocco, shrimp species like deep-water rose shrimp and blue and red shrimp are targeted by various trawlers, including coastal and deep-sea freezer trawlers. The shrimp fishery operates mainly along the continental shelf, on the slope and in deep waters. The foreign shrimp fisheries in Morocco ceased in 1999 with the expiration of the fishery agreement with the European Union, and new agreements after 2006 excluded shrimp fishing. Thus, the shrimp fishery in Morocco is currently operated by the national fleet.

Mauritania's shrimp fishery, involving both national and foreign fleets, saw fluctuating fleet sizes from 2012 to 2022 due to the terms of regulating agreements, especially with the European Union. Foreign fleets decreased after 2012, with a slight increase in 2022. By 2015, Mauritania's national fleet had dwindled to just one or two vessels, and after 2022 no domestic fishery has been registered as a result of low yields.

Senegal's shrimp fishery began with foreign vessels adopting Senegalese nationality in 1982. By 2013, the Senegalese fleet, consisting mainly of deep-sea trawlers, dominated shrimp fishing. The industrial fleet targeting southern pink shrimp in Senegal decreased significantly between 2008 and 2023. The artisanal fleet also targets shrimp species, mainly southern pink shrimp.

In the Gambia, both artisanal and industrial fisheries target southern pink shrimp. The artisanal fishery typically operates with canoes and various gears, particularly in estuarine and brackish waters, while industrial fleets operate larger vessels. Mainly foreign industrial vessels have a licence to fish shrimps in Gambian waters, often offloading their catches in foreign ports. A two-year fishing ban from 2015–2016 led to a decline in industrial vessels, though numbers rose again post-ban until 2021 before declining.

Finally, the giant tiger prawn *(Penaeus monodon),* which is an introduced species in the Area, has been increasingly observed in landings from the Senegal-Gambia region. More data is needed to understand its distribution and abundance.

Countries in the region have invested efforts in regulating the ocean shrimp fishery by putting in place management regulations covering mesh sizes, gears, bycatch rates and zoning over time and space (closed season and/or closed areas). The state of stocks varies based on species and areas. While one stock of deep-water rose shrimp was found to be overfished, others were underfished in the area, with an overall high level of certainty. Assessments for southern pink shrimp were available only in Senegal and the Gambia, where the stock is maximally sustainably fished, while striped red shrimp is underfished in Mauritania.

4.5 Small pelagic fish – Area 34 South

Catches in Area 34 South are primarily dominated by round and flat sardinellas. These species are found year-round, with catch peaks coinciding with peak upwelling periods. The CECAF working group for the assessment of small pelagic fish, sub-group South, has adopted four distinct sardinella species in **Area 34 South**: northern, western, central and southern zones, with different species predominant in each.

In the northern zone (Guinea-Bissau, Guinea, Sierra Leone, Liberia), round sardinella is primarily caught by industrial pelagic trawlers and as bycatch by demersal trawlers. Flat sardinella is mostly fished by artisanal canoes using various nets, including gillnets and beach seines. **In the western zone** (Ghana, Côte d'Ivoire, Togo, Benin), round sardinella dominates the catches, with flat sardinella being more common off the coast of Benin.

Both species are mainly fished by the artisanal fleets in Ghana, Togo and Benin and, to a lesser extent, by the semi-industrial (inshore) fleet and the industrial fish trawlers in Ghana and Côte d'Ivoire. **In the central zone** (Nigeria, Cameroon, Equatorial Guinea), round sardinella is the dominant species in Nigeria, while flat sardinella is more abundant in Cameroon. Artisanal fishers use drift gillnets and beach seines, with canoes of varying sizes equipped with outboard motors. **In the southern zone** (Gabon, Republic of Congo, Democratic Republic of the Congo, Angola), artisanal fleets target sardinella species, while industrial fleets also contribute significantly to the catch. In Gabon and the Republic of Congo, flat sardinella is the dominant species, whereas round sardinella is more abundant during specific months. In Angola, flat sardinella is mainly found inshore, with round sardinella offshore. The industrial pelagic trawling in Angola ceased in 2004, but the species is still caught using purse seines and artisanal gear. Most of the 12 sardinella stocks are overfished throughout the southern area, while three are maximally sustainably fished: the northern stock of round sardinella, and the central and southern stocks of flat sardinella.

Bonga *(Ethmalosa fimbriata),* an important species in coastal waters, estuaries and rivers, is mainly fished by artisanal fisheries in Guinea, Sierra Leone, Nigeria, Cameroon and Gabon. As for sardinella, the species is also divided into four stocks: northern, western, central and southern. **In the northern zone**, bonga is primarily caught using ring gillnets, purse seines and beach seines, with canoes ranging 6–18 m and powered by outboard motors. **In the western zone**, similar gears are used, and bonga constitutes a smaller portion of the total landings. **In the central zone**, bonga is also caught using a variety of nets, while in the **southern zone** it is targeted with surface drift gillnets and purse seines. The western and central stocks are overfished; the northern and southern ones are maximally sustainably fished.

European anchovy *(Engraulis encrasicolus),* found throughout Area 34 South, is a key species in upwelling areas, particularly in shallow coastal waters and estuaries. The CECAF working group has identified three anchovy stocks: northern, western and southern. Anchovy is caught in large quantities with beach seines and purse seines in Benin, Ghana and Togo, where it is a significant fishery product, sold separately from other pelagic species, as it is part of a traditional diet. In other countries like Cameroon, Gabon and Nigeria, the species is a bycatch, making data collection and monitoring challenging. In Guinea, anchovy is a bycatch with no commercial value, and it is often discarded. The northern and the southern European anchovy stocks were found to be maximally sustainably fished, whereas the western stock is overfished, with a high level of uncertainty.

4.6 Shrimps – Area 34 South

The shrimp fisheries have a high economic value in Area 34 South. They include coastal and offshore species, and are exploited by artisanal or industrial fleets depending on the main species' areas of distribution. Fishing grounds in national waters are exploited both by national and foreign fleets.

In Guinea-Bissau, industrial trawlers exploit coastal (mainly southern pink shrimp) and deep-sea (deep-water rose shrimp, striped red shrimp) species, targeted by Spanish shrimpers or caught as bycatch by Spanish and Chinese demersal trawlers targeting fish or cephalopods. Coastal shrimps are also captured as bycatch by other trawlers and artisanal canoes, but these fisheries are poorly documented. In Sierra Leone, the industrial sector accounts for over 75 percent of shrimp production, with the dominant species being southern pink shrimp, followed by Caramote prawn and deep-water rose shrimp. The shrimp fishery, mainly operated by industrial foreign vessels predominantly from China, has had fewer than 15 vessels in recent years, and the number of licences is gradually decreasing. In Liberia, shrimp fishing targeting mainly southern pink shrimp, Guinea shrimp *(Holthuispenaeopsis atlantica),* Caramote prawn and deep-water rose shrimp was a significant industry until the civil war in the 1990s. Fishing effort targeting shrimp in recent years has been low to non-existent, and little data is available on the shrimp bycatch of other fleets. In Ghana, since the closure of the industrial fishery, only the artisanal fleet continues to catch coastal shrimps (mainly Guinea shrimp) with artisanal purse seines, set nets and beach seines. In Benin, an artisanal fleet of pirogues and an industrial fleet (fish and shrimp trawlers) catch several species of shrimps. The industrial fleet is authorized to fish beyond 5 nautical miles. Both fleets operate under a licensing system and catch deep-water rose shrimp, Caramote prawn, giant tiger prawn, Guinea shrimp and southern pink shrimp, the bulk of which are for the export market.

In Nigeria, similarly to other countries, the composition of shrimp catches is dominated by southern pink shrimp, Caramote prawn, giant tiger prawn, Guinea shrimp and deep-water rose shrimp, exploited by an artisanal fishery within 5 nautical miles of the coast and an industrial trawling fishery (shrimp and fish trawlers) beyond 5 nautical miles. There were more than 200 industrial vessels until the 2010s; the number of vessels had decreased to 150 by 2016. The industrial shrimp fishery accounts for more than 80 percent of the total landings of all shrimp species.

In Cameroon, shrimps are also caught by artisanal and industrial fleets, including foreign vessels operating within 20 nautical miles. In Equatorial Guinea, species caught are southern pink shrimp, Caramote prawn, giant tiger prawn and Guinea shrimp; as of 2021, when licences to the Chinese industrial fleet were suspended, shrimp species have been a bycatch of semi-industrial vessels and artisanal canoes. In Gabon, since the entry into force of the 2013 management plan, only coastal shrimps (southern pink shrimp, Caramote prawn and Guinea shrimp) are exploited. Recent exploratory fishing of deep-sea crustaceans was carried out by Spanish trawlers under the fishing agreement between Gabon and the European Union. In the Congo, deep-water rose shrimp is targeted by six or fewer Spanish industrial shrimp trawlers, whereas coastal species – southern pink shrimp and Guinea shrimp – are caught as bycatch by industrial fish trawlers. In the Democratic Republic of the Congo, an artisanal fishery using gill nets and traps is known to exert heavy pressure on shrimp species.

Countries with active shrimp fisheries also include Angola, where the deep-sea shrimp fishery (catching deep-water rose shrimp and striped red shrimp) is one of the most important; it is operated by national trawlers and foreign fleets, including Spanish vessels. A coastal fishery is also active, operated by semi-industrial vessels targeting southern pink shrimp.

Assessments are only available for a few stocks: coastal shrimps (several Penaeid species mixed), southern pink shrimp, deep-water rose shrimp and striped red shrimp. The state of shrimp resources in Area 34 South is highly variable from one area and species to another: southern pink shrimp is underfished in Guinea-Bissau and Gabon and maximally sustainably fished in the Congo, and it is estimated to be overfished in other areas (albeit with high uncertainty). An overall review of all individual assessments of coastal shrimps indicates that stocks are overfished. Deep-water rose shrimp was also estimated to be overfished throughout the south of Area 34, except the Guinea–Guinea-Bissau stock, which was assessed to be maximally sustainably fished. The stock of striped red shrimp is assessed as maximally sustainably fished.

4.7 Cephalopods – Area 34 South

In Area 34 South, the bulk of cephalopod landings are comprised of common octopus and cuttlefish (mainly the giant African cuttlefish).

In Guinea-Bissau, cephalopods are fished by industrial fleets from foreign countries. The fishing effort has fluctuated over time (> 100 units since 2014) based on local conditions and the establishment of international agreements. Foreign fleets are composed mainly of "freezer" demersal trawlers. Domestic artisanal fisheries also exploit cephalopod stocks, with cuttlefish dominating the catch until 2007 although it has been overtaken by octopus. In Guinea, cephalopods, mostly cuttlefish, are targeted by industrial and artisanal fisheries. Industrial foreign fleets began operating in the 1980s, but in 2002 most of them left the fishery, moving to Guinea-Bissau. The cuttlefish stock appears to be overfished in Guinea-Bissau and underfished in Guinea.

In Ghana, the cephalopod catch is dominated by cuttlefish, with giant African cuttlefish constituting over 90 percent of the total cephalopod catch. This resource is exclusively targeted by national industrial "freezer" trawlers that run 30-day fishing trips. Assessments of cuttlefish species in the Area indicate that the stock is overfished

5. KEY FINDINGS

Previous assessments and studies carried out under CECAF have consistently called for improved management of fisheries resources in Area 34. This updated information on the state of stocks puts additional emphasis on the urgency to act. The results under the updated and previous methodology indicate a similar proportion of sustainable and unsustainable stocks (**TABLE D.4.4**). Despite the very slight change in percentage, the majority of stocks continue to be considered overfished, with the situation severe for both demersal and pelagic species. When weighted by production levels, biologically sustainable stocks account for 65.6 percent of the 2021 landings of assessed stocks monitored by FAO (**TABLE D.4.5**), significantly higher than estimated with previous assessments. Moreover the coverage of the assessment increased from 64.1 percent with the previous methodology to 71.6 percent with the current one in 2021.

TABLE D.4.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 34 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
133	16.5	30.8	52.6	47.4	52.6	39	10.3	38.5	51.3	48.7	51.3

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE D.4.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND CUPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 34 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
35.6	29.9	34.4	65.6	34.4	0.0	36.8	63.2	36.8	63.2

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

Initiatives aimed at addressing the growing concern over the state of the resources in the region have been undertaken, but stock assessment results clearly indicate that measures need to be strengthened and scaled up. For example, in terms of recent initiatives, Ghana, Côte d'Ivoire and Benin invested substantial coordination efforts to plan a common closed fishing season to address overfishing. In addition, countries like Mauritania have developed and are implementing management plans for small pelagics, including sardinella, which is a key small pelagic species that has been at the core of heated debates related to fishmeal. Subsequently, with the support of the EAF-Nansen Programme,[3] Senegal and the Gambia have also developed national fisheries management plans for sardinella, and a similar effort has been initiated in Guinea-Bissau. These national efforts are backed by the sub-regional "shared sardinella" initiative which aims to ensure consistent management practices across the sub-region, given the shared nature of the stock.

While management advice has been provided over the years by CECAF, the uptake of the advice by countries and the design and implementation of conservation and management measures has been lagging. This was the rationale for developing a series of studies to understand the bottlenecks that hinder the effective uptake of advice in fisheries management. An in-depth analysis of the gaps between theoretical recommendations and their actual uptake by national fisheries management bodies identified a number of barriers, among which were limited technical capacity, inadequate resources, and a lack of coordinated efforts between countries.

While CECAF has an advisory role, offering recommendations to its member states on fisheries management, countries have expressed a desire for CECAF to strengthen its role by providing more detailed, actionable and country-specific recommendations that can be more easily implemented at the national level. In particular, countries have called for clearer guidelines on managing fisheries that take into account local conditions, capacities and priorities.

To address these concerns, technical support is needed to provide more tailored management frameworks, fostering stronger scientific collaboration, and facilitating capacity-development programmes. Strengthening regional monitoring and enforcement systems is also essential to ensure that regulations are upheld.

Furthermore, increased scientific and policy dialogue among member states can enhance and strengthen shared responsibility and collective action in managing the exploitation of marine resources. With a coordinated approach and stronger national capacities, the CECAF region can work towards achieving long-term sustainability in its fisheries sector. Given the complexity of the region and the shared nature of fisheries resources, there is a need to strengthen management practices at the sub-regional level, and to leverage existing frameworks such as the Fisheries Commission for the West Central Gulf of Guinea (FCWC), the Sub-regional Fisheries Commission (SRFC) and the Gulf of Guinea Regional Fisheries Commission (COREP).

In conclusion, the future of fisheries management in the CECAF area lies in overcoming the barriers to the effective implementation of regulations and recommendations. By continuing to monitor the state of stocks in a regular manner and by providing more targeted, detailed guidance, CECAF can assist member states in cooperating in managing their fisheries in a more sustainable and cooperative manner, ensuring that the ecological, cultural and economic benefits of fisheries are preserved for future generations.

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[3] In collaboration with 32 countries across Africa and the Bay of Bengal, the EAF-Nansen Programme is committed to improving fisheries management in line with the ecosystem approach to fisheries (EAF), strengthening the capacities of fisheries institutions and generating scientific knowledge on marine resources and ecosystems. The Programme is executed by FAO in close collaboration with the Norwegian Institute of Marine Research, funded by the Norwegian Agency for Development Cooperation.

FAO MAJOR FISHING AREA 34

ATLANTIC, EASTERN CENTRAL

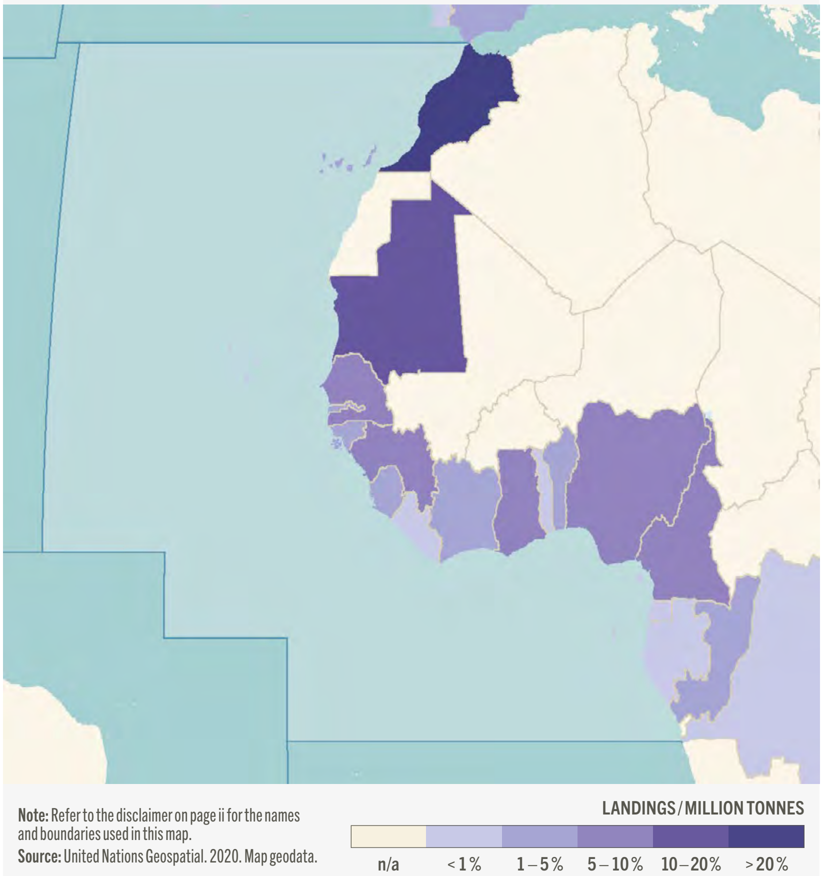
AREA 34

KEY MESSAGES

- Illegal fishing and overfishing increase pressures on local resources.
- Climate change is a particular threat to tropical fisheries, especially for SSF, due too changes in distribution and abundance.
- Essential fish habitats are threatened by anthropogenic impacts.
- Key to resilience are continued improvements in monitoring, enforcement of regulations, and integrated coastal management.

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

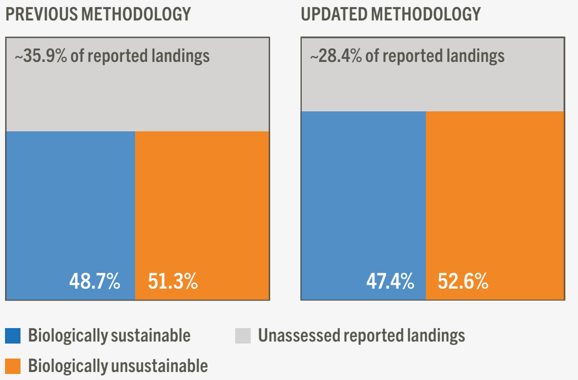
FAO data, 1950–2021



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

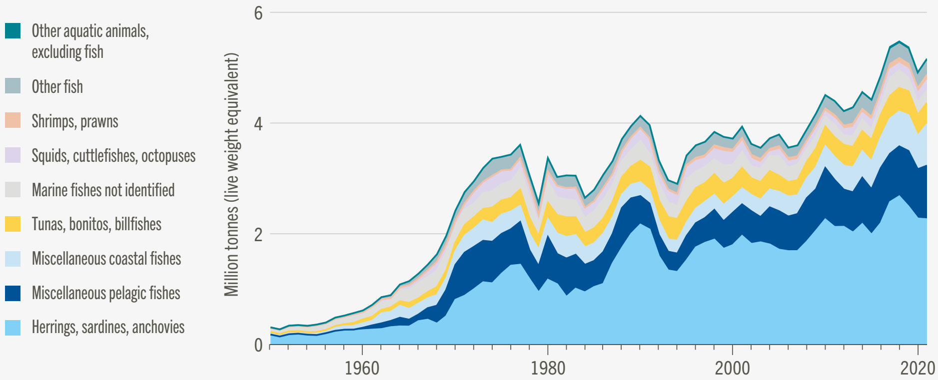
STOCK STATUS

FAO estimates, 2021



SPECIES COMPOSITION

FAO data, 1950–2021

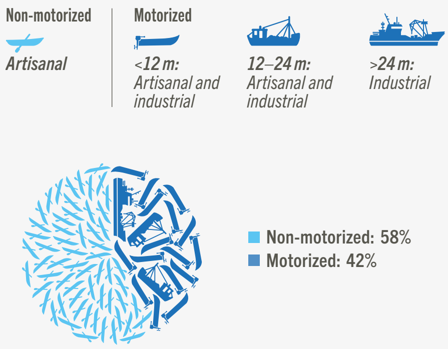


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

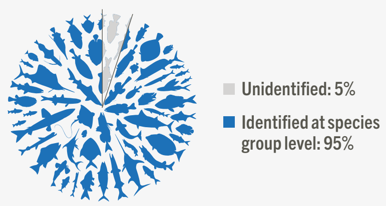
Active vessels ~ 404 000



LANDINGS

FAO data , 2021

Reported landings ~ 5.2 million tonnes



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 6.9 billion

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 923 000

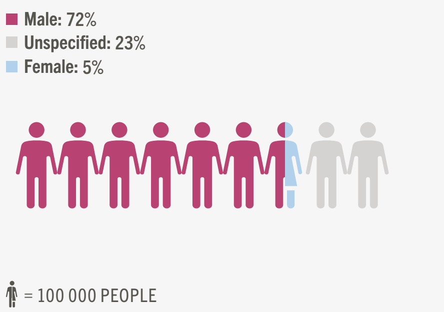


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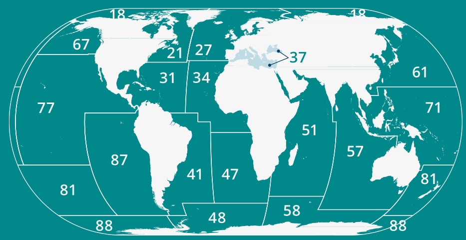
FIGURE D.4.3 *(previous page)*
AREA 34 – DATA AT A GLANCE

Illustration © Jana Kleineberg



MEDITERRANEAN AND BLACK SEA

FAO MAJOR FISHING AREA 37

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Secretariat of the General Fisheries Commission of the Mediterranean (GFCM-FAO)

1. OVERVIEW

The Mediterranean and the Black Sea, designated by FAO as Major Fishing Area 37 (hereafter, Area 37) (**FIGURE D.5.1**), cover an area of approximately 3 million km^2, accounting for 0.8 percent of the global marine surface. They are situated within a relatively narrow latitudinal range (30° to 46° north) in the temperate zone of the Northern Hemisphere. The average depth is 1 500 m, with the deepest point recorded in the Ionian Sea at about 5 200 m; the Black Sea reaches a maximum depth of approximately 2 200 m. The continental shelf of Area 37 is mostly narrow (23 percent of the total area), with notable exceptions in the Adriatic Sea, Gulf of Gabès, Strait of Sicily, Gulf of Lions, the Nile Delta and the northwestern portion of the Black Sea.

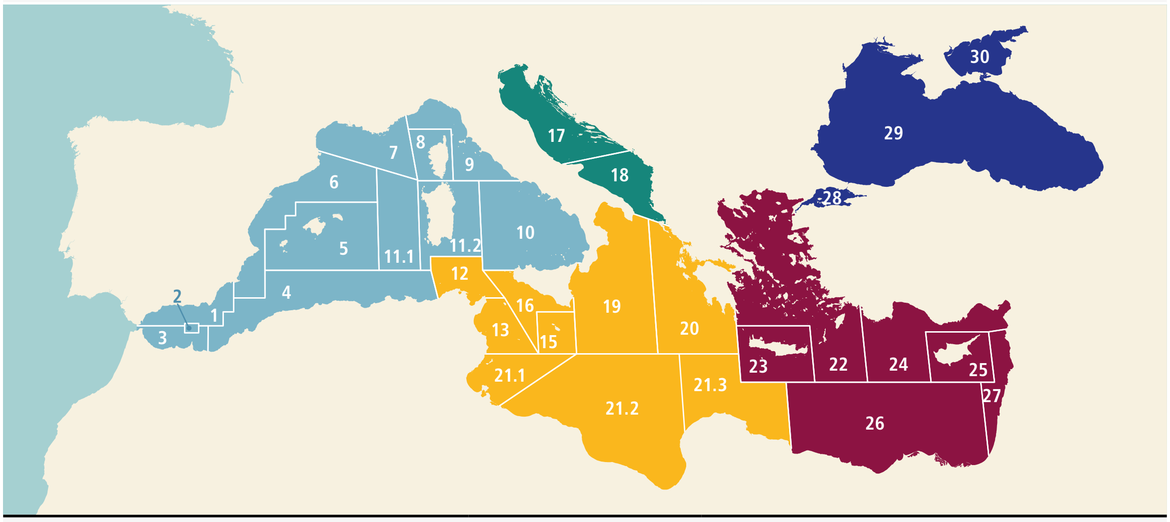
FIGURE D.5.1
FAO MAJOR FISHING AREA 37: THE MEDITERRANEAN AND THE BLACK SEA

Notes: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

The productivity and ecological health of the Mediterranean and the Black Sea are affected by a combination of regional and global factors, including their semi-enclosed nature, the region's status as a climate change hotspot, which facilitates the appearance and expansion of non-indigenous species, as well as relatively high levels of chemical and plastic pollution, and the existence of unsustainable fishing practices such as illegal, unreported and unregulated (IUU) fishing and overfishing. Adding to these challenges, the Mediterranean in particular has seen an exponential increase in competition for space at sea, including for maritime transport and renewable offshore energy. This trend poses additional threats to fisheries- and aquaculture-related livelihoods, and adds pressure on the marine environment.

The General Fisheries Commission for the Mediterranean (GFCM) is a regional fisheries management organization (RFMO) established in 1949 under the Food and

FIGURE D.5.2
AREA 37 ORGANIZED INTO THE GFCM SUBREGIONS AND GEOGRAPHICAL SUBAREAS (GSA)



GFCM subregions

Western Mediterranean | Central Mediterranean | Adriatic Sea | Eastern Mediterranean | Black Sea

01. Northern Alboran Sea	07. Gulf of Lion	13. Gulf of Hammamet	19. Western Ionian Sea	25. Cyprus
02. Alboran Island	08. Corsica	14. Gulf of Gabès	20. Eastern Ionian Sea	26. Southern Levant Sea
03. Southern Alboran Sea	09. Ligurian Sea and northern Tyrrhenian Sea	15. Malta	21. Southern Ionian Sea	27. Eastern Levant Sea
04. Algeria	10. Southern and central Tyrrhenian Sea	16. Southern Sicily	22. Aegean Sea	28. Marmara Sea
05. Balearic Islands	11.1 Western Sardinia 11.2 Eastern Sardinia	17. Northern Adriatic Sea	23. Crete	29. Black Sea
06. Southern Spain	12. Northern Tunisia	18. Southern Adriatic Sea	24. Northern Levant Sea	30. Azov Sea

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: Adapted from **FAO.** 2023. *The State of Mediterranean and Black Sea Fisheries 2023 – Special edition.* General Fisheries Commission for the Mediterranean. Rome. https://doi.org/10.4060/cc8888en

Agriculture Organization of the United Nations (FAO). It is rather unique in the fact that it is responsible for the conservation and sustainable use of all fishery resources in the Mediterranean and the Black Seas, with the exception of large migratory species (tunas, bonitos, billfishes and sharks), whose management is addressed through International Commission for the Conservation of Atlantic Tunas (ICCAT), and has the authority to adopt binding recommendations for fisheries conservation and management and for aquaculture development. For management purposes, its area of application is divided into five subregions: the western, central and eastern Mediterranean, the Adriatic Sea and the Black Sea which are further divided into 30 geographical subareas (GSAs) (**FIGURE D.5.2**).

The GFCM provides a comprehensive and up-to-date review of the status and trends of fisheries in the GFCM area of application through its biennial flagship publication, The State of Mediterranean and Black Sea Fisheries (SoMFi). SoMFi is based on data regularly submitted by GFCM member countries and on the most recent information produced by the GFCM's scientific bodies, providing an important tool to support strategic decision-making and monitor progress towards the main goals and objectives set by the GFCM. This chapter is based on the data analysed and published in SoMFi 2023, based on the reference year 2021 (FAO, 2023), together with additional stock status information that were sourced from the Sustainable Development Goal (SDG) 14.4.1 questionnaires.

2. FISHERY PROFILES

2.1 Overview

The Mediterranean and the Black Sea have supported significant fisheries activities since ancient times. At present, the fisheries sector in the region encompasses industrial, semi-industrial and small-scale operations employing a wide variety of fishing gear. A characteristic feature of fisheries in Area 37 is the exploitation of highly diverse assemblages of fishes, crustaceans and molluscs, which are often potentially associated with complex stock structuring. Notable exceptions include small pelagic fisheries, which are prominent in both basins. Furthermore, the geographic setting of these semi-enclosed seas results in many stocks being shared among fleets from multiple riparian countries.

These attributes pose important emergent challenges for the assessment and management of fisheries in the Mediterranean and the Black Sea. The disproportionately high number of stocks requires robust data collection and additional scientific capacity, alongside strong regional cooperation. Effective management in the region relies on the implementation of a combination of diverse measures at the regional level, aligned with an adaptive approach to multispecies management.

Fisheries landings in the Mediterranean and the Black Sea have exhibited fluctuating trends since 1950. Between 1971 and 1988, total capture fisheries production in the region gradually increased from 1 million tonnes to nearly 2 million tonnes (**FIGURES D.5.4A** and **D.5.4.B**). During the 1980s, total landings remained relatively stable at their peak before experiencing a decline between 1989 and 1991, primarily due to the collapse of pelagic fisheries in the Black Sea.

In 2021, the fisheries sector in the Mediterranean and the Black Sea recorded a total production of over 1 million tonnes, generating approximately USD 7.8 billion in revenues and providing employment for more than 457 500 individuals across the entire value chain (FAO, 2023). In recent years, revenues from capture fisheries have shown a modest increase of 1.3 percent since 2020, while employment has slightly decreased by 5.7 percent, with the fishing fleet remaining relatively stable.

In the Mediterranean Sea, landings continued to increase until 1994, reaching approximately 1 million tonnes, after which they decreased to 750 000 tonnes by 2015. The next three years saw a rise in production, which reached 800 000 tonnes in 2018, but then dropped sharply to about 670 000 tonnes in 2021. In the Black Sea, landings have fluctuated considerably year to year since 1990. Between 1992 and 1995 there was a generally increasing trend, followed by a decline from 1996 to 1998, with continued fluctuations until 2021 when reported landings amounted to around 400 000 tonnes. The decline in landings observed in 2020 and 2021 was likely further exacerbated by COVID-19 restrictions, which not only imposed temporary closures on fishing activities but also resulted in a near-total shutdown of tourism, negatively impacting trade and reducing demand (GFCM, 2020).

2.2 Fishing capacity

According to the GFCM (FAO, 2023), the capacity of operating fishing vessels in the Mediterranean and the Black Sea is about 867 400 gross tonnage and 5.407 million kilowatts (kW). Small-scale vessels account for around 82 percent of the fishing fleet, with 68 100 fishing vessels, followed by trawlers and beam trawlers (around 6 700 vessels, 8 percent), purse seiners and pelagic trawlers (almost 4 300 vessels, 5 percent), and what are classified as "other fleet segments" (almost 4 000 vessels, 5 percent). The prevalence of small-scale vessels is higher in the Black Sea (9 200 vessels, 85 percent of the fleet) than across the whole GFCM area of application.

In the Mediterranean Sea, small-scale vessels lead the fleet composition in all four subregions, especially in the central and eastern Mediterranean, where they represent 85 percent of the operating fleet, at 19 600 and 18 800 vessels respectively. Trawlers and beam trawlers range from 5 percent in the central Mediterranean (1 270 vessels) to 13 percent in the Adriatic Sea (1 338 vessels). The least-represented vessel group in Mediterranean subregions (excluding the aggregated group "other fleet segments") is purse seiners and pelagic trawlers, which shows a relative peak in the western Mediterranean (12 percent, 1 960 vessels) and contributes particularly low percentages in the central Mediterranean (3 percent, 680 vessels) and the Adriatic Sea (3 percent, 290 vessels).

Purse seiners and pelagic trawlers are responsible for the largest share of total landings (58.9 percent) in the GFCM area of application, accounting for 47.7 percent of landings in the Mediterranean Sea (ranging from 37.2 percent in the central Mediterranean to 58.8 percent in the Adriatic Sea) and 80.1 percent in the Black Sea. Trawlers and beam trawlers make the second-largest contribution to total landings (18.1 percent) and have a greater relative importance (23.5 percent) in the Mediterranean (where the western Mediterranean shows the highest peak, at 26.1 percent) than in the Black Sea (7.9 percent). Small-scale vessels are better represented in Mediterranean landings (19.9 percent of the total, reaching 33.9 percent in the central Mediterranean) than in the Black Sea (4.9 percent). Finally, the miscellaneous group "other fleet segments" accounts for 8.3 percent of the total landings, with a slightly higher share of landings in the Mediterranean (8.9 percent in total, peaking in the Adriatic Sea at 14.1 percent) than in the Black Sea (7.1 percent).

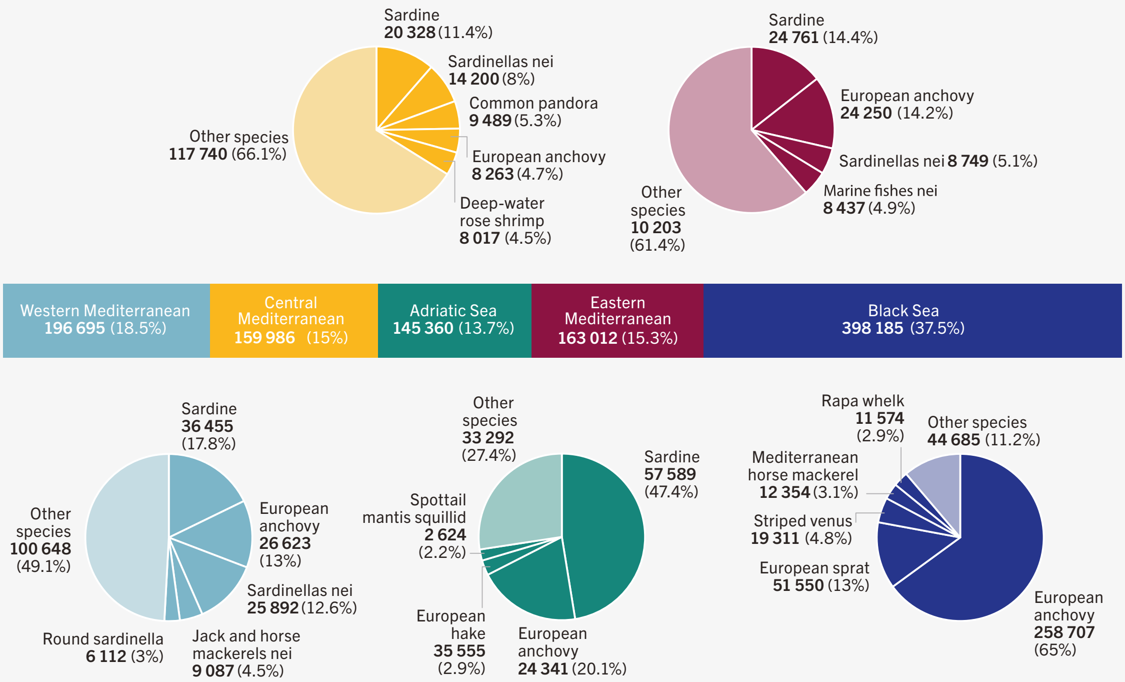
2.3 Landings and species

Landings in the GFCM area of application are largely dominated by small pelagic fish, mainly European anchovy *(Engraulis encrasicolus,* 343 000 tonnes) and sardine (also known as European pilchard, *Sardina pilchardus*) 141 400 tonnes). European anchovy and sardine are predominant in the Adriatic Sea (contributing 20.1 percent and 47.4 percent of total landings, respectively), the western Mediterranean (13 percent and 17.8 percent, respectively) and the eastern Mediterranean (14.2 percent and 14.4 percent, respectively). Sardinella (*Sardinella* spp.) is important in the western (15.6 percent) and the eastern Mediterranean (5 percent), whereas in the Black Sea European anchovy (65 percent) and European sprat *(Sprattus sprattus,* 13 percent) dominate in terms of landings (**FIGURE D.5.3**).

Several demersal species have followed an overall increasing trend in landings: deep-water rose shrimp *(Parapenaeus longirostris),* common cuttlefish *(Sepia officinalis),* red mullet *(Mullus barbatus)* and surmullet *(Mullus surmuletus),* and rapa whelk *(Rapana venosa)* in the Black Sea (FAO, 2023). In contrast, the landings of several other demersal species have decreased in recent years, including European hake *(Merluccius merluccius)* across the Mediterranean and whiting *(Merlangius merlangus)* in the Black Sea.

The overall diversity of species, represented by the lowest number of species that can be summed together to account for 90 percent of the total catch, is much lower in the Black Sea (five species) than in the Mediterranean Sea (55 species, ranging from 15 in the

FIGURE D.5.3
AVERAGE ANNUAL LANDINGS BY GFCM SUBREGION AND MAIN LANDED SPECIES (2020–2021)



Notes: (1) Landings are expressed in tonnes. (2) Percentages indicate relative contributions of GFCM subregions to total landings in the GFCM area of application and of main landed species to total landings in their respective GFCM subregions, 2020–2021 averages.

Source: Adapted from **FAO.** 2023. *The State of Mediterranean and Black Sea Fisheries 2023 – Special edition.* General Fisheries Commission for the Mediterranean. Rome. **https://doi.org/10.4060/cc8888en**

Adriatic Sea to 44 in the western Mediterranean). Landings of all the main pelagic species show wide fluctuations, particularly European anchovy, but also sardine, European sprat and round sardinella *(Sardinella aurita)*.

2.4 Fisheries management

The specific characteristics described in previous sections, together with the large number of stocks, make Mediterranean and Black Sea fisheries challenging to assess and manage, requiring good data and scientific capacity, coupled with strong regional cooperation, to effectively identify and implement combinations of different types of measures at regional level, in a move towards adaptive management.

Within the GFCM, stock assessments are performed and evaluated through the Scientific Advisory Committee for Fisheries (SAC) and its Working Groups for Stock Assessment (WGSAs) in the Mediterranean, and the Working Group on the Black Sea (WGBS) and its Subregional Group on Assessment for the Black Sea (SGSABS) in the Black Sea. The number of non-deprecated validated assessments (i.e. assessments from previous years that are still considered to be valid) has increased progressively in recent years, reaching a total of 114 in the reference year 2021, covering 28 out of the 30 GSAs in the Mediterranean and the Black Sea. This reflects a continued improvement in the spatial and temporal coverage of the stocks for which scientific advice is provided, which goes hand-in-hand with the increased quantity and quality of input data.

The 42nd session of the GFCM in 2019 (FAO, 2019) endorsed an externally-reviewed process for benchmarking stock assessments, providing a framework to ensure the quality of the advice produced while also building capacity.

TABLE D.5.1
LIST OF PRIORITY SPECIES AS APPROVED BY THE 42ND SESSION OF THE GFCM

	Western Mediterranean	Central Mediterranean	Adriatic Sea	Eastern Mediterranean	Black Sea
Pelagic species	European anchovy *Engraulis encrasicolus*	European anchovy *Engraulis encrasicolus*	European anchovy *Engraulis encrasicolus*	European anchovy *Engraulis encrasicolus*	European anchovy *Engraulis encrasicolus*
	European pilchard (Sardine) *Sardina pilchardus*	European pilchard (Sardine) *Sardina pilchardus*	European pilchard (Sardine) *Sardina pilchardus*	Round sardinella *Sardinella aurita*	Horse mackerel *Trachurus mediterraneus*
				European pilchard (Sardine) *Sardina pilchardus*	European sprat *Sprattus sprattus*
Demersal species	Deep-water rose shrimp *Parapenaeus longirostris*	Deep-water rose shrimp *Parapenaeus longirostris*	Red mullet *Mullus barbatus*	Red mullet *Mullus barbatus*	Whiting *Merlangius merlangus*
	European hake *Merluccius merluccius*	European hake *Merluccius merluccius*	European hake *Merluccius merluccius*	Lizardfish *Saurida lessepsianus*	Turbot *Scophthalmus maximus*
	Blackspot seabream *Pagellus bogaraveo*	Blue and red shrimp *Aristeus antennatus*	Norway lobster *Nephrops norvegicus*	European hake *Merluccius merluccius*	Red mullet *Mullus barbatus*
		Giant red shrimp *Aristaeomorpha foliacea*	Deep-water rose shrimp *Parapenaeus longi-rostris* (GSA 18)	Blue and red shrimp *Aristeus antennatus*	Rapa whelk *Rapana venosa*
		Red mullet *Mullus barbatus*	Common sole *Solea solea* (GSA 17)	Giant red shrimp *Aristaeomorpha foliacea*	
			Common cuttlefish *Sepia officinalis*		
			Spottail mantis squillid *Squilla mantis*		
Species of regional importance	Common dolphinfish *Coryphaena hippurus*				
Species of conservation concern	European eel *Anguilla anguilla*				Piked dogfish *Squalus acanthias*
	Red coral *Corallium rubrum*				
Non-indigenous species	Devil firefish *Pterois miles*				
	Silver-cheeked toadfish *Lagocephalus sceleratus*				

Source: FAO. 2019. *Report of the forty-second session of the General Fisheries Commission for the Mediterranean (GFCM), FAO headquarters, Rome, Italy, 22–26 October 2018.* GFCM Report No. 42. Rome. https://openknowledge.fao.org/server/api/core/bitstreams/edd16e17-cca7-4193-960cb64e2efc91c5/content

Concurrently, the regulation of fisheries in Area 37 has advanced, with the introduction and adoption of multiannual management plans. Within this approach, and without prejudice to addressing additional species, the GFCM has agreed on a list, by subregion, of priority commercial species for which advice should be produced (**TABLE D.5.1**). Priority species have been agreed in consultation with experts and managers, based on a combination of information, socioeconomic importance and conservation concerns; stock assessments are prioritized accordingly.

Since the adoption of the first comprehensive GFCM multiannual management plan – for small pelagic fisheries in the Adriatic Sea in 2013 – the GFCM has adopted a total of 11 adaptive multiannual management plans. Today, most GFCM multiannual management plans are implemented in different phases, foreseeing an initial period (usually three years) for implementing transitional measures while advancing on scientific work whose outcomes will comprise the basis for a second phase (usually five years) that implements long-term adaptive measures. The GFCM has established a process to inform management plans, including a compilation of all background information and the creation of technical elements for management, that, if successful, results in the management plan being adopted as a binding recommendation at the GFCM annual session. Multiannual management plans include combinations of management measures tailored to each fishery. These measures include classical input (effort limits) and/or output (catch limits and TACs) controls coupled with technical measures (e.g. minimum conservation reference sizes, mesh size, gear modifications, selectivity devices etc.) and spatial management to protect vulnerable marine ecosystems and essential fish habitats. Currently about 58 percent of the Mediterranean is protected from bottom trawling through 11 different Fisheries Restricted Areas (FRAs), including below 1 000 m.

Adaptive mechanisms to achieve and maintain objectives within a desired time frame are also specified, thus ensuring adaptability to changing and evolving stocks, fisheries and environments. At the basis of this adaptive framework are both forecasts and performance testing using management strategy evaluation. This process has recently taken an important step forward by facilitating the estimation of single species quotas for European anchovy and sardine in the Adriatic Sea, based on species-specific harvest control rules. The management strategy evaluation process is opening the door to management plans that are ever more focused on gathering information to assess and achieve social and economic sustainability in addition to biological sustainability, as well as involving stakeholders.

3. RESOURCE STATUS

The status of fish stocks in Area 37 for stock assessments that are formally reviewed and validated by the GFCM is summarized and published biennially in *SoMFi*, with the most recent report in 2023 based on the reference year 2021 (FAO, 2023). Stock status evaluations for *SoMFi* are currently based on fishing pressure with respect to F_{MSY} (fishing pressure that gives the maximum sustainable yield [MSY] or its proxy in the long term) at a stock level to classify stocks as "in overexploitation" or "in sustainable exploitation".

In this report, this approach to assessing sustainability of stocks was translated into FAO classification as explained below.

3.1 Reference list of stocks

The reference list of stocks for Area 37 in this report was revised based on the new methodology (**PART B, METHODOLOGY**, pp. 6). Since 2019, all stock assessment outcomes, validated by the GFCM, are stored in the Stock Assessment Results (STAR) database, which forms the basis of the *SoMFi* report (FAO, 2023). According to the updated methodology of this report, the STAR database provided the status of 89.5 percent of stocks (102 stocks) in the revised reference list for Area 37. The inclusion of assessments in this list was kept consistent with the SoMFi rules for non-deprecated assessments (small pelagic species: assessments no older than three years; demersal species: assessments no older than five years). These 102 stocks were complemented by 12 additional unique stocks derived from SDG 14.4.1 questionnaires submitted to FAO by national agencies. The SDG database was systematically scanned to identify additional stocks with stock status estimates that were not covered by the GFCM STAR database, according to the following rules:

1. Subset reference year using the SoMFi rule for non-deprecated assessments.
2. Subset "workshop tier" and review to stocks that were assigned Tier 1 or 3 (initially) by excluding stocks with "old data" or "insufficient data".
3. Remove stocks that were not in Area 37.
4. Remove all stocks readily covered by the SoMFi 2023 stock reference list.
5. Following a review of Tier 3 stock, only one stock in the Sea of Azov (Azov round goby) remained, but it had no reference points (empirical methods) and was removed.

This resulted in a total of 114 monitored stocks (**TABLE D.5.2**), comprising 39 species, being included in the updated reference stock list for Area 37 (**APPENDIX II, TABLE 5**, pp. 427). This represents an additional 74 stocks compared to the previous methodology which used 40 aggregated stocks. The percentage of the total capture fisheries production in Area 37 for the species monitored covered by at least one assessment remains very similar to the previous methodology, at 74.1 percent.

TABLE D.5.2
SUMMARY OF ASSESSED STOCKS IN AREA 37 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	114	39	13
Total	**114**	**39**	**13**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

3.2.1 METHODOLOGY

GFCM stock status classification and terminology was mapped and "translated" to match FAO terminology (**PART B, METHODOLOGY**, pp. 6) and to ensure full comparability with results emerging from other FAO Major Fishing Areas. The updated FAO methodology classifies stocks into tiers based on the availability and quality of information for each stock (Tier 1, Tier 2 or Tier 3). In general, stock status classification is straightforward in cases where estimates of the biomass level that can produce MSY in the long term (B_{MSY})or a direct proxy are available. However, within Area 37, stock status classification is typically based on fishing mortality relative to proxies for F_{MSY} (e.g. $F_{0.1}$), which define target fishing mortality F_{tgt}, and there are difficulties in estimating biomass reference points from the relatively short time series. Although the number of stocks for which biomass reference points are estimated is increasing every year, estimates of the target biomass reference point B_{MSY} (which defines B_{tgt}) were only available for about 40 percent of the validated quantitative assessments (n = 80). An additional 6.4 percent of stock assessments provided limit biomass reference points (B_{pa} and B_{lim}), but without an estimate for target reference point B_{MSY}.

The stock status classification for validated qualitative assessments is often corroborated by multiple analytical assessment methods and therefore provides a descriptive stock classifier, such as "Possibly in overexploitation" or "Possibly sustainably exploited", instead of distinct values for F/F_{MSY} or B/B_{MSY}.

To accommodate a consistent stock classification for FAO, the following classification rules were applied.

If a direct proxy for B_{MSY} is available:

- O: $B/B_{tgt} < 0.8$
- M: $0.8 \leq B/B_{tgt} \leq 1.2$
- U: $B/B_{tgt} > 1.2$ (Note all cases have $F < F_{tgt}$)

If the precautionary biomass reference points B_{pa} exists but not B_{MSY}

- O: $B < 2B_{pa}0.8$
- M: $B \geq 2B_{pa}0.8$

This is considering that B_{pa} was typically set to $0.5B_{MSY}$ in recent benchmark assessments, whereas 0.8 is the lower FAO bound. Therefore, the following approximation applies: $0.8\,B_{MSY} = 2B_{pa}0.8$. Note that only one stock has $B_{pa} > 1$ in the absence of B_{MSY}. In this case $B/B_{pa} > 3$ and $F/F_{MSY} < 1$, so there is no ambiguity when classifying this stock as M.

If no biomass reference point exists, but the ratio F/F_{MSY} is available:

- O: $F/F_{tgt} > 1$
- M: $F/F_{tgt} \leq 1$
- In the absence of a biomass reference point, the F-based classification becomes binary (O/M): it does not employ the 0.8–1.2 buffer and does not classify any stocks as underfished (U). The reason for not classifying as U is that it is not clear if a stock with $F/F_{tgt} << 1$ (e.g. $F/F_{MSY} < 0.5$) is under rebuilding ($B < 0.8B_{MSY}$) or underfished (U). The binary classification for a threshold of $F/F_{tgt} = 1$ is selected to achieve overall classification with the GFCM status advice.

For qualitative assessments, with only a descriptive stock status classifier, stocks were classified either:

- O: "Possibly in overexploitation", "Possibly overexploited" or "Possibly depleted"
- M: "Possibly sustainable" or "Possibly sustainably exploited"

It should be noted that the stock status classification rules employed for Area 37 stocks are very conservative.

3.2.2 STOCK STATUS AND CLASSIFICATION BY TIERS

All the 114 stocks in Area 37 are classified as Tier 1 stocks, which means they are assessed using "traditional" stock assessments and are deemed reliable. The main separation in terms of assessment quality is assigned by the level of uncertainty. All validated quantitative assessments were assigned a "low" uncertainty (79 stocks), whereas qualitative validated assessments and supplementary stocks were assigned a "medium" uncertainty level (35 stocks). Qualitative assessments are conducted with "traditional" stock assessment methods, but, through the review process, status classification is deemed to be based on data associated with higher uncertainty, so that improvement of data and refinements of the assessment may be needed prior to providing full quantitative advice. Overall for Area 37, of the 114 assessed stocks, 7.9 percent are considered underfished, 27.2 percent are considered maximally sustainably fished, and 64.9 percent are overfished (**TABLE D.5.3**). When weighted by their production levels, biologically sustainable stocks account for 56.9 percent of the 2021 landings of assessed stocks monitored by FAO (**TABLE D.5.4A**).

TABLE D.5.3
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 37 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	114	7.9	27.2	64.9	**35.1**	**64.9**
Total	**114**	**7.9**	**27.2**	**64.9**	**35.1**	**64.9**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.5.4
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 37 IN 2021

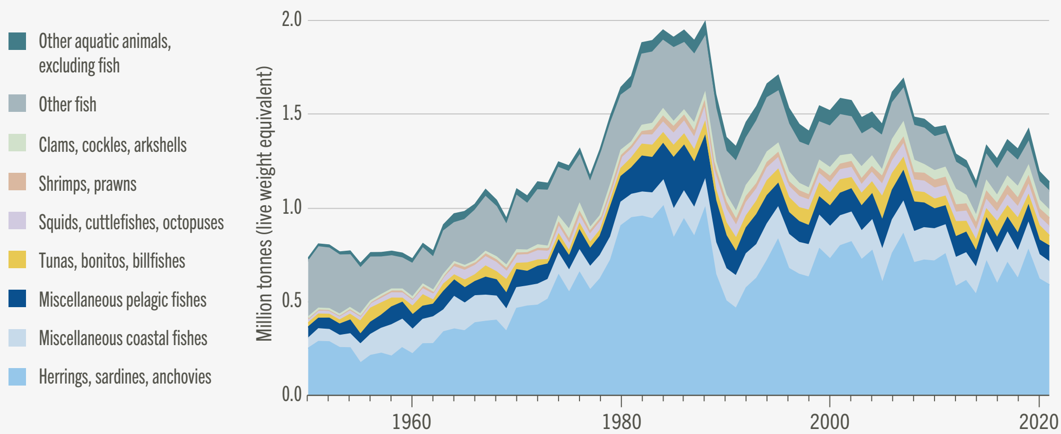
Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
0.81	**5.2**	**51.7**	**43.1**	**56.9**	**43.1**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

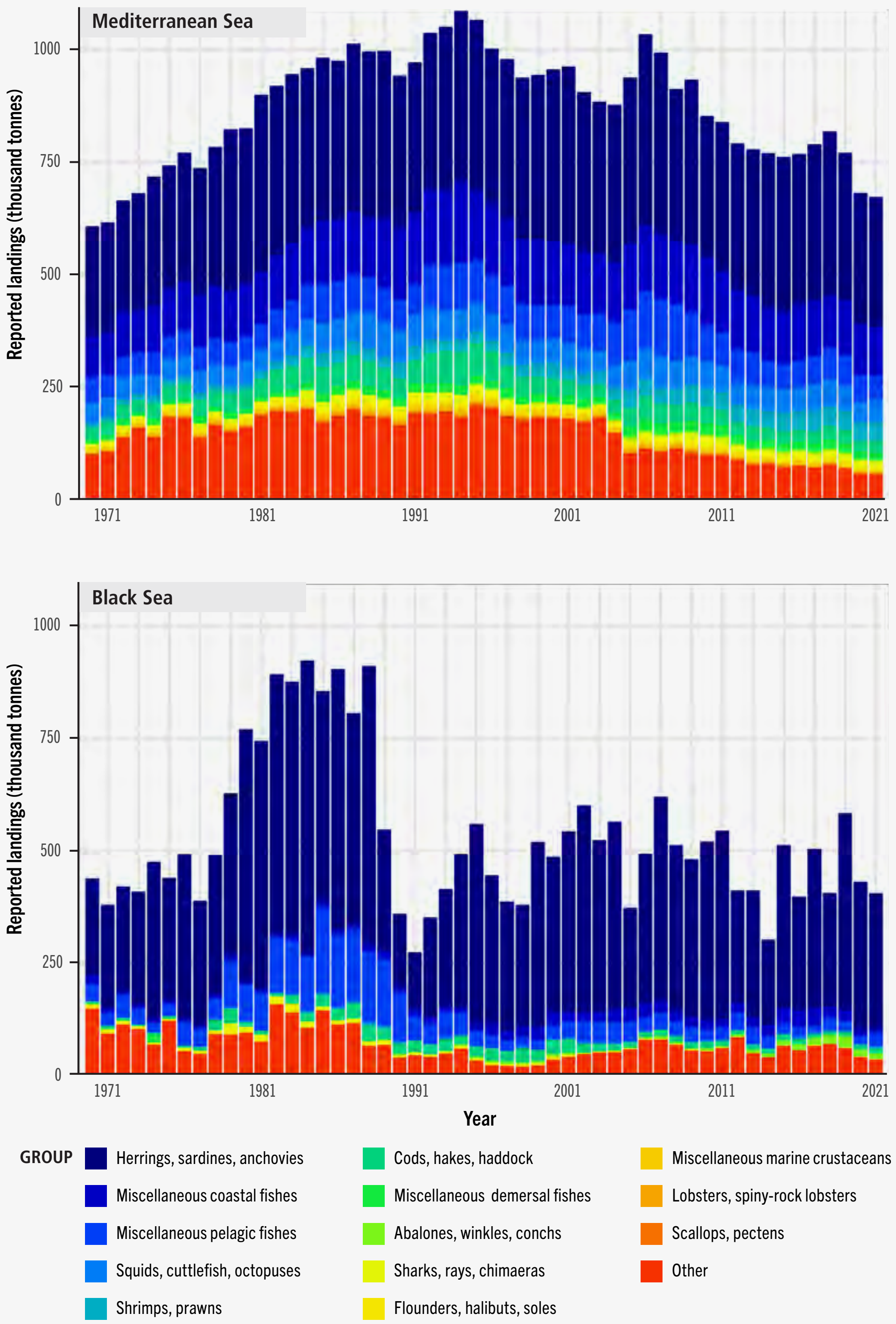
FIGURE D.5.4A
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE MEDITERRANEAN AND BLACK SEA (AREA 37) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) The figure includes highly migratory species (tunas, bonitos and billfishes) which are excluded from the analysis of stock status within this chapter.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

FIGURE D.5.4B
TOTAL REPORTED LANDINGS (IN THOUSAND TONNES) BY SPECIES GROUP IN THE MEDITERRANEAN AND BLACK SEAS BETWEEN 1970 AND 2021



Source: Area total landings were sourced from the FAO-GFCM-Capture-Production data table for the period 1970-2021.

4. SELECTED IMPORTANT KEY SPECIES

4.1 Small pelagic fishes

4.1.1 EUROPEAN ANCHOVY AND SARDINE

European anchovy *(Engraulis encrasicolus)* is a priority species in all subregions of the Mediterranean and the Black Sea. The anchovy stock in the Black Sea produced on average more than 250 000 tonnes over the period 2020–2021, representing 65 percent of all reported landings in the Black Sea and the largest landing volume produced by a single stock unit in Area 37. Anchovy in the Black Sea represents four of the nine anchovy stock units that are currently classified as maximally sustainably fished, whereas three stocks are considered overfished and two underfished.

Sardine (also known as European pilchard, *Sardina pilchardus*) is a priority in all subregions of the Mediterranean Sea. Sardine is targeted by the same fleets as European anchovy and generally appears more vulnerable to fishing pressure with six of the 12 assessed stocks classified as overfished.

Both European anchovy and sardine are under a multiannual management plan in the Adriatic Sea (GSAs 17, 18), where they represent the two predominant species, contributing 20.1 percent and 47.4 percent of total Adriatic Sea landings, respectively. Following the recent conclusion of a comprehensive management strategy evaluation process, the 47th annual session of the GFCM determined the long-term portion of the management plan, setting species-specific quotas, based on the best-performing harvest control rules, for the first time in the Mediterranean Sea.

4.1.2 ROUND SARDINELLA

In the eastern Mediterranean, round sardinella *(Sardinella aurita)* is also included in the list of priority species, commonly reported as sardinellas NEI (*Sardinella* spp.). It is the predominant species after European sardine and anchovy in terms of landings, contributing more than 5 percent of total landings in the subregion. The currently overfished status of round sardinella is monitored by assessments of the two stocks in the northeast Levant Sea (GSA 24, 27N) and in the southeast Levant Sea (GSA 25, 27S). These two assessments were the first to be successfully benchmarked in the eastern Mediterranean subregion.

4.1.3 EUROPEAN SPRAT

European sprat *(Sprattus sprattus)* is the second most important species in terms of landings in the Black Sea, representing 13 percent of landings; it is also included in the list of priority species. It is monitored by a recently finalized benchmark assessment and classified as maximally sustainably fished. The GFCM recommendation setting measures for the management of European sprat in the Black Sea is the first GFCM decision formally requiring an analysis of the possible climatic effects and their incorporation within the advice on stock status and potential management measures for European sprat.

4.2 Demersal fishes

4.2.1 EUROPEAN HAKE

European hake *(Merluccius merluccius)* is the dominant gadoid species in commercial catches across the Mediterranean Sea, where it is a priority species in all regions and among the most widely assessed species. Although European hake has shown an overall decreasing trend in both landings and fishing pressure since 2013, all ten stocks monitored by validated assessments remain in an overfished state. Three stocks are monitored by annual updates of benchmark assessments, of which the central Mediterranean stock in the Strait of Sicily (GSAs 12–16) and the Adriatic Sea stock (GSAs 17, 18) showed the strongest signals of an onsetting recovery and a good response to existing multiannual management plans. The biomass levels of the stock in the Strait of Sicily are approaching the sustainability threshold of 80 percent of B_{MSY}. European hake is exposed to high fishing mortality on juveniles by commercial otter trawling, while only passive gears, such as longlines and gillnets, catch a meaningful fraction of large mature females. Similarly, demersal surveys select against large individuals and, therefore, mostly represent changes in juvenile abundance. This also poses challenges to assessments of European hake, with spawning biomass often remaining difficult to estimate. Progress has been made by explicitly integrating data from passive fleets into integrated multi-fleet assessment models for the Adriatic Sea (GSAs 17,18) and the Strait of Sicily (12–16), which enabled improved inference about the available spawning biomass and thus stock status.

4.2.2 RED MULLET

Red mullet *(Mullus barbatus)* is a priority species throughout the Mediterranean and the Black Sea. It is caught in large volumes over muddy bottoms (50–200 m) by bottom trawlers and represents the predominant commercial species within the group of miscellaneous coastal fishes (ASFIS 33). Stock structuring of red mullet is complex, which is also reflected by the large number of assessments of individual stock units (16 stocks). Fishing pressure on red mullet has shown an overall decreasing trend since 2013. In contrast to the last detailed *Review of the state of world marine fishery resources* (FAO, 2011), which found that 100 percent of ten assessed stocks were overfished, in this report, 31 percent and 13 percent are respectively classified as maximally sustainably fished and underfished, whereas 56 percent remain in an overfished state. An example of a successful rebuilding of red mullet is the Adriatic Sea stock, where major reductions of demersal fishing effort, together with spatial and temporal inshore trawling restrictions and mesh size regulation measures under the multiannual management plan for key demersal species of the Adriatic Sea, have contributed to strong increases in biomass to levels above B_{MSY}.

4.2.3 FLATFISHES

The important fisheries for common sole *(Solea solea)* in the northern Adriatic Sea (GSA 17) and turbot *(Scophthalmus maximus)* in the Black Sea (GSA 29) target the two priority flatfish species, which are both managed under multiannual management plans.

Common sole is an important commercial species in the central and northern Adriatic Sea, representing more than USD 20 million in terms of landing value. More than half the landings are made by a target fishery with beam trawlers, while the remaining catch is similarly split between gill- and trammel netters and otter trawlers. Monitored by an annually updated benchmark assessment since 2019, Adriatic common sole has been rebuilt from an overfished ($F > F_{MSY}$) to a maximally sustainably fished stock, which was associated with a continuous reduction of fishing effort by more than 70 percent since 2013.

The turbot stock in the Black Sea is shared among all riparian countries. The stock has been under a multiannual management plan since 2017 and has been monitored by annual updates of a benchmarked assessment since 2019. The main fishing gear for turbot is gillnets, but in Türkiye bottom trawling is also permitted. Although turbot currently remains in an overfished state with respect to B_{MSY}, there are strong signals of rebuilding, evidenced by a threefold increase in biomass since 2017 that was associated with a threefold decrease in fishing mortality to levels below F_{MSY}. However, quantifying and determining significant landings from IUU fishing remains the biggest challenge towards sustainable exploitation of this stock.

4.3 Crustaceans

4.3.1 DEEP-WATER RED SHRIMPS

Deep-water red shrimps are the main target of Mediterranean bottom trawl fisheries in depths of 400–1 000 m. They comprise two species: blue and red shrimp *(Aristeus antennatus)* and giant red shrimp *(Aristaeomorpha foliacea)*. These are often mixed in catches, in varying proportions according to the geographic area. As highly valuable commercial species with relatively slow growth rates, deep-water red shrimps have been subjected to some of the highest exploitation rates in the region (FAO, 2023). All three stocks of giant red shrimp covered by quantitative assessments were found to be overfished, while out of the six stocks of blue and red shrimp assessed, only one was found to be maximally sustainably fished (northern Alboran Sea), while the rest was classified as overfished. It is worth noting that, despite a significant expansion of fishing activities in the eastern Mediterranean in recent decades (Fiorentino *et al.,* 2024) as well as ongoing efforts to improve fishery-dependent and fishery-independent data, to date qualitative stock assessments are not available for this subregion. Deep-water red shrimps are GFCM priority species in the central and eastern Mediterranean, where, since 2023, they have been covered by three multiannual management plans in the Strait of Sicily and the Ionian and Levant Seas. These plans mandate, inter alia, species-specific catch limits and spatiotemporal measures with the objective of achieving exploitation levels consistent with MSY by 2030 at the latest.

Deep-water rose shrimp *(Parapenaeus longirostris)* is an important resource in the Mediterranean Sea, where it produces the largest landings of a crustacean (FAO, 2023) and ranks as fourth in terms of total economic value among the main commercial species in the Mediterranean subregions (FAO, 2022). Deep-water rose shrimp has followed an overall increasing trend in landings from 7 000 tonnes in 1970 to 22 700 tonnes in 2021, with landings peaking in 2018 at 25 900 tonnes. The species typically occurs in shallower waters than deep-water red shrimps, and is almost exclusively targeted by bottom trawlers along the continental shelf at depths of 100–400 m (Knittweis *et al.,* 2013). Deep-water rose shrimp is short-lived, reproduces throughout the year and is characterized by high growth and mortality rates. The species exhibits a thermophilic preference for warmer waters (Colloca *et al.,* 2014), and its biomass dynamics seem to be largely driven by environmental regimes. Of the nine stocks monitored in the reference year 2021, seven were classified as overfished and only two as maximally sustainably fished. It is a priority species in the central Mediterranean and Adriatic Sea, where it is under multiannual management plans, and the two relevant stocks (GSAs 12–16 and GSAs 17–20) are monitored by annually updated benchmark assessments.

In general, the large environmentally driven population fluctuations pose a major challenge for stock status classification of this species, and specifically for determining appropriate biomass reference point levels. Catches tend to increase simultaneously with biomass during high productivity regimes, which can result in stocks being classified as overfished in the absence of a B_{MSY} reference point (i.e. $F > F_{MSY}$), even if the stock is at very high biomass levels. However, the recent benchmark assessment of the stock in the Adriatic and western Ionian Sea (GSAs 17–20) prompted significant advances in the assessment methodology for this species by applying stochastic biomass dynamic models that can account for time-varying productivity regimes and estimate biomass relative B_{MSY}. Current efforts to explore this approach for other stocks may provide improved inference about the state of the deep-water rose shrimp resource and a stepping stone towards a more adaptive management advice.

4.3.3 NORWAY LOBSTER

Norway lobster *(Nephrops norvegicus)* is mostly exploited by bottom trawls and, to a lesser extent, by baited traps. These gears sample different portions of the population: trawls will only catch individuals when they happen to be outside of their burrows, while the bait in traps entices animals out of their burrows. Average values of F/F_{MSY} for Norway lobster in the Mediterranean Sea are approaching sustainable exploitation (FAO, 2023). The species is a priority species in the Adriatic Sea (GSAs 17, 18), where it burrows within muddy grounds at depths from around 50 m to more than 400 m, and is the most valuable crustacean species landed in the subregion. Norway lobster is the only species covered by the Adriatic Sea multiannual demersal management plan whose assessment still has to be consolidated: different assessments tracking different combinations of GSAs all indicate the species is overfished in the subregion. A benchmarking process is currently underway.

5. KEY FINDINGS

When applied to Area 37, the updated methodology results in a much longer reference list of species comprising 114 stocks, each having a stock classification, compared to 40 stocks that were aggregated at the level of 27 species groups used to determine an overall status in previous assessments.

TABLE D.5.5
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 37 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
114	7.9	27.2	64.9	35.1	64.9	40	2.5	35.0	62.5	37.5	62.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.5.6
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 37 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
5.2	51.7	43.1	56.9	43.1	0.0	45.5	54.5	45.5	54.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

Despite the increased number of stocks and changes in methodology, the overall percentage of overfished stocks (64.9 percent) has remained similar to the 62.5 percent of overfished stocks reported with the previous methodology in 2021 (**TABLE D.5.5**). What differs is the percentages of underfished stocks, which are considerably higher with the updated methodology. In addition, the coverage of 74.1 percent of landings has remained relatively stable in comparison with 74.3 percent of landings assessed with the previous methodology in 2021 (**TABLE D.5.6**). When weighted by landings, the percentage of sustainable stocks increased under the updated and previous methodlogy to 56.9 percent and 45.5 percent, respectively. A notable difference is that some species with relatively high catch volumes, such as the Striped venus *(Chamelea gallina)* with 36 700 tonnes and Black Sea sprat *(Clupeonella cultriventris)* with 7 600 tonnes, were captured in the list of assessed species with the previous methodology (FAO, 2024), but are absent from the new reference list of stocks because they are not assessed.

A comparison with the last detailed *Review of the state of world marine fishery resources* (FAO, 2011) indicates some notable changes. The number of stock assessments has more than doubled, increasing from 40 in 2011 to 114 in 2021, while the percentage of overfished stocks reduced from 78 percent in 2011 to 65 percent in 2021.

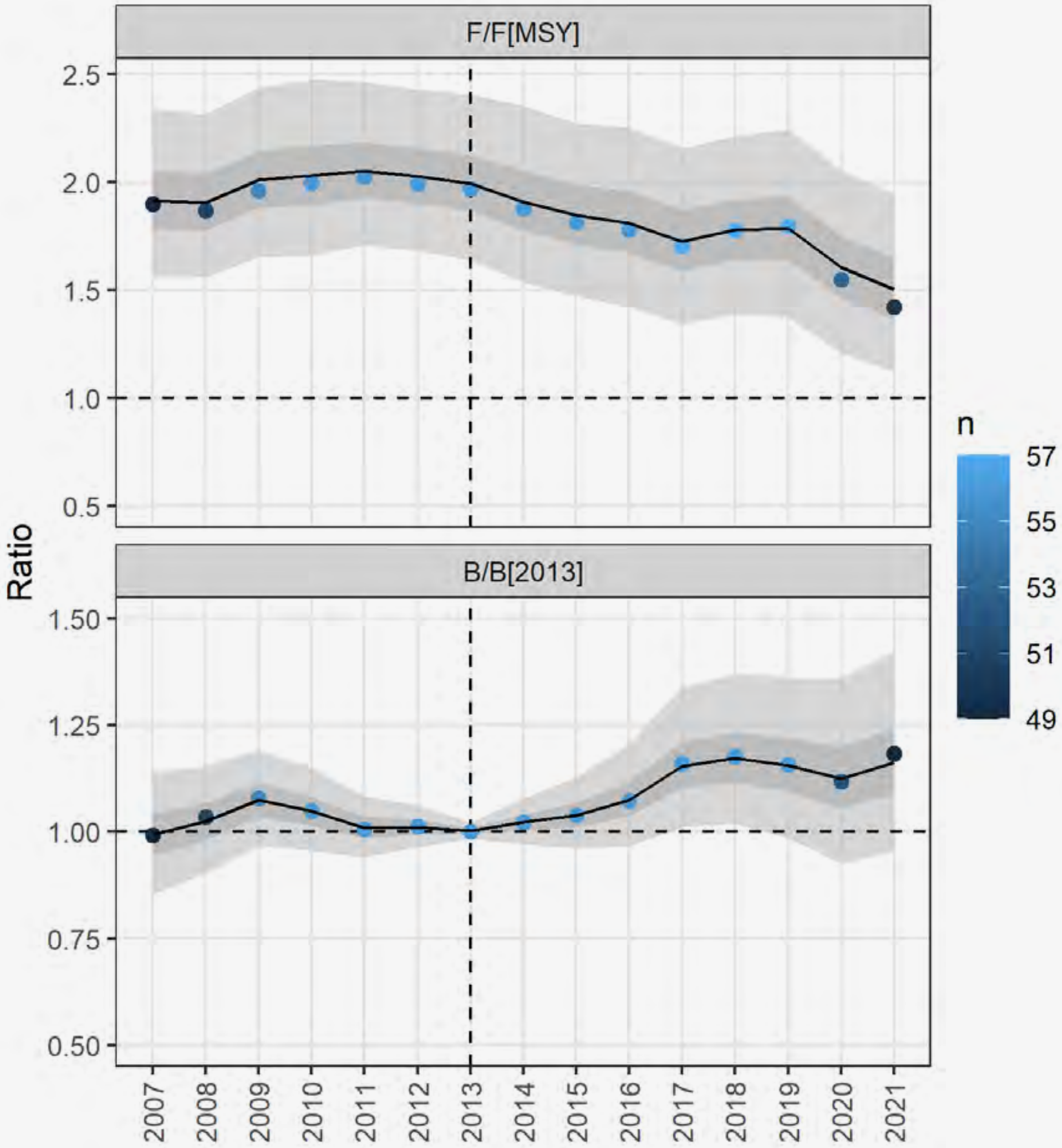
When considering the finer details of assessments used in this report, it is clear that significant improvements have been made. The past decade marked a significant increase in the number of stocks assessed in the Mediterranean and the Black Sea, together with a substantial improvement in the data collected at the national level and the capacity of national experts to perform assessments, supported by capacity development activities and the benchmarking process. In the past, the status of Mediterranean stocks was tracked primarily based on fishing mortality indicators, whereas the improvements in the quantity and quality of assessments have more recently enabled stock status estimates for a steadily increasing number of stocks in terms of biomass at sea. This will ensure that future analyses of Mediterranean-specific stock status will be more closely aligned with those performed in other FAO Major Fishing Areas, including estimating B_{MSY}.

Since 2013, 11 multiannual management plans have been adopted with the objective of achieving sustainable exploitation of several priority species in different areas of the Mediterranean and the Black Sea. Multiannual management plans include or are complemented by 11 FRAs. The GFCM's continued focus on expanding adaptive multiannual management plans and adopting combinations of input/output measures (e.g. effort/catch limits) along with technical and spatial measures is having positive results for key commercial species. This is demonstrated by a continuous reduction in fishing pressure (F/F_{MSY}) throughout the region, which has fallen by 31 percent since 2013, while relative biomass (B/B_{MSY}) has increased by more than 15 percent over the same period (FAO, 2023; **FIGURE D.5.5**).

The status of several stocks managed through management plans has shown important signs of improvement. For example, several of the of European hake *(Merluccius merluccius)* stocks covered by dedicated management plans showed notable reduction in overfishing, some of them already revealing signs of biomass rebuilding. Another notable example includes a 77 percent reduction in fishing pressure for common sole *(Solea solea)* in the Adriatic Sea, which has now reached sustainable exploitation rates and has allowed the effort reductions for Adriatic beam trawls to be halted. The improvement in several demersal stocks in several Mediterranean subregions and the Black Sea (e.g. red mullets and Black Sea turbot) is likely due to the combination of an effort regime and/or catch limits for the bottom trawl fleet, with appropriate spatial management (e.g. GFCM fisheries restricted areas) and technical measures (e.g. enhanced selectivity), aided by appropriate monitoring, control and surveillance actions (e.g. the joint international inspection schemes). A positive example is provided by the demersal resources in the Adriatic Sea, which are benefiting from the combined effects of an effort regime, spatio-temporal measures and a FRA in the Jabuka/Pomo Pit.[1] In addition, the finalization of a rigorous management strategy evaluation process in the Adriatic Sea supported a landmark decision to establish single species harvest control rules and annual catch limits for sardine (also known as European pilchard, *Sardina pilchardus*) and European anchovy *(Engraulis encrasicolus)*, moving away from the joint catch limits enforced until now and promoting ecological sustainability and economic stability.

[1] https://faolex.fao.org/docs/pdf/mul201495.pdf; https://www.fao.org/gfcm/news/detail/en/c/1455003/

FIGURE D.5.5
TRENDS IN AVERAGE FISHING PRESSURE (F/F_{MSY}) AND BIOMASS RELATIVE TO 2013 (B/B_{2013}) WHEN THE IMPLEMENTATION OF MULTIANNUAL MANAGEMENT PLANS STARTED



Source: Authors' own elaboration.

MEDITERRANEAN AND BLACK SEA

Some discrepancies may be observed in the data presented within this infographic with the data of the 2023 edition of the *State of the Mediterranean and Black Sea Fisheries* report (FAO, 2023) due to differences in the data submissions and updates on national datasets.

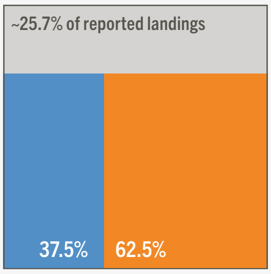
KEY MESSAGES

- Small-scale fishing boats comprise ~4/5 of the fleet, but larger vessels, such as purse seiners and trawlers, account for 77 percent of the landings.
- There are 11 multiannual management plans and 11 related Fishery Restricted Areas in Area 37. These have positive results for key commercial species, shown by a continuous reduction in fishing pressure and relative biomass increase.
- Management measures are used extensively in Area 37 to protect vulnerable marine ecosystems, bycatch species and essential fish habitats.

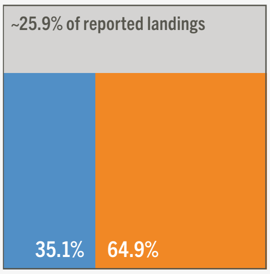
STOCK STATUS

FAO estimates, 2021

PREVIOUS METHODOLOGY



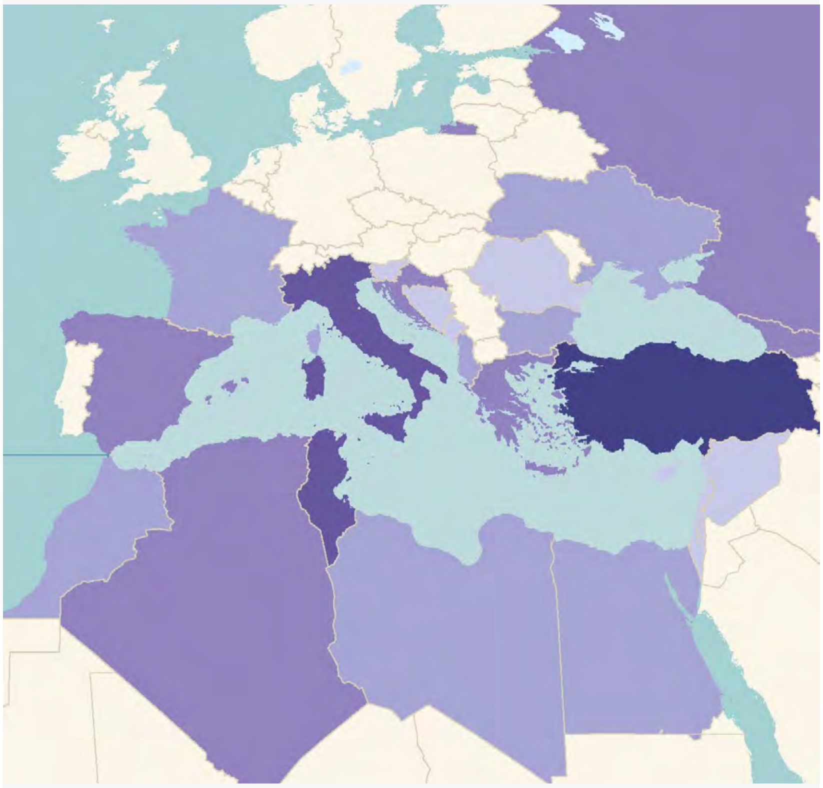
UPDATED METHODOLOGY



Biologically sustainable
Unassessed reported landings
Biologically unsustainable

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



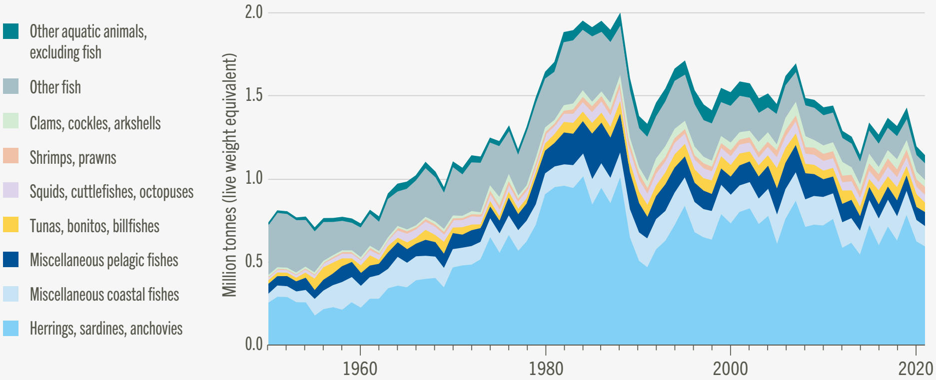
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | < 1% | 1–5% | 5–10% | 10–20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

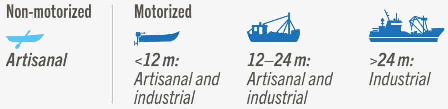


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 84 000



Non-motorized: 14%
Motorized: 86%

LANDINGS

FAO data, 2021

Reported landings ~ 1.1 million tonnes

Unidentified: 1%
Identified at species group level: 99%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 1.7 billion

= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 343 000

Male: 67%
Unspecified: 33%
Female: 0%

= 100 000 PEOPLE

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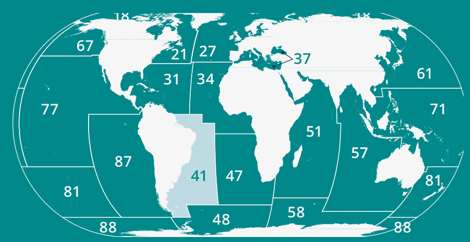
FIGURE D.5.6 *(previous page)*
AREA 37 – DATA AT A GLANCE


41



Part D, Chapter 6 (D.6)

SOUTHWEST ATLANTIC
FAO MAJOR FISHING AREA 41

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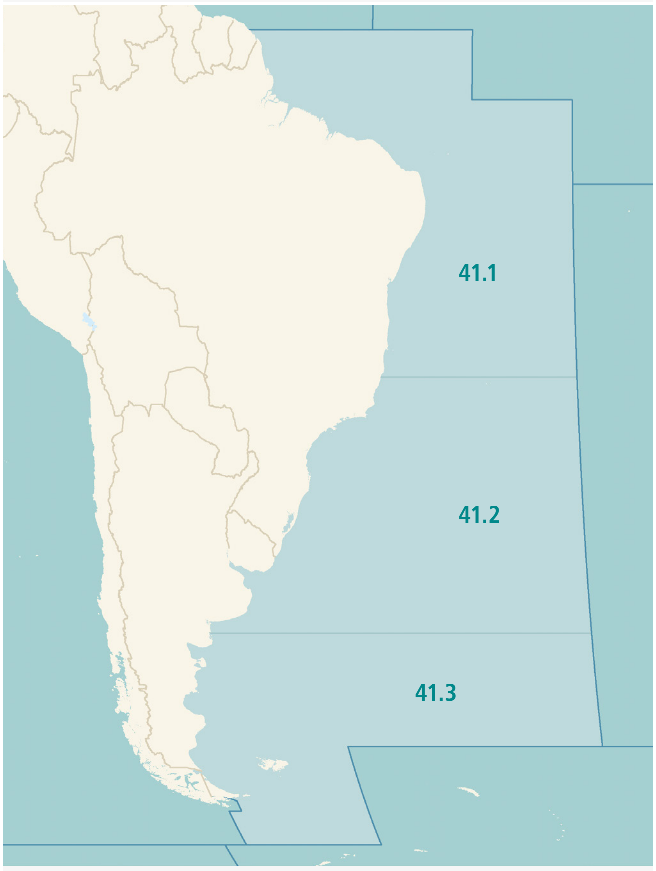
1. OVERVIEW

The Southwest Atlantic, designated by FAO as Major Fishing Area 41 (hereafter, Area 41), covers a total surface of 17.65 million km^2 off the eastern coast of South America, between latitudes 05° north off northern Brazil and 60° south off southern Argentina and the Falkland Islands (Malvinas) (**FIGURE D.6.1**). It is one of the world's most productive marine regions, characterized by rich biodiversity and abundant fish stocks that provide food and livelihoods to millions of people. This productivity has made it a focal point for intense fishing pressure from both national and international fleets. The high demand for commercially valuable species has resulted in heavy fishing activity, posing significant challenges to the sustainability of fish populations and the overall health of marine ecosystems.

Area 41 has distinct environmental characteristics which influence fisheries in the region. In the northern part of Area 41, the continental shelf extends up to 160 nautical miles (nm) and is influenced by deposits from the Amazon River. The narrow, coral-rich shelf is not suitable for trawling, and landings are dominated by diverse small-scale fisheries, which often lack detailed statistics. Further south, the middle section of Area 41 – spanning from Cabo Santa Marta (28° south) to Bahía Blanca (41° south) in the Southwest South Atlantic Ocean (SWAO) and including FAO subarea 41.2.1 to 41.2.3 along the coasts of Brazil, Uruguay and Argentina – is a transitional zone between subtropical and subantarctic waters (FAO, 2025). This region shows high seasonal and interannual variability due to wind patterns,

FIGURE D.6.1
FAO MAJOR FISHING AREA 41: THE SOUTHWEST ATLANTIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

continental discharges, and boundary currents (Piola *et al.,* 2005). The SWAO is a significant ocean-warming hotspot, with rising sea surface temperatures driving tropicalization and shifts in species distributions (Hobday and Pecl, 2014; Gianelli *et al.,* 2019; Gianelli *et al.,* 2021). Although the region supports valuable fisheries, it also poses governance challenges due to overlapping jurisdictions and complex oceanographic conditions (Defeo *et al.,* 2025). The southernmost region of Area 41 (41° south to 60° south) features dynamic conditions shaped by the Brazil-Malvinas Confluence, where the nutrient-rich Malvinas Current meets the warm Brazil Current, fostering high productivity and diverse ecosystems (Acha *et al.,* 2024; Piola *et al.,* 2024). The Patagonian Shelf, one of the world's largest continental shelves, enhances nutrient cycling and habitat diversity. Variability driven by the Southern Annular Mode affects productivity and species distribution, sustaining significant fisheries and biodiversity (Acha *et al.,* 2004, 2024; Alemany *et al.,* 2024).

Analysis of Area 41 landings from 1950 to 2019 reveals an initial growth phase, peaking in 1997, followed by a decline and stabilization of catches at approximately 2 million tonnes annually. It also reveals a shift in fisheries dynamics, with historical catches being dominated by two key species – Argentine hake *(Merluccius hubbsi)* and Argentine shortfin squid *(Illex argentinus)* – which represented 40 percent of historical catches, reflecting the region's past industrial fisheries' reliance on a few dominant resources. The current shift in fisheries dynamics is exemplified by transformations like the Argentine anchovy *(Engraulis anchoita)* fishery, which evolved from small-scale operations to multi-fleet systems. Similarly, the "variado costero" fishery in Buenos Aires targets multi-species demersal assemblages using diverse fishing methods. These developments necessitate comprehensive stock assessments that account for the complexities of multi-fleet and multi-gear fisheries. The growing diversity in catch composition, especially since the 1980s, highlights the need to expand FAO reference lists and methodologies to include emerging fisheries targeting species of high economic value.

2. FISHERY PROFILES

The Southwest Atlantic Ocean is of vital importance to global fisheries, providing essential resources that sustain the livelihoods of millions of people. The best and most extensive trawling areas are located in the Río de la Plata region, the Patagonian Shelf, and the Falkland Islands (Malvinas), where the shelf extends far beyond the 200 nm limit from the coastline, forming the largest and most productive continental shelf in the Southern Hemisphere (Bertrand *et al.,* 2018; Franco *et al.,* 2020). This productivity makes it a focal point for intense fishing pressure from national and international fleets (Defeo *et al.,* 2025).

The fisheries sector in Area 41 supports a diverse range of activities, involving 32 000 active vessels, including both artisanal and industrial operations, and 896 000 people engaged in the primary sector. Long-term average reported catches amount to around 2 million tonnes per year, generating an annual economic value exceeding USD 5.5 billion (FAO, 2024). The high demand for commercially valuable species has led to intense fishing activity, posing significant challenges to the sustainability of fish populations and the health of marine ecosystems (Defeo and Vasconcellos, 2020; FAO, 2024).

The fisheries in Area 41 have undergone significant changes over time, as is evidenced by long-term catch trends. From 1950 to 1997 landings increased steadily, driven by the expansion of fishing activities. However, a subsequent decline followed until 2004, after which annual landings stabilized at approximately 2 million tonnes, although showing high inter-annual variability (**FIGURE D.6.2**). Two species dominate the catches in this region: the Argentine hake *(Merluccius hubbsi)* and the Argentine shortfin squid *(Illex argentinus)*, which together have accounted for about 40 percent of total landings since 1950.

A marked shift in the fisheries landscape occurred during the 1980s and 1990s, driven by declining yields of some traditionally exploited demersal species. This decline prompted the emergence of fisheries targeting underexploited stocks with high economic value, fueled by increasing international demand (Gianelli and Defeo, 2017).

Key fisheries in the region have undergone significant evolution. For instance, the Argentine anchovy *(Engraulis anchoita)* fishery shifted from small-scale operations using traditional "Rada" or "Ría" vessels to a more complex multi-fleet system by 2018, including high-seas, coastal, and artisanal vessels. Similarly, the "variado costero" fishery in Buenos Aires demonstrates the increasing prevalence of multi-species fisheries. This fishery targets an assemblage of approximately 30 demersal species using various methods, including bottom and midwater trawling, longlines, gillnets and traps. These developments highlight the intricate dynamics of modern fisheries, requiring adaptive management strategies.

The small-scale fisheries sub-sector has been somewhat overlooked in the region despite its vital importance. Generally, these fisheries are considered data-poor, which poses challenges for comprehensive assessment and management (Basurto *et al.,* 2025). For example, in Brazil, small-scale fisheries contribute more than 90 percent of the employment in the fisheries sector. As of 2011, nearly 600 000 fishers were directly engaged in full-time fishing activities, primarily operating fleets of vessels less than 12 m in length. While the industrial fishing fleet is concentrated in southern Brazil, the majority of small-scale fishery activities take place in northern and northeastern regions. Landings from these fisheries include approximately 200 fish species, 20 crustacean species, and 14 mollusc species (Bertrand *et al.,* 2018; FAO, Duke and Worldfish, unpublished data). Marine extractive reserves represent the most significant government-supported initiative aimed at protecting the common-property resources upon which traditional small-scale fishers depend. These reserves benefit approximately 60 000 small-scale fishers along the coast. However, their effectiveness as a conservation tool is hindered by weak enforcement and various anthropogenic and economic pressures, such as tourism (Santos and Schiavetti, 2014).

The transboundary nature of the primary stocks exploited in Area 41 poses substantial challenges for fisheries management, as it requires alignment with the life cycle characteristics of these stocks and demands multinational collaboration. Nevertheless, stock assessments and management practices often remain restricted by geopolitical boundaries, disregarding the ecological realities of stock distributions and fishing activities (Defeo *et al.,* 2025). Additionally, the diversification of fisheries has emerged as a hallmark of the region, driven by shifts in socioeconomic and ecological dynamics. Compounding these challenges, the region is experiencing significant oceanographic changes that are altering the distribution and abundance of key stocks across their entire geographic range.

3. RESOURCE STATUS

3.1 Reference list of stocks

The fish stocks that FAO has monitored since 1974 in Area 41 draw from a wide spectrum of data, ranging from data-rich and formally assessed stocks, to those that have very little information apart from catch statistics, and those with no stock assessment at all. In consultation with most of the countries of Area 41, an updated reference list of stocks was compiled and classified, based on landings and/or socioeconomic importance (**APPENDIX II, TABLE 6**, pp. 429). All the information compiled was used to update the analysis on the state of the fisheries in Area 41. When possible, the list of reference stocks was matched with the list used by FAO in past assessments of the state of fisheries resources, and inconsistencies in the species names were corrected. In this report, the reference list of stocks for Area 41 covers 53 species or species groups and 69 stock units (**TABLE D.6.1**). Overall, landings of assessed stocks in Area 41 amounted to over 1.68 million tonnes (**TABLE D.6.2**).

TABLE D.6.1
SUMMARY OF ASSESSED STOCKS IN AREA 41 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	46	34	12
2 Surplus-production model approaches	23	20	8
Total	**69**	**53**	**14**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

Results indicate that 42.0 percent of stocks in Area 41 are overfished, 43.5 percent are maximally sustainably fished, and 14.5 percent are underfished (**TABLE D.6.2**). These findings align closely with previous assessments but provide enhanced resolution and were generated based on greater local participation, fostering regional collaboration. When weighted by landings volumes, an estimated 68.4 percent of the 2021 landings were from sustainable stocks.

Tier 1 stocks (with formal assessments) represent about 76.8 percent of Area 41 landings, covering 46 assessment units and 34 operational taxonomic units (most of them at the species resolution level) (**TABLE D.6.1**), of which several species are also distributed in international waters and exploited by foreign fleets. The remaining species and stocks (units of assessment) are under the exclusive jurisdiction of the countries of the Area or in shared waters (e.g. the Argentinian-Uruguayan Common Fishing Zone, AUCFZ). Most Tier 1 stocks are managed by Argentina, Brazil and Uruguay. These results include those stocks traditionally assessed by FAO and also stocks/units of assessment identified during the consultation process. In some instances, landings were aggregated under broader taxonomic categories (e.g. at the family level), while in others, taxonomic information needed to be updated. The stocks in the reference list correspond as much as possible to actual management or operational units, thus enhancing the linkages between the FAO Index and the assessment and management initiatives at the national or regional levels.

A total of 23 Tier 2 stocks were identified during the consultation process (**TABLE D.6.1**). Most of the Tier 2 stocks identified have associated effort and catch per unit effort (CPUE) estimates. For species, stocks or units of assessment where effort or CPUE data is available, extra effort should be made to select the most reliable estimates, with an emphasis on long-term data series. Additionally, it was important to prioritize the most significant fisheries/gear combinations for stocks that span multiple jurisdictions. Tier 2 species and the corresponding stocks or assessment units were included in this document under 3 subcategories: (1) stocks already included in the previous FAO reference list; (2) stocks distributed mainly in the AUCFZ and managed jointly through the Joint

Technical Commission of the Maritime Front (CTMFM), not included in the previous FAO reference list; and (3) other stocks of relevance for Brazil, Argentina and Uruguay that are mainly managed under their specific jurisdictions. The SRAplus package (Ovando *et al.*, 2021) was also used to assess some Tier 2 stocks in Area 41 as a surplus production model. Models employed effort estimates extracted from Rousseau *et al.* (2019) or specific inputs of fishing effort or abundance indices derived from, for instance, research surveys by the respective jurisdictions.

TABLE D.6.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 41 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	46	10.9	43.5	45.7	54.3	45.7
2 Surplus-production model approaches	23	21.7	43.5	34.8	65.2	34.8
Total	**69**	**14.5**	**43.5**	**42.0**	**58.0**	**42.0**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.6.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 41 IN 2021

	Weighted % by landings				
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1.68	**2.3**	**66.1**	**31.6**	**68.4**	**31.6**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 41 (**FIGURE D.6.2**).

4.1 Argentine hake

The Argentine hake *(Merluccius hubbsi)* is a benthopelagic species inhabiting the shelf and upper continental slope of the Southwest Atlantic Ocean, from 25° south (Cabo Frio, Brazil) to 48° south (Argentinian shelf). The number of stocks has been subject to scientific debate. Four main stocks have been identified for assessment and management purposes in the South Atlantic Ocean (Bezzi *et al.*, 1994; Vaz-dos-Santos and Schwingel, 2015); these stocks are located in (1) Southeastern Brazil, 21° to 29° south, (2) waters across Brazil, Uruguay and Argentina, from 29° to 41° south, (3) Southern Argentina

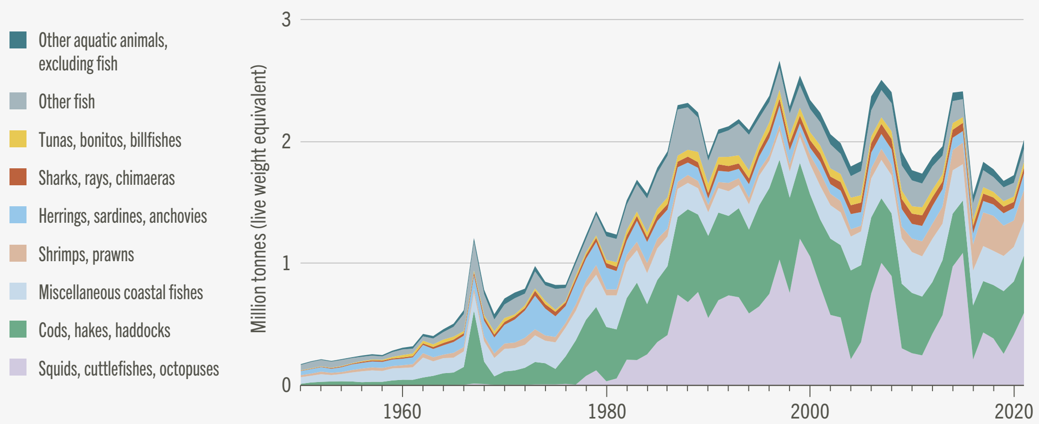
(Patagonian stock), mainly 41° to 48° south, and (4) the San Matías Gulf (41° to 42° south). The portion of the second stock in Brazilian waters is managed independently from the AUCFZ. In addition, there are other sources of Argentine hake, which include the Falkland Islands (Malvinas) stock (Winter and Ramos, 2021).

Argentine hake supports the most important offshore fisheries within the AUCFZ. Before 1998, landings in Uruguay and Argentina averaged more than 600 000 tonnes per year per fleet. Subsequently, landings declined steadily and, since 2005, total landings have not exceeded about 400 000 tonnes per year. A rebuilding management plan was initiated in 2011, including the creation of an assessment working group (CTMFM, 2016). Stock assessments are conducted regularly within the AUCFZ (Lorenzo and Defeo, 2015). Temporary spatial closures and total allowable catches (TACs) are regularly set (CTMFM, 2020a). Biomass levels are still suboptimal ($B_{2018} < B_{MSY}$) (CTMFM, 2020a). The Patagonian stock appears to be well managed. Results show an increase in the spawning biomass (estimated by extended survival analysis) close to reference point estimates of 450 000 to 550 000 tonnes (Giussi *et al.*, 2022). Spawning stock biomass estimates have been consistently above their target reference point since 2013, catches are consistently below TAC, and fishing mortality of totally recruited ages (F 3–6 years) decreased between 2014 and 2018 (Santos and Villarino, 2022). In Brazil, recent reports suggest that the stock exploited in southern Brazil is facing overexploitation (Perez and Sant'Ana, 2022). Sixty percent of catches are landed in Santa Catarina State, Brazil. Stock assessment estimates for Brazil yielded biomasses of 267 700 tonnes and 233 100 tonnes for 2001 and 2002, respectively. In 2004, the Ministry of Environment of Brazil designated this species as overexploited, but, shortly after, withdrew the resolution following political pressure (Vaz-dos-Santos and Schwingel, 2015).

4.2 Argentine shortfin squid

The Argentine shortfin squid *(Illex argentinus)* is a neritic species distributed in the Southern Atlantic Ocean between 20° and 55° south, frequently occurring between 35° and 52° south, and influenced by the Malvinas Current (Brunetti *et al.*, 1998; Haimovici *et*

FIGURE D.6.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE SOUTHWEST ATLANTIC (AREA 41) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

al., 1998; Allega *et al.,* 2020; Arkhipkin *et al.,* 2022). Coastal areas within 28° to 44° south are especially suitable most of the year (Crespi-Abril and Baron, 2012). It is distributed along the continental shelf and upper slope of the region of influence of temperate cold waters of sub-Antarctic origin and the upwelling of central Southwest Atlantic waters throughout southeastern Brazil. Its depth range extends from the surface to 800 m. The number of stocks remains uncertain (Perez *et al.,* 2009), although four sub-stocks have been suggested based on variations in length at maturity, spawning areas and seasons, and the distribution of early life stages (Brunetti *et al.,* 1998; Ivanovic *et al.,* 2023); these stocks are (1) the Summer Spawning stock (SSS), (2) the South Patagonian stock (SPS), (3) the Bonaerensis-North Patagonian stock (BNS), and (4) the Southern Brazil stock (SBS) (see additional information in Haimovici *et al.,* 1998; Rodhouse *et al.,* 2013). Argentina recognizes two main spawning populations as management units (e.g. north and south of 44° south: see Allega *et al.,* 2020). Concerning the SPS spawning site, some authors suggest that the squid spawn near the Brazil-Malvinas Confluence and egg masses reach southern Brazil (Rodhouse *et al.,* 2013); however, others favour the hypothesis that spawning takes place along the Patagonian slope between 45° and 48° south, near or at the core of the Malvinas Current. Spawning migrations to coastal areas are associated with primary productivity pulses at the Brazil-Malvinas Confluence front, whereas maturation is mainly associated with the Malvinas Current (Bazzino *et al.,* 2005; Santos and Haimovici, 2002).

Argentine shortfin squid is captured by jigging and trawling from southern Brazil to the Falkland Islands (Malvinas) (Arkhipkin *et al.,* 2022). The resource is primarily exploited within the Argentinian EEZ, in the AUCFZ, and in international waters. Since 1977, catches by local and long-range fleets have increased from 2 500 tonnes, and peaking at over 1.1 million tonnes in 1999. The fishery crashed in 2004 and has since oscillated, with peaks of around 1 million tonnes in 2007, 2014 and 2015; landings have stayed at low levels since then. The SPS supports one of the world's largest squid fisheries (Torres *et al.,* 2020). The amount of fishing by fleets in the high seas is uncertain (Winter, 2019). In 2021, the catch by the Falkland Islands (Malvinas) fleet amounted to 1 500 tonnes, while Argentina and Uruguay ammounted 132 200 tonnes and 6 200 tonnes respectively. In southeastern and southern Brazil, Haimovici *et al.* (2008) estimated a biomass of 11 300 tonnes and 41 700 tonnes for the winter–spring season of 2001 and the summer–autumn season of 2002, respectively. No published stock assessments and reference points were found in the last five years for Brazil (Perez and Sant'Ana, 2022).

For the SPS, an environmentally dependent surplus production model showed that biomass estimates ranged from 351 600 tonnes to 685 100 tonnes, therefore above B_{MSY}, and $F/F_{MSY} < 1$, suggesting a healthy condition (Wang *et al.,* 2018). Sizes at recruitment and maturity remain stable despite intense commercial exploitation (Arkhipkin *et al.,* 2022). The lack of size selection in fisheries targeting this short-lived squid is attributed to both jigs and trawls capturing the full size range of recruited individuals, thereby preventing fisheries-induced selection on size-dependent traits. With only one cohort present during the growth-phase fishery, size-related traits are primarily shaped by short-term fluctuations in population density and environmental factors, including temperature (Arkhipkin *et al.,* 2022). Management measures agreed between Argentina and the United Kingdom of Great Britain and Northern Ireland (hereafter, United Kingdom) are based on effort limitation (Dunne, 2017). There are no governance bodies or management objectives in place for the high seas of the Southwest Atlantic. However, a recent data exchange programme between Argentina and the United Kingdom set the basis for a recent stock assessment (Winter, 2019).

4.3 Whitemouth croaker

The whitemouth croaker *(Micropogonias furnieri)* is a coastal demersal species distributed from Veracruz, Mexico (20° north) to the Gulf of San Matías, Argentina (41° south) (Isaac, 1988). Its spatial distribution is explained by the broad range of temperatures and salinities that this species tolerates. Within Argentinean and Uruguayan waters, whitemouth croaker occur in a wide thermohaline gradient, from 10° C in winter to 23° C in summer, and in salinities of 0–34 practical salinity units (PSU) (CTMFM, 2020b).

Several stocks with some degree of mixing are currently recognized (Pereira *et al.,* 2009; Haimovici *et al.,* 2016). Whitemouth croaker stocks are targeted by small-scale fisheries (bottom gillnets) and by coastal industrial fisheries (gillnets and paired bottom trawls) from southern Brazil to northern Argentina. Stock assessments are conducted regularly within the AUCFZ. Temporary spatial closures to protect spawners and juveniles, a minimum landing size, and TACs are set regularly to improve stock status (CTMFM, 2020b). Within the AUCFZ, the species is sustainably fished ($F_{2019} < F_{MSY}$), and biomass levels are above target reference points ($B_{2019} > B_{MSY}$) (CTMFM, 2020b); whereas in southern Brazil, the stock size has decreased to about 10 percent of its virgin biomass (Haimovici *et al.,* 2021).

4.4 Stripped weakfish

The stripped weakfish *(Cynoscion guatucupa)* is endemic to the SWAO. It is distributed from Río de Janeiro, Brazil (22° south) to Chubut, Argentina (41° south), inhabiting shallow (< 50 m) mixohaline and marine coastal waters (Cousseau and Perrota, 2013). Up to three stocks have been suggested (although assessments are only available for two) based on latitudinal differences in population and biological parameters: the southern Brazil-Uruguay stock, the northern bonaerense stock and the southern bonaerense stock (El Rincón) (Volpedo *et al.,* 2007). Due to the poleward reproductive migration of the Brazilian stock, several authors propose that the southern Brazil stock and northern Argentinian stock are connected stocks and should be a single management unit (Vieira and Haimovici, 1997; Volpedo *et al.,* 2009). A single stock could also be feasible, considering the high variability between populations (CTMFM, 2020c). However, stocks are managed separately, primarily for geopolitical reasons.

The Brazilian management unit (Santa Catarina-Rio Grande do Sul) withstands high exploitation rates (Cardoso *et al.,* 2022). Even though regulations for bottom trawling (pair and otter trawlers) and gillnet fishing are in place, enforcement is poor. Within the AUCFZ, stripped weakfish are targeted by industrial (bottom pair trawlers) and small-scale (gillnets) fisheries. Stock assessments are conducted regularly in this management unit. Regulations (e.g. minimum landing size) and TACs are set regularly to improve stock status (CTMFM, 2020c). The species is sustainably fished ($F_{2018} < F_{MSY}$), and biomass levels are above target reference points ($B_{2018} > B_{MSY}$) (CTMFM, 2020c). The management unit of the El Rincón area is managed exclusively by Argentina.

4.5 Argentine anchovy

The Argentine anchovy *(Engraulis anchoita)* is a small pelagic fish distributed from Cabo Frío, Brazil (24° south) to Golfo San Jorge, Argentina (47° south). The species inhabits shallow areas and waters beyond the continental slope (CTMFM, 2020d). The existence of two populations southward of 34° south has been postulated: a northern population inhabiting the AUCFZ and the Buenos Aires platform, and a Patagonian population inhabiting between 41° and 47° south. In southern Brazil, two stocks have been suggested, although assessments on these units are not available (Castello, 2005; Carvalho and Castello, 2013): “sanpaulense” and “riograndense”. However, Carvalho and Castello (2013) suggested that the “riograndense” stock may be part of the AUCFZ stock that annually migrates to northern waters in winter.

The bonaerense stock (34° to 41° south) is almost exclusively exploited by the offshore and coastal fishing fleets of Argentina (they have been responsible for more than 95 percent of total landings in the last decade), operating in areas within the AUCFZ, but also in coastal waters and in the EEZ between 39° to 41° south. Landings in Argentina averaged 20 000 tonnes during the period 1990–2018, representing a minimal fraction of the available biomass. Uruguayan landings are almost negligible, except for 2005 and 2006 when landings reached 9 631 tonnes and 12 890 tonnes, respectively. Stock assessments are conducted regularly within the AUCFZ. TACs are set regularly following a precautionary approach (CTMFM, 2020d). The stock is sustainably fished ($F_{2018} < F_{MSY}$), and biomass estimates are well above sustainable yield levels ($B_{2018} > B_{MSY}$) (CTMFM, 2020d).

4.6 Brazilian sardinella

The Brazilian sardinella *(Sardinella brasiliensis)* is a pelagic species distributed from southern Florida (United States of America) to the South American coast. However, the current recognized distribution of Brazilian sardinella is limited to southeastern Brazil. Historically, its southern distribution edge was at 29° south (Santa Marta Grande Cape), but recent reports document catches in shallow waters (30 m depth) between 31° and 33° south (Catalani, 2017), suggesting a poleward shift likely linked to the intensification and poleward movement of the Brazilian Current. Gasalla *et al.* (2017) noted that the Brazilian sardinella has shifted to colder and deeper waters.

Brazilian sardinella has been the primary target of the southeastern Brazil seine fishery (23° to 9° south) for decades. Due to uncertainties regarding its distribution and the inclusion of congeneric species in catch statistics, this species is considered data-limited. Population collapses in the 1980s and 1990s were attributed to low recruitment driven by a small spawning stock, heavy fishing pressure, and unfavourable environmental conditions (Franco *et al.,* 2020). By 2016, the fishery was on the brink of collapse due to high catch and natural mortality rates, declining primary production, and rising water temperatures (Schroeder *et al.,* 2024).

4.7 Argentina red shrimp

The Argentine red shrimp *(Pleoticus muelleri)* is a cool-water species of sub-Antarctic origin. Its distribution has been mainly driven by the poleward displacement of the Brazilian Current during the past decades (Gianelli *et al.,* 2023). Abundance is affected by the South Atlantic Central Water (cold waters at 15 °C), which can lead to a temperature decrease in deeper areas (> 15 m). There is a positive relationship between Argentine red shrimp abundance and depth, with an inverse association with bottom temperature (Castilho *et al.,* 2008). Ocean warming could affect its thermal tolerance and survival, and could lead to changes in its bathymetric distribution. Abundance is also positively correlated with salinity and negatively with sediment silt and clay content. The increasing sedimentation and inflow of fresh water from the continent resulting from changes in climate and land use could also lead to deleterious effects (Bernardo *et al.,* 2018).

Argentine red shrimp is harvested throughout its geographic range. This species is one of the most valued in the international market, and currently provides the highest economic returns in Area 41. In Argentina, landings by freezer and fresh trawlers have increased since 2006, up to 255 000 tonnes in 2018 (Giussi *et al.,* 2022). In southern Brazil, it constitutes a critical trawl fishery in terms of catches and income (Metri and Perez, 2014). In Uruguay, it is artisanally harvested (Segura and Delgado, 2012). In Argentina, the management framework is mainly based on recruitment assessment and its relationship with environmental factors; an onboard observer programme monitors the bycatch of bony and cartilaginous fish. Minimum harvestable sizes and closed areas have been established.

5. KEY FINDINGS

Most of the fisheries in Area 41 are primarily targeted by industrial fleets, although some of the same stocks are also targeted by small-scale fisheries in coastal waters. In this context, data from industrial fisheries tend to be more reliable than data from small-scale fisheries. Furthermore, data on valuable export-oriented fisheries resources, most of which fall under Tier 1 categorization, are likely to be more reliable compared to less valuable species, some of which are grouped under Tier 2. Overall, there have been significant improvements in the taxonomic resolution of species data. For example, the volume of catch classified as "marine fishes nei" (not elsewhere included) has decreased since the 1987 peak. Although the taxonomic status of some stocks was updated during the consultation process, inconsistencies in the global FAO database remain.

The updated assessment shows that 42.0 percent of stocks in Area 41 are overfished, 43.5 percent are maximally sustainably fished, and 14.5 percent are underfished. These findings are broadly consistent with assessments under the previous methodology (**TABLE D.6.4** and **TABLE D.6.5**), but they offer improved resolution and have fostered regional collaboration. In addition, the coverage of assessed stocks accounted for 85.4 percent of landings in 2021, a significant increase in comparison with 68.4 percent of landings assessed with the previous methodology in 2021. The participatory approach to categorizing stocks into tiers based on data availability was highly effective. Beyond the similarity of the outcomes, the strength of using the updated methodology lies in several aspects: (1) it aligns more closely with the realities of the fisheries development situation in Area 41 and globally, (2) it encompasses a significant increase in the number of exploited stocks within the Area, and (3) the participatory process adds realism, confidence, and strengthens estimations, while simultaneously fostering interaction among countries. These estimates should be enhanced by incorporating stocks, potentially classified as Tier 3, that are targeted by small-scale fisheries with a critical socioeconomic role for local communities. This is particularly important for fisheries operating along the northern coasts of Brazil, although the approach should not be limited to this region.

The asymmetry in information among FAO subareas within Area 41 is also evident, with the majority of identified and assessed stocks distributed from subarea 41.2.1 (20° south) to subarea 41.3.2 (60° south). Tier 1 stocks located in southern Brazil, and those jointly managed by Argentina and Uruguay in the AUCFZ, are regularly assessed using age-based integrated stock assessment models. In many cases, these assessments undergo routine peer-review processes conducted by scientific groups. Consequently, robust quality control mechanisms are in place for Tier 1 stock assessments in these FAO subareas. However, differences were observed in the quality and quantity of information based on the fisheries complexity and data systems when comparing stocks in these subareas to those primarily located in the north and northeast of Brazilian waters (e.g. 41.1.1 to 41.1.4). Additional analyses are needed to assess the status of stocks in northern Brazil to provide a comprehensive understanding of the stock situation across the entire region. Using different auxiliary effort data gave conflicting stock assessment results for northern Brazilian stocks, indicating that more research was needed.

The updated FAO approach aligns stock assessments with ecological realities and regional bioregionalization schemes to address data inconsistencies. Indeed, many of the stocks categorized in Tiers 1 and 2 in this document broadly align with the distribution of FAO subareas and the bioregionalization scheme for coastal and shelf areas proposed by Spalding *et al.* (2007). Specifically, Tier 1 and Tier 2 stocks are primarily distributed and exploited within FAO subareas 41.2.1 (Santos), 41.2.2 (Rio Grande) and 41.2.3 (Platense) of Area 41 (Figure 1). While these FAO subareas are not identical, they correspond to the Southeastern Brazil, Rio Grande, and Rio de la Plata/Uruguay-Buenos Aires Shelf ecoregions within the Warm Temperate Southwestern Atlantic Province (Spalding *et al.*, 2007). Similarly, stocks in subareas 41.3.1, 41.3.2 and 41.3.3 predominantly inhabit the Magellanic Province and its associated ecoregions.

Regional collaboration and expert integration are essential for developing strategies that reflect the spatial and temporal complexity of fisheries. Sustainability depends on holistic management that supports ecosystem health and socioeconomic stability for dependent communities. Transboundary species highlight the urgent need for a regional approach that integrates science and governance to establish cohesive frameworks (Gianelli *et al.*, 2023; Defeo *et al.*, 2025). Given that there is no regional fisheries management organization in the Southwest Atlantic, the FAO-led participatory framework for categorizing the state of the stocks at the regional level is a critical step toward informing policies for effective regional fisheries management. Additional efforts might be needed to refine taxonomic resolution, and prioritize key fisheries across jurisdictions, as well as to assess smaller stocks, and enhance their time series. This ongoing, adaptive process is essential for addressing challenges posed by diverse fishery dynamics and fostering the sustainability of resources and livelihoods in the Southwest Atlantic.

Finally, refining methodologies to incorporate long-term data, improve taxonomic resolution, and prioritize key fisheries across jurisdictions is crucial. An adaptive process is needed to address fishery complexities and ensure the sustainability of resources and livelihoods in the Southwest Atlantic.

TABLE D.6.4
COMPARISON BY NUMBER OF STOCKS OF THE PAST AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 41

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
69	14.5	43.5	42.0	58.0	42.0	17	5.9	52.9	41.2	58.8	41.2

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.6.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 41 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
2.3	66.1	31.6	68.4	31.6	0.7	72.7	26.6	73.4	26.6

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

FAO MAJOR FISHING AREA 41

ATLANTIC, SOUTHWEST

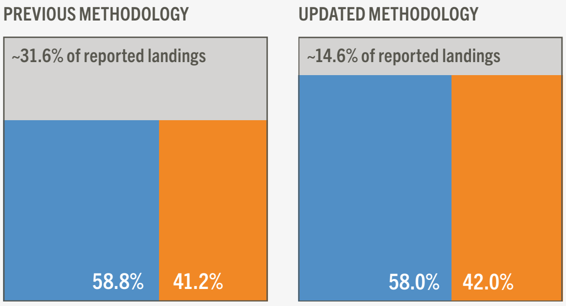
AREA 41

KEY MESSAGES

- Fisheries are a thriving industry and provide employment to many in the region.
- Fisheries are especially significant in terms of food security and livelihoods to millions, especially in the northern part of this region.
- Management is focused on rebuilding recently overfished large commercial stocks and improving enforcement and monitoring.
- In recent years, information on many more stocks became available.
- Protection of areas important to maintaining viable fisheries, such as spawning and nursing grounds, has been strengthened.

STOCK STATUS

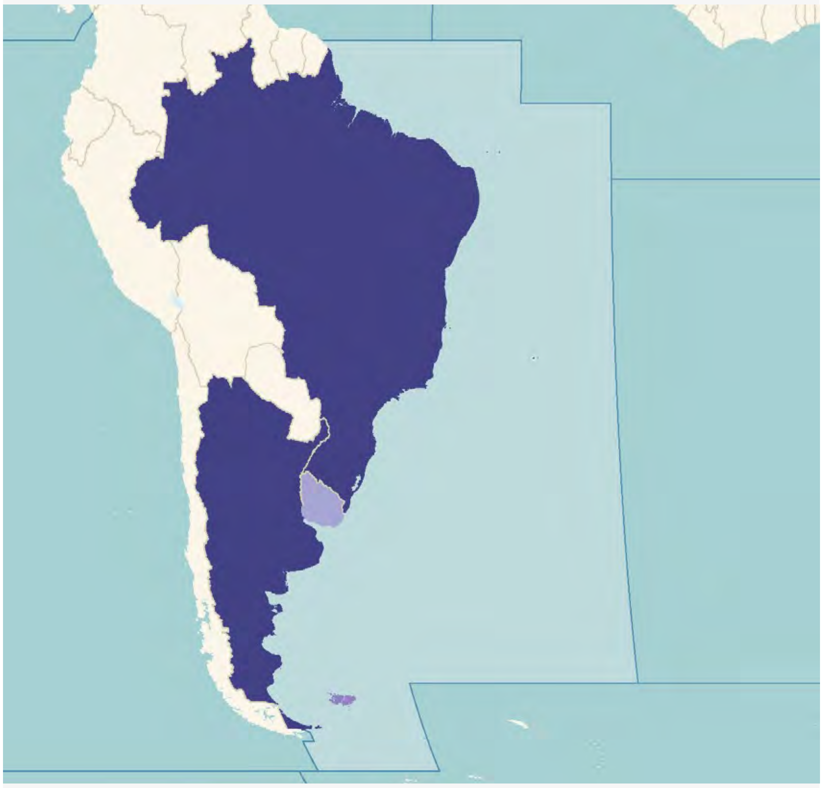
FAO estimates, 2021



- Biologically sustainable
- Biologically unsustainable
- Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



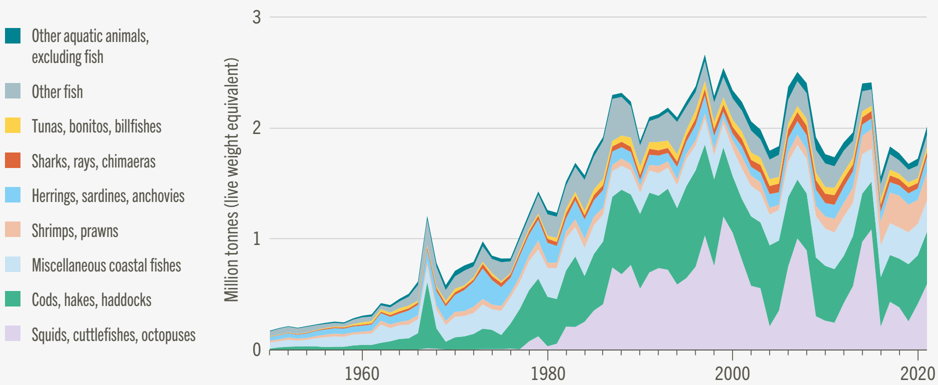
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | < 1% | 1 – 5% | 5 – 10% | 10 – 20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

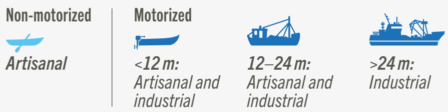


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 32 000



- Non-motorized: 7%
- Motorized: 93%

LANDINGS

FAO data, 2021

Reported landings ~ 2 million tonnes

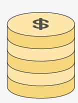
- Unidentified: 3%
- Identified at species group level: 97%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 5 billion



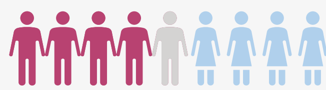
= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 895 000

- Male: 47%
- Unspecified: 11%
- Female: 42%



= 100 000 PEOPLE

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FIGURE D.6.3 *(previous page)*
AREA 41 – DATA AT A GLANCE

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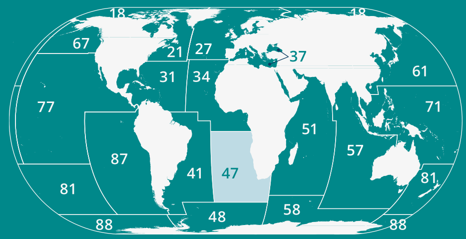
47



Part D, Chapter 7 (D.7)

SOUTHEAST ATLANTIC

FAO MAJOR FISHING AREA 47

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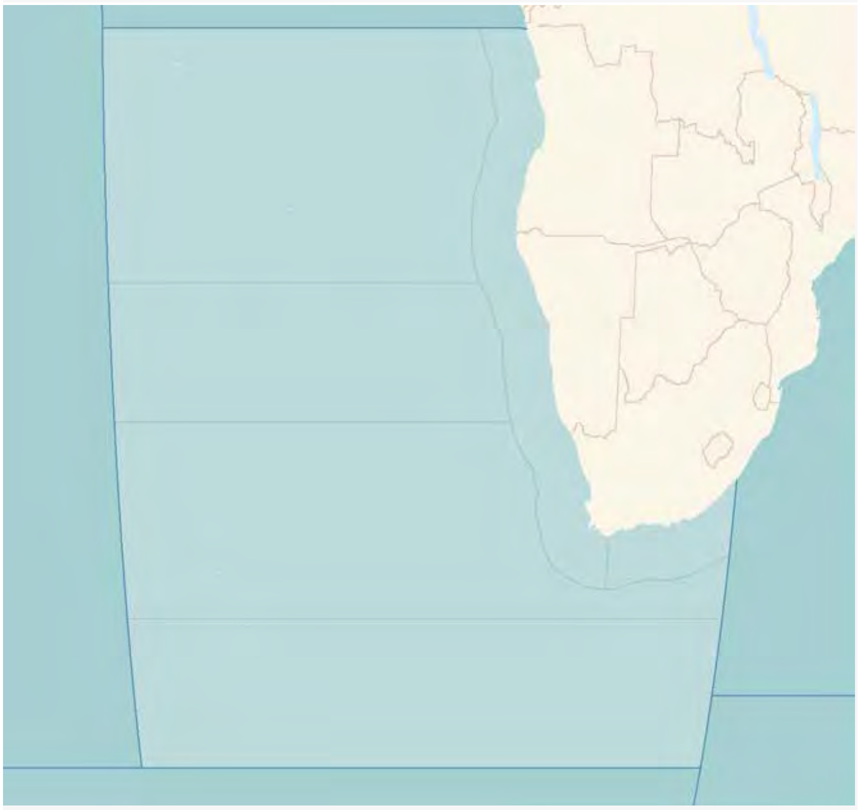
1. OVERVIEW

The Southeast Atlantic, designated by FAO as Major Fishing Area 47 (hereafter, Area 47), encompasses the exclusive economic zones (EEZ) of Angola (except for the Cabinda province exclave which forms part of Area 34), Namibia and South Africa, and extends well into the high seas to the south and west (**FIGURE D.7.1**). The islands of Saint Helena,

FIGURE D.7.1
FAO MAJOR FISHING AREA 47: THE SOUTHEAST ATLANTIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

Ascension and Tristan da Cunha also fall within Area 47. The region covers a total surface area of about 18 million km², with less than 0.5 million km² being shelf area. The high productivity of this region can mostly be attributed to the Benguela upwelling system.

The EEZs of Area 47 are dominated by two main current systems: the southward-flowing warm Angola Current (Kirkman and Nsingi, 2019) and the northward-flowing temperate Benguela Current. The Agulhas and Benguela currents meet around Cape Agulhas, on the southern tip of Africa. The northward flowing Benguela meets the southward flowing Angola current to form the Angola-Benguela Front (ABF). The relative position of the ABF (**FIGURE D.7.2**) moves seasonally, being located further north during the cold season (May to October) and displacing south during the warm season (November to April). The two current systems define two relatively well-defined ecosystems: the Angola subtropical warm ecosystem, with relatively high diversity and moderate resource abundance in the north; and the Benguela temperate upwelling ecosystem, characterized by lower diversity but higher abundance of fishery resources, in the south.

The Benguela ecosystem can be subdivided into the northern Benguela and the southern Benguela, separated near the town of Lüderitz by the Lüderitz cell, the most intensive wind-induced upwelling cell in the world (Bakun, 1996). The Benguela Current Large Marine Ecosystem (BCLME) covers the Atlantic coast of the three countries, including the two current systems in the Area (**FIGURE D.7.2**).

The region is periodically affected by the "Benguela Niño," which occurs periodically at irregular intervals of about once per decade. These events are characterized by abnormally high sea surface temperatures along the coasts of Angola and Namibia, which can significantly impact the climate, marine ecosystems, and fisheries in the Area (Shannon *et al.,* 1986; Imbol Koungue *et al.,* 2019)

2. FISHERY PROFILES

2.1 General

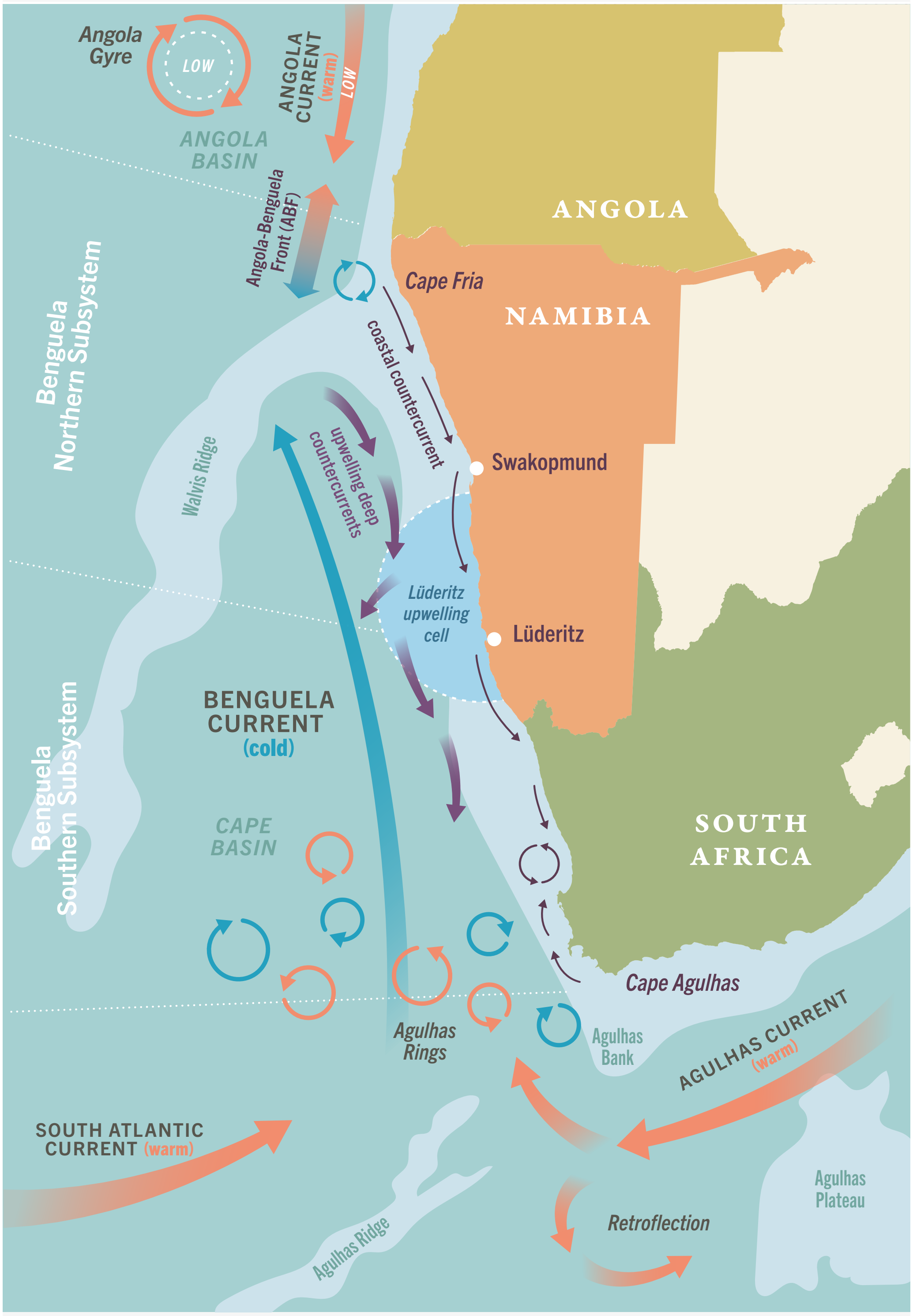
Area 47 is one of the most productive fishing grounds in the world. Reported catches in this Area peaked in 1978 at around 3.3 million tonnes and have since plateaued at around 1.5 million tonnes per year (**FIGURE D.7.3**). This Area accounted for 1.8 percent (1.5 million tonnes) of total declared global marine capture production in 2021 (80 million tonnes) (FAO, 2024c).

The majority of the catch by tonnage in the region is landed by industrial and semi-industrial fisheries, which operate mostly on the shelf and at the shelf edge (i.e. trawl, purse-seine and longline). This region also supports a large proportion of artisanal and small-scale fisheries (SSF). The coast is generally exposed to wave action and dangerous for landing fishing vessels. Vessels land mostly at more or less sheltered locations across the region.

Landings are dominated by small pelagic fish (Pacific sardine *(Sardinops sagax),* sardinellas, European anchovy [*Engraulis encrasicolus*], round herring [*Etrumeus teres*] and Atlantic horse mackerel [*Trachurus trachurus*]); these represent more than 42 percent of the declared landings of the last five years. Two hake species are second in terms of amount landed. Among the small pelagics, sardine used to be the dominant species in terms of landings, mostly from Namibia, although the Namibian stock collapsed between the late 1960s and early 1970s (Boyer and Hampton, 2001).

The level and scope of fisheries management differs between the three countries in the region. Some of these differences arise from the nature of the fisheries and the history of the three countries, shaped by colonial legacies and the industrial development of fisheries. In all three countries, fishing licences are required for all commercial fishing (industrial, semi-industrial and artisanal). Fisheries management is based on an annual cycle, and the combined use of effort and landings control with technical measures like minimum sizes and space and time closures. Industrial and semi-industrial fisheries for the main resources are mostly managed with a total allowable catch (TAC) and quota system, with total

FIGURE D.7.2
THE BENGUELA CURRENT LARGE MARINE ECOSYSTEM (BCLME)



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Source: United Nations Geospatial. 2020. Map geodata. Adapted from **Cochrane, K. L., Augustyn, C. J., Fairweather, T., Japp, D., Kilongo, K., Iitembu, J., Moroff, N. *et al.*** 2009. Benguela Current Large Marine Ecosystem—Governance and Management for an Ecosystem Approach to Fisheries in the Region. *Coastal Management*, 37(3–4), 235–254. https://doi.org/10.1080/08920750902851187 allowable effort (TAE) systems in place for some of the smaller commercial and artisanal fisheries. Landings from some artisanal fisheries are estimated using a catch assessment survey process and accounted for when setting TACs for the larger-scale fleet segments, others have catch reporting schemes similar to larger, industrial fleets.

Additionally, the three countries are parties to the Benguela Current Convention, which established the Benguela Current Commission (BCC) in 2007 as a permanent intergovernmental organization. The BCC is the first intergovernmental commission based on the Large Marine Ecosystem concept of ocean governance, and aims at coordinating multi-sectoral management of the BCLME.

All three countries make intensive use of scientific surveys at sea (including through cooperation with the EAF-Nansen programme) to monitor the state of the main fishery resources, and they also monitor the landings of the main target species from the large-scale commercial industrial fisheries. Only limited monitoring of non-target species from the large commercial fisheries is performed. With the exception of South Africa, the countries do not have the means to monitor in detail the artisanal, small-scale fisheries or semi-industrial fisheries that do not have long-standing or detailed catch information. South Africa also conducts its own fisheries independent surveys in addition to those of the EAF Nansen programme.

2.2 Angola

The Republic of Angola has a coastline of 1 700 km and an EEZ of 500 000 km^2. Almost all of the coastline (the exception being the Cabinda province exclave in the north that falls within FAO Major Fishing Area 34) falls within Area 47. The entire coast of Angola is located within the BCLME. Capture fisheries currently contribute 3–5 percent of gross domestic product (GDP), with a very important contribution to the food and nutritional security of the Angolan population (FAO, 2025).

Angolan fisheries include all sectors of fishing: industrial, semi-industrial, artisanal and subsistence. All these sub-sectors operate along the whole coast. The industrial fleet lands almost exclusively in the industrial fishing ports of Luanda, Lobito and Namibe, while the semi-industrial – and even more the artisanal – fleets land at more or less sheltered locations along the coastline.

Fishing zones in Angola can be divided into three geographically distinct fishing zones (Lankester, 2002; Soares and Jabado, 2024). The southern fishing zone, from Lobito to the mouth of the Cunene River, is the most productive. Species richness in this zone is greatest at depths of about 100 m, comprising horse mackerel, sardines, tunas, and a range of demersal species including sea breams, hakes, groupers and croakers. The central fishing zone, extending from Luanda to Lobito, yields mainly sardinellas, horse mackerel and several demersal species (hakes, groupers and seabreams). The northern fishing zone, extending from the mouth of the Congo River to Luanda, includes large populations of horse mackerel and sardinellas and a smaller proportion of demersal species.

The industrial fleet includes mostly purse-seiners and bottom trawlers, but there are also pelagic and semi-pelagic trawlers, longliners and trap vessels. The semi-industrial fleet is dominated by purse-seiners, with some longliners, bottom trawlers, trap vessels and other types of vessels. The artisanal fleet, on the other hand, includes vessels using almost all kinds of gear, mostly passive gear like handlines, longlines and gillnets.

Angola has a high per-capita consumption of fish, and most of the fish landed is used for domestic consumption. Additionally, Angola imports significant amounts of small pelagic fish to satisfy internal demand.

2.3 Namibia

The Republic of Namibia has a coastline of about 1 600 km and an EEZ of 540 000 km^2. This coastline falls entirely within Area 47 and within the BCLME region. Capture fisheries currently contribute about 2.6 percent of GDP, and over 10 percent of export earnings (NSA, 2021).

The Namibian marine fisheries sector includes commercial, recreational and subsistence fisheries. There are about 20 commercial fishery species in Namibia. Some of these species are regulated by the setting of annual TACs: horse mackerel, hake, monkfish (also known as devil anglerfish, *Lophius vomerinus*), Pacific sardine, orange roughy *(Hoplostethus atlanticus),* rock lobster, and crab, among others. Pilchard and orange roughy are currently in a moratorium while other commercial bycatch species are regulated through effort control and bycatch levies as derived from the landed value. Commercial fishing, especially the industrial sub-segment, takes place along the whole coast. Hake, monkfish and adult horse mackerel are present along the entire coast, while sardine, crab and juvenile horse mackerel are mainly in the north. Most of the recreational fishing activities are concentrated in the central area as large parts of the northern and southern areas are closed to recreational fishing. Commercial landings take place at Walvis Bay (the largest port) and Lüderitz.

Most of the industrial commercial vessels are bottom trawlers, purse seiners and midwater trawlers, with a lower number of longliners or handliners. The line fisheries are primarily small-scale fisheries in this Area. There is also a dedicated crab and lobster trap fishery. Most of the fish caught in Namibia is exported, as domestic fish consumption is limited.

2.4 South Africa

The Republic of South Africa has a coastline of over 3 000 km and an EEZ of just over 1 000 000 km^2. Most of the coastline falls within Area 47, although the easternmost part of the coastline is part of the Western Indian Ocean (Area 51). The whole coast of South Africa is considered to be within the BCLME. Capture fisheries in South Africa contribute less than 1 percent of GDP but constitute an important sector for food security, employment and culture, especially in the west and south coasts.

The South African marine fisheries sector includes large-scale commercial, artisanal, recreational and subsistence fisheries, which take place along the entire coast. Industrial vessels primarily land at fishing ports on the West Coast, St. Helena Bay, Saldanha Bay, Cape Town, and the South Coast posts of Mossel Bay and Port Elizabeth. Smaller commercial vessels also land at other smaller landing ports, including Port Nolloth, Hondeklip, Laaiplek, Hout Bay, Kalk Bay, Gansbaai, Hermanus and East London. Small-scale and artisanal fishers operate in almost 150 fishing communities along the coast.

Commercial fisheries include demersal and midwater trawl, purse-seine, demersal and pelagic longline, lobster pot, tuna pole-and-line, squid jig, and traditional line fishing. The small pelagic fishery uses purse seines and is the largest fishery by tonnage, with catches dominated by anchovy, followed by sardine and round herring. These contribute about 25 percent of the country's catch value. The fishery sectors which contribute the largest catch value are deep-sea demersal trawling and demersal longlining, both targeting hake. These contribute on average over 40 percent of total catch value, roughly equal to all other South African marine fisheries combined. Although the crustacean and squid jig fishery catches are comparatively small, they account for 15 percent of all catch value.

South Africa has both an active domestic market for fish products and an export market. A large part of the catch from the industrial fisheries is exported, while most of the products from the artisanal and small-scale fishing is sold on the domestic market.

2.5 Areas beyond national jurisdiction

The high seas under the South East Atlantic Fisheries Organization (SEAFO) cover most of Area 47 (with the exception of the EEZs of coastal states). Fisheries in the high seas include mostly those targeting tuna and tuna-like species, and those targeting demersal resources like deep-water red crab *(Chaceon quinquedens),* orange roughy and other deep-water resources. Both groups of fisheries are targeted by an international distant-water fleet as well as by some vessels from the coastal nations.

2.6 British Overseas Territories

The British Overseas Territories of Saint Helena, Ascension and Tristan da Cunha have very specific fishery types. In those islands, rock lobster is the main focus of fisheries, contributing 80 percent of declared catches in 2021, followed by tunas (FAO, 2024b). Saint Helena's tuna fishery promotes pole-and-line fishing. Ascension collects licence fees from commercial longline tuna vessels operating under fishing quotas issued by the International Commission for the Conservation of Atlantic Tunas (ICCAT). Ascension Island has designated all of its EEZ as a marine protected area (MPA), while Tristan da Cunha has declared 91 percent of its EEZ as an MPA (Tristan da Cunha Government and Tristan da Cunha Association, 2020).

3. RESOURCE STATUS

The reference list for Area 47 includes 81 assessed stocks, representing 70 distinct species (**TABLE D.7.1** and **APPENDIX II, TABLE 7,** pp. 432). Of these, 39 (48.1 percent) are considered Tier 1 (with formal assessments), 36 (44.4 percent) Tier 2 (assessed with surplus-production model approaches), and only 6 (7.4 percent) were Tier 3 stocks (assessed using data-limited approaches). The updated methodology covers 93.8 percent of the total declared landings for Area 47 in 2021, an increase from 84.6 percent.

TABLE D.7.1
SUMMARY OF ASSESSED STOCKS IN AREA 47 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	39	33	12
2 Surplus-production model approaches	36	36	7
3 Data-limited approaches	6	6	4
Total	**81**	**70**	**13**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

Of these 81 stocks, 33.3 percent were classified as underfished, 24.7 percent as maximally sustainably fished, and 42.0 percent as overfished in 2021 (**TABLE D.7.2**). Accordingly, it is estimated that 58.0 percent of the stocks can be classified as sustainable, while 42.0 percent are classified as unsustainable in 2021.

The distribution of stocks among the three status categories was not the same for all tiers (**TABLE D.7.2**). Tier 2 tended to have a higher percentage of stocks classified as underfished and overfished compared to Tier 1. The very low number of stocks from Tier 3 does not warrant any meaningful comparison regarding their distribution across the status categories.

While the overall proportion of sustainably fished stocks (those that are maximally sustainably fished and underfished) remains relatively unchanged, the distribution between underfished and maximally sustainably fished has shifted significantly under the updated methodology, with 33.3 percent rated as underfished and 24.7 percent as maximally sustainably fished in 2021 with the updated methodology, compared to 0 percent and 59.5 percent respectively for the same year with the previous methodology (**TABLE D.7.4**). This shift is largely due to the inclusion of several new stocks – primarily species that are either caught as bycatch or not actively targeted but hold important cultural and ecological value, many of which are rated as underfished. These species are mostly incidental catches within trawl fisheries. In contrast, the artisanal line fishery and small-scale fisheries do not produce bycatch, as all catch is utilized. Notably, none of the species in these small-scale fisheries, and few of the commercially targeted stocks included in the updated assessment, are considered underfished.

TABLE D.7.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 47 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	39	33.3	28.2	38.5	61.5	38.5
2 Surplus-production model approaches	36	38.9	19.4	41.7	58.3	41.7
3 Data-limited approaches	6	0.0	33.3	66.7	33.3	66.7
Total	**81**	**33.3**	**24.7**	**42.0**	**58.0**	**42.0**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

Considering the amount of declared landings attributed to these stocks in 2021 (**TABLE D.7.3**), stocks classified as underfished comprise 5.9 percent of the total landings accounted for by the assessed stocks, while those classified as maximally sustainably fished account for 37.9 percent, and those classified as overfished account for 56.2 percent of the total landings of the assessed stocks. Accordingly, stocks classified as sustainable account for 43.8 percent of the landings, with 56.2 percent classified as unsustainable in 2021.

TABLE D.7.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 47 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1.32	**5.9**	**37.9**	**56.2**	**43.8**	**56.2**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Sources: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 47 (**FIGURE D.7.3**).

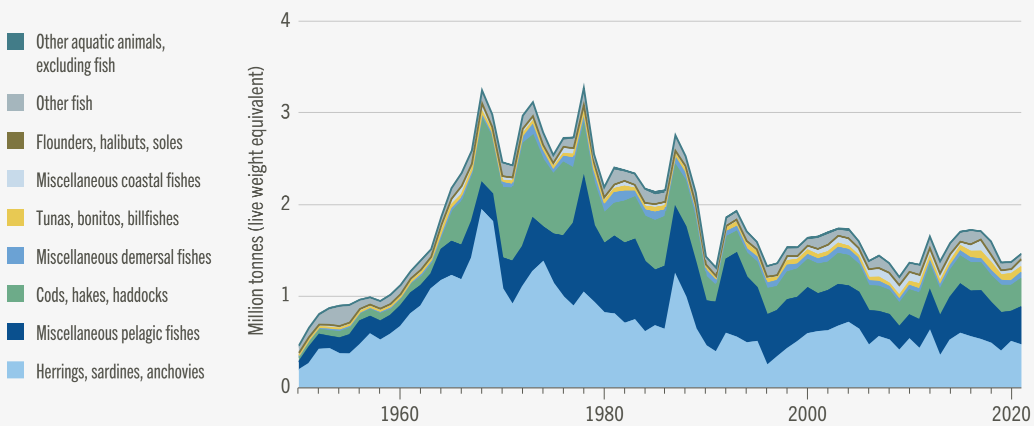
4.1 Small pelagic fishes

Small pelagic fishes are important in the region (**FIGURE D.7.3**). They are of high value, a high-quality source of protein, and occupy an important role in the marine food web since they are the forage fish that provide the link between plankton and larger-bodied predatory fish (DFFE, 2023). Acquiring a stock status for these species can prove difficult as they are characterized by inherent and high levels of natural variability. Careful management of these species is vital due to the key role they play within the BCLME. South Africa manages small-pelagic stocks through Operational Management Procedures (OMPs). An OMP is an adaptive management approach that uses a simulation-tested set of rules and pre-specified data, stock assessment methods and harvest control rules to determine and implement management actions (i.e. TAC).

In Namibia, catches of small pelagic fish peaked at 1.5 million tonnes in 1968, dominated by sardine, but collapsed shortly after (Paterson, Kirchner and Ommer, 2013). In Angola, sardinellas are an important pelagic fish stock, fished by purse-seining and used almost exclusively for human consumption. In South Africa, the purse-seine fishery is the largest fishery in terms of landed mass and second only to hake in terms of value (DFFE, 2023). Ninety-five percent of its landings are European anchovy [*(Engraulis encrasicolus)* also known as Southern African anchovy *(Engraulis capensis)*], Pacific sardine *(Sardinops sagax)* and Whitehead's round herring *(Etrumeus whiteheadi)* (DFFE, 2023). Overall, most sardines in Area 47 are overfished with one stock maximally sustainably fished. Anchovy and Whitehead's round herring are considered maximally sustainably fished.

Cape horse mackerel *(Trachurus capensis)* is a major target species in South Africa, Namibia and southern Angola. It is commonly accepted that there are two stocks, a northern stock distributed along northern Namibia and southern Angola, and a southern stock in the extreme south of Namibia and South Africa, separated by the Luderitz upwelling cell. Cunene horse mackerel *(Trachurus trecae)* is a main target species in the region. It is associated with the Angola Current ecosystem, and is distributed along the whole coast

FIGURE D.7.3
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE SOUTHEAST ATLANTIC (AREA 47) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

of Angola, extending to the northern part of Namibia with a higher proportion there during the cold season. The stock of Cunene horse mackerel is classified as overfished, while the two stocks of Cape horse mackerel are classified as maximally sustainably fished.

4.2 Hake

Shallow-water Cape hake *(Merluccius capensis)* and deep-water Cape hake *(Merluccius paradoxus)* are important economic stocks for Namibia and South Africa. They are also captured in small amounts in the south of Angola, together with Benguela hake *(Merluccius polli)* that is fished along the whole Angolan coast.

In South Africa, these stocks are targeted through multiple sectors (trawl, longline, handline) but the deep-sea trawl sector lands the most. Approximately 80 percent of all hake landed in the past decade in South Africa has been deep-water hake. Approximately 60 percent of the South African hake catch is exported, and the main markets are in Europe, Australia and the United States of America (SADSTIA, 2024). Since 1991, South African hake stocks have been managed through OMPs, similarly to small pelagic stocks. These OMPs regulate and attribute the hake TAC by sector.

In Namibia, hake is also an important economic resource. Most of the hake landed is exported. Hake is targeted by longline and bottom trawl. The stocks of shallow-water Cape hake and deep-water Cape hake are assessed and managed separately in Namibia and South Africa. Most stocks of hake are classified as overfished, although two stocks are considered underfished.

4.3 Lobster

West coast rock lobster or Cape rock lobster *(Jasus lalandii)* is endemic to the BCLME. Rock lobster is caught using baited traps off vessels. Catches peaked in the 1950s at over 25 000 tonnes, and then collapsed due to overfishing and changes in environmental conditions (Grobler and Noli-Peard, 1997). They have not shown any sign of recovery since. Two lobster stocks are overfished and one is maximally sustainably fished.

In South Africa, the Cape rock lobster resource is harvested inshore by hoop nets from small wooden rowing boats and then offshore by trap vessels. This resource is important to coastal communities and its decline has resulted in economic hardships for most fishers on the West Coast (DFFE, 2023). South Africa's southeast coast also has an endemic population of Southern spiny lobster *(Palinurus gilchristi)*. This fishery operates using longlines and traps and is now the largest rock-lobster fishery in South Africa. Lobster is also key to fishing activities in the British overseas territories, and there is a processing factory on Tristan da Cunha for St. Paul rock lobster *(Jasus paulensis)*.

4.4 Monkfish

Two stocks of monkfish occur off the Namibian coast – Cape monkfish or devil anglerfish *(Lophius vomerinus)* – making up 99 percent of commercial landings. Monkfish started as a bycatch species from the hake fishery but now has a directed demersal trawl fishery and is assessed annually using an age-structured population model (Kathena *et al.*, 2018). The resource is currently underfished. It is an important food source in Namibia and has important export value.

4.5 Squid

The Angolan flying squid *(Todarodes angolensis)* is found all along the Namibian coast and is caught as bycatch in demersal and mid-water trawl fisheries. Catches were at their lowest in the late 1980s but peaked in 2002 to 2003 at around 1 000 tonnes. In South Africa, a different species – the Cape Hope squid *(Loligo renaudii)*, commonly referred to as "chokka"– is caught. There is a targeted commercial jig fishery that operates using handheld jigs and is labour-intensive. It employs about 3 000 people and is South Africa's third-largest fishery in terms of value. Most of the squid is frozen at sea in small blocks and is then exported to European countries. It is to a lesser extent used locally as bait by linefishers. Squid is also caught as bycatch in the trawl fishery, with catches of 200 to 800 tonnes annually. The stock is managed using TAE. Overall, squid stocks in Area 47 are classified as underfished or maximally sustainably fished.

4.6 Sharks

South Africa has one shark-directed fishery, the demersal shark longline fishery, which targets smooth-hound *(Mustelus mustelus)* and soupfin shark (also known as tope shark, *Galeorhinus galeus).* In addition, two shark species represent considerable bycatch in the large pelagic longline fishery, namely blue shark *(Prionace glauca)* and shortfin mako shark *(Isurus oxyrinchus).* Finally some shark and ray species are sometimes also retained as bycatch species in the inshore and offshore trawl fishery for hake, as well as in the commercial line fishery. Recent assessments have enabled the stocks of slime skates *(Dipturus pullopunctatus)* and Saint Joseph sharks (also known as Cape elephantfish, *Callorhinchus capensis)* to be classified as underfished; smooth-hound, blue and shortfin mako sharks are maximally sustainably fished; yellow-spotted skate *(Leucoraja wallacei),* and soupfin shark are overfished. The exploitation status of several stocks of skate and of some shark species is still unknown. Many species are caught as bycatch and the risk of overfishing is exacerbated by the disaggregation of catches across many fisheries and the resultant uncertainty in catch and effort time series. Due to substantial efforts to reduce bycatch in the large pelagic longline fishery, it is estimated that the inshore trawl fishery is now responsible for 60 percent of total fishing mortality of sharks and rays in South Africa (DFFE, 2023). Deep-water and shallow-water and pelagic sharks are also landed in Namibia, although their abundance and numbers are not monitored.

Sharks and rays are caught across Angola's commercial and artisanal fisheries, yet there are no species-specific catch records (Soares and Jabado, 2024). Catches across industrial fleets are unknown and there is no requirement for fisheries to report on levels of bycatch (Soares and Jabado, 2024). In the absence of species-specific catch information, local ecological knowledge surveys currently represent the best available approach to understand small-scale elasmobranch fisheries in Angola. These surveys highlight that fishers target rays and guitarfishes but that sharks are mainly caught as bycatch (Soares and Jabado, 2024).

5. KEY FINDINGS

The overall status of fish stocks in Area 47 exhibits varying levels of exploitation, with some stocks maximally sustainably exploited and others under significant pressure due to overfishing. Indicators of key commercial species, such as hake (*Merluccius* spp.) and horse mackerel (*Trachurus* spp.), showed declining trends in recent years. Other stocks of small pelagic resources such as sardinella (*Sardinella* spp.) are declining due to lower recruitment as a function of environmental/climate changes. However, in cases where effective management measures were enforced, stocks recovered and presented a continued increase in the spawning biomass.

Across all 81 stocks assessed, 42.0 percent were considered overfished, 24.7 percent maximally sustainably fished and 33.3 percent underfished in 2021 (**TABLE D.7.4**). With the previous methodology, 40.5 percent of stocks were overfished, 59.5 percent were maximally sustainably fished, and no stocks underfished in 2021.

While the overall proportion of sustainably fished stocks (those that are maximally sustainably fished and underfished) remains relatively unchanged, the distribution within these categories has shifted significantly in the latest assessment. This shift is largely due to the inclusion of several new stocks – primarily species that are either caught as bycatch or not actively targeted but hold important cultural and ecological value. These species are mostly incidental catches within trawl fisheries. In contrast, the artisanal line fishery and small-scale fisheries do not produce bycatch, as all catch is utilized. Notably, none of the species in these small-scale fisheries are considered underfished.

In addition, the coverage of 93.8 percent of landings has increased significantly in comparison with 84.6 percent of landings assessed with the previous methodology in 2021. When weighted by production levels, biologically sustainable stocks account for

43.8 percent of the 2021 landings of assessed stocks monitored by FAO, a decrease if compared with the previous methodology (**TABLE D.7.5**). This is due partially to the inclusion of the landings of stocks of *Merluccius* spp., *Trachurus* spp. and *Sardinella* spp. that are estimated to be overfished.

Fisheries management in the region is governed by a combination of national and regional frameworks each playing critical roles. However, despite these efforts, compliance with regulations remains uneven. In some countries, there are agreed management procedures for small pelagics and hake resources that are regularly updated, while in others there is an ongoing process to develop and implement such procedures. Once fully established, these procedures are expected to improve the long-term sustainability of these resources in the face of climate change, while also increasing the overall proportion of sustainable landings.

TABLE D.7.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 47 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
81	33.3	24.7	42.0	58.0	42.0	37	0.0	59.5	40.5	59.5	40.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.7.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 47 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
5.9	37.9	56.2	43.8	56.2	0.0	76.7	23.3	76.7	23.3

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

FAO MAJOR FISHING AREA 47

ATLANTIC, SOUTHEAST

AREA 47

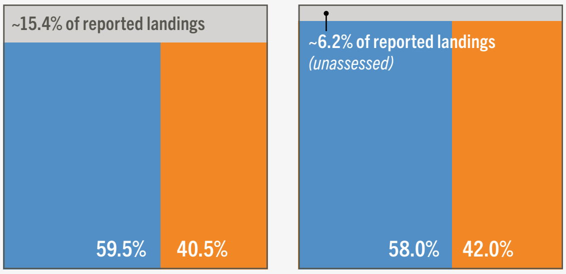
KEY MESSAGES

- Landings in Area 47 peaked in 1978 at around 3.3 million tonnes and have since plateaued at around 1.5 million tonnes per year.
- Hake and small pelagic resources incorporate management procedures/control rules in this region with positive results for the sustainability of these stocks.
- The management capacity to implement an ecosystem-based approach and to monitor fisheries has grown.
- Artisanal fishers are increasingly vulnerable due to lack of access to credit, infrastructure, and various climate change and other anthropogenic impacts.
- Redistribution of fish towards the poles and deeper waters has been observed, and higher frequency and intensity of extreme events are especially problematic for smaller fishing vessels.

STOCK STATUS

FAO estimates, 2021

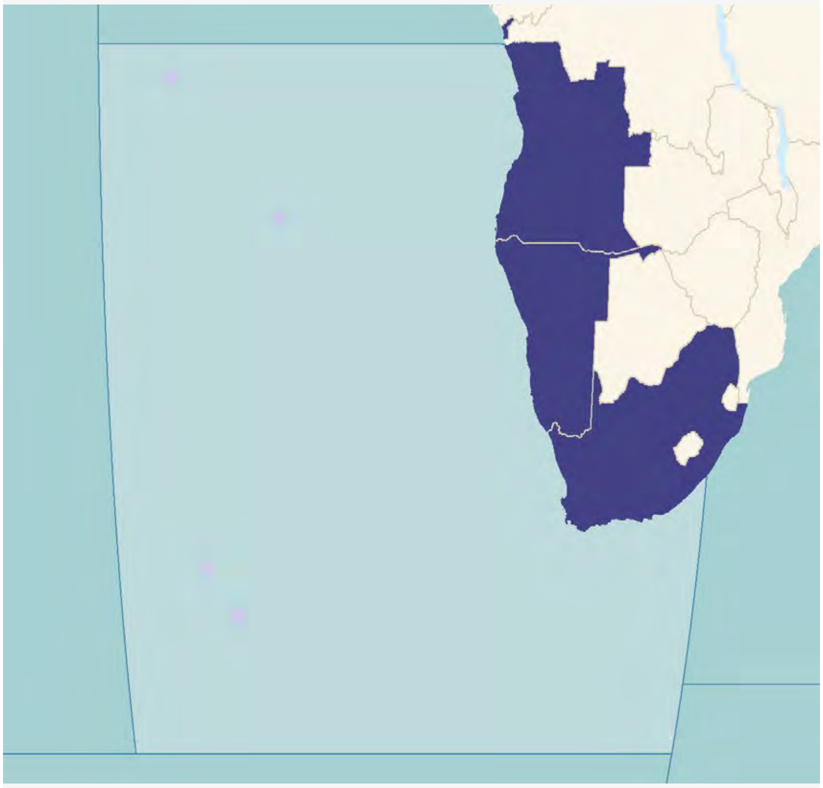
PREVIOUS METHODOLOGY | UPDATED METHODOLOGY



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

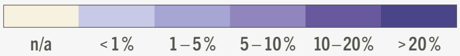
ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



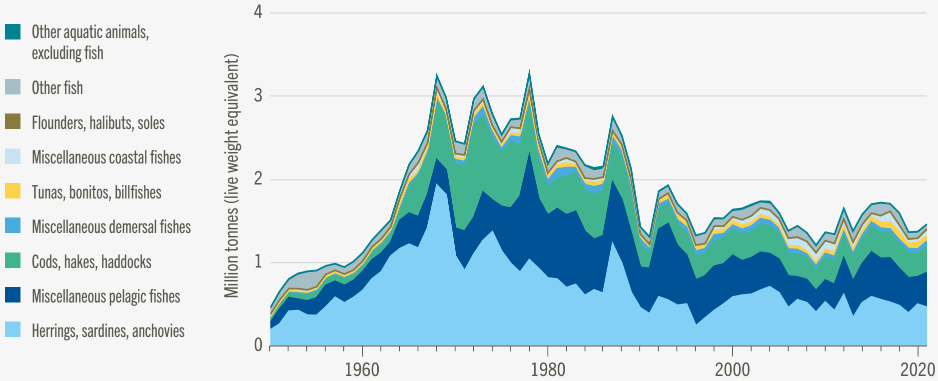
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES



SPECIES COMPOSITION

FAO data, 1950–2021

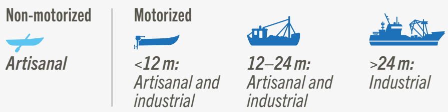


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 13 000



Non-motorized: 26%
Motorized: 74%

LANDINGS

FAO data , 2021

Reported landings ~ 1.5 million tonnes

Unidentified: 2%
Identified at species group level: 98%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 1.7 billion

= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 78 000

Male: 56%
Unspecified: 44%
Female: 0%

= 100 000 PEOPLE

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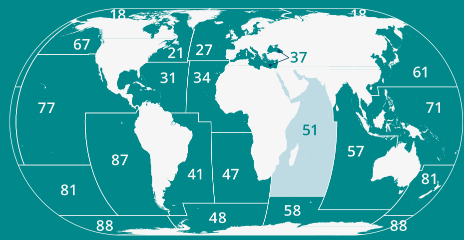
FIGURE D.7.3 *(previous page)*
AREA 47 – DATA AT A GLANCE

Illustration © Jana Kleineberg



Part D, Chapter 8 (D.8)

WESTERN INDIAN OCEAN

FAO MAJOR FISHING AREA 51

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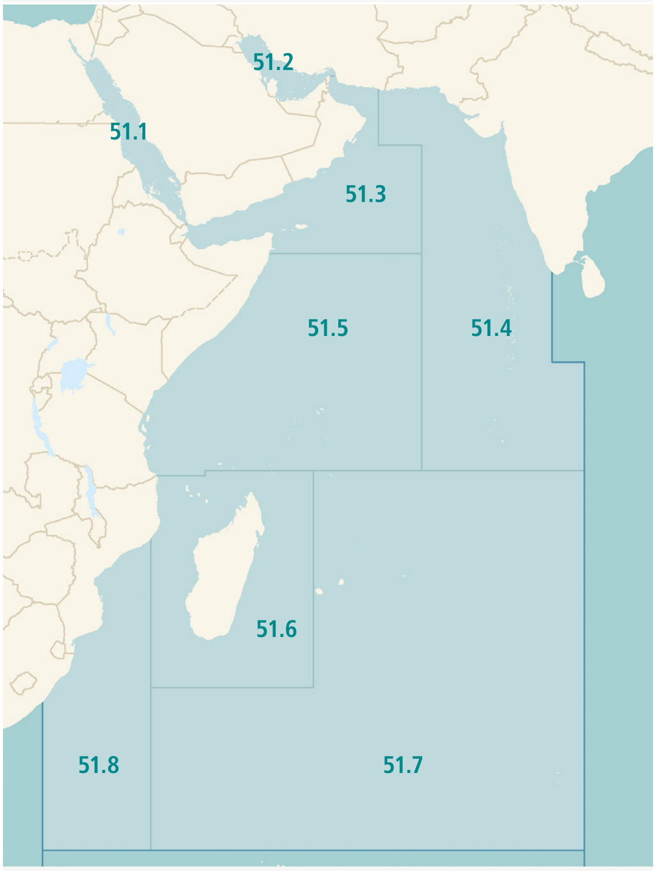
1. OVERVIEW

The Western Indian Ocean (WIO), designated by FAO as Major Fishing Area 51 (hereafter, Area 51), is a vast and diverse fishing area encompassing the Red Sea, the Persian Gulf, the Arabian Sea, and the waters off the east coast of Africa. It is home to a wide variety of marine ecosystems and supports numerous fisheries, both large and small-scale. Area 51 covers 29.3 million km^2, which is about 8.1 percent of the global marine fishing area. The region's continental shelf (< 200 m depth) is generally narrow (only around 6 percent of the total area), particularly off the east African mainland, but is wider off the northwest coast of India and the Arabian Gulf region.

The Area includes over 30 countries/territories: Bahrain, Chagos Archipelago, Comoros, Djibouti, Egypt, Eritrea, Ethiopia, Réunion, Mayotte, India, the Islamic Republic of Iran, Iraq, Israel, Jordan, Kenya, Kuwait, Madagascar, Maldives, Mauritius, Mozambique, Oman, Pakistan, Qatar, Saudi Arabia, Seychelles, Somalia, South Africa (east coast), Sudan, United Arab Emirates, United Republic of Tanzania, Zanzibar and Yemen. About 42 percent of the region is under national jurisdiction, the remainder being areas beyond national jurisdiction (ABNJ). The area is mostly tropical, apart from in the south as it approaches the Southern Ocean.

There are eight subdivisions (**FIGURE D.8.1**), as follows: Red Sea (subarea 51.1), Gulf (subarea 51.2), Western Arabian Sea (subarea 51.3, subdivided into 51.3.1 – Oman Sea and 51.3.2 – South Western Arabian Sea), Eastern Arabian Sea and Laccadives (subarea 51.4), Somalia, Kenya and

FIGURE D.8.1
FAO MAJOR FISHING AREA 51: THE WESTERN INDIAN OCEANC



Notes: (1) Refer to the disclaimer on page ii for the names and boundaries used in this map. (2) Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. (3) Final status of the Abyei area is not yet determined.
Source: United Nations Geospatial. 2020. Map geodata.

Tanzania (subarea 51.5), Madagascar and Mozambique Channel (subarea 51.6), Oceanic (subarea 51.7), and Mozambique and east coast South Africa (subarea 51.8).

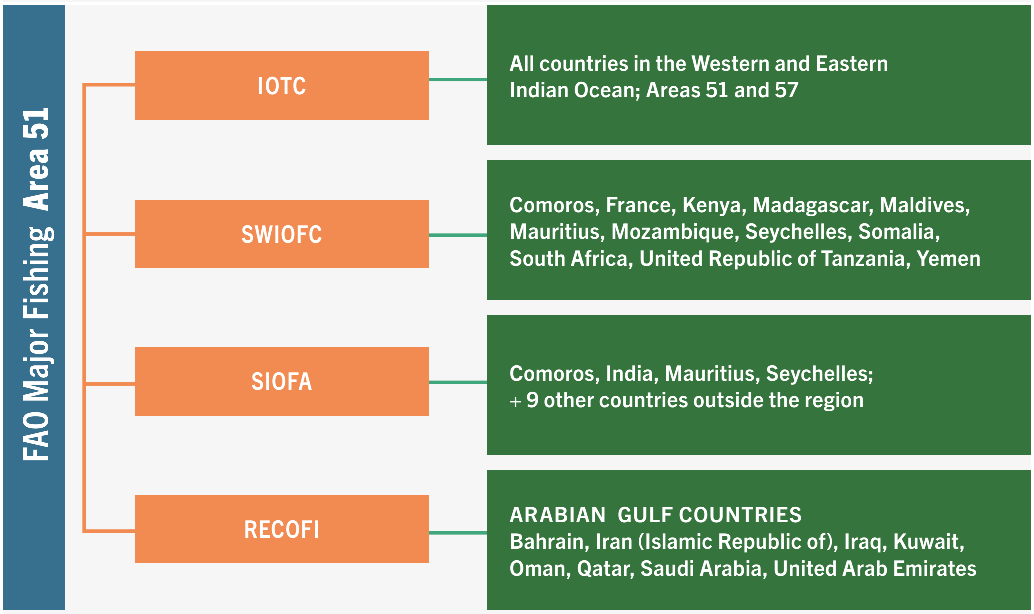
Area 51 accounted for around 7 percent (5.5 million tonnes) of total global marine production in 2021.

Fisheries in ABNJ are managed by two regional fisheries management organizations (RFMOs): the Indian Ocean Tuna Commission (IOTC), which is responsible for the management of highly-migratory tuna and tuna-like species in the Indian Ocean; and the Southern Indian Ocean Fisheries Agreement (SIOFA), which is responsible for the management of non-highly migratory species in ABNJ. In addition, there are two regional commissions: a) the Southwest Indian Ocean Fisheries Commission (SWIOFC), which is a regional fishery body providing advice on resources of the southwest Indian Ocean distributed in the exclusive economic zones (EEZs) of the member countries (Comoros, France, Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, Somalia, South Africa (east coast), the United Republic of Tanzania, Zanzibar, and Yemen), and b) the Regional Commission for Fisheries (RECOFI) which fulfills a similar role for the Gulf states – Bahrain, the Islamic Republic of Iran, Iraq, Kuwait, Qatar, Oman, Saudi Arabia and the United Arab Emirates (**FIGURE D.8.2**). There is also a project underway to develop a Red Sea Fisheries Commission in the next few years.

Area 51 also includes a portion of ABNJ which are not monitored by any of the RFMOs in the region – with the exception of tuna and tuna-like species which are covered by IOTC – and in which distant-water fishing nations exploit several ABNJ resources.

The disparity in upwelling and associated oceanographic productivity between the northern and southern regions of Area 51 accounts for substantial differences in fisheries catches between the two. In the north during summer, monsoon productivity is enhanced by the Somali Current upwelling system which also affects Oman, the southwest coast of India, and the wider Arabian Sea. In contrast, during the winter monsoon, productivity is driven by convective mixing and is mostly confined to the northern Arabian Sea.

FIGURE D.8.2
REGIONS AND COUNTRIES OF FAO MAJOR FISHING AREA 51



Note: India, Pakistan and countries around the Red Sea have substantial fisheries and landings in Area 51 but are not members of the regional fishery bodies listed, other than IOTC.
Source: Authors' own elaboration

Apart from these northern/northwestern areas, the majority of Area 51 has low productivity (Marsac *et al.,* 2024). Catches in India, in particular, are much higher than in other countries of the region.

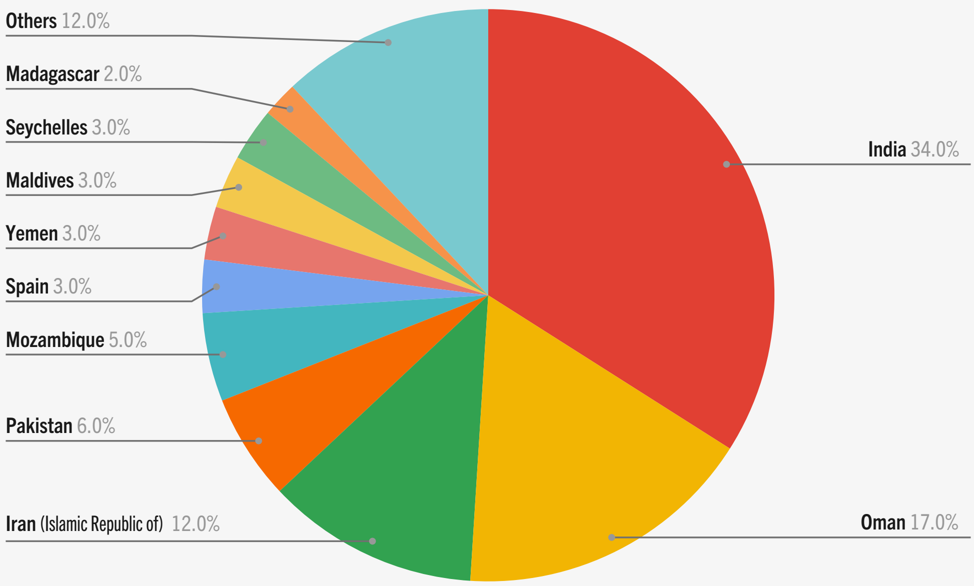
A wide diversity of species and stocks (about 500) are harvested using a wide variety of fishing gear. Small-scale fisheries contribute substantially to catches, and marine resources are extremely important for food security. While a large proportion of stocks are mainly caught by industrial/semi-industrial fisheries, an even greater proportion are caught by both small-scale and industrial/semi-industrial fisheries; there is a much smaller component of stocks that are mainly caught by small-scale fisheries.

Fleets belonging to Area 51 countries have a high proportion of small vessels, either motorized or non-motorized; non-motorized vessels account for around 39 percent of all fishing vessels, with few vessels > 24 m being reported, though there are reporting problems. Fishing effort is dominated by trawls, beach seines, gillnets, longlines and purse seines (Watson, 2017; Murua *et al.,* 2019).

2. FISHERY PROFILES

This section discusses the region's fisheries and fish stock status based on the RFMO regions. The marked disparities between the RECOFI and SWIOFC regions (see below) mean they can be described separately, with further separate consideration of India and Pakistan which do not belong to an RFMO. The ABNJ fisheries falling under IOTC and SIOFA are also considered separately. Some countries in Area 51 have not reported any fisheries updates in recent years. India (west coast) and Pakistan together with RECOFI nations account for over 70 percent of the 5.5 million tonnes of landings of aquatic animals reported by 42 countries/territories for Area 51 in 2021 (**FIGURE D.8.3**).

FIGURE D.8.3
PERCENTAGE CONTRIBUTION TO THE 5.5 MILLION TONNES OF MARINE AQUATIC ANIMALS REPORTED LANDED BY COUNTRIES/TERRITORIES FROM AREA 51 IN 2021; INDIA REFERS TO THE WEST COAST OF INDIA ONLY



Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 17 December 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

2.1 India and Pakistan – Subarea 51.4

These countries comprise a substantial part of the coastline of Area 51; the fisheries of the Southeastern Arabian Sea (SEAS) differ from those of the Northeastern Arabian Sea (NEAS) due to physical oceanographic characteristics. Although the fish catches are similar in both regions, the catch composition is different. This is largely due to monsoon rainfall which affects the numerous rivers flowing into the Arabian Sea, as well as southwesterly winds that drive upwelling along the coast during the monsoon, resulting in high productivity, which, in turn, drives the abundance of small pelagics (sardines, mackerel and anchovies), particularly in the SEAS. The NEAS, on the other hand, is influenced by higher-trophic-level demersal predators. Overall, different oceanographic characteristics give rise to small pelagic planktivorous species in the south, with higher trophic and carnivorous species in the north. However, it's important to remember that this is a simplification of a complex ecological system, and that there are overlaps, variations with depth and season, and the influence of fishing pressure to consider before reaching conclusions.

A very high number of fishers and fishing vessels are concentrated in this region. The principal fisheries include small-scale demersal, small pelagic, semi-industrial deep-sea, trawl and tuna (Sathianandan *et al.*, 2013; Patil *et al.*, 2018). The region contributes landings of > 2 million tonnes annually (more than a third of landings in Area 51). Being in the tropics, there is high diversity in the harvests, with more than 1 200 species identified (Sathianandan *et al.*, 2013). The catches of cephalopods, croakers, anchovies, jacks and natantian decapods have been relatively stable in recent decades. On the other hand, landings of small pelagics (Indian oil sardine, clupeids and mackerel) are highly variable.

FIGURE D.8.4
REGIONAL COMMISSION FOR FISHERIES (RECOFI)

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: Regional Commission for Fisheries (RECOFI) https://www.fao.org/fishery/en/organization/recofi [accessed 14 March 2025]'

2.2 Regional Commission for Fisheries (RECOFI) – Subareas 51.1, 51.2, 51.3

There has been a remarkable increase (of more than 300 percent) in marine fish landings from the RECOFI area (**FIGURE D.8.4**) in the past 25 years; this is mainly due to Indian oil sardine (*Sardinella longiceps*), which contributes > 15 percent to total landings. Other main species are tunas (skipjack tuna [*Katsuwonus pelamis*], longtail tuna [*Thunnus tonggol*] and yellowfin tuna [*Thunnus albacares*]) and narrow-barred Spanish mackerel (*Scomberomorus commerson*). Catches made in the Islamic Republic of Iran and Oman contribute the most to overall RECOFI production. The fleets fish predominantly with gillnets, traps, handlines, longlines, shrimp trawls and encircling nets. Collectively, these five types of fishing gear provide around three-quarters of the total fisheries catch (Ben-Hasan, 2024). The contribution of trawl fishing gear has declined overall, likely due to the banning or the imposition of various restrictions on trawling in several countries.

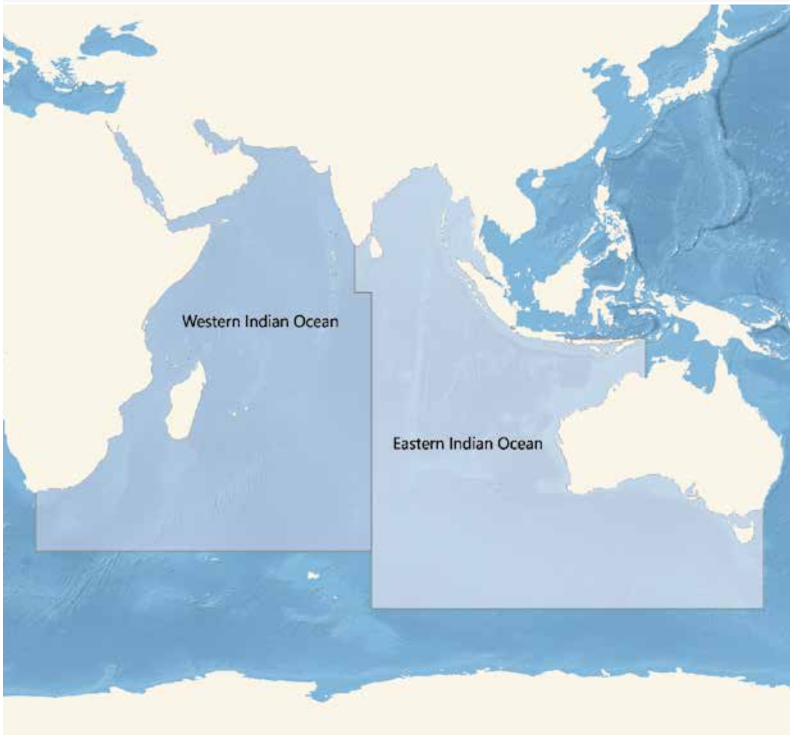
2.3 Southwest Indian Ocean Fisheries Commission (SWIOFC)–Subareas 51.5, 51.6 and 51.8

The 12 riparian countries of this region of Area 51 include Small Island Developing States (SIDS) where people and cultures are greatly influenced by the sea; the importance of the ocean and its fisheries to SWIOFC countries cannot be overstated (van der Elst *et al.*, 2005) and some of the world's poorest countries occur in the SWIOFC region (UNDP, 2020). In SWIOFC countries, small-scale fisheries account for most of the catches. These fisheries are critical for livelihoods, nutrition and income (Temple *et al.,* 2024). The harvest includes a wide variety of species including invertebrates and fishes that inhabit reefs, seagrass beds and shallow inshore waters, while there is limited industrial fishing by SWIOFC countries in deeper waters of the outer continental shelf and upper slope, in the form of bottom trawling and traps for crustaceans (WIOFish, 2024). Substantial numbers of coastal fishers make use of artisanal or small-scale fishing gear, either from the shore or small boats. Fishing gear includes sticks, spears, a variety of nets (mostly gillnets, trammel nets, beach seines and encircling nets), handlines and longlines, and several types of traps (Fulanda *et al.*, 2009; Temple *et al.,* 2018). There are also substantial numbers of gleaning harvesters, many of whom are women, who collect invertebrates by hand in intertidal areas. Reported landings since 2000 have doubled from around 0.6 million tonnes to 1.2 million tonnes in recent years, largely driven by a steady increase in reported artisanal landings in Mozambique since 2006 (Mafuca *et al.*, 2024).

2.4 Indian Ocean Tuna Commission (IOTC) – Subareas 51.1–51.8

The area of competence for IOTC covers Areas 51 and 57 and adjacent seas north of the Antarctic Convergence zone (**FIGURE D.8.3**). Essentially, IOTC is responsible for tuna and tuna-like species (bonitos, billfishes, large mackerels), and associated species (chapter on tunas, **PART E.1, GLOBAL TUNA FISHERIES**, pp. 330). The main target is yellowfin tuna, though skipjack tuna landings are greater; swordfish (*Xiphias gladius)* and bigeye tuna (*Thunnus obesus)* are also highly sought-after, though the management mandate covers a wide variety (16 species) of tunas and tuna-like species. Several distant-water fishing nations access stocks by means of sophisticated vessels with pelagic longlines and purse seines; SWIOFC coastal states have limited participation with these types of vessels, but some countries make considerable hook-and-line catches of smaller tunas such as skipjack using smaller vessels. There were 20 countries that reported industrial sector catches in Area 51 to IOTC, and 26 reported artisanal-scale catches using a wide variety of fishing gear. Not all SWIOFC countries provide permission to distant-water vessels for fishing in their EEZs; permission is often via confidential licensing agreements that amount to significant foreign exchange revenue for some Area 51 countries. The tuna catch in the Western Indian Ocean is substantial, and its landed value was recently estimated at more than USD 1.3 billion (Obura *et al.*, 2017).

FIGURE D.8.5
IOTC AREA OF COMPETENCE (BLUE), WITH FAO MAJOR FISHING AREA 51 IN DARKER BLUE

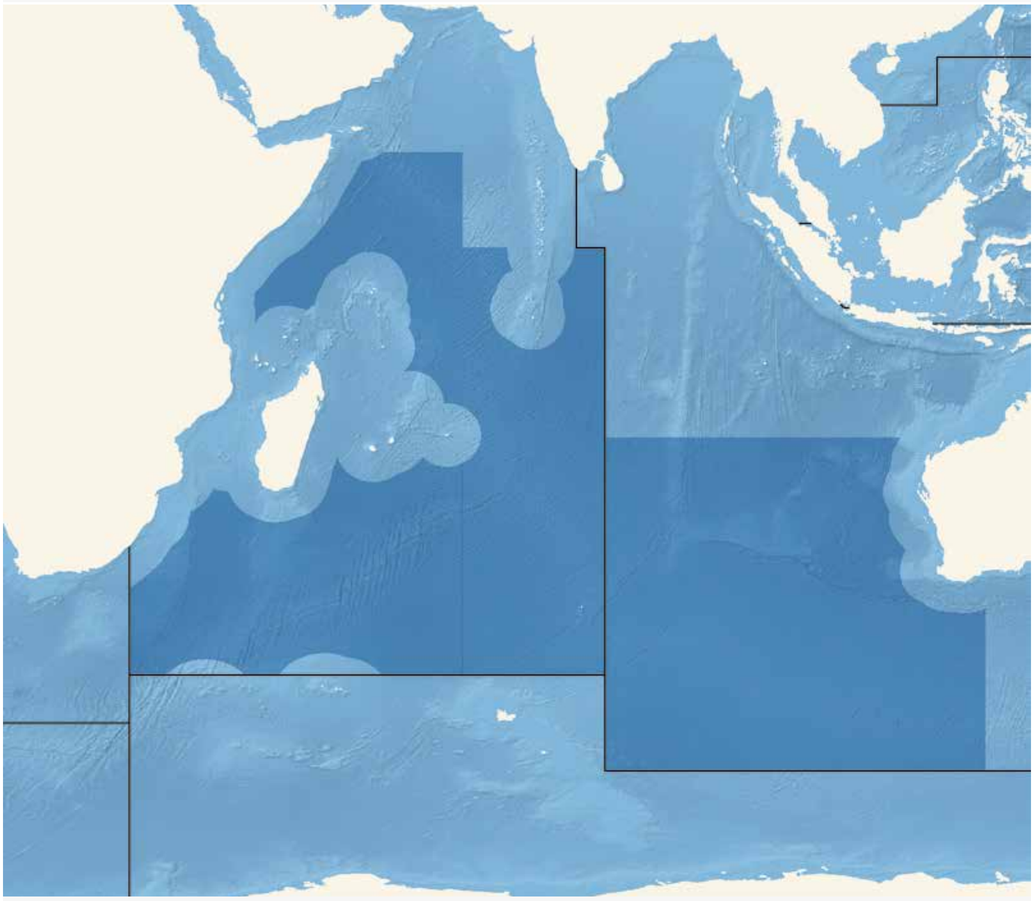


Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: Indian Ocean Tuna Commission (IOTC) https://iotc.org/about-iotc/competence [accessed 14 March 2025].

2.5 South Indian Ocean Fisheries Agreement (SIOFA) – Subareas 51.3–51.8

The SIOFA covers ABNJ resources including fish, molluscs, crustaceans and other sedentary species, but excludes highly migratory species and species subject to the jurisdiction of coastal states (**FIGURE D.8.4**). The Agreement came into force in 2012, although substantial catches were already being made in the early 2000s. Fishing gear used in these fisheries includes bottom and midwater trawls, seines, gillnets and longlines. In deep water, trawlers mainly catch splendid alfonsino *(Beryx splendens)* and orange roughy *(Hoplostethus atlanticus)*, as well as pelagic armourhead *(Pentaceros richardsoni),* bluenose warehou *(Hyperoglyphe antarctica)*, violet warehou *(Schedophilus velaini)*, oreo dories (e.g. *Neocyttus rhomboidalis*), black cardinal fish *(Epigonus telescopus)* and hapuku wreckfish *(Polyprion* spp.). Lizardfish *(Saurida* spp.) and scads (*Decapterus* spp.) were targeted by smaller trawlers on the Sayha de Malha Bank at one point. Longline catch composition varies depending on area and includes Patagonian toothfish (*Dissostichus eleginoides)* and associated species such as blue antimora *(Antimora rostrata)*, as well as oilfish *(Lepidocybium flavobrunneum, Ruvettus pretiosus),* pelagic armourhead and, historically, deep-water sharks, including Portuguese dogfish *(Centroscymnus coelolepis)* and kitefin sharks *(Dalatias licha).* The catch of the historical gillnet fishery (now prohibited) was also predominantly deep-water sharks. Seining targets mackerel (*Scomber* spp.) and bramids (*Brama* spp.), while bottom longlines target ruby snapper (*Etelis* spp.) and other lutjanids.

FIGURE D.8.6
AREA OF COMPETENCE (DARK BLUE) OF THE SOUTHERN INDIAN OCEAN AGREEMENT (SIOFA)



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: Southern Indian Ocean Agreement (SIOFA). https://www.fao.org/fishery/en/organization/SIOFA [accessed 14 March 2025].

3. RESOURCE STATUS

The updated methodology classifies stocks into tiers based on the availability and quality of information for each stock (Tier 1, Tier 2 or Tier 3). Information on the status of 470 stocks was compiled for Area 51, representing a total of 284 species (**D.8.1**).

Of the stocks assessed, 153 are classified as Tier 1 (with formal assessments), 133 are classified as Tier 2 (assessed with surplus-production model approaches), and 184 are Tier 3 (assessed with data-poor approaches).

The revised list of stocks and their respective status show that the majority of the stocks analysed in Area 51 were found to be biologically sustainably exploited, with 40.9 percent of the stocks estimated to be maximally sustainably fished and 22.1 percent underfished (**TABLE D.8.2**). The proportion of stocks that were estimated to be overfished was 37.0 percent.

The relatively high proportion of underfished stocks identified in this assessment may be due to a recent spurt in assessments of fish stocks in the region (**TABLED.8.1** and **APPENDIX II, TABLE 8**, pp. 436), with better resolution in species identification. In RECOFI and SWIOFC countries, a large number of recent assessments have been made, using data-deficient catch-only methods which are assumption-based and may have limitations in reliability (Sharma *et al.,* 2021).

Additionally, the recent efforts made towards undertaking stock assessments in the region has probably resulted in the addition of species of lesser importance in catches than the main target stocks, that were often assessed as aggregates in previous years. This potentially implies that at least some of these less important stocks may not be as heavily exploited as the main targets which have been subjected to fishing pressure for many years. However, some fish stocks in the RECOFI region are now subject to better monitoring, assessment and management, which has contributed to the proportion of underfished stocks.

Overall, though, the current proportion of maximally sustainably fished and under-fished stocks combined with the updated methodology in 2021 (63.0 percent) is almost the same as the combined maximally sustainably fished and underfished stocks with the previous methodology (around 62.5 percent). A considerable proportion of assessments are Tier 3 (39 percent), owing to inadequate data availability, and consequently have higher uncertainty over stock status.

When weighted by landings, biologically sustainable stocks accounted for 70.6 percent of assessed stocks monitored in 2021 (**TABLE D.8.3**).

TABLE D.8.1
SUMMARY OF ASSESSED STOCKS IN AREA 51 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	153	76	11
2 Surplus-production model approaches	133	133	18
3 Data-limited approaches	184	130	12
Total	**470**	**284**	**18**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

TABLE D.8.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 51 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	153	25.5	28.8	45.8	**54.2**	**45.8**
2 Surplus-production model approaches	133	20.3	48.9	30.8	**69.2**	**30.8**
3 Data-limited approaches	184	20.7	45.1	34.2	**65.8**	**34.2**
Total	**470**	**22.1**	**40.9**	**37.0**	**63.0**	**37.0**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.8.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 51 IN 2021

	Weighted % by landings				
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
3.47	**25.7**	**44.9**	**29.4**	**70.6**	**29.4**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

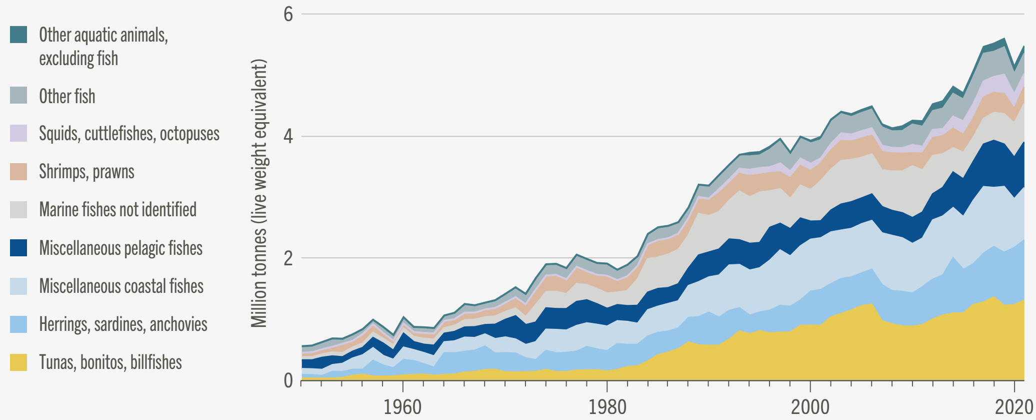
Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

Tuna landings (dominated by skipjack tuna [*Katsuwonus pelamis*] and yellowfin tuna [*Thunnus albacares*]) contribute most to landings and have increased steadily since the early 1980s (**FIGURE D.8.5**). There is still a high proportion of unidentified fish (around 50 percent of all fishes including elasmobranchs), reported as marine fishes NEI (not elsewhere included), which includes some jacks, crevalles NEI, clupeoids NEI, among others. Small pelagic fishes, particularly Indian oil sardine *(Sardinella longiceps),* have long made a steady substantial contribution; Bombay duck (*Harpadon nehereus*) predominates among the group of other small pelagic fishes. Other (non-tuna) Scombridae (Indian mackerel [*Rastrelliger kanagurta*] and narrow-barred Spanish mackerel [*Scomberomorus commerson*] predominating) have remained stable since the early 1980s, while tunas and Carangidae (mainly jacks, crevalles and carangids) have increased. Elasmobranchs, which are particularly poorly identified (80 percent of landings are only identified to family or higher taxa), appear to be declining in landings, while hairtails have made an increasing contribution since the mid-1990s. Catfishes (Ariidae) have declined towards the end of the series, billfish and swordfish as a group have remained steady, while there has been some increase in soles towards the 2020s.

After an increase in the relative contribution by invertebrates to catches from 2010 to 2019, there was a decline in the most recent year of the time series. Shrimp catches have remained reasonably steady since the increase of the 1970s, while contributions by cephalopods and other molluscs continue to increase. Crabs too have seen their catches increase markedly since the mid-1990s. Contributions by other crustaceans and sea cucumbershave

FIGURE D.8.7
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE WESTERN INDIAN OCEAN (AREA 51) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

declined since highs in the 1990–2010 period and the 1990s respectively. Lobsters have more than quadrupled from 2009 to 2021.

4.1 Indian oil sardine

The Indian oil sardine is a major species in Area 51,and landings from commercial fisheries have been reported from six countries: India, the Islamic Republic of Iran, Oman, Pakistan, the United Arab Emirates and Yemen. In 2014, landings peaked at 632 000 tonnes, making it the fifth-largest sardinella fishery in the world. The maximum catch recorded for Area 51 was in 2021 with 676 000 tonnes.

In the Southeastern Arabian Sea (SEAS), the main area of their abundance, oil sardines are fished by different combinations of crafts and gear, such as fishing boats with boats with outboard engines using ring seines, gillnets, and seines, mechanized units using ring seines and others. Oil sardine fisheries have existed for centuries in the SEAS, but there have also been declines and collapses during the last century. Recent studies have shown that this is associated with a combination of factors including rainfall variation, overfishing and recruitment failure (Kripa *et al.,* 2018). These observations indicate that historic declines of oil sardines along the SEASa may also be related to ocean-atmospheric processes, and these may occur at more frequent intervals in future due to climate change.

The Indian oil sardine fishery is a significant contributor to India's fisheries economy, particularly in coastal states like Kerala, Karnataka and Goa (west coast). The fishery provides livelihoods for thousands of fishers, fish processors and workers in related industries. A large portion of the Indian oil sardine catch is consumed domestically, especially in southern India. A significant portion of the catch is used for fishmeal production, which is an important ingredient in aquaculture feed. The recent surge in oil sardine landings in RECOFI countries primarily supports the bait and fishmeal industry, with occasional contributions to food demand in southern India.

4.2 Indian mackerel

Indian mackerel is a key species in the marine food chain and supports significant commercial fisheries in these regions. Different types of seine nets (ring seines, purse seines, beach seines etc.) are used to encircle schools of mackerel near the surface. Trawl nets are also commonly used to capture Indian mackerel, especially in deep waters. In addition, gillnets are used to target larger-sized mackerels. The average annual landing of Indian mackerel in Area 51 over the period 1950–2021 was 101 000 tonnes, with peak landings close to 300 000 tonnes in 1996.

Landings from the Indian west coast account for more than a third and up to half of the Indian mackerel landings in the region. Interannual fluctuations in mackerel catches are not as high as those of the Indian oil sardine. Mackerel's reproductive strategy appears to be quite distinct from that of oil sardine since it was found to have an extended spawning and recruitment season from March to August and even extending to October along India's west coast (Krishnakumar *et al.,* 2008). Therefore, the unfavourable environmental conditions associated with intense upwelling may not affect the spawning and recruitment of mackerel due to this reproductive strategy, which enables successful successful recruitment elsewhere to make up for lost potential during the early upwelling season.

4.3 Bombay duck

The Bombay duck fishery is supported by a single species, *Harpadon nehereus*, and contributes a significant percentage of annual marine fish landings in India. With a peculiar disjunct distribution of the species, the fishery is of particular importance in the two maritime states of Gujarat and Maharashtra (northeast Arabian Sea), where over 98 percent of the Bombay duck catch is landed. Bombay duck is caught in these two locations with fixed bagnets (dolnets) which work with the tides. The highly restricted distribution of the species is probably due to its preference for specific temperature and salinity regimes.

A recent assessment of the stocks of Bombay duck indicated that it is maximally sustainably fished in Gujarat and underfished in the state of Maharashtra (Sathianandan *et al.,* 2021). A recent assessment indicated that a 1 percent increase in salinity (due e.g. to extreme climate events) can reduce the MSY of the stock significantly (Kumar *et al.,* 2023).

4.4 Hairtails, cutlass fishes, ribbonfishes

The Trichiuridae family, commonly known as cutlassfishes or ribbonfishes, is a diverse group of marine fishes characterized by their elongated, ribbon-like bodies. These shoaling and migratory fishes are found in oceans worldwide, inhabiting the water column (midwater) in both shallow and deep waters. Trichiuridae have a unique shape, with a long, slender body that tapers towards the tail. They have a large mouth with sharp teeth, often extending beyond the jawbones. Their size varies widely, with some species reaching lengths of over 2 m. They are carnivorous, feeding on a variety of prey including smaller fish, squid and crustaceans, and serve as an important prey species for larger fish, including tuna, marlin and sharks.

Many species of ribbonfishes form a major component of the fisheries in Area 51, especially in India, Pakistan and RECOFI countries. Ribbonfish landings in Area 51 show wide variation, with an average of 75 300 tonnes and a peak of 264 500 tonnes in 2017.

Because of the excessive fishing pressure on ribbonfishes in India, the group has been assessed as overfished in Gujarat and recovering in Maharashtra, Karnataka and Kerala (Kumar *et al.,* 2023). Since the trawl is the main gear by which ribbonfishes are caught, Sathianandan *et al.* (2021) advise a reduction in trawl fishing effort varying from 34 to 62 percent in different states of India.

4.5 Indian squid

The Indian squid (*Uroteuthis [Photololigo] duvaucelii* [Loliginidae]) constitutes an important component of the inshore cephalopod fisheries in Area 51. It is one of the most important cephalopod species exploited by the bottom trawl fleets in the eastern Arabian Sea bordering the west coast of India, though the precise magnitude of the large catch is uncertain (approximately 100 000 tonnes). Typically, loliginids remain dispersed over the continental shelf during the major part of their life cycle. Mature squids undertake spawning migrations to inshore spawning grounds for congregation and egg laying, and commercial trawl and artisanal fisheries take advantage of these aggregations (Sasikumar *et al.,* 2018).

Currently, resource-specific management for Indian squid fisheries is limited to the minimum legal landing size (Mohamed *et al.,* 2014), apart from the seasonal fishery closure during the monsoon. The species has been assessed as maximally sustainably fished in the NEAS and the SEAS (CMFRI, 2023).

4.6 Prawns/shrimps

In this region, these are swimming crustaceans of the suborder Natantia, including penaeids and carids. They are generally short-lived, fast-growing and with high fecundity; species from shallow water (< 50 m). Those that probably make up the majority of landings generally have an obligatory estuarine nursery phase. There are also deep-water (over 200 m) fisheries in several countries, targeting a different suite of natantians.

Unfortunately, countries seldom report landings to levels below family. Landings increased steadily until 1988 when they increased sharply, reaching a maximum in 2017 (349 900 tonnes). Thereafter there has been a general decline to levels last seen in the early 1990s, despite improvements in fishing technology in the industrial sector.

For countries that have limited other sources of foreign income, exports can make a valuable contribution to the economy. The industrial sector mainly uses trawlers with varying levels of sophistication and with substantial levels of non-target bycatch; the small-scale sector uses beach seines, drag nets, a variety of static nets and more basic trawlers.

Despite the fast growth rates of prawns and shrimps, overexploitation is known to occur, and – in the SWIOFC area at least – increased catches by the small-scale sector have led to declines in industrial catches of shallow-water penaeids, likely as a result of recruitment overfishing in coastal waters. User conflicts between the sectors have resulted in spatial (inshore) area restrictions or multi-year moratoriums for industrial vessels, e.g. in Kenya (Thoya *et al.,* 2019) and Tanzania (Silas *et al.,* 2023). A recent assessment indicated that shallow-water penaeids from Mozambique are vulnerable to climate change (Fennessy *et al.,* 2024), and it is probable that such vulnerability exists in the wider Western Indian Ocean where sea surface temperatures are increasing. There is increasing mesoscale eddy activity in the Mozambique Channel, likely linked to climate change, and these eddies have been shown to have a considerable influence on penaeid prawn larval survival (Malauene *et al.,* 2024), which could have severe implications for recruitment of these resources in the Western Indian Ocean in future.

5. KEY FINDINGS

Area 51 is a large, highly biodiverse region encompassing over 32 countries/territories, with two RFMOs and two regional fisheries commissions; a large part of the region is beyond national jurisdiction. The region contributes about 7 percent of global production, with catches increasing gradually since the 1980s and reaching a peak in 2019 (5.6 million tonnes). There is marked regional disparity in fisheries production, with the northern part of the Indian Ocean contributing disproportionately to the landings – this is linked to the substantially higher oceanographic productivity in that region.

Millions of coastal dwellers in the region depend on fisheries as a source of food. Despite the effects of global warming, habitat degradation and the increased pressures from rising coastal populations, overall landings are still increasing; a large proportion of stocks are under pressure.

Improvements to monitoring are constrained by financial and human capacity, compounded by logistical difficulties in countries which have very long coastlines. A consequence is that stock assessments in the SWIOFC in particular are not always available and are irregular. There are ongoing efforts promoted by the SWIOFC to undertake weight-of-evidence assessments, including productivity and susceptibility assessments, for several species in the region. India, which contributes more than a third of the landings in the region, has recently carried out a considerable number of Tier 1 stock assessments using biomass dynamic models (Sathianandan *et al.,* 2021). However, several new Tier 3 assessments have recently been made with methodologies for data-poor fisheries with high uncertainties (CMFRI, 2023).

The proportion of overfished stocks – at 37.0 percent in 2021 – remains similar to the results obtained with the previous methodology for the same year (**TABLE D.8.4**). The number of Tier 3 assessments in non-SWIOFC countries/territories is higher than in SWIOFC countries. One Area 51 region which shows a high proportion of overfished stocks is the northern and eastern Arabian Sea.

The increase in the number of underfished stocks (22.1 percent in 2021 compared to 3.1 percent under the previous methodology) is due to a more than tenfold increase in assessments (from 32 stocks in 2011 to 470 stocks in 2021), many of them at the level of species using Tier 3 catch-only methods, rather than of species aggregates to genus or above. This has resulted in the inclusion of species of lesser regional importance in catches than the main targets. On the positive side, some stocks are better monitored and managed, which has contributed to the increased proportion of underfished stocks; and the overall proportion of sustainably fished stocks is substantial.

Moreover, maximally sustainably fished stocks – at 40.9 percent with the updated methodology in 2021 – were lower than the 59.4 percent with the previous methodology for the same year. Maximally sustainably fished stocks were less common in Tier 1 assessments than in Tiers 2 and 3. In addition, the coverage of 79.8 percent of landings has remained relatively stable in comparison with 62.8 percent of landings assessed with the previous methodology in 2021.

When weighted by production levels, biologically sustainable stocks account for 70.6 percent of the 2021 landings of assessed stocks monitored by FAO, a similar value to the result obtained with the previous methodology (**TABLE D.8.5**).

TABLE D.8.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 51 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
470	22.1	40.9	37.0	63.0	37.0	32	3.1	59.4	37.5	62.5	37.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Source: FAO estimates.

TABLE D.8.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 51 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
25.7	45.0	29.4	70.6	29.4	7.0	64.5	28.4	71.6	28.4

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

FAO MAJOR FISHING AREA 51

INDIAN OCEAN, WESTERN

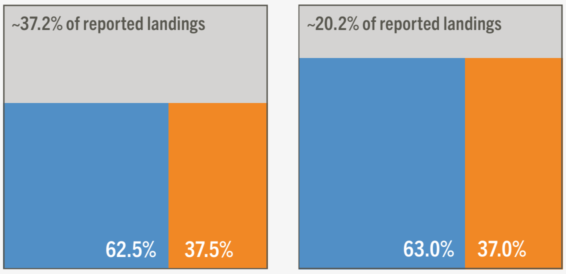
AREA
51

KEY MESSAGES

- Area 51 is vast and biologically diverse, including over 30 countries/territories and supporting numerous fisheries.
- New collaborative methods of assessment and management, based on ecosystem principles, are being advanced in the region.
- Mangroves and other essential fish habitats that sustain extremely diverse small-scale fisheries are being threatened.
- The coastal regions of Area 51 are vulnerable to the impacts of climate change, including coral bleaching, sea level rise and extreme events.

STOCK STATUS

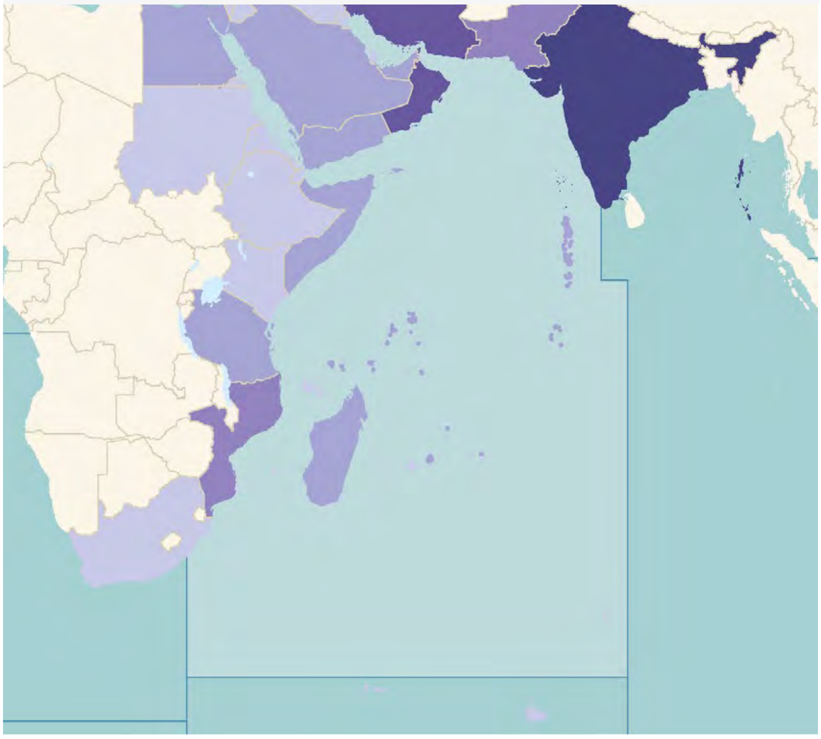
FAO estimates, 2021



Biologically sustainable
Unassessed reported landings
Biologically unsustainable

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



Notes: (1) Refer to the disclaimer on page ii for the names and boundaries used in this map. (2) Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. (3) Final status of the Abyei area is not yet determined.
Source: United Nations Geospatial. 2020. Map geodata.

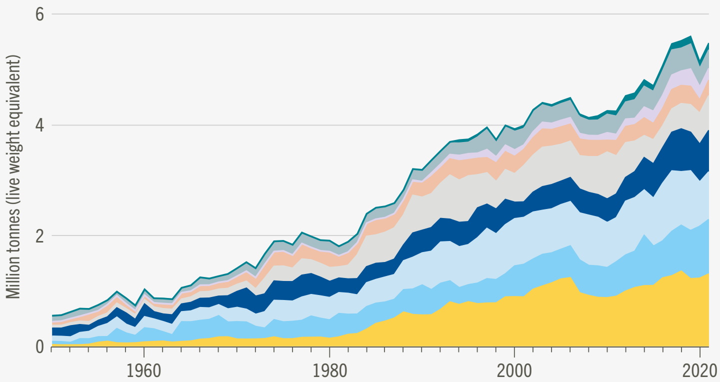
LANDINGS / MILLION TONNES (estimates for regions bordering this area)

n/a | < 1 % | 1 – 5 % | 5 – 10 % | 10 – 20 % | > 20 %

SPECIES COMPOSITION

FAO data, 1950–2021

- Other aquatic animals, excluding fish
- Other fish
- Squids, cuttlefishes, octopuses
- Shrimps, prawns
- Marine fishes not identified
- Miscellaneous pelagic fishes
- Miscellaneous coastal fishes
- Herrings, sardines, anchovies
- Tunas, bonitos, billfishes



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 407 000

Non-motorized — *Artisanal*

Motorized — *<12 m: Artisanal and industrial* | *12–24 m: Artisanal and industrial* | *>24 m: Industrial*

- Non-motorized: 39%
- Motorized: 61%

LANDINGS

FAO data, 2021

Reported landings ~ 5.5 million tonnes

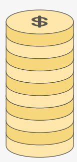
- Unidentified: 13%
- Identified at species group level: 87%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 10.3 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 2.9 million

- Male: 65%
- Unspecified: 16%
- Female: 19%

= 100 000 PEOPLE

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FIGURE D.8.8 *(previous page)*
AREA 51 – DATA AT A GLANCE

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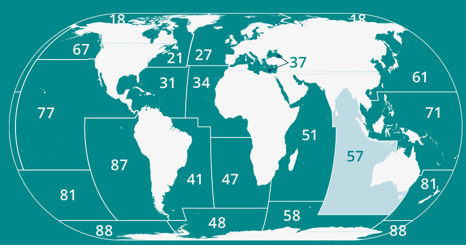

EASTERN INDIAN OCEAN
FAO MAJOR FISHING AREA 57

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Sustainable Seafood Network of India

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Food and Agriculture Organization of the United Nations

1. OVERVIEW

The Eastern Indian Ocean, designated by FAO as Major Fishing Area 57 (hereafter, Area 57), covers an area of 29.89 million km^2, including the Bay of Bengal in the north, the Andaman Sea, the northern part of the Malacca Straits, and the waters around western and southern Australia to the east. It covers the exclusive economic zones (EEZs)

FIGURE D.9.1
FAO MAJOR FISHING AREA 57: THE EASTERN INDIAN OCEAN

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

of several countries[1] as well as areas of high seas. To the south and west, it is bordered by FAO Major Fishing Areas 58 and 51, respectively (**FIGURE D.9.1**). Area 57 follows the southern coastlines of Indonesia and Timor-Leste as far as 129° east, bisecting Australia at the boundary between the State of Western Australia and the Northern Territory, and extending along the entire south coast of Australia (to a latitude of 55° south). There are approximately 2.37 million km^2 of shelf area in Area 57, which mostly coincides with the Bay of Bengal. Narrower shelf areas are present on the western and southern sides of Indonesia, Timor-Leste and Australia.

In the north of Area 57, the Bay of Bengal is located in the tropical monsoon belt and experiences sea surface circulation reversal in the monsoon period with the Monsoon Current (clockwise from January to July, counter-clockwise from August to December) (Schott and McCreary Jr, 2001). The monsoonal systems mean this region is highly affected by cyclones and storm surges. The primary productivity of the Bay of Bengal is considered lower than that of the Arabian Sea, largely as a consequence of stronger stratification and lack of upwelling (Prasanna Kumar *et al.,* 2002). Nonetheless, seasonal upwellings on the southeast coast of India and the east coast of Sri Lanka increase fishery productivity. In addition, areas adjacent to the major riverine outflows are provided with lowered salinities and considerable nutrient and sediment loads to the shelves. These drive highly productive, but relatively localized, shelf fisheries in the upper Bay of Bengal (the Ganges, Brahmaputra and Meghna rivers) and Gulf of Martaban (the Ayeyarwady river). Even more localized effects from smaller rivers in India also occur (the Mahanadi, Godavari, Krishna and Kaveri rivers).

Further south, the Indian Ocean shelves of Indonesia (Sumatra and Java) are relatively narrow and steep, mostly with coralline and sandy bottoms and no major riverine input. The south coast of Indonesia and the north coast of Australia are in the path of a low-salinity warm-water current flowing west from the Pacific into the Indian Ocean called the Indonesian Throughflow. While this current is relatively nutrient-poor, its interactions contribute to the upwelling system along the southern coast of Java and Bali, making it a driver of seasonal productivity surges (Koropitan and Osawa, 2021), particularly in coastal zones. In spite of this, these waters are comparatively unproductive relative to the more fertile Bay of Bengal region.

At the southern end of Area 57, the southward flow of the warm and low-nutrient Leeuwin Current extends the range of the tropical fish fauna to waters west of Australia, further south for this type of fauna than anywhere else in the world. However, this current is also responsible for the low productivity of these waters. Along the southwest and southern coasts of Australia, waters are temperate and the fish fauna is less diverse compared to the northern region of Area 57. The oceanic regions of Area 57 are characterized by low overall productivity except for higher primary productivity driven by equatorial upwelling. This effect is more limited in Area 57 compared with the productive upwellings of the Atlantic and Pacific Oceans.

Area 57 is divided into six subareas, including one which is split in two other subareas, reflecting its diverse characteristics and productivity. The main fisheries are pelagic oceanic tuna fisheries and the more productive coastal shelf fisheries. The resources range from the typical tropical species of the northern part of the Area changing to temperate species in southern latitudes west and south of Australia. The large number of species and aggregate groups reported for Area 57 is a reflection of the multispecies nature of most fisheries in the region, particularly those in the tropical and subtropical areas. The main groups that form the majority of the catch of Area 57 have not changed their order since FAO's previous *Review of the state of world marine fishery resources* (FAO, 2011).

Increased surface water temperatures and marine heatwaves, increased frequency or intensity of storms and cyclones, ocean acidification and long-term sea-level change (rises in most areas) – all made worse by climate change – are emerging concerns for Area 57. All of these factors will affect fisheries to some degree, in terms of productivity, species distribution and abundance, the ability of fishers to access resources, and the safety of fishing operations.

[1] Countries in Area 57 include Australia, Bangladesh, India, Indonesia, Malaysia, Myanmar, Sri Lanka and Thailand

2. FISHERY PROFILES

Area 57 encompasses a diversity of climatic and oceanographic conditions, as well as diverse types of fisheries, which can be separated into a northern region (Bay of Bengal and the Indian Ocean shelves of Indonesia) and a southern region (covering western and southern Australia, and adjacent oceanic waters). Landings harvested from Area 57 have displayed a consistent upward trend since records began, reaching over 7 million tonnes in 2017, although they have subsequently declined to around 6 million tonnes in recent years (**FIGURE D.9.2**). The total reported landings for Area 57 in 2021 were just under 5.9 million tonnes. Over 99 percent of the catch of Area 57 in 2021 was reported by coastal states, with non-coastal, distant-water fishing nations accounting for less than 0.5 percent (about 18 000 tonnes). Fishing capacity in Area 57 is high, with more than 520 000 vessels estimated to be operating in the Area. The majority of these are small motorized or non-motorized vessels.

It is not possible to accurately disaggregate the catch of Area 57 between large and small-scale fisheries, with the exception of oceanic tuna resources. This is because almost all demersal and small pelagic species are targeted by both segments of the fishing fleet, but using different types of gear. Larger-scale vessels use trawls and seine gears, whereas small-scale vessels typically use gillnets, traps, and hook-and-line gears. Based on national reports (where available) and other sources,[2] small-scale fisheries in Area 57 account for 43 percent of total landings (about 2.5 million tonnes), and large-scale fisheries account for 57 percent of these (about 3.4 million tonnes). Thus, Area 57 (especially 57.1 and 57.2) has the greatest landings of small-scale fisheries , and some same stocks are targeted by small-scale and large-scale fisheries. It is important that both segments be properly addressed by fishery management. These figures are in general agreement with other recent studies. FAO, Duke University and WorldFish (2023) found that small-scale fisheries in Asia account for 37 percent of the catch and large-scale fisheries for 63 percent of the catch. Another study for the entire Indian ocean (Zeller *et al.,* 2023) concluded that large-scale fishing contributed 57 to 60 percent of the catch in 2018 and that approximately 40 percent of total Indian Ocean catches originate from small-scale fisheries.

The large concentration of fishing effort in Area 57, which commenced in the 1970s, has resulted in overfishing and has had effects on fish stocks. Most notably, a shift in the composition of catches over time has been observed towards more resilient, faster-recruiting smaller species, along with a shift from demersal species to a mixture of smaller demersals and small pelagics. This has been identified by national fishery research programmes and fishery stakeholders and has spurred recent efforts by several fishery agencies to improve the management of fishing capacity.

2.1 Northern region

The northern region of Area 57 encompasses the Bay of Bengal down to the Indian Ocean waters around Indonesia (including coastal and adjacent oceanic waters), covering subareas 57.1, 57.2 and 57.5.1. The majority of reported landings for Area 57 occur in the northern region, with the Bay of Bengal alone representing over 70 percent of total reported landings for Area 57 in 2021.

Marine living resources are critical for livelihoods and nutrition in Area 57, and this is especially the case in the northern region where most coastal countries have large and growing populations. The coastal population around the Bay of Bengal is about 450 million, with fisheries employing some 4.5 million people, of whom 2.2 million are fishers (BOBLME, 2012). The southern coastline provinces of Sumatra, Java, Bali and West Timor employ a further 270 000–330 000 fishers (BOBLME, 2012). There are an estimated 420 000 small vessels operating in Area 57, nearly all in the northern region and most in the Bay of Bengal area, highlighting the importance of fishing for livelihoods. Aquatic foods also represent a critical source of food, making a significant contribution to animal proteins consumed by local populations; indeed, 76 percent of animal proteins

[2] These reports include DoFa (2020a, 2020b), Export Development Board (2022), FAO and MALI (2016), Jena and George (2018), Napitupulu *et al.* (2022), and Teh and Teh (2014).

consumed in the Maldives are from aquatic foods, along with 62 percent in Indonesia, 57 percent in Bangladesh and 52 percent in Sri Lanka. Aquatic foods are also critical to coastal states in India (BOBLME, 2012).

The catch in the northern region is largely composed of demersal species, with pelagic species in coastal areas and exclusive economic zones (EEZs), as well as open ocean resources. Fisheries in the northern region of Area 57 are predominantly coastal multi-species and multi-gear, with a high concentration of fishing activity in the coastal area.

Demersal species are typically associated with shelf areas, with the main demersal fish shelf fisheries located in the Bay of Bengal. These fisheries are largely correlated with the type of bottom on which they occur; as such, on muddy-soft bottoms, sciaenids (drums) dominate within a diverse and complex community including polynemids, sea catfishes, threadfin bream, lizardfish, hairtails, various flatfish species and crustaceans. In less heavily-fished shelf areas, snappers, butterfish and emperors are also important commercial species. Hilsa shad *(Tenualosa ilisha)* are significant around the major rivers discharging into the northern Bay of Bengal. The sandy shelf bottoms, such as in the Mergui Archipelago and along the Thai coast of the Andaman Sea, are dominated by assemblages of slipmouths, goatfishes, sciaenids and lizardfishes. Pelagic fisheries in coastal areas and within EEZs are dominated by neritic tunas, scads, short mackerel, sardines and anchovies.

Catches of open ocean resources in Area 57 are dominated by tuna fisheries, mainly skipjack tuna *(Katsuwonus pelamis),* along with yellowfin *(Thunnus albacares),* bigeye *(Thunnus obesus),* albacore *(Thunnus alalunga)* and southern bluefin tuna *(Thunnus maccoyii).* Historically, distant-water fleets from Japan, the Republic of Korea and Taiwan Province of China accounted for a larger proportion of catches, peaking at 81 percent in 1960. Following the expansion of the fleets of coastal countries in the Area in the early 1990s, however, their catches substantially decreased and stocks are now primarily exploited by coastal countries. In 2021, catches were dominated by Indonesia (62 percent), Sri Lanka (12 percent) and India (9 percent). These coastal countries also target the neritic tunas within their EEZs. Distant-water fishing nations now only account for less than 5 percent of the current catch of tunas, bonitos and billfish.

EEZ fisheries in this region are typically managed by a national fishery agency (Thailand, Malaysia, Myanmar, Sri Lanka and Bangladesh), although in larger and federal countries (India and Indonesia) fishery management is devolved to a state or provincial government fishery agency, with common or shared stocks managed jointly with the national or federal fishery agency. In cases where species are within the competence of an international regional fisheries management organization (RFMO), the national fishery agency cooperates in their management with the relevant RFMO – in Area 57, this is mainly the Indian Ocean Tuna Commission (IOTC). The IOTC is responsible for the management of tuna and tuna-like species in the Indian Ocean (across FAO Areas 51 and 57), with its mandate covering 27 individual species which can be broadly divided into large tunas, billfishes (swordfish, sailfish, marlins) and other tuna-like species (frigate bullet tunas and neritic tunas), and pelagic sharks caught as bycatch within tuna fisheries.

The assessment of marine fishery resources may reflect a similar organizational arrangement, but as capacity at the sub-national level may be limited, more typically assessments are conducted by national fishery research agencies, who act as science providers to the relevant management authority. Coastal states in the region have substantially improved their fishery assessments in recent years, and these are now being used to inform fishery policy and management decisions (SEAFDEC, 2024). The IOTC provides regular assessments for the stocks within its competence (IOTC-SC26, 2023).

Two decades ago, fishing effort and capacity rose sharply in the northern region of Area 57, with oceanic subareas seeing rising tuna catches, and other subareas witnessing increased catches of other pelagic and demersal stocks. Declining catch per unit effort (CPUE), changing catch compositions and declining profitability led to management measures being put in place. In fisheries that have been subjected to high fishing pressure for decades, increases in fishing efficiency and adoption of new technologies have not been accompanied by an increase in biomass and catch (Sathianandan *et al.,* 2021).

Macro-scale spatial initiatives to control or partition fishing effort have been established in many countries. These were primarily through zoning and exclusion arrangements for coastal waters according to fishing gear or vessel capacity (India, Indonesia, Malaysia, Thailand, Myanmar, Sri Lanka), although enforcement and compliance are challenging. Smaller-scale, localized spatial closures have also been implemented, associated with marine conservation areas or for nursery or breeding areas (hilsa shad in Bangladesh, lobster in Sri Lanka). Temporal closures are more broad-scale and have been enacted across some fisheries (e.g. Bangladesh, India, Sri Lanka), often coinciding with monsoon storm season. The application of measures may be to segments of the fishery (e.g. larger-scale commercial vessels), and where the measure impacts poorer fishers, there may be some form of compensation for lost fishing opportunities. The effectiveness of all of these measures has not been comprehensively assessed.

Starting in 2007, Malaysia (Department of Fisheries Malaysia, 2015) and subsequently Thailand in 2015 (DOF Thailand, 2015) implemented fleet and effort reduction plans for various gear groups and segments of their fisheries to match the assessed maximum sustainable yield (MSY) or multispecies MSY for the stocks they target. Indonesia is currently establishing a similar plan (through the 2023 Measured Fishing Regulation) to link vessel licensing to quotas based on estimates of maximum allowable catch for each of the country's fishery management areas.

In spite of these management structures, the expansion of fleets and increased capacity to access resources further from shore means that management capacity remains a challenge. Given that fisheries in the northern region of Area 57 are predominantly coastal multi-species and multi-gear, with a high concentration of fishing activity in the coastal area, controlling fishing effort is a persistent challenge. This is exacerbated where there are a high number of small, medium- and large-scale vessels that must be managed and whose catches need to be estimated.

Illegal, unreported and unregulated (IUU) fishing has also become a concern, both within the domestic fleets of or between neighbouring countries. Hotspots of IUU activity related to both forms have been identified in Area 57: they are typically located along EEZ boundaries between countries and in high seas areas, and tend to be concentrated on richer fishery resources (Wilcox *et al.,* 2019). Recent efforts by coastal states have improved the situation with regards to IUU fishing in Area 57. These improvements have notably been driven by accession to the FAO Port State Measures Agreement (PSMA) and national responses to trade pressures from market countries. As a result, countries have taken more effective action, including implementing PSMA provisions, establishing equivalent national regulations, and enhancing regional cooperation. Measures include suspending licences for foreign vessels violating regulations, strengthening port controls, and upgrading vessel licensing and registration systems. Monitoring has also improved through the creation of vessel monitoring centres, widespread adoption of vessel monitoring systems (as required by the IOTC for vessels over 24 m in length or operating on the high seas), tighter transshipment controls, and increased use of catch documentation. There are also indications of undeclared fishing in the Indian Ocean by long-distance fishing nations, as only nine out of the 40 long-distance fishing nations that have flagged vessels identified as operating in the Indian Ocean, report catches for Area 57 to FAO (Cappa *et al.,* 2024).

Climate change is also likely to impact several widely distributed species in the northern region of Area 57. Small pelagic species – such as sardines, anchovies and small mackerels – and species caught in the pelagic zone – neritic tunas, scads and squids – are particularly sensitive to climate-related environmental changes (Fernandes, 2018). Important demersal species also likely to be affected are hilsa shad, Bombay duck *(Harpadon nehereus),* and fourfinger threadfin *(Eleutheronema tetradactylum)* (Fernandes, 2018). Given that many of these are key target species, this may pose a risk for livelihoods.

2.2 Southern region

The southern region of Area 57 covers waters around western and southern Australia, including areas of high seas. Australia is an urban coastal nation, and outside of its coastal cities its western and southern coasts are very lightly populated; as such, fisheries play a less important role in terms of livelihoods compared to the northern region of Area 57. The total catch of the southern area is considerably less than in the northern region, with Australian landings covering only about 1.7 percent of the total catch of Area 57. This reflects both the very low productivity of these waters and the associated low numbers of fishing vessels operating in the region.

Demersal catches in the shelf areas of the southern region are about 46 000 tonnes (excluding sharks and rays) based on national reports. Clupeoids NEI (herrings, pilchards, sardines and anchovies) form the largest volume of Australian catches in Area 57, representing 40 000 tonnes in 2021. Most of this catch is used as feed for tuna fattening (FAO, 2011). The tuna captured in the southern region of Area 57 (primarily subarea 57.4) are mostly southern bluefin tuna, and the majority of Australia's current catches (4 697 tonnes in 2021) is value-added through cage fattening (Australian Fisheries Management Authority, 2020). Hotspots for climate change have been identified off southeast and southwest Australia and are predicted to expand and intensify. This is expected to have impacts on species distribution and abundance, thereby impacting fisheries as well as management by increasing uncertainty assessments (Butler *et al.,* 2023).

In Australia, fishery management is devolved to states and territories, except for common or shared stocks which are managed jointly with the relevant agency. In cases where species are within the competence of an RFMO, the national fishery agency cooperates in their management with the relevant RFMO. Australia's fishery management approach is primarily based on maximum economic yield, which typically results in catches below MSY. The outcome of this is that many (but not all) Australian fisheries have relatively low fishing capacity and the effort is limited. There are few examples of unsustainably fished stocks, and most overfished stocks are not directly targeted but are incidental or bycatch species of other fisheries or are stocks that are yet to recover. Australia has established some form of limited entry management for all of its commercial fisheries, which are strongly linked to assessment findings, required under specific legislation (e.g. environmental legislation and the 2007 *Guidelines for the ecologically sustainable management of fisheries*).

Nonetheless, several challenges for fisheries management exist. For instance, in fisheries where stocks are not overfished, but there are declining numbers of commercial vessels, this can limit the availability of catch data to the point where robust indices of abundance are difficult to maintain (Butler *et al.,* 2023).

3. RESOURCE STATUS

3.1 Reference list of stocks

Previous FAO assessments of the status of stocks in Area 57 were based on 52 fish stocks, most of them analysed using catch-only methods which are rated as Tier 3-type assessments. To date, comprehensive stock status data has been scarce, with information available primarily for selected coastal stocks in specific regions and only limited assessments available based on catch records. The updated assessment process applied in this report has significantly increased the number of stock assessments to 308 stocks, representing a total of 197 species (**TABLE D.9.1** and **APPENDIX II, TABLE 9**, pp. 447). The total weight of assessed landings represented by these stocks is 3.64 million tonnes (**TABLE D.9.3**). The large number of species and aggregate groups reported for Area 57 is a reflection of the multi-species nature of most fisheries in the region, particularly those in the tropical and subtropical areas. These aggregated groups have been assessed using single species methods. It is worth noting that the catch of pelagic and demersal species is nearly equal; given that just over half of the assessed stocks are demersal species, this indicates a reasonably balanced coverage of the assessments. The proportion of demersal species is higher for Tier 1 stocks.

TABLE D.9.1
SUMMARY OF ASSESSED STOCKS IN AREA 57 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	193	109	15
2 Surplus-production model approaches	96	96	19
3 Data-limited approaches	19	18	7
Total	**308**	**197**	**20**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 CLASSIFICATION OF STOCKS

Across the 308 stocks assessed for Area 57, 27.3 percent were considered overfished, 49.4 percent maximally sustainably fished, and 23.4 percent underfished (**TABLE D.9.2**). Of these stocks, 193 were classified as Tier 1 assessments, 96 as Tier 2, and 19 as Tier 3. The largest share of sustainably fished stocks is represented within Tier 2, although the difference between tiers is not significant. When weighted by landings, the portion of sustainably fished stocks increases to 82.9 percent (**TABLE D.9.3**), indicating that the highly abundant small-pelagic stocks, which dominate this region, are the most sustainable. Tier 2 stocks accounted for most of the more resilient species encountered in these areas, which is also why the status is more optimistic than for Tier 1 where more vulnerable stocks were assessed. Indeed, the assessed Tier 1 stocks were more evenly distributed across the range of resilience which thus gives an indication of reduced sustainability compared to Tier 2 stock. Moreover, most Tier 1 assessments have low uncertainty, while a majority of Tier 2 assessments were considered to have medium uncertainty, with some high. Finally, uncertainty for Tier 3 stocks was considered high.

TABLE D.9.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 57 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	193	36.8	26.4	36.8	63.2	36.8
2 Surplus-production model approaches	96	1.0	88.5	10.4	89.6	10.4
3 Data-limited approaches	19	0.0	84.2	15.8	84.2	15.8
Total	**308**	**23.4**	**49.4**	**27.3**	**72.7**	**27.3**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.9.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 57 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
3.64	9.3	73.6	17.1	82.9	17.1

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

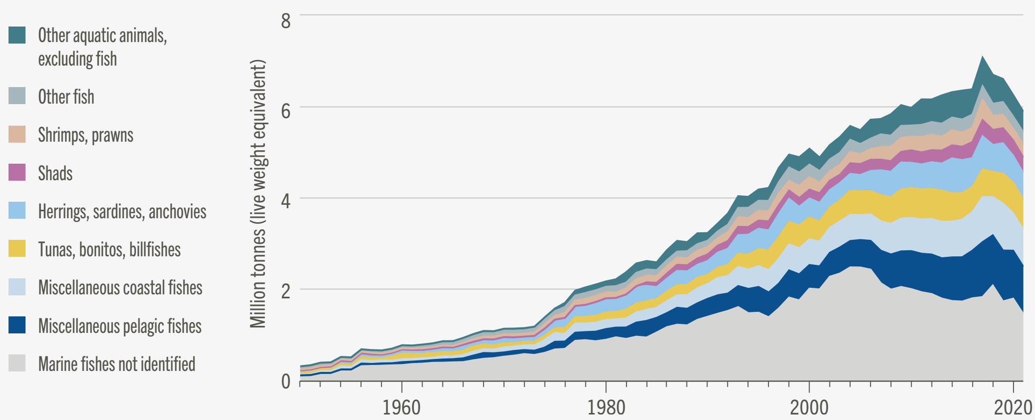
4. KEY SELECTED SPECIES AND GROUPS

This section identifies the main species and groups targeted in Area 57 (**FIGURE D.9.2**). The top five major groups that form the majority of the catch of Area 57 have largely remained the same since FAO's last review of the state of world marine fisheries resources (FAO, 2011). However, although the largest contribution is still generically classified as "marine fish NEI", its share has considerably reduced from its 34 percent in 2009 to 26 percent in 2021; as a result, there has been an increase in reporting for other groups which have increased their percentage share.

4.1 Pelagic fisheries

Pelagic fisheries in coastal areas and within EEZs are dominated by neritic tunas, scads, short mackerel, sardines and anchovies which together comprise 28 percent of the total catch in 2021. Specifically, miscellaneous pelagic fishes represented 18 percent of the catch, and small pelagic fish (herrings, sardines and anchovy) represented another 10 percent. These two groups form the first-largest group in terms of aggregate catch in Area 57.

FIGURE D.9.3
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE EASTERN INDIAN OCEAN (AREA 57) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

The total catch of pelagic species (including pelagic sharks and rays) was approximately 2.3 million tonnes in 2021.

4.1.1 MISCELLANEOUS PELAGIC FISHES AND SMALL PELAGIC FISH

These species are primarily targeted in coastal fisheries, with small pelagic fish being especially vital in Area 57. Relevant stocks of small pelagic fish in Area 57 include sardinellas, anchovies and Indian oil sardines *(Sardinella longiceps)*. They provide a high-quality protein source, support small-scale fisheries, and play a crucial ecosystem role as forage fish, connecting plankton to larger predatory fish. While these species are found throughout Area 57, most of the catch comes from the northern region (subareas 57.1 and 57.2). However, overfishing (particularly for scads) primarily occurs on some stocks in parts of the Bay of Bengal and Indonesia. In addition, these stocks demonstrate marked inter-annual fluctuations in catches that are driven by changes in environmental conditions and fishing pressure. This makes it challenging to determine species' stock status. Reported catches of both groups have levelled off over the past five years. Nonetheless, miscellaneous pelagic fishes and small pelagic fish remain quite resilient to fishing, and most are considered sustainably fished.

4.1.2 TUNAS, BONITOS AND BILLFISHES

The catches of open ocean resources in Area 57 are dominated by tuna fisheries. In 2021, the tunas, bonitos and billfishes group accounted for 11 percent of the total catch in Area 57, with catches having tracked those of the other pelagic groups, levelling off over the past ten years. These fisheries occur in oceanic waters further out from the coast. The large tuna fisheries represented 48 percent of this group, and are operated by longliners, purse seiners and gillnetters. Catches are dominated by skipjack tuna *(Katsuwonus pelamis,* at 186 414 tonnes), yellowfin tuna (*Thunnus albacares,* at 78 425 tonnes), bigeye tuna (*Thunnus obesus,* at 30 162 tonnes) and albacore tuna (*Thunnus alalunga,* at 13 686 tonnes). There are also smaller catches of southern bluefin tuna (*Thunnus maccoyii,* at 9 203 tonnes) taken in the more southern subareas. The status of these stocks is covered in **PART E.1, GLOBAL TUNA FISHERIES**, pp. 330 of this report.

Neritic tunas are caught closer to shore along the shelf by traditional, motorized and mechanized fleets operating multiple gears such as seines, gillnets, hooks-and-lines (longline, handline, pole and line) and even trawl. Neritic tunas represented 29 percent of the catch in 2021. The seerfishes (including Atlantic Spanish [*Scomberomorus maculatus*], narrow-barred Spanish [*Scomberomorus commerson*] and king mackerel [*Scomberomorus cavalla*]) made up 18 percent of the catch of this group. Catches increased until the early 2010s and have been stable since then. Overall, these stocks are mostly sustainably fished, with a few stocks overfished.

Billfish (marlin, swordfish etc.) comprise 3 percent of the catch of this group and are caught alongside tunas, mainly in the longline fishery. Their catches have declined from a peak in 2004. Overall, two out of five of these stocks are overfished, with the rest sustainably fished.

4.2 Demersal fisheries

Demersal species are typically associated with the shelf areas of Area 57, and comprised 34 percent of the total catch (2 million tonnes) for the Area in 2021.

4.2.1 MISCELLANEOUS COASTAL FISHES, MISCELLANEOUS DEMERSAL FISHES

The miscellaneous coastal fishes group, miscellaneous demersal fishes and flounders, halibuts, and soles together comprise 16.4 percent of the total catch of Area 57. They form an important part of the coastal fishery. After a continuous and steady rise, catches have levelled off since 2015. The miscellaneous coastal fish aggregate includes many resilient species that are an important component of trawl catches in the region (threadfin breams, goatfish, silverbellies, lizardfish), but also less resilient species such as Bombay duck *(Harpadon nehereus)*, *Arius* spp. catfish, croakers, snappers and groupers. The more vulnerable species tend to be in the overfished category, however there are also overfished stocks of some more resilient species (threadfin bream, goatfish and lizardfish).

4.2.2 SQUIDS, CUTTLEFISHES, OCTOPUSES

Cephalopods formed 2 percent of the total catch in 2021, and they are dominated by squid species. Cuttlefish and octopus are less significant components, although they have a higher value. The assessments indicate that cephalopods are mixed overfished or maximally sustainably fished in subareas 57.1, 57.2 and underfished in subareas 57.5 and 57.6.

4.2.3 CRUSTACEANS

Marine crustaceans are another part of the demersal fishery and are dominated by shrimp and prawns which made up 4.8 percent of landings in 2021. Crabs, sea spiders and other miscellaneous species make up a further 2.5 percent. Many of the shrimp and prawn stocks are overfished throughout 57.1 and 57.2. The crabs and sea spiders have more underfished stocks, although they are overfished in some places. Lobsters, spiny lobsters and rock lobsters form a small part of the catch and there are limited assessments which indicate they are currently sustainably fished.

4.2.4 CLAMS, SCALLOPS, OYSTERS, BIVALVES, MOLLUSCS

Molluscan shellfish form a very small part of the catch of Area 57 (less than 0.7 percent of the total) and there are very few stock assessments, but the six assessments available indicate they are sustainably fished.

4.2.5 SHADS AND MISCELLANEOUS DIADROMOUS FISHES

Shads, diadromous and anadromous fish are all highly vulnerable to changes in the brackish and freshwaters that they inhabit for part of their lifecycle. Disruptions to water quality and flow (due to damming, stage and abstractions) and the installation of barriers (e.g. saline barrages) all impact the ability of these species to successfully complete their lifecycles in estuaries and rivers. The shads are dominated by catches of the iconic hilsa shad *(Tenualosa ilisha),* which is a major fishery in Area 57 and comprised 5 percent of the total catch of the Area in 2021. It is a staple in diets of people in the northern part of the Bay of Bengal (particularly Bangladesh, Myanmar and West Bengal, India). The status of these species is a combination of maximally sustainably fished and overfished.

4.2.6 ELASMOBRANCHS

The elasmobranchs include sharks, rays and chimeras, and formed 1.6 percent of total identified landings in Area 57 in 2021. They can be split into two major groupings according to where they are encountered, either as oceanic and pelagic species which are usually caught as part of tuna and longline fisheries, or as demersal and coastal species that are more typically encountered in trawl fisheries and some gillnet fisheries. Overall, most species are considered sustainably fished. This result may be due to the inclusion of the more resilient, smaller shark and ray species and assessments based on aggregate groups. Individual less resilient species may be overfished in places, but the data is currently lacking and as such was not included in this analysis.

4.3 Marine fish NEI

The aggregated and non-specific nature of marine fish NEI prevents any assessment of status. This grouping represents 25 percent of total landings in Area 57 (just under 1.5 million tonnes), with the majority (58 percent, about 850 000 tonnes) being the non-disaggregated catch of Myanmar. Forty percent come from Bangladesh, India, Malaysia and Thailand. For the other reporting countries, this component is assumed to be primarily the unidentified components and bycatch of trawl and seine fisheries and the catch of multispecies coastal small-scale fisheries that are not disaggregated for statistical purposes.

The unidentified species caught in the larger-scale trawl and seine fisheries typically comprise juveniles of commercial species and low value species, and these landings are typically utilized as fresh feeds or converted to fishmeal.

Case studies on the small-scale fisheries of the region indicate that the species groups that dominate the small-scale fishery are primarily small and medium-sized pelagic species and coastal demersal species (FAO, Duke University and WorldFish, 2023). These landings are destined either for local processing and consumption, or more rarely as fresh feeds for aquaculture or poultry.

5. KEY FINDINGS

Overall, landings of assessed stocks in Area 57 represented 67.6 percent of total landings reported in the Area in 2021, an increase from the 46.8 percent that were covered by the previous methodology. The status results obtained for Area 57 are largely in line with those from the previous methodology in terms of the share of sustainable and unsustainable stocks, with even an increase in the proportion assessed to be sustainable (TABLE D.9.4). In fact, results from the updated methodology indicate a reduction in the proportion of maximally sustainably fished and overfished stocks, and an increase in the proportion of underfished stocks. This is because more resilient small pelagic stocks are being assessed compared to previous analyses, a point reflected in results when stocks are weighted by landings (TABLE D.9.5). The substantial increase in the number of stocks included in the analysis has not only improved granularity in terms of species and groups, but also with regards to the assessments by subarea. In addition, the use of the surplus-production analysis for Tier 2 stocks provided improved fitting of models and reduced estimation uncertainty in the results.

TABLE D.9.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 57 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
308	23.4	49.4	27.3	72.7	27.3	52	11.5	51.9	36.5	63.5	36.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1)For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.9.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 57 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
9.3	73.6	17.1	82.9	17.1	0.0	75.5	24.5	75.5	24.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

In spite of this, the results also reflect a considerable difference in the scale of fisheries and status of stocks among the subareas of Area 57. Indeed, the list of stocks compiled includes a larger portion of stocks from subareas 57.1, 57.2 and 57.5.1; however, this is representative of the fishing intensity and landings in Area 57, which are mainly concentrated in the northern region. It also aligns with the number of vessels of the coastal states in these areas. Thus, the assessment results also highlight how catches of Area 57 are skewed to the subarea 57.1 (Bay of Bengal), relative to the lower catches in the rest of Area 57. In Area 57, reporting of stock status by fishery subareas is better for indicating where management is working and where it could be improved, due to the considerable diversity of ecosystem contexts. Reporting the stock status of the region based on FAO subareas would be more useful to the respective member countries, as these stocks are under different forms of management and pressures.

This review has broadly split the fisheries of the region into pelagic and demersal fisheries, and this reflects the different types of fishing operations and species targeted by oceanic and shelf fisheries. It is worth noting that this analysis excluded the main commercial stocks of tunas (albacore, bigeye, bluefin, skipjack and yellowfin; covered in **PART E.1, GLOBAL TUNA FISHERIES**, pp. 330 of this document), although the neritic tunas, large mackerels (e.g. *Scomberomorus* spp.) and billfish (swordfish, marlins) were included.

Importantly, the current reference list of stocks used for Tier 1 and Tier 2 assessments reflects the current state of the commercial stocks which comprise the major fisheries in Area 57. Given the high level of fishing effort, these stocks may disproportionately represent species which are more resilient, with less resilient species no longer contributing significantly to the total catch. In addition, aggregation of species into larger groups in Area 57 presented some challenges. Given that the data for more vulnerable stocks is lacking, aggregating species could result in more resilient members of the group dominating the assessment. Both of these issues have the potential to present an overly optimistic picture of the state of the stocks in Area 57. It is therefore important to ensure that more vulnerable stocks continue to be increasingly included on the list of assessed stocks, even if they do not form a substantial part of the catch. If not, results will continue to be skewed towards the more resilient species.

FIGURE D.9.4 *(next page)*
AREA 57 – DATA AT A GLANCE

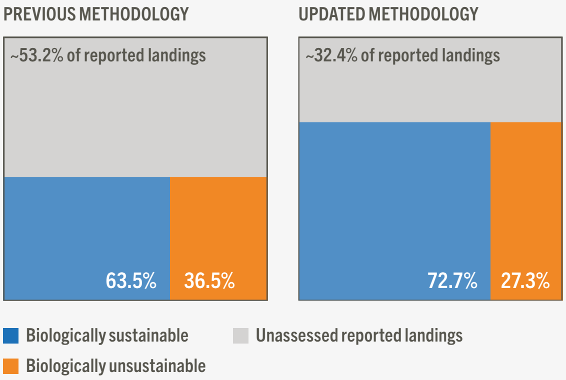
INDIAN OCEAN, EASTERN

KEY MESSAGES

- The region's share of artisanal fleets is one of the largest in the world. Millions of people in this area depend on fisheries for livelihoods and food security.
- The increase in landings up to 2017 can be attributed to higher landings and improved data collection, while the recent decrease appears to be due to a reduction in fishing pressure.
- The small-scale and multispecies nature of the majority of the region's fisheries, especially in the Bay of Bengal, poses challenges for both data collection and management systems.
- There is a growing social awareness, technological capacity and political will to manage fisheries sustainably.
- Fisheries in this region are important economically, nutritionally and culturally – but climate change poses a significant current and future risk.

STOCK STATUS

FAO estimates, 2021



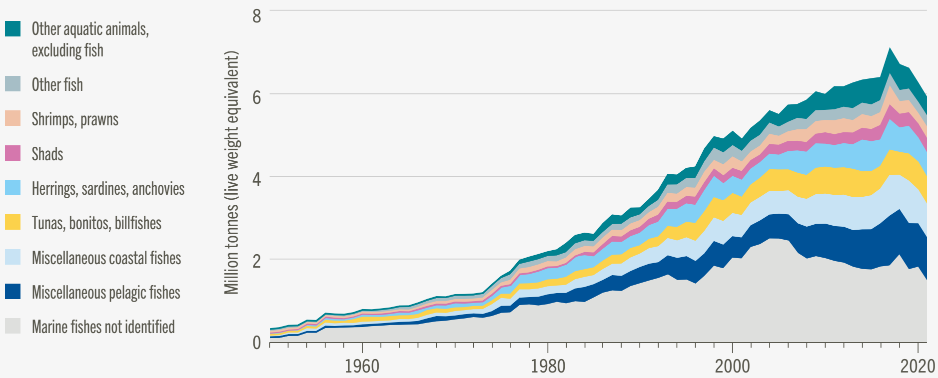
ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

SPECIES COMPOSITION

FAO data, 1950–2021

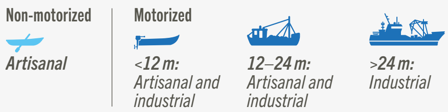


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 522 000



Non-motorized: 22%
Motorized: 78%

LANDINGS

FAO data, 2021

Reported landings ~ 5.9 million tonnes

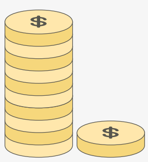
Unidentified: 25%
Identified at species group level: 75%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 10.6 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 3.5 million

Male: 72%
Unspecified: 17%
Female: 10%

= 100 000 PEOPLE

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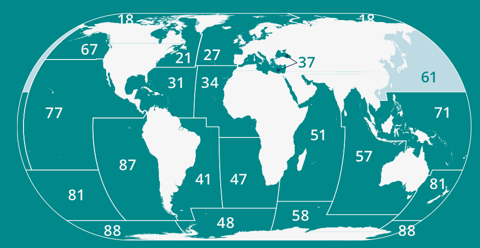
61



NORTHWEST PACIFIC
FAO MAJOR FISHING AREA 61

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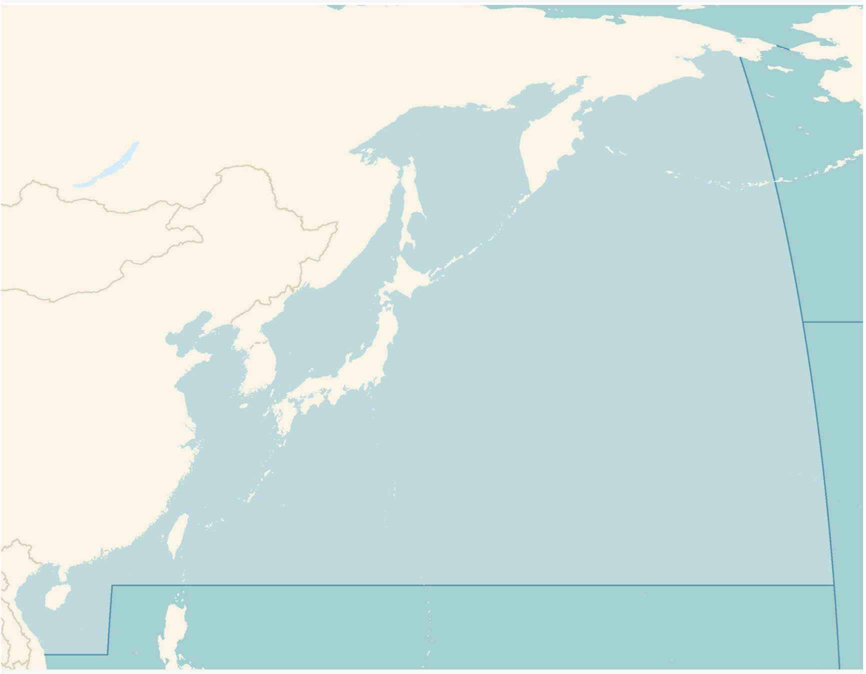
1. OVERVIEW

The Northwest Pacific, designated by FAO as Major Fishing Area 61 (hereafter, Area 61), includes major continental shelf regions such as the northern South China Sea, East China Sea, Yellow Sea, Sea of Japan, and Sea of Okhotsk. Additionally, it includes smaller yet productive shelf areas in regions like the western Bering Sea, the waters east of the Japanese

FIGURE D.10.1
FAO MAJOR FISHING AREA 61: THE NORTHWEST PACIFIC

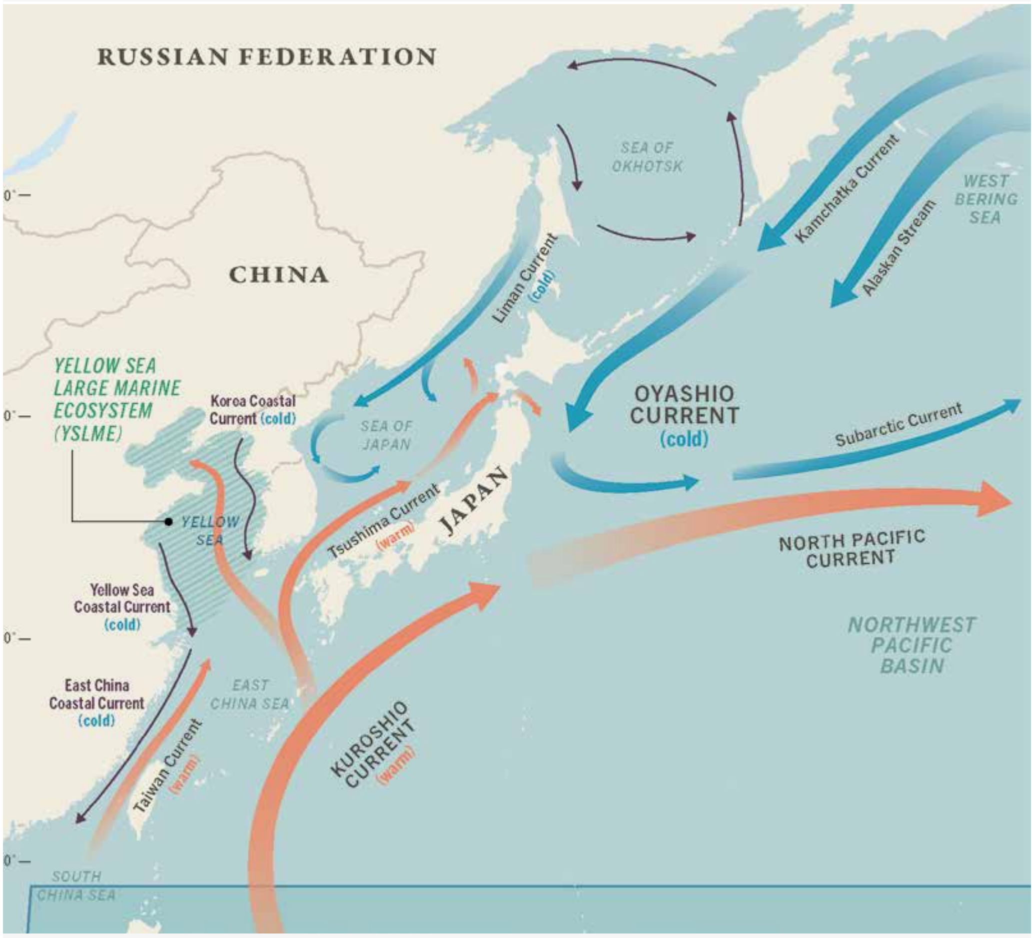


Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

archipelago, the Kuril Islands, and the southeastern Kamchatka Peninsula. The total area of the Northwest Pacific covers nearly 19 million km², including the third-largest continental shelf, which measures approximately 3.6 million km² (FAO 2005, 2011)

This region includes the Yellow Sea Large Marine Ecosystem (YSLME). Primary production in this ecosystem is strongly driven by multiple environmental dynamics (**FIGURE D.10.2**), including the Yellow Sea Cold Water Mass, the Taiwan Warm Current and the Kuroshio Current (also known as the Japanese Warm Current). The Yellow Sea Cold Water Mass is a low-temperature, highly saline water body that resides in the central part of the deep bottom layer of the Yellow Sea (Yellow Sea Trough); in summer it covers an area of about 130 000 km². Cold-water masses are usually rich in nitrates and phosphates, which can provide nutrients needed for the growth of plankton (Xing *et al.,* 2024). The abundance of plankton can provide food resources for fish and other high-trophic level aquatic organisms, thus supporting a productive marine ecosystem. Cold-water masses in the Yellow Sea mainly occur in summer, overlapping with peak spawning season for many economically important fish species, particularly species with a preference for lower temperatures. The Taiwan Warm Current is characterized by high temperatures and high salinity that flows from south to north along the coasts of Fujian province (115°50′ to 120°40′ east, 23°30′ to 28°22′ north) and Zhejiang province (27°02′ to 31°11′ north, 118°01′ to 123°10′ east).

FIGURE D.10.2
MAJOR CURRENT SYSTEMS IN AREA 61



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Sources: United Nations Geospatial. 2020. Map geodata. Adapted from National Oceanic and Atmospheric Administration. "JetStream Max: Major Ocean Currents." Last modified April 14, 2023. https://www.noaa.gov/jetstream/ocean/circulations/jetstream-max-major-ocean-currents [accessed 20 February 2025]; Major ocean current systems of the world. https://www.britannica.com/science/ocean-current [accessed 20 February 2025]; **Ishizaka, J., Kim, G., Lee, J.H., Liu, S.M., Yu, F. and Zhang, J.** Eds. 2021. Oceanography of the Yellow Sea and East China Sea. *PICES Scientific Report*, No. 62. North Pacific Marine Science Organization, Sidney, BC, Canada; and Flanders Marine Institute http://marineregions.org/mrgid/8555 [accessed 20 February 2025].

It brings a rich supply of nutrients and attracts a diverse assemblage of marine organisms. The high temperature and salinity of the water brought by the warm currents provide ideal conditions for the proliferation of heat- and salt-resistant marine organisms, contributing greatly to the diversity of the fishing community in the East China Sea.

The Kuroshio Current, also known as the Japanese Warm Current, is one of the four major warm currents in the world and is a northern tributary of the North Equatorial Current, originating in the eastern Philippine Sea and flowing into the East China Sea via the northeastern island of Taiwan Province of China and the southwestern Ryukyu Islands (Qu et al., 2016). Additionally, the Kuroshio flow process triggers surge currents that assist fish migrations. The influence of the Yellow Sea Cold water mass on fisheries is evident through the proliferation of the Zhoushan fishing grounds, the central Yellow Sea fishing grounds and the Liaodong Bay shrimp farms; while the flow of the Kuroshio Current has formed the East China Sea continental shelf fishing grounds, the Yellow Sea–Bohai Sea fishing grounds and the Taiwan Strait fishing grounds.

The major currents around the Korean Peninsula are the Tsushima Warm Current, the Jeju Warm Current, the North Korea Cold Current, and the Chinese Coastal Current (KHOA, 2024). The Tsushima Warm Current, a branch of the Kuroshio Current, flows between the Republic of Korea and Japan toward the northeast. The Jeju Warm Current flows clockwise around Jeju Island, the largest island in – and the southernmost land of – the Republic of Korea. The North Korea Cold Current comes along the east coast of the Korean Peninsula from the north, while the Chinese Coastal Current flows south along the Yellow Sea. The annual average sea surface temperatures around the Korean Peninsula measured by satellites from 2001 to 2023 ranged from 18.8 °C in 2011 to 19.8 °C in 2023 (NIFS, 2024).

Starting in the 1950s, there was a steep upward trend in annual fishery yields in the Northwest Pacific (Area 61), which reached 23.6 million tonnes in 1988 (**FIGURE D.10.3**). The fishery yields fell from 1988, but then quickly increased again to about 23.7 million tonnes by 1997. There has been a downward trend since 2014. In 2021, most of the catch was landed by China (57.4 percent), followed by the Russian Federation (19.0 percent), Japan (15.6 percent) and the Republic of Korea (5.1 percent) (**FIGURE D.10.3**). Catches by other countries amounted to about 3 percent. The Union of Soviet Socialist Republics (USSR) was formally dissolved in December of 1991, and thus the Russian Federation's fishery yields have been reported since 1992 in the FAO database. Recently, there has been a downward trend in fishing pressure in China, Japan and the Republic of Korea, which may lead to an increase in the number of sustainable stocks in the future. In 2021, there were nearly 448 000 active vessels in Area 61 and more than 2.5 million fishers.

Numerous studies have shown that climate change has impacted seawater pH, nutrient salt distribution, temperature, upper ocean currents, ocean density stratification, and other key oceanographic processes in the Area (Xu *et al.,* 2024; Zhang *et al.,* 2024). These environmental uncertainties can compound with fishing pressure and further affect the spatiotemporal dynamics in fishery resources (Lu *et al.,* 2024).

2. FISHERY PROFILES

2.1 China

Area 61 encompasses China's four major seas: the Bohai Sea, the Yellow Sea, the East China Sea and the South China Sea. China has a mainland coastline of 18 000 km and an island coastline of 14 000 km (Qi, 2019; Zhao and Lin, 2016). The total sea area is over 3 million km^2. China's exclusive economic zone (EEZ) supports some of the most productive fisheries in the world. Fisheries in China's EEZ employ a variety of fishing gears such as bottom and mid-water trawls, stow nets, hooks and lines, surrounding nets (seines) and gillnets.

The *Chinese Fishery Statistical Yearbook* indicates that in 2022, China's motorized marine fishing vessels, specifically those engaged in China's EEZ, totalled 130 000 (MARA, 2023). Small-scale fisheries account for a large proportion of China's fishing effort. However, fisheries landing data from China's EEZ do not distinguish clearly between industrial and small-scale fleets. Many fish stocks are subject to seasonal migration, moving between inshore and offshore areas and along the coast. Some fish stocks are distributed across different jurisdictional boundaries, subject to fishing in different countries (e.g. Japan and the Republic of Korea), and are found in international waters which are subject to regional fisheries management organizations (RFMOs) such as the North Pacific Fisheries Commission (NPFC).

China is the most productive fishing country in the world. The total marine fishery production of China was approximately 2.8 million tonnes in 1980, and by 1990 production had grown to about 5.8 million tonnes, making it the largest in the world. Its fisheries production exceeded 12 million tonnes for the first time in 1996, and reached a peak of more than 13.4 million tonnes in 2015. However, growth then started to slow and production has remained under 12 million tonnes since 2020. Recently, while continuing to maintain the current levels of fishery production, the Chinese government has placed greater emphasis on the sustainable use of fishery resources and alternative fishery production methods, such as marine ranching and stock enhancement, rather than simply pursuing an increase in the volume of wild fish caught.

The main species of economic value in marine capture fisheries in China are largehead hairtail *(Trichiurus lepturus),* yellow croaker *(Larimichthys polyactis)* and Japanese Spanish mackerel *(Scomberomorus niphonius)* (also known as Seerfishes NEI). Along with the rapid growth of China's economy and its fisheries industry, the number of people employed in the sector has greatly increased since 1980, when it supported the livelihoods of more than 1 million people (MOA, 1980). In each subsequent year the number of people working in the fishing industry rose, reaching 21 million people in 2004, then gradually declined, stabilizing at 17 million by 2020 due to reduced production (MARA, 2021).

Since the People's Republic of China was founded, the key goals of fishery policy have been evolving in accordance with the needs of national economic development and the condition of its fisheries. In recent years, China has gradually shifted from emphasizing economic growth to focussing on ecological protection. Along with the global call-to-action to protect the marine environment, fisheries resource conservation has become a top priority of marine fisheries management in China. After the 13th Five-Year-Plan (2016–2020) proposed updated double control targets and the first total yield limit, the Ministry of Agriculture issued the *Notice on Further Strengthening the Management of Domestic Fishing Vessels and Implementing the System for Managing Total Marine Fisheries Resources* in February 2017, which outlined China's central agenda for fisheries reforms. Soon afterwards, the national government reauthorized the Provisions of Administration of Fishing Licences, which entered into force on 1 January 2019; the Fisheries Law is currently being revised to take more consideration of ecological conservation (Su *et al.,* 2020).

To this day, the status of fisheries resources in China's EEZ remains uncertain because of limited fisheries catch and fishing effort data. In addition, the limited capacity for conducting formal stock assessments makes it difficult to regularly assess stock status. With the acceleration of urbanization, some fishers have begun moving to cities to work in other industries, forming a new livelihood pattern and leading to a decrease in the number of fisheries employees, which has also changed the traditional structure of the fisheries industry.

2.2 Japan

The main target species in Japan include small pelagic fish (e.g. sardine, anchovy, mackerel), cod, squid, crabs, tunas, salmon and several groundfish (e.g. sea bream, flounder). The revised Fisheries Act came into force in Japan in 2020, marking a significant reform in the country's fisheries management system. One of the key objectives of this reform is to strengthen fisheries resource management. The 2020 revision emphasizes the implementation of a management reference point aimed at achieving maximum sustainable yield (MSY). The goal is to maintain or restore fishery resources at sustainable levels. To achieve this, total allowable catches (TACs) are set in a way that ensures fish stocks remain above or can recover to MSY levels where they can be sustainably harvested.

Additionally, Japan launched a roadmap[1] for promoting new resource management, which focuses on several key initiatives to ensure the sustainable use of fisheries and other

1 **https://abchan.fra.go.jp/about/**

marine resources. The roadmap includes enhancing stock assessments by expanding the number of species evaluated based on the MSY, ensuring more accurate and science-based resource management.

The number of fishing vessels has been declining in Japan, with around 60 percent of the boats being at least 20 years old. In Japan, the ageing of the population is a particular concern for fishery workers, over 30 percent of whom are aged 65 or older (Delaney and Yagi, 2017). Moreover, membership in fishery cooperative associations, which play a crucial role in fisheries self-governance, has been declining (Delaney and Yagi, 2017).

In stock assessments for each fish stock, the biological characteristics of the species are thoroughly considered. This includes using population dynamics models that incorporate age structure information to the extent possible. Such models are employed to estimate resource levels, management reference points, and stock–recruitment relationships. For that purpose, a "virtual population analysis" has been used as the main method. This is a cohort-based analysis that reconstructs the historical population size of a fish stock by analysing past catch data. It does not estimate the stock–recruitment relationship within the model; the estimated recruitment and spawning stock biomass from the model are used outside the population model to estimate the stock–recruitment relationship. In cases where age-structured catch data is not available, other approaches such as statistical catch-at-size and surplus production models can be used when catch data and biomass indicators are available.

2.3 The Russian Federation

The majority of landings from the Russian Federation are reported to Area 61, with a smaller amount in Area 67. The fisheries primary sector of the Russian Federation employs over 67 000 people, and has an estimated fleet of more than 1 500 vessels. The Russian Federation has a well-developed system of fisheries regulation based on scientific research and consultations with fishing communities. Determination of TACs is regulated by the Federal Law (2004), the Fishing Rules (2022) and the Order of the Federal Agency for Fisheries, Rosrybolovstvo (2015), and based on regular research surveys.

The Fishing Rules allocate areas of catch, fishing zones and subzones, set fishing periods, and prohibit fishing in spawning areas, taking into account the biological characteristics of a species that makes up a stock in a particular area. They also dictate prohibited areas for fishing, minimal legal size, restrictions on the use of fishing gear, time limits, and consideration of the interests of Indigenous Peoples. In accordance with this zoning, the state of stocks is recorded and the TAC for fish stocks in a given area is determined.

The precautionary principle, the ecosystem approach and the concept of MSY are used to justify the TACs and the harvest control rules in accordance with the Federal Agency for Fisheries, Rosrybolovstvo, for the sustainable development of domestic fisheries. Surveys are carried out using bottom, mid-water and pelagic trawls, diving and acoustic methods. Specialized crab and shrimp stock surveys using bottom traps are also carried out.

2.4 The Republic of Korea

Marine waters around the Republic of Korea, located around 37° north and 127° east, belong to the temperate zone. The area of the Republic of Korea's EEZ is 288 045 km^2, with a continental shelf area of 68 902 km^2 (MOLIT, 2024). Around the end of the twentieth century, almost 300 different species of fish were caught by commercial fisheries in the Republic of Korea's EEZ (NFRDA, 1994, 2004).

The country's Ministry of Oceans and Fisheries uses the TAC policy as one of its key fisheries management tools. As of 1 July 2024, it listed 16 species subject to TACs (MOF, 2024), and is considering adding more species in the future. The Republic of Korea's government has been attempting to reduce fishing pressure on domestic fisheries since the mid-twentieth century due to conservation concerns, and in 2011 enacted a law to reduce the number of fishing vessels (MOLEG, 2011).

2.5 Democratic People's Republic of Korea

The Democratic People's Republic of Korea was not considered in this analysis due to the paucity of information about this region.

3. RESOURCE STATUS

The analysis for Area 61 was based on 92 stocks representing 51 species (**TABLE D.10.1** and **APPENDIX II, TABLE 10**, pp. 456). Of these, 56 stocks were classified as Tier 1 (with formal assessments) and 36 stocks as Tier 2 (stocks assessed with surplus-production model approaches). These stocks are considered to represent 63.4 percent of the total declared landings for Area 61 in 2021. This is a large increase from the previous methodology, which only comprised 25 species groups including multiple stocks of Alaska pollock *(Gadus chalcogrammus)* and cod *(Gadus macrocephalus),* which represented 52.7 percent of landings. However, assessments for some species have high uncertainty because of data limitations.

In 2021, out of a total of 56 stocks assessed as Tier 1, 42.9 percent, 25.0 percent, and 32.1 percent were assessed to be overfished, maximally sustainably fished, and underfished, respectively. Out of a total of 36 stocks assessed as Tier 2 stocks, 27.8 percent, 41.7 percent, and 30.6 percent were considered to be overfished, maximally sustainably fished, and underfished, respectively. Overall, 37.0 percent of stocks in Area 61 were defined as unsustainable and 63.0 percent as sustainable (31.5 percent maximally sustainably fished and 31.5 percent underfished) (**TABLE D.10.2**).

TABLE D.10.1
SUMMARY OF ASSESSED STOCKS IN AREA 61 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	56	27	10
2 Surplus-production model approaches	36	31	12
Total	**92**	**51**	**15**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

TABLE D.10.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 61 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	56	32.1	25.0	42.9	**57.1**	**42.9**
2 Surplus-production model approaches	36	30.6	41.7	27.8	**72.2**	**27.8**
Total	**92**	**31.5**	**31.5**	**37.0**	**63.0**	**37.0**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

Considering the amount of declared landings attributed to these stocks in 2021 (**TABLE D.10.3**), stocks classified as underfished comprise 30.5 percent of the total landings accounted for by the assessed stocks, while those classified as maximally sustainably fished account for 43.2 percent, and those classified as overfished account for 26.3 percent. Accordingly, stocks classified as sustainable account for 73.7 percent of the landings, with 26.3 percent classified as unsustainable in 2021 when weighted by landings.

TABLE D.10.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 61 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
12.04	30.5	43.2	26.3	73.7	26.3

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

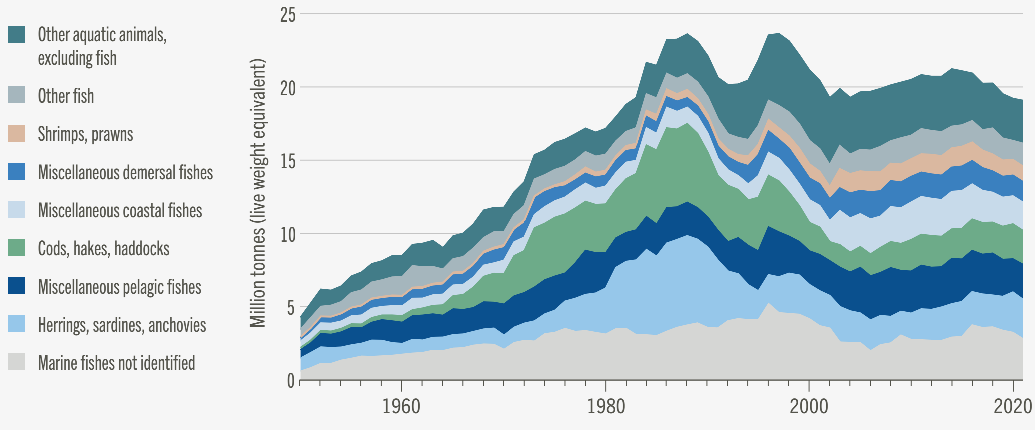
Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 61 (**FIGURE D.10.3**). The composition of annual yields by taxonomic group does not appear to have changed significantly over time.

FIGURE D.10.3
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE NORTHWEST PACIFIC (AREA 61) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.1 Small pelagic fishes (anchovy, sardine, herring)

As in other FAO Areas, small pelagic fishes have contributed to considerable catches in Area 61. This group has comprised, on average, 13.7 percent of the total yield in Area 61 since 1950.

From the early 1990s, landings of Japanese anchovy *(Engraulis japonicus)* have been primarily taken by China although landings by the Republic of Korea and Japan also represent part of the catch. Total landings peaked at around 1.9 million tonnes in 1998 and have since decreased, with a harvest of just under 1 million tonnes in 2021 of which around 600 000 tonnes were landed by China. Japan's catches of Japanese anchovy have mostly oscillated between 200 000 tonnes and 400 000 tonnes since 1950. They reached a historical maximum in 2004 at 500 000 tonnes and have since steadily declined, reaching a close to historical low of 120 000 tonnes in 2021. The Republic of Korea's landings of Japanese anchovy ranged from 54 000 tonnes to 293 000 tonnes between 1970 and 2021, with the average annual yield in the past ten years being 194 000 tonnes. There are five stocks of Japanese anchovy whose status in 2021 varied from underfished to overfished, with the majority (four stocks) being sustainably fished (underfished or maximally sustainably fished).

The catch of Japanese pilchard or Pacific sardine *(Sardinops sagax)* declined sharply since the early 2000s. The catch has historically been and remains dominated by Japan, whose catch represented around 640 000 tonnes in 2021. The combined landings of most countries in the region (the Russian Federation, Japan and the Republic of Korea), catches peaked at around 5 million tonnes in the 1990s, with a sharp decline since then. The average catch 2017–2021 is approximately 100 000 tonnes for China. This fishery is important for fishmeal and oil production. There are three stocks of Pacific sardine in the region; two of them were estimated to be overfished and one of them underfished in 2021.

The overall catches of Pacific herring *(Clupea pallasii)* averaged around 450 000 tonnes over the last decade. They have historically been and continue to be largely dominated by the Russian Federation (and previously the USSR), which accounted for approximately 410 000 tonnes of the catch in 2021. Japan and China were important players until the 1980s but the Russian Federation has taken most of the share of captures since the 1990s. There are three stocks of Pacific herring in Area 61, with two maximally sustainably fished and one underfished in 2021.

4.2 Largehead hairtail

The catch of largehead hairtail *(Trichiurus lepturus)* peaked at around 1.3 million tonnes in 2006 and has been gradually declining since, amounting to about 910 000 tonnes in 2021. Catches are mainly dominated by China since 1950, with largehead hairtail representing a major commercial fish species in the country. China's share of production has ranged from 68 percent in 1983 and 96 percent in 2012. The Republic of Korea is the second largest producer in the Area. From 1970 to 2021, the Republic of Korea's annual yield of largehead hairtail ranged 32 000–166 000 tonnes, averaging in the past ten years at 48 000 tonnes. Fisheries from Japan and the Russian Federation also catch these stocks, but in much smaller numbers (under 20 000 tonnes in 2021). There are two stocks of largehead hairtail in Area 61, one is maximally sustainably fished and the other is overfished.

4.3 Gazami crab

The fishery yield of gazami crab *(Portunus trituberculatus)* for Area 61 peaked in 2014 at 600 000 tonnes, gradually decreasing to about 476 000 tonnes in 2021. The average catch of gazami crab during the last five years (2017–2021) was 460 000 tonnes. Widespread fishing of gazami crab in Area 61 started when China entered the market in 1987. Since then, landings have been dominated by China as it is a major commercial fish in the country. The country's share of production has ranged between 74 percent (1988) and 98 percent (2004). Chinese production expanded until reaching a maximum of 580 000 tonnes in 2014 and has since declined, with 455 000 tonnes of landings in 2021. The Republic of Korea's annual landings of the species ranged 12 000–30 000 tonnes in the past ten years, amounting to about 19 700 tonnes in 2021. Japan has a small catch, representing 1 793 tonnes of the catch in 2021. The two stocks of gazami crab in Area 61 are maximally sustainably fished in 2021.

4.4 Pacific chub mackerel

The fishery yield of Pacific chub mackerel *(Scomber japonicus)* in Area 61 has had fluctuation of 0.5–1.5 million tonnes since the early 1960s, with the notable exception of a historical high exceeding 2 million tonnes in the late 1970s. In 2021, landings were estimated at 490 000 tonnes. Japan initially dominated landings, with a share of production between 70 percent and 90 percent during the 1950s and 1960s. Since then, Japanese catches have been declining and have converged with those of China. Both countries have had a share of production of about 40 percent since the early 2000s. A small number of catches are landed by the Republic of Korea, the Russian Federation, and other countries. There are three stocks of Pacific chub mackerel, two of which are considered overfished with one stock maximally sustainably fished.

3.5 Seerfishes/Spanish mackerel/Japanese Spanish mackerel

Landings for this species group (*Scomberomorus* spp.) in area 61 increased exponentially from negligible amounts in the early 1950s to a peak exceeding half a million tonnes at the end of the 1990s. Since then they have remained between approximately 400 000 and 500 000 tonnes and amounted to about 415 000 tonnes in 2021. China entered the market in the 1970s, during which its share of production in Area 61 revolved around 50 percent. This share steadily increased during the 1980s and 1990s to reach 90 percent in the second half of the 1990s and has since remained close to these levels. In 2021, Chinese landings of this species group in Area 61 represented about 380 000 tonnes. The Republic of Korea and Japan also target this species group but to a lesser extent. There are three stocks of *Scomberomorus* spp. in Area 61, whose respective statuses in 2021 were underfished, maximally sustainably fished, and overfished.

3.6 Yellow croaker

The yellow croaker *(Larimichthys polyactis)* fishery in Area 61 was initially dominated by Japan during the 1950s and 1960s. Overall catches for the Area fluctuated around 100 000 tonnes per year during that period. Between 1970 and 1990 catches for the area fell to about 50 000 tonnes per year, with China and the Republic of Korea sharing these landings amid a decline in Japanese catches. Since the 1990s, catches of yellow croaker in Area 61 increased dramatically, reaching a maximum of 460 000 tonnes in 2011 and subsequently declining, with 2021 catches at 320 000 tonnes. The Chinese share of production has remained close to 90 percent since the mid 1990s. There are two stocks of yellow croaker in Area 61; one is considered maximally sustainably fished and the other overfished.

4.7 Japanese jack mackerel

The Japanese jack mackerel *(Trachurus japonicus)* catch in Area 61 was historically dominated by Japan, which represented over 90 percent of the share of landings during the second half of the twentieth century. Its catches multiplied by a factor of close to 10 during the 1950s, remained around half a million tonnes during the first part of the 1960s and dropped back to about 60 000 tonnes by 1980. A second period of growth brought Japanese landings to about 300 000 tonnes per year in the mid-1990s. Since then, the share of Japanese landings has been declining and were close to 90 000 tonnes in 2021, corresponding to a Japanese share of catches of about 50 percent. In parallel, China's fishery for Japanese jack mackerel largely began in the early 2000s, with catches peaking at 190 000 tonnes in 2007, and gradually declining to 28 000 tonnes in 2021. The Republic of Korea's fishery yield of Japanese jack mackerel from 1970 to 2023 ranged from 565 tonnes in 1980 to 49 600 tonnes in 2021 with an annual average of 20 400 tonnes. Overall, the stocks of Japanese jack mackerel are considered overfished, with one maximally sustainably fished.

4.8 Alaska pollock

The Alaska pollock *(Gadus chalcogrammus)* stocks in the North Pacific are amongst the largest stocks globally. Landings peaked at around 5 million tonnes in 1985, and recently have been relatively stable at about 2 million tonnes. Japan, China and the Russian Federation fish on different components of these stocks. However, the largest and most productive stocks are in the waters targeted by the Russian Federation. The precautionary principle and the ecosystem approach are used to estimate the TAC and support the sustainable development of domestic fisheries. Surveys are carried out using bottom, mid-water and pelagic trawls, mid-water and pelagic trawls, acoustic and Ichthyoplankton methods; these inform the harvest control rule along with the fishery-dependent catch per unit effort (CPUE). Historically, Japan and to a lesser extent the Republic of Korea landed a larger portion of the stocks than at present. However, since the early 1990ss the share of landings of Alaska pollock from these countries has remained relatively stable at around 13 percent and 4 percent, respectively. Overall, most of the stocks of Alaska pollock in Area 61 are considered sustainably fished, with the exception of two that are considered overfished.

4.9 Pacific cod

Pacific cod *(Gadus macrocephalus)* is one the most important species in Area 61 after Alaska pollock. Landings of this species have range of 130 000–230 000 tonnes in the last ten years. The stocks are primarily targeted by the Russian Federation followed by Japan, and to a lesser extent the Republic of Korea. The landings of Japanese fleets have remained relatively stable since the late 1950s at around 51 000 tonnes per year, although with some peaks and dips. Production of Pacific cod by the Russian Federation (previously the USSR) grew exponentially in the early 1980s, peaking at just over 188 000 tonnes in 1985. In 2021, the Russian Federation landed just under 164 000 tonnes of Pacific cod, representing about 71 percent of the total landings of Pacific cod for Area 61. Overall, of the seven stocks of Pacific cod in Area 61, most are sustainably fished, with only one stock considered overfished.

5. KEY FINDINGS

This report found that, in 2021, 37.0 percent of assessed stocks in Area 61 were overfished, 31.5 percent were maximally sustainably fished, and 31.5 percent were underfished. Compared with the previous assessment in 2021, where 56 percent were assessed as overfished, 24.0 percent as maximally sustainably fished, and 20.0 percent as underfished, these new results indicate that the overall stock status is better than had previously been estimated (**TABLE D.10.4**). This is due to a number of reasons, including that the updated assessment has a higher resolution with 92 stocks in the reference list, while the previous assessment was based on 25 aggregated stocks. New unique stocks were added from China, the Republic of Korea and the Russian Federation that were not previously analysed. In addition, the improvement in the updated assessment results can also partly be attributed to the reduction in fishing pressure, as fishing efforts in China, Japan and the Republic of Korea have decreased during the last decade. As such, stocks may be on a rebuilding trajectory in the region. Moreover, in the North Pacific waters of the Russian Federation, management procedures are in effect that aim to ensure the long-term sustainability of the stocks.

Despite the increase in the number of assessed stocks, an estimated 37 percent of landings remain from unassessed stocks. Better data and information for some assessments could reduce uncertainty as well as improve coverage for the region. In addition, the stock structure of different species is poorly understood as multiple sub-stocks may exist in the region. For example, there is a need to examine whether or not the same species of Japanese flying squid *(Todarodes pacificus)* harvested in in waters of the Republic of Korea and Japan should be considered a single stock unit for assessment purposes.

When weighted by the volume of landings, biologically sustainable stocks accounted for 73.7 percent of the reported landings of assessed stocks monitored by the FAO in 2021 (**TABLE D.10.5**), a significant improvement over the previous methodology, which estimated only 52.8 percent from sustainable stocks in 2021.

The stock assessment results are highly sensitive to assumptions about stock structure and species distribution, which can vary drastically in this region under ocean changes influenced by climate. In regions where spatial distributions of marine fishes are affected by ocean conditions, changes in composition and abundance of fish species and populations are frequent – stock structures can be dynamic. In Areas where the impacts of rapid climate change are evident, it is important to carefully track and examine further variations in patterns of species abundance.

TABLE D.10.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 61 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
92	31.5	31.5	37.0	63.0	37.0	25	20.0	24.0	56.0	44.0	56.0

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Source: FAO estimates.

TABLE D.10.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 61 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
30.5	43.2	26.3	73.7	26.3	12.8	40.1	47.2	52.8	47.2

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

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FIGURE D.10.4 *(next page)*
AREA 61 – DATA AT A GLANCE

FAO MAJOR FISHING AREA 61

PACIFIC, NORTHWEST

AREA 61

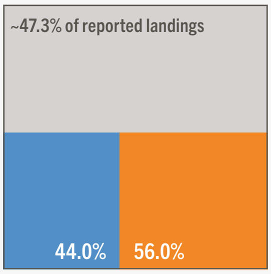
KEY MESSAGES

- The Northwest Pacific region is one of the most productive fishing areas in the world, supplying around a quarter of global landings.
- In this Area, concerted efforts have been taken to reduce fishing pressure by reducing effort and access to fishing grounds.
- Landings of squid, cuttlefish, octopus and shrimp have increased greatly since 1990, while landings of key fish species such as Japanese pilchard, Japanese anchovy and Alaska pollock have declined, partially due to overfishing and declines in recruitment.
- Climate change may increase the intensity and size of storms in the North Pacific and impact the distributional ranges of marine resources, fish sizes and stock abundances.

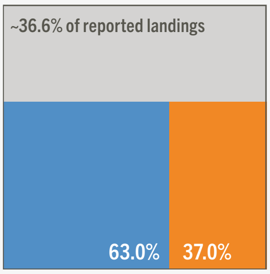
STOCK STATUS

FAO estimates, 2021

PREVIOUS METHODOLOGY



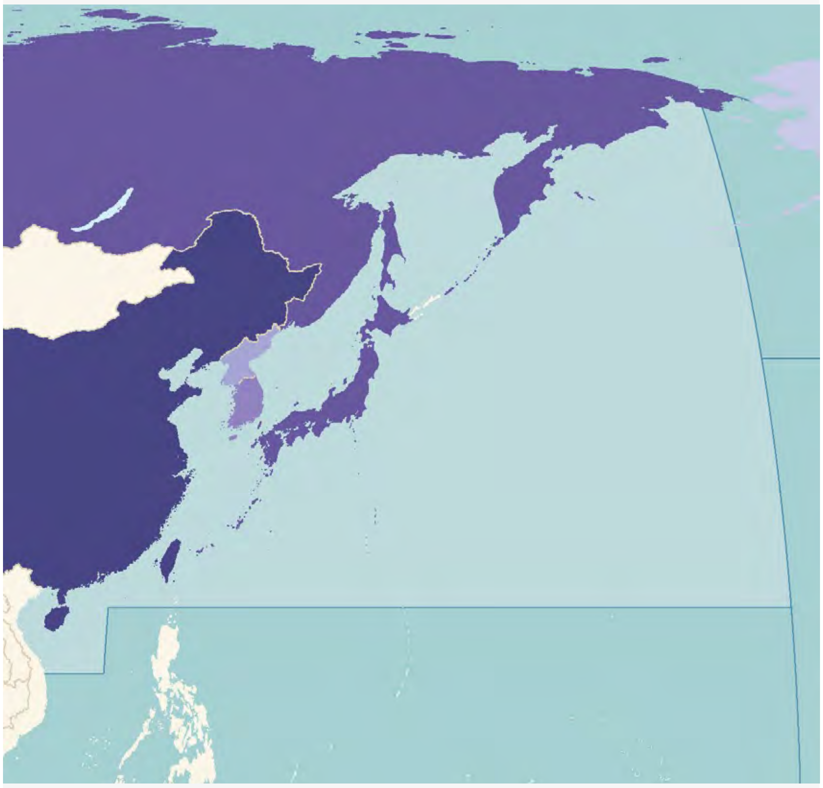
UPDATED METHODOLOGY



- Biologically sustainable
- Biologically unsustainable
- Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

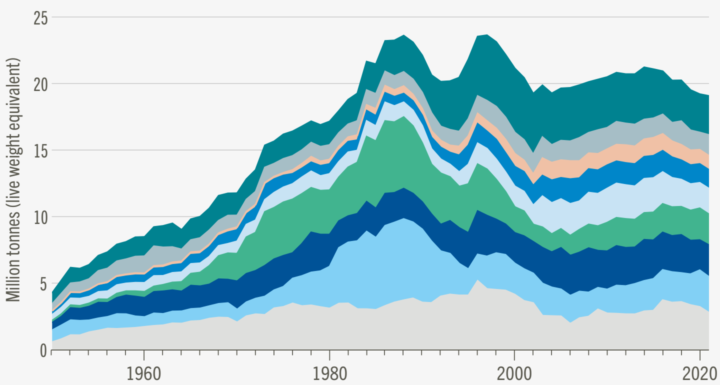
LANDINGS / MILLION TONNES

n/a | < 1% | 1–5% | 5–10% | 10–20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

- Other aquatic animals, excluding fish
- Other fish
- Shrimps, prawns
- Miscellaneous demersal fishes
- Miscellaneous coastal fishes
- Cods, hakes, haddocks
- Miscellaneous pelagic fishes
- Herrings, sardines, anchovies
- Marine fishes not identified



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~448 000

Non-motorized: *Artisanal*

Motorized: *<12 m: Artisanal and industrial*; *12–24 m: Artisanal and industrial*; *>24 m: Industrial*

- Non-motorized: 2%
- Motorized: 98%

LANDINGS

FAO data, 2021

Reported landings ~19 million tonnes

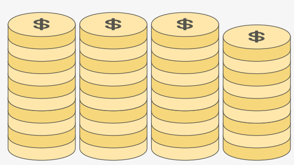
- Unidentified: 20%
- Identified at species group level: 80%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~USD 38.6 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~2.6 million

- Male: 6%
- Unspecified: 93%
- Female: 0%

= 100 000 PEOPLE

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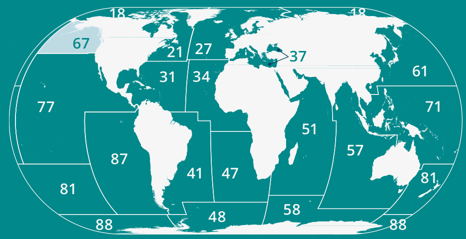
67



Part D, Chapter 11 (D.11)

NORTHEAST PACIFIC
FAO MAJOR FISHING AREA 67

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1. OVERVIEW

The Northeast Pacific, designated by FAO as Major Fishing Area 67 (hereafter, Area 67), is bounded to the north and east by the United States of America (hereafter, United States) and Canada, and in the northwest by the Russian Federation (the eastern Gulf of Anadyr). It encompasses the exclusive economic zones (EEZs) of the United States, Canada and the Russian Federation, as well as adjacent high seas. Area 67 extends from Alaska in the north, through British Columbia, Washington and Oregon, to California in the south. The southern limit of Area 67 is located in northern California, at the border with Area 77. Area 67 covers a total surface area of about 8 million km^2 (**FIGURE D.11.1**), of which 1.3 million km^2 is shelf area. A large part of the coastal range and shelf are located in the marine waters of Alaska, with a much narrower continental shelf in British Columbia.

FIGURE D.11.1
FAO MAJOR FISHING AREA 67: THE NORTHEAST PACIFIC

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

The Area is characterized by distinct large marine ecosystems, including the California Current, the Gulf of Alaska and the East Bering Sea. The California Current moves south carrying cold water from southern British Columbia along the western coast of North America, and spirals around at the southern Baja California Sur to meet the equator. The eastern part of the North Pacific Gyre, a Pacific-wide swirling current that stretches across the northern half of the Pacific, creates upwellings off the California coast bringing up cooler, nutrient-rich waters that support significant fish resources. This movement of cooler water creates a cooler climate on the west coast compared to the eastern side of the United States where ocean currents move up from the warm Caribbean and tropical Atlantic.

Area 67 has a long history of fisheries, with Indigenous populations having harvested marine resources in the region for millennia for nutrition, livelihoods and culture (Cox *et al.,* 2024). The importance of marine resources has been promoted through Indigenous artwork, ritual, cosmologies and storytelling in the region, and continues to represent a source of pride and identity. Marine resource management is a longstanding practice of Indigenous populations in Area 67, with approaches rooted in co-existence, building with, and enabling the mutual flourishing of habitats and their inhabitants. Given the historical importance of Indigenous fisheries, there is increased interest in incorporating traditional knowledge and management systems into modern management frameworks to make them more sustainable and equitable (Reid *et al.,* 2021).

Industrial fishing began in the 1960s with respect of demersal species off the coast of the United States and Canada with primarily foreign fleets targeting stocks in the Area. However, with the declaration of EEZs in 1982 – whereby around 40 percent of marine waters were placed within the waters of the United States and Canada – these fisheries sharply declined, transitioning through joint ventures to almost entirely domestic operations (Iriondo *et al.,* 2019). Today, the vast majority of catches are taken by the United States, with a smaller but significant contribution by Canada; Russian Federation fisheries are minor, covering only a small area. Recreational fishing has also grown substantially and contributes to the tourism and leisure economy both in coastal and inland areas.

Although species and fisheries in this region are diverse, landings are dominated by the Alaska pollock *(Gadus chalcogrammus,* also known as walleye pollock), which forms the largest catch of a single species in Area 67 at 50.6 percent of total landings in 2021. The North Pacific hake (*Merluccius productus)* is also an important fishery, representing the most abundant commercial fish species in the California Current Large Marine Ecosystem and an important part of the ecosystem as both predator and prey (Hamel *et al.,* 2015). Other primary fisheries that are targeted in Area 67 include Pacific cod *(Gadus macrocephalus),* Dungeness crab *(Metacarcinus magister),* sablefish *(Anoplopoma fimbria)* and Pacific salmons (*Oncorhynchus* spp.).

Since the early twentieth century, industrial trawl fisheries have been the dominant fishing gear used for both open water and demersal fisheries in Area 67, although many areas remain closed to demersal trawl fishing due to gear conflicts and sensitive habitats (e.g. rocky areas, corals, anemones, kelp beds). Technological improvements such as advanced gear and fish-finding technology have made commercial fisheries increasingly efficient. To manage these advances and address environmental and overfishing concerns, laws have been enacted to establish fishing seasons, size limits and catch quotas. In addition, regulations to minimize bycatch and reduce the impact of fishing gear on non-target species and habitats (e.g. the seafloor) have been developed.

2. FISHERY PROFILES

The fisheries in Area 67 cover multiple jurisdictions: three national jurisdictions (the United States, Canada and the Russian Federation) and the high seas. Over the years, total marine captures in Area 67 have increased from an average of around 600 000 tonnes per year in the 1950s to around 2–3.5 million tonnes per year between 1970 and 2021 (**FIGURE D.11.2**). The subsections below focus on the fisheries profiles of the United States and Canada, as these represent the large majority of catches in the Area. Landings from the Russian Federation for Area 67 only represent about 5 000 tonnes per year, and are largely pollock *(Gadus chalcogrammus)*.

2.1 United States of America

The fisheries of the United States in Area 67 are managed by the North Pacific Fishery Management Council, covering Alaskan fisheries, and the Pacific Fishery Management Council, covering fisheries in Washington, Oregon and California, both established under the Magnuson-Stevens Fishery Conservation and Management Act (1976) (NOAA, 2022). Each major fishery is required to have a fishery management plan which documents its harvest strategy; these plans are maintained by the Councils and amended regularly. Special provisions are also provided to Indigenous fisheries, including the protection of traditionally-fished areas and efforts to maintain or develop Indigenous fishing activities. Treaties are also established between Indigenous groups to co-manage the populations and uphold treaty-reserved fishing rights.

The Alaska pollock is the primary fishery of the United States in Area 67, and is caught by domestic pelagic trawls targeting fish aggregations. Catches peaked at over 1.5 million tonnes in 2005 and have generally been maintained at around 1.2 million tonnes since the late 1980s. Alaska pollock is managed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the North Pacific Fishery Management Council, and specifically under the 1982 Groundfish Fishery Management Plans for the Gulf of Alaska and the Bering Sea and Aleutian Islands. Management measures are based on an integrated assessment that sets total allowable catch (TAC) levels using an agreed management procedure; these are updated on a yearly basis. Management procedures for the Alaska pollock fisheries have been established relating to mesh size and prohibitions on the capture of certain species, such as snow crab *(Chionoecetes opilio)* and king crabs (*Lithodes* spp.).

Demersal fisheries are also significant, and are among the most economically important fisheries in Area 67, encompassing a large number of species and stocks. Pacific cod *(Gadus macrocephalus)* and yellowfin sole *(Limanda aspera)* form the highest proportion of the landed demersal catch, followed by Atka mackerel *(Pleurogrammus monopterygius),* Pacific ocean perch *(Sebastes alutus),* rock sole *(Lepidopsetta bilineata),* and arrowtooth flounder *(Atheresthes stomias).* Although trawling (specifically with otter trawls) is the prevalent gear in terms of landings, pots (traps), longlines, hook-and-line (mobile or fixed) and set nets (gillnets and trammel nets) are also permitted to catch groundfish. The different fishing vulnerabilities of demersal species, coupled with the mixed nature of the catch, make the demersal fishery difficult to manage. The health of any one of these stocks can limit fishing opportunities for the others.

The United States manages demersal fisheries through the 1982 Pacific Groundfish Fishery Management Plan. Specifically, the Pacific Coast Groundfish Fishery Management Plan (FMP) covers demersal fisheries from Washington to California, and Alaskan demersal fisheries are managed under two separate plans: one for the Gulf of Alaska and the other for the Bering Sea and Aleutian Islands. Improved management has shifted the demersal fishery from having high discard rates and overcapacity, to a profitable fishery using a catch share programme, reducing fishing capacity and rebuilding fish stocks. The limited-entry shore-based groundfish trawl fishery has several gear requirements and prohibitions that support minimizing the impact of gear on non-target species and habitats within the fishery. In addition, an active research plan conducts routine fish surveys to provide indices of abundance for species, as well as information on the environment and other factors that affect fish populations (NOAA Fisheries, 2023). Indigenous demersal fisheries also have specific management; for instance, the Makah tribe has a designated "Usual and Accustomed" area set aside for its groundfish fishing which protects traditional rights of access (Wilson *et al.,* 2024). The Makah fishery operates within the wider harvest strategy but the tribe monitors and enforces relevant regulations within this area.

The North Pacific hake *(Merluccius productus,* or Pacific whiting) is another important fishery, with coast-wide landings averaging 237 000 tonnes per year between 2010 and 2021. It is targeted using midwater trawls, although it is also caught in demersal trawls as part of the groundfish catch. Stocks of coastal North Pacific hake are managed under a bilateral treaty between the United States and Canada (Pacific Hake/Whiting Treaty, 2003), which includes a default harvest policy, fixed harvest allocations by country, and a joint management committee. Joint stock assessments, acoustic surveys and management meetings are also undertaken. The treaty grants 73.88 percent of the overall TAC to the United States and 26.12 percent to Canada, with specific allocations provided to Indigenous Peoples. Although catches of North Pacific hake are large, fleets from the United States only harvested 65 percent of their quota, while Canada harvested 27 percent, in the 2021–2023 period.

Pacific halibut *(Hippoglossus stenolepis)* is caught in commercial, recreational and subsistence fisheries. Although most of the fishery and stock is found in Alaskan waters, this fishery is jointly managed by the United States and Canada through the International Pacific Halibut Commission (IPHC, established in 1923). It sets catch limits for each country, dates for the closed season during spawning, and a minimum size to protect juveniles. These regulations are established and enforced by each country's fishery management systems. In both countries, some catch quota for halibut is allocated to eligible coastal communities for Indigenous and recreational fishing to support employment and socioeconomic development.

Salmon fishing has a long and important cultural and economic history in Area 67, both for Indigenous and commercial fisheries, the latter of which began in the 1800s. Pacific salmon includes several species (e.g. Chinook [*Oncorhynchus tshawytscha*], chum [*Oncorhynchus keta*], coho [*Oncorhynchus kisutch*], sockeye [Oncorhynchus nerka] and pink [*Oncorhynchus gorbuscha*] salmon), of which many are targeted by commercial fisheries. Salmon fisheries are primarily managed through state and indigenous tribal organizations. In addition, a a dedicated regional fisheries management organization (RFMO)–the Pacific Salmon Commission–which covers the allocation and catches in preterminal ocean salmon fisheries shared by the United States and Canada. They also look after the fisheries management of the Fraser river sockeye. In the United States, the Pacific Fishery Management Council and the Pacific Salmon Commission work with NOAA to manage harvesting of salmon in Area 67. Management plans include licensing and quotas to limit mortality in rivers and at sea, the development of hatcheries, and habitat restoration and protection (NOAA Fisheries, 2024).

The main trap fisheries for the United States in Area 67 are for Dungeness crab *(Metacarcinus magister),* spot shrimp *(Pandalus platyceros),* Mexican spiny lobster *(Panulirus interruptus)* and sablefish *(Anoplopoma fimbria).* The Dungeness crab fishery is the largest by far and represents one of the most important seafood industries in North America, ranking sixth in value among United States commercial fisheries in 2016 at USD 222.6 million (NOAA, 2018). There is no coast-wide management for Dungeness crab; instead, it is managed at state level by respective Fish and Wildlife Agencies, who consult through a Tri-state Dungeness Crab Committee. Key management measures include licences (for commercial and recreational fishing), trap and pot limits, male and hard shell only take, and seasonal closures. Fisheries have been closed in some states due to a population decrease caused by predation, environmental changes and other unknown causes.

2.2 Canada

Fisheries along the coast of British Columbia – the region of Canada included in Area 67 – have a long history of Indigenous and commercial fisheries, the latter of which began in the mid-twentieth century. Fisheries in Canada are primarily managed through the Canadian Department of Fisheries and Oceans (DFO), with engagement from some other authorities such as Indigenous communities. The participation of Indigenous communities in fisheries (both traditional and commercial) is managed by each province or territory. Moreover, the Fisheries Resources Reconciliation Agreement (2021) was established between eight First Nations of British Columbia and the Government of Canada to promote Indigenous fishing rights, access to fisheries and the marine economy, and increased involvement in policy and decision-making through community management.

The primary fisheries targeted by Canadian domestic fleets in Area 67 are the North Pacific hake, Pacific herring *(Clupea pallasii),* rockfish, salmon and Dungeness crab fisheries, and to a lesser extent flatfishes and Alaska pollock. Fisheries operations are similar to those of the United States in Area 67, but are usually smaller in scale. For example, Canadian Pacific hake fishery vessels almost exclusively deliver to shore-based processors rather than processing at sea.

Modern industrial fisheries (gillnet, purse seine and troll) developed in British Columbia from the late 1890s with the arrival of canning, through to the 1960s and were dominated by catches of Pacific herring and salmon. A subsequent decline until 1980 was largely driven by a sharp drop in Pacific herring catches (Castañeda *et al.,* 2020). Although the diversity of overall landings then increased again with the development of the North Pacific hake fishery, a general decline in commercial fisheries has nonetheless occurred since the early 1990s. Demersal trawl catches include flatfish, skates and rockfish (canary [*Sebastes pinniger*], quillback [*Sebastes maliger*], widow [*Sebastes entomelas*], yelloweye [*Sebastes ruberrimus*], yellowmouth [*Sebastes reedi*] and yellowtail rockfish [*Sebastes flavidus*]), similar to adjoining United States fisheries. Today, annual landings average 150 000–200 000 tonnes per year. Some species are also targeted by Indigenous fisheries; for instance, Pacific halibut is caught by First Nation communities in ceremonial and subsistence fisheries.

Commercial fishing for Pacific salmon in Canada has existed since the late 1890s (Castañeda *et al.,* 2020), with current harvests focused on sockeye, chum and pink salmon, with only a small percentage of the catch represented by Chinook and coho salmon. The typical commercial gears are gillnets and purse seine. The salmon fishery in Area 67 is managed by the federal government and was open-entry until 1975, when limited-entry licensing was introduced. Elsewhere along the West Coast and Alaska, the commercial catches of Chinook and Coho salmon have declined in the last decade. However, Sockeye, Pink and Chum salmon have remained stable. Indigenous fisheries are an important component when managing these stocks. These fisheries are both traditional and commercial, and are an important economic resource for many Indigenous Peoples along the entire west coast of North America.

The British Columbia Dungeness crab fishery uses traps. It is organized into seven management areas in British Columbia, with management overseen by the DFO. The management approach is very similar to that of the United States, with minimum size, male and hard shell only take, and a seasonal closure. The British Columbia Dungeness crab fishery also has a stock assessment programme based on fishery-independent survey data conducted by the DFO. It is based on surveys that give a status determination in each area, allowing further management intervention where it is considered necessary. Indigenous communities also harvest crab for food, social and ceremonial purposes. Catch opportunities are secured via Aboriginal Communal Fishing Licences, harvest documents or under fishery treaty agreements. Catch quantities are not set except in certain councils or under treaties, and Indigenous populations are subject to the same size limit and trap regulations as commercial fisheries (e.g. all female crabs must be released).

In 2019, the Canadian Fisheries Act was amended to include Indigenous knowledge in decision-making regarding fisheries and habitat management, and to explicitly include Indigenous representatives in decision-making.

2.3 High seas

High seas fisheries in Area 67 mainly consist of Alaska pollock. The Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP) was established to cover the shared Alaska pollock stock in international waters of the central Bering Sea, upon which there is currently a fishing moratorium to enable stock recovery. The Convention does not cover pollock resources within the national jurisdictions of the United States or the Russian Federation; those areas remain under the control and management of their respective governments.

There are also minor fisheries of sablefish, Pacific halibut and salmon in the high seas region of Area 67. The Pacific Anadromous Fish Commission (NPAFC) was set up to cover all key salmon species across the North Pacific. Its membership includes Canada, Japan, the Republic of Korea, the Russian Federation and the United States. However, landings of salmon, although historically important, are now minor beyond EEZs.

The IPHC is an international organization established by a convention between Canada and the United States to manage the shared Pacific halibut stock. It covers both areas within the EEZs of Canada and the United States as well as the adjoining international waters where halibut stocks occur. However, the portion of landings from the international waters is negligible compared to those within EEZs.

Most recently, the North Pacific Fisheries Commission (NPFC) was founded in 2015 to manage shared resources in the high seas of both the East and West North Pacific. The Commission has nine members including the United States and Canada, but it is mostly relevant for fisheries in Area 61.

3. RESOURCE STATUS

3.1 Reference list of stocks

The reference list of stocks for Area 67 in this report covers 110 stocks comprising 65 species (**TABLE D.11.1A** and **APPENDIX II, TABLE 11A**, pp. 459). It includes 84 stock units for the United States and 26 stock units for Canada. In previous FAO assessments, only 34 units were evaluated in total for Area 67. Although the evaluation used the same stock-based information, it reflected species and species groups rather than disaggregated stocks. In contrast, the units in this updated reference list of stocks reflect fisheries management units, which, as far as possible, represent self-replenishing populations. In fact, the number of stocks in this revised list is somewhat inflated due to the inclusion of many salmon stocks, as these are defined based on river basins. Nonetheless, some management units are still species complexes rather than stocks; for example, some skate, flatfish and rockfish species groups are managed together in Area 67, most likely to reduce management complexity in mixed fisheries and because catches may not have been reported separately. To avoid skewing regional results for Area 67, Pacific salmon was reported as a separate unit (**TABLE D.11.1B** and **APPENDIX II, TABLE 11B**, pp. 462 on Pacific salmon). Nonetheless, they are considered in the global estimate (**PART C, GLOBAL OVERVIEW**, pp. 20).

The data and information used to develop the updated reference list of stocks for Area 67 was compiled on a stock-by-stock basis from published DFO reports and the published United States stock list, both of which are public. For consistency, the same methodology is applied to the east and west coasts of the United States and Canada in terms of defining stock status.

TABLE D.11.1A
SUMMARY OF ASSESSED STOCKS IN AREA 67 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	110	65	13
Total	**110**	**65**	**13**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are assessed under Part E of this report on Special topics. (2) Pacific salmon stocks are not included in this table. (3) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

TABLE D.11.1B
SUMMARY OF PACIFIC SALMON STOCKS IN AREA 67 IN 2021

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	85	6	1
Total	**85**	**6**	**1**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Note: (1) Includes landings of Pink (= Humpback) salmon *(Oncorhynchus gorbuscha)*, Chum (= Keta = Dog) salmon *(Oncorhynchus keta)*, Coho (= Silver) salmon *(Oncorhynchus kisutch)*, Sockeye (= Red) salmon (*Oncorhynchus nerka)*, Chinook (= Spring = King) salmon *(Oncorhynchus tshawytscha)* and Eulachon *(Thaleichthys pacificus)*. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

3.2.1 METHODOLOGY

Approaches to conducting stock assessments in Canada and the United States vary, reflecting different policy frameworks. Fisheries in the United States are required to meet national standards laid out in the Code of Federal Regulations (50 CFR 600.305). Stock assessments are usually based on age-structured mathematical models in common with other countries; however, where data are limited, an index-based approach may be used to allow management to respond to trends in the fisheries.

Given that modern fisheries have a relatively short history on the West Coast of the United States, it is usually possible to reconstruct catch histories from the beginning of the intensive fishery, with many dating back to the early 1900s. However, reconstruction of these older catches is often a source of uncertainty in stock assessments; while total quantities of fish removals are usually approximately correct, the quantities by species that were caught are not always clear. Nevertheless, complete catch histories help define the unexploited state for the stock (where there is no fishing), which can be used as the basis for defining reference points, such as the biomass that produces the maximum sustainable catch (B_{MSY}). This approach is not universally used, partly because it is not always possible to reconstruct catch histories, and because changes in stock productivity mean that the unexploited stock from many years ago is not necessarily a good indicator of what the current stock productivity and size would be if no fishing was taking place. Climate change will make current stock status less dependent on historical catches, which is one of the very few positive effects of climate change on stock assessments that have unreliable early catch data.

To define stock status and provide scientific advice, the United States usually uses integrated stock assessment models that often include a stock-recruitment relationship as an assumed model if it cannot be fitted empirically. This approach allows estimation of the stock size compared to an unexploited state even where that unexploited state cannot be observed. This is a reasonable approach in terms of decision-making, and justified where stock productivity has been steady over the available data time series. Where this is done and status is reported as a ratio compared to unexploited biomass, status can be determined relative to 20 percent SSB_0 (spawning biomass when the stock is unfished level), below which a stock is overexploited, and 60 percent SSB_0, over which it is not maximally sustainably fished. Between these two reference levels, a stock is considered maximally sustainably fished. For these integrated approaches, the uncertainty of the status determination is low.

Fisheries advice in the United States has often adopted an index-based approach where the integrated model has been rejected in the independent review process. Index-based methods are often difficult to evaluate and include more untestable assumptions, so tend to underestimate uncertainty. However, in some cases, particularly for sedentary shellfish, a survey can obtain a reasonable precautionary absolute abundance estimate and can base recommended harvest on this. In general, other index-based methods have been broadly evaluated, and well evaluated in some cases, such that they have been shown to be robust. Therefore, these differences in uncertainty are not sufficiently far apart to warrant different classification within the broad determinations in this review.

Fisheries assessments in Canada are rooted in a precautionary approach method based on risk assessment which sets a limit reference point (LRP) and an upper stock reference (USR) point which define three zones along the abundance or biomass axis: “critical”, “cautious” and “safe”. The stock assessment is usually the most important input to determine this risk status, but not necessarily the only one.

Index-based approaches are effectively decision frameworks as opposed to providing definitive status information; as such, they are designed to deliver long-term safe yields rather than ensure that a stock is in a particular state. Nevertheless, the indices can be interpreted in terms of abundance status. If a stock is in the critical zone, it is considered overfished. Using this method to determine when a stock is underfished is more difficult. The zone between the LRP and USR is the “cautious” zone, and effectively indicates a trigger point when management action may be required to avoid the stock falling below the LRP. As a result, it does not indicate that a stock is less than maximally sustainably fished. Unless there is specific evidence otherwise, these stocks are assumed to be maximally sustainably fished instead of underfished. This is often supported by observing that many stocks are below or close to the USR or have dipped below the USR in the recent past.

3.2.2 STOCK STATUS

The large majority of fishery resources in the Northeast Pacific are sustainably fished (92.7 percent), of which 51.8 percent are underfished and 40.9 percent are maximally sustainably fished (**TABLE D.11.2**). When weighted by landings, the percentage of sustainably fished stocks rises to 99.0 percent (**TABLE D.11.3**). This reflects the nature of mixed fisheries, where it is not possible (or desirable from an economic or social perspective) to harvest all stocks at a common target level based on single-stock maximum sustainable yield (MSY) estimates. All stocks considered in the reference list for Area 67 are Tier 1 (**TABLE D.11.2**).

TABLE D.11.2A
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 67 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	110	51.8	40.9	7.3	**92.7**	**7.3**
Total	**110**	**51.8**	**40.9**	**7.3**	**92.7**	**7.3**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Pacific salmon stocks are not included in this table. (3) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.11.2B
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED SALMON STOCKS BY TIER FOR AREA 67 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	85	30.6	36.5	32.9	**67.1**	**32.9**
Total	**85**	**30.6**	**36.5**	**32.9**	**67.1**	**32.9**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Includes landings of Pink (= Humpback) salmon *(Oncorhynchus gorbuscha)*, Chum (= Keta = Dog) salmon *(Oncorhynchus keta)*, Coho (= Silver) salmon *(Oncorhynchus kisutch)*, Sockeye (= Red) salmon (*Oncorhynchus nerka)*, Chinook (= Spring = King) salmon *(Oncorhynchus tshawytscha)* and Eulachon *(Thaleichthys pacificus)*. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

It is important to note that the sustainability index for Area 67 is impacted when accounting for or discounting salmon stocks (the numbers in **TABLES D.11.1A, D.11.2A** and **D.11.3A** do not include salmon species). As such, two separate indices were produced, one with salmon and another one without, to assess the overall dynamics in this region. Previous estimates only assessed Pacific salmon at species level, not stock level; however, in this report there are 85 specific assessments for salmons, and 110 other assessments (included in **TABLES D.11.1–3**) for a total of 195 assessments from the region. If salmon is included in the calculations for the sustainability index, 82 percent of stocks are classified as sustainable, as compared to 76.5 percent under the previous approach, which assessed only 34 species/stocks. However, if salmon is assessed separately as a group, similar to tunas, 67.1 percent of salmon stocks are classified as sustainable, while 92.7 percent of the remaining non-salmon stocks are sustainable, thereby presenting a significantly different perspective of this region. This positive portrait can preliminarily be attributed to the policy for Alaska pollock which does not aim for maximum yield, but rather to ensure a stable TAC. This means that other species caught in the Alaska pollock-targeted fishery are managed at levels way above their B_{MSY} (biomass for MSY).

TABLE D.11.3A
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 67 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
2.44	27.9	71.1	1.0	99.0	1.0

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, Pacific salmons, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

TABLE D.11.3B
TOTAL LANDINGS OF ASSESSED SALMON STOCKS AND THEIR STATUS FOR AREA 67 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
0.38	19.7	70.9	9.4	90.6	9.4

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Includes landings of Pink (= Humpback) salmon *(Oncorhynchus gorbuscha),* Chum (= Keta = Dog) salmon *(Oncorhynchus keta),* Coho (= Silver) salmon *(Oncorhynchus kisutch),* Sockeye (= Red) salmon (*Oncorhynchus nerka),* Chinook (= Spring = King) salmon *(Oncorhynchus tshawytscha)* and Eulachon *(Thaleichthys pacificus)*. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

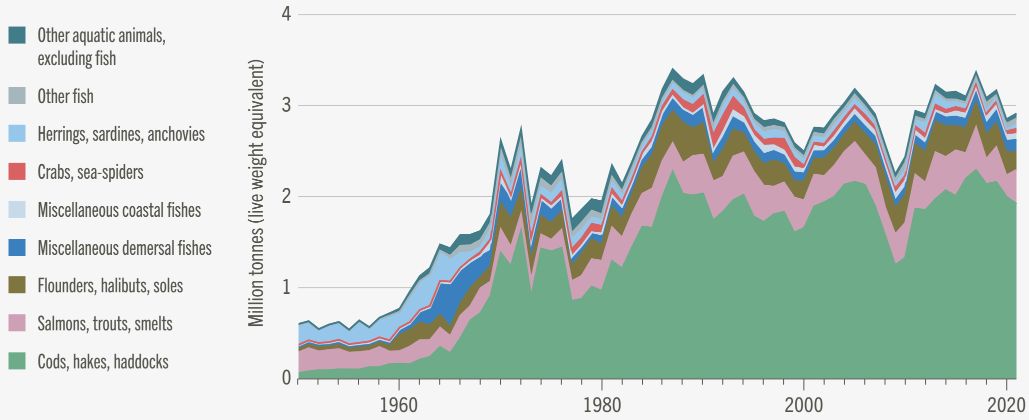
This section identifies and discusses species and stocks that are currently most important for Area 67 (**FIGURE D.11.2**).

4.1 Alaska pollock

Alaska pollock *(Gadus chalcogrammus)* is an abundant semi-pelagic schooling fish found across the North Pacific. It is relatively easy to catch in large quantities at low cost, and as such is a major white fish product on international markets. In Area 67, it represents the dominant catch. While trawling for Alaska pollock mainly occurs off the seabed, there is still some contact with the seafloor, and as such concerns are growing regarding the health of the benthic habitats and ecosystems (MacLean, 2017). In addition, discard rates are typically lower than compared to many other fisheries.

Most stock assessment activity for Alaska pollock has been conducted in Alaska, with directed surveys as an important component of the process. Nevertheless, the Bogoslof and Gulf of Alaska stocks depend upon an index-based assessment that only provides relative exploitation advice. Overall, most stocks of Alaska pollock are considered underfished, with some maximally sustainably fished. For the Bogoslof stock, catches are currently set to zero due to uncertainty over the stock status.

FIGURE D.11.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE NORTHEAST PACIFIC (AREA 67) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.2 North Pacific hake

North Pacific hake *(Merluccius productus)* is most abundant in coastal waters during the summer when large feeding aggregations are found in depths of 60–600 m (Hamel *et al.*, 2015). In the early 1960s, only small quantities of North Pacific hake were landed for local consumption, but the fishery grew rapidly in the late 1960s, initially dominated by foreign and joint venture fleets taking catches for human consumption and fishmeal. Since the early 1980s, the catch has been taken by the domestic fleets of the United States and Canada in their respective national waters, with most of the catch taken by the United States. A key challenge of the North Pacific hake fishery is that the fish must be frozen or processed soon after harvest to maintain quality. Currently, most North Pacific hake is marketed as fillets or as headed and gutted products of relatively low value. In the past, a large portion of the harvest was processed into surimi, a fish paste widely used to create other food products. Currently, about half of the stocks of North Pacific hake are underfished while the other half are maximally sustainably fished.

4.3 Salmon

Catches of salmon, trout and smelt represent a significant proportion of landings in Area 67. The most abundant stocks and catches are in Alaska, with salmon stock size declining further south. Currently, catches are dominated by sockeye *(Oncorhynchus nerka),* chum *(Oncorhynchus keta)* and pink *(Oncorhynchus gorbuscha)* salmon (primarily in Alaska). Salmon stocks in Area 67 are currently about equal parts overfished, maximally sustainably fished and underfished.

Salmon have a complex life cycle that includes sea and river habitats, migrating from their hatching sites in rivers to the ocean where they mature, before returning to the same rivers to spawn. The species are associated with fresh and brackish water; their anadromous life cycle makes these stocks particularly dependent on coastal and riverine habitats, which are often impacted by development. Salmon are also vulnerable to environmental impacts on riverine habitats as well as climate change, making spawning success and survival variable. Impacts around Alaska and other river systems are less pronounced than around the Atlantic, so salmon populations have been less affected. Many populations are also supported by hatcheries that release juvenile fish into the wild. The overexploited stocks are primarily Chinook *(Oncorhynchus tshawytscha)* and Coho *(Oncorhynchus kisutch)* salmon in British Columbia, Canada, and the west coast of the United States of America.

Salmon are predominantly managed locally on the basis of river basins and spawning areas due to the complex nature of their life history. Data on salmon fisheries is usually very accurate compared to other fisheries given that direct counts of return spawners is possible as they migrate upriver. While this may allow accurate monitoring of population size for some stocks, many stocks still lack information about size, and mortality through their life history is still often not well understood. As such, appropriate reference points may still be difficult to estimate. The result is that many stocks have poor estimates of population status, or lack them altogether. The primary concern is for salmon stocks in more southerly areas (California in particular), where populations tend to be less productive and face greater pressures. In parallel, climate change will likely increase temperature stress on salmon. Among other things, management plans have included stock enhancement through releasing juveniles from hatcheries, particularly for salmon stocks, although this can have adverse impacts on wild populations (McMillan *et al.,* 2023).

4.4 Demersal fisheries

4.4.1 FLATFISH COMPLEX

A wide range of flatfish are taken in the demersal trawl fishery in Area 67, representing an important component of the demersal trawl catch. While yellowfin sole *(Limanda aspera)* makes up the largest catch, other important flatfish caught include rock sole *(Lepidopsetta bilineata)* and flathead sole *(Hippoglossoides elassodon),* and historically Pacific halibut *(Hippoglossus stenolepis)*. Although not traditionally targeted, arrowtooth flounder *(Atheresthes stomias)* is also a common predator encountered by demersal trawls as it is taken as bycatch. While being an abundant stock, the value of this fish has historically been low due to the poor quality of the flesh. However, today, improved treatment of the catch has increased its marketability and as such it is now caught in significant quantities. Overall, the flatfish complex is considered underfished.

4.4.2 PACIFIC HALIBUT

Pacific halibut is primarily taken in commercial fisheries using longlines with large circle hooks which tend to have low bycatch, as well as by other fisheries that catch halibut as bycatch. It is also targeted by recreational and subsistence fishers. The former usually use droplines, with captures primarily controlled through licensing, size regulations and bag-limits.

Pacific halibut can attain a length of more than 250 cm. Similar to Atlantic halibut *(Hippoglossus hippoglossus),* the fish are a popular target species due to high market demand, but they also face similar pressures. The stock is coastwide and the fishery is managed by the IPHC. There is an extensive joint data collection programme to support the stock assessment, which currently indicates that the stock is maximally sustainably fished.

4.4.3 ROCKFISH COMPLEX

The most important demersal species with respect to management are rockfish or redfish. While rockfish represent quite a valuable part of the catch in Area 67, quantities caught are not large. Overall, most stocks in the rockfish complex are maximally sustainably fished or underfished, with a couple overfished.

These are a very diverse group of fish and are found across the region of Area 67. However, most of these species are characterized by long life spans and give birth to relatively small numbers of pelagic larvae rather than eggs, making them vulnerable to fishing; indeed, some stocks have been depleted in the past. For example, the longspine thornyhead *(Sebastolobus altivelis)* lays a relatively small number of eggs on the seabed, whereas flatfish and sablefish produce a large number of pelagic eggs.

The different fishing vulnerabilities of these species, and the mixed nature of the catch, make the fishery difficult to manage. The current status is now mixed but generally has improved as management plans have been implemented. As well as quotas, the species that are associated with reefs also gain protection from areas closed to fishing to protect habitats. Even if not an important part of the catch, rockfish may still be critical 'choke' species which stop all fishing in a mixed fishery when their quota is reached, so managing these stocks is important. For example, canary *(Sebastes pinniger),* chilipepper *(Sebastes goodei)* and bocaccio rockfish *(Sebastes paucispinis)* were depleted in 2000, and by the late 2010s had either recovered or were close to recovered through a rebuilding plan. However, the rebuilding process of these stocks prevented full harvest of other stocks in the complex because fishing gears were unable to target individual species.

Pacific ocean perch *(Sebastes alutus)* inhabit the outer continental shelf and upper slope regions of the North Pacific Ocean and the Bering Sea. In the past, higher caches lead to stock biomass declines in the 1960s and 1970s, which resulted in the lowest catches in the mid-1980s. Depleted stocks have been recovering slowly since the 1980s, and are now mostly maximally sustainably fished. Pacific ocean perch stocks have been managed in some cases within a rockfish species complex, but are now mostly managed as separate stocks.

4.4.4 SABLEFISH

Sablefish *(Anoplopoma fimbria)* primarily inhabit the northeastern Pacific Ocean, between northern Mexico and the Gulf of Alaska, and westward towards the Aleutian Islands and into the Bering Sea. Pelagic larvae hatched near the edges of the continental slope migrate inshore as juveniles, where they grow and then subsequently move offshore again into deeper water to spawn when they are mature. Adult sablefish are highly mobile, moving along the coast, and are generally caught at depths greater than 200 m. The main gear used to catch sablefish has been bottom-set longlines, although they are also caught in pots and as bycatch in trawls.

Sablefish have been exploited since the end of the nineteenth century by fishers in the United States and Canada. A substantial decline of sablefish stocks occurred in the 1970s. Since then, the fisheries have been rationalized (individual transferable quota, ITQ) and are now managed through quotas and other management measures (e.g. ten-day fishing season in 1994). Stocks of sablefish in Area 67 are currently primarily sustainably fished (underfished or maximally sustainably fished).

4.4.5 ATKA MACKEREL

Atka mackerel *(Pleurogrammus monopterygius)* is a greenling from the family Hexagrammidae rather than Scombridae. It spawns demersal eggs that the males tend within their territories. The species forms semi-pelagic schools that are susceptible to trawling in the locations and times that they occur each year. The majority of the fisheries catch for Atka mackerel is taken by catcher/processor vessels in the Aleutian Islands region and to a lesser extent in the Bering Sea on vessels targeting flatfish, Atka mackerel and Pacific ocean perch. The fishery is managed using single TACs, with the quota increasingly subdivided into smaller areas to avoid local depletion of the different spawning components of the stock since 1993 (Sullivan *et al.,* 2024). Currently, Atka mackerel is considered maximally sustainably fished.

4.5 Pacific herring

Similarly to the Atlantic herring *(Clupea harengus)*, Pacific herring *(Clupea pallasii)* populations are made up of individual spawning components which may be separated in autumn and spring. Although there is likely some mixing of components, they can often be managed in groups as separate units.

In the past, herring was widely overfished, and many components remain depleted. Of the stocks that had been assessed – all of which are in Canada – catches remain low but stocks are considered as effectively recovered. As such, most Pacific herring is considered maximally sustainably fished.

There is also a Pacific sardine *(Sardinops sagax)* stock which is still considered overfished and recovering; as such, there is effectively currently no fishery for it. Although some catches of the Pacific sardine stock are taken in Area 67, the majority are taken in Area 77 and it is therefore included under that Area.

4.6 Invertebrates

4.6.1 DUNGENESS CRAB

Dungeness crab *(Metacarcinus magister)* is found across the west coast of Canada and the United States. It plays an important ecological and economical role in Area 67, even though the landings are low. For instance, in the California Current ecosystem it is critical both as a predator of bivalves and other benthic species and as prey, with its larvae forming an important part of the diet of salmon, rockfish and other fishes (Rasmuson, 2013). The Dungeness crab fishery uses baited traps down to 90 m depth on sand and silt habitats, including eelgrass.

Dungeness crabs have low vulnerability to fishing due to their early age at reproductive maturity, high fecundity and short life span. However, other threats to the fisheries include parasites, hyper-salinity, ocean acidification on larval crabs, and low oxygen levels, which are all exacerbated by climate change.

Management of Dungeness crab is not coastwide, but rather by specific region or state. Measures are focused on trying to ensure sufficient crabs survive to reproduce, preventing overfishing by applying minimum landing size regulations, harvesting only hard-shell males, and applying seasonal closures rather than quotas.

Most stocks do not undergo regular stock assessments. For example, Dungeness crab in California is not regularly assessed, and the population has fluctuated widely due to environmental effects rather than fishing. Its components are generally considered to be in a healthy state based on local depletion estimates in the United States (Richerson, Punt and Holland, 2020). In Canada, the same conclusion was reached based on fishery-independent surveys. Overall, Dungeness crab in Area 67 is considered to be maximally sustainably fished.

4.6.2 SHRIMPS AND PRAWNS

Species of shrimps and prawns are relatively diverse and difficult to separate in landings. For example, of the 90 species of shrimp found in waters of British Columbia, seven of these species (from the Pandalidae family) are harvested by a Canadian shrimp trawl fishery. Despite a large variety of shrimp species in Area 67, landings of commercial trawl fleets are mainly composed of ocean shrimp *(Pandalus jordani)* and sidestripe shrimp *(Pandalus dispar)*. The fishery varies in complexity from single species harvest to multi-species harvest. In the United States, a number of species (e.g. smelt, rockfish and flatfish) are also present in catches (ODFW, 2025). Cold-water shrimp fisheries have had no stock assessments in the United States, and the management focus has been on bycatch limits. Catches of northern prawn *(Pandalus borealis)* along the West Coast of the United States have averaged around 13 000 tonnes and the stocks are considered at low risk of overfishing. Overall, shrimps and prawns in Area 67 are currently considered maximally sustainably fished.

4.6.3 KING CRABS

Three species of king crab are targeted by pot fisheries in Alaska: golden *(Lithodes aequispinus)*, blue *(Paralithodes platypus)* and red king crab *(Paralithodes camtschaticus)*. Fisheries are managed through minimum landing sizes and males-only landings with closed seasons. Catches of king crab have declined substantially since the 1980s, and the productivity of the stocks appears to be currently low. The deeper-water golden king crab appears to be in a better state than other stocks, with the status estimated at maximally sustainably fished. Blue king crabs are considered overfished, and red king crabs have some overfished and some underfished stocks.

5. KEY FINDINGS

Fisheries in Area 67 are primarily managed by the United States and Canada, with the majority of the catch volume taken in Alaskan waters. Overall, most stocks are healthy and sustainably fished, several having recovered from past overfishing. The coverage of assessed stocks in Area 67 represents 96.8 percent of total stocks, representing one of the highest coverages among FAO Areas. In terms of catch volume and total value, the Alaska pollock *(Gadus chalcogrammus)* fisheries are dominant. The other larger fisheries are the mixed demersal trawl and salmon fisheries.

Area 67 is unique among FAO Areas, because of the large number of small salmon stocks. These stocks have intentionally been excluded from the overall sustainability analysis for Area 67, so as not to skew the results. Nonetheless, a comparison between the sustainability of stocks in Area 67 with or without accounting for salmon provides interesting insights (Section 3.2.2 of this chapter).

Compared to the assessment using the past methodology, the percentage of sustainably fished stocks under the updated methodology, in particular underfished stocks, has substantially increased (**TABLE D.11.4**). This can be attributed to adding many unique rockfish stocks which are underfished to the reference list of stocks. In addition, the previous approach included five different categories of salmon, several of which were not sustainably fished, which impacted overall sustainability results for Area 67. The updated assessment for Area 67 does not include salmon species; however, if salmon were included, the percentage of sustainably fished stocks would drop to 82 percent, which is closer to what was estimated with the previous approach. When weighted by landings, the contrast between the previous and updated methodologies becomes less marked (**TABLE 4.11.5**), because neither rockfish nor salmon represent a significant percentage of landings.

Finally, management interventions in all fisheries in Area 67 have rapidly increased in recent decades, and they now perform better despite difficulties with managing a complex demersal mixture of species, including vulnerable rockfish and the very large number of salmon stocks. Results from Area 67 reflect the complexities of mixed fisheries, where harvesting all stocks at a common target level, based on single-stock MSY estimates, is neither practical nor always desirable from an economic or social perspective.

TABLE D.11.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 67 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
110	51.8	40.9	7.3	92.7	7.3	34	23.5	52.9	23.5	76.5	23.5

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.11.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 67 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
27.9	71.1	1.0	99.0	1.0	47.1	45.6	7.4	92.6	7.4

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, Pacific salmons, aquatic products (corals, pearls, shells and sponges) and algae. (2) For the purpose of this analysis, highly migratory tunas and sharks are assessed under Part E of this report on Special topics. (3) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

FIGURE D.11.3 *(next page)*
AREA 67 – DATA AT A GLANCE

FAO MAJOR FISHING AREA 67

PACIFIC, NORTHEAST

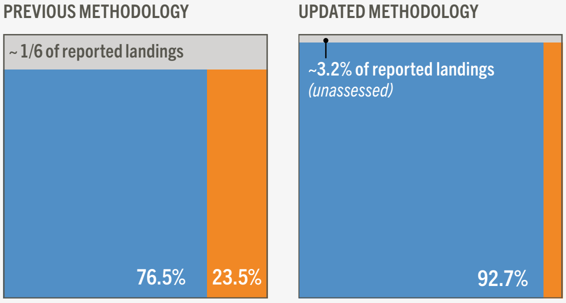
AREA 67

KEY MESSAGES

- Landings in this region have been stable, and fisheries generally well managed. Alaska pollock comprises nearly half of the commercial catch, while Pacific salmon is especially valuable to Indigenous communities.
- Marine recreational fisheries are also very significant, especially in Canada, both economically and culturally.
- Habitats, such as cold water corals, anemones and kelp forests are increasingly protected from the impacts of fishing gear.
- Indigenous communities are most vulnerable to climate change impacts that are predicted to affect distribution of marine resources and the frequency and severity of extreme events.

STOCK STATUS

FAO estimates, 2021

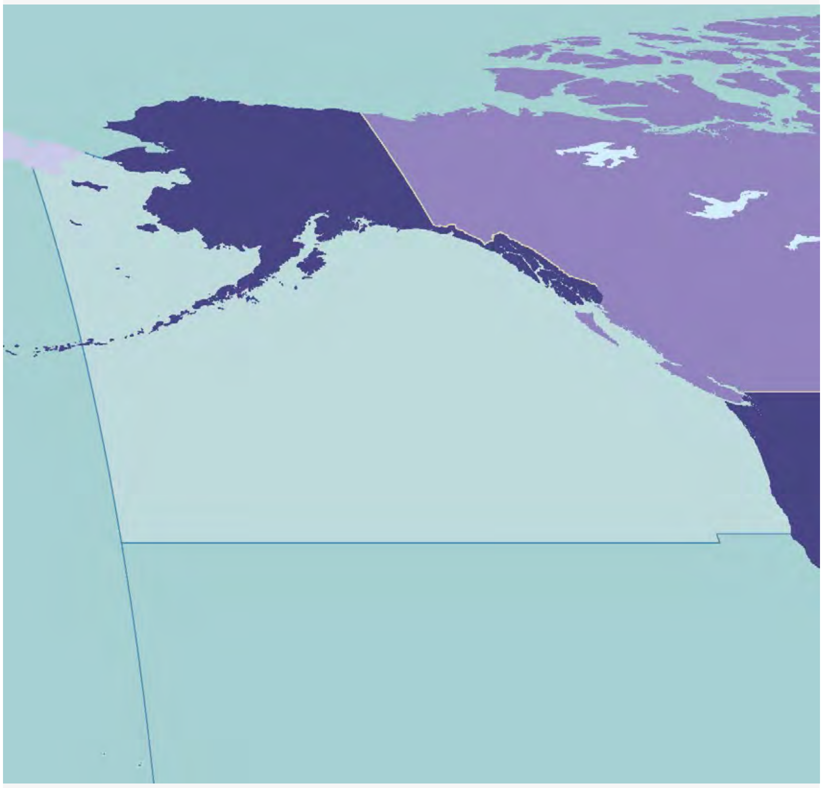


Biologically sustainable
Biologically unsustainable
Unassessed reported landings

Note: Pacific salmon stocks not included.

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

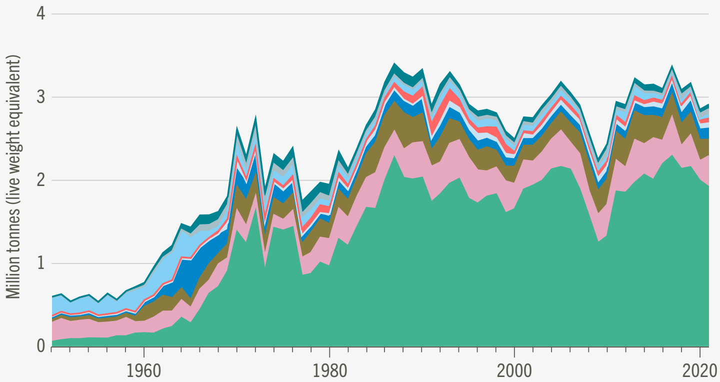
LANDINGS / MILLION TONNES

n/a | < 1 % | 1 – 5 % | 5 – 10 % | 10 – 20 % | > 20 %

SPECIES COMPOSITION

FAO data, 1950–2021

- Other aquatic animals, excluding fish
- Other fish
- Herrings, sardines, anchovies
- Crabs, sea-spiders
- Miscellaneous coastal fishes
- Miscellaneous demersal fishes
- Flounders, halibuts, soles
- Salmons, trouts, smelts
- Cods, hakes, haddocks

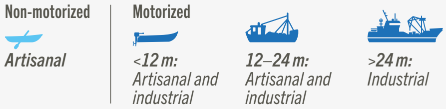


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 51 000



Non-motorized: 0%
Motorized: 100%

LANDINGS

FAO data, 2021

Reported landings ~ 2.9 million tonnes

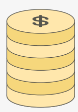
Unidentified: 2%
Identified at species group level: 98%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 5.7 billion



= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 127 000

Male: 0%
Unspecified: 100%
Female: 0%

= 100 000 PEOPLE

Northeast Pacific

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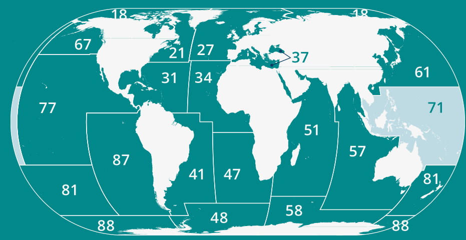

Part D, Chapter 12 (D.12)

WESTERN CENTRAL PACIFIC
FAO MAJOR FISHING AREA 71

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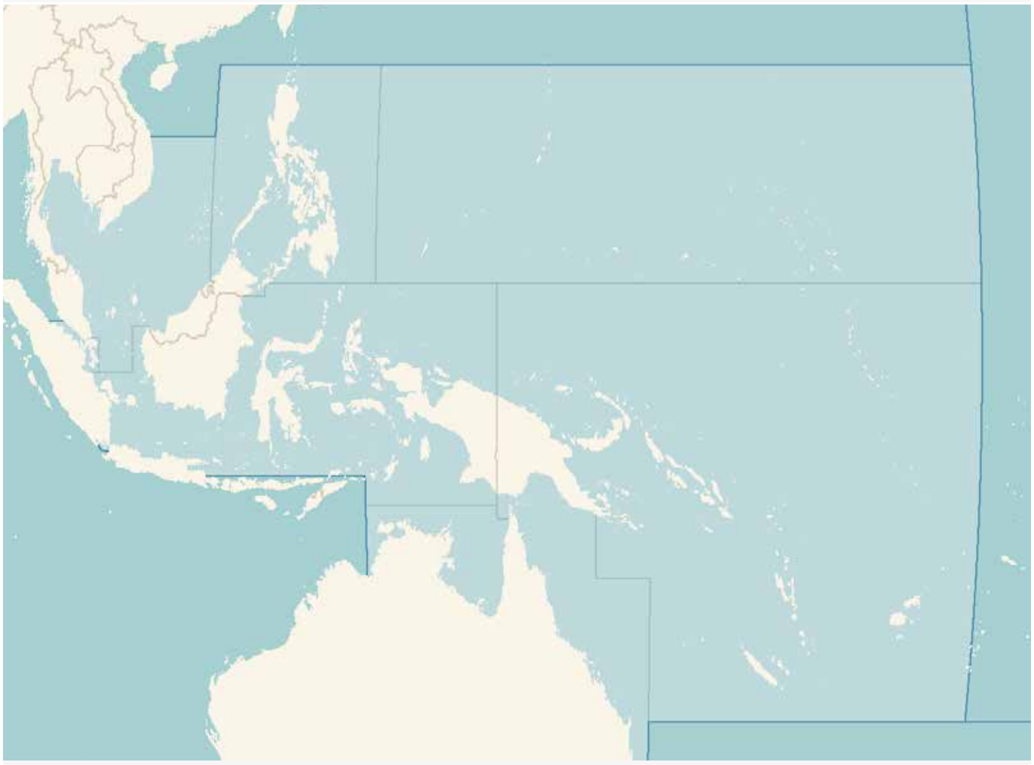
1. OVERVIEW

The Western Central Pacific region, designated by FAO as Major Fishing Area 71 (hereafter, Area 71), includes the exclusive economic zones (EEZs) of 23 countries and territories. With an area of about 33.9 million km^2, it is the second-biggest FAO Major Fishing Area (**FIGURE D.12.1**) and has 6.6 million km^2 of continental shelf. The geography of the Area includes continental, island and archipelagic countries, with over 600 million inhabitants. For instance, Indonesia has more than 17 000 islands, while the Philippines has 7 641 in its territorial waters. In addition, the Central Pacific is home to hundreds of sparsely populated and unpopulated islands.

FIGURE D.12.1
FAO MAJOR FISHING AREA 71: THE WESTERN CENTRAL PACIFIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

Area 71 hosts one of the world's largest fishing fleets (over 1.7 million vessels) and is among the regions with the highest number of fishers (about 4.8 million people), and represents the second ranked Area in terms of landings worldwide (13.5 million tonnes in 2021). It supports the largest number of artisanal and small-scale fishers in the world, and is thus important in terms of nutrition and livelihoods. In Area 71, five Southeast Asian countries (Indonesia, Viet Nam, Malaysia, the Philippines and Thailand) have historically dominated the reported catches.

Tunas, bonitos and billfishes (e.g. skipjack tuna *[Katsuwonus pelamis]*, yellowfin tuna *[Thunnus albacares]*, kawakawa *[Euthynnus affinis]* and others) account for 27 percent of the total reported catch in the Area. Moreover, small pelagic fishes (e.g. sardines, anchovies, scads and others), which are almost exclusively reported by Southeast Asian countries, represent 16 percent of the total reported catch. Cephalopods (squids, cuttlefish and octopus) account for 5 percent of the reported catch by weight. However, multiple issues exist with catch reporting in Area 71, which are a challenge for the accuracy of stock status analysis.

Most of the countries in Area 71 are developing countries, and their communities depend on reef fishes and other coastal species for food security and livelihoods (Gillett and Tauati, 2018; Pomeroy, 2012). Due to extensive fishing of inshore stocks and, in many cases, unregulated use of anchored fish aggregating devices (aFADs) (Widyatmoko, Hardesty and Wilcox, 2021) and lamps (Candelario, Gonzales and Jardin, 2018), some large and small pelagic species are experiencing localized depletion (Bintoro *et al.,* 2022; Mallawa *et al.,* 2021; Yutuc, Vallejo and Mendoza, 2018) despite being more resilient than many coral reef species (Birkeland, 2017).

2. FISHERY PROFILES

Area 71 has diverse marine seascapes and social, cultural, economic and political characteristics, making its fisheries highly complex. This chapter organizes fishery profiles for Area 71 into five subregions and presents status assessments for each separately: (1) the Central Pacific, which predominantly comprises small island developing states (SIDS), (2) the high seas, which incorporates results for stocks straddling all of Area 71, (3) northern Australia, including the Northern Territory and Queensland, (4) the South China Sea, which only contains regions not within current EEZs, and (5) Southeast Asia, the most significant contributor to total reported catches in Area 71.

2.1 The Central Pacific

The Pacific island countries and territories in Area 71 include the Federated States of Micronesia, Fiji, Guam, Kiribati, the Marshall Islands, Nauru, New Caledonia, the Northern Mariana Islands, Palau, Papua New Guinea, Solomon Islands, Tuvalu, Vanuatu, and the Wallis and Futuna Islands. Small land areas characterize the countries in the Central Pacific subregion, with vast and deep open-ocean regions in their EEZs. The exception is Papua New Guinea, which has the largest land area and the most significant coastal catch because it also has the largest population in the subregion (Gillett and Fong, 2023). Most of the population in the Central Pacific resides in coastal areas. As such, coastal fishing has a rich cultural significance and is vital for food security and local income. These countries have some of the highest fish consumption rates globally, and approximately 70 percent of the coastal catch is for subsistence (Gillett and Fong, 2023). Fisheries are largely artisanal, small-scale, coastal fisheries, targeting more than 500 nearshore pelagic and coastal reef finfish and invertebrate species (Preston, 2005).

The subregion has two main fishing sectors: industrial oceanic fisheries, which target the four main tuna species (skipjack *[Katsuwonus pelamis]*, yellowfin *[Thunnus albacares]*, bigeye *[Thunnus obesus]* and albacore *[Thunnus alalunga]*); and coastal fisheries, which are almost exclusively small-scale fishers targeting many species of coastal fishes and invertebrates for livelihoods and subsistence. The total catch reported to FAO from the 14 Central Pacific islands for 2021 was around 922 900 tonnes, approximately 7 percent of the total reported for Area 71 (FAO, 2024). Of the reported catch, 94.9 percent (875 800 tonnes) came from oceanic tuna fisheries, of which 872 500 tonnes were the four main target tuna species. Therefore, the reported coastal fisheries catch in the subregion was 47 200 tonnes (FAO, 2024). Other independent catch estimates (Gillett and Fong, 2023) indicate that actual catches may be higher than those reported to FAO for both sectors.

Although fishery data collection and reporting for oceanic fisheries are considered advanced, the total oceanic catch for the subregion formally reported by countries to FAO is approximately half of that reported by these countries to the Western and Central Pacific Fisheries Commission (WCPFC) for 2021 (1 515 500 tonnes; Gillett and Fong, 2023). This issue is also evident in the coastal fisheries component of catches reported to FAO. The total reported to FAO is significantly lower than a comparative estimate of 149 000 tonnes for 2021 (Gillett and Fong, 2023). Although numerous uncertainties exist in calculating the latter, we consider it a more accurate estimate of coastal catch in the subregion. The low resolution in reported data and evidence of under-reporting for coastal catches is primarily due to the fact that coastal fisheries, including coastal tuna fisheries, are often less sampled less reliable and less documented in the subregion, compared to higher-value tuna fisheries that have specific allocations (e.g. total allowable catch) and monitoring (Gillett and Fong, 2023; Gillett and Tauati, 2018; Gillett, Lewis and Cartwright, 2014). The most significant concern for communities in this subregion is that most local fish are used for domestic consumption, and fishing incomes come from coastal fishing (Gillett and Fong, 2023).

The region faces some of the world's toughest challenges in adapting to climate change. Welch *et al.* (in press) project that climate change will reduce catches in these countries by 11–73 percent by 2050 under the high-emissions scenario. These issues present current and emerging threats to coastal fisheries and people in the region.

2.2 The high seas

The high seas subregion is included separately to better describe transboundary species in Area 71. There are four main target tuna species caught in this region: bigeye tuna, skipjack tuna, yellowfin tuna and albacore. WCPFC is the regional fishery advisory body in the region that has a mandate to provide advice to manage transboundary resources of migratory tunas and tuna-like species (sharks and billfish). As such, species that are caught in oceanic waters by industrial and semi-industrial vessels are under WCPFC's jurisdiction. Fisheries in this subregion also target billfishes (black marlin *[Istiompax indica]*, blue marlin *[Makaira nigricans],* striped marlin *[Kajikia audax]*, Indo-Pacific sailfish *[Istiophorus platypterus],* swordfish *[Xiphias gladius]* and shortbill spearfish *[Tetrapturus angustirostris]*), oceanic sharks (silky shark *[Carcharhinus falciformis]*, oceanic whitetip shark *[Carcharhinus longimanus],* blue shark *[Prionace glauca],* thresher shark *[Alopias vulpinus]* and mako sharks [*Isurus* spp.]), manta rays and finfish species (including wahoo *[Acanthocybium solandri]* and common dolphinfish *[Coryphaena hippurus]*). However, there is an overlap of reported catches/landings from the high-seas with those from EEZs since countries report individually to FAO, including high-seas species taken in their waters (WCPFC, 2023).

The WCPFC monitors and manages high-seas species, conducts frequent and extensive assessments, and provides observer coverage for fishing fleets. While there have been improvements in the accuracy of shark species identification and their traceability in recent years, areas of concern remain. Illegal, unregulated and unreported (IUU) fishing is an ongoing issue for high-seas fisheries.

Temperature and ocean circulation determine the distribution and abundance of highly migratory species in the high-seas subregion. This relationship is well demonstrated by substantial fluctuations in catches correlated with phases of the El Niño Southern Oscillation (Lehodey *et al.,* 1997). Using well-established spatially-structured population dynamics models, the WCPFC conducts regular stock assessments for the four main target tuna species (Castillo-Jordán *et al.,* 2022).

2.3 Northern Australia

The Northern Australia subregion includes the Northern Territory, Queensland and many islands, having a combined coastline length of 24 306 km (Geoscience Australia, 2004). The EEZ of these jurisdictions includes diverse environmental conditions and habitat types, covering tropical shallow waters influenced by seasonal monsoonal freshwater flows, subtropical coastal sandy beaches, coral reefs including the Great Barrier Reef, extensive areas of mangrove and seagrass beds, shallow and deep-water shoals, continental shelf slopes, and deep open ocean.

As such, this subregion contains diverse fisheries and target species. The Northern Australia subregion has nearshore continental shelf fisheries targeting a range of finfish and invertebrate species, including barramundi *(Lates calcarifer)*, prawns, mud crabs, goldband snapper (also known as goldbanded jobfish, *Pristipomoides multidens)*, grey mackerel (also known as broad-barred king mackerel, *Scomberomorus semifasciatus)*, threadfin salmon (also known as fourfinger threadfin, *Eleutheronema tetradactylum)*, Spanish mackerel *(Scomberomorus maculatus)*, coral grouper *(Epinephelus corallicola)*, tailor (also known as bluefish, *Pomatonus salvatrix)*, sharks, rays, whiting, sea mullet (also known as flathead grey mullet, *Mugil cephalus)*, yellowfin bream (also known as surf bream, *Acanthopagrus australis)*, squid and sea cucumbers. The northern and east coast prawn trawl are two of this subregion's most significant and valuable fisheries.

Their management is organized by jurisdiction, with some fisheries managed under federal legislation. While not regarded as highly productive fisheries relative to global totals, the economic input to the local economy from commercial fishing and through associated industries is significant. Recreational, charter and Indigenous fishery sectors are also substantial in this subregion.

The total catch volume reported by Australia to FAO in 2021 was 27 196 tonnes, less than 1 percent of the total for Area 71. Prawn species comprise 36.1 percent of the reported catch, with tunas and bonitos approximately 13.5 percent (FAO, 2024). As is the case in the Central Pacific subregion, there is evidence that reported catches to FAO underrepresent the actual level of catches in Northern Australia.

2.4 The South China Sea

In the northwest of Area 71, the South China Sea covers around 3.5 million km^2. It is less productive than other subregions, yet has a high level of marine biodiversity with more than 6 500 species. It stretches from the Strait of Malacca in the southwest to FAO Major Fishing Area 61 in the north, although its geographic extent goes to the Strait of Taiwan. The subregion includes the Paracel and Spratly Islands and hundreds of other islands and reefs. The waters around them have abundant oil, natural gas, mineral and aquatic food reserves. The lack of information on fish caught by fishing zones did not allow this report to extract the proportion of the catch in this subregion. The numbers in this report came from various publications that assessed species at this geographical level; specifically, information was found for two small pelagic and four large pelagic fish species. The Asia-Pacific Fishery Commission (APFIC) is a regional fisheries body established to promote the full and proper utilization of living aquatic resources through the development and management of fishing and culture operations, as well as the development of related processing and marketing activities in conformity with the objectives of its Members. However, during its 37th Session the Commission (2023) agreed to suspend all its activities for a period of five year after which Members will reconvene to consider its future.

2.5 Southeast Asia

The Southeast Asian countries in Area 71 are Brunei Darussalam, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Timor-Leste and Viet Nam. Countries in the west of Area 71 (Cambodia, Malaysia, Thailand and Viet Nam) border the Gulf of Thailand Large Marine Ecosystem (LME), which covers an area of around 400 000 km^2. This gulf is relatively shallow, with a mean depth of 45 m and a maximum depth of 80 m (Piyakarnachana, 1989, 1999). It is highly productive due to the considerable nutrient input from rivers, fertilizers, sewage and aquaculture operations (Piyakarnachana, 1999).

The seas surrounding Brunei Darussalam, Malaysia, the Philippines, Indonesia, Timor-Leste, Papua New Guinea and Solomon Islands are within the Coral Triangle, a region unparalleled in marine biodiversity. It extends over 5.7 million km^2, contains the world's largest mangrove forest as well as over 76 percent of the world's shallow-water reef-building coral species, 37 percent of all reef fish species and six out of seven of the sea turtle species (Asaad *et al.*, 2018). The fish caught in this region are consumed locally as well as exported nationally and internationally. In addition, a large industry collects fish, corals, giant clams and other animals for the ornamental aquarium trade.

This subregion is home to some of the most complex fisheries in the world. The large number of species captured, variety of gears and vessels used, and complex geography all contribute to make the task of data collection and fisheries management a challenging one. In 2021, Southeast Asian countries caught a reported 11.8 million tonnes, of which 25 percent was marine fishes NEI. When we include other general categories (e.g. order, family, genus), of the total catch reported to FAO by Southeast Asian countries, around 73 percent is unidentified at the species level. This subregion contributed 88 percent to the total catch of Area 71 in 2021. Therefore, the lack of species identification in this subregion affects all of Area 71. Additionally, species misidentification is ubiquitous due to the immense diversity of species caught. Also, identification is difficult due to capturing juveniles of many species which are morphologically different from the adults.

The subregion's resources and environment suffer, inter alia, from overfishing, damaging fishing techniques (including poisons and explosives), pollution, the pervasive capture of immature animals, ocean acidification and habitat destruction. Additionally, climate change significantly impacts coral reefs through bleaching and displaces species that cannot withstand increasing water temperatures (Cheung *et al.*, 2010). Finally, despite recent efforts, IUU fishing continues to affect Southeast Asian fisheries, both by foreign and local fleets fishing.

3. RESOURCE STATUS

3.1 Reference list of stocks

This report of the state of stocks for Area 71 includes a revision of the reference list of stocks (**APPENDIX II, TABLE 12**, pp. 463), with revisions to better incorporate relevant and vital species for each country. To achieve this, the reference list of stock criteria adopted under Sustainable Development Goal (SDG) 14.4.1 reporting was promoted, including available catch composition data, and national fisheries departments were consulted. The key to this process was to accept that species lists would not be exhaustive, but rather that they would comprise a manageable and representative number of species for routine monitoring purposes. Aggregating all species across countries provided the revised list for current stock status reporting.

In this report under the updated methodology (**PART B, METHODOLOGY**, pp. 6) the reference list of stocks for Area 71 covers 142 species or species groups and 263 stocks (assessment units) (**TABLE D.12.1**).

TABLE D.12.1
SUMMARY OF ASSESSED STOCKS IN AREA 71 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	23	18	7
2 Surplus-production model approaches	51	48	9
3 Data-limited approaches	189	94	11
Total	**263**	**142**	**13**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

The restricted spatial coverage of data collection constrains the country-specific approach for determining stock status. Where the spatial extent of the main fished areas is relatively limited, applying available assessment outcomes to the national scale, regardless of the spatial scale of data collection, is less of an issue since they often represent a single stock (e.g. some small island states). For larger countries, country-level stock status for each species based on the available information is reported, assuming that the status is representative of that species and acknowledging that additional biological stocks may exist in that country. In cases where data from various areas in a country exist, this report treated them as separate stocks if the biological characteristics and the distances between them warranted it.

Despite several studies highlighting uncertainties, knowledge of the stock structure for the four main tuna species captured in Area 71 suggests that, at this scale, each consists of a single stock (Moore *et al.,* 2020). The only exception may be albacore *(Thunnus alalunga),* for which there is evidence of separate Northern and Southern Pacific Ocean stocks (Nikolic *et al.,* 2017). The two oceanic shark species included in the current assessment also mix across large spatial scales. However, recent research has suggested the possibility of genetic structuring within the Indo-Pacific region for silky sharks *(Carcharhinus falciformis)* (Clarke *et al.,* 2015; Ruck, 2016). This report includes assessments for the stock status of the four main target tuna species and the two oceanic shark species on the scale of Area 71.

Conversely, knowledge of the stock structure for the many coastal fishery species captured in Area 71 is generally poor. Furthermore, where stock structure studies assess contemporary levels of connectivity, they primarily use genetic data, which can be limited when compared to alternative methods in detecting the separation of stocks at finer spatial and temporal scales applicable to fisheries management (Welch *et al.,* 2015). Therefore, while some species investigated here are likely to have more than one stock within a country, a species may legitimately be a single stock for some countries, even when covering large areas with dispersed islands. Nonetheless, knowing the appropriate spatial scale for assessment with certainty is only possible with local studies. Available studies indicate high variability in connectivity for tropical marine species, and these studies can inform plausible spatial scales of stocks for key species assessed (Barton *et al.,* 2018; Craig *et al.,* 2007; Horne *et al.,* 2011; Newman *et al.,* 2010; Rasheeq *et al.,* 2023; Skillings, Bird and Toonen, 2014; Szabo *et al.,* 2014; Welch *et al.,* 2015). While a full search and use of relevant studies is beyond the scope of the current study, it would help build a more appropriate framework for assessing stock status at the relevant scales and facilitate more accurate reporting of stock status across Area 71 in the future.

3.2 Classification of the status of stocks

Results indicate that 124 stocks in Area 71 are overfished, 78 stocks are maximally sustainably fished, and 61 stocks are underfished – and thus that 52.9 percent of stocks are sustainably fished (**TABLE D.12.2**). While this is significantly lower than previous estimates for 2021 under the previous methodology (65.2 percent), the revised species list, the greater number of stocks, and finer resolution by country, ensure that the current estimate is based on the best available information.

In contrast to other FAO Major Fishing Areas where the percentage of sustainable landings from the updated methodology presented a healthier picture of the state of exploitation of stocks, for Area 71 the percentage of sustainable stocks dropped to 45 percent when weighted by landings (**TABLE D.12.3**). This is due to the fact that tuna species, which are in an overall better state of exploitation than coastal species, make up about 26.9 percent of landings in the Area in 2021; however, the updated methodology excludes tuna species in its assessment of stock status weighted by landings. This is because they are highly migratory species and also occur in Area 61 and Area 77. As such, the percentage of sustainable stocks appears lower as it particularly reflects the state of coastal resources (if tuna were included in the assessment weighted by landings, the percentage of sustainable stocks for Area 71 would increase to about 60 percent instead of 45 percent). In addition, this is why the amount of landings from assessed stocks is only 4.54 million tonnes; if tunas were incorporated, this number would be just over 6.9 million tonnes.

TABLE D.12.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 71 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	23	39.1	47.8	13.0	87.0	13.0
2 Surplus-production model approaches	51	15.7	13.7	70.6	29.4	70.6
3 Data-limited approaches	189	23.3	31.7	45.0	55.0	45.0
Total	**263**	**23.2**	**29.7**	**47.1**	**52.9**	**47.1**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.12.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 71 IN 2021

	Weighted % by landings				
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
4.54	**22.2**	**22.8**	**55.0**	**45.0**	**55.0**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent. (3) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Stock status information for ten Central Pacific subregion countries and territories was sourced. From these ten countries and the final species list, there was stock status information for 121 stocks; of these, 24 were underfished, 42 maximally sustainably fished and 55 overfished. This analysis found that 55 percent of this subregion's stocks were biologically sustainably fished. While countries in this region have 5–25 species on their respective national reference lists of stocks, we did not include all species based on available assessments and the agreed-upon list. Two countries had assessments for one to two species, each by expert judgement. All assessments were Tier 3. Five countries' status information came from 2018 (four stocks) and 2016 (one stock) assessments, and on this basis alone we assigned these assessments a high level of uncertainty. Published information was absent or unavailable for eight countries and territories, and several countries failed to respond to requests for information. Therefore, the stock status information currently reported for this subregion is incomplete.

Stock status information for the high seas subregion was provided for skipjack tuna *(Katsuwonus pelamis)*, yellowfin tuna *(Thunnus albacares)*, bigeye tuna *(Thunnus obesus)* and albacore, since these represent the main target species in the Pacific Ocean. In addition, two shark species taken in the tuna fishery – oceanic whitetip *(Carcharhinus longimanus)* and silky *(Carcharhinus falciformis)* sharks – were also included, as they are a major bycatch species and present an important conservation concern. Tier 1 assessment methods were used for all these species, with the exception of the silky shark, which Kindong *et al.* (2022) assessed using length-based spawning potential ratio and length-based Bayesian biomass estimator methods (Tier 3).

The most recent stock assessments determined that the four tuna species were sustainably fished. Skipjack tuna, assessed in 2022, had spawning biomass compared to unfished levels of 0.46 (Castillo-Jordán *et al.,* 2022). Vincent et al. (2020), Ducharme-Barth (2020) and Castillo-Jordán (2021) estimated spawning biomass relative to unfished levels as 0.54 for yellowfin tuna, 0.38 for bigeye tuna and 0.36 for albacore tuna, respectively. Therefore, skipjack tuna and yellowfin tuna are considered underfished, while bigeye tuna and albacore are maximally sustainably fished[1] (see **PART E.1, GLOBAL TUNA FISHERIES**, pp. 330). Given that both bycatch shark species are overfished, overall 67 percent of high-seas stocks are biologically sustainably fished.

The assessment results for the Northern Australia subregion were primarily based on those included in the most recent SDG 14.4.1 reporting period. These results included 11 stocks assessed using Tier 1 assessments and comprising two finfish species, one lobster species, and three species groupings of shrimp. The 11 stocks included four stocks of narrow-barred Spanish mackerel *(Scomberomorus commerson),* one stock of Malabar blood snapper *(Lutjanus malabaricus),* one of ornate spiny lobster *(Panulirus ornatus),* one of the prawn species complex *(Penaeus indicus/Penaeus merguiensis),* and two stocks for each species complex *Metapenaeus endeavouri/Metapenaeus ensis* and *Penaeus esculentus/Penaeus semisulcatus.*[2] Ten stocks (91 percent) were sustainably fished.

Of the six species included in this report from the South China Sea, mackerel scad *(Decapterus macarellus),* short mackerel *(Rastrelliger brachysoma)* and narrow-barred Spanish mackerel were overfished, while kawakawa *(Euthynnus affinis),* Indo-Pacific king mackerel *(Scomberomorus guttatus)* and longtail tuna *(Thunnus tonggol)* are sustainably fished. Therefore, 50 percent of the stocks assessed in this subregion are sustainably fished.

Of the nine Southeast Asian countries in Area 71, stock status information was found for seven (information for Singapore and Timor-Leste was not found). Most stock statuses were Tier 3 (except a few in Thailand), and most had high uncertainty due to the methodology or the assessment year. Overall, the seven countries with assessments had 97 stocks, 26 of which were estimated to be underfished, 23 maximally sustainably fished, and 48 overfished. Therefore, 51 percent of the stocks in this subregion were found to be sustainably fished. While most Southeast Asian countries in Area 71 had stock assessments, three countries only assessed one species. Six countries had assessments dating back to 2016, the cut-off year used in this report.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 71 (**FIGURE D.12.2**).

4.1 Tunas

Tunas *(Scombridae)* are essential for Area 71 as they are highly valued and targeted by many local and foreign industrial and semi-industrial vessels. They also support small-scale domestic and artisanal fisheries. The four main target tuna species are skipjack *(Katsuwonus pelamis),* yellowfin *(Thunnus albacares),* bigeye *(Thunnus obesus)* and albacore *(Thunnus alalunga).* However, these fleets catch other large oceanic finfish and sharks, primarily as bycatch. Tunas caught in Area 71 and some adjacent areas comprise most of the global commercial tuna catch (Moore *et al.,* 2020). The WCPFC has well-organized management, monitoring and surveillance. However, catch statistics reporting is challenging due to numerous domestic vessels in some countries and foreign ships from multiple countries fishing in individual EEZs and international waters (WCPFC, 2023).

Despite the WCPFC finding the overall condition of tropical tuna and other species as biologically sustainably fished in Area 71, local depletion of essential species like skipjack tuna and yellowfin tuna is common in Southeast Asia. These are the result of overcapacity, excessive effort, and capture at small sizes, among other problems (Bintoro *et al.,* 2022; Mallawa *et al.,* 2021; Yutuc, Vallejo and Mendoza, 2018).

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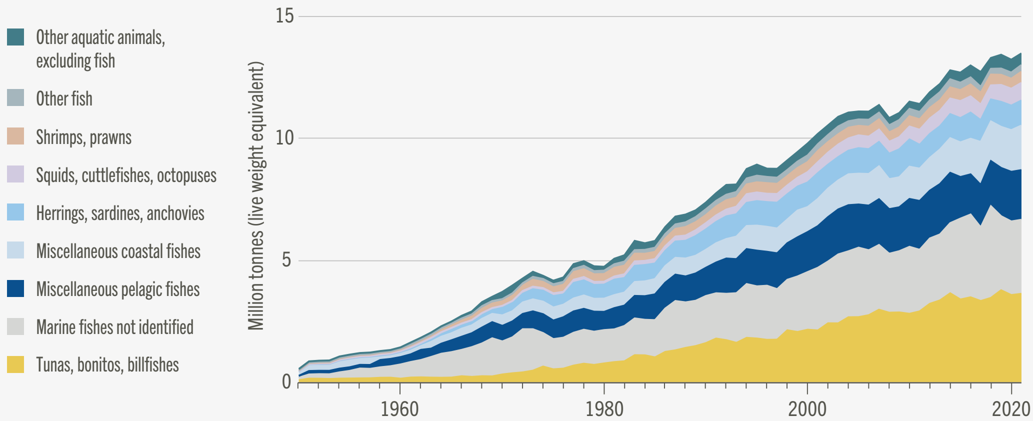
1 Note that the production function that estimates yield is left-skewed for tunas in the Western Central Pacific, indicating that BMSY would occur substantially below 0.5 B_0.

2 See Fisheries Research and Development Corporation – CC BY 3.0 AU, **https://www.fish.gov.au**

FIGURE D.12.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE WESTERN CENTRAL PACIFIC (AREA 71) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj** Licence: CC-BY-4.0.

4.2 Small pelagic fishes

Small pelagic finfish species (such as anchovies, sardines, herrings, scads) are essential for coastal communities in Area 71, and their relative importance is far greater in Southeast Asia. Although they are not major target species in northern Australia, artisanal fishers target them throughout much of the Pacific islands region. In spite of this, a lack of monitoring means that the catches of small pelagic species in the Pacific islands are unknown. These species have become more important for local consumption as coral reef and other coastal fishes, like groupers and snappers, have been overfished. However, they are under increasing pressure from pollution, habitat loss (mangroves) and overexploitation. The unregulated use of lamps and the large number of vessels catching them place these stocks under tremendous pressure, and some stocks are overfished.

4.3 Sharks, skates and rays

Many elasmobranchs are susceptible to overfishing due to life history characteristics, including slower growth, lower fecundity, longer lives and late maturity. Commercial fisheries capture sharks in northern Australia, and these are comprehensively managed and sustainable.[3]

Shark, skate and ray catch data in the Pacific islands region and Southeast Asia are extremely poor. However, fishers harvest these species and, in many areas, they are depleted compared to historical levels (Welch, unpublished data). There has been increasing concern that elasmobranchs captured in oceanic fisheries have experienced significant declines, with two of the major species (silky shark *[Carcharhinus falciformis]* and oceanic whitetip *[Carcharhinus longimanus]*) reported as being overfished.

Southeast Asia's largest targeted elasmobranch fisheries are in Indonesia and the Philippines (Clark-Shen *et al.,* 2023). There are at least 273 species of marine elasmobranchs (IUCN, 2021) in that subregion, several of which are of conservation concern (Clark-Shen *et al.,* 2023). Artisanal, semi-industrial and industrial vessels catch elasmobranchs of multiple species, and due to weak legislation and enforcement they capture many juveniles and locally prohibited species (Moreno, personal observations). Because the area holds so many endemic species with restricted distributions, the strict regulation of their fisheries is essential.

[3] See Fisheries Research and Development Corporation – CC BY 3.0 AU, **https://www.fish.gov.au**

4.4 Coastal and coral-reef species

Coastal finfish and invertebrates are critical in Southeast Asia and the Pacific islands subregions, where coastal communities rely heavily on them for food security as a significant source of protein and for local livelihoods. This reliance, along with rapidly increasing human populations, improvements in fishing technology and gear availability, and low capacity for monitoring and management, have resulted in significant declines in many species. Historically vital species, including invertebrates like sea cucumbers and large predators like groupers and snappers, have become rare in Southeast Asia and many Pacific islands. Their proximity to the shore, desirability, high value and life history characteristics make them vulnerable to overexploitation. Furthermore, recent studies of the projected impacts of climate change indicate that the biomass of coastal finfish and invertebrates within Area 71 will experience significant declines within the next 10 to 30 years, further exacerbating current sustainability concerns (Blanchard and Novaglio, 2024; Welch *et al.,* in press). Primary fisheries management for coastal fisheries is urgently needed in many countries (Welch, 2024).

5. KEY FINDINGS

This report estimates that 52.9 percent of the assessed stocks in Area 71 are biologically sustainably fished. The percentage of stocks estimated to be sustainably fished is similar for the two main subregions of Area 71, at 55 percent for the Central Pacific and 51 percent for Southeast Asia. **TABLES D.12.4** and **D.12.5** provide a comparison between results from the updated and previous FAO state of stocks assessments, based on the 2021 data. The drop in biologically sustainably fished stocks is not due to a change in their condition but instead is linked to the use of an updated methodology, which includes a significant increase to the number of stocks assessed, thereby improving the representativeness of status reporting and providing a more accurate reflection of the current context of fisheries in Area 71. The coverage of 51.3 percent of landings in 2021 is slightly higher than the previous coverage of 48.9 percent for the same reference year.

Despite these improvements in the reliability of the regional assessment, stock assessments and relevant information are still overall limited in Area 71. The species for which stock status was determined in each country were generally ad hoc and often the subject of opportunistic and snapshot-type data collections typically conducted by non-government and external experts. Of note is that the majority of stock status information for Area 71 was derived from Tier 3 assessments, including some assessments from local expert judgement; the exception being northern Australia and most high-seas stocks associated with valuable tuna fisheries. In addition, over 64 percent of the total reported catch in Area 71 came from mixed-species groups that were only used in this analysis for comparative purposes, given that they cannot accurately inform on the status of the stocks (noting that some species groupings may be valid). For example, the country with the largest catches in the Area, Viet Nam, reports 79.2 percent of its catch in two categories: marine fishes NEI and tuna-like fishes NEI.

In Area 71, as with some other FAO Major Fishing Areas, the data also show fluctuations that reflect challenges with the reliability of data collection, collation and analysis. Furthermore, data collectors or managers may apportion a species in FAO's historical stock list to various categories due to poor species identification. These issues are significant obstacles to using catch data to determine a species or stock status.

The assessment information for this report was obtained from multiple sampling locations in various countries. However, for each country, the sampling location for a particular species was unique and a single location. Without further data, it was assumed that outputs from these assessments represented the country-level status for a given species, even where other stocks for the same species were likely to exist. In some cases, the assessments for single species from different locations were collected within the same country. Expert judgement and existing literature were used to determine whether each location likely represented a separate stock. Where separate stocks were determined, the assessment results from each area were treated independently. While the status at the stock level is reported in this report (**APPENDIX II, TABLE 12**, pp. 463), comprehensive knowledge of the spatial scale of stocks and their structure is lacking. It should be acknowledged that some countries may have several stocks of the same species while others may be shared across adjacent countries. Due to the region's scarcity of stock status information, assessments dating back to 2016 were included.

Finally, a continued focus on collating information on the status of fished species at the stock level in future FAO stock status reporting and on using the best available information will continue to improve the accuracy and paint a more meaningful picture of stock status in Area 71. Many countries and territories in Area 71 have reduced capacity to monitor and assess stocks; national reference lists of stocks need to be refined to make the best use of limited resources. Supporting these nations in achieving this goal and using data-limited assessment approaches appropriate to local contexts will help significantly improve the accuracy in reporting Area 71 stock status in the future.

TABLE D.12.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 71 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
263	23.2	29.7	47.1	52.9	47.1	46	10.9	54.3	34.8	65.2	34.8

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Source: FAO estimates.

TABLE D.12.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 71 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
22.2	22.8	55.0	45.0	55.0	13.6	50.4	36.1	63.9	36.1

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Sources: FAO estimates.

PACIFIC, WESTERN CENTRAL

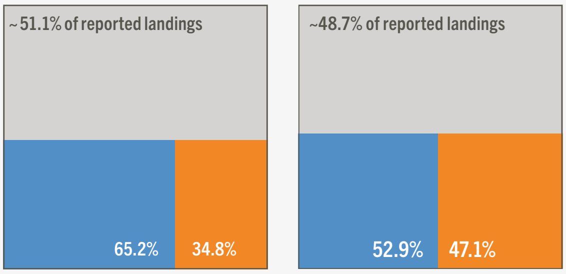
KEY MESSAGES

- The number of people who depend on fisheries in Area 71, both directly and indirectly, is the largest of any Area in the world and the majority of landings are consumed locally.
- Tunas are key target species and a major source of revenue in the Area. The current status of tuna resources is highly sustainable, in part due to management procedures instituted by WCPFC. However, the distribution and abundance of tunas are likely to be negatively impacted by climate change.
- Many local communities depend on the ocean for their livelihood and nutrition, which are under threat from climate change.

STOCK STATUS

FAO estimates, 2021

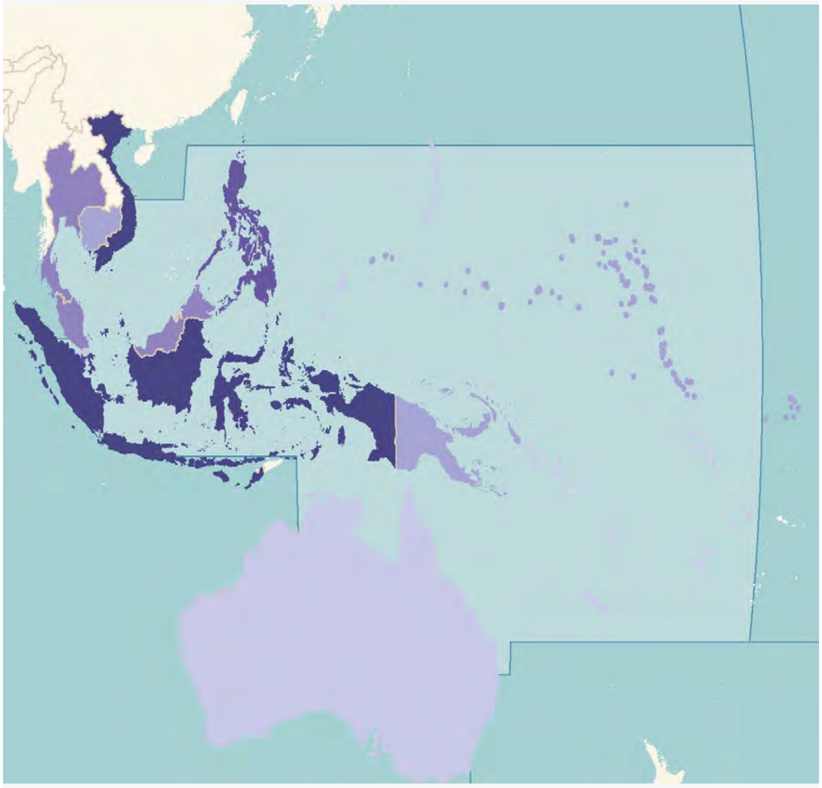
PREVIOUS METHODOLOGY — UPDATED METHODOLOGY



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



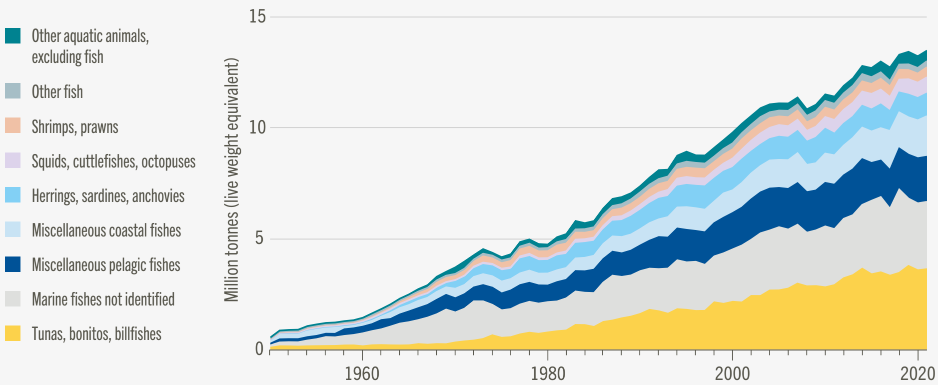
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | < 1% | 1–5% | 5–10% | 10–20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

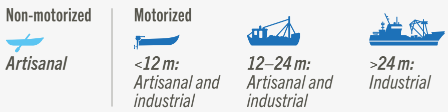


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 1.8 million



Non-motorized: 26%
Motorized: 74%

LANDINGS

FAO data, 2021

Reported landings ~ 13.5 million tonnes

Unidentified: 25%
Identified at species group level: 75%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 25.5 billion

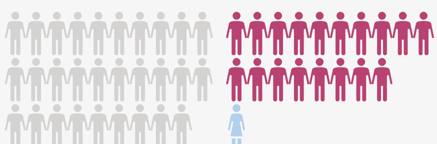
= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 4.8 million

Male: 38%
Unspecified: 60%
Female: 2%



= 100 000 PEOPLE

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FIGURE D.12.3 *(previous page)*
AREA 71 – DATA AT A GLANCE

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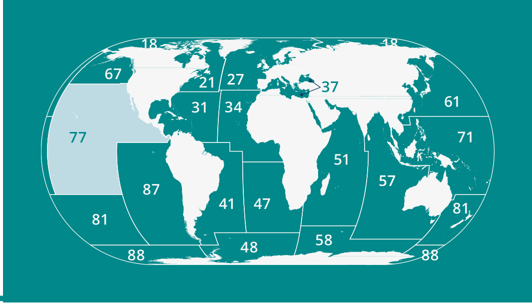

Part D, Chapter 13 (D.13)

EASTERN CENTRAL PACIFIC
FAO MAJOR FISHING AREA 77

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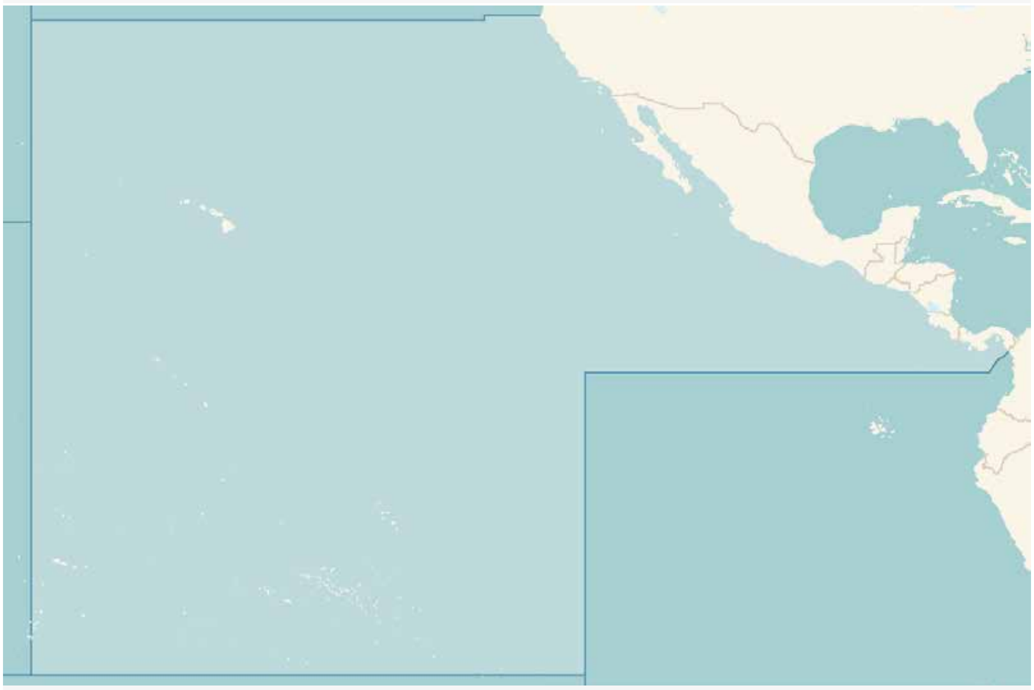
1. OVERVIEW

The Eastern Central Pacific, designated by FAO as Major Fishing Area 77 (hereafter, Area 77), encompasses the exclusive economic zones (EEZs) of Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and the United States of America (hereafter, United States). Area 77 is recognized as a productive fishing ground, with catches primarily consisting of large and small pelagics, snappers, groupers, tunas and shrimps, among others. The majority of the catch by tonnage in this region is landed by industrial and semi-industrial fisheries, primarily operating on the continental shelf and at the shelf edge (i.e. trawling, purse-seining and longlining). Furthermore, Area 77 also supports a significant proportion of artisanal and small-scale fisheries, which face increasing

FIGURE D.13.1
FAO MAJOR FISHING AREA 77: THE EASTERN CENTRAL PACIFIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

pressures from overfishing. These contribute significantly to the economies of the coastal countries in the Area, with the United States, Mexico, Costa Rica, Panama and Honduras being particularly important fishery producers in the region. These fisheries are often capital-intensive, fleet-based enterprises which yield substantial landings; however, the number of jobs and livelihoods directly dependent on these resources can vary significantly.

The biological productivity of Area 77 is influenced by several oceanic currents, including the California Current, the North Pacific Current and the North Equatorial Current (FAO, 2011). The primary temporal variation scales affecting the fishing sector are interannual and multidecadal, with the El Niño-Southern Oscillation (ENSO) phenomenon being a major source of interannual environmental change, showing dominant signals every two to seven years (Lluch-Cota *et al.,* 2018). Longer-term climatic variability is represented by periodicities in various environmental indices, such as sea surface temperature, ranging from 20 to 60 years (Chavez *et al.,* 2003). These variations can significantly impact fishery resources, leading to fluctuations in biomass and catch availability. Indeed, during El Niño events, the abundance of species like Pacific sardine *(Sardinops sagax)* and California anchovy *(Engraulis mordax)* can be affected, influencing the overall productivity of the fisheries. For example, in the Mexican Pacific, both interannual and multidecadal variations have been shown to affect fishery resources and the ecosystems that support them. This generally leads to negative consequences for the sector, as biomass – and, consequently, available catch – can decrease by up to 136 000 tonnes. However, shrimp and squid catches have shown increases during El Niño events (Bertrand *et al.,* 2020). Some regions of Area 77 are also influenced by other oceanic characteristics; for instance, El Salvador's fisheries are influenced by a shallow thermocline, seasonal shifts in the Intertropical Convergence Zone, and coastal wind jets that create cyclonic and anticyclonic eddies. Upwelling zones, such as the Costa Rica Dome, and the Eastern Boundary Current system also significantly affect marine productivity and species distribution.

The history of marine resource utilization in this region is shaped by colonial legacies and the industrial development of fisheries. Each country has developed its fisheries sector within different historical and political contexts. Many coastal communities in Area 77 continue to depend on marine resources, although several fish stocks are showing signs of overfishing.

Climate change, pollution and overexploitation also pose significant threats to fishery resources and the artisanal fishers who depend on them. The current trend shows a decline in the abundance of many species – and, consequently, in fishing profitability. An increase in sea surface temperature and a reduction in oxygenated zones in the water column have been observed (FAO, 2018).

Moreover, the growth of commercial catches over the years has led to the depletion of some inshore resources. While certain species are managed effectively, others are overfished, and data on artisanal and semi-industrial fisheries are often limited. This creates uncertainty regarding the status of these unassessed resources, which represent a notable portion of landings in the region. This situation poses significant challenges regarding food security and poverty alleviation.

2. FISHERY PROFILES

The fisheries in Area 77 have multiple jurisdictions that correspond to the EEZs of countries in the Area; the subsections below outline the fisheries profiles for each country.

2.1 The United States of America

The United States' Pacific coast fisheries are significant due to their extensive range and the diverse marine resources they encompass. The region under Area 77 spans the Pacific coastline from the border between the United States and Mexico, to northern California.

The United States has both industrial and artisanal fishing fleets, targeting a wide variety of species. The industrial fleets primarily target species such as tuna, small pelagics and groundfish. The tuna fleet operates in the central and southern regions of the United States' Pacific EEZ (thus, within the scope of Area 77), using longlines and purse seines to capture species like albacore *(Thunnus alalunga),* bigeye *(Thunnus obesus),* yellowfin *(Thunnus albacares)* and skipjack *(Katsuwonus pelamis)* tunas. The small pelagic fleet employs purse seines and targets species such as Pacific sardine *(Sardinops sagax),* California anchovy *(Engraulis mordax)* and Pacific chub mackerel *(Scomber japonicus).* Groundfish, including species like Pacific cod *(Gadus macrocephalus)* and various rockfish *(Sebastes* spp.), are primarily caught using trawl nets and longlines. Artisanal fleets are vital for the livelihoods of coastal communities along the United States' Pacific coast. These fleets use a variety of fishing techniques – including gillnets, hand lines and traps – to catch a wide range of species. Key species targeted by artisanal fishers include salmon, Dungeness crab *(Metacarcinus magister)* and various species of flatfish.

The regulatory framework for fisheries management in the Pacific waters of the United States is established by the Magnuson-Stevens Fishery Conservation and Management Act. This law aims to prevent overfishing, rebuild overfished stocks, ensure conservation, and facilitate long-term economic and social benefits. Key management measures include catch limits, gear restrictions, closed seasons, and marine protected areas (MPAs). The National Marine Fisheries Service and regional fishery management councils are responsible for implementing these regulations.

2.2 Mexico

The fishing zones along Mexico's Pacific coast are of great significance due to their vast expanse and the diverse marine resources they harbour. This region spans approximately 7 828 km of coastline, stretching from the southern border of the United States to the border between Mexico and Guatemala, and encompasses an EEZ of about 3.2 million km^2. Mexico has industrial fishing fleets as well as artisanal fleets, which use smaller vessels to catch a wide variety of finfish and invertebrates.

The industrial fleets in the Mexican Pacific primarily target tuna, small pelagics and penaeid shrimp. The tuna fleet operates in the central and southern regions of the Gulf of California, off the western coast of the Baja California peninsula, and in oceanic waters within Mexico's EEZ, using longlines and purse seines. The small pelagic fleet also employs purse seines and mainly operates in the Gulf of California and along the western coast of the Baja California peninsula. Key species caught include Pacific sardine, three species of thread herring (Pacifc thread herring [*Opisthonema libertate*], slender thread herring [*Opisthonema bulleri*] and middling thread herring [*Opisthonema medirastre*]), Pacific chub mackerel and California anchovy. Shrimp capture is concentrated in the Gulf of California and the Gulf of Tehuantepec, primarily using bottom trawl nets to catch species like blue shrimp *(Penaeus stylirostris),* whiteleg shrimp *(Penaeus vannamei)* and yellowleg shrimp *(Penaeus californiensis).*

Artisanal fleets are essential for the livelihoods of communities along the Pacific coast of Mexico. These fleets target a wide range of species using various fishing techniques that vary by location. In the central Pacific region, artisanal fleets catch snappers (Lutjanidae) and snook *(Centropomus* spp.) using handlines. Artisanal fishing of mojarras (Gerreidae) and Pacific sierra *(Scomberomorus sierra)* is conducted in the central and southern Pacific regions using gillnets and handlines. On the western coast of the Baja California peninsula, high-value fisheries, such as lobster, are carried out using traps, allowing for selective harvesting and the implementation of sustainable practices. Other important fishery resources along the Pacific coast of Mexico include groupers and snappers, which are caught using gillnets, handlines, hooks and longlines. Crab *(Callinectes* spp.) is another significant resource, mainly captured with traps in various regions including the Gulf of California and the Gulf of Tehuantepec. Various clam species are also valuable resources, especially in the Gulf of California and along the western coast of the Baja California peninsula, where they are harvested through semi-autonomous diving.

The regulatory framework and policy instruments governing fisheries management in the Pacific waters of Mexico are established by the General Law of Sustainable Fisheries and Aquaculture. This law is applied according to the specific needs of different resources, aiming to achieve two primary goals: the sustainability of resource exploitation, and conservation or recovery in case of any identified threat or degradation. The main instruments include laws, official standards, and management plans. These give rise to various measures such as regulated access, minimum catch sizes, controlled fishing gear and capture methods, closed seasons, quotas, fishing units, authorized nominal effort, fishing zones, and fishery refuges.

2.3 Guatemala

Guatemala has approximately 402 km of coastline along the Pacific Ocean, and its EEZ in this area covers 110 945 km^2, with a continental shelf of about 14 009 km^2 (López, 2022).

Guatemala has a significant fishery sector, characterized by a blend of industrial and artisanal fishing activities. The fisheries are divided into commercial, sport, scientific and subsistence fishing, with commercial fishing further classified into tuna fishing, large-scale, medium-scale, small-scale and artisanal fishing (Martínez *et al.,* 2024). The main fishing gears include longlines targeting dolphinfish and sharks, bottom gillnets for demersal fish and shrimp, trawl nets for shrimp, and surface gillnets for fishing green jack *(Caranx caballus)*. Key management measures include the issuing of fishing licences for medium- and large-scale fleets, as well as the regulation of fishing gear. The shrimp trawl fleet is limited to 25 vessels to control fishing effort and capacity.

Among the main fishery resources are common dolphinfish *(Coryphaena hippurus),* silky shark *(Carcharhinus falciformis),* striped marlin *(Kajikia audax),* yellowfin tuna, Indo-Pacific sailfish *(Istiophorus platypterus),* shrimp (whiteleg shrimp, blue shrimp, Western white shrimp [*Penaeus occidentalis*], Pacific seabob [*Xiphopenaeus riveti*], crystal shrimp [*Penaeus brevirostris*] and yellowleg shrimp), snappers (spotted rose snapper [*Lutjanus guttatus*], Pacific red snapper [*Lutjanus peru*] and Colorado snapper [*Lutjanus colorado*]), snooks "(black snook [*Centropomus nigrescens*] and white snook [*Centropomus viridis*]), groupers, ronco (also known as raucous grunt, *Haemulopsis leuciscus*), croakers *(Cynoscion reticulatus),* flounders (toothed flounder, *Cyclopsetta querna)* and catfish *(Arius* spp.).

2.4 El Salvador

El Salvador has 321 km of coastline along the Pacific Ocean, extending from the Río Paz to the Gulf of Fonseca. Its EEZ covers approximately 88 000 km^2, with a depth of 0–4 000 m, offering significant potential for fisheries. Fisheries are economically and socially important in El Salvador, with many coastal communities relying heavily on fishing for food security. The fleet of El Salvador operates in the coastal-marine area, primarily supplying marine food for national consumption and export.

Key species include shrimp, dolphinfish, snapper *(Lutjanus* spp.), Pacific sierra, croaker (Sciaenidae), and green spiny lobster *(Panulirus gracilis).* The main fishing gears used include gillnets, longlines, cast nets and handlines. Industrial shrimp trawling also plays a crucial role, targeting species of the Penaeidae family, such as whiteleg, blue, Western white, yellowleg, crystal and Pacific seabob shrimps. Tuna – highly migratory pelagic fish – currently holding the highest recorded catch levels in national fisheries. Salvadoran vessels use purse seines to catch tropical tuna species, including bigeye, yellowfin and skipjack tunas.

Fisheries management is governed by the General Law of Fisheries and Aquaculture and its regulations, which aim to regulate and promote sustainable fishing and aquaculture activities. Key management measures include regulated access, minimum catch sizes, controlled fishing gear, closed seasons, quotas, and designated fishing zones. The law also establishes an Aquatic Reserve Area, defined as a marine area extending one nautical mile from the lowest tide line along the entire Salvadoran coast. Industrial fishing is prohibited within three nautical miles of the coast, while artisanal fishers can operate starting from the one mile limit.

2.5 Honduras

The capture fisheries on the Pacific coast of Honduras, particularly in the Gulf of Fonseca, are primarily small-scale and artisanal. The Gulf of Fonseca is a strategic region, not only because of its geographical location, but also because of the economic and trade relations established in a cross-border area shared by Honduras, El Salvador and Nicaragua (CETMAR, 2021). Despite its rich biodiversity, the region faces a number of social and environmental problems, as it is one of the poorest and most vulnerable areas of the country. Local fishing communities rely on a variety of traditional techniques, including handlines, gillnets and cast nets. Honduras has a significant fishing industry focused on both reef and pelagic species. Key target species include croakers, snappers, groupers, jacks, and sea catfish. Shrimp fishing is also practised, mainly for domestic consumption and to sell to intermediaries who distribute the catch in national markets.

According to Honduran fishers, the decline and collapse of some fisheries was a result of irresponsible fishing practices and habitat degradation from destructive fishing gear (Canty *et al.,* 2019). In addition, challenges in coordination among the three countries sharing the Gulf hinders the implementation of comprehensive and sustainable fisheries policies, exacerbating issues of poverty and vulnerability in the region (CETMAR, 2021). Over time, awareness of the need for responsible fishing has grown, leading to initiatives aimed at promoting sustainability, such as replacing illegal fishing gear and engaging in mangrove reforestation projects. While industrial trawl fishing is not viable in this part of the Pacific due to unsuitable conditions for trawling, artisanal fishers continue to play a vital role in local economies, contributing to food security and livelihoods in coastal communities.

2.6. Nicaragua

The Pacific coast of Nicaragua is a vital area for both industrial and artisanal fisheries. Industrial activities mainly focus on shrimp and finfish, with shrimp trawlers operating extensively along the coast. Impoverished communities along Nicaragua's Pacific coast face worsening food insecurity and income challenges due to overfishing, mangrove loss, rapid population growth and limited access to services and opportunities (Crawford *et al.,* 2010). Despite some declines in landings over time, shrimp fishing remains an important part of the industry. Additionally, various fish species, such as snapper and grouper, are caught in both industrial and artisanal fisheries. Artisanal fishing is especially significant, making up a large portion of marine production. Fishers primarily use small boats like fiberglass pangas with outboard motors and employ methods such as gillnets and handlines. Key fishing centres along the coast, like Potosí, Mechapa, and Corinto, contribute to the sector's output. While infrastructure remains limited in some areas, the Pacific fisheries are essential to Nicaragua's economy, providing employment and supporting exports, with ongoing efforts toward sustainability and resource management.

The main fishery resources in the Pacific were shrimp (both coastal and deep-sea), which accounted for 1.7 percent of marine landings, and finfishes, which represented 17.5 percent of total marine production. Aquaculture, particularly shrimp farming, played a dominant role, contributing 77.9 percent of the Pacific's total production. Despite challenges such as the impact of hurricanes in 2020, the sector demonstrated resilience, with investments in infrastructure, machinery, and equipment supporting its recovery and growth. Overall, the fisheries and aquaculture sector remained a vital component of Nicaragua's economy, contributing to food security, employment, and export earnings (INPESCA, 2021).

2.7 Costa Rica

The fisheries along Costa Rica's Pacific coast are significant due to their extensive range and the diverse marine resources they encompass. This region spans from the border with Nicaragua to the border with Panama, including an EEZ of approximately 574 725 km^2. Costa Rica has both industrial and artisanal fishing fleets, targeting a wide variety of species.

The industrial fleets in Costa Rica's Pacific EEZ primarily target large and small pelagic species. The large pelagic fleet uses longlines and purse seines to capture species such as yellowfin tuna,common dolphinfish (also known as mahi-mahi, *Coryphaena hippurus)* and swordfish *(Xiphias gladius)*. The small pelagic fleet employs purse seines and targets species like Pacific sardine and anchovy species. Artisanal fleets are vital for the livelihoods of coastal communities along Costa Rica's Pacific coast. These fleets use a variety of fishing techniques, including gillnets, handlines and traps, to catch a wide range of species. Key species targeted by artisanal fishers include snapper (Lutjanidae), snook and various shrimp and crab species.

The regulatory framework for fisheries management in Costa Rica's Pacific is established by the Fisheries and Aquaculture Law. This law aims to prevent overfishing, rebuild overfished stocks, ensure conservation, and facilitate long-term economic and social benefits. Key management measures include catch limits, gear restrictions, closed seasons, and MPAs. The Costa Rican Institute of Fisheries and Aquaculture (INCOPESCA) is responsible for implementing these regulations. Costa Rica emphasizes sustainable fishing practices, with a significant focus on responsible management of its fish stocks.

2.8 Panama

The fisheries sector in Panama plays a vital role in food supply and food security, particularly in coastal areas and remote regions. For many coastal communities, fishing is the primary livelihood.

The structure of Panama's fishing industry is diverse, ranging from small-scale artisanal boats to large industrial vessels. Panama serves as a vital transit point for fisheries, with significant small-pelagic fisheries operating in its waters. The industrial fishing fleet consists of shrimp trawlers, purse seiners, and longliners. Longliners primarily target species like snapper, grouper, shark, common dophinfish (also known as mahi-mahi), and tuna. The longline fleet has recently diversified, focusing on common dolphinfish and tuna, with semi-industrial longliners targeting snapper, grouper, and shark. Herring and anchovy fishing is conducted by purse seiners. Shrimp trawling primarily targets Northern white shrimp *(Penaeus setiferus)*. Artisanal fishing takes place throughout Panama's waters. Most artisanal vessels are small, under 10 gross tonnes. Subsistence fishing still exists in marginalized areas, mainly in regions with Indigenous communities. While little data is available, many traditional subsistence fishers have transitioned to full-time or occasional commercial artisanal fishing. Panama is also a renowned destination for sport fishing, particularly for billfish species.

3. RESOURCE STATUS

3.1. Reference list of stocks

In this report, the reference list of stocks for Area 77 was updated (**APPENDIX II, TABLE 13**, pp. 469), now covering 65 species or species groups and 91 stock units (**TABLE D.13.1**). This list was reviewed and verified by national experts during the FAO Regional Workshop to Review the Stock Status Analysis in Area 77, held in Mexico City 27–31 May 2024.

TABLE D.13.1
SUMMARY OF ASSESSED STOCKS IN AREA 77 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	47	34	10
2 Surplus-production model approaches	43	34	11
3 Data-limited approaches	1	1	1
Total	**91**	**65**	**15**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

Overall, of the 91 assessed stocks for Area 77, 69.2 percent are sustainably fished while 30.8 percent are unsustainably fished. More specifically, 36.3 percent are considered underfished, 33 percent are considered maximally sustainably fished, and 30.8 percent are considered overfished (**TABLE D.13.2**). When weighted by their production levels, biollogically sustainable stocks account for 81.2 percent of the 2021 landings of assessed stocks monitored by FAO (**TABLE D.13.3**).

TABLE D.13.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 77 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	47	34.0	46.8	19.1	80.9	19.1
2 Surplus-production model approaches	43	39.5	16.3	44.2	55.8	44.2
3 Data-limited approaches	1	0.0	100.0	0.0	100.0	0.0
Total	**91**	**36.3**	**33.0**	**30.8**	**69.2**	**30.8**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

Under the updated methodology (**PART B, METHODOLOGY**, pp. 6), stocks were divided into three tiers to determine their state of exploitation. A total of 47 stocks representing 34 species were included under Tier 1 (**TABLE D.13.1**). The stock status information for these stocks was extracted from available national and regional stock assessment reports. A total of 43 stocks representing 34 species were identified for Tier 2, all of which were considered non-straddling and thus to only occur within the jurisdictional waters of the reporting countries. The stock status information was extracted from available assessment reports or obtained through model runs using catch and effort data when available. Only one stock (Dungeness crab) was considered in Tier 3.

TABLE D.13.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 77 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1.30	**43.4**	**37.8**	**18.8**	**81.2**	**18.8**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED STOCKS AND SPECIES

This section identifies and discusses species and stocks that are currently most important for Area 77 (**FIGURE D.13.2**), including their description, available data, catch trends and current status.

4.1 Cods (hakes and haddocks)

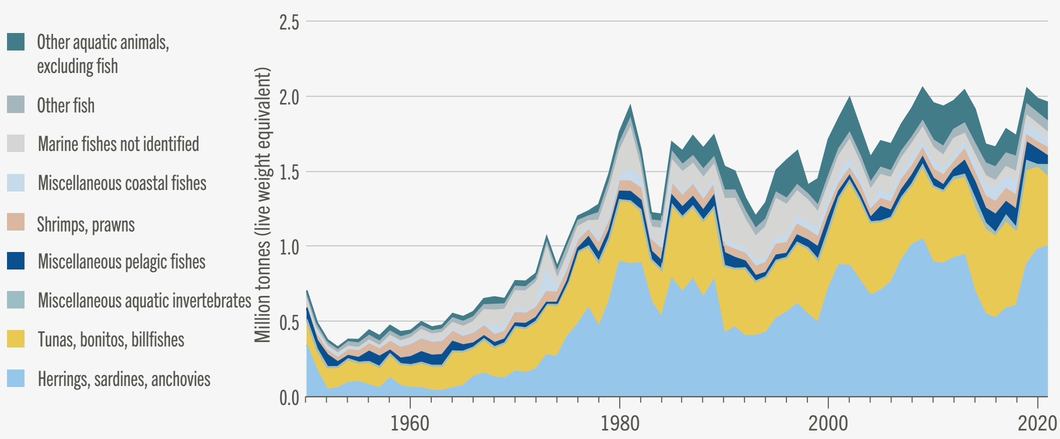
In Area 77, cods are a monospecific group consisting only of North Pacific hake *(Merluccius productus)*. In 2021, hake landings were 297 000 tonnes throughout its coastal range, of which about 7 400 tonnes were caught in Area 77. North Pacific hake consists of four stocks spread across Area 77 and Area 67, with the North Central Pacific hake being the only stock in Area 77 (ranging from northern California to northern British Columbia). The species' distribution extends beyond the boundaries of Area 77 (e.g. to the Strait of Georgia and Puget Sound), but of the fleets that exploit it, only the Northern California fleet operates within Area 77.

Each year, the United States and Canada use separate fishery statistics, disaggregated by fleet, to determine both the status of the portion of the stock harvested in Areas 67 and 77, as well as corresponding management measures. The information used to assess the stock as a whole includes biomass time series, fishing mortality estimates and catches (Edwards *et al.*, 2022). About 25 percent of the total catch comes from Area 77. The FSB in 2022 was 40 percent below the reference point. The stock is maximally sustainably fished.

4.2 Miscellaneous coastal fishes

The resources of miscellaneous coastal fish mainly comprise species that are highly valued and thus possess significant commercial worth. Among these are the croakers, which include various species from the Sciaenidae family, particularly weakfishes (*Cynoscion* spp.) and croakers (*Micropogonias* spp.); the Northern red snapper *(Lutjanus campechanus)* and various other snapper species, primarily from the Lutjanidae family, especially within the genus *Lutjanus* spp.; as well as several species of groupers and rock snappers from the Serranidae family; mojarras from the Gerreidae family; and snooks from the Centropomidae family. These species are caught using various fishing gears by small-scale fleets, and in most cases there is very little recorded information available to

FIGURE D.13.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE EASTERN CENTRAL PACIFIC (AREA 77) BETWEEN 1950 AND 2021



Note: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

conduct assessments of their exploitation status. In most of Area 77, independent biological stocks are not identified, and as such, it is assumed that a continuous distribution of a particular species exists along the Central Pacific coast. In certain countries within the region, such as Mexico, the United States, Panama and Costa Rica, some fishing stocks corresponding to specific regions have been identified, and where there is recorded information on fisheries, the status of their exploitation is presented. The aforementioned fish families have contributed an average of 52 000 tonnes annually over the past ten years, while the total ISSCAAP 33 group averages 66 000 tonnes annually. Overall, stocks of groupers and snappers in Central America range from overfished to maximally sustainably fished. As a whole, this group is not doing as well as the other species groupings in the Area.

4.3 Miscellaneous demersal fishes

Miscellaneous demersal fishes, also referred to as benthic fishes, are typically associated with marine bottoms, whether muddy, rocky or reef-like. Typical species include members of the family Sebastidae *(Sebastes* spp.), commonly known as rockfish; various families of flatfish such as Soleidae, Paralychthidae and Bothidae; cod species from the family Gadiidae *(Gadus* spp.); as well as other species such as morays (Muraenesocidae, *Cynoponticus* spp.), scorpionfish from the Scorpaenidae family *(Scorpaena* spp.), and brotulas, Trhichiuridae, among others. Given the variety of species, various gears and fishing methods are employed for their capture, including bottom trawls, pots and traps, bottom longlines and gill nets. Minimum size limits are defined, and in some regions controlled areas and escape devices are in place. In terms of fishing regulation, quotas, minimum size limits and designated closed areas and seasons are enforced, along with regulations on fishing gear, while monitoring and surveillance activities are conducted in some regions. According to available assessments in the United States, the California blue and deacon complex *(Sebastes mystinus/Sebastes diaconus),* sunset rockfish *(Sebastes miniatus/Sebastes crocotulus),* black rockfish *(Sebastes melanops)*, blackgill rockfish *(Sebastes melanostomus)* and bocaccio *(Sebastes paucispinis)* were all maximally sustainably fished. The chilipepper rockfish *(Sebastes goodei),* cowcod *(Sebastes levis),* gopher and black-and-yellow rockfish complex *(Sebastes carnatus/Sebastes chrysomelas),* the shortbelly rockfish *(Sebastes jordani),* stripetail rockfish *(Sebastes saxicola)* and longspine thornyhead *(Sebastolobus altivelis)* were diagnosed as underfished. The California scorpionfish *(Scorpaena guttata)* is underfished. In Costa Rica, the stock of red pike conger *(Cynoponticus coniceps)* was assessed as underfished. Stocks of sablefish, belonging to the family Trichiuridae, are assessed as overfished in Area 77.

4.4 Herrings, sardines and anchovies

Small pelagics are the most productive fish group in Area 77 in terms of landings, reaching roughly 1 million tonnes in 2021, of which more than half comprised Pacific sardine *(Sardinops sagax)* and California anchovy *(Engraulis mordax)* (Kuriyama *et al.,* 2022a, 2022b; INAPESCA, 2022). The group consists of ten species whose stocks are distributed from northern California to Panama, but the largest biomasses are concentrated along the Californias, including the west coast of the Baja peninsula and the Gulf of California. It has been shown that fluctuations in the abundance of these stocks are largely determined by the variability of oceanographic conditions, but virtually all are fished at their maximum productivity levels. They are also the best-monitored group of fishes within Area 77 (annual biomass surveys, size/age structure and recruitment levels), and their management is based on quantitative methods and high-quality data (PFMC, 2020). The following is a summary of the species that constitutes the small pelagics group in Area 77. The central stock of northern anchovy is assessed as maximally sustainably fished, while the Gulf of California is overfished. Two stocks of Pacific sardine (Gulf of California and Southern stocks) were assessed as maximally sustainably fished. The Pacific thread herring complex in Mexico and in Panama, including species of slender thread herring *(Opisthonema bulleri),* Pacific thread herring *(Opisthonema libertate)* and middling thread herring (Opisthonema medirastre), are assessed as maximally sustainably fished. The stocks of Pacific anchoveta (*Cetengraulis mysticetus)* in the Gulf of California and Gulf of Panama are assessed as maximally sustainably fished (INAPESCA, 2022; Canales, 2020).

4.5 Flounders, halibuts and soles

The toothed flounder *(Cyclopsetta querna)* is a demersal species that inhabits the soft-bottom areas of the continental shelf in the Guatemalan Pacific, primarily between 25 m to 30 m in depth. Although it is not a target species for commercial fisheries, its incidental capture in shrimp trawl nets has increased in recent years, with an average annual catch of 94 tonnes over the past ten years (González Bolaños, 2015; Ixquiac, 2010). The main fishing grounds for flounder are located between Puerto San José and the border with El Salvador. These areas are associated with high biological diversity zones and feature water temperatures between 26 °C to 28 °C, which are optimal conditions for this species (Flores-Ortega *et al.,* 2013).

The biomass of flounder on the Guatemalan Pacific shelf is estimated at around 827 tonnes, with historical values ranging up to 1 033 tonnes. Assessments indicate that the species is in a maximally sustainably fished state (Bianchi, 1991; Ixquiac, 2010). Evaluations based on the swept-area method suggest that flounder abundance is maximized at depths of 25–30 m, with stable dynamic biomass over the years supporting its classification as maximally sustainably fished (González, 2015).

4.6 Miscellaneous pelagic fishes

Pacific chub mackerel *(Scomber japonicus)* and Pacific jack mackerel *(Trachurus symmetricus)* are among the main species of miscellaneous pelagics in Area 77. These stocks are distributed from Canada to the Gulf of California and together contributed more than 40 700 tonnes of catches in 2021 (Kuriyama *et al.,* 2023). As these stocks are caught by the small pelagic fisheries in Mexico and the United States, they are also monitored and managed by harvest control rules, but they are not as actively managed as other stocks of small pelagics. The assessments of the Central California and Gulf of California stocks of Pacific chub mackerel indicate that stocks are maximally sustainably fished. The stock of Pacific jack mackerel exploited by the Pacific sardine fishery is considered underfished.

The common dolphinfish *(Coryphaena hippurus)* is also a pelagic species of significant commercial importance, particularly within the EEZ of Guatemala. This species is caught seasonally by both artisanal and industrial fleets, primarily through the use of longlines. Catches have shown a significant decline in recent years. Studies have shown that 50 percent of females and males are caught at sizes below 75 and 85 cm, respectively, indicating unsustainable exploitation of the resource (López, 2010).

4.7 Sharks, rays and chimaeras

In Area 77, several species of commercially important sharks have been identified. Among the most notable are the hammerhead shark *(Sphyrna* spp.), silky shark *(Carcharhinus falciformis),* blue shark *(Prionace glauca),* shortfin mako shark *(Isurus oxyrinchus)* and thresher shark *(Alopias* spp.). Regarding rays, there are several species of commercial importance in the region, including the whipray *(Dasyatis longa),* Pacific whipray (also known as diamond stingray, *Hypanus dipterurus*), California butterfly ray *(Gymnura marmorata)* and spotted eagle ray *(Aetobatus narinari),* among others. With regards to chimaeras, also known as ghost sharks, the most significant species are the shortnose chimaera (also known as spotted ratfish, *Hydrolagus colliei*), black chimaera (also known as the East Pacific black goatshark, *Hydrolagus melanophasma*) and ghost chimaera (also known as silver chimaera, *Chimaera phantasma*).

Several species are subject to special protection. The fishing of sharks, rays and chimaeras occurs along the coast of Area 77, with a heterogeneous distribution, although for some species movement patterns are well understood. Among the primary management measures are restrictions on fishing, minimum size limits, the frequent implementation of training programmes for fishers, and monitoring. The most commonly employed fishing gears include surface longlines, gill nets, pots and harpoons. These species provide sustenance for coastal communities and are considered an important source of employment and family livelihoods. In the case of sharks, they are typically long-lived and have low fecundity, making them vulnerable to overfishing; hence, several species are classified as threatened or endangered.

In Guatemala, the scalloped hammerhead shark *(Sphyrna lewini)* is considered underfished, with low catches compared to other shark species. However, due to the pressure on neonates and juveniles, as well as the growing demand for shark products, the species faces significant threats. Annual landings of silky sharks are estimated at around 220 tonnes, with an average of 234 tonnes over the past five years, although the sizes of captured individuals continue to show a declining trend (CONAP, 2023).

The big skate *(Beringraja binoculata,* also known as the giant skate) fishery in Southern California primarily occurs in coastal and demersal waters. This is the largest skate species in the North American Pacific Ocean, found from Alaska to Baja California. In California, regulations aim to protect the big skate, including catch limits and seasonal closures to manage the population. The assessment performed indicates that this stock is currently underfished.

4.8 Crabs and sea-spiders

Crabs are a fishery resource found along the coastline of Area 77, closely linked to lagoon systems, estuaries, bays and adjacent marine regions. They are economically and socially important species for coastal communities, providing employment and family sustenance. The crabs correspond to different species of Callinectes swimcrabs (*Callinectes* spp.), which are primarily targeted by coastal fishing, employing various types of fishing gear, including fixed traps (pots or traps) or manually operated nets such as baskets, gill nets or hand-capture techniques. These species are relatively accessible, and the dispersion of both the resource and the fishing fleets does not allow for continuous record-keeping that would provide accurate assessments of their exploitation status.

One of the few evaluations along Mexico's coastline focuses on the brown crab (also known as warrior swimcrab, *Callinectes bellicosus*) in the Upper Gulf of California. Regulations generally focus on minimum catch sizes and area closures to protect reproduction. The stock is assessed as underfished. The Dungeness crab *(Cancer magister)* in Area 77 is a resource of commercial importance and is also targeted by recreational fishers, primarily in the central-southern region of California, notably in Monterey Bay and Orange County. Fishing is primarily conducted using pots and hand collectors. The regulation of the fishery is mainly based on catch limits, minimum size restrictions, a fishing season and fishing permits, which may vary by region. Both commercial and recreational fishing establish catch limits that can differ according to the area. Recent commercial catches have averaged around 6 000 tonnes annually. The stock is maximally sustainably fished.

4.9 Lobsters and spiny rock lobsters

The lobster resource (*Panulirus* spp.) is highly valued for its economic importance along the coastal region of the Eastern Central Pacific. The primary target species for fishing include the Mexican spiny lobster *(Panulirus interruptus),* the green spiny lobster *(Panulirus gracilis),* the blue spiny lobster *(Panulirus inflatus)* and Revillagigedo lobster (also known as pronghorn spiny lobster, *Panulirus penicillatus*), as well as occasionally species from the family Scyllaridae. Fishing is conducted using various methods that vary by region, including diving, traps, nets and hand collection. Regulation is based on fishing seasons, minimum catch sizes and protected areas; in some regions, monitoring and surveillance are also maintained. The seafood products are sold either whole or as tails, and can be fresh or frozen; the majority are sold live. Pre-cooked lobster is less common. Overall, there is limited information available for stock assessment studies to support management measures. Most of the catch is achieved through small-scale fisheries, with industrial fishing being infrequent. The assessment of the Mexican spiny lobster along the Pacific coast of Mexico, particularly in the Baja California peninsula, indicates that the stock is maximally sustainably fished.

4.10 Shrimps and prawns

Shrimp fisheries in Area 77 are arguably the most economically and socially significant for several countries in the region, and they represent an important fraction of the gross domestic product (GDP) in Mexico. Their capture occurs at different life stages, constituting a typical sequential fishery, with juveniles in inner coastal waters and estuaries, pre-adults in the coastal zone, and adults in marine areas. Catches in coastal and inland waters are made using various fishing methods, including different types of nets and even traps. In the ocean, shrimp vessels typically operate using trawl nets. The regulation of fishing varies by region and generally consists of temporary closures, catch limits, regulations on fishing fleets and fishing techniques, and minimum size limits according to the fishery and the gear employed. The most important species include the y ellowleg shrimp *(Penaeus californiensis),* blue shrimp *(Penaeus stylirostris),* crystal shrimp *(Penaeus brevirostris),* whiteleg shrimp *(Penaeus vannamei),* and the botalón shrimp or Pacific seabob shrimp *(Xiphopenaeus riveti),* among others. These species are distributed along the coast of Area 77 with heterogeneous distribution, with some regions being more productive than others; the Gulf of California is considered the most productive area.

The main shrimp stocks of brown, blue and white shrimp in the Mexican Pacific are all maximally sustainably fished. Other stocks of these species in Central America are mainly overfished with some maximally sustainably fished, although it is important to note that the uncertainty on these estimates is high.

4.11 Scallops and pectens

Scallops or pectens are bivalve species belonging to the family Pectinidae. Some of the most important species include the Pacific calico scallop *(Argopecten ventricosus)* and Pacific lion's paw *(Nodipecten subnodosus),* among others. Catches are primarily made through hand collection and diving. Key management practices consider catch quotas, minimum sizes and protected areas. Since clam beds are distributed by regions according to suitable habitats, the benefits of fishing primarily accrue to local inhabitants, either through extraction activities or in processing plants when products are exported. The commercial capture of scallops is still at an early stage in Central America, with the Gulf of California and the Pacific coast of the Baja California peninsula being the most developed regions.

The fishery for the Pacific calico scallop, also known as the Pacific calico clam, is an important economic activity in Mexico, particularly in the region of Baja California Sur. This species is found along the Pacific coast from Santa Barbara, California, to Piura, Peru, with a distinct fishery developing in the southern region of the Baja California peninsula. At its peak in 1990, over 29 000 tonnes were harvested. Currently, this fishery provides employment to approximately 3 000 families through the commercialization of the scallop's meat. Management measures include seasonal closures to protect reproductive periods, along with limits on the quantity and size of scallops that can be harvested. The resource is considered underfished.

4.12 Clams, cockles and arkshells

Clam fisheries in Area 77 hold significant importance in certain regions, both for their economic value and as a crucial source of employment. Among the most prized clams are those belonging to the family Veneridae, such as the chocolata clam (also known as squalid callista, *Megapitaria squalida*), the white clam (also known as ponderous dosinia, *Dosinia ponderosa*), and the Pismo clam *(Tivela stultorum);* as well as the Pacific geoduck clam *(Panopea generosa)* from the family Hiatellidae, and several species of the genus *Chione*, among others. Generally, these fisheries are considered to be in a developmental phase, although the exploitation status of the stocks varies by region. Management measures include defining fishing seasons, setting quotas, establishing protected areas, requiring fishing permits and enforcing minimum size limits. Fisheries are conducted in shallow waters close to the shore, depending on the species. Among the greatest challenges are the risk of overfishing due to easy access, climate change, pollution, and the lack of scientific information and monitoring that would facilitate the implementation of effective management measures. These fisheries are relevant from a social perspective, providing jobs and sustaining families and communities.

The fishery for the chocolata clam is one of the most significant in Baja California Sur, Mexico. The fishery is concentrated primarily in six regions: Bahía de La Paz, Laguna Ojo de Liebre, Bahía Magdalena, Laguna San Ignacio, Bahía de Loreto, and the Costa de Santa Rosalía, with the first three regions representing just over 95 percent of total catches. Historically, there was a significant increase in production from 1992 (315 tonnes) to 2002 (1 128 tonnes), primarily associated with increases in Laguna Ojo de Liebre and Bahía de La Paz. After 2002, a general decline in catches was observed. In Bahía Magdalena, catches decreased significantly from 457 tonnes in 2001 to 73 tonnes in 2006. It has been considered that in regions such as Bahía de La Paz, the resource is being exploited at its maximum biological production capacity, though more detailed studies are recommended due to the risk of it being overfished.

4.13 Miscellaneous aquatic invertebrates

The cannonball jellyfish *(Stomolophus* spp.) fisheries are developed in the central-northern region of the western Gulf of California. These are recent fisheries that began around the year 2000 as development fisheries and transitioned to commercial fisheries in 2010. The species is typically captured at the mouths of estuaries and within 30 m of beaches. The product for consumers represents approximately 10 percent of the live weight volume, while its value is generally high, with exports primarily directed to Asian countries. The management of the fishery is regulated through fishing permits, a minimum size requirement, and a minimum mesh size in the scoop net used for capture. There is limited scientific knowledge about the resource, and official fishing statistics are still at an early stage; however, fishing organizations maintain catch records. The analysis of the fishery status was conducted considering annual catch and effort data for the blue and amber cannonball jellyfish. It was concluded that the resource is maximally sustainably fished.

5. KEY FINDINGS

Across all 91 stocks assessed in Area 77, 30.8 percent were considered overfished, 33 percent maximally sustainably fished, and 36.3 percent underfished. Comparisons of results obtained from the previous assessments and the updated approach show significant differences, with the proportion of overfished stocks being twice as high in the updated approach; this is even more apparent when weighted by landings (**TABLES D.13.4** and **D.13.5**). Given that this region had poor coverage of information in the past, many smaller assessment units and species were added in this updated assessment, resulting in an estimate that is worse than if landings information alone had been used. Indeed, the number of assessed stocks grew from 19 to 91 units that are now regularly assessed. In addition, the coverage of 86.6 percent of landings has increased in comparison with 74.2 percent of landings assessed with the previous methodology in 2021.

Specifically, this change may be a result of the inclusion of an additional number of Tier 2 stocks, which are mostly from small-scale fisheries with high uncertainty in their data. About 47.2 percent of stocks assessed under the new approach were Tier 2. The percentage of Tier 2 stocks that were overfished (44.2 percent) was more than double that of Tier 1 stocks (19.1 percent) (**TABLE D.13.2**), in line with the trend that stocks with better monitoring and assessment tend to be in better condition. Notably, several overfished stocks include coastal resources of high socioeconomic importance, such as groupers, snappers and shrimps. Strengthening management and monitoring efforts for these fisheries will be essential to ensuring their long-term sustainability and the livelihoods they support.

TABLE D.13.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 77 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
91	36.3	33.0	30.8	69.2	30.8	19	26.3	57.9	15.8	84.2	15.8

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Source: FAO estimates.

TABLE D.13.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 77 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
43.4	37.8	18.8	81.2	18.8	0.2	98.8	1.0	99.0	1.0

U = Underfished, M = Maximally sustainably fished, O = Overfished
Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.
Sources: FAO estimates.

To conclude, despite an increased percentage of overfished stocks under this new methodology, the proportion of stocks which are sustainably fished in Area 77 remains above the global average. Strengthening management systems in Central America would be a useful step towards ensuring that the resource base remains or gets closer to high sustainability levels in the future.

FIGURE D.13.3 *(next page)*
AREA 77 – DATA AT A GLANCE

FAO MAJOR FISHING AREA 77

PACIFIC, EASTERN CENTRAL

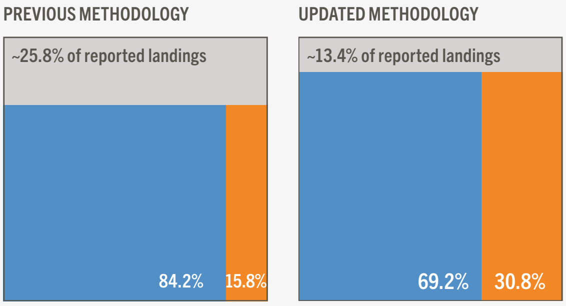
AREA 77

KEY MESSAGES

- A large proportion of landings in this region is comprised of small and short lived pelagic species whose abundance varies greatly with environmental changes.
- The percentage of sustainable stocks in Area 77 is amongst the highest of any FAO Area, although overfishing and climate change threaten some high-value coastal resources such as groupers, snappers and shrimps.
- There are valuable commercial fisheries for tunas and swordfish.
- There are important recreational fisheries, especially around Hawaii, which is also one of the world's largest marine protected area.

STOCK STATUS

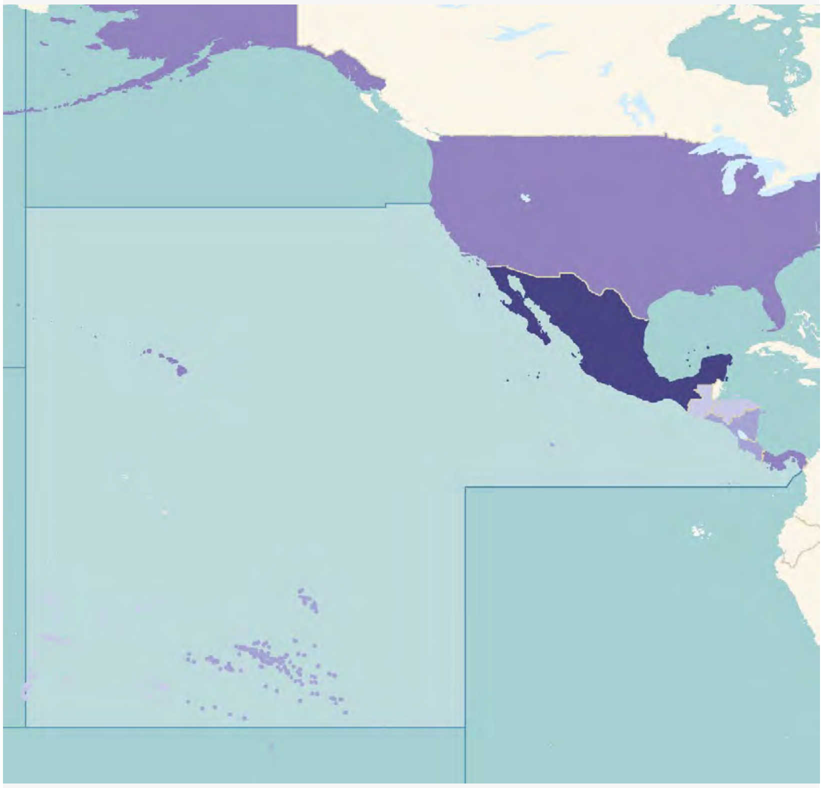
FAO estimates, 2021



Biologically sustainable
Biologically unsustainable
Unassessed reported landings

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021



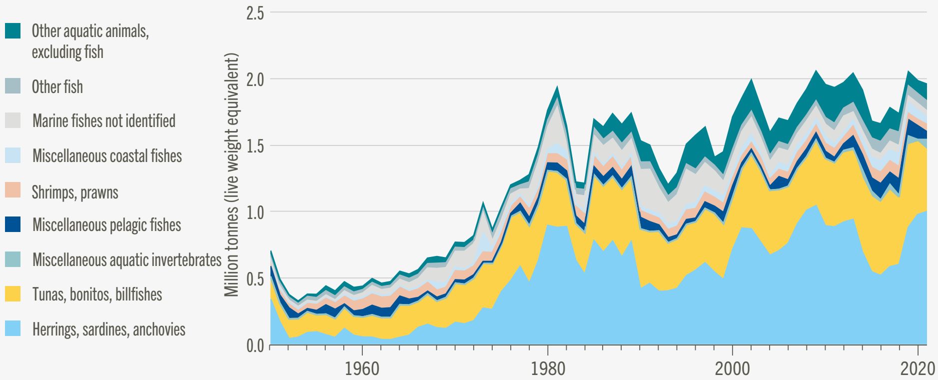
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | < 1 % | 1 – 5 % | 5 – 10 % | 10 – 20 % | > 20 %

SPECIES COMPOSITION

FAO data, 1950–2021

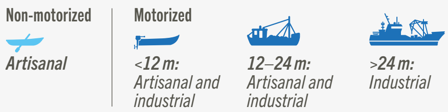


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 106 000



Non-motorized: 23%
Motorized: 77%

LANDINGS

FAO data , 2021

Reported landings ~ 2 million tonnes

Unidentified: 5%
Identified at species group level: 95%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 2.5 billion

= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 290 000

Male: 21%
Unspecified: 75%
Female: 4%

= 100 000 PEOPLE

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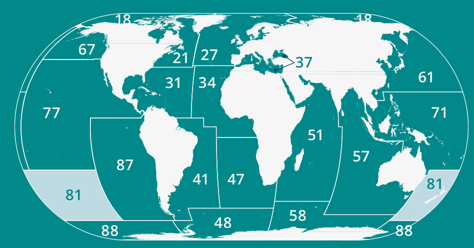
81



SOUTHWEST PACIFIC
FAO MAJOR FISHING AREA 81

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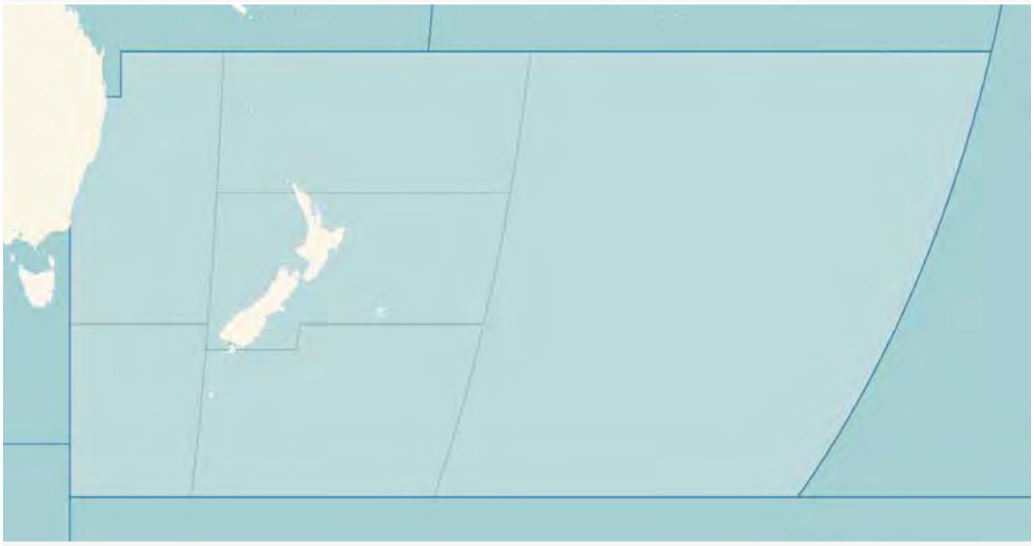
1. OVERVIEW

The Southwest Pacific, designated by FAO as Major Fishing Area 81 (hereafter, Area 81), encompasses the Tasman Sea and the Pacific Ocean from 150° to 120° east. It includes the exclusive economic zones (EEZs) of New Zealand and a part of Australia (the state of New South Wales), as well as extensive areas of the high seas. The total surface area is 27.7 million km^2, with only 0.4 million km^2 of shelf area. It is delimited in the west by the eastern limit of FAO Area 57, in the south by FAO Area 88, in the east by FAO Area 87, and in the north by FAO Areas 71 and 77 (**FIGURE D.14.1**).

Australia and New Zealand are linked by the East Australian Current (EAC). It flows south along the east coast of Australia but becomes weaker and diffused south of Sydney.

FIGURE D.14.1
FAO MAJOR FISHING AREA 81: THE SOUTHWEST PACIFIC



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

Part of this current system turns east to form the Tasman Front, flows across northern New Zealand, then down the east coast of the North Island where it becomes known as the East Cape Current. An extension to the EAC flows further south until it comes into contact with the northern edges of the Southern Ocean at the southern margin of the Tasman Sea. The Subtropical Convergence forms where the Tasman Sea meets the Southern Ocean, across the Tasman Sea and around the southern part of the South Island of New Zealand, flowing north up the east coast to Chatham Rise (an oceanic rise extending to beyond the Chatham Islands), where it meets the East Cape Current and turns east. Areas of high fisheries productivity occur where the Subtropical Convergence forms around New Zealand.

The Southwest Pacific is among the smallest areas globally in terms of landings. Nonetheless, the fisheries in Area 81 are diverse with both small-scale and industrial-scale fishing operations covering estuarine, coastal and continental shelf fisheries, as well as oceanic fisheries. A range of different fishing methods and gears are used. Management systems in the jurisdictions of New Zealand, Australia and the high seas are well developed, including catch reporting and assessment systems. The fisheries resources consist of the coastal species of the Australian state of New South Wales (with very small areas of Northern Victoria and offshore Tasmania), and of New Zealand, the pelagic resources of the Southwest Pacific, and mesopelagic species. Species compositions of declared landings have remained relatively stable over the FAO time series observed.

It is worth noting that the data and information presented in this Chapter not only comes from FAO, but also from Fisheries New Zealand (2024) and Australian Status of Fish Stocks Reports.[1]

2. FISHERY PROFILES

The fisheries in Area 81 can be organized into three subregions based on jurisdictions, habitats and types of species generally targeted: the Australian New South Wales (NSW) EEZ, the New Zealand EEZ, and the high seas. The latter incorporates the large expanse of open ocean in Area 81 and contains distinct fisheries and resources.

Historically, reported landings for Area 81 increased sharply during the 1970s and 1980s, peaking at around 929 000 tonnes in the early 1990s. Landings have steadily declined since then, largely due to a reduction in catch limits to ensure sustainability; in 2021 they were at around 388 000 tonnes (**FIGURE D.14.2**). Landings in this Area contain many different species, with blue grenadier *(Macruronus novaezelandiae)*, horse mackerels *(Trachurus* spp.) and Wellington flying squid *(Nototodarus sloanii)* representing the major species reported, respectfully accounting for 26 percent, 12 percent and 8 percent of the total reported catch. Snoek *(Leionura atun)* and southern blue whiting *(Micromesistius australis)* were also key species in the Area, representing 6 percent and 5 percent of the total reported catch. Approximately 7 percent of the total catch are oceanic high seas species.

Six different countries reported catch for Area 81 in 2021, with the vast majority reported by New Zealand (88 percent), followed by Australia (7.5 percent), Spain (1.3 percent), Japan (1.2 percent), Taiwan Province of China (1.2 percent), China (about 1 percent), and a negligible catch from Pitcairn Island.

2.1 Australian New South Wales EEZ

The waters of NSW include about 8 802 km^2 of estuary and ocean, over 1 750 km of ocean coastline, 44 offshore islands, and 185 estuaries and coastal lakes. The NSW continental shelf is generally less than 50 km and is only 53 km at its widest point (Whitehouse, 2007); as such, most of this region is characterized by deep waters. The marine habitats supporting fisheries in NSW comprise a multitude of shallow and deep rocky reefs, nearshore and offshore islands, sandy and muddy substrate areas, and a mosaic of corals, sea urchins, kelp and mixed algal assemblages. An increasing tropical influence in habitats and organisms is seen on the northern part of the coast (Jordan *et al.,* 2010; GeoScience Australia, 2014).

[1] Available at **https://www.fish.gov.au**.

The poleward-flowing EAC has a significant influence in modulating the region's climate as well as the composition, organization and function of marine ecosystems; it brings warm water down the NSW coast and the eddy field it produces dominates the marine environment on the narrow continental shelf.

In Australia, marine fisheries management responsibilities are spread across multiple jurisdictions: the Commonwealth, states and the Northern Territory. The Commonwealth manages commercial fisheries within the Australian Fishing Zone, which generally extends from three to 200 nautical miles off the coast. It also manages the activities of Australian-flagged fishing vessels operating on the high seas. This responsibility lies with the Australian Fisheries Management Authority (AFMA), which coordinates international cooperation on straddling and highly migratory fish stocks through regional fisheries management organizations (RFMOs). State governments have the responsibility of administering Australia's fisheries within three nautical miles of the coastline. In NSW, this responsibility lies with the NSW Department of Primary Industries.

Australia's reported landings for Area 81 come from a diverse range of small-scale and semi-industrial fisheries targeting a range of species in different habitats, primarily in estuarine, coastal and continental shelf waters, but also on the continental slope. In 2021, a total of 29 178 tonnes was reported, dominated by blue mackerel *(Scomber australaticus)* and greenback horse mackerel *(Trachurus declivis).* Together, these two species made up around 51 percent of total reported landings. Other species of importance for this region were mullets (8.9 percent), eastern school shrimp *(Metapenaeus macleayi)* (3.6 percent), southern bluefin tuna *(Thunnus maccoyii)* (3.5 percent), sillago (3.3 percent), flathead (3.2 percent) and Australian salmon *(Arripis trutta)* (3.2 percent). Approximately 8 percent of the total catch reported by Australia in Area 81 is comprised of oceanic species targeted by industrial tuna vessels in the high seas. In addition, approximately 25 percent of the total catch reported by Australia in Area 81 is reported as species groupings.

The state-managed fisheries include the abalone fishery that uses hand collection methods to target blacklip abalone *(Haliotis rubra),* the estuary general fishery (a multi-species, multi-gear fishery operating within NSW estuarine systems), and the estuary prawn trawl fishery. In addition, a lobster fishery is also present which uses beehive/square traps and rectangular traps to target green rock lobster *(Sagmariasus verreauxi).* The ocean hauling fishery in this region uses haul nets off beaches and purse-seine nets in deeper water offshore targeting schooling species including Pacific sardines *(Sardinops sagax),* flathead grey mullet *(Mugil cephalus),* Australian salmon, blue mackerel, yellowtail horse mackerel *(Trachurus novaezelandiae)* and surf bream (*Acanthopagrus australis*). Moreover, the ocean trap and line fishery (OTLF) operates along the entire NSW coast in both continental shelf and continental slope waters and uses traps and hook-and-line gear to target mainly silver seabream *(Chrysophrys auratus),* yellowtail amberjack *(Seriola lalandi),* leatherjacket *(Oligoplites saurus),* bullet tuna *(Auxis rochei)* and silver trevally *(Pseudocaranx georgianus).* The ocean trawl fishery also operates in continental shelf and continental slope waters, and uses otter and Danish seine trawl nets to target a range of species, including prawns, shrimps, octopus, cuttlefish, squid, Japanese fan lobsters *(Ibacus ciliatus),* and several fish and shark species. Finally, the sea urchin and green turban shell *(Turbo marmoratus)* restricted fishery operates using hookah and hand collection methods.

The Commonwealth fisheries operate within the Australian Fishing Zone off the NSW coast and often span multiple state jurisdictions. These include the small pelagic fishery, which covers the entire NSW coastline (typically outside three nautical miles) and uses mid-water trawl and purse-seine methods to target a range of small pelagic species (minor line fishing and squid jigging are also permitted). It also encompasses the southern and eastern scalefish and shark fishery (SESSF) which is a multi-sector, multi-species fishery that uses many different gear types to target species that include blue grenadier, tiger flathead *(Platycephalus richardsoni),* common warehou *(Seriolella brama),* gummy shark *(Mustelus antarcticus),* pink cusk-eel *(Genypterus blacodes),* and Flinders' sillago *(Sillago flindersi).* Moreover, the eastern tuna and billfish fishery is also present and mainly uses longlines to target albacore tuna *(Thunnus alalunga)*, bigeye tuna *(Thunnus obesus)*, yellowfin tuna *(Thunnus albacares)*, swordfish *(Xiphias gladius)* and striped marlin *(Kajikia audax)*. As these are all straddling stocks taken by a number of other countries, they are managed through the Western and Central Pacific Fisheries Commission. The southern bluefin tuna fishery uses pelagic longline and purse-seine gear; most fish caught using the latter are transferred to aquaculture farms for grow-out before final harvest. There is also a southern squid jig fishery, a single-method, single-species fishery targeting Gould's flying squid *(Nototodarus gouldi)*. Lastly, the Macquarie Island toothfish fishery only operates in the Australian waters surrounding the island, located in sub-Antarctic waters in the southwestern region of Area 81, and mainly uses longline gear (demersal or bottom longline) to catch Patagonian toothfish *(Dissostichus eleginoides)*.

Indigenous fisheries are important in the NSW EEZ, representing a critical source of social cohesion, kinship connection and communal life for Aboriginal peoples. This is recognized through legislation such as the Native Title Act 1993 (Cth) and the Native Title (NSW) Act 1994. These allow Aboriginal title-holders to exercise their rights to fish for personal, domestic or non-commercial needs and are not affected by NSW fisheries management legislation (NSW Government, n.d.).

Recreational fishing is also extremely important in NSW waters for social and economic benefits, with more than 1 million anglers per year generating approximately USD 3.4 billion of economic activity (Murphy *et al.*, 2022). The sector targets similar species to the commercial fishing sector, in particular seabream, dusky flathead *(Platycephalus fuscus)* and sillago species.

2.2 New Zealand EEZ

New Zealand has a coastline of approximately 15 000 km and an EEZ of over 4 083 000 km^2: this is the fifth-largest EEZ in the world, and covers 30 degrees of latitude. There is a sizable continental shelf available to coastal fisheries. Larger vessels have access to offshore continental rises, the most important being Chatham Rise which runs east from the South Island to beyond the Chatham Islands. Together these fishable grounds occupy about 30 percent of the area of the EEZ. Marine habitats supporting fisheries comprise shallow and deep rocky reefs, nearshore and offshore islands, sandy and muddy substrate areas, mangroves and coastal harbours, and deep-sea habitats including both flat grounds and underwater ridges, pinnacles and hills. In addition, the mixing of waters in the Subtropical Convergence is associated with high primary productivity, and is consequently where several of New Zealand's largest fisheries are located.

New Zealand fisheries are managed by a property-rights based quota management system (QMS), under which fishers can own catch allocation for fish stocks (Fisheries Act 1996; Lock and Leslie, 2007). The Harvest Strategy Standard (2008) provides guidance for setting fishery and stock targets and limits. A total allowable catch (TAC) is set for each stock, which is split between fishers according to their annual catch entitlement (ACE). ACE can be owned, leased and traded, and may only be held by companies that are at least 75 percent New Zealand-owned. Catches of all QMS species must be landed (with a few exceptions). Each species or species group is split into quota management areas (QMAs) based on a combination of biological and administrative factors; there are currently 642 stocks representing 98 species or species groups in the QMS.[2] In 2016, legislation required all chartered fishing vessels operating in the New Zealand EEZ to be flagged to New Zealand.

The Treaty of Waitangi (1840) guaranteed Māori, the Indigenous Peoples of New Zealand, "undisturbed possession" of fisheries until they chose to dispose of them to the Crown. Breaches of the Treaty were claimed by Māori over many years and included the introduction of the QMS in 1986. A Treaty of Waitangi claim was settled in 1992 that guaranteed Māori 20 percent of the commercial fishing quota for new species introduced

[2] The current status and biological information on all stocks is available in annual reports from the Fisheries Assessment Plenary.

to the QMS and enabled Māori to purchase 50 percent of a major owner of the current fisheries quota.

Fish and shellfish were a historically important food source in New Zealand. However, most offshore fisheries were only developed in the 1960s, largely by foreign fleets. From the late 1970s, fleets transitioned to joint ventures, with New Zealand companies buying their own vessels in the 1980s and 1990s (Walrond, 2006). In 2020, the commercial fishing industry exported NZD 1.8 billion, being New Zealand's seventh-largest export commodity by value and representing 3 percent of total exports (Dixon and McIndoe, 2022). It directly employed the equivalent of just over 6 300 full-time workers and was estimated to support 16 500 full-time jobs, representing 0.7 percent of New Zealand's total employment (Dixon and McIndoe, 2022).

New Zealand currently has a diverse range of small-scale and semi-industrial fisheries operating in coastal regions, from hand collection of abalone *(Haliotis* spp.) and other shellfish, to pots for red rock lobster *(Jasus edwardsii)* and New Zealand blue cod (*Parapercis colias),* and set nets, surface and bottom lines, and Danish, midwater and bottom trawls, for a wide variety of finfish. New Zealand also has substantial offshore industrial midwater and bottom trawl fisheries, with the most valuable targeting blue grenadier *(Macruronus novaezelandiae),* southern blue whiting *(Micromesistius australis),* pink cusk-eel *(Genypterus blacodes),* orange roughy *(Hoplostethus atlanticus),* silver warehou *(Seriolella punctata)* and New Zealand lobster *(Metanephrops challengeri).* The most commercially important species in the deepwater fishing sector are blue grenadier, pink cusk-eel and Wellington flying squid. In 2022, blue grenadier represented 44 percent of the value for deepwater fisheries and 29 percent of the total commercial fishing value (Dixon and McIndoe, 2022). The rock lobster fishery represented 12 percent, and the shellfish harvesting sector 8.5 percent of the total fishing value. Fishing for highly migratory species represented less than 2.5 percent of total commercial fishing value (Dixon and McIndoe, 2022).

It is estimated that 600 000 people, or approximately 13 percent of New Zealand's population, go recreational fishing annually, with 1.2 million trips undertaken between October 2022 and October 2023. Even so, compared to previous surveys, the proportion of New Zealanders that consider themselves as marine recreational fishers has reduced, along with the proportion of survey participants reporting at least one trip per year (Heinemann and Gray, 2024). Over half of all recreational harvest is taken during summer, between December and March, and about half of all recreational fishing happens around the relatively densely populated North Island's northeastern coastline. Silver seabream, Australian salmon, New Zealand blue cod and bluefin gurnard *(Chelidonichthys kumu*) make up over 80 percent of all fish harvested by recreational fishers (Heinemann and Gray, 2024). In 2021, 77 species had an allowance within the New Zealand TAC for recreational fishing, amounting to a total of 11 727 tonnes.

Customary fisheries are recognized fishing rights of tangata whenua (people of the land with authority in a particular place) for customary fisheries management practices or non-commercial traditional gathering of fish. Customary activities are managed by guardians (called tangata kaitiaki or tangata tiaki) chosen by the tangata whenua (confirmed by the central government). These guardians are the only people who can authorize customary fishing. In 2021, 78 species had an allowance within the TAC for customary fishing, amounting to a total of 4 665 tonnes. The customary allowances are decided on a case-by-case basis. A customary fisheries research fund has as an objective to determine past levels of Māori customary and traditional harvest levels and help clarify the relationship between customary and traditional rights and current harvest levels. There are also Mātaitai reserves, which recognize and provide for traditional fishing through local management. They allow customary and recreational fishing but usually do not allow commercial fishing.

2.3 The high seas

The high seas fisheries in Area 81 predominantly target tuna species using surface longline, trolling (albacore tuna) or purse seine (skipjack tuna), as well as orange roughy using bottom trawl. The main tuna species targeted are albacore tuna *(Thunnus alalunga),* bigeye tuna *(Thunnus obesus),* southern bluefin tuna *(Thunnus maccoyii),* Pacific bluefin tuna *(Thunnus orientalis),* skipjack tuna *(Katsuwonus pelamis)* and yellowfin tuna (*Thunnus albacares).* All assessments for tunas and other highly migratory pelagic species, except southern bluefin tuna, are presented to the Scientific Committee of the Western and Central Pacific Fisheries Commission (WCPFC). Southern bluefin tuna assessments are presented to the Scientific Committee of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

The bottom trawl fishery targets orange roughy on underwater features such as seamounts and hills in the Tasman Sea and east of New Zealand on the Louisville Ridge. The orange roughy fishery has been dominated by industrial factory trawlers from New Zealand. Management of these stocks comes under the inter-governmental South Pacific Regional Fisheries Management Organisation (SPRFMO). Currently, there are no stock assessments of high seas orange roughy in Area 81 (assessments used in this report only include orange roughy stocks within the EEZ of New Zealand).

Highly migratory high seas stocks such as blue shark *(Prionace glauca),* striped marlin *(Kajikia audax)* and swordfish *(Xiphias gladius)* also all have assumed stock units covering Area 81 and the wider southwest Pacific. With regards to blue shark and striped marlin, Area 81 is likely to represent a significant portion of separate stocks. The range of the blue shark is global, and in the Pacific tagging studies suggest stock boundaries around the equator. Further, blue sharks tagged in Area 81 have a strong tendency to remain in the Area. There is likely to be a separate stock for the southern Pacific Ocean, and possibly with little mixing between east and west (Sippel *et al.,* 2011). The range of the striped marlin is also global, with the highest catches coming from the Pacific. Large adults are more common in the southwest Pacific, while juveniles are more common closer to the equator. While stock structuring is uncertain, an increasing number of studies suggest there is a separate stock in the southwest Pacific covering a large portion of Area 81 (Ducharme-Barth *et al.,* 2019).

Although swordfish may be part of a Pacific-wide stock, it is possible that a distinct sub-stock exists in the waters around Australia and New Zealand (Moore, 2020). Moreover, genetic evidence strongly suggests the Pacific Ocean and Indian Ocean stocks are separate. However, within the Pacific Ocean stock structure is poorly understood; multiple studies show mixing but at different spatial scales.

3. RESOURCE STATUS

3.1 Reference list of stocks

Area 81 includes countries and RFMOs with advanced fisheries management systems with assessments for key species. As such, the reference list of stocks for Area 81 is largely determined by what has been assessed in each jurisdiction, but with criteria and rules for inclusion/exclusion based on national standards and procedures.

The previous FAO reference list of stocks included 29 species; this updated methodology significantly improves the resolution and granularity of the reference list of stocks by assessing 165 stocks covering 91 species (**TABLE D.14.1** and **APPENDIX II, TABLE 14**, pp. 473). Of the total reported catch, only a relatively small portion is reported as species groups, indicating relatively good resolution in species-level data for the Area. For Eastern Australia assessments, 49 stocks were included which comprised 33 fish stocks and 16 invertebrate stocks. For New Zealand, 114 stock assessments were included, covering 84 fish stocks and 30 invertebrate stocks. Finally, two high seas stocks were included.

TABLE D.14.1
SUMMARY OF ASSESSED STOCKS IN AREA 81 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	71	38	12
2 Surplus-production model approaches	17	14	9
3 Data-limited approaches	77	50	10
Total	**165**	**91**	**19**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

3.2.1 METHODOLOGY

3.2.1.1 Eastern Australia

Australia has a consistent national framework for assessing and reporting on the biological sustainability of fish stocks: the Status of Australian Fish Stock (SAFS) Reports (Roelofs *et al.*, 2024). The SAFS stock status classification system assesses current abundance and current levels of fishing pressure against agreed reference points. This information is combined to assign a stock status of sustainable, depleting, depleted, recovering, negligible, or undefined. Wherever possible the framework assigns status at the biological stock level. Where knowledge of stock structure is insufficient to enable reporting at the biological stock level, status is reported at either the jurisdictional or management-unit level.

The SAFS reports were used as the basis for assigning status for Australian stocks within Area 81, while applying the following criteria:

1. Species are included if they are reported as a single stock within the Australian coastal area of Area 81 (NSW) or it is deemed likely that a substantial portion of the stock occurs within Area 81.
2. Stocks assessed as negligible under SAFS, or had an annual catch < 1 tonne, were not included.
3. Stocks assessed as undefined under SAFS were reviewed and, where it was deemed appropriate and possible, a status was assigned using a Tier 3 (expert judgement) assessment.
4. The stock name assigned under SAFS was used in the assessment.
5. Any status assigned under SAFS using a recent stock assessment (past ~3 years), and that considered recent robust data in combination with the stock assessment results (weight of evidence), was assigned as a Tier 3 assessment.
6. Since the SAFS stock status categories did not align with those used by FAO, status was assigned as follows:
   a. Sustainable (SAFS) = underfished (U) or maximally sustainably fished (M), determined by available estimates relative to reference points, or expert judgement.
   b. Recovering, Depleted or Depleting (SAFS) = overfished.

3.2.1.2 New Zealand

New Zealand also has a consistent national framework for assessing and reporting on the biological sustainability of fishery stocks, documented in the fisheries assessment plenary reports.[3] Stocks are assessed against four performance measures:

- **A hard limit** – a biomass level below which a stock is deemed to be collapsed, and fishery closures should be considered to rebuild the stock at the fastest possible rate.
- **A soft limit** – a biomass level below which a stock is deemed to be overfished or depleted and needs to be actively rebuilt using a formal, time-constrained rebuilding plan.
- **A management target** – the level of biomass or a fishing mortality rate that stocks are expected to fluctuate around for the best balance between use and sustainability, while allowing for environmental variation.
- **Overfishing threshold** – a rate of extraction (percentage of a stock removed each year) that should not be exceeded, as it will ultimately lead to stock biomass falling below other performance measures.

Of these, the soft limit is considered the key performance measure for determining the status of New Zealand's fish stocks. Wherever possible, status is assigned at the biological stock level; however, there is high uncertainty over stock structure for a number of species, which can lead to assessments being conducted according to administrative boundaries.

When possible, New Zealand stocks are assessed using Tier 1 probabilistic integrated assessment models. Conclusions on stock status relative to the performance measures are given in terms of probabilities with categories: Virtually Certain (greater than 99 percent), Very Likely (greater than 90 percent), Likely (greater than 60 percent), About As Likely As Not (40 to 60 percent), Unlikely (less than 40 percent), Very Unlikely (less than 10 percent), and Exceptionally Unlikely (less than 1 percent). Conclusions from Tier 3 assessment approaches are expressed in the same way, but in these instances expert opinion has a greater role in converting assessment outcomes into probability statements.

All stocks within the New Zealand EEZ fall within Area 81. The plenary reports have been used for assigning status for New Zealand stocks, applying the following criteria:

1. The stock name assigned in the plenary document was used in the assessment.
2. Stocks with no status assessment were excluded.
3. Stocks where a Tier 3 assessment had been attempted, but from which no conclusions on status relative to the soft limit, management target, or overfishing threshold were made, were considered unassessed and therefore excluded.
4. FAO status was assigned as follows:
   a. FAO underfished (U): Any stock where the plenary has stated the stock to be considered in a near-virgin state or assessed to be at least "Very Likely" to be above the management target.
   b. FAO maximally sustainably fished (M): Any stock not judged underfished, and at least "Unlikely" to be below the soft limit. Many stocks in this category were assessed "About As Likely As Not" to be at the target.
   c. FAO overfished (O): Any stock assessed to be "About As Likely As Not" to be at or below the soft limit.
5. Stock status resulting from a fully quantitative (Tier 1) assessment was assigned low uncertainty unless the assessment was considered old. Stock status resulting from a Tier 3 assessment was assigned medium or high uncertainty depending on the age of the assessment.

[3] See https://www.mpi.govt.nz/fishing-aquaculture/fisheries-management/fish-stock-status/

3.2.1.3 The high seas

For Area 81 stock status reporting was included for two high seas species known to span the western Pacific Ocean, but that are important target species throughout Area 81: striped marlin *(Kajikia audax)* and swordfish *(Xiphias gladius)*. In addition, the blue shark *(Prionace glauca)* was also examined but is covered in the chapter on sharks (**PART E.3, HIGHLY MIGRATORY SHARKS**, pp. 388).

3.2.2 STOCK STATUS AND CLASSIFICATION BY TIER

The majority of stocks in Area 81 are considered sustainably fished, with 75.8 percent maximally sustainably fished and 9.7 percent underfished (**TABLE D.14.2**). Only 24 stocks, representing 14.5 percent of total assessed stocks, were overfished. When weighted by landings, the percentage of sustainable stocks increases to 95.7 percent, given that the larger more commercially valuable stocks tend to be in better shape than some of the smaller stocks (**TABLE D.14.3**).

Most stocks in this Area were Tier 1 and Tier 3 stocks, with only 17 stocks that were Tier 2. In Australia, 19 stocks were considered Tier 1, 16 stocks were considered Tier 2, and 14 stocks were considered Tier 3. Of the stocks assessed for New Zealand, assessments were fairly evenly split between Tier 1 and Tier 3 assessments (50 for Tier 1, 63 for Tier 3), and only one assessment – for green rock lobster *(Sagmariasus verreauxi)* – was Tier 2. The 3 high seas stocks were considered Tier 1 assessments. In Australia, Tier 3 assessments were mostly done using a weight of evidence approach, noting that this used data that generally included catch, effort and catch per unit effort data as a minimum, and that is considered robust. Several of these Tier 3 assessments also drew on recent Tier 1 stock assessment results, with more recent data used in the intervening period in determining stock status (weight of evidence).

It is worth noting that in New Zealand, all stocks of New Zealand scallop *(Pecten novaezelandiae)* are currently under moratorium (customary fishing is exempted). The Nelson and Marlborough Sounds stock is still included in the reference list of stocks because an assessment based on surveys concluded the stock had not yet rebuilt to the biomass target. One management area for pipi wedge clam *(Paphies australis)* has been closed since 2014 and recent surveys indicate very low numbers in the areas once harvested. The orange roughy stock on the west coast of South Island has been effectively closed since 2007 with a 1 tonne TAC.

TABLE D.14.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 81 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	71	15.5	69.0	15.5	84.5	15.5
2 Surplus-production model approaches	17	0.0	76.5	23.5	76.5	23.5
3 Data-limited approaches	77	6.5	81.8	11.7	88.3	11.7
Total	**165**	**9.7**	**75.8**	**14.5**	**85.5**	**14.5**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.14.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 81 IN 2021

Weighted % by landings					
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
0.30	2.7	93.0	4.3	95.7	4.3

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4 KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses the species and stocks that are currently most important for Area 81 (**FIGURE D.14.2**). Although tunas constitute a part of the catch in Area 81, they are not included in this section since there is a dedicated chapter on tunas and tuna-like species (**PART E.1, GLOBAL TUNA FISHERIES**, pp. 330).

4.1 Blue grenadier (hoki)

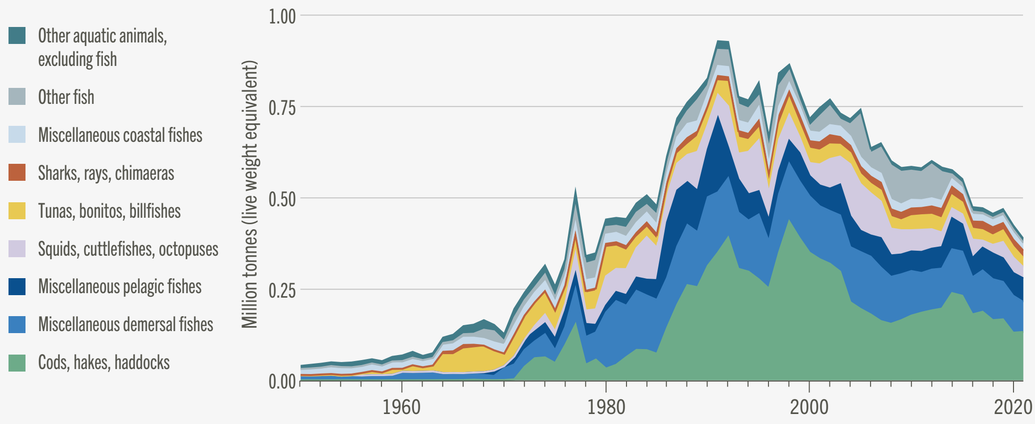
Blue grenadier (also known as hoki in New Zealand, *Macruronus novaezelandiae*) are widely distributed throughout New Zealand waters from 34° to 54° south, in depths of 10 m to over 900 m, with the greatest abundance between 200 m and 600 m. The two main spawning grounds on the west coast of the South Island and in the Cook Strait have been considered to comprise fish from separate stocks and have been assessed separately. Before the declaration of the EEZ and the implementation of the QMS, blue grenadier catches reached about 100 000 tonnes in 1977. Once it was introduced into the QMS in 1986 with a catch limit of 250 000 tonnes, catches then increased to a peak of 267 616 tonnes in 1998. Low recruitment saw the TAC reduced through the early 2000s, to 90 000 tonnes in 2007, then increase again to 160 000 tonnes by 2014 as the stock rebuilt, before being reduced again in stages to the current level of 110 000 tonnes.

In Australia, blue grenadier is also a very important commercial species. It is taken predominantly in the southern and eastern scalefish and shark fishery of southeastern Australia and in 2021 the reported catch was 11 949 tonnes. The eastern Australian stock is not included in status of stocks reporting for Area 81 since the vast majority of the catch comes from the southeastern edges of Area 57. Overall, stocks of blue grenadier in Area 81 are considered to be maximally sustainably fished.

4.2 Small pelagics

Jack and horse mackerel are key species targeted in New Zealand, representing 90 000 tonnes of landings in 2021. In Australia, the two small mackerel species that are particularly important in terms of quantity of landings are blue mackerel *(Scomber australasicus)* and greenback horse mackerel *(Trachurus declivis),* which make up 28 percent and 23 percent of the total catch reported by Australia to FAO for Area 81 in 2021 (51 percent overall). Other important small pelagic species are Pacific sardine *(Sardinops sagax)* and yellowtail horse mackerel *(Trachurus novaezelandiae),* with 721 tonnes and 603 tonnes respectively reported by Australia in 2021. These species are taken principally in the Commonwealth-managed small pelagic fishery which operates throughout waters adjacent to NSW (generally seawards of 3 nautical miles) and south, then west across the southern Australian coast. The fishery is divided into two areas based on separate stocks of the main target species, with a large portion of the eastern stocks targeted in Area 81. The fishery operates using mid-water trawl and purse-seine methods and is considered

FIGURE D.14.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE SOUTHWEST PACIFIC (AREA 81) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

well managed with a conservative annual catch quota system in accordance with a harvest strategy. Overall, small pelagics in Area 81 are primarily maximally sustainably fished.

4.3 Sillago (whiting)

Sillago are important species both commercially and recreationally in NSW. The three main species in NSW by reported commercial catches are Flinders' sillago *(Sillago flindersi),* sand sillago *(Sillago ciliata)* and trumpeter sillago *(Sillago maculata),* with reported catches in 2021 of 1 008, 85 and 8.7 tonnes respectively. Stout whiting *(Sillago robusta)* are also caught in northern NSW, although the majority of catches from the stock are found to the north in FAO Area 71. Recreational catch is most significant for sand sillago and trumpeter sillago, with the most recent annual estimates being 46 and 5 tonnes, respectively. In NSW, the different sillago species are taken in different fisheries using various gear types, depending on their preferred habitat. Overall, sillago stocks were assessed to be underfished and maximally sustainably fished.

4.4 Orange roughy

Orange roughy *(Hoplostethus atlanticus)* inhabit depths from 700 m to at least 1 500 m within the EEZs of New Zealand and Australia. They are slow-growing and may live over 100 years, making stock productivity and sustainable catches relatively low. In New Zealand, the EEZ is divided into eight orange roughy QMAs, and the main orange roughy fisheries are on Chatham Rise (Stephenson *et al.*, 2022). Where more than one discrete orange roughy fishery occurs within a QMA, management subareas have been implemented and separate stock assessments may be undertaken, resulting in separate catch limits for each stock. In the Australian EEZ, there are six stocks of orange roughy that are routinely assessed. Although there has been found to be genetic similarity among these stocks, distinct demographic differences mean they are managed as separate stocks. Of these stocks, the Cascade Plateau stock sits just inside the western edge of Area 81, southeast of Tasmania. Overall, the catch of orange roughy in Area 81 was just under 10 000 tonnes in 2021, with about 9 445 tonnes attributed to New Zealand and 436 tonnes attributed to Australia. Most of these stocks are considered maximally sustainably fished with some stocks overfished.

4.5 Silver seabream (snapper)

Silver seabream (*Chrysophrys auratus,* called snapper in Australia and New Zealand) occur at depths up to 200 m, but are most abundant from 15 m to 60 m. In New Zealand, they are widely distributed in warmer waters, being most abundant in the Hauraki Gulf (Fisheries New Zealand, 2024). Despite challenges with overfishing in the 1980s, catch limits under the QMS for commercial fisheries remain stable or have been increased in recent years (Fisheries New Zealand, 2024). The snapper fishery is the largest recreational fishery in New Zealand; snapper is the major target species on the northeast and northwest coasts of the North Island, and it is targeted seasonally around the rest of the North Island and the top of the South Island. Recreational harvests of snapper are managed using minimum legal size limits and daily bag limits. Recent surveys found a three-fold increase in abundance for the southern North Island stock since 2021 (MacGibbon *et al.,* 2024), which may be related to climate change-induced warming (Francis, 1993).

In Australia, snapper also has a widespread distribution and they are found along the entire Australian coast of Area 81. A single separate stock has been shown to occur throughout NSW waters extending into Queensland to the north. Snapper have been a popular target species in NSW for over 150 years, both commercially and recreationally. The majority of the commercial catch is taken in continental shelf and slope waters by the ocean trap and hook and line fishery using a variety of fishing methods. Recreational harvest is by hook-and-line. Despite recent concerns about the stock, the assessment considers silver seabream to be maximally sustainably fished.

4.6 Mullets

Flathead grey mullet *(Mugil cephalus),* referred to as sea mullet in Australia, comprise the largest catch by weight of all species taken in commercial fisheries in NSW state waters. They are taken in the ocean hauling fishery and the estuary general fishery. In the former, they are mainly targeted using a general purpose hauling net deployed from beaches using small boats, which is one of the oldest forms of commercial fishing in NSW. A single stock spans the Australian east coast from central Queensland to eastern Victoria. Thus, NSW coastal waters constitute a substantial proportion of the stock's total geographic distribution. In 2021, Australia's reported catch was 4 130 tonnes. The fishery is well managed using spatial management units, limited entry and strict monitoring and reporting mechanisms. Overall, mullets are considered maximally sustainably fished.

4.7 Rainbow abalone

Rainbow abalone *(Haliotis iris),* known as pāua in New Zealand, is an important commercial, customary and recreational catch. They are found throughout New Zealand and may form large aggregations on reefs in shallow subtidal coastal habitats, with the largest volume of landings coming from the Chatham Islands. Fishers gather rainbow abalone by hand while free diving; the use of underwater breathing apparatus is not permitted, except around the Chatham Islands. The commercial fishery for rainbow abalone dates from the mid-1940s, and there is also an important customary use of rainbow abalone by Maori for food, decorations and making fishing devices. Most rainbow abalone stocks have been assessed, but qualitative data suggests that significant illegal, unreported and unregulated (IUU) activity occurs in this fishery (Fisheries New Zealand, 2024). Rainbow abalone stocks are considered maximally sustainably fished.

4.8 Red rock lobster

Red rock lobster *(Jasus edwardsii)* is New Zealand's most valuable invertebrate fishery. Rock lobster inhabit coastal waters throughout New Zealand and are divided into nine QMAs, with the most important in terms of catch volume being the south and southwest coasts of the South Island. The rock lobster fisheries were brought into the QMS and TACs introduced in 1990, and are also managed using minimum legal size limits, a prohibition on the taking of berried females and soft-shelled lobsters, and some local area closures. There are both customary fishing and recreational fishing allowances for red rock lobster, and when combined these allowances represent approximately one-seventh of the TAC (Fisheries New Zealand, 2023). Overall, red rock lobster stocks are considered maximally sustainably fished.

4.9 Shrimps and prawns

Shrimp are highly valuable in Australia's fisheries, and in NSW they include eastern school shrimp *(Metapenaeus macleayi),* eastern king prawn *(Penaeus plebejus)* and jack-knife shrimp (*Haliporoides sibogae*). The estuary prawn trawl fishery uses otter trawl nets to target school shrimp and eastern king prawns in three estuaries in NSW. The ocean trawl fishery operates offshore in NSW waters and targets all three species ranging in depth depending on the species. Jack-knife shrimp and some eastern king prawn are also taken in the Commonwealth trawl fishery in Area 81. The eastern king prawn is a single stock that spans from Queensland to northeastern Tasmania with NSW representing a significant portion of the stock's distribution by area. Stock structure knowledge of eastern school shrimp and jack-knife shrimp is limited.

The reported catches by Australian authorities for 2021 were 3 030 tonnes, 1 050 tonnes and 227 tonnes for eastern king prawn, eastern school shrimp and jack-knife shrimp, respectively. Shrimp species in Area 81 are currently considered underfished or maximally sustainably fished.

4.10 Blue shark

The blue shark *(Prionace glauca)* is caught as bycatch mainly in the tuna surface longline fishery, with smaller bycatch by bottom longline, midwater trawl and set net. The proportion of the Southwest Pacific stock catch taken in Australian and New Zealand waters has been relatively low, with most (over 90 percent) taken at low latitudes within the stock range. Blue shark is caught in relatively large numbers by recreational fishers, but is not a highly regarded catch. Shark finning has been banned in Australia and New Zealand. The blue shark in Area 81 are considered underfished.

4.11 Striped marlin

Landings of striped marlin *(Kajikia audax)* from within Australian and New Zealand fisheries waters represent a relatively small proportion (about one-quarter) of commercial landings from the greater stock in the Southwest Pacific. Most striped marlin are caught as commercial bycatch in surface longline fishing targeting tunas. Striped marlin cannot be retained by commercial fishers in New Zealand, and are not included in the QMS, so most landings are made by recreational fishers. Recreational fishers use trolling or handlining in oceanic waters over the continental shelf and slope. Striped marlin is caught by recreational fishers and also targeted by commercial surface longline fishers in Australia. Striped marlin in Area 81 are considered overfished.

4.12 Swordfish

Swordfish *(Xiphias gladius)* are sometimes targeted but are mainly caught as bycatch in the bigeye tuna and southern bluefin tuna surface longline fisheries. The highest catch areas for the stock within Area 81 have consistently been off the central east coast of Australia and northeast of New Zealand. There are very few catches of swordfish taken south of 40° south. Overall, swordfish in Area 81 are considered underfished.

5 KEY FINDINGS

The updated methodology resulted in an estimated 85.5 percent of the assessed stocks in Area 81 being considered sustainably fished. The percentage of sustainable stocks is similar for Australia and New Zealand, reflecting strong institutional and management capacities in both countries. Compared to the results from the previous methodology, the percentage of sustainably fished stocks has increased from 75.9 percent to 85.5 percent (**TABLE D.14.4**). This reflects the greater accuracy brought about by an increase in the number of stocks evaluated with fewer combined stock evaluations. Indeed, the updated reference list of stocks includes far fewer taxonomic groupings (e.g. genus or family-level) and instead reports status either at the biological stock level, or in a way that is more closely aligned to this spatial scale (self-replenishing populations). As a result, the updated overall estimate is considered more comprehensive and representative as a record of marine resource exploitation than previously reported. Overall, landings of assessed stocks in Area 81 represented 81.4 percent of total landings reported in 2021, an increase from 64.8 percent covered by the previous methodology.

Moreover, when weighted by landings, the proportion of sustainable stocks rises to 95.7 percent, and the results under the previous and updated methodology are very similar. This indicates that larger more commercially valuable stocks tend to be in better shape than some of the smaller stocks, and highlights that these larger stocks were likely included both in the previous and updated reference lists of stocks (**TABLE D.14.5**).

An important element to note with regards to Area 81 is that there are some discrepancies between FAO landing estimates and those used by countries for assessments and management. For some species the landings reported to FAO were very similar; however, there were varying degrees of difference. In some cases this appears to be due to the grouping of species for reporting. The FAO methodology on stock status is moving from a catch-based approach on a species level to a continued focus on collating information on the status of fished species at the stock level to provide a more accurate and meaningful picture of Area 81 stock statuses.

To conclude, Area 81 is one of the Areas where more extensive management is applied, with levels of sustainable stocks being among the highest globally (second only to Area 67). This is mostly due to higher than average assessment, management and institutional capacity in the two countries that primarily share this Area. Both countries have taken substantial measures to curtail overfishing since the 1990s, with effective results.

TABLE D.14.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 81 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
165	9.7	75.8	14.6	85.5	14.5	29	0.0	75.9	24.1	75.9	24.1

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

TABLE D.14.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 81 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
2.7	93.0	4.3	95.7	4.3	0.0	97.3	2.7	97.3	2.7

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

FAO MAJOR FISHING AREA 81

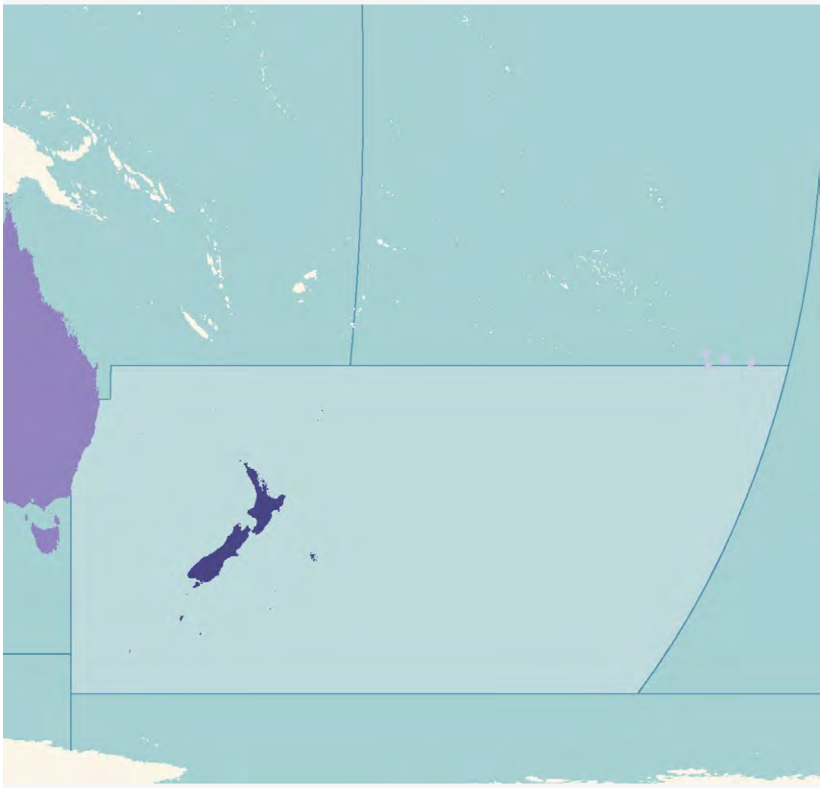
PACIFIC, SOUTHWEST

AREA 81

KEY MESSAGES

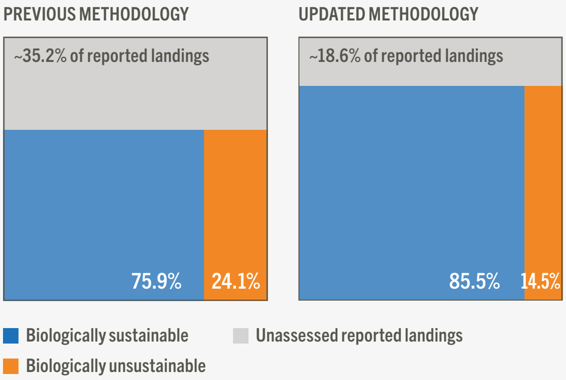
- This region is a leader in managing fisheries taking into account their economic, social and ecological importance.
- Area 81 is one of the richest Areas in terms of data and assessments globally.
- There are especially high social expectations for managing fisheries, and eco-certification is widespread.
- Climate change has caused shifts in the distributions of many fish and invertebrates, and presents risks to coastal communities and their sociocultural connections with the marine environment.

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA *FAO data, 1950–2021*

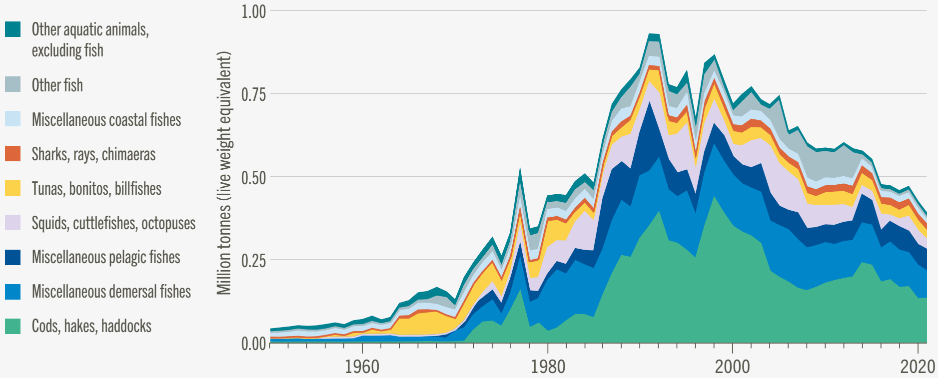


Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

STOCK STATUS *FAO estimates, 2021*



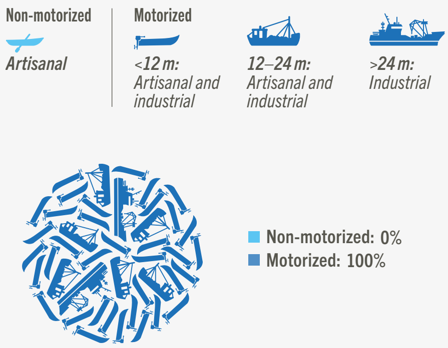
SPECIES COMPOSITION *FAO data, 1950–2021*



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

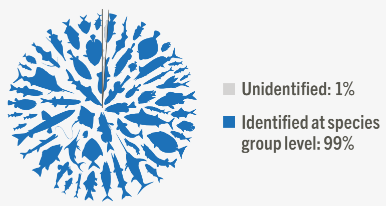
FLEET SIZE AND COMPOSITION *FAO estimate, 2021*

Active vessels ~ 1 600



LANDINGS *FAO data, 2021*

Reported landings ~ 400 000 tonnes



Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES *FAO estimate, 2021*

Value of landings ~ USD 0.8 billion

= USD 1 BILLION

EMPLOYMENT *FAO estimate, 2021*

Fishers (primary sector / fishing) ~ 7 000

- Male: 5%
- Unspecified: 95%
- Female: 0%

= 100 000 PEOPLE

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FIGURE D.14.3 *(previous page)*
AREA 81 – DATA AT A GLANCE

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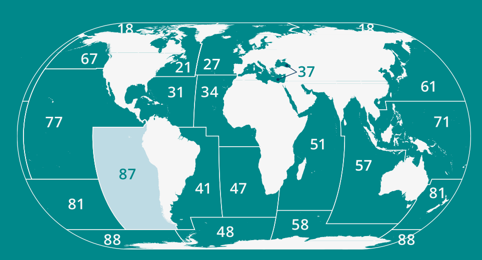

Part D, Chapter 15 (D.15)

SOUTHEAST PACIFIC
FAO MAJOR FISHING AREA 87

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1. OVERVIEW

The Southeast Pacific, designated byFAO as Major Fishing Area 87 (hereafter, Area 87), spans from northern Colombia to southern Chile, encompassing ocean waters of four countries: Chile, Peru, Ecuador and Colombia. The continental shelf is predominantly narrow with a steep slope, except for specific areas off the coast of southern Ecuador, northern Peru, and central and southern Chile, where it can widen to a maximum of 130 km. South of 41° south, the shelf extends several hundred kilometres. Key oceanic islands within this Area include the Galápagos Islands, located off the coast of Ecuador, and the Juan Fernández Islands, situated off Chile. The most suitable fishery zones are found off the northern coasts of Colombia, Ecuador, northern Peru, and central and southern Chile, with the areas off northern Peru and southern Chile being especially productive (FAO, 2025).

The northern region, encompassing waters off the coast of Colombia and Ecuador, is characterized by a tropical climate. This area has relatively low productivity, with average sea surface temperatures around 28 °C and salinity levels of 33 parts per thousand (ppt) or less during the rainy season and in coastal zones. Surface equatorial currents, flowing parallel to the equator, dominate the hydrodynamic processes in this region. Moving southward, along the coasts of Peru and northern and central Chile, the coastal zones are influenced by the Humboldt-Peru eastern boundary current system (HCS). The HCS is a major eastern boundary current system where wind causes an offshore flow in the surface, driving intense oceanic upwelling along the coast, bringing cold, deep, nutrient-rich waters to the surface that significantly enhance the region's productivity. Even near the equator, water masses adjacent to upwelling zones

FIGURE D.15.1
FAO MAJOR FISHING AREA 87: THE SOUTHEAST PACIFIC

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

exhibit surface temperatures typically ranging 14–20 °C, with surface salinity levels around 35 ppt. Further south, off the southern coast of Chile, water masses are significantly colder and more turbulent yet remain highly productive. Surface temperatures in this region are well below 14 °C, and salinity levels average around 34 ppt. The coastal zones in southern Chile are also influenced by freshwater inputs from fjords.

Shrimp, small coastal pelagic species, and large migratory tropical pelagic species support the main fisheries in the waters off the coast of Colombia and Ecuador. In contrast, small pelagic species dominate off the coasts of Peru and northern and central Chile, while demersal species and benthic invertebrates sustain most of the major fisheries further south. The distribution and abundance of fishery resources are strongly influenced by local topography and environmental conditions, which cause substantial interannual fluctuations and long-term changes in the abundance of fish and the total production of key exploited species (Bertrand *et al.,* 2018 and references therein). The HCS is subject to the influence of the two phases ("El Niño" and "La Niña") of the El Niño-Southern Oscillation (ENSO) cycle (Chavez *et al.,* 2008). These phases have drastic effects on climate, fishery resources and productivity, particularly during the warm El Niño phase, which occurs with varying intensity every three to seven years (Chavez *et al.,* 2003, 2008).

The adverse effects of El Niño on the world's largest single-species fishery, the anchoveta (also known as Peruvian anchovy, *Engraulis ringens*), are well documented (Csirke, 1989; Castillo *et al.,* 2019). Its impacts on other fish populations, as well as on seabirds and marine mammals, are also well understood (FAO, 2024a). Subtler, longer-term environmental changes have also been cited as potential causes of variability and possible explanations for the observed interdecadal regional oscillations in the availability and abundance of some living resources in this Area (Chavez *et al.,* 2003; Castillo *et al.,* 2019). Evidence from the early Pliocene, when temperatures were higher than today, suggests permanent El Niño conditions for this region (Fedorov *et al.,* 2010). Extreme El Niño and La Niña events are expected to become more frequent over the whole region in a warming climate (Cai *et al.,* 2014, 2015; FAO, 2024a).

2. FISHERY PROFILES

2.1 Regional profile

Area 87 is an exceptionally productive region that supports extensive fisheries activities. It ranks as the third-highest among FAO Major Fishing Areas in terms of landings, producing 10 million tonnes in 2021, equivalent to 12.5 percent of global landings (FAO, 2024b). In 2021, the fisheries sector involved 54 000 active vessels, of which 3 700 were non-motorized, 40 700 were motorized and less than 12 m in length, and almost 10 000 belonged to the industrial subsector. Across the four countries within Area 87, fisheries provided employment to approximately 1.5 million people in 2021, with 500 000 engaged in the primary sector. The long-term average reported catch is around 9–10 million tonnes per year. The high demand for commercially valuable species has led to intense fishing activity, posing significant challenges to the sustainability of fish populations.

The long-term trend in Area 87 has been a decline in catches since the mid-1990s, even when accounting for fluctuations in anchoveta *(Engraulis ringens)* landings. The long-term analysis revealed an initial phase of expansion followed by sustained growth in landings from 1950 to 1970, which was then abruptly interrupted by a sharp decline in anchoveta landings. Following this decline, there was another significant increase between 1974 and 1994, reaching the highest catch levels in the entire time series, with over 20 million tonnes. However, after that year, catches exhibited a downward trend, and are currently stabilizing at around 10 million tonnes per year (**FIGURE D.15.2**).

The anchoveta has historically accounted for over 50 percent of total landings on average, although with significant fluctuations due to its extreme sensitivity to oceanographic conditions – particularly the occurrence of El Niño, which leads to drastic reductions in stock size. For example, the relative representation of anchoveta in total landings dropped to as low as 1–2 percent in 1983 and 1984, as a result of the occurrence of a super El Niño event in 1982–1983. The recent decline in total catches has been driven primarily by reductions in two key species: anchoveta and Chilean jack mackerel *(Trachurus murphyi).* However, high-value catches of jumbo flying squid *(Dosidicus gigas)* have grown significantly since the early 2000s, partially offsetting the declines in other species. Catches of jumbo flying squid increased from approximately 128 000 tonnes in 2000 to a peak of 1.15 million tonnes in 2014, before fluctuating in subsequent years and reaching 996 000 tonnes in 2021 (FAO, 2022).

2.2 Chile

Fishing in Chile is a crucial sector for both domestic consumption and export revenues. The Chilean coast is home to a wide variety of commercially important fish species, both pelagic and demersal. Pelagic species including anchoveta, Araucanian herring *(Strangomera bentincki)* and Chilean jack mackerel make up an important part of the country's fisheries. The jumbo flying squid, Pacific chub mackerel *(Scomber japonicus),* as well as demersal species such as mote sculpin *(Normanichthys crockeri)* and Patagonian grenadier *(Macruronus magellanicus)* make smaller contributions to the country's fisheries. Several invertebrates, which are mainly targeted by small-scale fisheries and have considerable socioeconomic importance, include the "loco" sea snail (also known as the false abalone, *Concholepas concholepas),* the Chilean sea urchin *(Loxechinus albus),* the Southern king crab *(Lithodes santolla),* and various seaweeds (IFOP, 2024). The productivity of Chile's marine resources is influenced by the cold Humboldt Current, which brings nutrient-rich waters to the region, supporting a highly productive marine ecosystem. However, periodic events such as El Niño can impact fish availability, leading to fluctuations in fishery yields (Bertrand *et al.,* 2018, and references therein).

2.3 Peru

Fishing in Peru plays a vital role in the national economy, contributing significantly to both domestic consumption and export revenues. The Peruvian coast is home to several commercially important small pelagic species, with Peruvian anchovy making the largest contribution to the country's fisheries. It forms the basis of Peru's fishmeal industry, which is one of the largest globally. The fishing industry also includes other pelagic species such as Chilean jack mackerel, Pacific chub mackerel, eastern Pacific bonito *(Sarda chiliensis)* and common dolphinfish *(Coryphaena hippurus),* demersal species like South Pacific hake *(Merluccius gayi),* and invertebrates such as the jumbo flying squid, Peruvian calico scallop *(Argopecten purpuratus),* the "loco" sea snail and the cholga mussel *(Aulacomya ater).* The availability of these resources is influenced by the complex interactions of the cold Humboldt Current and the warm waters of the El Niño phenomenon, which can lead to dramatic fluctuations in abundance, affecting overall productivity (Chavez *et al.,* 2003, 2008; Castillo *et al.,* 2019).

2.4 Ecuador

Fishing in Ecuador is one of the most significant contributors to national production, supporting both domestic consumption and export revenues. Along the Ecuadorian coast, commercially important small pelagic fish species are distributed, such as skipjack tuna *(Katsuwonus pelamis)* and Pacific chub mackerel which together represent over 40 percent of landings. Other species targeted in Ecuador include frigate *(Auxis thazard),* yellowfin *(Thunnus albacares)* and bigeye *(Thunnus obesus)* tunas, thread herring *(Opisthonema* spp.), shortfin scad *(Decapterus macrosoma)* and Pacific anchoveta *(Cetengraulis mysticetus).* Other demersal or epipelagic species are often part of the bycatch associated with small pelagics, including trumpetfish *(Fistularia corneta)* and largehead hairtail *(Trichiurus lepturus).* The availability of pelagic resources is mainly shaped by the influence of the cold Humboldt Current from the south, characterized by highly fertile waters, and the warm waters of the Panama Current (Canales and Jurado, 2024).

2.5 Colombia

Fisheries in Colombia are spread across five major basins – Amazon, Atrato, Caribbean, Magdalena, and Orinoquia – and two secondary basins, Pacific and Sinú. The Pacific basin is the largest contributor, accounting for over 53 percent of production, followed by the Atlantic Ocean (about 30 percent) and the inland areas (over 16 percent). Marine fisheries account for 83.8 percent of Colombia's total catch, with production steadily increasing. These fisheries target small coastal pelagic species and large migratory tropical pelagics (Rueda *et al.,* 2011). Small-scale fisheries have significant socioeconomic importance, using handlines and gillnets within 2.5 nautical miles of the coastline in the Exclusive Zone for Artisanal Fishing (Selvaraj *et al.,* 2023). Key resources exploited in Colombia include skipjack tuna and yellowfin tuna which account for half the catch. Other important species include bigeye tuna, Pacific anchoveta, Pacific sierra *(Scomberomorus sierra),* Pacific seabob *(Xiphopenaeus riveti)* and western white shrimp *(Penaeus occidentalis).* The small-scale fishery targeting Pacific sierra has contributed to local economies and food security, with annual landings exceeding 1 500 tonnes in recent years (Selvaraj *et al.,* 2022).

3. RESOURCE STATUS

3.1 Reference list of stocks

Historically, landings of 12 stocks from 11 species (excluding tunas) have been assessed in Area 87. These include three stocks assessed by the South Pacific Regional Marine Fishery Organization (SPRFMO). The historically selected species were South Pacific hake *(Merluccius gayi),* southern hake *(Merluccius australis),* Patagonian grenadier *(Macruronus magellanicus),* Pacific chub mackerel *(Scomber japonicus),* Patagonian toothfish *(Dissostichus eleginoides),* Pacific sardine *(Sardinops sagax),* Araucanian herring *(Strangomera bentincki),* anchoveta *(Engraulis ringens),* jumbo flying squid *(Dosidicus gigas),* Pacific thread herring *(Opisthonema libertate)* and Chilean jack mackerel *(Trachurus murphyi).* These 11 species rank within the top 22 fisheries based on historical catches from 1950 to the present. The exception is the Patagonian toothfish, which ranks 58th, with landings barely exceeding 5 000 tonnes per year over the last 20 years.

In consultation with the member countries of Area 87 (Chile, Colombia, Ecuador and Peru), an updated reference list of stocks was compiled, resulting in an expansion of the list to 97 stocks assessed, representing 73 species, which provides a more representative state of the stocks index for the Area (**TABLE D.15.1** and **APPENDIX II, TABLE 15**, pp. 478). The increasing diversity in catch composition added urgency to the need to expand the FAO reference list and include fisheries targeting species of high economic value.

TABLE D.15.1
SUMMARY OF ASSESSED STOCKS IN AREA 87 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	68	55	12
2 Surplus-production model approaches	23	23	11
3 Data-limited approaches	6	4	4
Total	**97**	**73**	**16**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

The updated methodology classifies stocks into tiers based on the availability and quality of information for each stock (Tier 1, Tier 2 or Tier 3; see **PART B, METHODOLOGY**, pp. 6). Overall, of the 97 stocks assessed for Area 87, 46.4 percent are sustainably fished while 53.6 percent are unsustainably fished. More specifically, 18.6 percent are considered underfished, 27.8 percent are considered maximally sustainably fished, and 53.6 percent are considered overfished (**TABLE D.15.2**). With regards to the number of stocks, 18 stocks are underfished, 27 are maximally sustainably fished, and 52 are overfished.

TABLE D.15.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREA 87 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	68	19.1	36.8	44.1	55.9	44.1
2 Surplus-production model approaches	23	17.4	0.0	82.6	17.4	82.6
3 Data-limited approaches	6	16.7	33.3	50.0	50.0	50.0
Total	**97**	**18.6**	**27.8**	**53.6**	**46.4**	**53.6**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) Percentages might not add up to a total of 100 due to rounding.

Source: FAO estimates.

The stocks for Area 87 have also been classified by tiers, according to the updated methodology, with 68 stocks in Tier 1, 23 stocks in Tier 2 and six stocks in Tier 3. The stocks classified as Tier 1 represented 70.1 percent of all assessed stocks in this Area, covering 55 species. The results from the Tier 1 stock assessments indicate that 13 stocks are underfished, 25 are maximally sustainably fished and 30 are overfished. Hence, 55.9 percent of Tier 1 stocks are sustainably fished while 44.1 percent are not sustainably fished.

The selected Tier 2 stocks were comparatively fewer in number than the Tier 1 stocks, and in all cases the SraPlus package (Ovando *et al.,* 2021) was used to assess them on the basis of a surplus production model. Effort estimates were extracted from Rousseau *et al.* (2019) or derived from specific inputs such as fishing effort or abundance indices from research surveys. The estimates obtained from these applications reveal that nearly all Tier 2 stocks are unsustainably fished, with 82.6 percent of stocks overfished. Finally, of the Tier 3 stocks, half are fished sustainably and the other half fished unsustainably.

TABLE D.15.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREA 87 IN 2021

	Weighted % by landings				
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
9.17	17.7	63.4	18.9	81.1	18.9

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Sources: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Overall, landings of assessed stocks in Area 87 amounted to about 9.17 million tonnes (**TABLE D.15.3**), representing about 96.0 percent of total reported landings in Area 87, a slight increase from the 91.7 percent coverage under the previous methodology. When weighted by landings, the percentage of sustainably fished stocks in Area 87 is significantly higher at 81.1 percent.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important for Area 87 (**FIGURE D.15.2**).

4.1 Peruvian anchovy

The Peruvian anchovy (also known as anchoveta, *Engraulis ringens)* represents the world's largest single-species fishery in terms of catch volume (FAO, 2024b). The Peruvian anchovy is a small pelagic fish distributed along the coast of Peru and Chile from 2° to 42°30′ south, depending on the coastal extent of the Humboldt Current. This species, endemic to this upwelling systems, is found within the first 100 m of depth, with seasonal variations: during spring and summer its distribution tends to narrow to a coastal strip 30–60 km wide, while in autumn and winter its range reaches up to 150 km – and sometimes over 180 km – from the coast. Two fishing stocks have been identified (Heck Franco, 2015): (1) the North-Central Peru Zone (2°–16° south), with the highest concentrations and catches, and (2) the South Peru–North Chile Zone (south of 16° south), where the resource is shared by both countries. In Peru, three purse seine fleets target Peruvian anchovy: the industrial fleet (with storage capacities above 32.6 m^3), the small-scale fleet (with capacities 10–32.6 m^3) and the artisanal fleet (with capacities below 10 m^3, relying mostly on manual, non-mechanized operations) (Heck Franco, 2015). Two additional stocks of Peruvian anchovy are found in Chile, one in the north and one in the south.

Between 1950 and 2021, cumulative landings exceeded 370 million tonnes, accounting for 7 percent of total global fish landings during that period. Consequently, the patterns of fishery landings in Area 87 are primarily driven by variations in the magnitude of anchoveta landings. Peruvian anchovy landings peaked in 1970, exceeding 13 million tonnes, but have experienced sharp declines, including as a result of El Niño events (Bouchon *et al.,* 2018). The recovery of the fishery has been supported by enhanced management regulations. These include a total allowable catch (TAC) system, individual vessel quotas and restricted access for new entrants, area- and time-specific quotas based on biomass assessments, short closures (three to five days) to protect juveniles under 12 cm, seasonal closures during peak spawning (winter and summer), and effort regulation by limiting vessels, fishing days and processing capacity (Ñiquen *et al.,* 2001; Bouchon *et al.,* 2018; Oliveros-Ramos *et al.,* 2020). Fishing occurs during two annual seasons. Currently, the Peru north-central stock of anchoveta supports the world's largest single-species fishery, while maintaining the spawning stock biomass (SSB) around maximum sustainable yield

(MSY) and fishing mortality (F) below F_{MSY}. While most stocks of Peruvian anchovy in Area 87 are considered maximally sustainably fished, some are considered overfished.

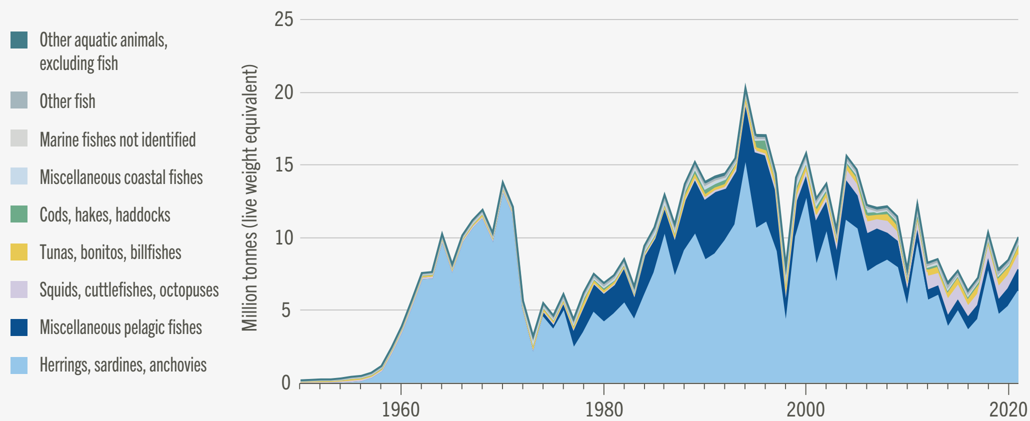
4.2 Chilean jack mackerel

During the last 70 years, Chilean jack mackerel *(Trachurus murphyi)* has been the second-most important fish stock captured in Area 87. Between 1950 and 2021, cumulative landings exceeded 87 million tonnes. This pelagic fish is distributed throughout the southeast Pacific, ranging from the Galapagos Islands and south of Ecuador to southern Chile. While Chile is the main country targeting this resource, it is also exploited in Peru and Ecuador, and jointly managed through the SPRFMO (IFOP, 2024). The species is harvested by both artisanal and industrial fleets in the countries of Area 87.

Long-term trends show a dramatic rise and fall of landings over the second half of the 20th century and into the 21st century. From the 1950s through until the early 1970s landings were minimal, reflecting either a low exploitation level or limited fishing effort and technological development at the time. Beginning in the late 1970s, there was a rapid increase in landings, which peaked in the mid-1990s at approximately 5 million tonnes. This sharp growth aligns with the expansion of industrial fishing fleets and increased global demand for pelagic fish. However, following this peak, landings began to decline precipitously, likely due to overfishing and environmental changes affecting stock abundance. By the mid-2010s landings had reached historically low levels, before showing signs of recovery in recent years but remaining far below peak levels.

The spawning biomass showed a declining trend from 1970 to 2012, with significant fluctuations, including a historical maximum of 20 million tonnes in 1988. However, starting in 2013, the trend reversed, rising back up to 16 million tonnes in 2023, a value similar to that of 1991. Recent stock assessments through the SPRFMO showed that the resource is maximally sustainably fished (IFOP, 2024; see also SPRFMO, 2024). Global fishing mortality rates (combined fleets) exhibited a decreasing trend from 2010 to 2023, dropping to values as low as 0.13/year, comparable to those estimated at the beginning of the 1980s (IFOP, 2024).

FIGURE D.15.2
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE SOUTHEAST PACIFIC (AREA 87) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.3 Pacific thread herring

The Pacific thread herring *(Opisthonema* spp., included in the FAO database as *Opisthonema libertate)* is a small pelagic fish distributed along the Eastern Pacific, ranging from Santa Rosalita (28° north) on the Pacific coast of Baja California, Mexico, southward to Punta Picos (5° south) in Piura, Peru. In Ecuadorian waters, this species is found along the continental coastline. However, the fishery primarily operates in productive waters from the northern region of Bahía de Caráquez in Manabí Province to the southern area of the Gulf of Guayaquil in Guayas Province.

Total landings by the industrial Ecuadorian fleet exceeded 1.2 million tonnes between 1950 and 2022. Currently, landings are relatively stable at approximately 20 000 tonnes per year. Stock assessment models estimate the adult biomass to average around 86 000 tonnes, equivalent to 49 percent of the virgin biomass. Fishing mortality levels are currently estimated to be 82 percent below the F_{MSY} reference point (Canales and Jurado, 2024). The resource is considered maximally sustainably fished.

4.4 Pacific sierra

Pacific sierra *(Scomberomorus sierra)* is a pelagic fish distributed along the eastern Pacific coast, from southern California to Peru (33° north to 20° south). This species exhibits high densities in the Gulf of California and along the coasts of Costa Rica, Panama, Colombia and northern Ecuador, including the Galápagos Islands (Robertson *et al.,* 2023). In Colombia, it is commonly found in coastal waters, particularly in areas with high salinity and high net primary production. The species exhibits a preference for shallow waters, often forming schools near the surface, which makes it accessible to artisanal fishers. There is no known stock division for this species, and despite its wide distribution there is no shared management framework among the countries. As a result, Colombia manages the species as a single stock unit.

This coastal fishery in Colombia is predominantly artisanal, involving small-scale fishers who utilize handlines and gillnets up to 2.5 nautical miles from the coastline in the Exclusive Zone for Artisanal Fishing (Selvaraj *et al.,* 2023). Indeed, long-term trends indicate that Pacific sierra has been a significant component of artisanal landings, making notable contributions to local economies and food security. Landings have increased in recent years, surpassing 1 500 tonnes annually. Recent studies suggest that climate change may affect the distribution of this species, potentially leading to shifts in its availability to coastal communities (Selvaraj *et al.,* 2022). This resource is subject to an annual fishing quota based on stock assessment models that incorporate data on catch, effort, catch per unit effort, and size distribution, derived from annual monitoring of artisanal and industrial fisheries (Barreto *et al.,* 2023). The stock is currently considered maximally sustainably fished.

4.5 Invertebrates and marine algae

Invertebrates are playing an increasingly significant role in the fisheries statistics of the region, with standout species including the Chilean sea urchin *(Loxechinus albus),* cholga mussel *(Aulacomya ater),* clam *(Protothaca taca),* and Peruvian calico scallop *(Argopecten purpuratus).* These resources exhibit substantial variability over time, with capture pulses that may be explained by synergistic effects resulting from environmental variations and the intensity of exploitation.

Although not included in the index of stock status, there has been a notable increase in the exploitation of marine algae, including Chilean kelp *(Lessonia nigrescens), Gracilaria* seaweeds, and *Lessonia trabeculata*. These species rank among the top 30 in terms of capture volume, a trend that has become increasingly evident in recent years (FAO, 2024b). However, due to the intrinsic characteristics of their life cycle (sessile distribution) and the dispersal of spores or algal fragments among different areas, it is essential to establish a spatially explicit approach for their analysis before making an overall assessment of these stocks.

5. KEY FINDINGS

Overall, 46.4 percent of assessed stocks in Area 87 are being fished at or below maximum sustainable levels, while 53.6 percent are overfished in 2021, presenting a more positive perspective on the region's stock sustainability status compared to the previous assessment (**TABLE D.15.4**). This change might be due to some improvements in stock status, but is most likely due to a greater representation of the stocks included in the list of reference stocks for the Area. While this marks an improvement in terms of sustainability, the percentage of overfished stocks remains high. It is worth noting that the majority of Tier 2 stocks are overexploited, highlighting the need for intensifying efforts to develop robust databases that include fishing effort and abundance indices, enabling proper monitoring of these stocks over time.

With the possibility of extreme El Niño and La Niña events becoming more frequent in a warming climate (Cai *et al.,* 2015), the dynamic nature of critical fishery resources (e.g. anchoveta [*Engraulis ringens*]) and their sensitivity to environmental variability will require adaptive management frameworks to support improved fisheries sustainability. For instance, Peru has integrated real-time data and scenario-based planning, which can help mitigate overexploitation risks and enhance the resilience of fisheries to environmental change (Oliveros-Ramos *et al.,* 2020). Similar frameworks should be adopted to address fluctuations caused by climatic events, enabling more flexible and responsive management strategies, particularly for small pelagics, which represent a significant proportion of landings.

The number of stocks increased significantly under the updated assessment methodology compared to previous FAO estimates, going from a reference list of 12 to 97 stocks (**TABLE D.15.4**). In other words, the number of assessed stocks increased sixfold, providing a more comprehensive representation of the fisheries in the region, incorporating both long-standing and newly recognized stocks of economic and ecological importance. When weighted by landings, the proportion of sustainable stocks under the previous and current methodologies is similar (**TABLE D.15.5**). In addition, with regards to the coverage, there has been a slight increase from 91.7 percent to 96.0 percent from the previous to the updated methodology.

Moreover, the updated methodology's tiered approach allowed for a nuanced classification of resources. Stocks categorized as Tier 1 accounted for a very high percentage of the total number of stocks, reflecting the availability of robust, long-term landings and effort data that enables the application of dynamic models and the estimation of reference points for management purposes, as well as the enhanced capacity of countries in the region to conduct formal stock assessments. A substantial amount of auxiliary information, such as survey data, strengthened these assessment approaches. Additionally, most Tier 1 stocks exhibited low uncertainty in their estimates due to formal stock assessments conducted at both regional and national levels.

TABLE D.15.4
COMPARISON BY NUMBER OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 87 IN 2021

Updated SoSI categories						Previous SoSI categories					
No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
97	18.6	27.8	53.6	46.4	53.6	12	0.0	33.3	66.7	33.3	66.7

U = Underfished, M = Maximally sustainably fished, O = Overfished
Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.
Source: FAO estimates.

TABLE D.15.5
COMPARISON BY LANDINGS OF THE PREVIOUS AND UPDATED METHODOLOGY FOR ASSESSING THE STATE OF EXPLOITATION OF FISHERY RESOURCES IN AREA 87 IN 2021

Updated SoSI categories					Previous SoSI categories				
U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
17.7	63.4	18.9	81.1	18.9	0.0	82.9	17.1	82.9	17.1

U = Underfished, M = Maximally sustainably fished, O = Overfished
Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.
Sources: FAO estimates.

Nonetheless, the asymmetries in the quality and quantity of available information among countries was evident, underscoring the need for strengthened regional cooperation as well as stronger long-term, stable databases for a comprehensive stock assessment, with efforts to improve data on other fisheries underway (Canales and Jurado, 2024).

The assessment for Area 87 largely focused on Tier 1 and Tier 2 stocks, with Tier 3 stocks only representing a minority of stocks. Stocks that could be classified as Tier 3 in the region are primarily targeted by small-scale fisheries. These fisheries hold significant socioeconomic importance across the region, particularly given the increasing relative contribution of invertebrates and algae to regional fisheries. In fact, around 30 percent of the total catch for the Americas region comes from small-scale fisheries, with this number increasing substantially for some individual countries (Basurto *et al.,* 2025). Expanding the scope of future FAO assessments to include Tier 3 stocks would increase the relevance and provide a more comprehensive representation of fisheries in Area 87, ensuring that assessments reflect the full spectrum of fisheries. Achieving this requires tailored methodologies that address the unique characteristics of small-scale fisheries and their associated data limitations.

In addition, long-term fisheries data highlight the growing importance of different species of algae as key resources, which should be considered in future assessments. Adopting this continuous and adaptive approach is critical for addressing the complexities of diverse fishery systems while fostering the sustainable use of resources and supporting livelihoods across the Southeast Pacific.

Finally, the results for Area 87 have significantly enhanced the understanding of stock status in the region, and have emphasized the importance of inclusive and participatory approaches in enhancing the accuracy, scope and representativeness of fisheries assessments. The process not only improved the plausibility of assessments and confidence in stock status estimations, but also strengthened regional collaboration by fostering interaction among countries. Given that several key exploited species in Area 87 cross political boundaries, a regional approach for integrating scientific knowledge and management capabilities to establish cohesive governance frameworks at appropriate scales is important (Defeo and Vasconcellos, 2020). Strengthening regional cooperation through capacity building, shared best practices, and standardized assessment methodologies will improve data quality, comparability across countries, and the sustainability of fisheries management. The SPRFMO could enhance cooperation among member countries, which is important for addressing asymmetries in data quality and availability. The Permanent Commission for the South Pacific (CPPS by its Spanish acronym), comprising the four countries of Area 87, could also catalyse the implementation of stock assessments aligned with ecological and jurisdictional realities, addressing data gaps and inconsistencies.

FAO MAJOR FISHING AREA 87

PACIFIC, SOUTHEAST

AREA 87

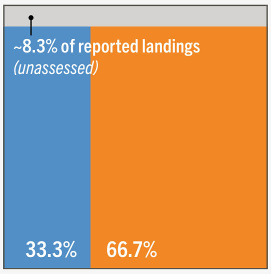
KEY MESSAGES

- Anchoveta is the key stock in the region and currently sustainably fished thanks to improved management. Some other species, such as South American pilchard, hakes and Patagonian toothfish, are still being overfished.
- This region illustrates the difference between accounting for sustainability in terms of landings (or weight – more than 90 percent of landings in this region come from sustainably managed stocks) versus by the proportion of stocks that are assessed as sustainable – only 46.4 percent of the number of stocks assessed are of good status.
- Managing fisheries in this region is complex due to different fleet types and associated obstacles in heir management.

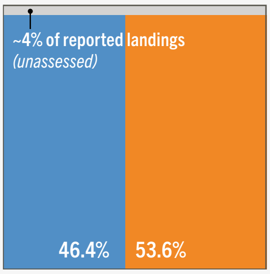
STOCK STATUS

FAO estimates, 2021

PREVIOUS METHODOLOGY



UPDATED METHODOLOGY



Biologically sustainable
Unassessed reported landings
Biologically unsustainable

ESTIMATED LANDINGS (MILLION TONNES) FOR REGIONS BORDERING THIS AREA

FAO data, 1950–2021

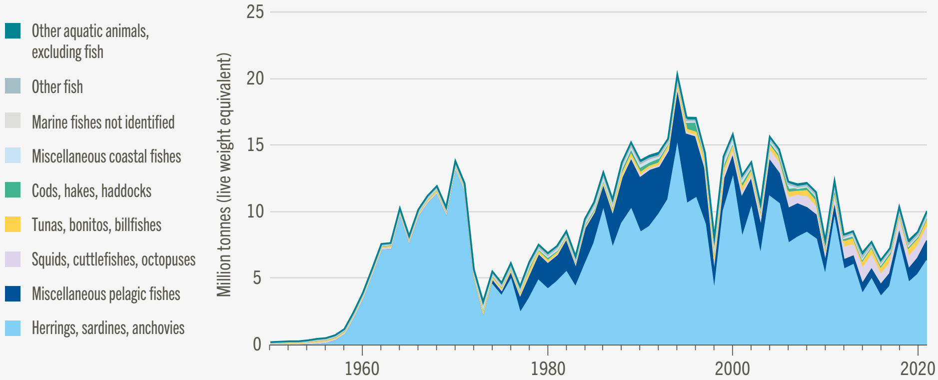
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

LANDINGS / MILLION TONNES

n/a | < 1% | 1–5% | 5–10% | 10–20% | > 20%

SPECIES COMPOSITION

FAO data, 1950–2021

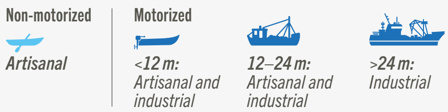


Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

FLEET SIZE AND COMPOSITION

FAO estimate, 2021

Active vessels ~ 54 000



Non-motorized: 7%
Motorized: 93%

LANDINGS

FAO data, 2021

Reported landings ~ 10 million tonnes

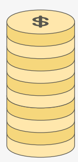
Unidentified: 1%
Identified at species group level: 99%

Data refer to aquatic animals, excluding aquatic mammals, crocodiles, alligators, caimans, sponges, corals, pearls and algae.

ECONOMIC VALUES

FAO estimate, 2021

Value of landings ~ USD 9.6 billion



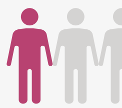
= USD 1 BILLION

EMPLOYMENT

FAO estimate, 2021

Fishers (primary sector / fishing) ~ 255 000

Male: 39%
Unspecified: 56%
Female: 6%



= 100 000 PEOPLE

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FIGURE D.15.3 *(previous page)*
AREA 87 – DATA AT A GLANCE

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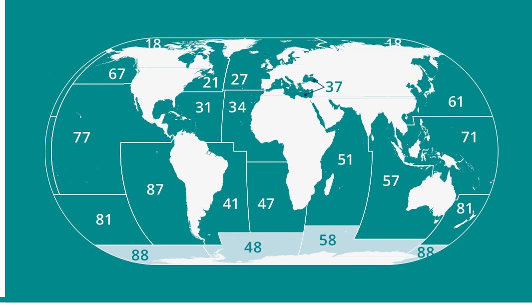
48 | 58 | 88



Part D, Chapter 16 (D.16)

ANTARCTIC AREA
FAO MAJOR FISHING AREAS 48, 58, 88

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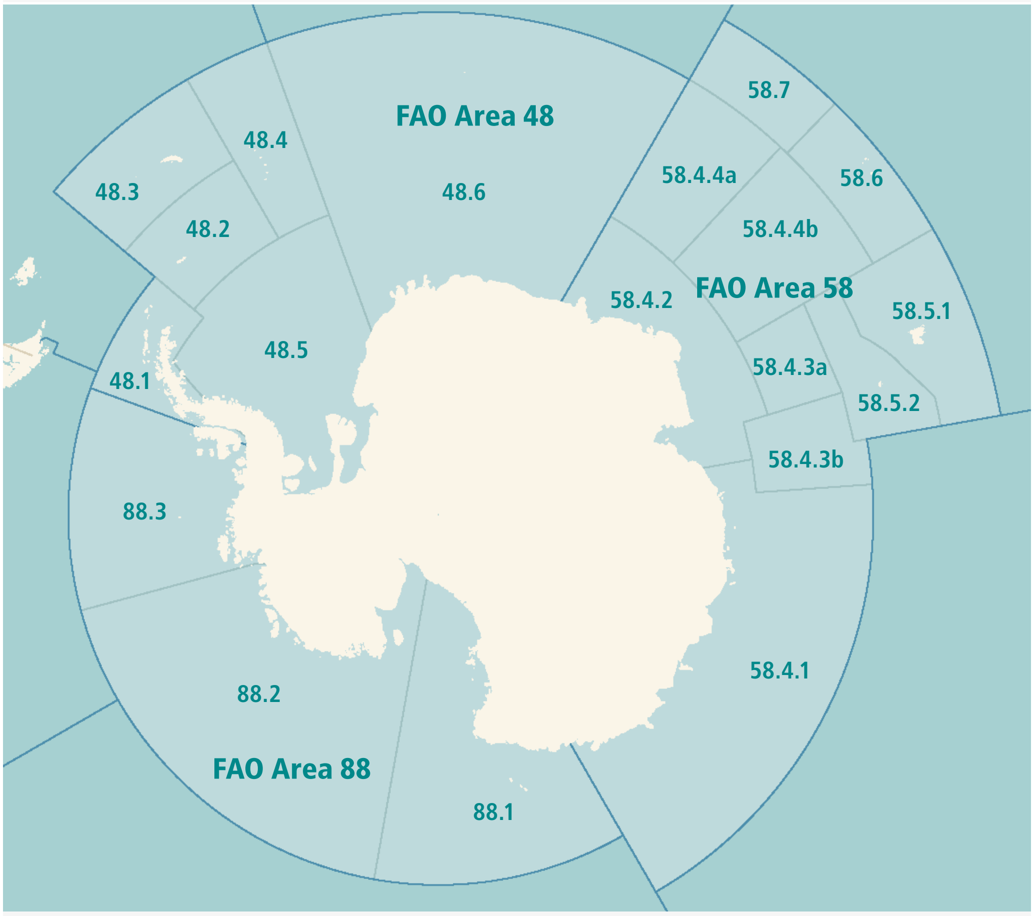
1. OVERVIEW

The Antarctic Area is designated by FAO as Major Fishing Areas (hereafter, Areas) 48 (Antarctic Atlantic), 58 (Antarctic Indian) and 88 (Antarctic Pacific). It surrounds Antarctica and represents about 10 percent of the world's ocean, extending from the coast of the continent out to the Antarctic Convergence (**FIGURE D.16.1**). The Antarctic Area is characterized by an eastward-flowing Antarctic Circumpolar Current and a series of

FIGURE D.16.1
FAO MAJOR FISHING AREAS 48, 58 AND 88: THE ANTARCTIC AREA



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

clockwise-rotating gyres that contribute to a westward-flowing East Wind Drift along the Antarctic coast. The Antarctic Area has three distinct ecological zones: an ice-free zone to the north, an extensive seasonal pack-ice zone between about 55°–60° south and 70°–75° south, and a permanent pack-ice zone adjacent to the continent.

The Antarctic Convergence encircles Antarctica and is formed by cold, northward-flowing Antarctic waters sinking beneath the relatively warmer and more saline waters of the sub-Antarctic. Its position varies seasonally and geographically, but is generally located near 50° south in the Atlantic and Indian sectors of the Antarctic Area and near 60° south in the Pacific sector. The Antarctic Convergence separates two hydrological regions with distinctive marine life and climate, thereby creating an ecological boundary. Associated zones of mixing and upwelling create high biological productivity, especially of Antarctic krill *(Euphausia superba).*

The harvest of marine living resources in the Antarctic Area is managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), which is responsible for the conservation of marine species, including seabirds, and the management of fisheries (but excluding management or harvesting of whales and seals), in all marine waters south of the Antarctic Convergence (in the Antarctic Area).[1] As the Antarctic Convergence is an oceanographic boundary and does not follow a straight-line path, the CCAMLR Area is defined in Article I (4) to follow a set of defined longitude and latitude points that approximate the position of the Convergence. These boundaries align with those of FAO Areas 48, 58 and 88, which fully cover the CCAMLR Area.

2. FISHERY PROFILES

In the Antarctic Area, large-scale fishing for finfish began in the late 1960s, targeting species such as mackerel icefish *(Champsocephalus gunnari),* marbled rockcod *(Notothenia rossii)* and Patagonian rockcod *(Patagonotothen guntheri).* By the late 1970s, some species were overfished in some areas and their fisheries were subsequently closed, while some have remained closed since the late 1980s (Kock, 2000). Krill fishing started in the mid-1970s, and by 1980 more than 400 000 tonnes were caught annually, representing the majority of catch by weight in this region (**FIGURE D.16.2**). Antarctic krill *(Euphusia superba)* is considered a keystone species in the Antarctic ecosystem with seabirds, squid, fish, seals and whales relying on it as prey.

Concern over increased fishing and its effect on the wider ecosystem led to the establishment of CCAMLR. Its objective is the conservation of Antarctic marine living resources, where the term "conservation" includes rational use. It promotes and follows an ecosystem-based and precautionary approach to management (Article II of CCAMLR). For instance, although CCAMLR does not cover the management and harvesting of whales and seals, it does consider the role of these species in the ecosystem when making management decisions.

In accordance with these approaches, CCAMLR has adopted a comprehensive set of fisheries management measures to implement an ecosystem approach to fisheries management. For instance, some areas are closed to certain types of fishing activity, while others are open to fishing but subject to the requirements of other conservation measures. More broadly, management measures in the CCAMLR Area include reducing bycatch of fish such as grenadiers and skates, minimizing the incidental mortality of seabirds and marine mammals, and taking into consideration the benthic impacts of bottom fishing gear. CCAMLR also requires haul-by-haul catch and effort data and implementation of an extensive mark-recapture programme for toothfish. CCAMLR has agreed a framework to implement a representative network of marine protected areas (MPAs), and currently has two: the South Orkney Islands southern shelf MPA and the Ross Sea region MPA.

[1] Whaling and sealing – which currently do not take place in the CCAMLR Area – are the responsibility of the International Whaling Commission (IWC) and the Convention for the Conservation of Antarctic Seals (CCAS), respectively.

CCAMLR determines catch limits and other measures necessary to manage fisheries through analysis of extensive data collected by independent scientific observers (mandatory on all vessels) and catch and effort data provided by all vessels. Scientific surveys and research provide independent estimates of stock abundance and recruitment patterns. There are large-scale acoustic surveys of krill populations, a long-term tagging programme implemented by toothfish vessels that generates estimates of stock sizes for toothfish, and trawl surveys to determine the abundance of icefish and some toothfish stocks.

Today, the main species caught in the Antarctic Area are Antarctic and Patagonian toothfish *(Dissostichus mawsoni* and *Dissostichus eleginoides),* Antarctic krill and mackerel icefish. In 2021, 25 vessels participated in toothfish fisheries, and 15 vessels notified to participate in the krill fishery. Catches from the CCAMLR Area are dominated by the Antarctic krill fishery, which currently occurs almost exclusively in the Atlantic region of the Convention Area. As a consequence, the total catch in 2021 from Area 48 of 371 526 tonnes dominated reported landings, with 15 210 tonnes of landings of toothfish distributed across all three regions, and minor landings of icefish in Area 58 (**FIGURES D.16.2a**, **D.16.2b** and **D.16.2c**). A trend of increasing harvest of krill continues to attract considerable iinternational attention due to its role as a keystone species in the Antarctic ecosystem.

3. RESOURCE STATUS

3.1 Reference list of stocks

This report updated the reference list of stocks for Areas 48, 58 and 88 (**APPENDIX II, TABLE 16**, pp. 482) according to the updated methodology to cover four species or species groups and 15 stock units (**TABLE D.16.1**).

TABLE D.16.1
SUMMARY OF ASSESSED STOCKS IN AREAS 48, 58 AND 88 IN 2021, INCLUDING THE NUMBER OF ASFIS SPECIES AND ISSCAAP GROUPS

Tier	Total assessed stocks	Total ASFIS species (from total assessed stocks)	Total ISSCAAP groups (from total assessed stocks)
1 Formal assessments	11	4	2
2 Surplus-production model approaches	4	1	1
Total	**15**	**4**	**2**

ASFIS – Aquatic Sciences and Fisheries Information System;
ISSCAAP – International Standard Statistical Classification of Aquatic Animals and Plants.

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) The ASFIS species and ISSCAAP groups may not sum up to the total number of stocks because there may be multiple stocks in the same species or group.

Source: FAO estimates.

3.2 Classification of the status of stocks

Because CCAMLR has stock status targets that are higher than if they were based on single species management objectives, the status of CCAMLR stocks evaluated in relation to CCAMLR decision rules does not translate easily to FAO classification categories, which utilize a single-species target of maximum sustainable yield. Nonetheless, CCAMLR stock status and harvest strategies can be expressed in relation to FAO classification criteria and reference points to generate a FAO classification, allowing them to be compared with other fisheries globally.

CCAMLR currently manages fisheries on Antarctic krill *(Euphusia superba)*, mackerel icefish *(Champsocephalus gunnari)* and two species of toothfish. Biological stock definitions are not yet fully developed for several CCAMLR fisheries, but all current fisheries are managed as individual stocks. "Current" fisheries are defined as fisheries which have had harvest (including any research harvest) or a biomass assessment within the past five years. Three different methods were used to align CCAMLR assessments to FAO classifications, as CCAMLR assessment procedures differ by species.

CCAMLR's decision rules reflect all three aspects of Article II (3)[2] to determine a precautionary catch limit. The decision rules project stock status into the future with a timeline chosen to reflect the life history of the species, and are used to determine a catch limit that minimizes the probability of recruitment impairment and results in a projected target stock status set in accordance with an ecosystem approach (Constable *et al.,* 2000). For krill and toothfish, there is a requirement that the probability of spawning stock biomass (SSB) dropping below $SSB_{20\%}$ (20 percent of SSB_0 – which is SSB at virgin levels) must be less than 10 percent over the chosen projection periods of 20 and 35 years, respectively. The target reference points for CCAMLR stocks are 75 percent of unfished spawning stock biomass ($SSB_{75\%}$) for krill and $SSB_{50\%}$ for toothfish ($SSB_{60\%}$ for toothfish in Division 58.5.1). For icefish, decision rules were developed using short-term assessments to estimate catches over the next two fishing seasons that would result in $SSB_{75\%}$. For CCAMLR fisheries of krill and toothfish, metrics for unfished and current biomass typically refer to SSB_0 and SSB_{CURR}, and it is this metric that is used to classify current stock status for CCAMLR fisheries into a FAO status.

Overall, of the 15 stocks assessed for Areas 48, 58 and 88, 100 percent are sustainably fished; more specifically, 80.0 percent are considered underfished, 20.0 percent are considered maximally sustainably fished, and none are considered overfished (**TABLE D.16.2**). The stocks for Areas 48, 58 and 88 have also been classified by tiers, according to the updated methodology. For the stocks classified as Tier 1, the information gathered covers 4 species and 11 stock units. The results from the Tier 1 stock assessments demonstrate that the majority of stocks are considered underfished (90.9 percent), with one maximally sustainably fished (9.1 percent). With regards to the stocks in Tier 2, which represent one species and four stocks, 50 percent of stocks are underfished and the other half are maximally sustainably fished.

Overall, landings of assessed stocks in Areas 48, 58 and 88 amounted to just under 390 000 tonnes, with the amount of total landings and total assessed landings identical. When weighted by the volume of landings, biologically sustainable stocks account for100 percent of the 2021 landings of assessedstocks monitored by FAO.

[2] Article II (3) sets out the principles of conservation to achieve the objective of the Convention as: (a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment; (b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and (c) prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

TABLE D.16.2
CLASSIFICATION OF THE STATE OF EXPLOITATION OF ASSESSED STOCKS BY TIER FOR AREAS 48, 58 AND 88 IN 2021

Tier	No. of stocks	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
1 Formal assessments	11	90.9	9.1	0.0	100.0	0.0
2 Surplus-production model approaches	4	50.0	50.0	0.0	100.0	0.0
Total	**15**	**80.0**	**20.0**	**0.0**	**100.0**	**0.0**

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics.

Source: FAO estimates.

TABLE D.16.3
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS FOR AREAS 48, 58 AND 88 IN 2021

	Weighted % by landings				
Total assessed landings (Mt)	U (%)	M (%)	O (%)	Sustainable (%)	Unsustainable (%)
0.39	**98.8**	**1.2**	**0.0**	**100.0**	**0.0**

Mt = million tonnes, U = Underfished, M = Maximally sustainably fished, O = Overfished

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO estimates; and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4. KEY SELECTED SPECIES AND GROUPS

This section identifies and discusses species and stocks that are currently most important in Areas 48, 58 and 88 (**FIGURES D.16.2a**, **D.16.2b** and **D.16.2c**).[3] Further details on the status of each fishery are available in the CCAMLR fishery reports and the CCAMLR Statistical Bulletin.[4]

4.1 Toothfish stocks

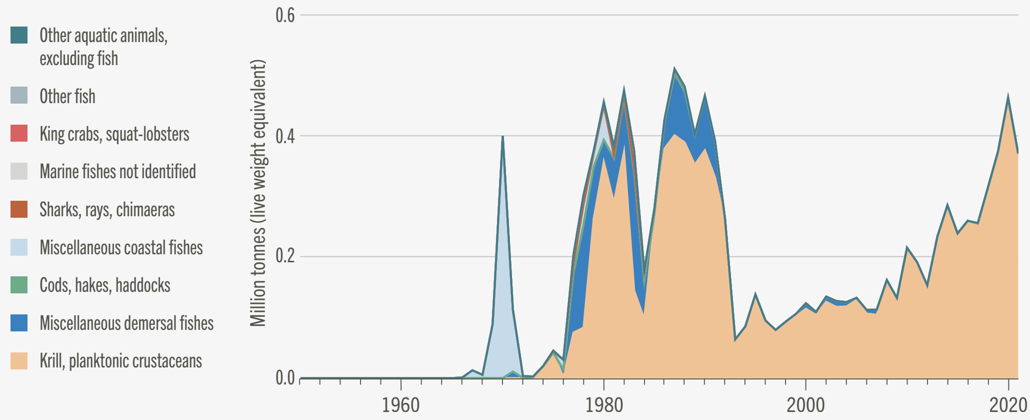
Six toothfish stocks have had integrated stock assessments conducted using CASAL or Casal2 (Bull *et al.*, 2012; Casal2 Development Team, 2024) and hence fulfill the criteria for FAO Tier 1 stocks (Antarctic toothfish [*Dissostichus mawsoni*] in Subarea 88.1 and Small-Scale Research Unit 88.2AB, and Patagonian toothfish [*Dissostichus eleginoides*] in Subareas 48.3, 48.4, 58.6, and Divisions 58.5.1 and 58.5.2).[5] The current stock statuses for five of these stocks using the criterion of SSB_{CURR} / SSB_0 metric range from 37.9 percent to 65.2 percent (for FAO, B_{MSY} in these cases is assumed to be 40 percent of SSB_0). The stock status of Patagonian toothfish in Subarea 48.3 was last agreed in 2019 at 50 percent SSB_0 (SC-CAMLR-38 paragraph 3.71 and **TABLE D.16.1**). These stocks, therefore, are classified using FAO categories as maximally sustainably fished (one stock) or underfished (five stocks).

[3] Please be aware of the difference in scale of the y-axis of the graphs, reflecting differences in landings in each Area.

[4] See https://fisheryreports.CCAMLR.org and https://www.ccamlr.org/en/publications/statistical-bulletin

[5] For the location of the Subareas see **FIGURE D.16.1**.

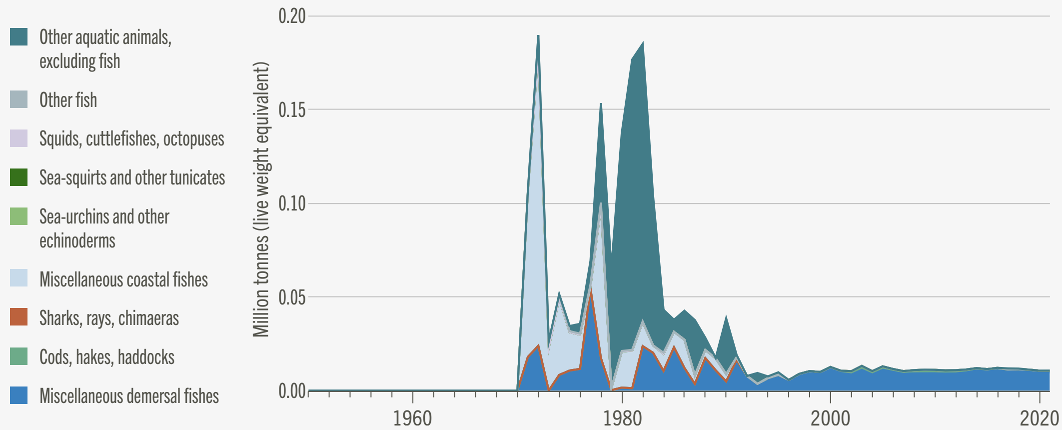
FIGURE D.16.2A
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE ANTARCTIC ATLANTIC (AREA 48) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

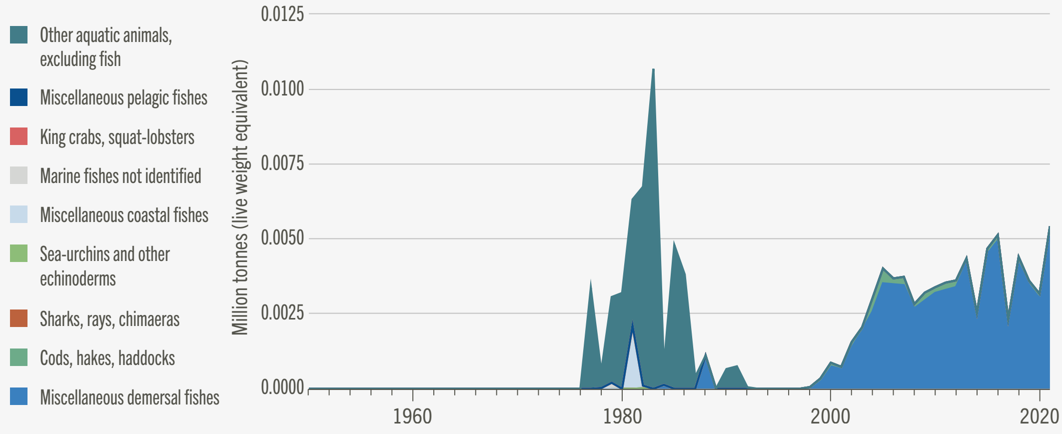
FIGURE D.16.2B
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE ANTARCTIC INDIAN (AREA 58) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

FIGURE D.16.2C
TOTAL REPORTED LANDINGS (IN MILLION TONNES) BY ISSCAAP SPECIES GROUP FOR THE ANTARCTIC PACIFIC (AREA 88) BETWEEN 1950 AND 2021



Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.
Source: FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

Other CCAMLR toothfish stocks can be considered as FAO Tier 2 (Antarctic toothfish in Subareas 48.4, 48.6, 88.2, 88.3 and Division 58.4 [see **fisheryreports.ccamlr.org**], and Patagonian toothfish in Subarea 58.7 [DFFE, 2023]). Note these status evaluations derive from "characteristic metric 3: catch trend" of the FAO criteria (FAO, 2011). The target metric for managing data-limited fisheries uses a proportion (gamma) of vulnerable biomass, set at 4 percent of the current estimate of vulnerable biomass of toothfish in a defined area using five-year trends in either change to catch per unit effort (CPUE) or vulnerable biomass as determined through a mark-recapture programme. The 4 percent value was derived from an evaluation concluding that a 4 percent harvest rate of a depleted toothfish stock would not influence the time needed for rebuilding to the target status (i.e. the stock size would increase at a rate indistinguishable from a non-harvested stock).

In addition to a conservative harvest rate, fishing is only allowed in a small proportion of each data-limited stock's geographic range and the precautionary catch limit is updated annually. Therefore, FAO stock status is typically classified as underfished. Several stocks with these characteristics are not fished currently (last fished more than five years ago) and are therefore classified as unknown; however, when fishing last occurred their FAO status was underfished (i.e. biomass estimates were above target thresholds), with the exception of Patagonian toothfish in Division 58.4.4.

In relation to the Patagonian toothfish stock in Division 58.4.4, this fishery was closed in 2002 as a result of concerns over low stock levels due to illegal, unreported and unregulated (IUU) fishing in the area. However, no evidence of IUU fishing has been reported since 2010, and the limited research fishing conducted was managed based on a precautionary harvest rate applied to the biomass in the fished area at the time, with the last year of research fishing in 2019. A draft integrated stock assessment was presented in 2021.

4.2 Icefish stocks

There are two fisheries for mackerel icefish *(Champsocephalus gunnari),* one in Division 58.5.2 and one in Subarea 48.3. For each icefish stock, survey data and stock assessments are updated annually (Division 58.5.2) or biennially (Subarea 48.3). Catch limits are set based on the harvest rate that, when applied to the one-sided lower 95 percent confidence bound of the current biomass estimate for the following two years, would result in 75 percent of the vulnerable biomass remaining.

4.3 Krill stocks

Antarctic krill *(Euphausia superba)* is distributed throughout the Convention Area and is a highly abundant keystone circumpolar species, especially in the seasonal pack-ice zone. This is especially pronounced in Area 48, where the bulk of krill fishing takes place. Antarctic krill is also dominant in Area 58, while another species – ice krill *(Euphausia crystallorophias)* – is abundant in Area 88, but these populations are not currently fished. Acoustic survey data on krill biomass have been updated periodically, most recently in 2019 by a large-scale multi-national survey (Krafft *et al.,* 2021), and from 2012 to 2024 by annually or multi-year mesoscale surveys covering areas where the fishery operated in Subareas 48.1 (Delegation of China, 2024), 48.2 (Skaret *et al.,* 2023; Krafft *et al.,* 2024) and 48.3 (Liska *et al.,* 2023). Acoustic surveys were conducted in Division 58.4.1 in 2019 (Abe *et al.,* 2023) and in 58.4.2 in 2020 (Cox *et al.,* 2022) for the East Antarctic region.

The target reference point for krill is $SSB_{75\%}$, which takes account of the key role of krill within the Antarctic ecosystem. Application of the decision rules in the South Atlantic region, where survey biomass is about 60 million tonnes, implies a precautionary catch limit of 5.61 million tonnes per fishing season in Subareas 48.1, 48.2, 48.3 and 48.4 combined, which is less than 10 percent of the stock size (Zhao *et al.,* 2024). However, to take account of local ecosystem requirements, the catch limit applied in Subareas 48.1 to 48.4 is constrained to 620 000 tonnes until there is an agreed mechanism to distribute catches spatially and seasonally such that localized impacts on dependent predators are avoided or minimized (Conservation Measure 51-01). The krill fishery in Area 48 is therefore classified as underfished. However, additional measures are under consideration to avoid ecosystem impacts that may result from localized depletion of krill.

The krill fishery was active in Area 58 until 1995, with some minor catches between 2017 and 2019. Revised biomass estimates were provided in 2023 based on recent surveys, but the catch limits have not been updated. The FAO stock status is classified as underfished.

5. KEY FINDINGS

Overall, 15 stocks within four target species are being assessed and their status classified relative to FAO stock status in the Antarctic Area (**TABLE D.16.4**). There are an additional 41 stocks of species for which fishing occurred prior to the implementation of the CCAMLR Convention or prior to the development of the current management procedures and which are currently not fished; no FAO stock status is provided for these stocks (**TABLE D.16.5**).

There has been an increasing trend in the annual krill harvest since 1993, demonstrating progressively more interest as markets and processing technology develop. The toothfish harvest has been nearly constant in recent years as the fishery on each stock is small and constrained by precautionary catch limits. Icefish fisheries are recruitment-driven, and the two fisheries have had little interest in harvest in recent years.

The Antarctic Area is noteworthy among FAO Major Fishing Areas due to the fact that all assessed stocks are considered sustainably fished. Moreover, these stocks account for 100 percent of the total landings in the area. This success can be attributed to robust management practices, comprehensive catch reporting and effective international cooperation, especially since the area involves transboundary fisheries. Furthermore, the strong capacity for stock assessments is underscored by the predominance of Tier 1 stocks among those evaluated.

TABLE D.16.4
TOTAL LANDINGS OF ASSESSED STOCKS AND THEIR STATUS IN 2021 FOR AREAS 48, 58 AND 88

Species	CCAMLR Subarea or Division	Last calendar year of reported catch	CCAMLR assessment category	CCAMLR status as of 1 October 2024	FAO Tier and (metric category)	FAO status classification
Euphausia superba	48.1 to 48.4	2024	2[4]	Above target	1 (3)	Underfished
	48.5	1991		Not assessed		
	48.6	1993		Not assessed		
	58.4.1	2017	2[4]	Above target	1 (3)	Underfished
	58.4.2	2019	2[4]	Above target	1 (3)	Underfished
	58.4.3	1979		Not assessed		
	58.4.4	1979		Not assessed		
	88.1	1990		Not assessed		
	88.2	1980		Not assessed		
	88.3	1991		Not assessed		
Champsocephalus gunnari	48.2	1990		Commercial fishing prohibited		
	48.3	2018	1	Above target	1 (2)	Underfished
	58.5.1	2017		Not assessed		
	58.5.2	2024	1	Near target	1 (2)	Underfished
Dissostichus eleginoides	48.1	Never commercially fished		Commercial fishing prohibited		
	48.2	Never commercially fished		Commercial fishing prohibited		
	48.3[1]	2024	1	Near target	1 (2)	Underfished
	48.4	2024	1	Above target	1 (2)	Underfished
	58.4.3a outside areas of national jurisdiction	2018		Closed fishery with catch limit of zero tonnes		
	58.4.3b	2009		Not assessed		
	58.4.4a	2000		Not assessed		
	58.4.4b	2020		Not assessed		
	58.5.1[2]	2024	1	Near target	1 (2)	Underfished
	58.5.2 within areas of national jurisdiction	2024	1	Below target	1 (2)	Maximally Sustainably Fished
	58.5.2 outside areas of national jurisdiction	Never commercially fished		Commercial fishing prohibited		
	58.6[2]	2024	1	Above target	1 (2)	Underfished
	58.7[2]	2024		Not assessed		

[1] Catch and effort data from fishing for ***Dissostichus eleginoides*** in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. This fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

[2] This stock is managed by national authorities.

[3] Annual research fishing occurs, with catches reported through 2024.

[4] CCAMLR assessment categories for krill will be refined in 2025 by the working groups of the Scientific Committee.

TABLE D.16.4
(CONTINUED)

Species	CCAMLR Subarea or Division	Last calendar year of reported catch	CCAMLR assessment category	CCAMLR status as of 1 October 2024	FAO Tier and (metric category)	FAO status classification
Dissostichus mawsoni	48.1	Never commercially fished		Commercial fishing prohibited		
	48.2	Never commercially fished		Commercial fishing prohibited		
	48.4	2024	3	Near target	2 (3)	**Underfished**
	48.5	Never commercially fished		Commercial fishing prohibited		
	48.6	2024	3	Near target	2 (3)	**Maximally Sustainably Fished**
	58.4.1	2018		Commercial fishing prohibited		
	58.4.2	2024	3	Near target	2 (3)	**Underfished**
	58.4.3b outside areas of national jurisdiction	2010		Closed fishery with catch limit of zero tonnes		
	88.1 and 88.2AB	2024	1	Above target	1 (2)	**Underfished**
	88.2C-G and H	2024	3	Near target	2 (3)	**Maximally Sustainably Fished**
	88.3[3]	Never commercially fished		Commercial fishing prohibited		

[1] Catch and effort data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. This fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

[2] This stock is managed by national authorities.

[3] Annual research fishing occurs, with catches reported through 2024.

[4] CCAMLR assessment categories for krill will be refined in 2025 by the working groups of the Scientific Committee.

Notes: Current research fishing and fisheries that operated before the CAMLR Convention entered into force are not included. 'Near target' indicates stocks with biomasses (CCAMLR Assessment Categories 1 and 2) or harvest rates (CCAMLR Assessment Category 3) currently or projected to be within ±5 percent of established CCAMLR targets. 'Above target' and 'below target' indicate stocks with biomasses or harvest rates outside of this range. Target biomasses are 50 percent (60 percent in Division 58.5.1) of unfished spawning biomass for *Dissostichus* spp. and 75 percent of unfished biomass for *Euphausia superba* and *Champsocephalus gunnari*. CCAMLR category 1 assessments are integrated stock assessments (*Dissostichus* spp.) or two-year projections based on the results of recent trawl surveys *(Champsocephalus gunnari)*. CCAMLR category 2 assessments *(Euphausia superba)* are 20-year projections based on the results of hydroacoustic surveys conducted more than five years in the past. CCAMLR category 3 assessments *(Dissostichus* spp.) are trend analyses of catch per unit effort or mark-recapture estimates of vulnerable biomass, with target harvest rates of 4 percent for toothfish in category 3. FAO status is determined on the basis of indicated FAO metric as of 1 October 2024 from FAO (2011). Blank indicates no information available.

Source: CCAMLR. 2024. Report of the Forty-third Meeting of the Scientific Committee (Hobart, Australia, 14 to 18 October 2024). CCAMLR Document SC-CAMLR-43. **https://meetings.ccamlr.org/system/files/meeting-reports/e-sc-43-rep.pdf**

TABLE D.16.5
STATUS OF STOCKS IN THE CCAMLR AREA FOR SPECIES THAT WERE NOT COMMERCIALLY HARVESTED AS OF 1 OCTOBER 2024. RESEARCH FISHING IS NOT INCLUDED.

Species or family	CCAMLR Subarea or Division	Last year of reported catch	CCAMLR assessment category	CCAMLR status	FAO status
Lithodidae	48.2	2010		Not assessed	
	48.3	2010		Not assessed	
Martialia hyadesi	48.3	2001		Not assessed	
Macrouridae	58.4.3a	2004		Not assessed	
	58.4.3b	2004		Not assessed	
Channichthyidae	48.3	1986		Not assessed	
Chaenocephalus aceratus	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	Never commercially fished		Commercial fishing prohibited	
Chaenodraco wilsoni	58.4.2	2004		Not assessed	
Pseudochaenichthys georgianus	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	Never commercially fished		Commercial fishing prohibited	
Nototheniidae	48.3	1980		Not assessed	
	58.4.4	1979		Not assessed	
	58.5	1978		Not assessed	
	58.6	1983		Not assessed	
Lepidonotothen kempi	58.4.2	2004		Not assessed	
Trematomus eulepidotus	58.4.2	2004		Not assessed	
Pleuragramma antarcticum	58.4.2	2004		Not assessed	
Gobionotothen gibberifrons	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	1988		Commercial fishing prohibited	
	48.3	Never commercially fished		Commercial fishing prohibited	

TABLE D.16.5
(CONTINUED)

Species or family	CCAMLR Subarea or Division	Last year of reported catch	CCAMLR assessment category	CCAMLR status	FAO status
Lepidonotothen squamifrons	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	Never commercially fished		Commercial fishing prohibited	
	58.4.4a except for waters adjacent to the Prince Edward Islands	Never commercially fished		Commercial fishing prohibited	
	58.4.4b	Never commercially fished		Commercial fishing prohibited	
Notothenia rossii	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	1985		Commercial fishing prohibited	
Patagonotothen guntheri	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	1988		Commercial fishing prohibited	
Myctophidae	88.3	1988		Not assessed	
Electrona carlsbergi	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	
	48.3	1991		Commercial fishing prohibited	
Sharks	all	Never commercially fished		Commercial fishing prohibited	
All other finfishes	48.1	Never commercially fished		Commercial fishing prohibited	
	48.2	Never commercially fished		Commercial fishing prohibited	

Source: CCAMLR. 2024. Report of the Forty-third Meeting of the Scientific Committee (Hobart, Australia, 14 to 18 October 2024). CCAMLR Document SC-CAMLR-43. https://meetings.ccamlr.org/system/files/meeting-reports/e-sc-43-rep.pdf

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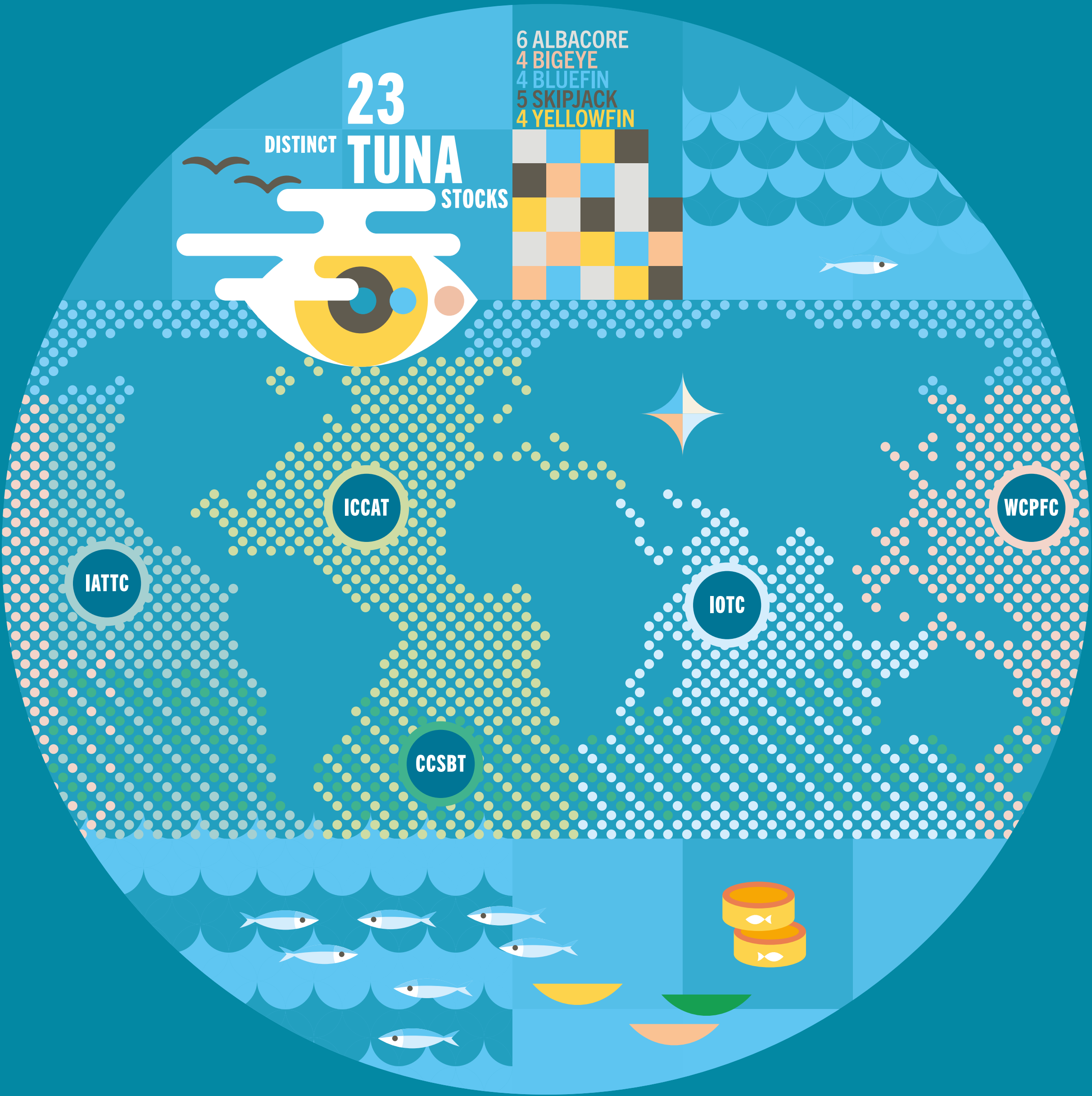
PART E



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Special topics: Part E, Chapter 1 (E.1)

GLOBAL TUNA FISHERIES:
TRENDS, STATUS AND MANAGEMENT

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1. OVERVIEW

Among the seven major commercial species of oceanic tuna, 23 distinct stocks are recognized for stock assessment and management (6 albacore, 4 bigeye, 4 bluefin, 5 skipjack and 4 yellowfin tuna stocks) by the five tuna regional fisheries management organizations (the Commission for the Conservation of Southern Bluefin Tuna [CCSBT], the Inter-American Tropical Tuna Commission [IATTC], the International Commission for the Conservation of Atlantic Tunas [ICCAT], the Indian Ocean Tuna Commission [IOTC], and the Western and Central Pacific Fisheries Commission [WCPFC]). This document reviews tuna catch by species and gear type, summarizes the status of the stocks based on the most recent scientific assessments, and outlines the current management measures adopted by tuna regional fisheries management organizations (RFMOs). The chapter is structured by RFMOs to provide readers with a comprehensive view of the fisheries operating across each region.

Since the onset of large-scale commercial exploitation in the 1950s, global tuna catches have steadily risen, reaching 1 million tonnes in the mid-1960s, 2 million tonnes in the mid-1980s, 3 million tonnes in 1990, 4 million tonnes in the late 1990s, 5 million tonnes in 2014, and finally topping out at 5.4 million tonnes in 2019. The global tuna catch has been stable at around 5 million tonnes since then. In 2023, the latest available data, the global tuna catch was approximately 5.2 million tonnes.

The majority of tuna catches are attributed to skipjack tuna (57 percent), followed by yellowfin tuna (31 percent), bigeye tuna (7 percent), albacore tuna (4 percent), and three species of bluefin tuna (1 percent).

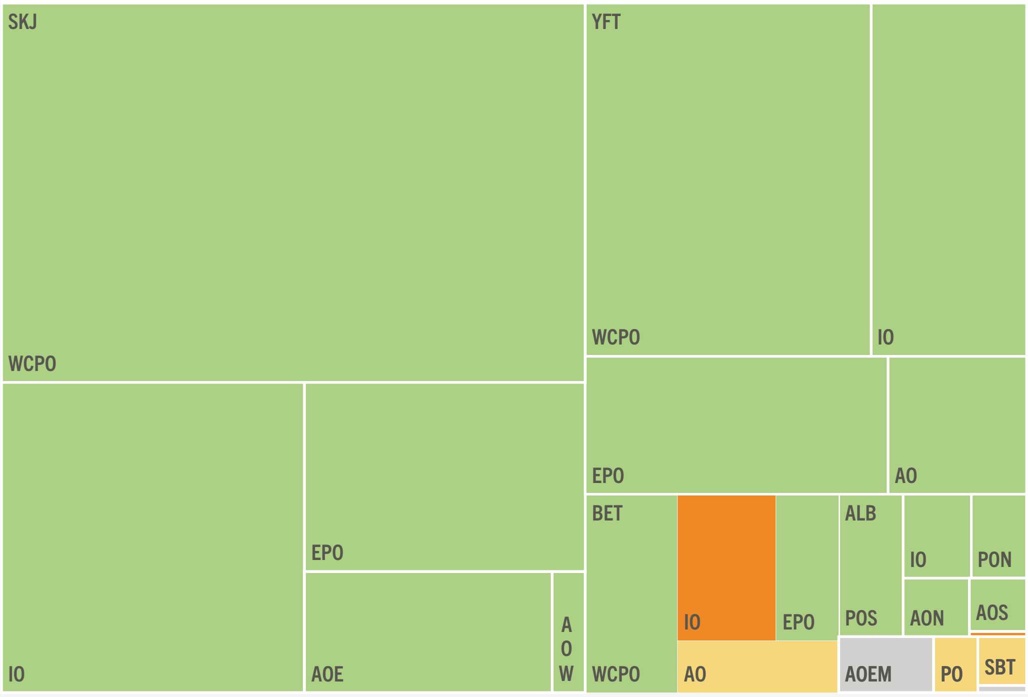
In terms of fishing methods, purse seining accounts for 66 percent of global tuna catches, while longlines (9 percent), pole-and-line (7 percent), gillnets (4 percent) and other miscellaneous gear (14 percent) make up the remainder (FIGURE E.1.1). Purse seine catches are further categorized into associated sets (38 percent), unassociated sets (25 percent), and dolphin sets (3 percent).

In 2023 the Pacific Ocean yielded the highest catches of principal market tuna species, contributing approximately 66 percent of the total. This was followed by the Indian Ocean, which accounted for around 23 percent, and the Atlantic Ocean and adjacent seas, with a contribution of about 11 percent.

Globally, based on the most recent stock status adopted by tuna RFMOs, 16 out of 23 stocks are not overfished and overfishing is not occurring, 5 stocks are overfished but overfishing is not occurring (i.e. are in a state of rebuilding), and 2 stocks are overfished and overfishing is occurring (**TABLE E.1.1**).

Similarly, in relation to catch, 95 percent of the total catch comes from sustainable stocks – that is, stocks that are not overfished and where overfishing is not occurring. This is due to the fact that skipjack tuna stocks contribute more than half of the global catch of tunas, and all are in healthy conditions. In contrast, two bluefin tuna stocks, two bigeye tuna stocks and one albacore tuna stock are overfished; accounting for the 5 percent of the total catch that comes from overfished stocks (**FIGURE E.1.1**).

FIGURE E.1.1
CATCH PERCENTAGE OF THE TOTAL CATCH BY STOCK IN 2023



Notes: (1) Each stock is represented by a rectangle, where the colour indicates its status and the size represents its catch. (2) Green = not overfished and overfishing not occurring, Yellow = overfished and overfishing not occurring, Red = overfished and overfishing occurring, Grey = unknown. (3) ALB: albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)*, SKJ: skipjack tuna *(Katsuwonus pelamis)*, BFT: Atlantic bluefin tuna *(Thunnus thynnus)*, PBF: Pacific bluefin tuna *(Thunnus orientalis)*, and SBT: southern bluefin tuna *(Thunnus maccoyii)*. (4) AO: Atlantic Ocean, AOE: Eastern Atlantic Ocean, AOW: Western Atlantic Ocean, AON: North Atlantic Ocean, AOS: South Atlantic Ocean, EPO: Eastern Pacific Ocean, PO: Pacific Ocean, PON: North Pacific Ocean, POS: South Pacific Ocean, WCPO: Western and Central Pacific Ocean, IO: Indian Ocean.

Sources: CCSBT, IATTC, ICCAT, IOTC, ISC,[1] WCPFC nominal catch public datasets and Scientific Committee reports for stock status (for more details see the section on tuna catch data and management).

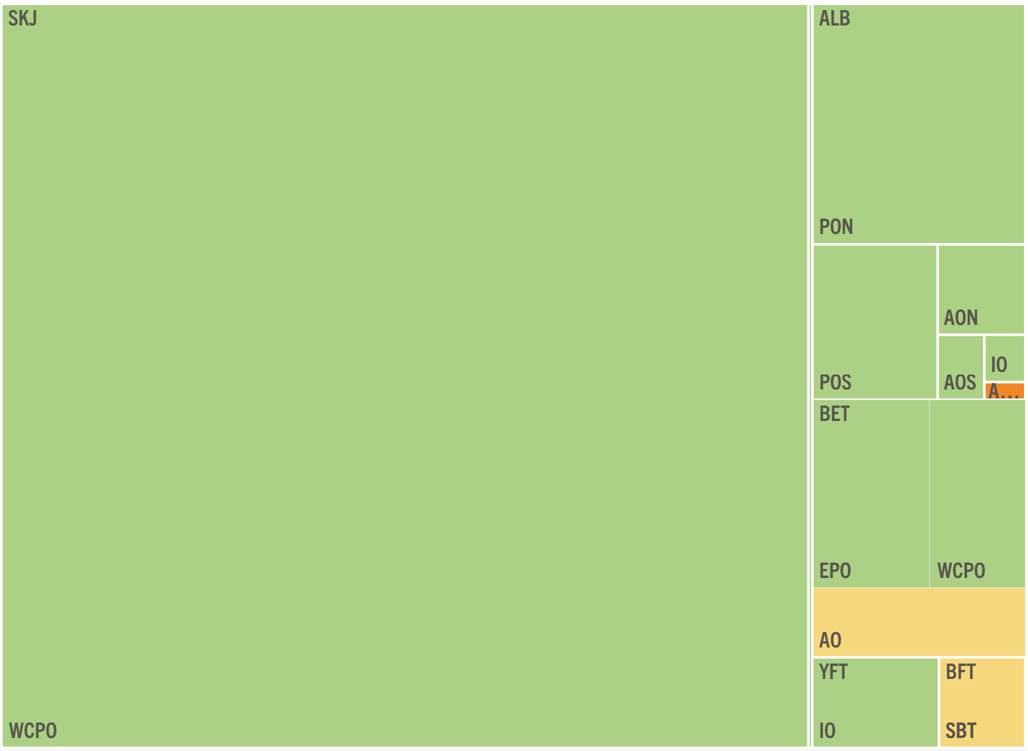
The estimated maximum sustainable yield (MSY) of all tuna populations across the 23 commercial tuna stocks totals approximately 6.3 million tonnes. In 2023, the total catch from these 23 populations was 5.2 million tonnes. **FIGURE E.1.2** illustrates the difference between the catch and MSY for each stock, with each stock represented by a rectangle: the colour indicates its status, while the size reflects the difference. The bigeye, yellowfin, bluefin and albacore tuna populations are fished at MSY levels, while skipjack tuna could in theory generate higher yields, particularly in the WCPFC. However, in the WCPFC, which is the region primarily responsible for the difference between total catch and potential total MSY level (e.g. there is a 1 million tonne difference between the catch and MSY of WCPFC skipjack tuna), a target reference point and management procedure

[1] International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

for skipjack tuna has been established, and fishing is already occurring at that MSY level, meaning further increases would not be feasible under the current management regime. Additionally, since almost all skipjack tuna fishing is done with fish aggregating devices (FADs), an increase in skipjack tuna catches would likely lead to higher bigeye and yellowfin catches, which would be detrimental to these species.

In conclusion, the current scenario implies a need to maintain yields, with limited prospects for increasing yields in the future. It appears that the maximum catch under the current tuna management framework has either been reached or is close to being reached; therefore, further increases in catches are not likely.

FIGURE E.1.2
DIFFERENCE BETWEEN CURRENT CATCH AND MSY PER STOCK



Notes: (1) Each stock is represented by a rectangle, where the colour indicates its status and the size represents the difference between current catch and MSY, only for those stocks where the difference is positive. (2) Green = not overfished and overfishing not occurring, Yellow = overfished and overfishing not occurring, Red = overfished and overfishing occurring. (3) ALB: albacore tuna *(Thunnus alalunga),* BET: bigeye tuna *(Thunnus obesus),* YFT: yellowfin tuna *(Thunnus albacares),* SKJ: skipjack tuna *(Katsuwonus pelamis),* BFT: Atlantic bluefin tuna *(Thunnus thynnus),* PBF: Pacific bluefin tuna (*Thunnus orientalis*), and SBT: southern bluefin tuna *(Thunnus maccoyii).* (4) AO: Atlantic Ocean, AOE: Eastern Atlantic Ocean, AOW: Western Atlantic Ocean, AON: North Atlantic Ocean, AOS: South Atlantic Ocean, EPO: Eastern Pacific Ocean, PO: Pacific Ocean, PON: North Pacific Ocean, POS: South Pacific Ocean, WCPO: Western and Central Pacific Ocean, and IO: Indian Ocean.

Sources: CCSBT, IATTC, ICCAT, IOTC, ISC, WCPFC nominal catch public datasets and Scientific Committee reports for stock status (for more details see the section on tuna catch data and management).

FAO uses different criteria to determine the stock status of fish populations compared to those used by tuna RFMOs. The FAO Blue Transformation roadmap (FAO, 2022) aims to maximize opportunities within aquatic food systems to enhance food security and maintaining fish stocks at levels capable of producing MSY. Thus, the FAO methodology's targets focus on ensuring food security and maximizing catches at MSY (Hilborn, 2010). FAO criteria include a buffer around biomass corresponding to MSY. According to these criteria, when a stock is between 0.8 SSB/SSB_{MSY} and 1.2 SSB/SSB_{MSY}, it is considered "maximally sustainably fished", meaning that production can be sustainably maintained but not grow. If it is greater than 1.2, the stock is classified as "underfished", whether it

TABLE E.1.1
COMPARISON OF TUNA POPULATIONS' STOCK STATUS BASED ON TUNA RFMO CRITERIA AND FAO CRITERIA WHEN ONLY CONSIDERING THE BIOMASS OF THE STOCK (I.E. NOT THE FISHING MORTALITY COMPONENT) IN 2024

Name	Stock	RFMO	Species	FAO criteria	RFMO
Albacore tuna	Northern Atlantic	ICCAT	*Thunnus alalunga*	Underfished	Not overfished
Albacore tuna	Southern Atlantic	ICCAT	*Thunnus alalunga*	Underfished	Not overfished
Albacore tuna	Mediterranean	ICCAT	*Thunnus alalunga*	Overfished	Overfished
Atlantic bluefin tuna	Eastern Atlantic and Mediterranean	ICCAT	*Thunnus thynnus*	Maximally sustainably fished	Overfishing not occurring
Atlantic bluefin tuna	Western Atlantic	ICCAT	*Thunnus thynnus*	Maximally sustainably fished	Overfishing not occurring
Bigeye tuna	Atlantic	ICCAT	*Thunnus obesus*	Maximally sustainably fished	Overfished
Skipjack tuna	Eastern Atlantic	ICCAT	*Katsuwonus pelamis*	Underfished	Not overfished
Skipjack tuna	Western Atlantic	ICCAT	*Katsuwonus pelamis*	Underfished	Not overfished
Yellowfin tuna	Atlantic	ICCAT	*Thunnus albacares*	Underfished	Not overfished
Albacore tuna	Indian	IOTC	*Thunnus alalunga*	Underfished	Not overfished
Bigeye tuna	Indian	IOTC	*Thunnus obesus*	Maximally sustainably fished	Overfished
Skipjack tuna	Indian	IOTC	*Katsuwonus pelamis*	Underfished	Not overfished
Yellowfin tuna	Indian	IOTC	*Thunnus albacares*	Maximally sustainably fished	Not overfished
Albacore tuna	North Pacific	WCPFC/IATTC	*Thunnus alalunga*	Underfished	Not overfished
Albacore tuna	South Pacific	WCPFC/IATTC	*Thunnus alalunga*	Underfished	Not overfished
Pacific bluefin tuna	North Pacific	WCPFC/IATTC	*Thunnus orientalis*	Maximally sustainably fished	Overfished
Bigeye tuna	Western and Central Pacific	WCPFC	*Thunnus obesus*	Underfished	Not overfished
Yellowfin tuna	Western and Central Pacific	WCPFC	*Thunnus albacares*	Underfished	Not overfished
Skipjack tuna	Western and Central Pacific	WCPFC	*Katsuwonus pelamis*	Underfished	Not overfished
Bigeye tuna	Eastern Pacific	IATTC	*Thunnus obesus*	Maximally sustain-ably fished	Not overfished
Yellowfin tuna	Eastern Pacific	IATTC	*Thunnus albacares*	Underfished	Not overfished
Skipjack tuna	Eastern Pacific	IATTC	*Katsuwonus pelamis*	Underfished	Not overfished
Southern bluefin tuna	CCBFT convention area	CCSBT	*Thunnus maccoyii*	Maximally sustainably fished	Overfished

is because of a deliberate management choice for precautionary reasons or because the fishery has not yet reached maximum sustainable production, and if it is less than 0.8, it is considered "overfished" (**PART B, METHODOLOGY**, pp. 6). This difference in criteria explains potential discrepancies in stock status determination between FAO and this chapter (**TABLE E.1.1**). For the purpose of this report, the reference year for the assessments is 2021. However, this chapter presents the most up-to-date data on tuna populations as of 2024. In 2021, Pacific bluefin, Southern bluefin, and Mediterranean albacore tuna were all classified as overfished according to FAO criteria. By 2024, only Mediterranean albacore tuna remained in the overfished category. The status of the other tuna stocks remained unchanged, except for yellowfin tuna, which shifted from being classified as fished at a maximally sustainable level in 2021 to underfished in 2024, based on FAO criteria.

2. INTRODUCTION

Tuna and tuna-like species are important socioeconomic resources as well as a significant source of protein for society (Pew, 2020; Guillotreau *et al.,* 2017). Therefore, tuna fisheries play a crucial role in the global seafood industry, providing a vital source of food, employment and economic value to many coastal nations (FAO, 2024). Tuna are among the most commercially valuable fish, with millions of tonnes caught annually to meet the demand for fresh, frozen and canned products (FAO, 2024). These fisheries support livelihoods in both developed and developing countries, particularly in the Pacific, Atlantic and Indian Oceans (Bell *et al.,* 2015). Effectively managing global tuna populations is challenging due to their high value that generates a strong economic incentive, which can lead to overfishing and illegal fishing practices. Additionally, climate change presents another challenge, as it affects the productivity and distribution of these highly migratory populations (Erauskin-Extramiana *et al.,* 2019; Bell *et al.,* 2021). Thus, international cooperation is key to ensuring sustainable fishing and compliance with regulations.

There are seven major commercial oceanic tuna species, which are extensively harvested. These species are albacore *(Thunnus alalunga,* ALB), bigeye *(Thunnus obesus,* BET), yellowfin *(Thunnus albacares,* YFT), skipjack *(Katsuwonus pelamis,* SKJ), and the three species of bluefin tuna, Atlantic bluefin *(Thunnus thynnus,* BFT), Pacific bluefin *(Thunnus orientalis,* PBF) and southern bluefin *(Thunnus maccoyii,* SBT). These species can perform long migrations and their spatial distribution includes temperate and tropical regions of all oceans (Collette *et al.,* 2001). Based on their distribution and habitat preferences, tunas are categorized into "temperate" and "tropical" species (Block and Stevens, 2001). The temperate tunas, including bluefins and albacore, can inhabit waters as cold as 10 °C but are also found in warmer tropical regions. Conversely, tropical tunas such as skipjack tuna and yellowfin tuna thrive in waters above 18 °C, while bigeye tuna exhibit intermediate habitat preferences (Korsmeyer and Dewar, 2001). The biological characteristics, migratory patterns and growth rates of these species directly impact fishery management strategies and stock assessments (**BOX E.1.1**).

Various industrial fleets, along with artisanal fleets from coastal states, catch these species in the three oceans (ISSF, 2024). They are then landed and processed in multiple locations worldwide, traded on a global market, and ultimately consumed around the world. Over the past decades, tuna catches have exhibited a consistent upward trend, stabilizing in the early 2000s before resuming growth in recent years (**FIGURE E.1.3**). The global annual catches of commercial tunas have continuously increased over time since the beginning of their exploitation in the 1950s, reaching 1 million tonnes in the mid-1960s, 2 million tonnes in the mid-1980s, 3 million tonnes in 1990, 4 million tonnes in the late 1990s, 5 million tonnes in 2014, and finally topping out at approximately 5.4 million tonnes in 2019 (**FIGURE E.1.3**). The global tuna catch has remained stable at around 5 million tonnes since then. In 2023, the global tuna catch was approximately 5.2 million tonnes. The majority of tuna catches are attributed to skipjack tuna (57 percent), followed by yellowfin tuna (31 percent), bigeye tuna (7 percent), albacore tuna (4 percent) and bluefin tuna (1 percent).

In 2023 the Pacific Ocean yielded the highest catches of principal market tuna species, contributing approximately 66 percent of the total. This was followed by the Indian Ocean, which accounted for around 23 percent, and the Atlantic Ocean and adjacent seas, which contributed the remaining 11 percent.

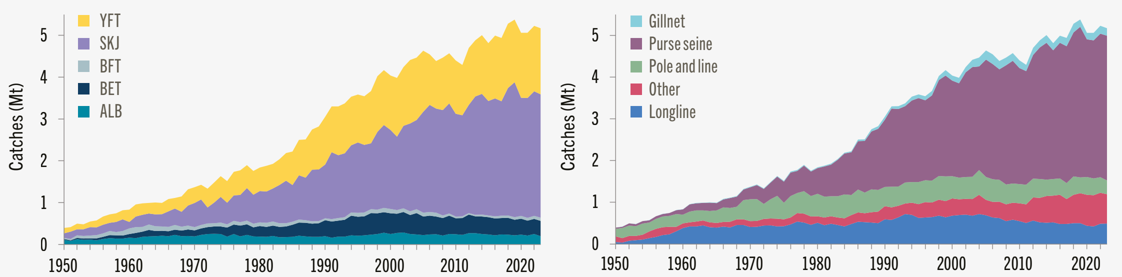
In terms of fishing methods, purse seining accounts for 66 percent of global tuna catches, while longlines (9 percent), pole-and-line (7 percent), gillnets (4 percent) and other miscellaneous gear (14 percent) make up the remainder (**FIGURE E.1.3**). Purse seine catches are further categorized into associated sets (38 percent), unassociated sets (25 percent), and dolphin sets (3 percent).

The relative contribution of each gear to total tuna catches has changed over time. In the 1950s, most catches were taken with trolling and pole-and-line gear, accounting for 20 percent and 40 percent of the total catch, respectively. However, their share declined rapidly with the expansion of longline fleets, which accounted for around 50 percent of catches by 1960. By that time, the contribution of trolling and pole-and-line gear had decreased to 7 percent and 25 percent, respectively. Purse-seine gear accounted for 15 percent of total catches at this time.

From 1960 onward, longline contributions gradually declined to around 30 percent by 1970 and remained at that level until the mid-1980s. Meanwhile, pole-and-line maintained a 30 percent share until the early 1980s, while purse-seine contributions continued to rise, reaching 40 percent of total catches by the 1980s. The continuous increase in total catches since then has primarily been driven by the expansion of purse-seine fisheries. In recent years, purse-seine gear has contributed approximately 65 percent of total catches (**FIGURE E.1.3**).

Longline catches increased steadily from 1950, peaking at about 0.7 million tonnes in 1993. Since then, they have fluctuated between 0.6 million tonnes and 0.7 million tonnes until 2007, and between 0.42 million tonnes and 0.55 million tonnes thereafter. Similarly, pole-and-line catches increased from 1950, reaching a record high of approximately 0.6 million tonnes in 1984, before declining to 0.4 million tonnes by 2014, where they have since remained. In contrast, purse-seine catches have steadily increased from 1950 to 2023, reaching an all-time high of around 3.6 million tonnes in 2019 (**FIGURE E.1.3**).

FIGURE E.1.3
THE GLOBAL CATCH IN MILLION TONNES (MT) OF MAJOR COMMERCIAL TUNA SPECIES, BY SPECIES (LEFT) AND GEAR (RIGHT) FOR THE PERIOD 1950–2023



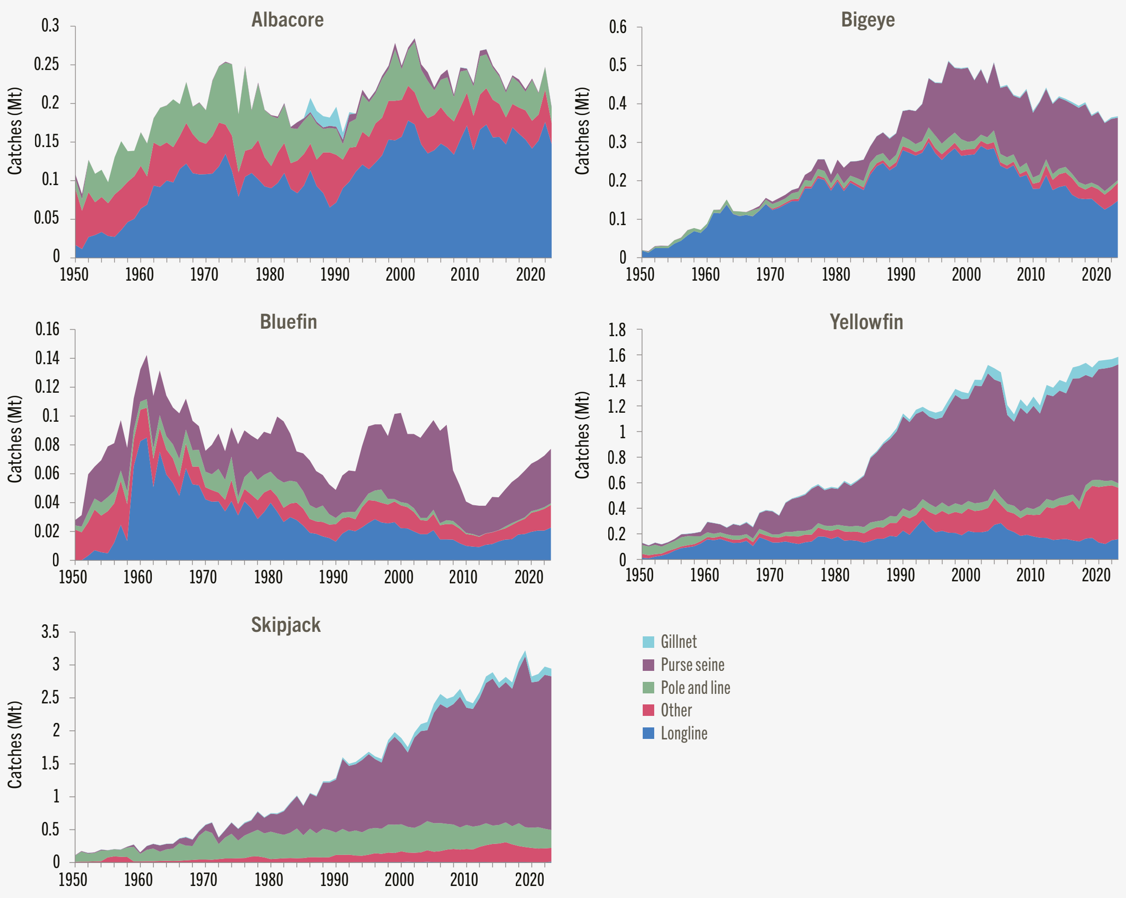
Notes: (1) ALB: albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)*, SKJ: skipjack tuna *(Katsuwonus pelamis)*, and 3 BFTs: Atlantic bluefin *(Thunnus thynnus)*, Pacific bluefin *(Thunnus orientalis)* and southern bluefin tuna *(Thunnus maccoyii)*. (2) Data expressed in live weight equivalent.

Sources: CCSBT, IATTC, ICCAT, IOTC, ISC, WCPFC nominal catch public datasets and Scientific Committee reports for stock status (for more details see the section on tuna catch data and management).

Regarding the contribution of different gears to the catch of temperate and tropical tunas, the temporal trend of gear use in tropical tuna fisheries closely mirrors the overall trend described above. However, for temperate tunas, the contribution of different gears has remained relatively stable since 1960. The primary gears targeting temperate tunas are longline and pole-and-line, though the contribution of purse seine has slightly increased in recent years, particularly for bluefin tunas.

The increasing trend in total tuna catch is primarily due to the expansion of tropical tuna fisheries (**FIGURE E.1.4**). In fact, the tropical tuna catch has risen continuously since 1950, reaching the highest recorded level in the time series in 2019, at approximately 5 million tonnes. A similar increasing trend is observed for each tropical tuna species. For example, the yellowfin tuna catch peaked at around 1.5 million tonnes in 2003, then declined to 1.2 million tonnes in 2009 before rising again to a new record high of 1.6 million tonnes in 2023. Meanwhile, the skipjack tuna catch reached its highest level in 2019, with a total of about 3.2 million tonnes, and has remained at around 3 million tonnes since then (**FIGURE E.1.4**). However, bigeye tuna followed a different trend, with catches peaking at approximately 510 000 tonnes in 1997, then declining to around 400 000 tonnes until 2013 and stabilizing between 370 000 tonnes and 400 000 tonnes thereafter.

FIGURE E.1.4
THE GLOBAL CATCH IN MILLION TONNES (MT) OF MAJOR COMMERCIAL TUNA SPECIES BY GEAR FOR EACH SPECIES FOR THE PERIOD 1950–2023



Notes: (1) Data expressed in live weight equivalent. (2) Bluefin tuna catches include Atlantic bluefin *(Thunnus thynnus)*, Pacific bluefin *(Thunnus orientalis)* and southern bluefin *(Thunnus maccoyii)*.

Source: CCSBT, IATTC, ICCAT, IOTC, ISC, WCPFC nominal catch public datasets and Scientific Committee reports for stock status (for more details see section on tuna catch data and management).

The catch history of temperate tunas differs from that of tropical tunas. Their catches also increased from 1950, reaching a peak of around 380 000 tonnes in 1999 (**FIGURE E.1.4**). Since then, however, they have followed a declining trend, reaching the third-lowest level since 1999 at approximately 270 000 tonnes in 2023. This downward trend is also observed in albacore and the three bluefin tuna species. For instance, the albacore tuna catch steadily increased until reaching a record high of 280 000 tonnes in 2002, then declined and has remained between 200 000 tonnes and 250 000 tonnes since. The three bluefin tuna species show a different historical pattern. Their catches increased until a record high of approximately 140 000 tonnes early in the time series in 1961, followed by a general decline until 1993. At that point, an upward trend began, reaching 100 000 tonnes in 2000. Since then, catches have decreased again, hitting a record low of 38 000 tonnes in 2013 – the lowest level since 1951. However, since 2013 catches have been increasing due to population recovery, and in 2023 the total catch of the three species reached approximately 80 000 tonnes (**FIGURE E.1.4**).

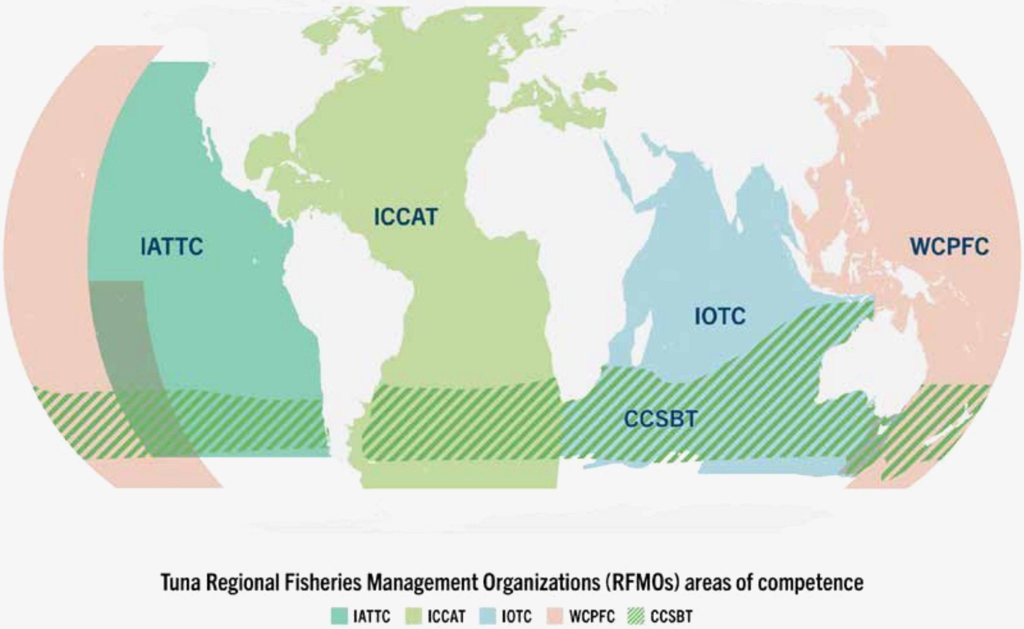
For management purposes, 23 stocks of oceanic tuna species are recognized. The Atlantic Ocean has three albacore tuna stocks: North Atlantic, South Atlantic, and Mediterranean. In the Pacific there are two albacore tuna stocks, one in the North Pacific and another in the South Pacific, while the Indian Ocean has a single stock. Atlantic bluefin tuna is divided into two stocks: a western stock and an eastern stock, which includes the Mediterranean Sea. Pacific bluefin tuna consists of a single stock, as does southern bluefin tuna, which inhabits the southern regions of all three oceans. For bigeye and yellowfin tunas, the Pacific Ocean is divided into two stocks – eastern and western – whereas both the Atlantic and Indian Oceans each have a single stock. Similarly, skipjack tuna is managed as two stocks in both the Pacific and Atlantic Oceans (eastern and western, respectively), while the Indian Ocean has a single stock (see **BOX E.1.1**).

Given the economic and ecological significance of tuna, international organizations, such as the five tuna regional fisheries management organizations (RFMOs), manage tuna stocks to prevent overexploitation and achieve sustainable fishing practices (Allen, 2010; De Bruyn *et al.,* 2013). Scientific committees within each tuna RFMO conduct annual stock assessments based on data related to abundance, fishing effort and environmental factors, and provide scientific advice for management decisions. Ultimately, the Commissions of these organizations adopt binding management measures that each member implements. The five tuna RFMOs are (**FIGURE E.1.5**):

- The **Inter-American Tropical Tuna Commission (IATTC)**, responsible for the management of tunas in the Eastern Pacific Ocean.
- The **International Commission for the Conservation of Atlantic Tunas (ICCAT)**, responsible for the management of tunas in the Atlantic Ocean and Mediterranean Sea.
- The **Commission for the Conservation of Southern Bluefin Tuna (CCSBT)**, responsible for the conservation of southern bluefin tuna in the southern Atlantic, Indian and Pacific Oceans.
- The **Indian Ocean Tuna Commission (IOTC)**, responsible for the conservation of tunas in the Indian Ocean.
- The **Western and Central Pacific Fisheries Commission (WCPFC)**, responsible for the management of tunas in the Western and Central Pacific Ocean.

The purpose of this chapter is to review tuna catch by species and gear type, summarize the status of the stocks based on the most recent scientific assessments, and briefly describe the current management measures adopted by tuna RFMOs. The chapter is structured by ocean region to align with RFMO mandates to provide a comprehensive view of the fisheries operating across each region.

FIGURE E.1.5
COVERAGE OF TUNA RFMOS



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: United Nations Geospatial. 2020. Map geodata.

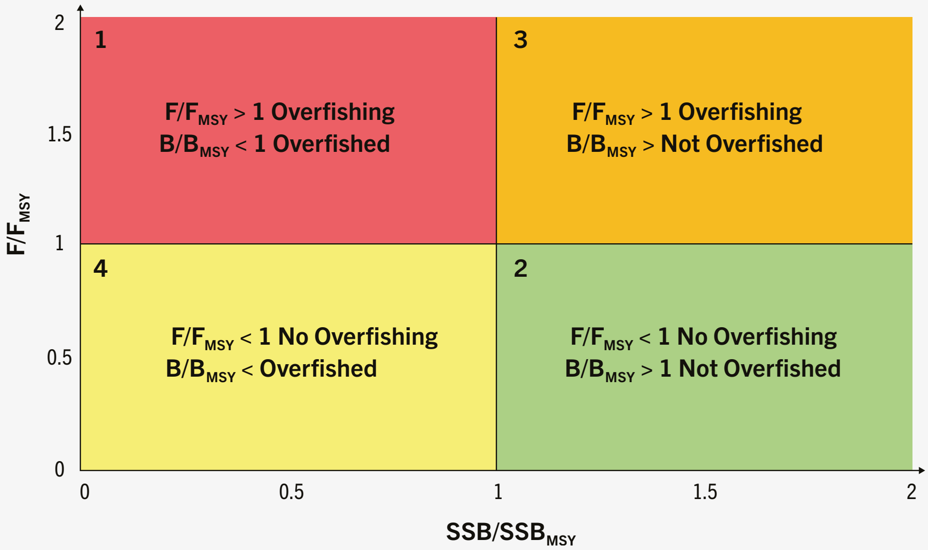
3. DATA AND METHODOLOGY

3.1 Stock status determination criteria

The assessment of tuna stock status relies on two primary indicators, the spawning stock biomass (SSB), usually defined as the total abundance of the female population, and the fishing mortality or exploitation rate (F). Stock status is estimated using biological and fishing mortality maximum sustainable yield (MSY) reference points commonly used in most of the tuna RFMOs: SSB/SSB_{MSY} defined as the spawning stock biomass (SSB) relative to the spawning stock biomass at MSY and F/F_{MSY} defined as the fishing mortality (F) relative to the F at which MSY can be obtained. As such, when the abundance of each stock falls below SSB_{MSY}, the stock is considered overfished in most tuna RFMOs and in this analysis. When the fishing mortality (F) exceeds F_{MSY}, tuna RFMOs consider that overfishing is occurring with the stock being at risk of becoming overfished.

Stock status is commonly represented by a Kobe plot, as produced by the scientific bodies of each tuna RFMO (**FIGURE E.1.6**). The Kobe plot represents SSB/SSB_{MSY} and F/F_{MSY} as references in a figure with four different zones, each representing a different stock status: (1) red zone, representing an overfished stock and that overfishing is occurring; (2) green zone, representing a situation where no overfishing is taking place and where the stock is not overfished; (3) orange zone, where overfishing is occurring while the stock is not overfished; and (4) yellow zone, where overfishing is not taking place but the stock is overfished.

FIGURE E.1.6
THE KOBE PLOT REPRESENTS SSB/SSB_{MSY} AND F/F_{MSY} AS REFERENCES IN A FIGURE, WHICH GIVES FOUR DIFFERENT ZONES, EACH REPRESENTING A DIFFERENT STOCK STATUS



Source: Adapted from IOTC Recommendation 14/07. https://openknowledge.fao.org/server/api/core/bitstreams/c7c94171-81c2-44a3-aee0-4399e410bb09/content

Moreover, for comparison, the FAO stock status classification – based solely on population abundance or biomass – is also included in each species-specific stock status determination. Since the FAO Blue Transformation roadmap (FAO, 2022) aims to maximize opportunities in aquatic food systems to enhance food security, FAO determines the stock status of fish populations in relation to maximizing catches at MSY. FAO criteria include a buffer around biomass corresponding to MSY. According to these criteria, when a stock is between 0.8 and 1.2 SSB/SSB_{MSY}, it is considered "maximally sustainably fished". If it is greater than 1.2, the stock is classified as "underfished", and if it is less than 0.8, it is considered "overfished" (see **PART B, METHODOLOGY**, pp. 6).

3.2 Tuna catch data and management

The annual tuna catch information in this document is sourced from the publicly available nominal catch data or the best available scientific estimates datasets from the respective tuna RFMOs, which are updated annually following each RFMO's scientific committee meeting:

- CCSBT. Annual catch by flag or gear from 1952 to 2023 inclusive. *SBT Data*. 2024. **https://www.ccsbt.org/en/content/sbt-data** (last access in October 2024).
- IATTC. EPO total estimated catch by year, flag, gear, species. *Public domain data for download*. 2024. **https://www.iattc.org/en-US/Data/Public-domain** (last access in October 2024).
- ICCAT. Nominal catch Task 1 Excel. *Access to ICCAT statistical databases*. 2024. **https://www.iccat.int/en/accesingdb.HTML** (last access in October, 2024).
- IOTC. Best scientific estimates of nominal retained catch data by species and gear. *IOTC Available Datasets*. 2025. **https://iotc.org/data/datasets** (last access in January 2025).
- WCPFC. Annual Catch Estimates 2023 – data files. *WCPFC Tuna Fishery Yearbook – Annual Catch Estimates*. 2024. **https://www.wcpfc.int/statistical-bulletins** (last access in October 2024); ISC. ISC24 Annual Catch Table. *Fisheries statistics*. 2024. **https://isc.fra.go.jp/fisheries_statistics/index.html** (last access in September 2024).

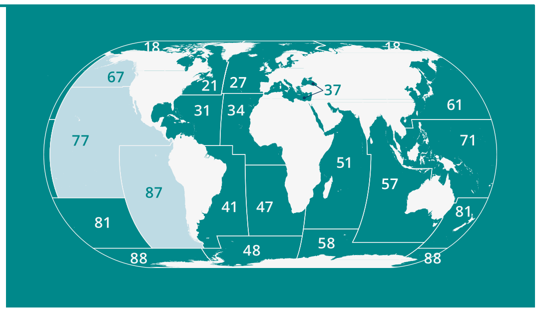
Catch data is presented by the following main gear type categories: *purse seine, longline, pole and line, gillnet,* and *other.* The nominal catch data for tunas used in this document covers up to the year 2023, as this is the most recent data currently available in publicly accessible tuna RFMO catch datasets.

In terms of management, tuna RFMOs are increasingly embracing management procedures (MP) (also known as harvest strategies), tested using management strategy evaluation (MSE), as a modern and precautionary management tool to ensure the sustainability of their tuna stocks (Punt *et al.,* 2016). The first tuna RFMO to adopt a management procedure was the CCSBT when it adopted one for the recovery of southern bluefin tuna in 2011 (Hillary *et al.,* 2016). Since then, the other tuna RFMOs have adopted management procedures, or in some instances harvest control rules , for several of their tuna stocks. The use of management procedures differs between RFMOs. For instance, while some RFMOs have adopted some elements of the management procedures (e.g. the harvest control rule), others have adopted them in full, including the monitoring strategy and the revision of exceptional circumstances (**BOX E.1.2**).

Thus, this chapter provides an overview of tuna stock status, global catches, and management strategies based on the most recent scientific assessments. It summarizes RFMO findings, highlighting stock-specific trends and conservation measures. The chapter is structured by ocean region to align with RFMO mandates, and catches are shown by different gear types. For the purpose of this report, the reference year for the assessments is 2021. However, this chapter presents the most up-to-date data on tuna populations as of 2024. In 2021, Pacific bluefin, Southern bluefin, and Mediterranean albacore tuna were all classified as overfished according to FAO criteria. By 2024, only Mediterranean albacore tuna remained in the overfished category. The status of the other tuna stocks remained unchanged, except for Atlantic yellowfin tuna , which shifted from being classified as fished at a maximally sustainable level in 2021 to underfished in 2024, based on FAO criteria.

4. STATUS AND TRENDS BY REGIONS

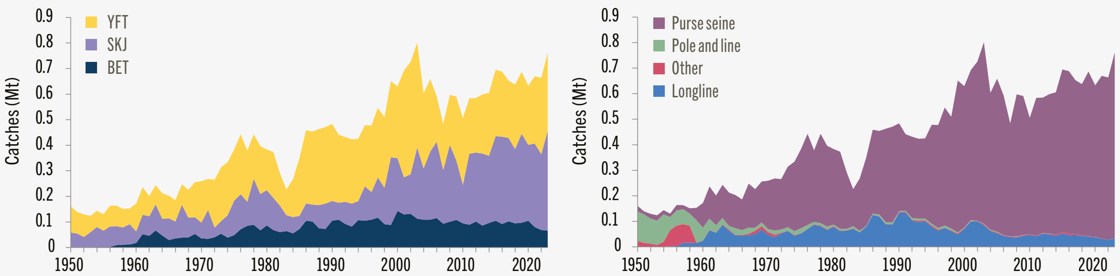
4.1 EASTERN PACIFIC OCEAN



Approximately 13 percent of the world's tuna production comes from the Eastern Pacific Ocean (EPO) – FAO Major Fishing Areas 67, 77 and 87. In 2023, catches of skipjack tuna, yellowfin tuna and bigeye tuna totaled around 761 800 tonnes, reflecting a 15 percent increase from 2022. The catch of tropical tunas in the EPO steadily increased since 1990s, reaching a record high of 800 000 tonnes in 2003. Total catches then declined until 2007 but have again been rising since, reaching the second-highest level in the entire time series in 2023 (FIGURE E.1.7). Catches of Pacific albacore tuna and Pacific bluefin tuna also occur in the EPO; however, these stocks are covered in the Western and Central Pacific Ocean section, as they are distributed there too.

Average annual tropical tuna catches for the last five-year period (2019–2023) totalled 683 100 tonnes. During this recent period, skipjack tuna accounted for 49 percent of the catches by weight, followed by yellowfin tuna (39 percent) and bigeye tuna (12 percent). Purse-seine vessels took 95 percent of the total catch, followed by longliners (5 percent). During this time the skipjack tuna catch continuously increased to peak at around 390 000 tonnes in 2023, the highest level on record. Meanwhile, the yellowfin tuna catch reached its highest level in 2002, with a total of about 410 000 tonnes, and decreased to around 230 000 tonnes in 2020, before increasing to 300 000 tonnes in 2023 (**FIGURE E.1.7**). However, bigeye tuna followed a different trend, with catches peaking at approximately 140 000 tonnes in 2000 and declining since then to 70 000 tonnes in 2023, the lowest catch since 1984.

FIGURE E.1.7
TRENDS IN CATCH IN MILLION TONNES (MT) OF BIGEYE TUNA, SKIPJACK TUNA AND YELLOWFIN TUNA IN THE EPO REGION, BY SPECIES (LEFT) AND GEAR (RIGHT) FROM 1950 TO 2023



Notes: (1) BET: bigeye tuna, SKJ: skipjack tuna, and YFT: yellowfin tuna. (2) Data in live weight equivalent.
Source: IATTC. EPO total estimated catch by year, flag, gear, species. Public domain data for download. 2024. https://www.iattc.org/en-US/Data/Public-domain [accessed on 25 October 2024].

4.1.1 Catches by species

BIGEYE TUNA

Bigeye tuna catches in 2023 were about 67 000 tonnes, a 2 percent decrease from 2022. Longline fishing dominated the catches in weight until the mid-1990s. However, in recent years purse-seine fishing accounts for a majority of the catch (71 percent), while longlining accounts for 29 percent (**FIGURE E.1.8**). Bigeye catches in the EPO by other gears are negligible.

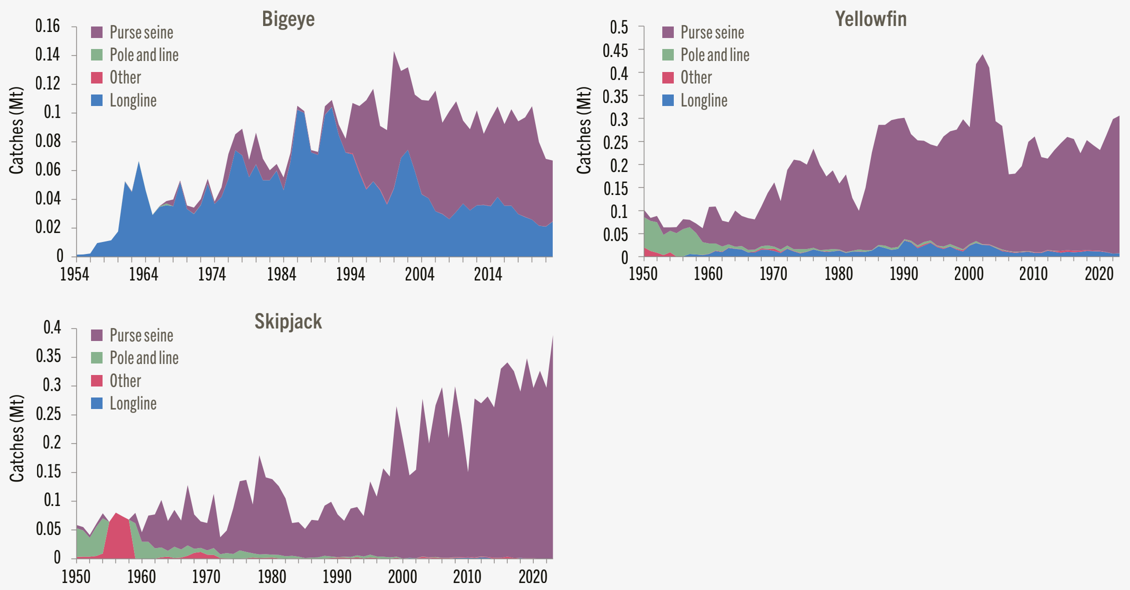
YELLOWFIN TUNA

The yellowfin tuna fishery started at the beginning of the 1920s. Until about 1960, fishing was dominated by pole-and-line vessels; however, in the early 1960s pole-and-line vessels were converted into purse seiners, which have been the main gear since then (96 percent of the catch). The recent catches by purse seiners were about 70 percent (300 000 tonnes) of the record high caught in 2002 of 412 000 tonnes (**FIGURE E.1.8**). Catches from longline vessels, although smaller in magnitude, have also declined substantially in recent years.

SKIPJACK TUNA

In 2023, skipjack tuna catches were about 388 800 tonnes, a 31 percent increase from 2022. Skipjack tuna catches in the EPO are notoriously variable (**FIGURE E.1.8**). Purse-seine fishing dominates the catches, accounting for nearly 100 percent of the total.

FIGURE E.1.8
CATCHES IN MILLION TONNES (MT) OF BIGEYE TUNA, YELLOWFIN TUNA AND SKIPJACK TUNA IN THE EPO FROM 1950 TO 2023, BY GEAR TYPE



Note: Data in live weight equivalent.

Source: IATTC. EPO total estimated catch by year, flag, gear, species. Public domain data for download. 2024. **https://www.iattc.org/en-US/Data/Public-domain** [accessed on 25 October 2024].

4.1.2 Stock status

BIGEYE TUNA

In 2024, to evaluate stock status, the IATTC conducted a benchmark assessment that continues to use a risk analysis approach (Xu *et al.,* 2024). The risk analysis encompasses three hypotheses structured hierarchically to address the main uncertainties, resulting in a total of 33 different models. The results of the assessment and risk analysis indicate that bigeye is **not overfished** and is likely fluctuating around the target level of SSB_{MSY}, and that it is likely being exploited below the target level of F_{MSY}, indicating that **overfishing is not occurring** (**TABLE E.1.2** and **FIGURE E.1.9**).

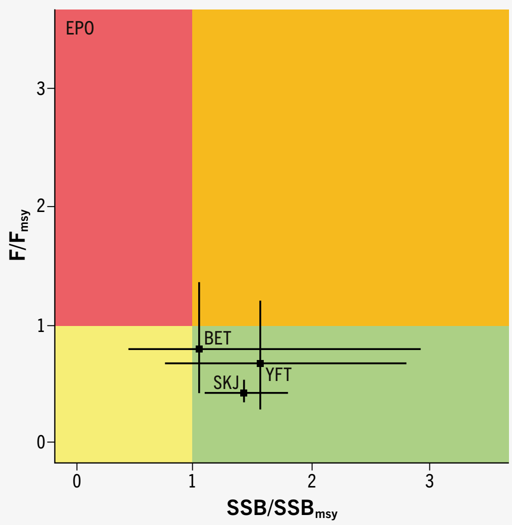
YELLOWFIN TUNA

In 2024, the IATTC attempted to conduct a stock assessment (Minte-Vera *et al.,* 2024), but the staff deemed that the model results were not sufficiently reliable to provide management advice. The results of the previous assessment (Minte-Vera *et al.,* 2020) and risk analysis in 2020 (Aires-da-Silva *et al.,* 2020) indicated the stock was **not overfished and overfishing was not occurring.** However, the model-weighted average of MSY across all models was estimated to be 288 000 tonnes, and current catches (306 000 tonnes in 2023) are above the estimated MSY.

SKIPJACK TUNA

In 2024, IATTC staff conducted a benchmark stock assessment (Bi *et al.,* 2024) using an integrated age-structured catch-at-length model and concluded that the stock is **most likely not overfished and overfishing is not occurring** (**TABLE E.1.2**).

FIGURE E.1.9
COMBINED KOBE PLOT FOR EPO BIGEYE TUNA, YELLOWFIN TUNA AND SKIPJACK TUNA SHOWING THE ESTIMATES OF CURRENT SPAWNING BIOMASS (SSB) AND CURRENT FISHING MORTALITY (F) IN RELATION TO MSY-BASED REFERENCE POINTS



Note: BET: bigeye tuna, YFT: yellowfin tuna, SKJ: skipjack tuna.

Source: adapted from IATTC, 2024. The tuna fishery in the Eastern Pacific ocean in 2023. IATTC 102nd meeting. Panama City, Panama, 2–6 September 2024. IATTC-102-01 REV. https://www.iattc.org/GetAttachment/5f3054db-560e-4b4a-b417-456226a275e0/IATTC-102-01_The-tuna-fishery-in-the-Eastern-Pacific-Ocean-in-2023.pdf

TABLE E.1.2
STOCK STATUS OF THE THREE TROPICAL TUNA STOCKS MANAGED BY THE IATTC

Stock	Latest stock assessment year	SSB/ SSBMSY	F/FMSY	Stock status	Management procedures	FAO status
Bigeye tuna	2024	1.05 (0.45–2.92)	0.79 (0.42–1.36)	Not overfished & Not overfishing	No (harvest control rules C-23-06)	Maximally sustainably fished
Yellowfin tuna	2020	1.57 (0.76–2.80)	0.67 (0.28–1.20)	Not overfished & Not overfishing	No (harvest control rules C-23-06)	Underfished
Skipjack tuna	2024	1.43 (0.73–1.67)	0.42 (0.30–0.55)*	Not overfished & Not overfishing	No (harvest control rules C-23-06)	Underfished

* F relative to the F target reference point corresponding to a SSB depletion level of 30 percent.

In 2024, the IATTC updated the stock status indicators that serve as supplemental information to monitor the stocks of bigeye, yellowfin and skipjack tuna. Most fish aggregating device (FAD) fishery indicators suggest that the stocks for all three tropical tuna species have potentially been subject to increased fishing mortality, mainly due to the increase in the number of sets in the FAD fishery. The number of sets on floating objects in 2022 reached the highest value since 2000. The catch of yellowfin tuna and skipjack tuna on floating object sets were the highest in the time-series. However, for bigeye, both catch in weight and catch-per-set on floating-object sets are at the lowest level since 2000, which may partly be a result of the introduction of the bigeye catch threshold scheme per vessel in 2021 (Resolution C-24-01). An evaluation of the impact of this scheme confirmed that it likely had a positive effect on reducing bigeye tuna catches in 2022 and 2023 (Ovando et al., 2024).

4.1.3 Management procedures

There is an ongoing strategy evaluation (MSE) process for tropical tunas at the IATTC, adopted through Resolution C-19-07. This process has included introductory workshops for the fishing industry, managers and other stakeholders, as well as technical developments to refine the MSE framework and improve simulation models.

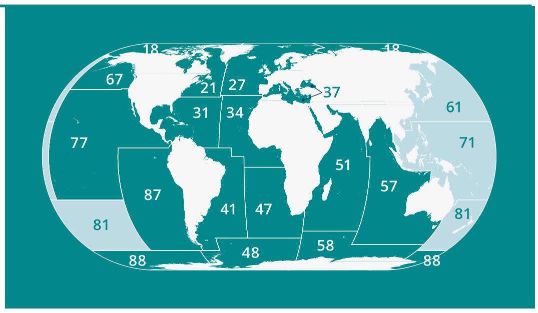
In 2016, the IATTC adopted a harvest control rule (HCR) for the tropical tuna purse-seine fishery, based on interim target and limit reference points established in 2014 (Resolution C-16-02, later amended by C-23-06). The HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack tuna) that requires the strictest management. Additionally, if fishing mortality or spawning biomass approaches or exceeds the corresponding limit reference point – with an estimated probability of 10 percent or greater – the HCR triggers the implementation of additional management measures to reduce fishing mortality and support stock rebuilding.

4.1.4 MANAGEMENT MEASURES

The main conservation measure established by the IATTC for bigeye, yellowfin and skipjack tuna is **Resolution C-24-01**, which establishes a multi-annual management measure for tropical tunas in the Eastern Pacific Ocean during 2025–2026. This measure calls for:

- An annual 72-day closure for purse seiners greater than 182 tonnes capacity through January 2027.
- Additional 13 to 22 days of closure for vessels exceeding a particular annual bigeye tuna catch limit in a previous year.
- A seasonal closure of the purse seine fishery in an area known as "El Corralito".
- A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas.
- Bigeye tuna catch limits for the main longline fishing nations.
- Limits on the number of active FADs from 50 FADs/vessel for the smallest to 340 FADs/vessel for Class 6 vessels (1 200 m^3 capacity) in the 2025–2026 period.
- No deployment of FADs 15 days before the selected closure period.
- Provision of daily information on all active FADs (position and echosounder biomass data) as well as Vessel Monitoring System (VMS) data to the Secretariat.

4.2 WESTERN AND CENTRAL PACIFIC OCEAN



About 51 percent of the world's production of tuna is from the Western and Central Pacific Ocean (WCPO) – FAO Major Fishing Areas 61, 71 and 81. Provisional catches of skipjack tuna, yellowfin tuna and bigeye tuna in 2023 were 2 490 300 tonnes, a 2 percent decrease from 2022; and provisional catches of North Pacific albacore tuna, South Pacific albacore tuna and Pacific bluefin tuna were 120 000 tonnes, a 25 percent decrease from 2022. Note that despite catches of North Pacific albacore tuna, South Pacific albacore tuna and Pacific bluefin tuna occurring throughout the entire Pacific Ocean (i.e. in both the IATTC and WCPFC areas), they are reported under this section dealing with the WCPFC.

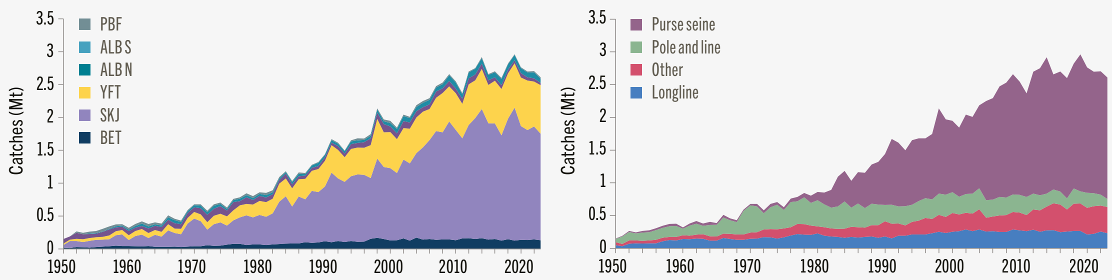
The catch of tropical tunas in the WCPO steadily and continuously increased by around half a million tonnes per decade since the 1960s, reaching 1 million tonnes in 1984, 1.5 million tonnes in 1994, and 2 million tonnes in 2005, before peaking at a record high of 2.7 million tonnes in 2014. Since then, total catches have stabilized at around 2.5 million tonnes (**FIGURE E.1.10**). Catches of North Pacific albacore, South Pacific albacore and Pacific bluefin tuna also steadily increased to 175 000 tonnes from 1950 to 1973, then decreased to 89 000 tonnes by 1991 (the third-lowest level in the time series). They then increased again, reaching a peak of 204 000 tonnes in 2002, before showing a decreasing trend, reaching around 120 000 tonnes in 2023 (**FIGURE E.1.10**).

Average tuna catches for the last five-year period (2019–2023) were 2 747 415 tonnes. During this period, skipjack tuna accounted for 64 percent of the total catch by weight, followed by yellowfin tuna (26 percent), bigeye tuna (5 percent), North Pacific albacore tuna (2 percent), South Pacific albacore tuna (2.5 percent) and Pacific bluefin tuna (0.5 percent). Purse-seine vessels took 70 percent of the total catch, followed by longline (9 percent), pole-and-line (6.5 percent), and other gears (14.5 percent).

The skipjack tuna catch continuously increased, peaking at around 2 million tonnes in 2019 – the highest on record – before stabilizing at around 1.6–1.7 million tonnes since then. Meanwhile, the yellowfin tuna catch reached its highest level in 2021, totaling about 750 000 tonnes, and has remained at that level since (**FIGURE E.1.11**).

However, bigeye tuna, South Pacific albacore tuna, North Pacific albacore tuna and Pacific bluefin tuna followed different trends, with catches peaking at different times: in the 2000s for bigeye tuna and North Pacific albacore tuna, in 2010 for South Pacific albacore tuna, and in 1956 for Pacific bluefin tuna. In all cases, catches have declined since their peak records in the time series.

FIGURE E.1.10
TRENDS IN CATCH IN MILLION TONNES (MT) OF BIGEYE, SKIPJACK AND YELLOWFIN TUNA IN THE WCPO REGION, AND NORTH PACIFIC ALBACORE, SOUTH PACIFIC ALBACORE AND PACIFIC BLUEFIN TUNA IN THE PO REGION, BY SPECIES (LEFT) AND GEAR (RIGHT) FROM 1950 TO 2023



Notes: (1) ALB N: North Pacific albacore tuna *(Thunnus alalunga)*, ALB S: South Pacific albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)*, SKJ: skipjack tuna *(Katsuwonus pelamis)*, and PBF: Pacific bluefin tuna *(Thunnus orientalis)*. (2) Data expressed in live weight equivalent.

Sources:
WCPO stocks, North Pacific albacore tuna and South Pacific albacore tuna:
WCPFC. Annual Catch Estimates 2023 – data files. *WCPFC Tuna Fishery Yearbook – Annual Catch Estimates.* 2024. https://www.wcpfc.int/statistical-bulletins [accessed on 14 October 2024].

Pacific bluefin tuna:
ISC. ISC24 Annual Catch Table. *Fisheries statistics.* 2024. https://isc.fra.go.jp/fisheries_statistics/index.html [accessed on 30 September 2024].

4.2.1 Catches by species

BIGEYE TUNA

Provisional bigeye tuna catches in 2023 were about 133 700 tonnes, a 7 percent decrease from 2022. Longline fishing dominated the catches by weight until the mid-1990s. However, the relative contribution of purse seine to the catch in recent years has increased. For example, in the most recent five years, the main fishing gears are purse seine and longline with 44 percent and 39 percent of the catch, respectively (**FIGURE E.1.11**). Bigeye catches in the WCPO by other gears were relatively minor, but have increased in recent years.

YELLOWFIN TUNA

Provisional yellowfin tuna catches in the WCPO in 2023 were about 737 400 tonnes, an 8 percent increase from 2022. Until about 1980, fishing was dominated by longline and pole-and-line vessels; however, since the early 1980s purse seine has been the main gear. In the last five years purse seiners caught around 55 percent of the total catch, while 31 percent of the catch was taken by a number of mixed gears in the Philippines and Indonesia, and 11 percent was taken by longliners (**FIGURE E.1.11**). Most of the catches are taken from the tropical region where the stock is considered fully exploited and there is little or no room for increased fishing pressure.

SKIPJACK TUNA

The WCPO skipjack tuna stock supports the largest tuna fishery in the world, accounting for 35 percent of worldwide tuna landings. Catches in 2023 were 1 619 100 tonnes, a 6 percent decrease from 2022. Purse seining, which accounts for 83 percent of the catches, has increased steadily over the past three decades. In contrast, pole-and-line fishing (about 8 percent) has been declining since the mid-1980s (**FIGURE E.1.11**).

NORTH PACIFIC ALBACORE TUNA

North Pacific albacore tuna provisional catches in 2023 were about 34 000 tonnes, a 31 percent decrease from 2022. Approximately 77 percent of the catch occurs in the WCPO and 23 percent in the EPO. The main fishing gears are longline (45 percent) and pole-and-line (31 percent), followed by trolling (19 percent) (**FIGURE E.1.11**). Catches by longline have shown a decreasing trend since 1999.

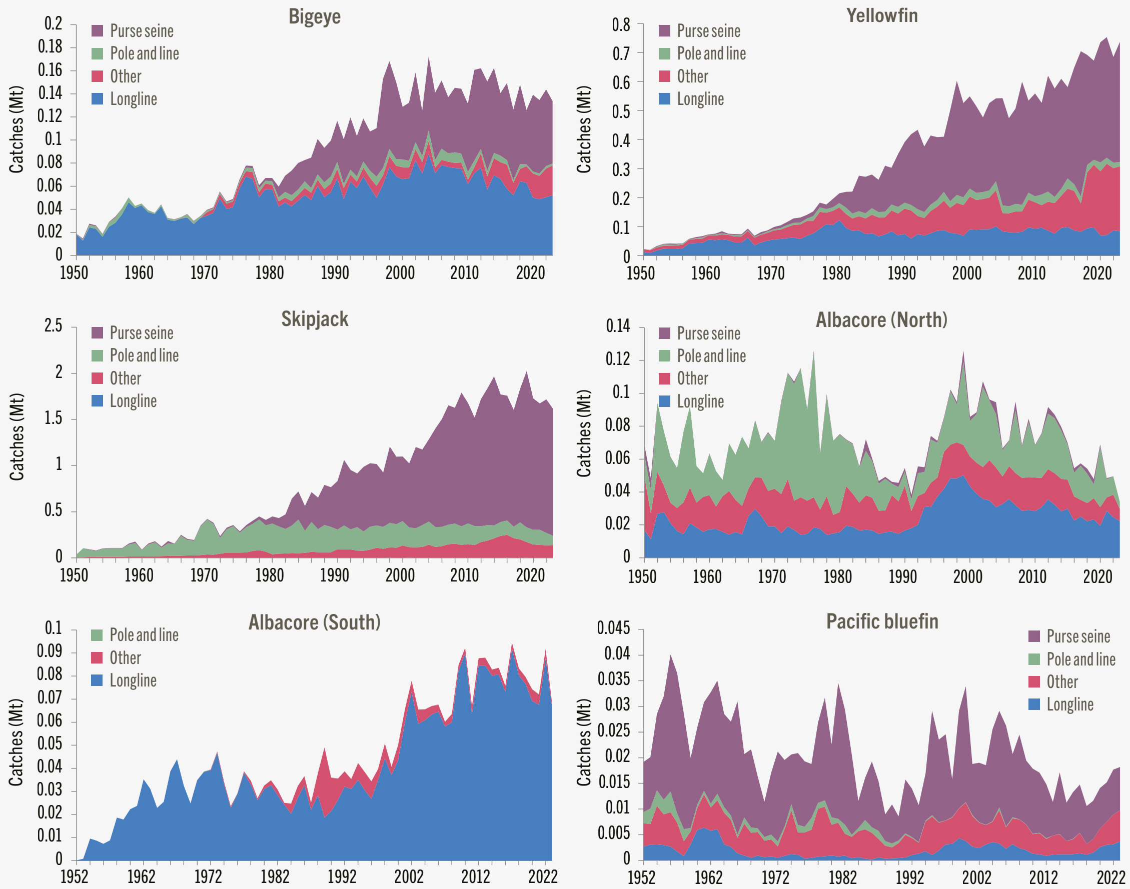
SOUTH PACIFIC ALBACORE TUNA

South Pacific albacore tuna extends beyond the WCPFC Convention Area. However, the stock is assessed by WCPFC. South Pacific albacore tuna provisional catches in 2023 were about 67 700 tonnes, a 26 percent decrease from 2022 catches. Approximately 70 percent of the catch occurs in the WCPO and 30 percent in the EPO. The main fishing gear is longline, accounting for 95 percent of the catch. Relatively minor amounts are taken by other gears like trolling (**FIGURE E.1.11**).

PACIFIC BLUEFIN TUNA

Reported Pacific bluefin tuna provisional catches in 2023 were about 18 200 tonnes, a 3 percent increase from estimates available for 2022. Most of the catch (71 percent) occurs in the Western Pacific Ocean. About 52 percent of the Pacific-wide catch is made by purse-seine fisheries, followed by a variety of gears such as coastal set nets and troll (29 percent) and longline (18 percent) (**FIGURE E.1.11**).

FIGURE E.1.11
CATCHES IN MILLION TONNES (MT) OF BIGEYE, SKIPJACK AND YELLOWFIN TUNA, IN THE WCPO REGION AND NORTH PACIFIC ALBACORE, SOUTH PACIFIC ALBACORE AND PACIFIC BLUEFIN TUNA IN THE PO REGION BY GEAR TYPE FROM 1950 TO 2023



Note: Data in live weight equivalent.

Sources:
WCPO stocks, North Pacific albacore tuna and South Pacific albacore tuna:
WCPFC. Annual Catch Estimates 2023 – data files. *WCPFC Tuna Fishery Yearbook – Annual Catch Estimates.* 2024. https://www.wcpfc.int/statistical-bulletins [accessed on 18 October 2024].
Pacific bluefin tuna:
ISC. ISC24 Annual Catch Table. *Fisheries statistics.* 2024. https://isc.fra.go.jp/fisheries_statistics/index.html [accessed on 30 September 2024].

4.2.2 Stock status

BIGEYE TUNA

In 2023, the Pacific Community (SPC) conducted an assessment (Day *et al.,* 2023) that included some improvements and a more rigorous approach than the previous assessment in 2020. All models in the uncertainty grid indicated that the stock is above the biomass limit reference point as well as MSY-based reference points. Therefore, **the stock is not overfished and overfishing is not occurring** (**TABLE E.1.3** and **FIGURE E.1.12**).

YELLOWFIN TUNA

The last yellowfin tuna assessment was conducted in 2023 (Magnusson *et al.,* 2023). The results were in general less optimistic compared to previous assessments. All models in the uncertainty grid indicate the stock is above the biomass limit reference point as well as MSY-based reference points. Therefore, the assessment results indicate that the **stock is not overfished and overfishing is not occurring.** However, the current (2023) catches are larger than the median MSY, estimated to be 700 400 tonnes.

SKIPJACK TUNA

The last skipjack tuna assessment was conducted in 2022 (Castillo Jordan *et al.,* 2022). Stock status was determined over an uncertainty grid of 18 models. There were several new developments and improvements to the stock assessment compared to the 2019 assessment, including the application of a new approach to estimate fishing mortality, the inclusion of an alternative growth model, and the use of new free-school indices of abundance. The results of the assessment indicate that the **stock is not overfished and overfishing is not occurring.**

NORTH PACIFIC ALBACORE TUNA

The last North Pacific albacore tuna stock assessment was conducted in 2023 (ISC, 2023) and the results indicated that the **stock is not overfished and overfishing is not occurring.** However, the stock assessment showed that increasing fishing effort is unlikely to result in higher yield.

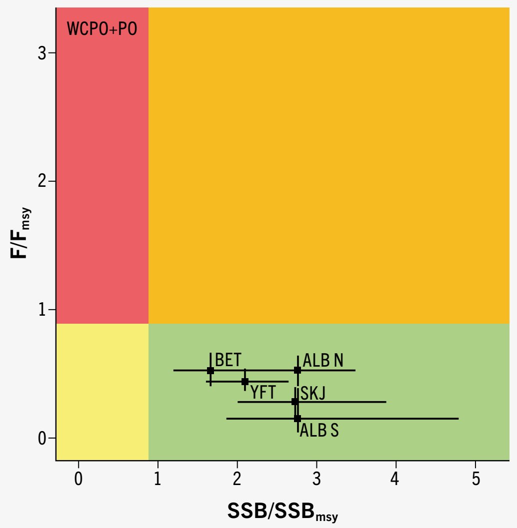
SOUTH PACIFIC ALBACORE TUNA

The last full assessment was conducted in 2024 (Teears *et al.,* 2024) and indicated the **stock is not overfished and that overfishing is not occurring.**

PACIFIC OCEAN BLUEFIN TUNA

In 2024, a benchmark stock assessment was conducted (ISC, 2024). All aspects of the model were critically reviewed, and some modifications were made to improve the model. The assessment estimated that the SSB was 23.2 percent of the unfished level, having achieved the second rebuilding target set by the WCPFC and the IATTC in 2021. The point estimate of the depletion level is now above the biomass depletion-based limit reference point of 20 percent of the unfished stock biomass set by the WCPFC. Although the assessment indicated that the **stock is overfished, overfishing is likely not occurring.** Pacific bluefin tuna was heavily overfished but has now rebuilt to interim rebuilding targets. Management has been implemented to rebuild the stock towards higher target reference points that are currently being estimated.

FIGURE E.1.12
COMBINED KOBE PLOT FOR WCPFC BIGEYE, YELLOWFIN AND SKIPJACK TUNA; AND NORTH PACIFIC ALBACORE AND SOUTH PACIFIC ALBACORE OF THE PO REGION SHOWING THE ESTIMATES OF CURRENT SPAWNING BIOMASS (SSB) AND CURRENT FISHING MORTALITY (F) IN RELATION TO MSY-BASED REFERENCE POINTS



Notes: (1) ALB N: North Pacific albacore tuna *(Thunnus alalunga),* ALB S: South Pacific albacore tuna *(Thunnus alalunga),* BET: bigeye tuna *(Thunnus obesus),* YFT: yellowfin tuna *(Thunnus albacares)*, and SKJ: skipjack tuna *(Katsuwonus pelamis).* (2) Pacific Bluefin tuna stock is not included as its SSB_{MSY} is unknown.

Source: adapted from **WCPFC.** 2024. WCPFC–SC20 2024. Scientific Committee Twentieth Regular Session Outcomes Document. Manila, Philippines, 14–21 August 2024. https://meetings.wcpfc.int/node/23614 WCPFC21-2024-SC20-01: and **ISC.** 2024. ISC–SC24 2024. Report of the Twenty-fourth Meeting of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean. Victoria, Canada, 19–24 June 2024. https://isc.fra.go.jp/pdf/ISC24/ISC24_Plenary_Report_r1.pdf

TABLE E.1.3
STOCK STATUS OF THE THREE TROPICAL TUNA STOCKS MANAGED BY WCPFC AND THE TEMPERATE TUNAS OF THE PACIFIC REGION

Stock	Latest stock assessment year	SSB/ SSBMSY	F/FMSY	Stock status	Management procedures	FAO status
Bigeye tuna	2023	1.83 (1.32–2.38)	0.59 (0.46–0.74)	Not overfished & Not overfishing	No	Underfished
Yellowfin tuna	2023	2.30 (1.77–2.89)	0.50 (0.42–0.61)	Not overfished & Not overfishing	No	Underfished
Skipjack tuna	2022	2.98 (2.20–4.22)	0.32 (0.18–0.45)	Not overfished & Not overfishing	Yes (CMM 2022-01)	Underfished
North Pacific albacore tuna	2023	3.02 (2.24–3.81)	0.59 (0.46–0.72)*	Not overfished & Not overfishing	Yes (IATTC Res. C-23-02 & WCPFC HS 2023-01)	Underfished
South Pacific albacore tuna	2024	3.02 (2.04–5.21)	0.18 (0.06–0.44)	Not overfished & Not overfishing	No	Underfished
Pacific bluefin tuna	2024	23 percent SSB0**	0.24*	Overfished but not overfishing	No (a harvest control rule is in place)	Maximally sustainably fished

* $F_{\%SPR}$ used as proxy for F_{MSY}
** SSB/SSB_0 is used instead of SSB/SSB_{MSY}

4.2.3 Management procedures

BIGEYE TUNA AND YELLOWFIN TUNA

There is ongoing work under a mixed fishery framework that involves developing stock-specific management procedures for skipjack, yellowfin, bigeye and South Pacific albacore tunas, in line with the agreed WCPFC harvest strategy workplan. The interaction of these management procedures, as well as their impact on yellowfin tuna, would then be evaluated using a combined mixed fisheries evaluation framework.

SKIPJACK TUNA

The skipjack tuna in the WCPO is managed through a management procedure **CMM 2022-01**. The management procedure applies to the catch and effort of purse-seine and pole-and-line fisheries, and other commercial fisheries referred to in **CMM 2022-01** taking more than 2 000 tonnes of tropical tunas (bigeye, yellowfin and skipjack tuna) in the exclusive economic zones and areas beyond national jurisdiction. The objectives of the management procedure ensure that the spawning potential depletion ratio of skipjack tuna is maintained on average at a level consistent with the target reference point; and the spawning potential depletion ratio of skipjack tuna is maintained above the limit reference point with a risk of the limit reference point being breached of no greater than 20 percent; in a manner that achieves the objective of relative stability in fishing levels between management periods and in the longer term.

NORTH PACIFIC ALBACORE TUNA

The IATTC (**IATTC Res. C-23-02**) and the WCPFC (Harvest Strategy 2023-01) adopted a full management procedure, including a harvest control rule, in 2023, which was applied for the first time in 2024 based on the latest stock assessment performed. The IATTC/WCPFC management procedure is aligned and its objectives are defined as follows:

- Maintain spawning stock biomass (SSB) above the limit reference point, with a probability of at least 80 percent over the next ten years. The risk of breaching the limit reference point based on the most current estimate of SSB shall be no greater than 20 percent.
- Maintain depletion of total biomass around historical (2006–2015) average depletion over the next ten years.
- Maintain fishing intensity (F) at or below the target reference point with a probability of at least 50 percent over the next ten years.
- To the extent practicable, management changes (e.g. catch and/or effort) should be relatively gradual between years.

The limit reference point is set at 14 percent of the dynamic unfished SSB and the target reference point at the fishing intensity (F) level that results in the stock producing 45 percent of spawning potential ratio.

SOUTH PACIFIC ALBACORE TUNA

There is no management procedure adopted for South Pacific albacore tuna in either the IATTC or in the WCPFC. However, various components of the management procedure, such as the target reference point and limit reference point, have been adopted.

PACIFIC BLUEFIN TUNA

There is no management procedure adopted for Pacific bluefin tuna in either the IATTC or in the WCPFC. However, various components of the management procedure, such as the target reference point, limit reference point and a harvest control rule for its rebuilding plan, have been adopted.

4.2.4 Management measures

TROPICAL TUNAS

The main binding conservation measure for bigeye, yellowfin and skipjack tuna established by the WCPFC is CMM 2023-01. For the 2024–2027 period, it calls for:

- A one-and-a-half-month closure (July to mid-August) of fishing on FADs in EEZ waters and on areas beyond national jurisdiction between 20° north and 20° south.
- Extension of the FAD closure for one additional month in areas beyond national jurisdiction, with some exemptions for Kiribati- and Philippines-flagged vessels.
- Fully non-entangling FADs without netting in their construction.
- A limit of 350 drifting FADs at any one time per purse-seine vessel.
- A limitation on the number of vessel days in EEZs (i.e. a vessel day scheme).
- Limitation of purse-seine effort on the high seas for non-Small Islands Developing States (SIDS) members.
- A full-retention requirement for all purse-seine vessels regarding bigeye, skipjack and yellowfin tunas between 20° north and 20° south.
- Flag-specific catch limits for non-SIDS longline fleets for bigeye tuna. These catch limits may be increased by up to 10 percent if linked to a proportional increase of observer coverage (achieved by human and/or electronic monitoring).

This conservation and management measure (CMM) is complex, with many "either/or" choices, exemptions or exclusions and decisions yet to be made with respect to some measures, which makes it difficult to predict the outcomes in terms of actual future catch and effort levels.

NORTH PACIFIC ALBACORE TUNA

The main binding conservation measure for North Pacific albacore tuna established by the WCPFC is CMM 2019-03, which calls for members not to increase fishing effort for North Pacific albacore tuna in the Convention Area north of the equator and not to increase fishing effort directed at North Pacific albacore tuna beyond 2002–2004 annual average levels. In the IATTC, Resolution C-05-02 calls for members not to increase fishing effort directed at North Pacific albacore tuna beyond the "current level".

SOUTH PACIFIC ALBACORE TUNA

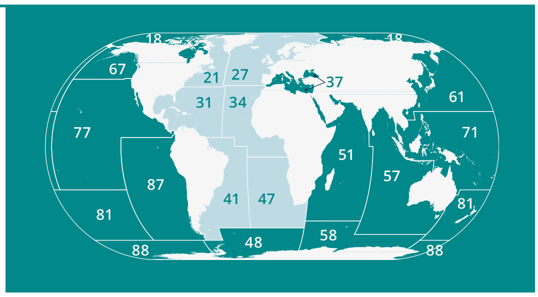
The main binding conservation measure for South Pacific albacore tuna, established by the WCPFC, is CMM 2015-02, which aims to limit fishing mortality by capping the number of vessels fishing for South Pacific albacore tuna per Commission member, with some exemptions for SIDS. This capacity limitation prevents the number of vessels from exceeding the 2005 level or the 2000–2004 average. The IATTC adopted Resolution C-24-04, encouraging collaboration and alignment with the WCPFC in South Pacific albacore management.

PACIFIC BLUEFIN TUNA

WCPFC CMM 2024-01 establishes management measures to rebuild the Pacific bluefin tuna spawning biomass to its historical median level (the median point estimate for the 1952–2014 period) by 2024 with at least 60 percent probability. This CMM limits total fishing effort north of 20° north to below the average 2002–2004 levels. It also establishes catch limits per member for Pacific bluefin tuna less and larger than 30 kg, and allows members to use part of their juvenile catch limit (< 30 kg) to catch adults (> 30 kg). Members with less than 10 tonnes of catch during 2002–2004 are allowed to increase catch up to 10 tonnes. Any overcatch or undercatch on the catch limit will be deducted from or added to the following year's TAC, with a maximum undercatch that can be carried over in any given year not exceeding 17 percent of its initial annual catch limit.

An overall combined total commercial catch limit of 12 585 tonnes for the 2025–2026 period was set by IATTC in Resolution C-24-02. IATTC Resolution C-23-01 describes the objectives for both rebuilding periods, establishes harvest control rules for the second rebuilding period and the subsequent period after the second objective is met, sets over- and under-harvest limits, and calls on the Commission to collaborate with the WCPFC Northern Committee to develop candidate reference points and harvest control rules.

4.3 ATLANTIC OCEAN



About 11 percent of the world's tuna production comes from Atlantic Ocean (AO) stocks – FAO Major Fishing Areas 21, 27, 31, 34, 41 and 47. Catches of skipjack tuna, yellowfin tuna, bigeye tuna, albacore tuna and bluefin tuna in 2023 totaled 544 700 tonnes, a 9 percent decrease from 2022 levels. The total catch has generally declined since the mid-1990s, followed by an upward trend since 2009 (FIGURE E.1.13).

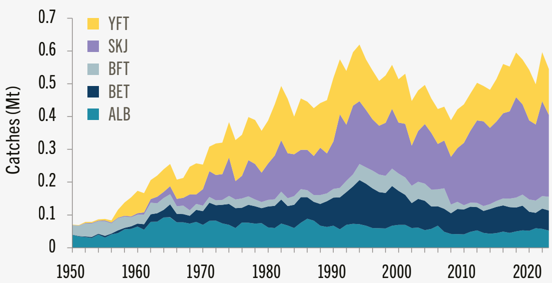
The catch of tropical tunas (bigeye tuna, yellowfin tuna and skipjack) in the AO initially steadily increased by approximately 100 000 tonnes per decade, reaching 100 000 tonnes in 1963, 200 000 tonnes in 1971, and 300 000 tonnes in 1980. It then quickly rose to 0.4 million tonnes by 1982, before reaching 500 000 tonnes in 1994. Total catches declined to 300 000 tonnes in 2006 but then began increasing again, reaching a historical high of 520 000 tonnes in 2018. Since then, catches have fluctuated between 400 000 tonnes and 500 000 tonnes (**FIGURE E.1.13**).

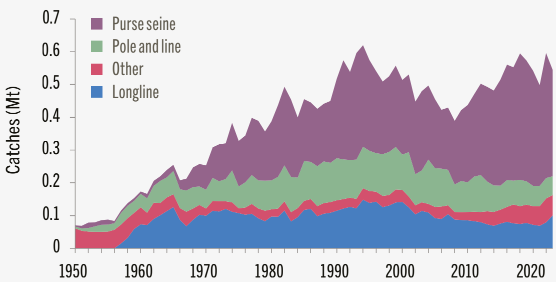
Catches of temperate tunas (albacore and bluefin tuna) also steadily increased from 1950, reaching 130 000 tonnes by 1964. However, they then fluctuated between 80 000 and 125 000 tonnes until 2007 when they began to decline, reaching a historic low of 54 000 tonnes in 2010 and a second low of 57 650 tonnes in 2014. Since then, catches have recovered, primarily due to the resurgence of bluefin tuna and the healthy status of North Atlantic albacore tuna. Recent catches are around 95 000 tonnes (**FIGURE E.1.13**).

The average tuna catch over the last five years (2019–2023) was 551 010 tonnes. During this period, skipjack tuna accounted for 47 percent of the total catch by weight, followed by yellowfin tuna (25 percent), bigeye tuna (11 percent), albacore tuna (10 percent) and bluefin tuna (7 percent). Purse-seine vessels were responsible for 63 percent of the total catch, followed by longline (15 percent), pole-and-line (11 percent) and other fishing methods (11 percent).

Skipjack tuna catches have continuously increased to peak at 300 000 tonnes in 2018, the highest on record, and have fluctuated between 230 000 and 290 000 million tonnes since then. Meanwhile, the yellowfin tuna catch reached its highest level in 1990, totaling about 200 000 tonnes, but then showed a decreasing trend until 2013, when it dropped to

FIGURE E.1.13
TRENDS IN CATCH IN MILLION TONNES (MT) OF BIGEYE, SKIPJACK, YELLOWFIN, ALBACORE AND BLUEFIN TUNA IN THE ATLANTIC OCEAN BY SPECIES (LEFT) AND GEAR (RIGHT) FROM 1950 TO 2023





Notes: (1) ALB: Atlantic albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)*, SKJ: skipjack tuna *(Katsuwonus pelamis)*, and BFT: Atlantic bluefin tuna *(Thunnus thynnus).* (2) Data expressed in live weight equivalent.

Source: ICCAT. Nominal catch Task 1 Excel. Access to ICCAT statistical databases. 2024. https://www.iccat.int/en/accesingdb.HTML [accessed on 16 October 2024].

130 000 tonnes. Since then, catches have increased, reaching 0.15 million tonnes in 2022 (**FIGURE E.1.13**). Similarly, bigeye tuna catches followed a continuous upward trend until 1994, when they peaked at 135 000 tonnes. Since then, they have declined, with recent catches ranging between 50 000 and 60 000 tonnes over the past four years.

Atlantic bluefin tuna catches have also shown a continuous increasing trend, reaching a record high of 62 000 tonnes in 2007 before declining sharply to just 10 000 tonnes by 2011, when their populations were considered unsustainable. However, due to a recovery plan, bluefin tuna stocks have rebounded, and catches increased again to 40 000 tonnes in 2023.

Albacore tuna catches peaked at 92 000 tonnes in 1964 and have since fluctuated between 53 000 and 85 000 tonnes until 2006, after which they declined to 40 000 tonnes in 2010. Since then, catches have increased, and current levels are around 53 000–59 000 tonnes.

4.3.1 Catches by species

BIGEYE TUNA

Atlantic bigeye tuna catches in 2023 were about 61 300 tonnes, a 2 percent decrease from 2022. Catches by longline, the main fishing gear (50 percent of the catch), declined sharply between 1999 and 2006, but they have declined more slowly during the last few years. Purse-seine and pole-and-line vessels account for about 31 percent and 10 percent of the catches, respectively (**FIGURE E.1.14**).

YELLOWFIN TUNA

Yellowfin tuna catches in 2023 were about 139 500 tonnes, a 6 percent decrease from 2022. The main fishing gear is purse seining (about 68 percent of the catch) (**FIGURE E.1.14**). Purse-seine catches showed a general decrease since the early 1990s but started growing again after 2007. About 13 percent of the catch is made by longlining and 5 percent by pole-and-line vessels.

EASTERN SKIPJACK TUNA

Skipjack tuna catches in the Eastern Atlantic Ocean in 2023 were about 219 900 tonnes, an 18 percent decrease from 2022. Purse seine (89 percent) and pole-and-line (7 percent) dominate the catches (**FIGURE E.1.14**). The purse-seine catches had been decreasing from the early 1990s to 2009, but have increased substantially since then, reaching a peak in 2018 and again in 2022. Catches by other gears have remained stable.

WESTERN SKIPJACK TUNA

Skipjack tuna catches in the Western Atlantic Ocean in 2023 were about 29 600 tonnes, a 37 percent increase from 2022. Pole-and-line fishing dominates the catches (69 percent), followed by purse seining (8 percent) (**FIGURE E.1.14**). Pole-and-line catch levels remained relatively stable between the mid-1980s and the early 2010s, but have been much lower in recent years after a sharp decline in the 2014–2015 period.

NORTH ATLANTIC ALBACORE TUNA

Albacore tuna catches in the North Atlantic in 2023 were about 28 200 tonnes, an 11 percent decrease from 2022 catch levels. Catches are made by a variety of fishing gears, including pole-and-line (38 percent), trawl (27 percent), troll (19 percent) and longline (16 percent) (**FIGURE E.1.14**).

SOUTH ATLANTIC ALBACORE TUNA

Albacore tuna catches in the South Atlantic in 2023 were about 22 100 tonnes (**FIGURE E.1.14**), a 6 percent decrease from 2022. Catches are made primarily by longline (78 percent) and pole-and-line (21 percent).

MEDITERRANEAN ALBACORE TUNA

Albacore tuna catches in the Mediterranean in 2023 were about 2 300 tonnes, similar to 2022 levels. Catches are highly variable and are made primarily by longline (95 percent), with the remainder by other surface gears (**FIGURE E.1.14**).

EASTERN ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA

Eastern Atlantic and Mediterranean bluefin tuna catches were subject to a high degree of misreporting from the mid-1990s until the recent past. However, in recent years, misreporting is thought to have diminished considerably. In 2023, reported catches were about 39 200 tonnes (**FIGURE E.1.14**), a 12 percent increase from 2022. Purse seiners take 62 percent of the catch, followed by traps (16 percent), longlines (15 percent), and a variety of surface gears including pole-and-line, handlines and trolling.

WESTERN BLUEFIN TUNA

Western Atlantic bluefin tuna catches in 2023 were about 2 600 tonnes, a 5 percent decrease from 2022. Sport gears (handline, rod-and-reel) take 61 percent of the catch, followed by longlines (32 percent) and other surface gears. Purse-seine catches in recent years have been very minor (**FIGURE E.1.14**).

4.3.2 Stock status

BIGEYE TUNA

The last (2021) assessment conducted by the ICCAT Standing Committee on Research and Statistics (SCRS) gave more optimistic results than the 2018 assessment (ICCAT, 2024). The SCRS indicated that while uncertainty on natural mortality was included in the grid, but the uncertainty related to the longline index was not incorporated in the advice, as it derived a more pessimistic stock status, which SCRS deemed unrealistic. Based on combining several model-data scenarios, the **stock is estimated to be overfished, but overfishing is not occurring** (**TABLE E.1.4** and **FIGURE E.1.15**).

YELLOWFIN TUNA

The most recent full assessment of yellowfin tuna was carried out in 2024 using an age-structured model framework applied to the available data through 2022 (ICCAT, 2024). These results were more optimistic than those of the 2019 assessment and indicated that **the stock is not overfished and overfishing is not occurring.** The estimate of MSY is 121 661 tonnes, lower than in previous decades because the overall fishery selectivity has shifted towards smaller yellowfin, mainly through fishing on FADs. The current catch (139 500 tonnes) is above MSY and the adopted catch limit (110 000 tonnes); if this catch trend continues, overfishing might occur.

EASTERN ATLANTIC SKIPJACK TUNA

The stock was last assessed in 2022, using data up to 2020 and two different model platforms (ICCAT, 2024). The combined results of both assessment models, based on the median of an uncertainty grid with 18 scenarios in each model, show that the **stock is not overfished and overfishing is not occurring.**

WESTERN ATLANTIC SKIPJACK TUNA

The stock was last assessed in 2022, using data up to 2020 (ICCAT, 2024). Stock status was estimated by combining the results of the nine scenarios in the uncertainty grid. It is estimated that the **stock is not overfished, and overfishing is not occurring.**

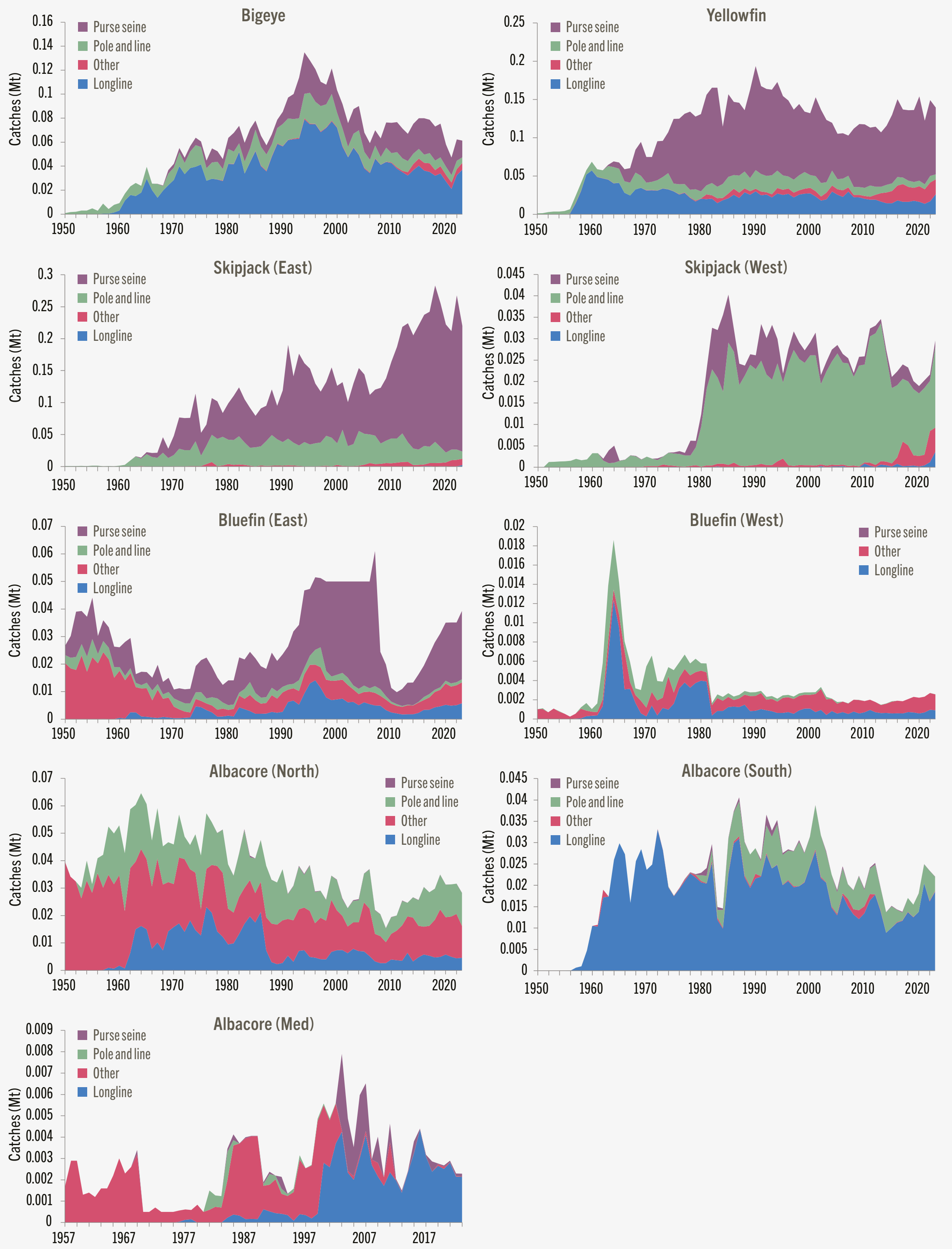
NORTH ATLANTIC ALBACORE TUNA

The most recent assessment for the North Atlantic albacore tuna stock was conducted in 2023 using data up to 2021 (ICCAT, 2024). The results indicated that the **stock is not overfished and overfishing is not occurring.**

SOUTH ATLANTIC ALBACORE TUNA

The most recent assessment for the South Atlantic stock of albacore tuna was conducted in 2020, including data until 2018 (ICCAT, 2024). The results were more optimistic than those in the previous assessment and the new stock assessment indicated that the **stock is not overfished and overfishing is not occurring.**

FIGURE E.1.14
CATCHES IN MILLION TONNES (MT) OF BIGEYE, YELLOWFIN, EASTERN ATLANTIC SKIPJACK, WESTERN ATLANTIC SKIPJACK, NORTH ATLANTIC ALBACORE, SOUTH ATLANTIC ALBACORE, MEDITERRANEAN ALBACORE, WESTERN ATLANTIC BLUEFIN, AND EASTERN AND MEDITERRANEAN BLUEFIN TUNA IN THE ICCAT REGION BY GEAR TYPE FROM 1950 TO 2023



Source: ICCAT. Nominal catch Task 1 Excel. Access to ICCAT statistical databases. 2024. https://www.iccat.int/en/accesingdb.HTM [accessed on 16 October 2024].

MEDITERRANEAN ALBACORE TUNA

The Mediterranean albacore tuna stock was last assessed in 2024 using data up to 2022 (ICCAT, 2024), but there is considerable uncertainty about the accuracy of reported catches, and the available indices of abundance show a limited ability to monitor stock trends. In particular, uncertainty related to the larval survey index made the SCRS consider two different stock status scenarios. Based on the most pessimistic scenario, which was used to provide the catch management advice, **the stock is considered to be overfished and overfishing is occurring.**

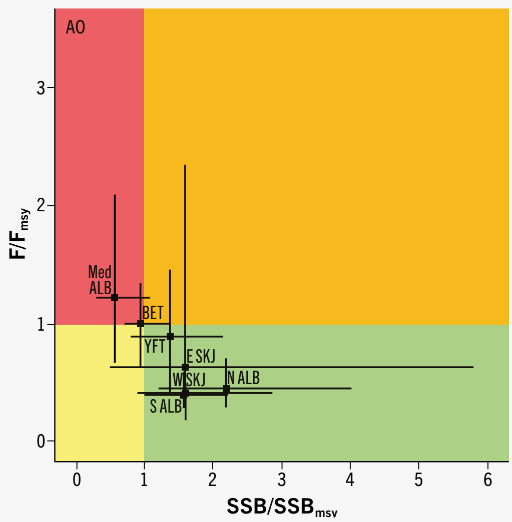
EASTERN ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA

There is considerable uncertainty about its level of abundance. The last assessment in 2022 (ICCAT, 2024) indicated that, although the current ratio of spawning biomass **SSB/SSB_{MSY} is unknown, overfishing is not occurring**. Catches were reduced by over 70 percent in the years following 2007 due to strict limits and controls, but they have been progressively increasing in recent years as the stock has recovered. Catches are now ~50 percent less than the 2007 level. The existing TAC and strict controls have helped end overfishing.

WESTERN ATLANTIC BLUEFIN TUNA

The last stock assessment in 2021 (ICCAT, 2024) indicated that while the current ratio of spawning biomass **SSB/SSB_{MSY} is unknown, overfishing is not taking place**. The estimate of MSY is unknown.

FIGURE E.1.15
COMBINED KOBE PLOT FOR ICCAT BIGEYE TUNA, YELLOWFIN TUNA, SKIPJACK TUNA AND ALBACORE TUNA STOCKS SHOWING THE ESTIMATES OF CURRENT SPAWNING BIOMASS (SSB) AND CURRENT FISHING MORTALITY (F) IN RELATION TO MSY-BASED REFERENCE POINTS



Notes: (1) Mediterranean albacore tuna scenario 1 of ICCAT SCRS report is used. (2) Bluefin tuna stocks are not included as their SSB is unknown. (3) Med ALB: Mediterranean albacore tuna *(Thunnus alalunga),* N ALB: North Atlantic albacore tuna *(Thunnus alalunga),* S ALB: South Atlantic albacore tuna *(Thunnus alalunga),* BET: bigeye tuna *(Thunnus obesus),* YFT: yellowfin tuna *(Thunnus albacares),* E SKJ: Eastern Atlantic skipjack tuna *(Katsuwonus pelamis),* and W SKJ: Western Atlantic skipjack tuna *(Katsuwonus pelamis).*

Source: adapted from ICCAT. 2024. ICCAT–SC 2024. Report of the Standing Committee on Research and Statistics. Hybrid/Madrid (Spain), 23–27 September 2024. https://www.iccat.int/com2024/ENG/PLE_104_ENG.pdf

TABLE E.1.4
STOCK STATUS OF THE TROPICAL AND TEMPERATE TUNA STOCKS MANAGED BY ICCAT

Stock	Latest stock assessment year	SSB/ SSBMSY	F/FMSY	Stock status	Management procedures	FAO status
Bigeye tuna	2021	0.94 (0.71–1.37)	1.00 (0.63–1.35)	Overfished & Not overfishing	No (interim operational management objectives suggested)	Maximally sustainably fished
Yellowfin tuna	2024	1.37 (0.91–2.15)	0.89 (0.40–1.46)	Not overfished & Not overfishing		Underfished
Eastern Atlantic skipjack tuna	2022	1.60 (0.50–5.79)	0.63 (0.18–2.35)	Not overfished & Not overfishing		Underfished
Western Atlantic skipjack tuna	2022	1.60 (0.90–2.87)	0.41 (0.19–0.89)	Not overfished & Not overfishing	Yes, partially (ICCAT Rec 24-04)	Underfished
North Atlantic albacore tuna	2023	2.19 (1.21–4.01)	0.45 (0.29–0.71)	Not overfished & Not overfishing	Yes (ICCAT Rec 21-04)	Underfished
South Atlantic albacore tuna	2020	1.58 (1.14–2.05)	0.40 (0.28–0.59)	Not overfished & Not overfishing	No (operational management objectives adopted)	Underfished
Mediterranean albacore tuna*	2024	0.58 (0.31–1.10)	1.22 (0.66–2.10)	Overfished & Overfishing	No	Overexploited
Eastern Atlantic and Mediterranean bluefin tuna	2022	Unknown	0.81 (0.48–1.62)	Unknown & Not overfishing	Yes (ICCAT Rec 23-07)	Maximally sustainably fished
Western Atlantic bluefin tuna	2021	Unknown	0.53 (0.49–0.58)	Unknown & Not overfishing	Yes (ICCAT Rec 23-07)	Maximally sustainably fished

* ICCAT SCRS considered two different scenarios due to the uncertainty related to the larval survey index; however, here we included the most pessimistic/conservative scenario which was used to provide the catch scientific advice.

Source: ICCAT. 2024. ICCAT–SC 2024. Report of the Standing Committee on Research and Statistics. Hybrid/Madrid (Spain), 23–27 September 2024. https://www.iccat.int/com2024/ENG/PLE_104_ENG.pdf

4.3.3 Management procedures

BIGEYE/YELLOWFIN AND EASTERN ATLANTIC SKIPJACK TUNA

No management procedure has been adopted, however, ICCAT has started a process for developing a multiespecies management strategy evaluation for the three tropical tuna species. Interim operational management objectives are not yet defined, but have been suggested for consideration when developing a management procedure for these species (ICCAT Res 24-02).

WESTERN ATLANTIC SKIPJACK TUNA

In 2024, ICCAT adopted candidate management procedures for Western Atlantic skipjack tuna to achieve agreed management objectives. It tasked the SCRS with testing these candidate procedures, allowing the Commission to adopt the final management procedures in 2025 to set the TAC for the 2026–2028 period.

NORTH ATLANTIC ALBACORE TUNA

The stock is managed through a full management procedure (including a harvest control rule) described in ICCAT Rec 21-04 to support the management objectives for North Atlantic albacore tuna, which have been set by ICCAT to maintain the stock in the green quadrant of the Kobe plot ($SSB > SSB_{MSY}$ and $F < F_{MSY}$) with at least 60 percent probability.

SOUTH ATLANTIC ALBACORE TUNA

Management procedures are not currently used, but initial operational management objectives have been recommended for consideration when developing a management procedure (ICCAT Res 24-09).

MEDITERRANEAN ALBACORE

Management procedures are not currently used.

EASTERN ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA, AND WESTERN ATLANTIC BLUEFIN TUNA

Both of these bluefin tuna stocks – the Eastern Atlantic and Mediterranean, and the Western Atlantic – are managed through a management procedure described in ICCAT Rec 23-07 with the objective to have a 60 percent or greater probability of occurring in the green quadrant of the Kobe plot (no overfishing occurring and not overfished); to have 15 percent or smaller probability of stock falling below B_{LIM}; to maximize overall catch levels; and to limit any change in TAC between consecutive management periods in both the western and eastern management areas to no more than a 20 percent increase or a 35 percent decrease.

4.3.4 Management measures

TROPICAL TUNAS

The main binding conservation measure for bigeye, yellowfin and skipjack tuna established by the ICCAT is Recommendation 24-01. This multi-annual management plan for tropical tunas for 2025–2027 calls for:

- A TAC of 73 011 tonnes in 2025 for bigeye tuna, with catch limits established for members; for the 2026–2027 period the TAC will be maintained provided the 2025 stock assessment indicates a 65 percent or larger probability of the stock being in the green zone in 2034.
- An overall TAC of 110 000 tonnes for yellowfin tuna (unallocated by country) for the 2025–2027 period.
- A 45-day closure (17 March to 30 April) in 2025 for purse-seine and baitboat (pole-and-line) vessels fishing on floating objects (including their support vessels' activities) on the high seas and EEZs. In addition, a prohibition on deploying drifting FADs during the 15 days prior to the closure.
- Observer coverage (human or electronic) of 100 percent for purse-seine vessels and 10 percent for large longline vessels.
- A limit of 300 FADs with operational buoys at any one time per vessel in 2025, which will be reduced to 288 FADs in 2026–2027.
- Fully non-entangling FADs constructed without netting.
- A phased transition to biodegradable FADs aiming for 100 percent biodegradable FADs (excluding the FAD tracking buoy) by 2028.

Additionally, ICCAT Recommendation 17-01 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse-seine vessels

NORTH ATLANTIC ALBACORE TUNA

In 2023, as a result of applying the management procedure, an annual TAC of 47 251 tonnes was established for 2024–2026 (ICCAT Rec 23-05). The TAC for 2024–2026 represents a 25 percent increase with respect to the previous TAC in the 2021–23 period and is above the MSY estimate for this stock (42 000 tonnes) because the current biomass is well above B_{MSY}. The management procedure will be applied again in 2026.

Additionally, the multi-annual management programme established by ICCAT for North Atlantic albacore tuna calls for a limit on the number of vessels from each member targeting North Atlantic albacore tuna to its average level of the 1993–1995 period.

EASTERN ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA

The Eastern Atlantic and Mediterranean bluefin tuna stock has been subject to a rebuilding programme since 2006 (ICCAT Rec. 06-05). In 2022, ICCAT (Rec. 22-08, which was amended by Rec. 24-05), moved from that rebuilding plan to a management plan. And in 2023 ICCAT adopted a management procedure for the stock (ICCAT Rec. 23-07).

The management plan set up in Rec. 24-05 is very comprehensive and combines multiple conservation and compliance elements. Using the results of the management procedure, the annual TAC for the 2023–2025 period is set at 40 570 tonnes. In addition to the TACs, the plan includes the following measures, among others:

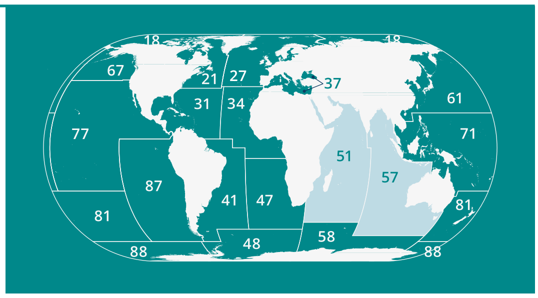
- Manages fishing capacity and farming capacity.
- Establishes closed fishing seasons for large-scale longliners (seven months closed season) and purse seiners (11 month closed season), and requires contracting parties or cooperating non-contracting parties (CPCs) to provide information on closed fishing seasons for other vessel types in their annual fishing plans.
- Sets minimum sizes of 8 kg and 30 kg (75 cm and 115 cm, respectively), depending on the fishery.
- Introduces bycatch limits on bluefin tuna.
- Establishes records of authorized fishing vessels, authorized traps and authorized farming facilities.
- Requires that CPCs establish annual farming management plans.
- Establishes provision for recreational and sport fisheries, requiring CPCs to regulate those fisheries.
- Establishes an observer programme with 100 percent coverage for purse seiners, for transfers to cages and operations in tuna farms, for operations from traps, and of towing vessels.
- Establishes an observer programme with 20 percent coverage for active pelagic trawlers, longline vessels and baitboats (all over 15 m).

The multiple amendments made to the management plan since 2006 have resulted in increasingly tighter controls of the actual catches. Combined with lower quotas, fishing mortality rates have been reduced substantially.

WESTERN ATLANTIC BLUEFIN TUNA

Western Atlantic bluefin tuna has been the subject of a rebuilding programme since 1998, which has been amended every other year since 2002. Recommendation 2022-10 sets up a conservation and management plan starting in 2023, that includes the establishment of TACs based on the application of the bluefin tuna management procedure (Rec. 23-07). The annual TAC set for the 2023–2025 period is 2 726 tonnes, allocated by country in Rec. 2022-10. This conservation and management plan also includes a 30-kg minimum size and the prohibition of directed fisheries in the Gulf of Mexico (the only known spawning area for the stock).

4.4 INDIAN OCEAN



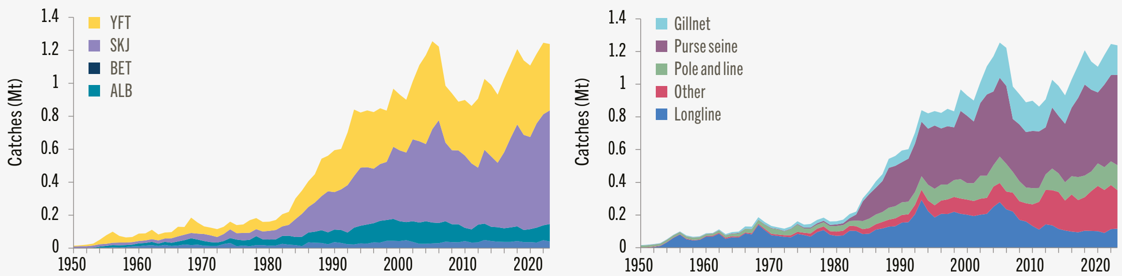
About 23 percent of the world's tuna production comes from the Indian Ocean (IO)– FAO Major Fishing Areas 51 and 57 – making it the second most important region for tuna fishing after the Western and Central Pacific Ocean. Catches of skipjack, yellowfin, bigeye and albacore tuna in 2023 totaled approximately 1 237 000 tonnes, a 1 percent decrease from 2022. The total catch generally declined after 2005, when a record 1.25 million tonnes were caught, followed by an increase in recent years which has brought catches back to 2005 levels (FIGURE E.1.16). Catches of southern bluefin tuna occur primarily in the IO Area of Competence. However, due to their distribution across three oceans, this stock is covered below under a separate section on the CCSBT convention area.

The catch of tropical tunas and albacore tuna in the IO steadily increased, reaching 200 000 tonnes in the early 1980s. It then rose rapidly to 500 000 tonnes in 1988 with the advent of the purse-seine fishery in the mid-1980s. Catches continued increasing quickly, reaching 600 000 tonnes in 1991, 700 000 tonnes in 1992, 800 000 tonnes in 1993, 900 000 tonnes in 1999, and 1.0 million tonnes in 2002. The highest recorded catch of 1.25 million tonnes was reached in 2005. Since then, catches declined until 2015 but have increased again, returning to 2005 levels in recent years (2022 and 2023) (**FIGURE E.1.16**).

The average tuna catch over the last five-year period (2019–2023) was 1 181 710 tonnes. During this period, skipjack tuna accounted for 53 percent of the total catch by weight, followed by yellowfin tuna (36 percent), bigeye tuna (8 percent) and albacore tuna (3 percent). Purse-seine vessels caught 42 percent of the total catch, followed by other fishing gears including handlines, trolling lines, coastal drifting longlines, and all other fishing gears used in coastal areas (22 percent), gillnets (15 percent), pole-and-line (12 percent), and longlines (9 percent).

Skipjack tuna catches continuously increased, peaking at around 0.6 million tonnes in 2006, then declined before rising again in 2016. They reached a record high of 0.69 million tonnes in 2023. Meanwhile, the yellowfin tuna catch reached its highest level in 2004, totaling about 0.54 million tonnes. Since then, catches have declined, stabilizing at about 0.4–0.45 million tonnes over the last ten years (**FIGURE E.1.16**). Bigeye tuna has a similar catch history to yellowfin tuna, with catches increasing until reaching a record high of 137 000 tonnes in 2004, followed by a decline. However, albacore tuna exhibited different trends, peaking in 2013 at 50 000 tonnes and then fluctuating between 35 000 tonnes and 48 000 tonnes.

FIGURE E.1.16
TRENDS IN CATCH IN MILLION TONNES (MT) OF BIGEYE, SKIPJACK, YELLOWFIN AND ALBACORE TUNA IN THE INDIAN OCEAN, BY SPECIES (LEFT) AND GEAR (RIGHT) FROM 1950 TO 2023



Notes: (1) ALB: albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)* and SKJ: skipjack tuna *(Katsuwonus pelamis)*. (2) Data expressed in live weight equivalent.

Source: IOTC. Best scientific estimates of nominal retained catch data by species and gear. IOTC Available Datasets. 2025. https://iotc.org/data/datasets [accessed on 15 January 2025].

4.4.1 Catches by species

BIGEYE TUNA

Bigeye tuna catches in 2023 were about 105 877 tonnes, a 17 percent increase from 2022. For the period 2019–2023, the main fishing gear is purse seine (43 percent), followed by longline (37 percent). Longline catches have declined dramatically from a high in 2004 (**FIGURE E.1.17**), due to vessels moving away from the main fishing grounds to avoid piracy, though they increased sharply in 2012 only to decrease again since then. In contrast, catches from purse-seine vessels have been relatively stable since 2000, with the exception of 2018 and 2021–2023 during which catches were elevated: the catch in 2023 is the highest in the record (52 000 tonnes).

YELLOWFIN TUNA

Yellowfin tuna catches in 2023 were about 401 364 tonnes, an 8 percent decrease from 2022. The main fishing gears for yellowfin tuna for the 2019–2023 period are purse seine (30 percent of the catch), followed by handlines (27 percent), gillnets (15 percent), other line fisheries such as troll and coastal longline (15 percent), longline (9 percent) and pole-and-line (3 percent) (**FIGURE E.1.17**). Catches by gillnet (15 percent) and miscellaneous line gears (42 percent including handline, troll and coastal longline) have become increasingly important in recent years. Catches by these gears are poorly estimated. Catches from pole-and-line vessels (3 percent) have been relatively stable. Overall, catches have declined by 26 percent from a record high of 540 000 tonnes in 2004; but annual catches have stayed above 400 000 tonnes since 2012, and another peak of over 450 000 tonnes was reached in 2018–2019.

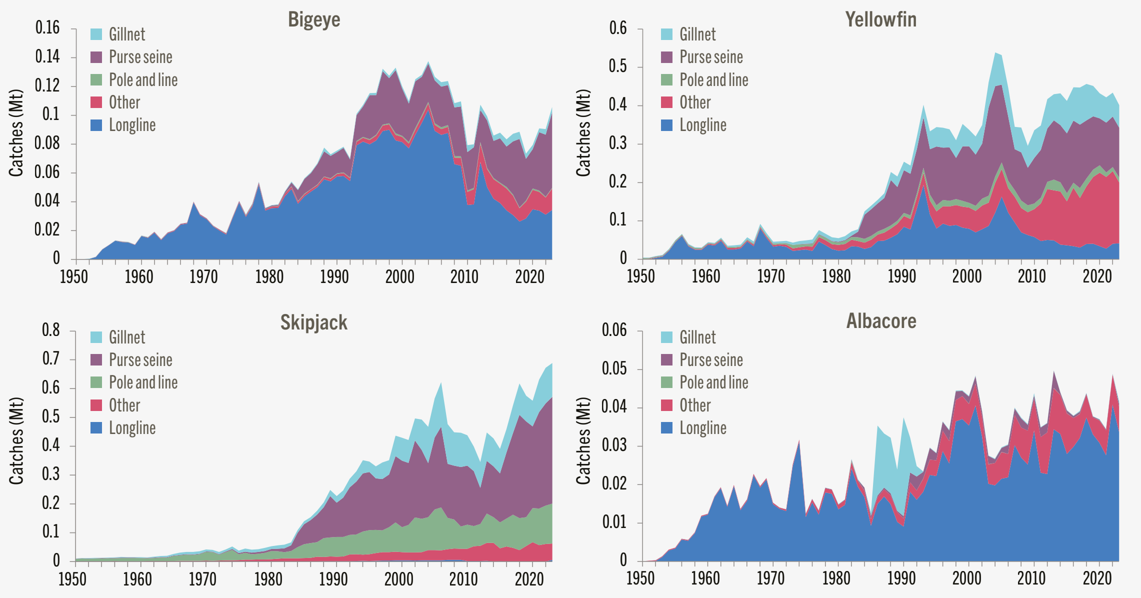
SKIPJACK TUNA

Skipjack tuna catches in the IO in 2023 were about 688 679 tonnes, a 2 percent increase from 2022. Purse seine (54 percent), pole-and-line (20 percent) and gillnets (17 percent) dominate the catches, with other miscellaneous gears catching around 9 percent (**FIGURE E.1.17**). Pole-and-line, purse-seine and gillnet catches decreased since the mid-2000s for about a decade, but show an increasing trend after 2012, notably so for purse seine.

ALBACORE TUNA

Albacore tuna catches in the IO in 2023 were about 41 680 tonnes, a 15 percent decrease from 2022. Almost all catches are made by pelagic longlines (83 percent) while the contribution of other miscellaneous gears is around 17 percent (**FIGURE E.1.17**).

FIGURE E.1.17
CATCHES IN MILLION TONNES (MT) OF BIGEYE, YELLOWFIN, SKIPJACK AND ALBACORE TUNA IN THE INDIAN OCEAN BY GEAR TYPE FROM 1950 TO 2023



Note: Data in live weight equivalent.
Source: IOTC. Best scientific estimates of nominal retained catch data by species and gear. IOTC Available Datasets. 2025. https://iotc.org/data/datasets [accessed on 15 January 2025].

4.4.2 Stock status

BIGEYE TUNA

The latest assessment conducted by the Scientific Committee in 2022 (IOTC, 2024) indicated that the **stock is overfished and overfishing is taking place** (**TABLE E.1.5** and **FIGURE E.1.18**). The 2022 and 2023 catch (both around 100 000 tonnes) were above the MSY level and above the TAC for 2024–2025 (80 583 tonnes).

YELLOWFIN TUNA

In 2024 a new stock assessment was carried out for yellowfin tuna in the IOTC area of competence which resulted in a more optimistic stock status than the 2021 model (IOTC, 2024). This was mostly due to the new abundance index derived from the joint catch per unit effort (CPUE) estimated for longline fleets which was significantly different from the index used in 2021, suggesting a marked increase of abundance for yellowfin in the last three years (2021–2023). The new stock assessment indicated that the **stock is not overfished and overfishing is not occurring**. According to the 2024 assessment, the total catch has remained within the estimated range of MSY since 2007 (i.e. between 402 000 tonnes and 427 000 tonnes), with the exception of 2018 (443 252 tonnes) and 2019 (450 586 tonnes), the latter being the largest catch since 2006 and above the estimated recent MSY value. However, there is considerable uncertainty related to the new CPUE that requires further exploration.

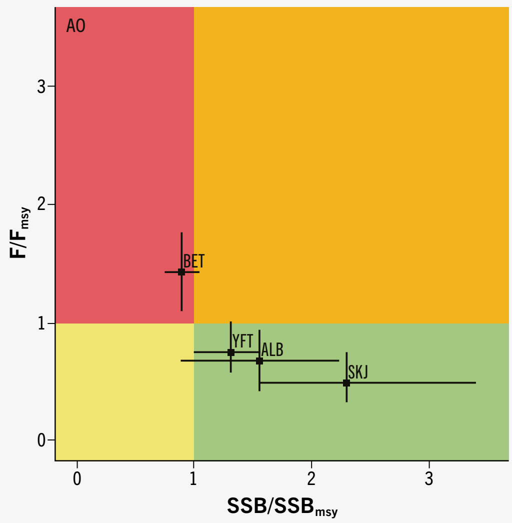
SKIPJACK TUNA

The most recent stock assessment of skipjack tuna was conducted in 2023 (IOTC, 2024) and indicated that the **stock is not overfished and overfishing is not occurring**. The catch in 2023 (688 680 tonnes) was larger than the estimated median value of MSY (584 800 tonnes); if this catch trend continues, overfishing might occur.

ALBACORE TUNA

The latest assessment was performed in 2022 (IOTC, 2024) and indicated that the **stock is not overfished and overfishing is not occurring**. However, there is considerable uncertainty associated with the latest stock assessment.

FIGURE E.1.18
COMBINED KOBE PLOT FOR IOTC BIGEYE, YELLOWFIN, SKIPJACK AND ALBACORE TUNA SHOWING THE ESTIMATES OF CURRENT SPAWNING BIOMASS (SSB) AND CURRENT FISHING MORTALITY (F) IN RELATION TO MSY-BASED REFERENCE POINTS



Notes: (1) ALB: albacore tuna *(Thunnus alalunga)*, BET: bigeye tuna *(Thunnus obesus)*, YFT: yellowfin tuna *(Thunnus albacares)* and SKJ: skipjack *(Katsuwonus pelamis)*.

Source: Adapted from IOTC. 2024. IOTC–SC27 2024. Report of the 27th Session of the IOTC Scientific Committee. Online, 2–6 December 2024. IOTC–2024–SC27–R[E]. https://iotc.org/sites/default/files/documents/2025/04/IOTC-2024-SC27-RE_0.pdf

TABLE E.1.5
STOCK STATUS OF THE TROPICAL TUNA STOCKS AND ALBACORE TUNA STOCK MANAGED BY THE IOTC

Stock	Latest stock assessment year	SSB/SSB_{MSY}	F/F_{MSY}	Stock status	Management procedures	FAO status
Bigeye tuna	2022	0.90 (0.75–1.05)	1.43 (1.10–1.77)	Overfished & Overfishing	Yes (IOTC Res 22/03)	Maximally sustainably fished
Yellowfin tuna	2024	1.32 (1.00–1.59)	0.75 (0.58–1.01)	Not overfished & Not overfishing	No	Underfished
Skipjack tuna	2023	2.30 (1.57–3.40)	0.49 (0.32–0.75)	Not overfished & Not overfishing	Yes (IOTC Res 24/07)	Underfished
Albacore tuna	2022	1.56 (0.89–2.24)	0.68 (0.42–0.94)	Not overfished & Not overfishing	No	Underfished

Source: IOTC–SC27 2024. Report of the 27th Session of the IOTC Scientific Committee. Online, 2–6 December 2024. IOTC–2024–SC27–R[E] https://iotc.org/sites/default/files/documents/2025/04/IOTC-2024-SC27-RE_0.pdf

4.4.3 Management procedures

BIGEYE TUNA

Indian Ocean bigeye tuna is managed by a management procedure (IOTC Res 22/03) with the objective of maintaining the stock with 60 percent probability in the green zone of the Kobe plot while maximizing the average catch from the fishery and reducing the variation in the TAC between management periods (15 percent TAC change limit).

YELLOWFIN TUNA

There is no management procedure.

SKIPJACK TUNA

The skipjack tuna in the IO is managed through a management procedure (IOTC Res 24/07) with the objective to have at least 50 percent probability that the spawning stock biomass achieves the target biomass level of 40 percent SSB_0 by 2034–2038, is maintained above the biomass of SSB_{MSY} with very high probability, is maintained above the biomass of 20 percent of SSB_0 at all times, and a maximum increase in TAC of 15 percent and a maximum decrease of 10 percent relative to the previous TAC.

ALBACORE TUNA

There is no management procedure.

4.4.4 Management measures

BIGEYE TUNA

The only conservation measure established by the IOTC specifically for bigeye tuna is Resolution 23/04, which establishes catch limits by contracting parties or cooperating non-contracting parties (CPCs) as per the management procedure (Res. 22/03) and Resolution 01/06 concerning IOTC bigeye tuna statistical document programme.

YELLOWFIN TUNA

Resolution 21/01 establishes an interim plan for rebuilding the IO yellowfin tuna stock in the IOTC area of competence. This plan details yellowfin tuna catch limits and provisions, requiring that CPCs whose fleets exceed their catch limits will have that overcatch deducted from their annual limits in future years. Moreover, Resolution 21/01 requests CPCs to gradually reduce supply vessels by 31 December 2022, which also affects the management of bigeye and skipjack tuna.

SKIPJACK TUNA

The annual skipjack tuna catch limit for the 2024–2026 period was established in IOTC Circular 2024-11 applying the skipjack tuna harvest control rule specified in Resolution 21/03, which has been amended by IOTC Res 24/07. The new management procedure will be used to establish the catch limits for the 2027–2029 period.

TROPICAL TUNAS

In addition to the species-specific management measures above, there are other IOTC resolutions affecting the three tropical tunas, which are described below:

- Resolution 24/06 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse-seine vessels.
- Resolution 24/02 establishes procedures on a FAD management plan, including:
  - An IOTC-wide FAD register effective as of 1 January 2026.
  - A limit of 250 instrumented buoys at sea at any one time per vessel from 1 January 2026 (225 from 1 January 2028) and a limit of 400 instrumented buoys to be acquired annually by each fishing vessel.
  - A requirement to report daily information on all active drifting fish aggregating devices (DFADs) to the IOTC with a time delay of 30 to 60 days.
  - Ban, prevention and reporting measures for abandoned, lost or otherwise discarded DFADs.
  - A requirement to use non-entangling FADs constructed without netting material and remove from the water all traditional FADs encountered (e.g. those made of entangling materials or designs).
  - A stepwise timeline for a fleet-wide transition to the use of biodegradable FADs between 1 January 2026 and 1 January 2030.
  - A DFAD marking scheme requires that the instrumented buoys attached to deployed DFADs are permanently marked with a unique reference number marking and the IOTC unique vessel identifier.
  - A timeline to reduce supply vessels in tropical tuna purse-seine operations.

4.5 CCSBT CONVENTION AREA

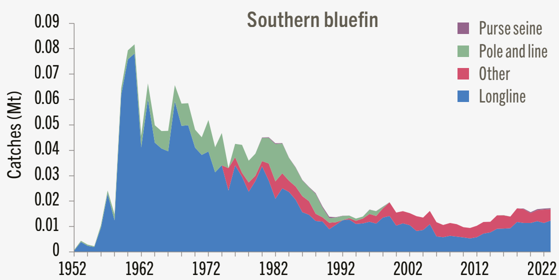
Southern bluefin tuna *(Thunnus maccoyii)* is assessed and managed by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Practically all of the catches are made in the IOTC, ICCAT and WCPFC convention areas (62 percent in the Indian Ocean, 25 percent in the Pacific Ocean and 13 percent in the Atlantic Ocean).

4.5.1 Catch of southern bluefin tuna

Southern bluefin tuna catches in 2023 were approximately 17 300 tonnes, reflecting a 1 percent increase from 2022. Catches rose sharply from the beginning of the fishery around 1950, reaching a record high of 81 000 tonnes in 1961. However, they then declined continuously until 2011, when the lowest recorded catch of 9 459 tonnes was reported (**FIGURE E.1.19**). Since then, catches have been gradually increasing to the current level of 17 300 tonnes, largely due to strict catch limits established under the Southern Bluefin Tuna Management Procedure. This procedure, initially known as the "Bali Procedure" (adopted in 2011), was replaced by the "Cape Town Procedure" in 2019.

Virtually all catches are made using longline (70 percent) and purse-seine (28 percent) fishing methods. Current catch levels are approximately 20 percent of the peak recorded in 1961 (**FIGURE E.1.19**).

FIGURE E.1.19
CATCHES IN MILLION TONNES (MT) OF SOUTHERN BLUEFIN TUNA BY GEAR TYPE FROM 1952 TO 2023

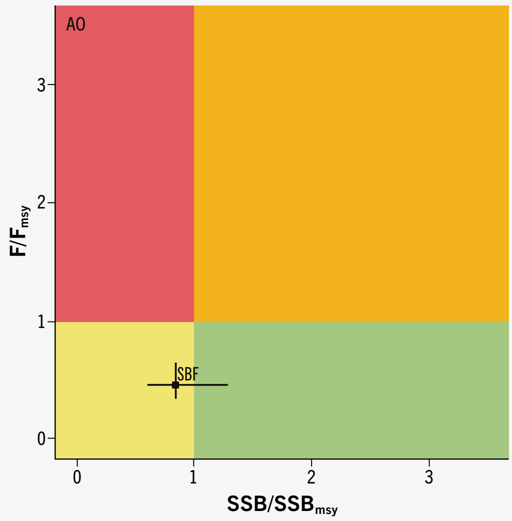


Source: CCSBT. Annual catch by flag or gear from 1952 to 2023 inclusive. SBT Data. 2024. https://www.ccsbt.org/en/content/sbt-data [accessed on 20 October 2024].

4.5.2 Stock status

The latest full stock assessment was conducted in 2023 (CCSBT, 2023). Since 2017, CCSBT has measured reproductive capacity as total reproductive output (TRO) rather than SSB. The 2023 stock assessment suggested that the southern bluefin tuna TRO is at 23 percent of its initial value as well below the level that could produce maximum sustainable yield. According to the 2023 assessment, the current ratio of TRO/TRO_{MSY} is estimated at 0.85, indicating that the stock is in an overfished state. The ratio of $F_{current}/F_{MSY}$ is estimated at 0.46, indicating that overfishing is not occurring. The estimate of MSY is 30 648 tonnes, well above current catch levels (20 647 tonnes in 2024). Thus, the **stock is overfished and overfishing is not occurring** (**TABLE E.1.6** and **FIGURE E.1.20**).

FIGURE E.1.20
KOBE PLOT FOR THE SOUTHERN BLUEFIN TUNA SHOWING THE ESTIMATES OF CURRENT SPAWNING BIOMASS (SSB) AND CURRENT FISHING MORTALITY (F) IN RELATION TO MSY-BASED REFERENCE POINTS



Notes: (1) SBT: southern bluefin tuna *(Thunnus maccoyii).* (2) TRO is used as SSB.
Source: Adapted from CCSBT. 2024. CCSBT–SC28 2023. Report of the 28th Meeting of the CCSBT Scientific Committee. Jeju Island, Republic of Korea, 1 September 2023. https://www.ccsbt.org/sites/default/files/userfiles/file/docs_english/meetings/meeting_reports/ccsbt_30/report_of_SC28.pdf

TABLE E.1.6
STOCK STATUS OF SOUTHERN BLUEFIN TUNA MANAGED BY CCSBT

Stock	Latest stock assessment year	SSB/SSB_{MSY}	F/F_{MSY}	Stock status	Management procedures	FAO status
Southern bluefin	2023	0.85 (0.61-1.29)	0.46 (0.34-0.65)	Overfished & Not overfishing	Yes (Cape Town Procedure)	Maximally sustainably fished

Source: CCSBT. 2024. CCSBT–SC28 2023. Report of the 28th Meeting of the CCSBT Scientific Committee. Jeju Island, Republic of Korea, 1 September 2023. https://www.ccsbt.org/sites/default/files/userfiles/file/docs_english/meetings/meeting_reports/ccsbt_30/report_of_SC28. pdfhttps://www.ccsbt.org/sites/default/files/userfiles/file/docs_english/meetings/meeting_reports/ccsbt_30/report_of_SC28.pdf

4.5.3 Management procedures

The southern bluefin tuna is managed through a management procedure adopted in 2011 (the Bali Procedure) and renewed in 2019 (the Cape Town Procedure). This guides the setting of TACs with the objective of achieving 20 percent of the unfished biomass (20 percent TRO_0) with a 70 percent probability by 2035 and 30 percent TRO with a 50 percent probability by 2035. Additionally, if a change to the TAC is recommended, it is subject to a minimum change of 100 tonnes and a maximum change of 3 000 tonnes in either direction.

4.5.4 Management measures

TACs under the management procedure are set for three-year periods to keep the stock on its planned rebuilding trajectory. The management procedure specifies the minimum and maximum permissible changes in TAC (either an increase or decrease, depending on stock status relative to the rebuilding trajectory). The management procedure was applied in 2022 and recommended that the TAC for the 2024–2026 period be increased by the maximum allowable TAC change of 3 000 tonnes (from 17 647 to 20 647 tonnes). The 2024 ESC found no evidence of exceptional circumstances and therefore confirmed the TAC recommendation for the 2024–2026 period of 20 647 tonnes/year, which the Commission endorsed.

5. CONCLUDING REMARKS

Globally, the seven major commercial oceanic tuna species are assessed and managed as 23 distinct stocks by the five tuna Regional Fisheries Management Organizations (RFMOs): CCSBT, IATTC, ICCAT, IOTC and WCPFC. These stocks include six albacore, four bigeye, four bluefin, five skipjack, and four yellowfin tuna stocks.

The global tuna catch has remained stable at around 5 million tonnes in recent years. In 2023, the total catch was approximately 5.2 million tonnes, a figure similar to the previous year. Skipjack tuna accounted for the largest share (57 percent), followed by yellowfin tuna (31 percent), bigeye tuna (7 percent), albacore tuna (4 percent), and the three bluefin tuna species collectively contributing just 1 percent of the total catch.

From a stock perspective, based on the most recent stock status adopted by tuna RFMOs, 16 out of the 23 assessed tuna stocks are not overfished, and overfishing is not occurring. Additionally, five stocks are classified as overfished but are not currently subject to overfishing, indicating they are in a rebuilding phase. Meanwhile, two stocks remain both overfished and subject to ongoing overfishing: Indian Ocean bigeye tuna and Mediterranean albacore tuna. Encouragingly, 95 percent of the total global tuna catch originates from stocks that are not overfished and where overfishing is not occurring. This is largely due to the healthy status of skipjack tuna stocks, which contribute more than half of the total tuna catch. It should be noted that FAO uses different criteria to determine fish stock status, which may result in discrepancies between RFMOs' assessments and the FAO assessment, as shown in the population-specific stock status tables.

Since the adoption of the first management procedure for southern bluefin tuna in 2011, several other tuna stocks have also implemented them, which has contributed to both rebuilding depleted stocks and maintaining the health of existing ones (**BOX E.1.2**). Additionally, ongoing management strategy evaluation processes are in place to develop and adopt new management procedures for remaining tuna stocks, ensuring their long-term sustainability.

The estimated MSY for all 23 commercial tuna stocks is approximately 6.3 million tonnes. Stocks of bigeye, yellowfin, bluefin and albacore tuna are being fished at levels consistent with MSY, while skipjack tuna could potentially sustain slightly higher yields, particularly in the WCPFC region. However, in the WCPFC, which accounts for the main difference between total catch and potential MSY (approximately 1 million tonnes), a target reference point and a management procedure for skipjack tuna have already been established. Fishing in this region is occurring at the defined sustainable level, meaning further increases in skipjack tuna catches are not feasible under current management. Moreover, because skipjack tuna fishing globally is primarily conducted using FADs, and the tropical tuna fisheries is multispecies in nature, an increase in skipjack tuna catch would inevitably result in higher catches of bigeye and yellowfin tuna stocks globally, which could negatively impact these species.

In conclusion, the current scenario suggests a management focus that maintains yields and catches rather than expanding them. Under existing management frameworks, the global tuna fishery appears to have reached or is close to reaching its maximum, and further increases in catch are not advisable. Instead, efforts should continue to focus on strengthening management measures, where required, through adopting management procedures, maintaining stock health, and ensuring the long-term sustainability of tuna populations.

BOX E.1.1

MAJOR COMMERCIAL TUNA SPECIES BIOLOGY AND STOCK INFORMATION

There are three species of bluefin tuna, and one each of albacore, bigeye, yellowfin and skipjack tuna. Due to differences in their distributions and the different fisheries that exploit them, the species are classified as "temperate" or "tropical". The temperate tunas are the bluefin, plus albacores tuna; they are found in waters as cold as 10 °C, but can also be found in tropical waters. Skipjack and yellowfin tuna are classified as tropical and are found in waters with temperatures greater than 18 °C (although they can dive in colder waters). Although bigeye tuna could be classified as being between both groups, it is mostly treated as a tropical species by tuna RFMOs.

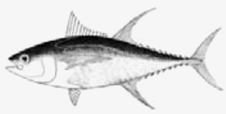
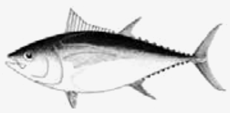
Figure	Species	Stocks	Biology	Main gears	Global catch (1 000 tonnes)
	**Skipjack tuna** *(Katsuwonus pelamis)* The most commonly caught species, primarily used for canned tuna. It is found in tropical and subtropical waters and is relatively fast-growing, making it more resilient to fishing pressure.	5 stocks or populations: Eastern Atlantic Ocean, Western Atlantic Ocean, Eastern Pacific Ocean, Western and Central Pacific Ocean, and Indian Ocean	The smallest of the major commercial tuna species. Highly fecund and can spawn year-round over a wide area of the tropical and subtropical waters. Environmental conditions are believed to significantly influence recruitment and can produce widely varying recruitment levels between years.	Skipjack tuna are caught mainly on the surface by purse seine and pole-and-line gear. Skipjack tuna form both free schools and schools associated with floating objects. They are the principal species associated with FADs and are caught in conjunction with juvenile yellowfin and bigeye tunas.	3 000
	**Yellowfin tuna** *(Thunnus albacares)* A widely distributed species through tropical and subtropical areas, known for its versatility in sushi, sashimi, and fresh fish markets.	4 stocks or populations: Atlantic Ocean, Eastern Pacific Ocean, Western and Central Pacific Ocean, and Indian Ocean	Yellowfin tuna reach intermediate sizes between albacore and bigeye tuna. Individuals as large as 150 cm are common in some fisheries. Highly fecund and can spawn year-round over a wide area of the tropical and subtropical oceans, providing environmental conditions (such as water temperature and forage availability) are suitable. As with many tropical tuna species, environmental conditions are believed to significantly influence recruitment levels over time.	Small yellowfin tuna are caught on the surface by a range of gears including handline, ring net, purse seine (FADs) and pole-and-line gear and are used mainly for canning, while the majority of larger/older fish are caught by both purse seine and longline fisheries, with the longline catch often shipped fresh to overseas markets. Yellowfin tuna form both free and associated schools with adults generally forming schools of similarly sized individuals. The free-swimming schools tend to contain large individuals and are mono-specific. In the Eastern Pacific, schools are often associated with dolphin pods, an association not common elsewhere.	1 600
	**Bigeye tuna** *(Thunnus obesus)* Valued for its higher fat content, making it a premium choice for sashimi. It is found in deeper waters than other tropical tuna.	4 stocks or populations: Atlantic Ocean, Eastern Pacific Ocean, Western and Central Pacific Ocean, and Indian Ocean	Bigeye tuna reach similar maximum sizes to yellowfin. Individuals as large as 150 cm are common in some fisheries. Bigeye tuna are highly fecund and can spawn year-round over a wide area of the tropical and subtropical oceans, providing environmental conditions (such as water temperature) are suitable.	Bigeye tuna can form either free schools or those associated with floating objects. Juvenile bigeye tuna will form schools with juvenile yellowfin and skipjack tunas. Smaller bigeye tuna are caught on the surface by a range of gears including handline, ring net and purse seine (FADs) and are used mainly for canning, while the majority of larger/older fish are caught by longline fisheries for the sashimi market.	400

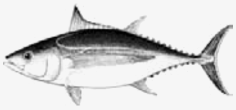
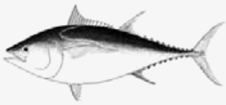
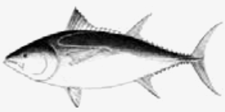
Figure	Species	Stocks	Biology	Main gears	Global catch (1 000 tonnes)
	**Albacore tuna** *(Thunnus alalunga)* Mainly used for canned 'white meat' tuna, albacore tuna is found in temperate and sub-tropical waters.	6 stocks or populations: Northern Atlantic Ocean, Southern Atlantic Ocean, Mediterranean Sea, Northern Pacific Ocean, Southern Pacific Ocean, and Indian Ocean	Albacore tuna is one of the smaller major commercial tuna species, reaching sizes intermediate between skipjack and yellowfin tuna. Mature albacore tuna spawn in the spring and summer in tropical and sub-tropical waters between 10° and 25° north and south from the equator.	Albacore tuna tend to travel in single species schools, without the level of mixing with other species seen in other tuna groups (e.g. tropical tuna). Association with floating objects – as seen with tropical tunas – is not common. Small albacore tuna are caught by trolling at the surface in cool water outside the tropics, while larger fish are caught deeper and mainly at lower latitudes (subtropical) using longline gear.	200
	**Atlantic bluefin tuna** *(Thunnus thynnus)* One of the most prized species, highly valued in Japan for sushi and sashimi. It is mainly found in the Atlantic Ocean and Mediterranean Sea, with strict management due to historical overfishing and underreporting.	2 stocks or populations: Western Atlantic Ocean, Eastern Atlantic and Mediterranean Sea	The largest of the tuna species. It can reach 3 m in length, although the common size ranges 80–200 cm. The Atlantic bluefin tuna tolerates a wide range of temperatures. It lives in subtropical and temperate waters of the Atlantic Ocean and the Mediterranean and Black Seas, although sightings in the Black Sea are now rare. They are highly migratory and tend to form schools by size.	Western Atlantic bluefin tuna are caught mainly by sport fisheries (handline, rod and reel) and longline fisheries. The main gears targeting Eastern Atlantic and Mediterranean bluefin tuna are purse seines, and, to a lesser extent, longlines and traps.	35
	**Pacific bluefin tuna** *(Thunnus orientalis)* Similar to the Atlantic bluefin, it is highly sought after for sushi markets, and is primarily caught in the Pacific Ocean.	1 stock or population: Northern Pacific Ocean	Although it is generally smaller than Atlantic bluefin tuna, Pacific bluefin tuna is still one of the largest of the tuna species, ranging 80–200 cm in length. It is a temperate tuna species that can also range into tropical waters. It forms schools by size, sometimes with other tuna and mackerel species.	Most of the catch is made by purse seine fisheries, followed by a variety of gears, such as coastal set nets,trolls, and longlines.	15
	**Southern bluefin tuna** *(Thunnus maccoyii)* Primarily found in the Southern Hemisphere, this species is highly valuable but has faced significant stock declines, leading to strict quotas.	1 stock or population: Southern Oceans	Southern bluefin tuna was the first of the three bluefin tunas to be recognized as a distinct species. Like the other bluefin tunas, it reaches large sizes: adults commonly grow to 180 cm in length. Southern bluefin tuna's thermoregulation capacity enables it to tolerate water temperatures from more than 25 °C in the subtropics to less than 3 °C in the sub-Antarctic regions. Southern bluefin tuna migrate vast distances and tend to school by size, especially when they are juveniles and during the spawning season.	Virtually all of the catches are made by longline and purse seine fisheries.	17

Image credits: Albacore tuna (ALB), Atlantic bluefin tuna (Atl BFT), bigeye tuna (BET), southern bluefin tuna (SBT), skipjack tuna (SKJ), and yellowfin tuna (YFT): In: FAO Species Catalogue, Vol. 2. Scombrids of the World. 1983. **FAO.** 1983. FAO Species Catalogue, Vol. 2. Scombrids of the World. Rome, Italy. https://openknowledge.fao.org/handle/20.500.14283/ac478e; Pacific bluefin tuna (PBF): George Mattson. In: **James, J., Klawe, W. and Murphy, P.** 1988. Tuna and Billfish. Fish without a Country. 1988. Inter-American Tropical Tuna Commission, La Jolla, CA. ISBN 10: 0960307826 ISBN 13: 9780960307821

BOX E.1.2

THE IMPORTANCE OF MANAGEMENT STRATEGY EVALUATION AND MANAGEMENT PROCEDURES IN TUNA MANAGEMENT

Tuna fisheries play a crucial role in global seafood production, providing food security, employment and economic value to many coastal nations. However, growing concerns related to unsustainable fishing, climate change, ecosystem impacts and mismanagement necessitate robust management approaches. Management strategy evaluation (MSE) and precautionary management procedures have emerged as a key tool for ensuring sustainable tuna stocks while balancing economic and ecological objectives (Punt *et al.,* 2016). MSE tested management procedures for tunas have recently become an improved management tool in rebuilding tuna stocks and ensuring their long-term sustainability (Hillary *et al.,* 2016).

MSE is a simulation-based framework that allows fisheries managers and stakeholders to test and evaluate the performance of different management options against pre-agreed management objectives before implementation (Sainsbury *et al.,* 2000). This process accounts for uncertainties in stock assessments, biological and environmental variability, as well as management implementation difficulties, ensuring that the selected management approach is robust to the various uncertainties (Punt *et al.,* 2016). The MSE approach helps assess trade-offs between conflicting management objectives, such as sustainability, yield and stability, by evaluating multiple candidate management procedures (Butterworth, 2007). As such, the MSE allows policymakers to understand trade-offs between conservation goals, economic benefits, and food security (Miller *et al.,* 2019). Moreover, it promotes transparency, credibility and consensus in fisheries management as it engages all stakeholders (scientists, industry representatives, NGOs and policymakers) in the MSE evaluation process (Miller *et al.,* 2019).

MSE-tested management procedures provide a pre-agreed framework for making management decisions, shifting fisheries management from reactive, short-term decision-making to proactive, long-term sustainability planning. A well-designed management procedure includes (Punt *et al.,* 2016):

1. **Management objectives** –
   Operational objectives to be achieved by the management procedure related to stock status, safety, catch levels and catch stability.
2. **Monitoring and data collection** –
   Regular collection of stock indicators, fishery and biological data to track stock status as well as the performance of the adopted management procedure.
3. **Harvest control rules** –
   Pre-agreed rules that determine catch limits or effort restrictions based on stock status indicators.
4. **Reference points** –
   Biological and economic benchmarks (e.g. target and limit reference points) that guide management decisions.
5. **Adaptive management** –
   The ability to adjust measures based on the stock condition to achieve the management objectives of the management procedure.

ENHANCING FISHERIES MANAGEMENT WITH MSE AND HARVEST STRATEGIES

The integration of MSE and harvest strategies is critical in addressing the challenges of modern fisheries management. These tools help mitigate risks associated with overfishing, climate change and economic uncertainties by providing a structured, science-driven and adaptive approach to decision-making. Additionally, they foster international cooperation, as many fish stocks, particularly tuna, are highly migratory and require coordination among multiple nations. By adopting MSE and robust management procedures, fisheries managers can enhance stock sustainability, maintain economic and viable fisheries, and ensure that marine ecosystems continue to thrive for future generations.

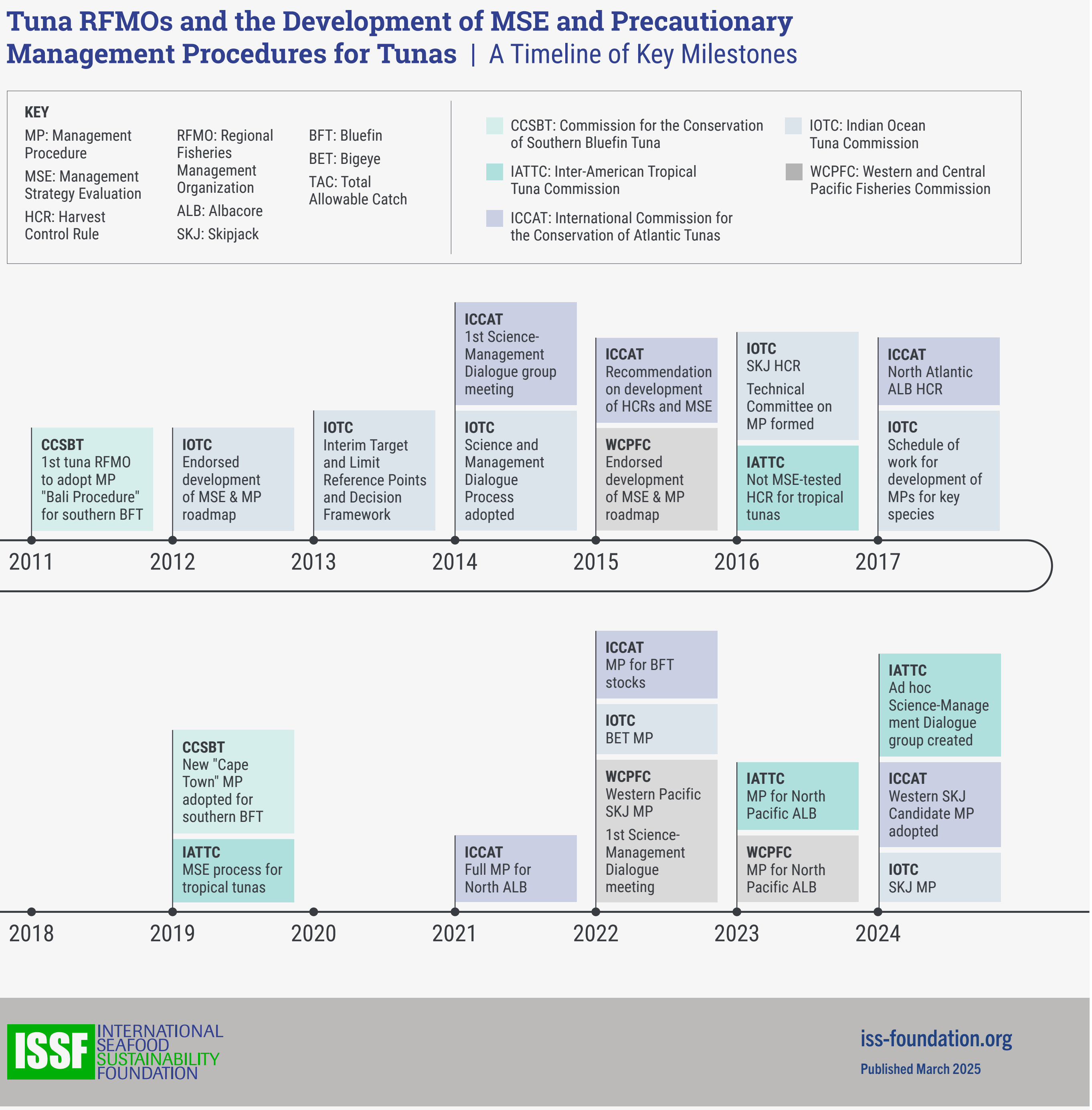
TUNA RFMOS: SUCCESSFUL IMPLEMENTATION OF MSE AND PRECAUTIONARY MANAGEMENT PROCEDURES

Since the adoption of the first tuna management procedure in 2011 (Hillary *et al.,* 2016), tuna RFMOs have embraced MSE and management procedures as a management approach to rebuild, first and when needed, and then maintain sustainable tuna stocks and fisheries. The following figure illustrates the development of management procedures by tuna RFMOs.

Precautionary management procedures are indispensable tools for achieving sustainable tuna fisheries. MSE provides a rigorous framework for testing management procedures before implementation, reducing risks and enhancing decision-making. Precautionary management procedures ensure that fishing limits are based on scientific evidence, safeguarding stocks from overexploitation. While challenges remain, continued investment in these approaches will be critical in securing the long-term health of global tuna fisheries.

Sources: Butterworth, D.S. 2007. Why a management procedure approach? Some positives and negatives. *ICES Journal of Marine Science*, 64: 613–617. https://doi.org/10.1093/icesjms/fsm003; **Hillary, R.M., Preece, A.L., Davies, C.R., Kurota, H., Sakai, O., Itoh, T., Parma, A.M., Butterworth, D.S., Ianelli, J. & Branch, T.A.** 2016. A scientific alternative to moratoria for rebuilding depleted international tuna stocks. *Fish and Fisheries,* 17: 469–482. https://doi.org/10.1111/faf.12121; **Miller, S.K., Anganuzzi, A., Butterworth, D.S., Davies, C.R., Donovan, G.P., Nickson, A., Rademeyer, R.A. & Restrepo,** V. 2019. Improving communication: the key to more effective MSE processes. *Canadian Journal of Fisheries and Aquatic Sciences,* 76: 643–656. https://doi.org/10.1139/cjfas-2018-0134; **Punt, A.E., Butterworth, D.S., de Moor, C.L., De Oliveira, J.A.A. & Haddon, M.** 2016. Management strategy evaluation: best practices. *Fish and Fisheries,* 17: 303–334. https://doi.org/10.1111/faf.12104 and **Sainsbury, K.J., Punt, A.E. & Smith, A.D.M.** 2000. Design of operational management strategies for achieving fishery ecosystem objectives. *ICES Journal of Marine Science*, 57: 731–741. https://doi.org/10.1006/jmsc.2000.0737

BOX E.1.2 *(continued)*



Source: ISSF, 2025, Tuna RFMOs and the development of MSE and precautionary management procedures for tunas https://www.iss-foundation.org/about-issf/what-we-publish/issf-documents/tuna-rfmos-and-the-development-of-mse-and-precautionary-management-procedures-for-tunas/

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Special topics: Part E, Chapter 2 (E.2)

DEEP-SEA FISHERIES
IN AREAS BEYOND NATIONAL JURISDICTION

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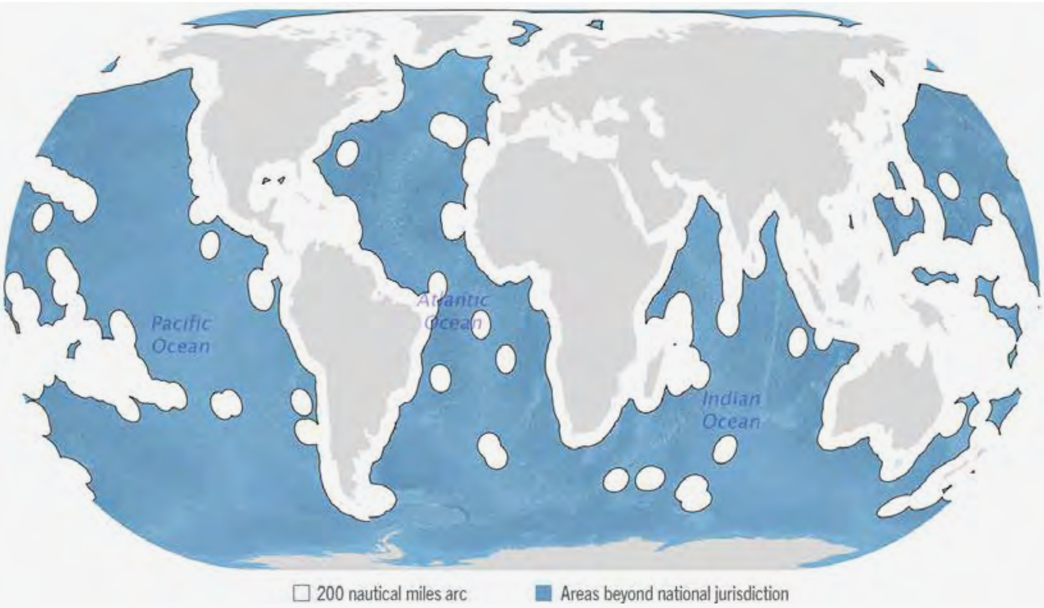
1. OVERVIEW

The ocean and the seabed are politically divided into various maritime zones, each with its applicable jurisdictional regime, pursuant to customary international law and the United Nations Convention on the Law of the Sea (UNCLOS, 1982). Beyond the territorial baseline and the territorial sea, a single coastal state can normally claim or have jurisdiction over two large main maritime zones, namely the exclusive economic zone (EEZ) which can extend to a maximum of 200 nautical miles (nm) from the territorial baseline, and the seabed and subsoil thereof extending to the outer extent of the continental shelf. The continental shelf can extend beyond the 200 nm EEZ or otherwise to the outer limit of the EEZ where the outer edge of the continental margin is less than the 200 nm. The water column beyond the EEZ and the outer edge of a coastal state's continental shelf constitutes a marine area beyond national jurisdiction (ABNJ).

Flagged vessels that operate in ABNJ are subject only to the jurisdiction of their respective flag states (**FIGURE E.2.1**; UNCLOS, 1982). These vessels, however, still need to meet international requirements for sustainability in ABNJ. In most areas, ensuring and monitoring compliance of these vessels with applicable international laws and standards is a cooperative effort made by the states concerned, either directly or through regional fisheries management organizations (RFMOs) that serve as fora for scientific deliberations and management decisions.

FIGURE E.2.1.
MARINE AREAS BEYOND NATIONAL JURISDICTION (ABNJ) ARE THOSE AREAS OF THE OCEAN THAT ARE MORE THAN 200 NAUTICAL MILES FROM THE COAST



Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: FAO. 2020. Worldwide review of bottom fisheries in the high seas in 2016. FAO Fisheries and Aquaculture Technical Paper No. 657. Rome. https://doi.org/10.4060/ca7692en

This chapter deals with demersal fisheries in ABNJ, which include fish and crustaceans. Detailed accounts of the fisheries in ABNJ up to 2016 are provided by Bensch *et al.* (2009) and FAO (2020), and only a summary is presented in this chapter.

2. INTRODUCTION

Deep-sea fisheries are generally regarded as those fisheries where the total catch includes species that can only sustain low exploitation rates and that deploy gears that are likely to contact the seafloor during the normal course of fishing operations (FAO, 2009). In ABNJ, these fisheries catch demersal species with bottom trawls and bottom-set gillnets, longlines, pots and traps typically in depths of 200–2 000 m, but occasionally shallower or deeper. Deep-sea fisheries in ABNJ tend to occur on topographical features, such as continental shelves, steep slopes, ridges, canyons and seamounts. The methods used are similar to those for deep-sea fishing within EEZs, though fishing at great depths invariably requires specialist equipment. This is especially true for trawl fishing on seamounts, where smaller bottom or deep (semi-pelagic) midwater trawls are deployed in a highly targeted manner along well-defined tow lanes where bottom contact may be limited to less than 15 minutes. These fishing methods require large vessels that must carry considerable lengths of wire or warp to get the gear down to fishable depths and be able to withstand the roughest of weather. Many of these fisheries also occur far from vessels' home ports, and land their catch in foreign ports. For these reasons, deep-sea fisheries are operated by developed country fishing nations (although they may employ crew from developing countries), and only very rarely by smaller or artisanal fleets from developing nations (FAO, 2011, 2020).

Deep-sea species, and especially mesopelagic species that migrate between deep and more shallow waters, are a key part of the biological carbon cycle.

2.1 ABNJ and topography

ABNJ have variable depths, bottom topographies, and productivity. The continental shelf is the extension from the land into the ocean, which can be fairly shallow, sloping gently down to a depth of a few hundred metres. The extent of the shelf can range from tens of nautical miles in most places to more than 200 nm in others. The main extended continental shelf regions are in the North Atlantic and Barents Sea, the Antarctic Area, the Saya de Malha Bank in the Indian Ocean, and the shelf around the Arctic Ocean which is currently (still) largely ice-covered, along with a few other areas. The continental shelves are often hospitable to biodiversity, as sunlight penetrates at shallow depths, supporting abundant plant and animal life. Canyons frequently cut into the continental shelves, and they may have steep rocky slopes. Canyons can be quite productive owing to the water currents that sweep through them being rich in nutrients and oxygen. Many canyons have dense concentrations of deepwater corals, sponges and other sedentary organisms.

The outer edge of the continental shelf descends rapidly down to 3 000 m or more, forming deep abyssal plains. Life at these great depths is very different, and productivity is very low without light and usually little oxygen. However, the underwater features that rise up at places from the abyssal seafloor provide a more productive environment. Best-known of these features are the underwater volcanoes (also known as seamounts), the mid-ocean ridges, and the seeps and vents with their chemosynthetic life forms. These deep-sea landscape features and the fisheries they support are very diverse, depending on which part of the globe they happen to occur in as well as other factors. Seamounts and ridges dominate the North and South Pacific Ocean, Indian Ocean, South Atlantic and the Antarctic Area. The North Atlantic has many canyons, whereas the Mediterranean has a mix of very diverse deep-sea ecosystems that include the full range of the features mentioned above.

2.2 Fisheries in ABNJ

The data on deep-sea fisheries in ABNJ has not been well documented, mainly because there was not that much global interest in monitoring and controlling activities in ABNJ until after the various Earth Summits were held, especially from 1992 onwards (Agenda 21, 1992). Early deep-sea fishing had started by the beginning of the nineteenth century using sailing vessels. Power and efficiency greatly increased with the invention of steam-powered trawlers at the end of the nineteenth century. Trawlers were capable of deploying larger trawl fishing gear. Deep-sea trawling underwent a major expansion from the 1950s to the 1980s, particularly in more remote areas further offshore in what is now ABNJ. Unable to sustain high catches, and with concerns over ecological damage increasing, the deep-sea fishing industry has been generally contracting since the end of the twentieth century (FAO, 2020).

From the 1960s to the 2000s, the states most involved in distant-water fishing on deep-sea demersal species were the Union of Soviet Socialist Republics (USSR, which became the Russian Federation), Spain, Japan, Poland, Portugal and Germany (**TABLE E.2.1**), landing an estimated 1 million tonnes annually (author's estimates based on data publicly available from relevant RFMOs). Fleets moved to target emerging resources, and in the absence of regulation some were subject to overfishing. A recent example are the Indian Ocean orange roughy *(Hoplostethos atlanticus)* and alfonsino *(Beryx decadactylus)* stocks targeted around the turn of the century. The fishery started around 1997 and by 2001 there were upwards of 35 vessels and catches of around 35 000 tonnes. The fleet and catches dropped in 2002 to fewer than 10 vessels and catches under 10 000 tonnes (SIOFA, 2016). Today, there are only a few vessels and catches of around 5 000 tonnes (SIOFA, 2024).

TABLE E.2.1
BRIEF HISTORY OF THE EARLY DEVELOPMENT OF ABNJ FISHERIES

Region	History
Northwest Atlantic	1904–1920s: French trawlers targeting cod on the tail of the Grand Bank. (Fisheries closer to land, in current EEZs, started much earlier.) Continual expansion through the 1990s, by vessels from Europe and the Russian Federation, leading to stock and fisheries reductions.
Northeast Atlantic	1905: Deep trawling on continental shelf west of Ireland. 1920s: Trawling for deep-living, slow-growing redfish in Barents Sea. 1960–1970s: USSR expansion into deep water of Northeast Atlantic, followed later by European fleets.
Central Atlantic	Almost no fisheries resources in ABNJ area of the Central Atlantic. 1839: Deep line-fishing for black scabbard off Azores (likely in current EEZ). 1900: Trawling for European hake off Morocco (also likely in current EEZ). 1960s: Sporadic deep mid-water and bottom trawling on western (Corner Rise seamounts) and eastern side for alfonsino, by the USSR.
Southwest Atlantic	Current stocks in ABNJ are a small extension of the vast EEZ stocks. Many distant-water fleets have exploited these, but their history is uncertain.
Southeast Atlantic	Early history is uncertain. 1990s: Bottom trawling for alfonsino, pelagic armourhead and orange roughy.
Mediterranean Sea	Deeper fisheries for European hake with various gears likely developed early. 1930s: Deepwater blue and red shrimp in western basin. 1990s: Giant red shrimp fishery in eastern basin.
North Pacific	1960s: USSR seamount fisheries along Emperor-Hawaiian seamount chain. Japan started trawling here later. 1980s: Expansion of mid-water trawl fisheries for Alaska pollock in the Bering Sea.
South Pacific	1980s: Trawling on seamounts by the USSRand Japan. 1980s: Trawling for orange roughy on deep slopes by the USSR, and by others from the 1990s.
Indian Ocean	1998–2003: Large short-lived international fishery on seamounts.
Antarctic area	1960s: Fishing for demersal fish (most of it reported as marine fishes nei, MZZ) by the USSR (FAO, 2024). 1970s: Trawling for krill by the USSR and Japan. 1990s: Longlining for toothfish around subantarctic islands.

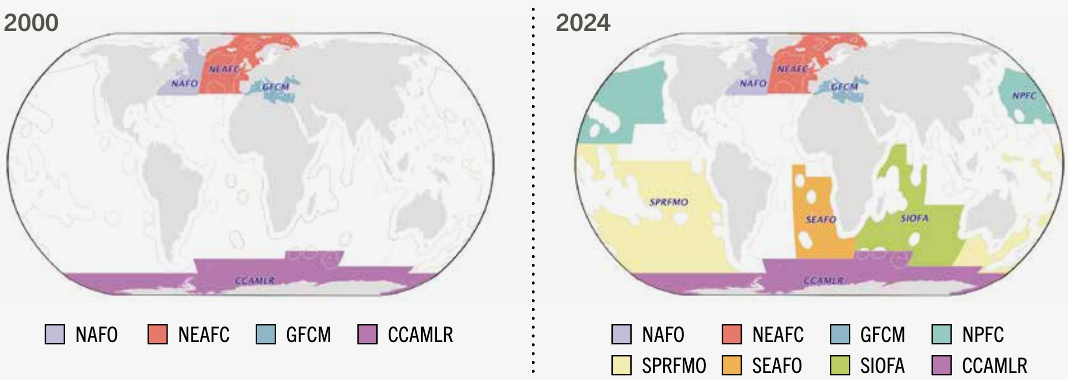
2.3 Fisheries management in ABNJ

The management of fisheries in ABNJ has changed dramatically over the years. The International Whaling Commission was established in 1946 and was the first international body to start undertaking scientific research and management decisions relating to a marine living resource in ABNJ; in some ways, it was a precursor to the species-specific RFMOs. Prior to the entry into force of UNCLOS in 1994, there were no clear fisheries management responsibilities in ABNJ. Consequently, flag states – those with fishing vessels registered and flying their respective flag – operating in the ABNJ did not have to meet any international obligations controlling what, where and how their vessels fished in such areas.

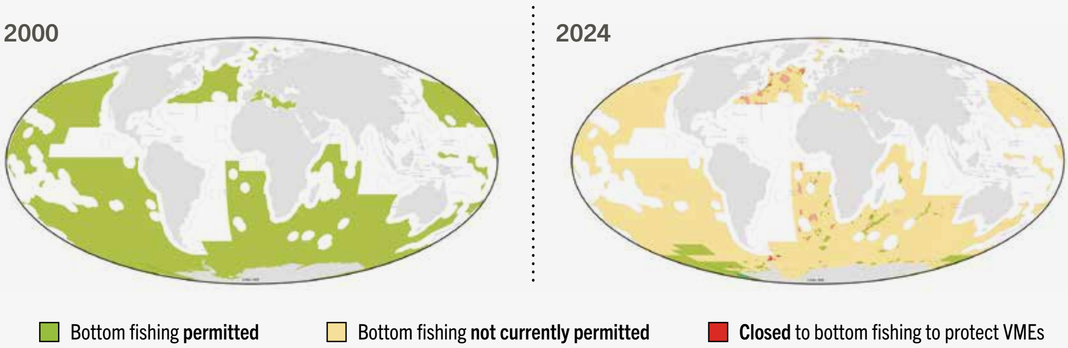
There was almost no information collected on fishing activities in ABNJ. This problematic situation began to change when states agreed on adopting two key legally binding

FIGURE E.2.2
BOTTOM FISHERIES MEASURES TO CONTROL FISHED AREAS AND PROTECT VULNERABLE MARINE ECOSYSTEMS (VMES) IN 2000 AND 2024

Under RFMO Management: **3.2 times more area covered.**



Areas open to bottom fishing: **1/6th area now open.**
Protect corals and sponges (VMEs): **182 new VMEs.**



Notes: (1) Refer to the disclaimer on page ii for the names and boundaries used in this map.
(2) **CCAMLR**: Commission for the Conservation of Antarctic Marine Living Resources; **GFCM**: General Fisheries Commission for the Mediterranean; **NAFO**: Northwest Atlantic Fisheries Organization; **NEAFC**: North East Atlantic Fisheries Commission; **NPFC**: North Pacific Fisheries Commission; **SEAFO**: South East Atlantic Fisheries Organization; **SIOFA**: Southern Indian Ocean Fisheries Agreement; **SPRFMO**: South Pacific Regional Fisheries Management Organization.

Source: FAO. 2025. Vulnerable Marine Ecosystems DataBase. https://www.fao.org/fishery/geoserver/factsheets/vme.html [accessed on 25 March 2025].

instruments that required their cooperation for the management and conservation of marine living resources in ABNJ. The first was UNCLOS, which was adopted in 1982, entered into force in 1994, and has 170 Parties (as of March 2025). The second was the Agreement for the implementation of the UNCLOS provisions relating to the conservation and management of straddling fish stocks and highly migratory fish stocks (UNFSA, 1995), which was adopted in 1995, entered into force in 2001, and has 93 Parties (as of March 2025).

The two instruments set out flag states' responsibility over the vessels flying their flag, including the exercise of effective jurisdiction and control (Kuemlangan *et al.,* 2023). Specifically, the United Nations Fish Stocks Agreement (UNFSA) requires Parties to adopt management and conservation measures for the stocks concerned based on the best scientific evidence available, the precautionary approach and the need to protect biodiversity, and taking into account the interests of artisanal and subsistence fishers. Another important instrument for the management and conservation of ABNJ fisheries is the FAO Agreement to promote compliance with international conservation and management measures by fishing vessels on the high seas (Compliance Agreement). This was adopted in 1993, entered into force in 2003, and currently has 45 Parties (as of March 2025). The Agreement requires Parties to ensure that vessels flying their flag comply with applicable conservation and management measures on the high seas.

Management of fisheries stocks in ABNJ, where possible, is intended to be coordinated through RFMOs. These organizations act as fora for adopting legally-binding conservation and management measures that principally set and control the amount of catch of, and/or effort on, the target species to ensure sustainability (as defined by the regional body). In the early 2000s, biodiversity conservation became a global concern, and with the help of various United Nations General Assembly (UNGA) Resolutions (e.g. Resolutions 59/25, 61/105), management measures were adopted to reduce impacts and protect biodiversity (FAO, 2009). Fisheries, and particularly bottom fisheries, underwent an enormous transformation, and much of ABNJ came under stricter management control (**FIGURE E.2.2**).

In 2023, the Agreement under the United Nations Convention on the Law of the Sea on Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ Agreement) was finally adopted. This marked an important milestone in the governance of oceans, conservation and sustainable use of marine biological diversity. This Agreement offers an opportunity to strengthen existing policy instruments and processes, and enhance the coordination and cooperation efforts among sectoral bodies, without undermining their mandates or the progress already achieved. It will enter into force once 60 countries have officially ratified or acceded to it. As of April 2025, the BBNJ Agreement has 113 signatories and 21 Parties.

3. FISHERY PROFILES

The *FAO Deep-sea Fisheries Guidelines* (FAO, 2009) states that deep-sea fisheries can be described as "the total catch (everything brought up by the gear)", includes species that can only sustain low exploitation rates, and it applies to fishing gear that is likely to contact the seafloor during the normal course of fishing operations. It further notes that deep-sea fisheries have "specific challenges for their sustainable utilization and exploitation". These include: (i) maturation at relatively old ages; (ii) slow growth; (iii) long life expectancies; (iv) low natural mortality rates; (v) intermittent recruitment of successful year classes; and (vi) spawning that may not occur every year (**TABLE E.2.2**). Indeed, some deep-sea species have very low productivity which can only withstand low exploitation rates, such as the iconic seamount species orange roughy, and are easily overfished. Others are more productive, such as cod, and can withstand modest exploitation levels.

TABLE E.2.2
PRODUCTIVITY ATTRIBUTES AND RISK CATEGORIES

Attribute	Low productivity (high vulnerability)	Medium productivity (medium vulnerability)	High productivity (low vulnerability)
Average age at maturity	> 15 years	5–15 years	< 5 years
Average maximum age	> 25 years	10–25 years	< 15 years
Fecundity	< 100 eggs per year	100–20 000 eggs per year	> 20 000 eggs per year
Average maximum size	> 300 cm	100–300 cm	< 100 cm
Average size at maturity	> 200 cm	40–200 cm	< 40 cm
Reproductive strategy	Live bearer	Demersal egg layer	Broadcast spawner
Trophic level in food chain	>3.25	2.75–3.25	<2.75

Source: Adapted from **Hobday, A., Smith, A., Stobutzki, I., Bulman, C., Daley, R., Dambacher, J., Deng, R.** ***et al.*** 2011. Ecological risk assessment for the effects of fishing. *Fisheries Research*, 108: 372–384. **https://doi.org/10.1016/j.fishres.2011.01.013**, and **Georgeson, L., Nicol, S., Hobday, A., Hartog, J. & Fuller, M.** 2018. Preliminary ecological risk assessment for teleosts in SPRFMO demersal trawl, midwater trawl and demersal longline fisheries. 6th Meeting of the Scientific Committee Puerto Varas, Chile, 9–14 September 2018. SC6-DW07. **https://www.sprfmo. int/assets/Meetings/02-SC/2018-SC6/ Meeting -Documents /S C 6 -DW07-Preliminary-teleosts-risk-assessment.pdf**

The fisheries in ABNJ vary greatly according to the region fished, and many are extensions of similar fisheries occurring in deeper EEZ waters; they can broadly be divided into:

3.1 Deeper continental shelf/slope fisheries

These occur on both sides of the North Atlantic, targeting species such as gadoids, Greenland halibut *(Reinhardtius hippoglossoides),* northern shrimp *(Pandalus borealis)* and demersal redfish (*Sebastes* spp.); in the Southwest Atlantic targeting species such as Argentine hake *(Merluccius hubbsi);* and in the South Pacific targeting hapuku *(Polyprion oxygeneios)* and orange roughy. These fisheries are usually undertaken with bottom or deep-midwater trawls, but can include gillnets, longlines etc. Many of these have been operating since the 1920s, with the advent of steam trawlers, and have a long history of exploitation. These fisheries can also have significant bycatches of deepwater sharks, which is a cause for concern.

3.2 Seamount fisheries

These operate on the underwater volcanic features that rise from abyssal plains to fishable depths, typically with peaks at a maximum depth of 1 500 m, but they can be deeper. They are characterized by especially long-lived low-productivity species such as orange roughy, alfonsino and armourhead. These species once formed large shoals of older fish that ceased to reproduce. Initial catches were poorly documented, but they were huge compared to present-day catches. Uncontrolled fishing effort decimated these stocks in just a few years; there was no fisheries management from 1970s to 1990s. A large reduction in stock size was inevitable, even under a modest fishing pressure, which would be desirable if the goal was to increase the productivity of the stock at a sustainable exploitation rate. Instead, these early fisheries pushed many stocks well beyond sustainability levels. Remnant seamount fisheries exist today and are more sustainably harvested. They require specialized fishing techniques using highly targeted smaller mid-water or bottom trawls and sophisticated acoustic fish finders; this is especially true now that the stocks are harder to find. Similar fisheries to those on seamounts occur on some ridges and occasionally in canyons. These fisheries have been found in the North and South Pacific, Indian Ocean, and to a much lesser extent in the northwestern and northeastern Atlantic.

3.3 Deep longline fisheries in the Antarctic Area

These specialize in targeting toothfish and can go to depths of 2 300 m. The seafloor is usually rocky, consisting of ridges and seamounts, and bottom trawling has been banned since 2006 in the ABNJ area of this ocean (as well as the use of longlines for toothfish at depths shallower than 550 m), both to protect fish resources and vulnerable benthic habitats. A similar fishery using pots and longlines occurs for sablefish *(Anoplopoma fimbria)* in the northeast Pacific. Deep longline fisheries targeting toothfish also occur in the southern parts of the Indian Ocean, South Pacific and South Atlantic, usually on straddling stocks with the Antarctic area. The longline fishery in the southern Indian Ocean can have a significant bycatch of deepwater sharks.

There are many other fisheries in ABNJ, including the small pelagic fisheries using mainly mid-water trawls to catch mackerel *(Scomber scombrus),* blue whiting *(Micromesistius poutassou),* Pacific saury *(Cololabis saira),* chub mackerel *(Scomber japonicus),* squid and other similar species, described in the respective chapters of the areas; highly migratory tuna species described in **CHAPTER E.1**, pp. 330; and highly migratory sharks in **CHAPTER E.3**, pp. 388.

The landings of demersal species vary greatly by species and region. Many species, especially those caught by bottom fishing gears at great depths, tend to have high market values since the respective fishing costs are high. A summary of demersal landings in 2021 by region is provided in **TABLE E.2.3**.

TABLE E.2.3
LANDINGS OF DEMERSAL SPECIES (IN TONNES) IN THE ABNJ FOR 2021

Species group	Northwest Atlantic	Northeast Atlantic	Southwest Atlantic	Southeast Atlantic	Mediterranean Sea	North Pacific	South Pacific	Indian Ocean	Antarctic Area	Total
Crab	742	6 541*		20						**7 303**
Teleost fish	61 400	1 725	117 602	16	17 837	722	13 371	6 471	4 146	**223 290**
Elasmobranch fish	4 000		1 351					1 617		**6 968**
Shrimp	5 900	7 185*			27 119					**40 204**
Total	**72 042**	**15 451**	**118 953**	**36**	**44 956**	**722**	**13 371**	**8 088**	**4 146**	**277 765**

* Estimates from 2016, not available for 2021.

Notes: (1) Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. (2) Data expressed in live weight equivalent.

Source: Author's own elaboration based on data publicly available from relevant RFMOs.

3.4 Resource status of demersal stocks in ABNJ

Defining what constitutes a fish stock in ABNJ is a similar mix of biological, social, practical and political considerations as is the case for defining a stock elsewhere. In practice, a stock is often a mix of a biological unit (a self-contained entity that does not mix with other populations, especially when reproducing, so that there is only limited migration between different stocks) and a management unit (being the entity for scientific advice and management measures, and depending on factors such as infrastructure, fleet, geography and political and socioeconomic arrangements). Stock assignments provided in this chapter follow the RFMOs' own usage for a particular species that typically defaults to a management unit which may or may not comprise more than one biological unit.

4. RESOURCE STATUS

4.1 Reference list of stocks

The reference list of fish species used in the previous methodology generally consisted of stocks within EEZs, or straddling stocks mainly within EEZs where only a small portion occurs in ABNJ (with the exception of tuna). Therefore, the stocks considered for ABNJ are mostly new additions to the updated methodology (**TABLE E.2.4**).

TABLE E.2.4
NUMBER OF NEW STOCKS INCLUDED IN THIS ASSESSMENT, NOT INCLUDED IN THE PREVIOUS METHODOLOGY, THAT OCCUR IN ABNJ

FAO Area	Region	ABNJ stocks	Previously included	New in this assessment
21	Northwest Atlantic	17	7	10
27	Northeast Atlantic	8	7	1
41	Southwest Atlantic	5	0	5
47	Southeast Atlantic	5	0	5
37	Mediterranean Sea	9	0	9
61, 67	North Pacific	4	1	3
81, 87	South Pacific	2	0	2
51, 57	Indian Ocean	7	2	5
48, 58, 88	Antarctic Area	13	0	13
	Total	**70**	**17**	**53**

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) A few of these stocks are straddling stocks.
Source: FAO estimates.

4.1 Classification of the status of stocks

Stock status for ABNJ stocks is assessed based on recent stock biomass estimates, which are typically estimated with a delay of two to four years. The estimated biomass is compared to the estimated biomass that is expected to produce maximum sustainable yield (B_{MSY}). Stocks where estimated biomass is above 80 percent of the estimated B_{MSY} are considered sustainable (**PART B. METHODOLOGY**, pp. 6). This is in line with UNCLOS (1982), Art. 119 paragraph 1(a): "to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors".

The resource status shows considerable differences among regions (**TABLE E.2.5** and **TABLE E.2.6** for the list of stocks considered in this chapter). Globally, 75 demersal stocks that are fished in ABNJ are considered in this assessment. Of these, 20 stocks are considered overfished (20 percent), 13 stocks are maximally sustainably fished (19 percent), 12 stocks are underfished (17 percent), and 25 stocks are of an unknown status (36 percent).

The regions with the longest catch and management history are Areas 21, 27 and 37, where most of ABNJ fisheries are managed by NAFO, NEAFC and GFCM, respectively. These regions have a total of 30 assessed stocks, of which 23 are overfished and seven are assessed as maximally sustainably fished. In addition, there are 11 stocks with an unknown status.

The Antarctic Area has been managed by CCAMLR since 1982. CCAMLR was formed under the Antarctic Treaty as a result of concerns about the expansion of krill fisheries. Fisheries in this region focus mainly on toothfish and krill (**PART D.16, ANTARCTIC AREA**, pp. 316). These are among the most conservatively managed fisheries in the world, with 12 of 13 assessed stocks being underfished (by the FAO definition; they are managed at target levels by the CCAMLR classification) and the remaining ones being maximally sustainably fished. There are additional toothfish stocks with an unknown status, all with low catch levels and limited fishing effort.

TABLE E.2.5
STOCK STATUS FOR ABNJ DEMERSAL AND SMALL PELAGIC STOCKS

FAO area	21	27	41	47	37	61,67	81,87	51,57	48,58, 88	
Region	Northwest Atlantic	Northeast Atlantic	Southwest Atlantic	Southeast Atlantic	Mediterranean Sea	North Pacific	South Pacific	Indian Ocean	Antarctic Area	Total
Overfished	12	3	0	0	4	1	0	0	0	20
Maximally sustainably fished	3	4	0	1	0	1	0	3	1	13
Underfished	0	0	0	0	0	0	0	0	12	12
Unknown	2	1	5	4	5	2	2	4	0	25
Totals	**17**	**8**	**5**	**5**	**9**	**4**	**2**	**7**	**13**	**70**

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2)A few of these stocks are straddling stocks.
Source: FAO estimates.

The regions with management in place tend to have established fisheries that previously suffered the boom-and-bust extractivism in the 1970s–2000s period. These are the North Pacific (managed by NPFC) and South Pacific (manged by SPRFMO), the Southeast Atlantic (managed by SEAFO), and the Indian Ocean (managed by SIOFA). These regions have a total of 28 stocks, with 17 stocks being so far unassessed and thus having an unknown status. This is partly due to the short time-series of catch data, but also because these stocks have a life-history that makes them difficult to assess. Of the assessed stocks, three are considered overfished, and the remaining eight stocks are maximally sustainably fished.

The only region with significant ABNJ catches not under RFMO management is the Southwest Atlantic, where all six stocks have an unknown status. However, these ABNJ stocks are a small transboundary extension of much larger EEZ stocks that are managed by coastal states.

5. KEY FINDINGS

There are many challenges to both estimating current biomass and estimating the biomass to optimize yield (B_{MSY}), particularly for deep-sea stocks, as they often have complex life-histories and limited data availability. Seamount species are particularly challenging to assess. Proxies and expert judgement can be useful on occasion. There is high uncertainty in the knowledge and status of deep-sea resources, and the majority of species encountered in these fisheries are classified with an unknown status.

Each RFMO manages the fish stocks in its ABNJ region, and typically has its own definitions, usually linked to its precautionary approach framework that is based on stock biomass and fishing mortality. Regions differ not just in terms of their history of fishing, but also in their management institutions. It matters when the RFMO entered into force. Regions with well-established ABNJ fisheries are the Northwest and Northeast Atlantic, the Mediterranean, and, to a lesser extent, the Antarctic Area. Likewise, these regions have the earliest established RFMOs (and CCAMLR) and the longest histories of collecting information and undertaking stock assessments. The regions with newer fisheries (and these tend to include the seamount fisheries) are in the North and South Pacific, the Southeast Atlantic, and the Indian Ocean. In these regions, the RFMOs have been established more recently; data and assessments are thus more limited, making stock status harder to determine.

TABLE E.2.6
LIST OF ABNJ STOCKS CONSIDERED IN THIS CHAPTER

Region	Species
Northeast Atlantic	**FAO Area 27**
Crab	Snow crab (mainly subarea 1)
Demersal	Greenland halibut (mainly subarea 1), haddock (Rockall), orange roughy (NE Atlantic), roundnose grenadier (NE Atlantic and Hatton Bank), tusk (NE Atlantic)
Shrimp	Northern prawn (mainly subarea 1)
Northwest Atlantic	**FAO Area 21**
Crab	Snow crab (3LNO)
Demersal	Alfonsino (Corner Rise seamounts), American plaice (3LNO and 3M), Atlantic cod (3M Flemish Cap, 3NO Grand Bank), Greenland halibut (widely distributed), redfish (3M Flemish Cap, 3LN Grand Bank, 3O Grand Bank), roughhead grenadier (SA2+3), thorny skate (Grand Bank and Flemish Cap), white hake (3NOPs), witch flounder (3NO), yellowtail flounder (3LNO)
Shrimp	Northern prawn (3M and 3LNO)
Southeast Atlantic	**FAO Area 47**
Crab	Deepsea red crab
Demersal	Alfonsino, orange roughy, Patagonian toothfish, southern boarfish
Southwest Atlantic	**FAO Area 41**
Demersal	Argentine hake, blue grenadier, longtail southern cod, Patagonian toothfish
Mollusc	Patagonian scallop
Mediterranean	**FAO Area 37**
Demersal	European hake (GSAs 01–11, 12–21, 17–18, 22–27)
Shrimp	Blue and red shrimp (GSAs 01–06, 18–20, 24), giant red shrimp (09–11), deepwater rose shrimp (western and central GSAs)
North Pacific	**FAO Areas 61 and 67**
Demersal	Alfonsino, black spotted and rougheye rockfish, pelagic armourhead, sablefish
South Pacific	**FAO Areas 81 and 87**
Demersal	Alfonsino, orange roughy
Indian Ocean	**FAO Areas 51 and 57**
Demersal	Alfonsino, common mora, deepwater sharks, hapuka, orange roughy, Patagonian toothfish, lizardfish, scads (Saya de Malha Bank)
Antarctic Area	**FAO Areas 48, 58 and 88**
Demersal	Antarctic toothfish (48.1, 48.4, 48.6, 58.4.2, 88.1, 88.2 and 88.3), Patagonian toothfish (48.3, 48.4, 58.5.1, 58.5.2, 58.6, 58.7)

Notes: (1) For the purpose of this analysis, highly migratory tunas and sharks are excluded and assessed under Part E of this report on Special topics. (2) A few of these stocks are straddling stocks.

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HIGHLY MIGRATORY SHARKS

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1. INTRODUCTION

Sharks and their relatives – the batoids and chimaeras – stand out as a distinct category of marine fishery resources with respect to species diversity, vulnerability and resilience, resource condition and management. They comprise the chondrichthyan fishes (**TABLE E.3.1**), a group of more than 1 300 species, of which more than 500 are sharks (Fricke *et al.,* 2025). The chimaeras are a small, mostly deep-sea group that contribute little to fisheries landings. Discussions in this chapter focus on sharks and batoids (elasmobranchs), as fishery statistics for many countries report the two groups together as one category (Lack and Sant, 2009).

TABLE E.3.1
SHARKS, SKATES AND RAYS BY ORDER WITH COMMON SPECIES OR SPECIES GROUPS

Order	Family	Genera	Common species or species group
Carcharhiniformes	Carcharhinidae	***Carcharhinus, Galeocerdo, Sphyrna***	Requiem sharks (e.g. blue shark, hammerhead sharks)
Hexanchiformes	Hexanchidae	***Hexanchus, Chlamydoselachus***	Cow sharks, frilled sharks
Lamniformes	Lamnidae	***Carcharodon, Isurus, Alopias***	Mackerel sharks (e.g. great white, thresher sharks)
Orectolobiformes	Orectolobidae	***Rhincodon, Orectolobus***	Carpet sharks (e.g. whale shark, wobbegong)
Pristiophoriformes	Pristiophoridae	***Pristiophorus***	Sawsharks
Squaliformes	Squalidae	***Squalus, Centroscymnus***	Dogfish, sleeper sharks
Squatiniformes	Squatinidae	***Squatina***	Angel sharks
Myliobatiformes	Myliobatidae	***Myliobatis, Aetobatus***	Stingrays, eagle rays
Rhinopristiformes	Rhinobatidae	***Glaucostegus, Rhinobatos***	Guitarfish, sawfish
Torpediniformes	Torpedinidae	***Torpedo, Narcine***	Electric rays
Rajiformes	Rajidae	***Raja, Dipturus***	Skates

Elasmobranchs (sharks, skates and rays) are a very diverse group of fishes showing extreme variability in some of their life history traits, including maximum size and age, size and age at maturity, offspring size, number of offspring, gestation period, breeding frequency, and growth rate (CITES, 2024). This diversity of life history traits includes example species with low intrinsic rates of population increase and a limited ability to withstand fishing pressure (Smith, Au and Show, 1998). For this reason a range of sharks are more vulnerable to overexploitation and require appropriate management considerations. As a group sharks can be viewed as a continuum that is ultimately expressed as largely different productivity values, which affects the vulnerability of the different species to human-induced stressors.

Sustainable fisheries for sharks are possible (Simpfendorfer and Dulvy, 2017), particularly for the smaller, faster-growing species such as the gummy shark *(Mustelus antarcticus)* which has been managed through size-selective gillnet regulations for several decades (Walker, 1998a, 1998b; Stevens, 1999). Even slower-growing species can be harvested sustainably, but they must be very closely managed with small yields relative to biomass, particularly the reproductive portion of the stock (Simpfendorfer, 1999).

FISHERY PROFILES

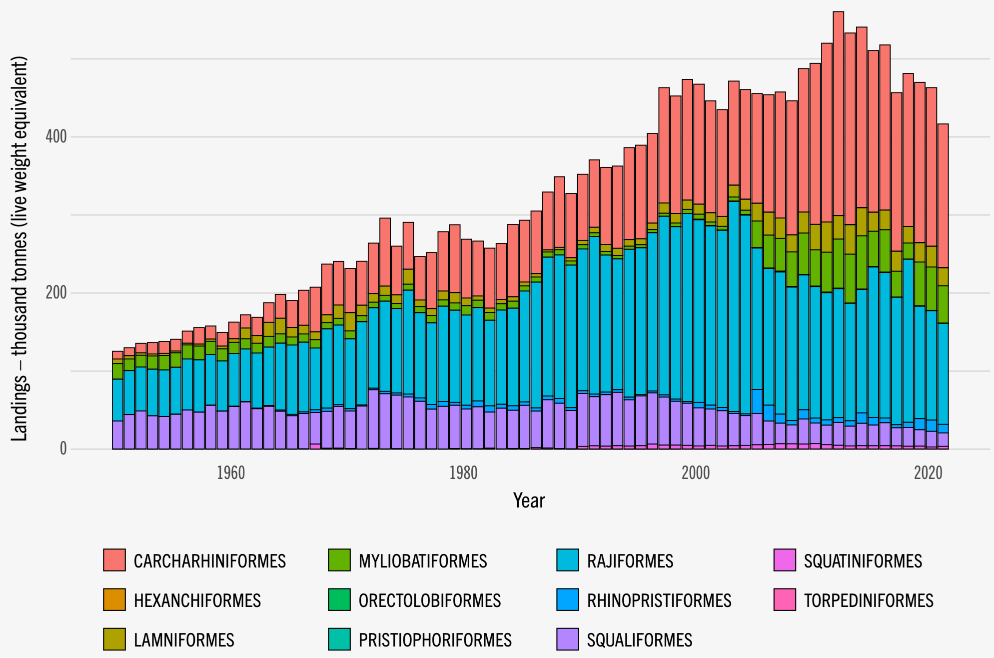
The world's shark and ray fisheries have been prone to overexploitation due to fishing pressure, biological characteristics and associated lower resilience, requiring precautionary management. This is especially true for highly migratory shark species given they inhabit the upper pelagic zones of the world's oceans and often range widely, overlapping multiple fishing grounds (Musick, 1999; Stevens *et al.,* 2000; Schindler *et al.,* 2002; Compagno, 2001). Indeed, the history of most directed shark fisheries around the world has been one of overharvest, rapid stock decline, collapse and limited recovery (Bonfil, 1994). Examples of such fisheries include the porbeagle *(Lamna nasus)* in the North Atlantic (Campana *et al.,* 2008); the tope shark (*Galeorhinus galeus*) off California and Australia (Ripley, 1946; Olsen, 1959; Stevens, 1999); various basking shark *(Cetorhinus maximus)* fisheries (Parker and Scott, 1965; CITES, 2002); and several picked dogfish *(Squalus acanthias)* fisheries (Bargmann, 2009; Pawson, Ellis and Dobby, 2009; Rago and Sosebee, 2009; Wallace *et al.,* 2009).

The total reported catch of sharks and their relatives increased substantially until the early 2000s, and has since gradually decreased over the last two decades, from over 868 000 tonnes in 2000 to approximately 605 000 tonnes in 2021 (**FIGURE E.3.3**). However, landings for highly migratory species – as listed in Annex 1 of United Nations Convention on the Law of the Sea (UNCLOS) – continued to increase and peaked at over 250 000 tonnes in 2012, to decline to approximately 170 000 tonnes in 2021 (**FIGURE E.3.4**). The top five shark reporting nations are Indonesia, Spain, Mexico, India and the United States of America, followed by Brazil, Taiwan Province of China, Nigeria, Japan and Bangladesh. Indonesia has been the top global shark and ray capture producer in recent years, with at least 105 species observed in Indonesian landings according to a region specific study (White and Sommerville, 2010). The fisheries include a wide variety of both fixed and mobile fishing gear types and a high percentage of artisanal fishers who depend on elasmobranch landings.

The overall increasing trend in reported landings of sharks and rays observed since the 1950s, until the more recent declines, is likely due to a combination of factors related to species exploitation and changes in market demand, changes in fisheries management, including mandatory reporting, catch monitoring, and enhanced species breakdown in reported landing statistics, although actual historical landings are likely higher in many regions. The wider application of restrictions on shark finning may be leading to increased landings of whole sharks, as the take of just fins is no longer permitted. It is also possible that the market demand for shark meat increased in response to changes in consumer preferences and marketing strategies, as traditional fisheries reach maximum levels or become depleted.

Shark and ray fisheries may be classified into four main categories: pelagic, coastal cold-temperate, coastal tropical, and deep sea fisheries. The majority of landings come from pelagic fisheries in areas beyond national jurisdictions (ABNJ). Requiem sharks *(Carcharhinidae)* have accounted for the majority of landings over the last two decades, with rajiforms making up the largest share of batoids (**FIGURE E.3.1**). Coastal tropical regions host the highest shark and ray species diversity, which is reflected in fisheries captures (White and Sommerville, 2010). Indeed, the three of the four FAO Areas with the highest average annual catches of sharks and rays since 1950 are tropical: the Western Central Pacific (Area 71), the Eastern Indian Ocean (Area 57) and the Western Indian Ocean (Area 51) (**FIGURE E.3.2**). Coastal cold-temperate shark and ray fisheries are dominated by the spiny dogfish (also called picked dogfish, *Squalus acanthias, Squalus suckleyi* in the North Pacific) alongside smooth hounds (*Triakidae* spp.) and various rajid skates (Ebert and Winton, 2010).

FIGURE E.3.1
REPORTED SHARK AND RAY LANDINGS BY ORDER BETWEEN 1950 AND 2021

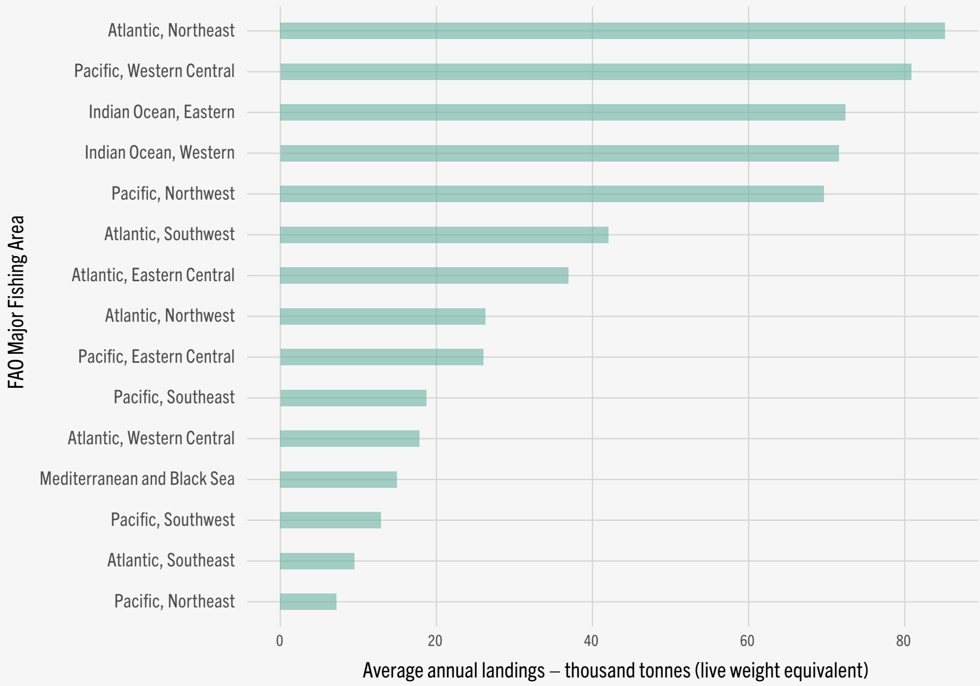


Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

Deep-sea fisheries targeting sharks have been ongoing locally over continental and insular slopes (200–2 000 m) for several decades. These demersal fisheries typically target deep-water dogfishes (Squaliformes) of several genera (Kyne and Simpfendorfer, 2010). Two well-documented examples include the kitefin shark *(Dalatias licha)* in the Azores and the deep-water line fishery in Suruga Bay, Japan (Kyne and Simpfendorfer, 2010; Yano and Tanaka, 1988). Deep-water dogfishes have been targeted for their meat, but especially for their livers, which are high in squalene, (Gordon, 1999) an organic compound used in the production of vaccines, medicines and personal health products. Catches of deep-sea sharks increased substantially in the last decades of the twentieth century as large industrial fisheries moved from continental shelves (where certain fish stocks were depleted) to continental slopes (Merrett and Haedrich, 1997). The targets of these fisheries were bony fishes, but sharks made up a substantial part of the nontarget catch, some of which was landed, some discarded. Kyne and Simpfendorfer (2010) show that for the Australian scalefish and shark fishery, deep-sea shark abundance over a 30-year period dropped by 75–99 percent, depending on species. Gulper sharks (*Centrophorus* spp.) were the most heavily affected. In the Northeast Atlantic deep-water fisheries, gulper sharks, Portuguese dogfish *(Centroscymnus coelolepis)* and birdbeak dogfish (*Deania* spp.) declined by 62–99 percent between the late 1970s and the early 2000s (Kyne and Simpfendorfer, 2010). Deep-sea squaliform sharks have inherently slow growth rates and live in deep, cold water where food resources are limited (Kyne and Simpfendorfer, 2010). Such species have very limited capacity to respond to fishing pressure and can be harvested only at very low ratios of yield to standing stock. When taken in mixed species fisheries supported by more productive teleosts, deep-sea shark populations have declined rapidly and local extirpations have occurred.

FIGURE E.3.2
AVERAGE ANNUAL REPORTED SHARK AND RAYS LANDINGS BETWEEN 1950 AND 2021, ACCORDING TO FAO MAJOR FISHING AREAS



Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Although some international longline fleets specifically target sharks, most distant-water longline operations primarily pursue tunas and billfishes. However, these are effectively mixed shark/tuna/billfish fisheries, as they catch large numbers of sharks incidentally (Camhi, Pikitch, & Babcock, 2008; Stevens, 2010). Highly migratory shark species are also caught in both targeted and incidental fisheries, especially in longline, purse seine, gillnet and midwater trawl fisheries aimed at tuna, swordfish and small pelagic species (Clarke *et al.,* 2006). While directed shark fisheries have led to stock declines and collapse of some elasmobranch species, the greatest global threats stem from bycatch in mixed fisheries and other operations targeting more productive teleost species; this is especially the case for highly migratory shark species (Musick, 1999; Stevens *et al.,* 2000; Schindler *et al.,* 2002; Compagno, 2001; Rice and Harley, 2012; Rice and Harley, 2013; Rice, 2018; ICCAT, 2020; Coelho et al. 2024)

Although there is variation in demographic rates among shark and ray species, the combination of broad distribution, high bycatch rates, and slow population growth renders many of these species increasingly at risk (Cortés, 2000; Dulvey *et al.,* 2008). Traditional harvest strategies designed to maximize economic and social benefits from single or multi-species fisheries have a high probability of depleting the least-productive species (such as sharks), while maintaining a robust target stock.

The FAO International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) was adopted in 1999 as part of FAO's Code of Conduct for Responsible Fisheries, in response to growing global concerns about the sustainability of shark populations. It is a voluntary international framework that encourages all FAO Members to assess the status of their shark fisheries and adopt a National Plan of Action for Sharks (NPOA-Sharks) if their sharks are found to be at risk. Its objectives include improving species-specific catch and landing data, reducing bycatch, and enhancing the conservation and management of shark species. Initially, progress was slow due to limited capacity, insufficient data, and a lack of political will in some regions. Indeed, many countries delayed adopting a NPOA-Sharks due to technical and financial constraints, as well as challenges in monitoring and enforcing shark-specific measures. Recently, however, increased awareness of the ecological importance of sharks and international pressure from conservation organizations have spurred action, although there are challenges such as resource limitations and competing priorities.

Progress has been made on data collection and reporting, especially reporting to species level. These improvements in data have led to improved scientific research, bycatch mitigation and stock assessments; for example, blue shark *(Prionace glauca),* silky shark *(Carcharhinus falciformis),* oceanic whitetip *(Carcharhinus longimanus)* and others have been assessed for the first time in the last decade (Rice and Harley, 2012, 2013; Rice *et al.,* 2013; Rice and Sharma, 2015). Although the IPOA-Sharks has been a catalyst for international cooperation, its voluntary nature means that progress is uneven, especially at smaller regional scales. Fisheries in ABNJ managed by regional fisheries management organizations (RFMOs) and nations with highly regulated fisheries that are subject to monitoring and control have made the most progress. Strengthening technical and financial assistance to developing nations and fostering regional collaboration remain crucial for its long-term success.

The inclusion of many shark species in international agreements like the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species (CMS) complements the IPOA-Sharks. The most influential among these is CITES, which regulates or prohibits international trade in threatened species. Over the years, the number of sharks and rays listed under CITES Appendices has increased significantly, reflecting growing concern over their conservation status. Currently, all species of sawfish (family *Pristidae*) are listed under Appendix I, which prohibits international trade except in exceptional circumstances. Meanwhile, numerous shark and ray species – such as the oceanic whitetip shark, hammerhead sharks (*Sphyrnidae*), the silky shark and manta rays (*Mobula* spp.) – are listed under Appendix II, allowing regulated trade to prevent overexploitation. Wedgefishes (*Rhynchobatus* spp.), giant guitarfishes (*Glaucostegus* spp.) and the shortfin mako shark *(Isurus oxyrinchus)* were also recently added to Appendix II, highlighting the escalating threat to elasmobranch populations due to overfishing and habitat loss. Further proposals to list additional species are expected as scientific evidence continues to highlight the vulnerability of these animals to global trade pressures. CITES remains a critical mechanism for driving international cooperation to ensure the sustainability of shark and ray populations.

Finally, major tuna RFMOs have also adopted many shark-specific conservation and management measures. These include measures regarding the full utilization of sharks, prohibiting shark finning (removal of fins and discarding of the carcass), protecting specific shark species (e.g. oceanic whitetip shark), mandating data collection and reporting, and mitigating bycatch (**TABLE E.3.2**). These have contributed to driving progress towards countries' adopting formal NPOA-Sharks, including major shark-fishing nations such as Australia, the United States of America, and the European Union.

TABLE E.3.2
KEY CONSERVATION AND MANAGEMENT MEASURES RELATED TO SHARKS ADOPTED BY RFMOS

Prohibition on shark finning

- **WCPFC:** Sharks must be landed with fins naturally attached (outlined in CMM 2010-07 and reaffirmed in CMM 2014-05.
- **IOTC:** Finning is prohibited and fins must be naturally attached until first landing (Resolution 17/05). In addition, full utilization is mandated, with the prohibition of wasteful practices like discarding carcasses after fin removal (Resolution 05/05).
- **ICCAT:** The total weight of shark fins on board a vessel must not exceed 5 percent of the weight of sharks landed, ensuring compliance with finning bans (Recommendation 04-10).

Protection of specific shark species

- **WCPFC:** Retention of oceanic whitetip sharks and silky sharks is prohibited (CMM 2011-04 and (CMM 2013-08).
- **IATTC:** Oceanic whitetip and silky sharks are prohibited (Resolutions C-11-10 and C-16-04).
- **CCSBT:** Although there are no direct shark-specific measures, Members often adopt other RFMO shark resolutions.
- **ICCAT:** Retention of oceanic whitetip sharks, hammerhead sharks (excluding bonnethead) and silky sharks is prohibited (Recommendations 10-07, 10-08 and 11-08). In addition, strict management measures are in place for shortfin mako sharks, including retention bans in the North Atlantic and catch limits in the South Atlantic (Recommendation 21-09).

Data collection and reporting

- **IOTC:** Detailed reporting of shark catches, bycatch and discards is required (Resolution 15/06).
- **WCPFC:** Obligations are in place for data submission to monitor shark stocks (CMM 2014-05).
- **ICCAT:** Contracting parties are required to report all catches, bycatch and discards of sharks (Recommendation 05-05).

Mitigation of bycatch

- **IATTC:** Bycatch reduction through gear modifications, such as using circle hooks or shark deterrents, is emphasised (Resolution C-05-03).
- **WCPFC:** Member States are encouraged to adopt bycatch mitigation measures (CMM 2019-04).

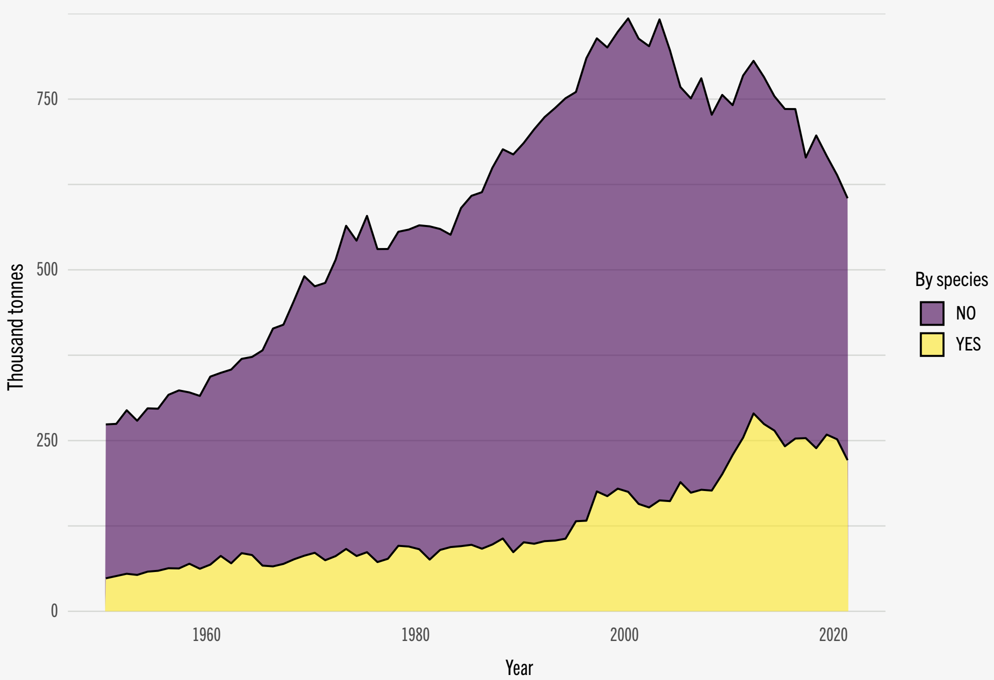
WCPFC – Western and Central Pacific Fisheries Commission
IOTC – Indian Ocean Tuna Commission
ICCAT – International Commission for the Conservation of Atlantic Tunas
IATTC – Inter-American Tropical Tuna Commission
CCSBT – Commission for the Conservation of Southern Bluefin Tuna

3. RESOURCE STATUS

The state of many shark populations is unknown or poorly known. Historical landings data is sparse, with species-specific catch statistics especially lacking; nonetheless, data may be available for aggregations and labeled as general “not elsewhere indicated” (NEI) (**FIGURE E.3.3**). This lack of species identification of the catches and lack of information on fishing effort means basic data for stock assessment are usually not available, and must be estimated or inferred from other sources. Data collection and management of highly migratory shark species in particular has historically been difficult due to added challenges of high mobility for assessments. In addition, species catch data aggregated into higher groups can easily mask declines of individual species or with certain regions. Dulvy and Forrest (2010) provide examples of larger, slower-growing sharks being replaced by smaller, faster-growing species with no apparent changes in landings data for the group.

Nonetheless, the total reported as NEI species has decreased over the last two decades (**FIGURE E.3.3**). In fact, the observed increase in landings of sharks and their relatives reported at species level reflects improved species identification and reporting by shark fishing nations that used to report shark catches in highly aggregated taxonomic categories. For instance, in the same period of increasing catches of highly migratory sharks there has been a decreasing trend in unidentified landings reported as "Elasmobranchii" (sharks, rays, skates, etc. NEI), from about 694 000 tonnes in the early 2000s to under 385 000 tonnes in 2021.

FIGURE E.3.3
GLOBAL TRENDS IN SHARK AND RAY CATCH REPORTING, ACCORDING TO WHETHER OR NOT THE CATCH IS REPORTED AT SPECIES LEVEL, BETWEEN 1950 AND 2021



Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

TABLE E.3.3 includes the status of selected highly migratory sharks, with the level of uncertainty of the assessment. Overall, for 23 stocks of highly migratory sharks assessed, 56.5 percent was considered sustainable fished in 2021. These species have cross jurisdictional boundaries and require international cooperation, making their management critical to global fisheries governance.

TABLE E.3.3
STOCK STATUS OF SELECTED HIGHLY MIGRATORY SHARKS, WITH THE LEVEL OF UNCERTAINTY

				Status	FAO	
Species	Scientific name	Ocean	Area	Year	Stock status	Uncertainty (H,M,L)
GLOBAL/ALL AREAS						
Basking shark	***Cetorhinus maximus***	Global/All areas	Global/All areas		**Unknown**	High
Great white shark	***Carcharodon carcharias***	Global/All areas	Global/All areas		**Unknown**	High
Longfin mako	***Isurus paucus***	Global/All areas	Global/All areas		**Unknown**	High
ATLANTIC						
Blue shark	***Prionace glauca***	Atlantic	North	2021	**Maximally sustainably fished**	Low
Blue shark	***Prionace glauca***	Atlantic	South	2021	**Underfished**	Low
Great hammerhead	***Sphyrna mokarran***	Atlantic	Western, Northwest		**Unknown**	High
Porbeagle	***Lamna nasus***	Atlantic	Northeast	2021	**Overfished**	Low
Porbeagle	***Lamna nasus***	Atlantic	Northwest	2018	**Overfished**	
Porbeagle	***Lamna nasus***	Atlantic	Southern	2018	**Overfished**	Medium
Shortfin mako	***Isurus oxyrinchus***	Atlantic	North	2015	**Overfished**	Low
Shortfin mako	***Isurus oxyrinchus***	Atlantic	South	2015	**Overfished**	Low
INDIAN OCEAN						
Pelagic thresher	***Alopias pelagicus***	Indian Ocean	Western		**Unknown**	Medium
Blue shark	***Prionace glauca***	Indian Ocean	Indian Ocean	2019	**Underfished**	Low
Shortfin mako	***Isurus oxyrinchus***	Indian Ocean	Indian Ocean	2024	**Maximally sustainably fished**	Low
Silky shark	***Carcharhinus falciformis***	Indian Ocean	Eastern	2019	**Maximally sustainably fished**	Low
Silky shark	***Carcharhinus falciformis***	Indian Ocean	Western	2020	**Underfished**	Low
Oceanic whitetip shark	***Carcharhinus longimanus***	Indian Ocean	Indian Ocean		**Maximally sustainably fished**	Low

TABLE E.3.3
STOCK STATUS OF SELECTED HIGHLY MIGRATORY SHARKS, WITH THE LEVEL OF UNCERTAINTY

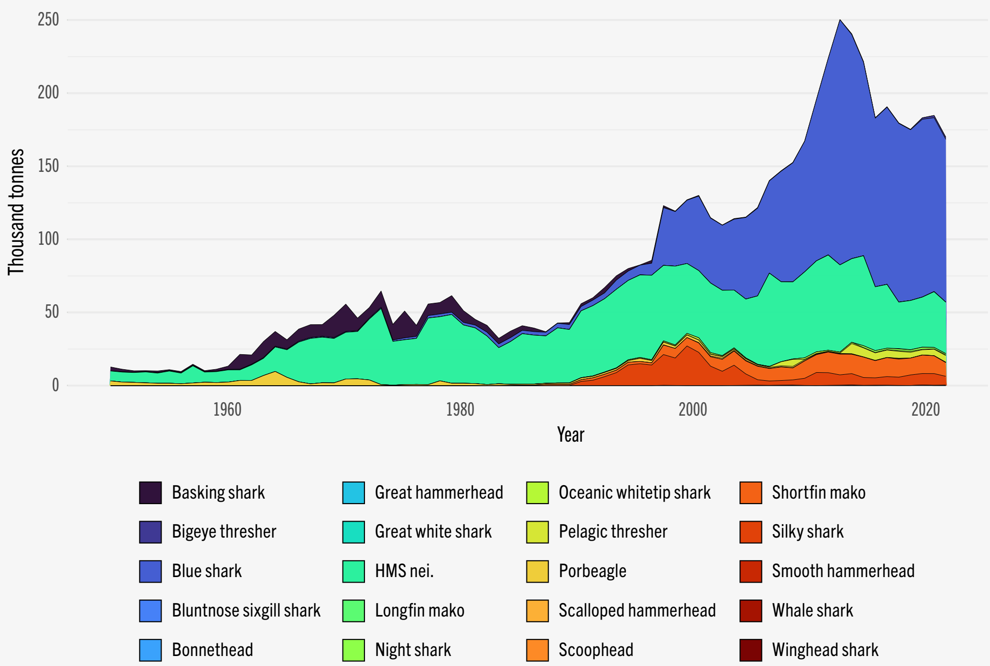
				Status	FAO	
Species	Scientific name	Ocean	Area	Year	Stock status	Uncertainty (H,M,L)
MEDITERRANEAN AND BLACK SEA						
Blue shark	***Prionace glauca***	Mediterranean and Black Sea			**Unknown**	Medium
Bluntnose sixgill shark	***Hexanchus griseus***	Mediterranean and Black Sea			**Unknown**	High
Shortfin mako	***Isurus oxyrinchus***	Mediterranean and Black Sea			**Unknown**	Medium
PACIFIC						
Bigeye thresher	***Alopias superciliosus***	Pacific	Central	2014	**Unknown**	High
Blue shark	***Prionace glauca***	Pacific	North	2020	**Maximally Sustainably Fished**	Low
Blue shark	***Prionace glauca***	Pacific	South	2020	**Overfished**	Low
Blue shark	***Prionace glauca***	Pacific	Southwest	2020	**Underfished**	High
Pelagic thresher	***Alopias pelagicus***	Pacific	Southeast		**Unknown**	Low
Pelagic thresher	***Alopias pelagicus***	Pacific	Eastern Central		**Underfished**	Low
Porbeagle	***Lamna nasus***	Pacific	Southern	2014	**Overfished**	Medium
Shortfin mako	***Isurus oxyrinchus***	Pacific	North	2015	**Underfished**	Medium
Shortfin mako	***Isurus oxyrinchus***	Pacific	South		**Overfished**	Medium
Silky shark	***Carcharhinus falciformis***	Pacific	Eastern Central	2019	**Overfished**	Medium
Silky shark	***Carcharhinus falciformis***	Pacific	Western Central	2016	**Maximally sustainably fished**	Low
Whale shark	***Rhincodon typus***	Pacific	Western Central	2016	**Unknown**	High
Oceanic whitetip shark	***Carcharhinus longimanus***	Pacific	Western Central	2015	**Overfished**	Low

Source: FAO estimates.

4. KEY SELECTED SPECIES AND STOCKS

This section identifies and discusses key shark and ray species, especially those that are highly migratory given that the regional chapters (**PART D**, pp. 66) of this report cover coastal species. Over the last two decades, 23 species of highly migratory sharks have been assessed by tuna RFMOs (including two NEI groups). The trends in global landings of highly migratory shark species are set out in **FIGURE E.3.4** below.

FIGURE E.3.4
ANNUAL REPORTED LANDINGS OF HIGHLY MIGRATORY SHARKS BETWEEN 1950 AND 2021



Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.
Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.1 Blue shark

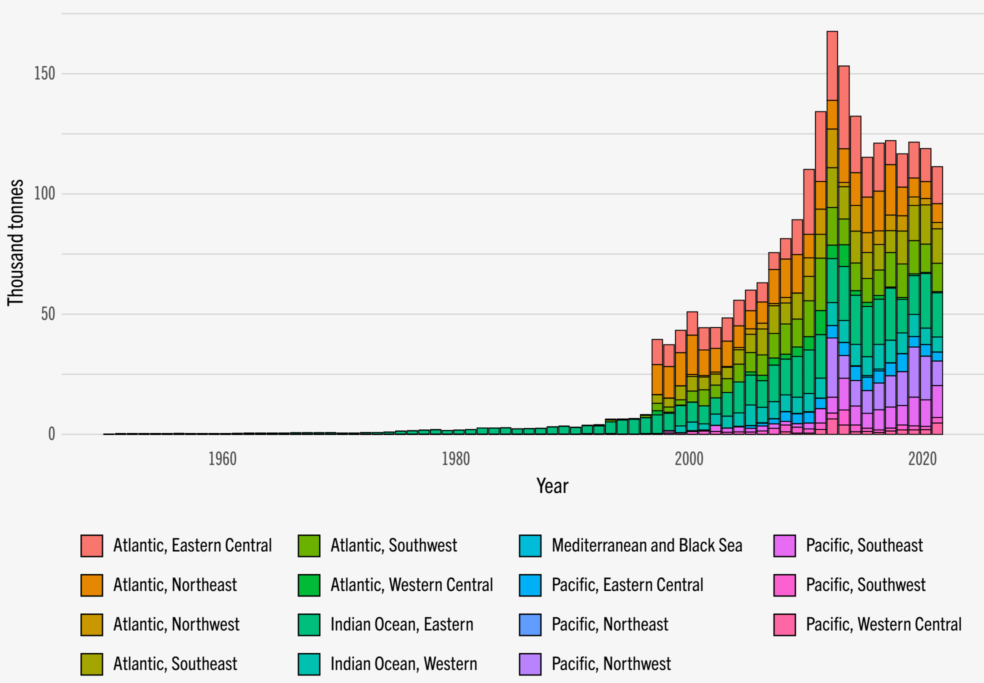
Within requiem sharks and their relatives *(Carcharhiniformes)*, the blue shark *(Prionace glauca)* is by far the most common of the dozen or so commercially important shark species captured (**FIGURE E.3.5**). They are found in temperate and tropical oceans across the globe, and are often caught incidentally in high seas longline and drift gillnet fisheries targeting tuna and swordfish. Despite its relatively fast growth and higher reproductive output compared to other large sharks, the blue shark is still vulnerable to overexploitation due to the sheer volume of catch. It represents one of the highest reported shark catches globally, both in terms of landings and discards.

Over the last two decades, reported landings have risen from approximately 8 000 tonnes in 1996 to about 51 000 tonnes in 2000, with a peak at over 167 000 tonnes in 2012, and recently stabilizing at between about 111 000 tonnes and 122 000 tonnes in recent years (2017 to 2021). At the regional level, trends in the blue shark landings between 1950 and 2021 (**FIGURE E.3.5**) show a peak of more than 34 000 tonnes in the

Eastern Central Atlantic in 2013, followed by a decline. The highest cumulative landings of blue shark between 1950 and 2021 come from the Eastern Indian Ocean, followed by the Eastern Central Atlantic and the Northeast Atlantic. These nominal reported landings likely underestimate the actual blue shark fishery removals, due in part to the large amounts of sharks reported as "NEI" as well as the practice of finning and discarding the carcasses at sea (Camhi, Pickitch and Babcock, 2008). Historically, blue shark fins have been five times more common than any other pelagic species in the fin trade in China, Hong Kong SAR. Estimates of the total shark biomass required to support the documented global shark fin trade (all species) annually exceeded the total landings reported to FAO by a factor of three to four in 2000 (Clarke *et al.,* 2006). In some regions, targeted shark fisheries existed with little to no control of the catches and limited reporting beyond total landings (Clarke *et al.,* 2006).

While blue shark are currently classified as sustainably fished in nearly all regions, signs of population stress have emerged, particularly in the North Atlantic, where catch rates have declined in some long-term datasets. The status of one stock of blue shark remains unknown. Blue shark are listed as Near Threatened on the International Union for Conservation of Nature (IUCN) Red List, List, and growing concern over their status has led to increased calls for improved monitoring, reporting and international management measures.

FIGURE E.3.5
ANNUAL REPORTED BLUE SHARK LANDINGS BETWEEN 1950 AND 2021, ACCORDING TO FAO MAJOR FISHING AREAS

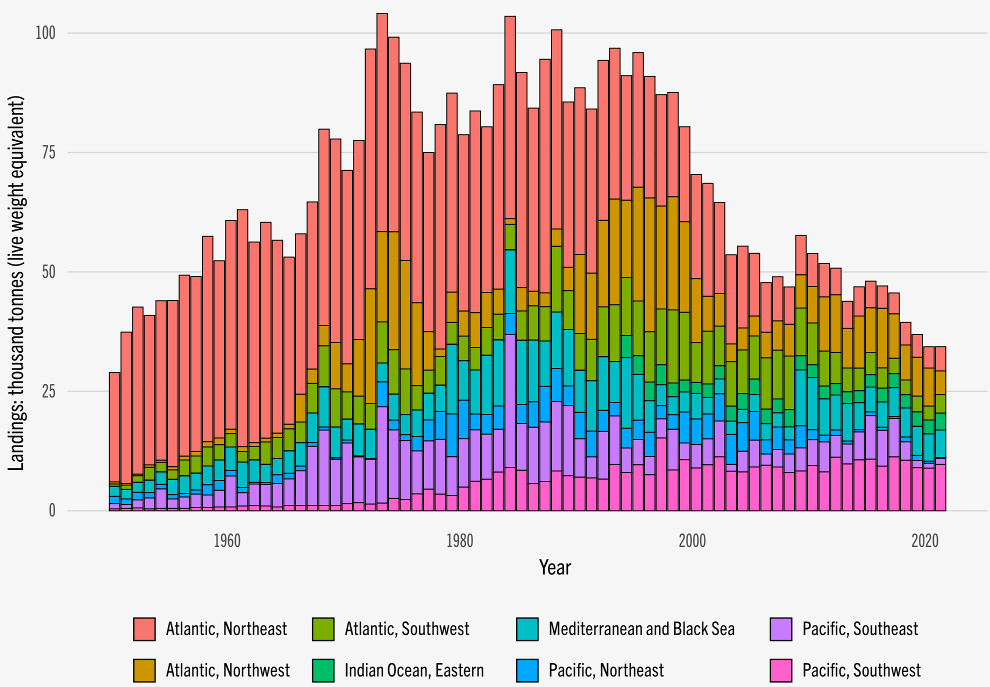


Note: Given the limited historical data on shark and ray species, it is likely that landings are higher than reported.
Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.2 Dogfishes

Spiny dogfish (also known as picked dogfish, *Squalus acanthias*) landings remain particularly notable in global fisheries data, second only to blue shark for landings reported to species. Trends show that the Northeast Atlantic (Area 61) historically accounted for the highest total dogfish landings which peaked at 50 200 tonnes in 1972, followed by the Northwest Atlantic (Area 67) which peaked at just over 28 000 tonnes in 1996 (**FIGURE E.3.6**). Trends indicate a steep decline in dogfish catches in the Northeast Atlantic to around 5 000 tonnes in 2021, prompting the IUCN to maintain its listing as Critically Endangered. In parallel, historical overfishing in the Northwest Atlantic (Area 21), which had previously led to recruitment failures, has since been mitigated by stricter management controls. Finally, landings data from the Southwest Pacific (Area 81) have been relatively stable since 1990.

FIGURE E.3.6
ANNUAL REPORTED DOGFISH LANDINGS BETWEEN 1950 AND 2021, ACCORDING TO FAO MAJOR FISHING AREAS



Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.
Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

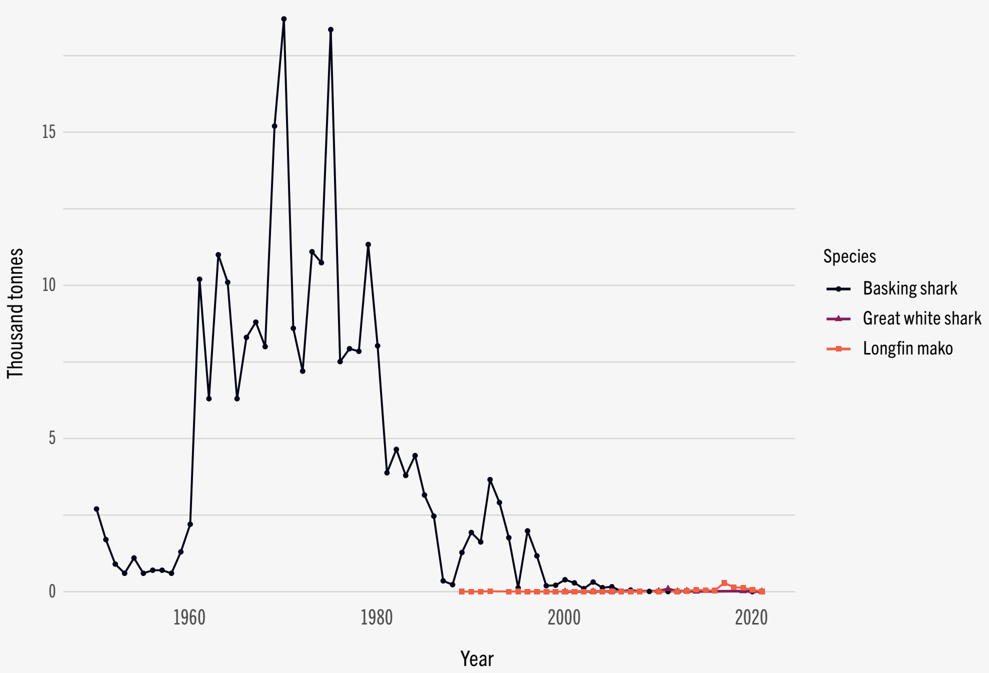
4.3 Basking, great white and longfin mako sharks

As the second-largest fish in the ocean, the basking shark *(Cetorhinus maximus)* was heavily hunted throughout the twentieth century for its large liver, which is rich in is rich in oil, as well as for meat, fins and cartilage. Targeted fisheries operated in the Northeast Atlantic, including off the coasts of the United Kingdom of Great Britain and Northern Ireland, Ireland and Norway, leading to significant population declines. Reported landings in excess of 8 000 tonnes were common during the period from 1960 to 1980, but they have been much less since the end of the 1990s and almost nonexistent since 2009 (with the exception of 2012), with 0.12 tonnes reported in 2021 (**FIGURE E.3.7**). Although most targeted fisheries have now ceased, the species remains at risk from incidental capture in various gear types, including trawls, gillnets and longlines. In recognition of these vulnerabilities, and the lack of data on regional abundance or population trends, the basking shark is listed as Endangered on the IUCN Red List and is protected under several international agreements, including CITES Appendix II and CMS Appendix I and II. Despite these protections, ongoing threats from bycatch and the species' low reproductive rate mean that continued conservation efforts are essential to support recovery and prevent further population decline. The status of basking shark remains unknown.

The great white shark *(Carcharodon carcharias)* is another iconic pelagic species that is highly vulnerable to overexploitation. Historically targeted for its jaws, teeth, fins and as a trophy species, the great white shark has also suffered from high levels of bycatch in commercial and recreational fisheries (Dudley and Simpfendorfer, 2006). Despite their widespread distribution across temperate and subtropical oceans, great whites often aggregate in predictable coastal areas, increasing their exposure to fishing and habitat disturbance. Since 1950, there have only been 11 years in which landings of great white shark have been reported. Of these, none have exceeded 25 tonnes (which was the peak in 2013), with multiple years of zero reported catches (**FIGURE E.3.7**). The species is listed as CITES Appendix II and CMS Appendix I and II, and is classified as Vulnerable on the IUCN Red List globally, with some regional populations facing even greater risk. Legal protections now exist in many countries, including complete prohibitions on targeted fishing and retention, but the species continues to be threatened by bycatch, illegal trade, and habitat degradation. Effective enforcement of conservation measures and continued monitoring are essential to prevent further decline and to support the recovery of great white shark populations worldwide. The status of the great white shark remains unknown.

The longfin mako *(Isurus paucus)* is one of the least understood pelagic shark species, making its conservation particularly challenging. Its distribution is poorly known, and due to its rarity and close resemblance to the more abundant shortfin mako *(Isurus oxyrinchus)*, it is likely that longfin mako are frequently misidentified or included in landing data for shortfin species, masking accurate assessments of population status. Historical reported landings ranged between 1 tonne and 5 tonnes from the early 1990s until 2013 when reported landings began increasing, with nearly 300 tonnes reported in 2017 (**FIGURE E.3.7**). The lack of reliable data poses significant obstacles for effective management and highlights the need for a precautionary approach in any fisheries that may capture this species. The longfin mako is listed on Appendix II of both the CMS and CITES, signalling the need for international cooperation and monitoring to ensure its conservation. The status of the great white shark remains unknown as of 2021.

FIGURE E.3.7
ANNUAL REPORTED LONGFIN MAKO, BASKING AND GREAT WHITE SHARKS LANDINGS BETWEEN 1950 AND 2021, ACCORDING TO FAO MAJOR FISHING AREAS

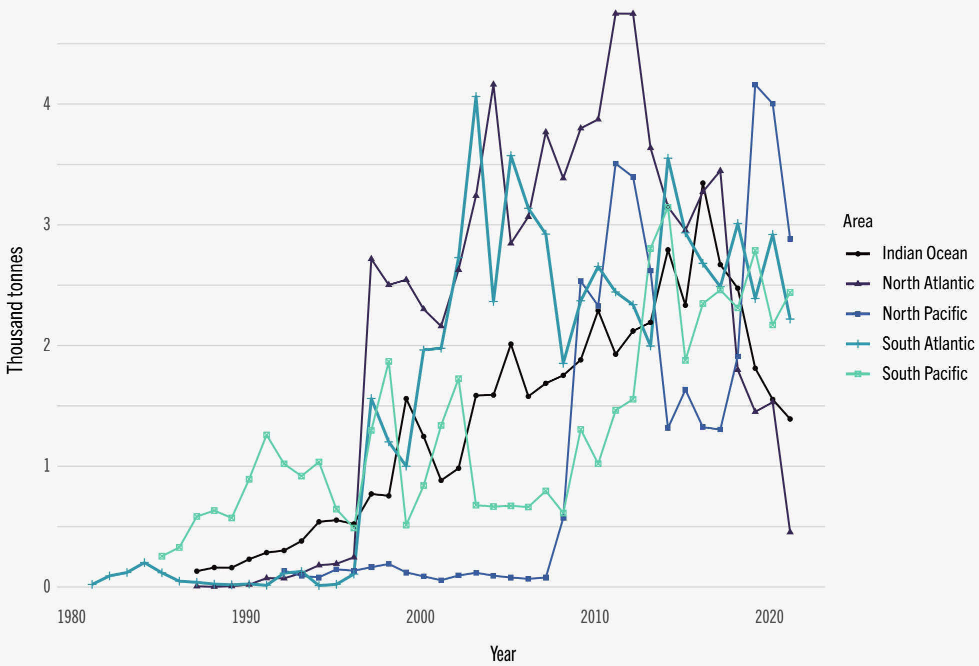


Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.4 Shortfin mako shark

The shortfin mako *(Isurus oxyrinchus)* is a fast-swimming, highly migratory shark that has been heavily exploited in global fisheries, both as a targeted species and as bycatch. Valued for its meat, fins and sport fishing appeal, the shortfin mako has experienced significant fishing pressure, particularly in high seas longline fisheries targeting tuna and swordfish. Reporting of landings for shortfin mako shark began in 1981 and increased through the 1990s until the mid-2010s in all major ocean basins; in 2021, reported landings were found to be just over 9 300 tonnes (**FIGURE E.3.8**). The apparent increase in landings may be due to increased reporting requirements, changes in markets, or both. Stock assessments have shown that populations in the Atlantic Ocean were overfished in 2021. In response, management bodies such as the International Commission for the Conservation of Atlantic Tunas (ICCAT) have adopted measures including catch limits and retention bans to mitigate further declines. In the Indian Ocean, stocks of shortfin mako were maximally sustainably fished in 2021, while the stock in the Pacific South was overfished, and the one in Pacific North was underfished in 2021. The shortfin mako is listed on Appendix II of both CITES and CMS, reflecting international concern for its status; this listing may be responsible for the recent decline in landings in some regions (**FIGURE E.3.8**). Additionally, the IUCN Red List categorizes the species as Endangered globally. Continued enforcement of conservation measures, improved landings reporting and further research on population trends are crucial to ensuring the long-term survival of this species.

FIGURE E.3.8
ANNUAL REPORTED SHORTFIN MAKO SHARKS LANDINGS BETWEEN 1980 AND 2021, ACCORDING TO FAO MAJOR FISHING AREAS



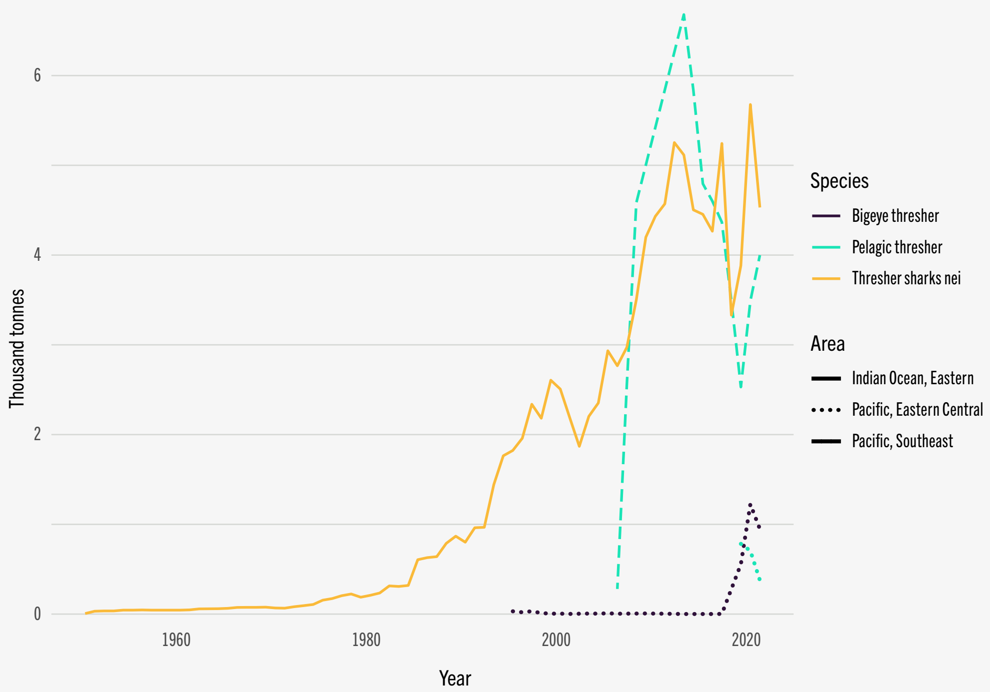
Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.5 Thresher sharks

Thresher sharks (family *Alopiidae*), particularly bigeye *(Alopias superciliosus)* and pelagic *(Alopias pelagicus)* species, are frequently caught in pelagic longline and gillnet fisheries targeting tuna and swordfish, often without specific management or catch reporting. Trends (**FIGURE E.3.9**) show that pelagic thresher shark landings in the southeast and Eastern Central Pacific rose sharply from the mid-2000s, peaking in 2013 at nearly 7 000 tonnes before declining significantly in the following years. Landings of thresher sharks not identified to species level in the Eastern Indian Ocean show a steady increase from the early 1990s, peaking intermittently over the last decade, suggesting continued fishing pressure; these may represent landings of the common thresher *(Alopias vulpinus)*. Reported landings of bigeye thresher show a rise to 1 224 tonnes in 2020, with a decrease to 948 tonnes in 2021. The decline in reported landings, particularly for bigeye thresher, may reflect both reduced populations and improved identification or reporting, though the absence of robust population data necessitates a precautionary management approach. The status of most thresher sharks is unknown, although one assessed stock in the Pacific is considered underfished. Thresher sharks are listed on CITES Appendix II, highlighting international concern for their conservation and the need for stronger regulation of trade and fishing practices.

FIGURE E.3.9
ANNUAL REPORTED THRESHER (BIGEYE, PELAGIC AND NOT IDENTIFIED TO SPECIES, NEI) SHARK LANDINGS BETWEEN 1950 AND 2021



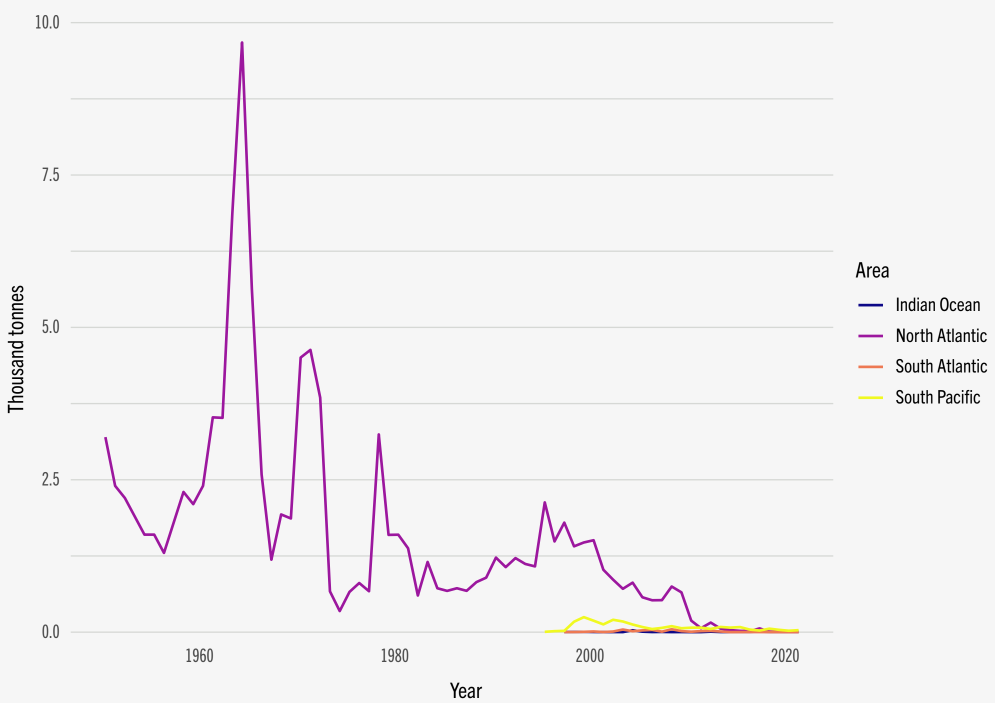
Note: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.6 Porbeagle shark

The porbeagle shark *(Lamna nasus)* has experienced significant population declines, particularly in the North Atlantic, where it has historically been most heavily fished and therefore from where landings have primarily been reported. North Atlantic landings peaked in 1964 at over 9 600 tonnes but have since plummeted, reaching minimal levels after 2010 (**FIGURE E.3.10**). This sharp decline reflects both possible population depletion and the implementation of stricter management measures following concerns about stock sustainability. The North Atlantic stock is currently listed as Critically Endangered by the IUCN, with some regional populations (such as in the Northeast Atlantic) still under moratoriums or strict quotas due to their depleted state and slow recovery potential. In contrast, the Southern Hemisphere populations of porbeagle shark have been less exploited, although they are still subject to fishing pressure and remain poorly studied. All assessed stocks of porbeagle shark were considered overfished in 2021. In addition, porbeagle shark are listed on Appendix II of CITES and CMS, emphasizing the need for international cooperation to ensure their long-term conservation and recovery. A precautionary approach to their management is useful given these listings and the lack of comprehensive data for these southern populations.

FIGURE E.3.10
ANNUAL REPORTED PORBEAGLE SHARK LANDINGS BETWEEN 1950 AND 2021, IN THE INDIAN, ATLANTIC AND SOUTH PACIFIC OCEANS



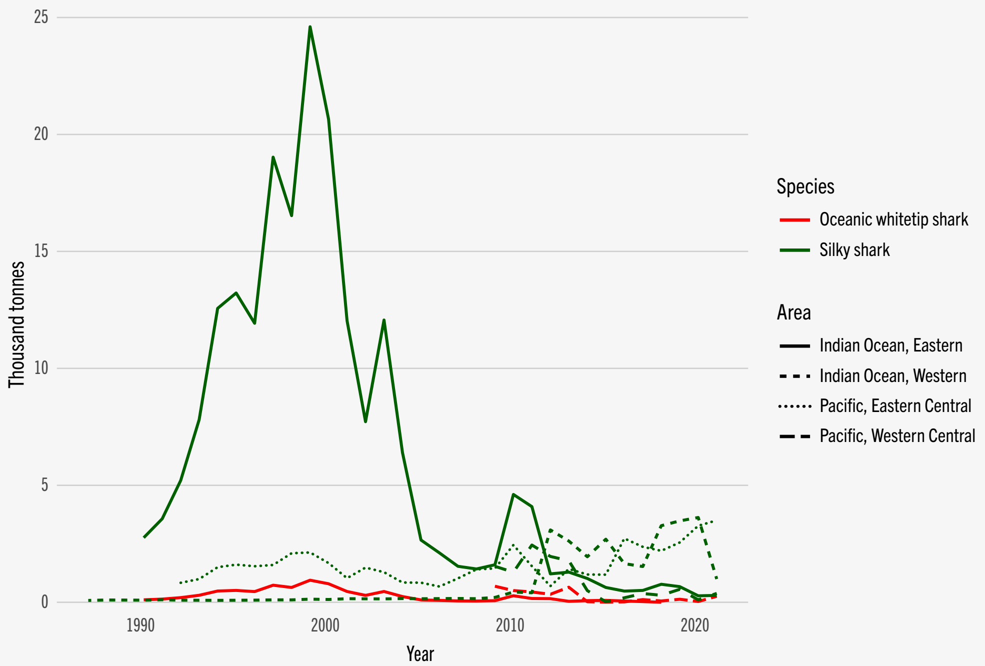
Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.7 Silky and oceanic whitetip sharks

The silky shark *(Carcharhinus falciformis)* is a highly migratory pelagic species that is among the most frequently caught sharks in tuna purse seine and longline fisheries, especially in tropical and subtropical oceans. Its abundance in these fisheries, combined with high market demand for fins, has led to intense fishing pressure. Silky shark are often taken as bycatch, particularly around fish aggregating devices (FADs), where juveniles are commonly encountered. Landings in the Indian Ocean are estimated to have peaked in 1999 at nearly 25 000 tonnes (**FIGURE E.3.11**). Although the species has a faster growth rate and higher fecundity than some other large sharks, it still exhibits key life history traits – such as late maturity and relatively slow reproduction – that limit its ability to withstand sustained fishing mortality. Population declines of 70 percent or more have been reported in several ocean basins, prompting concern about its conservation status. In response, the silky shark was listed on CITES Appendix II in 2016, and it is also included in CMS Appendix II and listed as Vulnerable on the IUCN Red List. RFMOs such as ICCAT have introduced measures to reduce mortality, including prohibiting retention in some fisheries. Nevertheless, ongoing bycatch and insufficient enforcement remain challenges. Currently, stocks of silky shark in the Indian Ocean are considered underfished to maximally sustainably fished in 2021, and in the Pacific overfished to maximally sustainably fished.

Once one of the most widespread and abundant pelagic sharks, the oceanic whitetip shark *(Carcharhinus longimanus)*, has seen a dramatic decline in population due to overfishing and habitat degradation. Historically, this shark was found in tropical and subtropical waters across the world's oceans, but its range has been significantly reduced. Conservation efforts are underway to protect the species, but continued threats from unsustainable fishing practices and the loss of prey species pose ongoing challenges for its recovery. It is currently considered to be overfished in the Indian and Pacific Oceans, with catch rates and catches declining in recent years (**FIGURE E.3.11**). Currently, the oceanic whitetip shark stock in the Indian Ocean is considered maximally sustainably fished in 2021, and in the Pacific Ocean overfished. It is also currently classified as Critically Endangered by the IUCN.

FIGURE E.3.11
ANNUAL REPORTED SILKY AND OCEANIC WHITETIP SHARK LANDINGS BETWEEN 1987 AND 2021



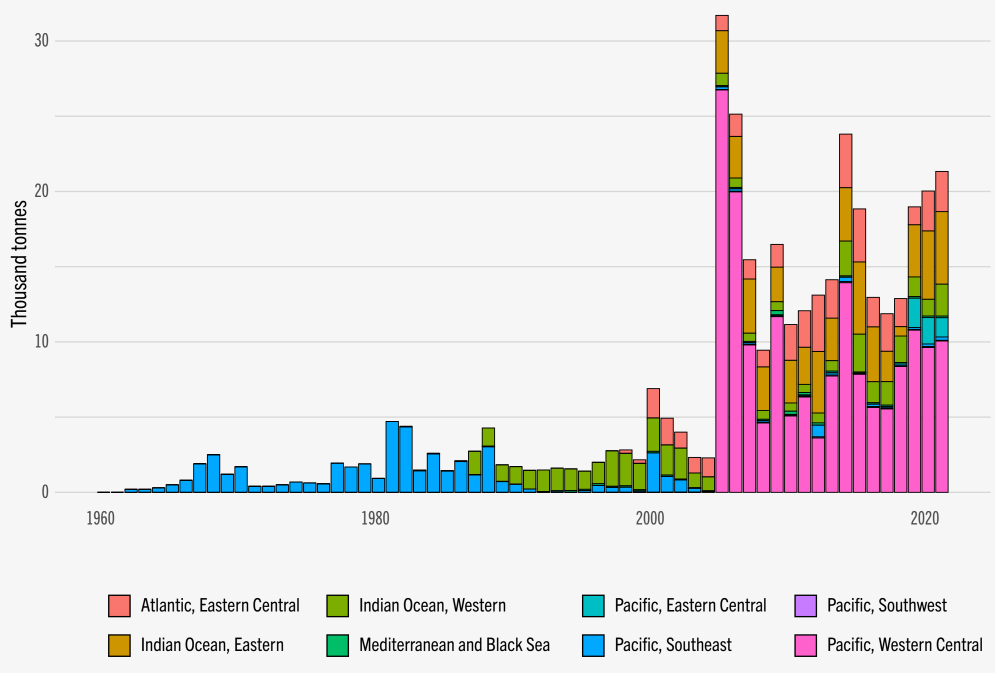
Note: The start year of this figure is 1987 because there are no reported landings for silky or oceanic whitetip sharks prior to this date.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

4.8 Batoids

Coastal tropical regions host the highest shark and ray species diversity (White and Sommerville, 2010). Among batoids, stingrays (*Myliobatiform* rays), guitarfishes *(Rhinobatidae)* and wedgefishes *(Rhynchobatidae)* are the larger fishery components, with the largest landings reported in the Western Central Pacific, Indian Ocean, and Eastern Central Atlantic **(FIGURE E.3.12)**. The fisheries in these regions rely on a combination of fixed and mobile gear types, with a high proportion of artisanal fishers depending on elasmobranch landings for their livelihoods.

FIGURE E.3.12
ANNUAL REPORTED STINGRAY, GUITARFISH AND WEDGEFISH LANDINGS BETWEEN 1960 AND 2021



Notes: Given the limited historical data on shark and ray species, it is likely that historical landings were higher than reported. The start year of this figure is 1960 because there are no reported landings for stingray, guitarfish and wedgefish prior to this date.

Source: FAO. 2024. FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

5. KEY FINDINGS

Shark species show biological vulnerabilities and have historically faced overexploitation. Despite some successful management cases, global trends underscore persistent threats from targeted fishing as well as bycatch. While the total global landings of sharks has declined from its peak in the early 2000s, the risk of overfishing due to bycatch still remains high for many species. Nevertheless, regional and international cooperation has broadened the stakeholder involvement in shark conservation and management, which in turn has improved the outlook for many species. For instance, more than 20 countries have adopted NPOAs-Sharks.

Despite some improvements in data collection and reporting, many species remain poorly monitored, and several – such as the basking, great white and shortfin mako sharks – are listed as endangered or critically endangered. Other species (e.g. longfin mako) are so rarely caught in recent years that their population status remains unknown, but this does not remove the possibility of depletion, given their low productivity.

Finally, the ustainable use and conservation of sharks, and highly migratory sharks in particular, requires coordinated, science-based, and enforceable international efforts. These species traverse vast ocean areas, which necessitates strengthened international cooperation and implementation/enforcement of conservation and management measures, catch reporting and bycatch reduction. Catch limits, which are based on sound stock assessments, are necessary for the management of many species, and these assessments in turn rely on rigorous studies of age, growth, reproduction and movement. Long term monitoring, improved data collection, and continued cooperation and research will help sustainbly use and conserve highly migratory shark populations for years to come.

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APPENDIX I

METHODOLOGY FOR ESTIMATING LANDINGS OF ASSESSED SPECIES NOT MAPPED TO FAO FISHSTAT DATABASE

For species that were assessed but could not be directly matched to the landings of the FAO FishStat database, the following multi-level taxonomic allocation approach was applied. The majority of these species are reported in FAO Areas 51, 57 and 71, where data collection was more limited in some regions or subareas.

1. TAXONOMIC-LEVEL ALLOCATION

Landing data were distributed across taxonomic levels, using a scaling factor that increased as specificity decreased (i.e. from genus, to family, order or class, to *marine fishes not elsewhere identified* [nei]) depending on the data available.

a. Genus-level example:

In cases where the species (e.g. *Epinephelus morio*) had no reported landings data for a given FAO Major Fishing Area *X,* landings were assigned at the genus level. Specifically, the species was assigned the total landings of *Epinephelus* spp. in Area X for 2021, denoted as $L_{g,X}$. A genus-level factor of $f_{g,X}$ was then applied (i.e. $f_{g,X}$ is the number of species assigned to a given genus for a given FAO Area *X*, in this case if there was only one species not assigned to this genus it would be 1, if there were two, it would 2, and so on), representing the total number of species with no individual landing data in FishStat and grouped under *Epinephelus* spp. at the genus level in FAO Area *X*.

Assumption: Other species within the genus were properly identified and listed in FishStat.

b. Family-level example:

In cases where the species (e.g. *Saurida undosquamis*) had no reported landings data for a given FAO Major Fishing Area *X,* landings were assigned at family level. Specifically, the species was assigned the total landings of *Synodontidae* in FAO Area X in 2021, denoted as $L_{f,X}$. A family-level factor $f_{f,X}$ was then applied (a similar factor was applied to the one above for the family level), representing the total number of species with no individual landing data in FishStat and grouped under *Synodontidae* at the family level in FAO Area *X*.

Assumption: Other species within the family were properly identified and listed in FishStat.

c. Order-level example:

In cases where the species (*e.g. Encrasicholina heteroloba*) had no landing data in FAO Major Fishing Area *X*, landings were assigned at order level. Specifically, the species was assigned the total landings of *Clupeiformes* in FAO Area *X* in 2021, denoted as $L_{o,X}$. An order-level factor $f_{o,X}$ was then applied, representing the total number of species with no landing data in FishStat and grouped under *Clupeiformes* at the order level in FAO Area X.

Assumption: Other species within the order were properly identified and listed in FishStat.

2. CLASS-LEVEL ALLOCATION

If a given species with no reported landing data in FAO Major Fishing Area X belonged to class c, it was assigned class-level landings $L_{c,X}$, representing the total catch for class c in FAO Area X in 2021. As such, in this case, only landings of whatever class it corresponded to (e.g. marine fish nei) would be associated with the given species.

a. Marine fishes nei

If a given species with no reported landing data in FAO Major Fishing Area X corresponded to the category *"marine fishes nei"* (which broadly encompasses all marine bony fish species not identified elsewhere) at the class level, the scaling factor was adjusted accordingly to account for this aggregation as follows:

$$f'_{c,X} = \frac{4 f_{c,X}|X|}{|X_m|}$$

Where:

- The number 4 was used to down-weight this category, as we are already accounting for 3 other categories; genus family and order (this is the 4th class)
- $f'_{c,X}$ is the adjusted scaling factor for the given species in FAO Area X
- $f_{c,X}$ is the original scaling factor for the given species in FAO Area X, representing the number of species with no landings assigned to the species at the class level in FAO Area X
- $|X|$ is the number of assessed species (which includes all species in Area X assessed in FishStat J)in FAO Area X
- $|X_m|$ is the number of assessed species (which includes classes other than marine fished) with missing landings in FAO Area X.

b. All other classes

All species corresponding to classes other than *"marine fishes nei"* were assigned the original scaling factor $f_{c,X}$, representing the number of species with no reported landings assigned to the same class c in FAO Major Fishing Area X.

3. HANDLING OVERLAPS AND DOUBLE COUNTING

If a proxy species (used for unmatched assignment) overlapped with a species already reported in the same area, the following adjustment was applied:

- The reported species' landings were reduced to 75 percent of their original value.
- The remaining 25 percent was assigned to the proxy species to avoid double counting, i.e. the landings for level l in FAO Area X were adjusted to:

$$L'_{l,X} = \frac{1}{4} L_{l,X}$$

4. FINAL ESTIMATION OF LANDINGS FOR UNMATCHED SPECIES

After applying the adjustments in steps 1 and 2, each species with missing landings was assigned an estimated landing based on:

$$L_{s,X} = \sum_{l \in \{g,f,o,c\}} \frac{L_{l,X}}{f_{l,X}}$$

Where:

- $L_{s,X}$ are the new assigned landings to species s in FAO Area X
- $L_{l,X}$ are the landings at level l (ranging over genus, family, order and class levels) in FAO Area X
- $f_{l,X}$ is the scaling factor at level l in FAO Area X.

EXAMPLE: *Trachurus novaezelandiae* IN FAO AREA 81

a. Assignment across taxonomic and class levels

For the species T*rachurus novaezelandiae,* we have the following mapping across taxonomic and class levels:

Species	Genus	Family	Order	Class
Trachurus novaezelandiae	Jack and horse mackerels NEI	Carangids NEI	Percoids NEI	Marine fishes NEI

b. Landings across taxonomic and class levels

Using these mappings, we retrieve the reported landings from FishStat for each level in FAO Area 81.

REPORTED LANDINGS 2021 IN FISHSTAT FOR FAO AREA 81 IN TONNES

Species	Genus	Family	Order	Class
0	45 722.97	3 175.69	11.8	461.27

We must adjust these landings based on the presence of stocks in Area 81 which already match the genus, family, order, or class assigned to *Trachurus novaezelandiae.* This ensures we do not double count landings at these levels.

The genus level (Jack and horse mackerels NEI) is already contained in the assessment in Area 81. Thus, we adjust the landings on each level to be allocated to *Trachurus novaezelandiae* to 25% of those reported in FishStat.

LANDINGS FOR ALLOCATION TO *Trachurus novaezelandiae* IN FAO AREA 81 IN TONNES

Species	Genus	Family	Order	Class
0	11 430.74	3 175.69	11.8	461.27

The assessed stocks corresponding to Jack and horse mackerels NEI already reported in Area 81 are allocated the remaining 75% (34 292.22 tonnes) of their total landings for the area.

c. Scaling factor across taxonomic and class level

For each level, we assign a scaling factor to *Trachurus novaezelandiae* based on the number of species with no reported catch assigned to the same taxonomic/class level.

For the taxonomic levels (genus, family, and order), *Trachurus novaezelandiae* is the only species assigned to Jack and horse mackerels NEI, Carangids NEI, and Percoids NEI. Therefore, *Trachurus novaezelandiae* receives a scaling factor of 1 on the genus, family, and order level.

For the class level, there are 23 species assigned to Marine fishes NEI. However, since the class is Marine fishes NEI, the scaling factor needs to be further adjusted, instead of simply assigning *Trachurus novaezelandiae* a class scaling factor of 23.

In Area 81, there are 96 species reported in the assessment. Of these 96 species, 36 of them do not have catch data reported in FishStat. This gives an adjusted class scaling factor of

$$f_{MZZ,51} = \frac{4 \times 23 \times 96}{36} \approx 245.33$$

Then, for *Trachurus novaezelandiae* we have scaling factors across all levels:

SCALING FACTORS FOR Trachurus novaezelandiae IN FAO AREA 81

Species	Genus	Family	Order	Class
N/A	1	1	1	245.33

d. Calculation of assigned landings

Now that we have the landings and scaling factors at each level, we can calculate the assigned landings for *Trachurus novaezelandiae* in FAO Area 81, which comes out to be approximately 14 620 tonnes:

$$L_{\text{Tr.nov.},51} = \frac{11\,430.74\,T}{1} + \frac{3\,175.69\,T}{1} + \frac{11.8\,T}{1} + \frac{461.27\,T}{245.33} \approx 14\,620\,T$$

APPENDIX II, TABLE 1

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 21

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
22	American eel	*Anguilla rostrata*	< 1	< 1	2	1	1	< 1	< 1	< 1	< 1		1							
	22–River eels		**< 1**	**< 1**	**2**	**1**	**1**	**< 1**	**< 1**	**< 1**	**< 1**									
23	Atlantic salmon	*Salmo salar*	2	3	4	2	< 1	< 1	< 1	0	< 1			4						
	Arctic char	*Salvelinus alpinus*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		1							
	23–Salmons, trouts, smelts		**2**	**3**	**4**	**2**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
25	Striped bass	*Morone saxatilis*	2	4	4	< 1	2	3	3	2	2		1							
	25–Miscellaneous diadromous fishes		**2**	**4**	**4**	**< 1**	**2**	**3**	**3**	**2**	**2**									
31	Witch flounder	*Glyptocephalus cynoglossus*	5	28	38	19	9	5	2	2	2		3	1						
	Amer. plaice (=Long rough dab)	*Hippoglossoides platessoides*	31	77	97	79	19	7	3	2	2		1	5						
	Atlantic halibut	*Hippoglossus hippoglossus*	5	4	2	4	2	2	4	7	8		2							
	Yellowtail flounder	*Myzopsetta ferruginea*	9	42	50	30	12	16	9	15	16	1	2	3						
	Summer flounder	*Paralichthys dentatus*	7	5	7	11	6	6	4	3	4		1							
	Winter flounder	*Pseudopleuronectes americanus*	9	15	15	16	8	6	3	1	1		1	2						
	Greenland halibut	*Reinhardtius hippoglossoides*	< 1	17	47	38	67	61	63	67	67		2							
	Windowpane flounder	*Scophthalmus aquosus*	0	0	< 1	2	1	< 1	< 1	< 1	< 1	2								
	31–Flounders, halibuts, soles		**67**	**189**	**257**	**199**	**123**	**102**	**88**	**98**	**99**									
32	Tusk (=Cusk)	*Brosme brosme*	2	5	6	6	3	1	< 1	< 1	< 1			1						
	Atlantic cod	*Gadus morhua*	857	1 453	754	644	165	50	55	42	30		2	8						
	Haddock	*Melanogrammus aeglefinus*	144	148	39	54	16	24	22	27	19	1	1	4						
	Silver hake	*Merluccius bilinearis*	48	180	203	83	46	22	14	10	13	2	1							
	Saithe (=Pollock)	*Pollachius virens*	49	37	38	61	27	13	9	7	7	1	1							
	White hake	*Urophycis tenuis*	15	10	18	24	13	8	4	3	3			2						
	32–Cods, hakes, haddocks		**1 115**	**1 833**	**1 059**	**872**	**270**	**118**	**103**	**88**	**72**									
33	Black seabass	*Centropristis striata*	6	2	1	2	1	1	1	2	2	1								
	Longhorn sculpin	*Myoxocephalus octodecemspinosus*	0	0	0	0	0	0	0	0	0		1							
	Scup	*Stenotomus chrysops*	18	16	8	7	3	2	7	6	6	1								
	Ocean pout	*Zoarces americanus*	< 1	3	1	< 1	< 1	< 1	0	0	0			1						
	33–Miscellaneous coastal fishes		**24**	**21**	**10**	**10**	**4**	**4**	**8**	**8**	**8**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Atlantic wolffish	*Anarhichas lupus*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Alfonsino	*Beryx decadactylus*	0	0	0	0	0	0	0	0	0									1
	Lumpfish (=Lumpsucker)	*Cyclopterus lumpus*	0	< 1	< 1	1	1	7	9	9	5			1						
	American angler	*Lophius americanus*	< 1	2	10	6	23	20	10	8	7		1							
	Great Northern tilefish	*Lopholatilus chamaeleonticeps*	< 1	< 1	1	2	< 1	< 1	< 1	< 1	< 1		1							
	Acadian redfish	*Sebastes fasciatus*	0	0	0	0	0	0	4	6	6	1	1							
	Beaked redfish, Acadian redfish	*Sebastes mentella, Sebastes fasciatus*	< 1	11	4	< 1	0	5	6	9	6		2	3						
	Beaked redfish	*Sebastes mentella, Sebastes norvegicus, Sebastes fasciatus, Sebastes spp.*	175	227	216	143	87	45	38	47	44		1							
	34–Miscellaneous demersal fishes		**176**	**240**	**232**	**154**	**112**	**77**	**66**	**81**	**68**									
35	Atlantic menhaden	*Brevoortia tyrannus*	428	268	270	305	307	207	196	178	202		1							
	Atlantic herring	*Clupea harengus*	170	451	466	233	277	265	183	91	74		5	3						
	35–Herrings, sardines, anchovies		**598**	**719**	**736**	**538**	**584**	**471**	**379**	**269**	**275**									
37	Capelin	*Mallotus villosus*	15	6	174	65	46	30	31	27	24		3							1
	Atlantic butterfish	*Peprilus triacanthus*	0	2	7	< 1	< 1	0	2	2	2	1								
	Bluefish	*Pomatomus saltatrix*	< 1	< 1	3	5	4	3	2	1	1			1						
	Atlantic mackerel	*Scomber scombrus*	15	33	244	49	39	71	17	16	10			3						
	37–Miscellaneous pelagic fishes		**30**	**42**	**428**	**120**	**89**	**105**	**51**	**46**	**37**									
38	Starry ray	*Amblyraja radiata*	0	0	0	0	0	0	0	0	0			1						
	Barndoor skate	*Dipturus laevis*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Little skate	*Leucoraja erinaceus*	0	0	0	0	0	2	5	3	3			1						
	Freckled skate	*Leucoraja garmani*	0	0	0	0	0	0	0	0	0	1								
	Winter skate	*Leucoraja ocellata*	0	0	0	0	0	0	7	10	5	1								
	Smooth skate	*Malacoraja senta*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Clearnose skate	*Rostroraja eglanteria*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	38–Sharks, rays, chimaeras		**0**	**0**	**0**	**0**	**0**	**2**	**11**	**13**	**9**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
42	Atlantic rock crab	*Cancer irroratus*	< 1	< 1	< 1	2	5	9	6	3	3		1							
	Queen crab	*Chionoecetes opilio*	0	1	12	36	59	103	89	74	80		5							
	42–Crabs, sea-spiders		**< 1**	**2**	**13**	**38**	**64**	**112**	**94**	**77**	**83**									
43	American lobster	*Homarus americanus*	34	33	32	52	74	89	150	150	167		13							
	43–Lobsters, spiny-rock lobsters		**34**	**33**	**32**	**52**	**74**	**89**	**150**	**150**	**167**									
45	Northern prawn	*Pandalus borealis*	< 1	7	33	64	139	302	219	171	170		5	4						
	Aesop shrimp	*Pandalus montagui*	0	0	0	0	0	< 1	< 1	< 1	< 1		2							
	45–Shrimps, prawns		**< 1**	**7**	**33**	**64**	**139**	**303**	**220**	**171**	**170**									
55	Iceland scallop	*Chlamys islandica*	0	0	0	< 1	8	3	1	< 1	< 1		1	1						
	American sea scallop	*Placopecten magellanicus*	83	120	122	155	149	280	247	249	221	1	5	2						
	55–Scallops, pectens		**83**	**120**	**122**	**155**	**157**	**283**	**248**	**249**	**221**									
56	Ocean quahog	*Arctica islandica*	1	< 1	34	159	166	90	52	37	86		1							
	Stimpson's surf clam	*Mactromeris polynyma*	< 1	< 1	< 1	2	22	22	28	30	36		2							
	Sand gaper	*Mya arenaria*	17	20	24	20	10	10	8	6	6		1							
	Atlantic surf clam	*Spisula solidissima*	44	124	129	149	155	138	92	30	61		2							
	56–Clams, cockles, arkshells		**62**	**145**	**187**	**329**	**352**	**260**	**180**	**103**	**188**									
57	Longfin squid	*Doryteuthis pealeii*	0	< 1	21	20	18	14	11	9	11	1								
	Northern shortfin squid	*Illex illecebrosus*	5	5	55	23	21	7	13	32	29		1							
	57–Squids, cuttlefishes, octopuses		**5**	**5**	**76**	**44**	**38**	**21**	**25**	**42**	**40**									
76	Sea Cucumber	*Cucumaria frondosa*	0	0	0	0	0	0	0	0	0		3							
	76–Sea-urchins and other echinoderms		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total selected species groups		**2 200**	**3 364**	**3 195**	**2 579**	**2 010**	**1 950**	**1 627**	**1 397**	**1 440**									
	Total other species groups		**435**	**407**	**493**	**319**	**316**	**264**	**205**	**168**	**175**									
	Total marine capture		**2 635**	**3 771**	**3 689**	**2 898**	**2 326**	**2 214**	**1 832**	**1 565**	**1 616**									
	Total aquaculture		**1**	**1**	**2**	**8**	**50**	**114**	**125**	**105**	**121**									
	Total production		**2 636**	**3 773**	**3 691**	**2 906**	**2 376**	**2 327**	**1 957**	**1 670**	**1 737**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 27

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
23	Atlantic salmon	*Salmo salar*	7	9	8	7	5	2	< 1	< 1	< 1		2	2						
	Sea trout	*Salmo trutta*	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1			1						
	23–Salmons, trouts, smelts		**7**	**9**	**8**	**8**	**6**	**3**	**1**	**< 1**	**1**									
31	Witch flounder	*Glyptocephalus cynoglossus*	3	3	2	7	10	11	7	4	4		1							
	Four-spot megrim	*Lepidorhombus boscii*	0	0	0	0	0	< 1	< 1	< 1	< 1		1							
	Megrims NEI	*Lepidorhombus* spp.	5	9	11	18	10	10	12	14	15	1	1							
	Megrim	*Lepidorhombus whiffiagonis*	7	10	8	11	11	8	6	3	3		2							
	Common dab	*Limanda limanda*	13	13	15	16	16	15	9	6	5		2							
	Lemon sole	*Microstomus kitt*	7	9	8	12	12	12	9	6	6		1							
	European flounder	*Platichthys flesus*	9	9	12	11	11	19	21	22	20		2							
	Baltic flounder	*Platichthys solemdali*	0	0	0	0	0	0	0	0	0		1							
	Righteye flounders	*Platichthys* spp.	0	0	0	0	0	0	0	0	0		2							
	European plaice	*Pleuronectes platessa*	107	161	176	169	146	89	100	68	60	2	8	1						
	Greenland halibut	*Reinhardtius hippoglossoides*	6	38	66	56	51	45	49	52	52		1	1						
	Turbot	*Scophthalmus maximus*	8	7	6	6	8	5	5	5	5		2							
	Brill	*Scophthalmus rhombus*	< 1	1	2	2	3	3	3	2	2		1							
	Common sole	*Solea solea*	23	33	27	29	39	29	23	18	17		7	1						
	31–Flounders, halibuts, soles		**189**	**291**	**333**	**337**	**315**	**246**	**242**	**201**	**191**									
32	Polar cod	*Boreogadus saida*	1	14	105	15	16	25	5	< 1	< 1	1								
	Tusk (= Cusk)	*Brosme brosme*	18	34	33	42	33	25	22	17	16		3							
	Roundnose grenadier	*Coryphaenoides rupestris*	0	< 1	9	12	15	22	3	< 1	< 1			1						1
	Atlantic cod	*Gadus morhua*	1 675	1 611	1 772	1 425	1 104	814	1 162	1 051	1 115		3	10						
	Haddock	*Melanogrammus aeglefinus*	289	464	493	316	256	275	326	287	311	1	6							
	Whiting	*Merlangius merlangus*	118	191	214	147	80	38	34	33	32	1	4	2						
	European hake	*Merluccius merluccius*	126	120	86	68	49	41	89	84	77		2							
	Blue whiting (= Poutassou)	*Micromesistius poutassou*	13	18	223	713	675	1 726	1 019	1 473	1 144		1							
	Blue ling	*Molva dypterygia*	4	6	14	25	12	11	6	5	6		2	1						
	Ling	*Molva molva*	30	47	57	59	52	39	43	41	37		4							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 27

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
32	Pollack	*Pollachius pollachius*	7	6	7	16	14	11	9	8	6		1	1						
	Saithe (=Pollock)	*Pollachius virens*	210	323	592	420	349	396	324	319	316	1	3							
	Norway pout	*Trisopterus esmarkii*	2	155	532	409	275	62	62	133	74	1	1							
	32–Cods, hakes, haddocks		**2 494**	**2 991**	**4 138**	**3 667**	**2 930**	**3 485**	**3 103**	**3 452**	**3 134**									
33	Sandeels (=Sandlances) NEI	*Ammodytes* spp.	45	152	498	810	966	474	298	449	233	4	3	1						
	European seabass	*Dicentrarchus labrax*	< 1	< 1	1	3	4	6	6	4	4		2							
	Blackspot seabream	*Pagellus bogaraveo*	9	9	10	4	3	2	< 1	< 1	< 1		1	1						
	33–Miscellaneous coastal fishes		**55**	**162**	**509**	**817**	**972**	**482**	**305**	**454**	**238**									
34	Atlantic wolffish	*Anarhichas lupus*	21	22	17	15	16	17	12	12	13		1							
	Greater argentine	*Argentina silus*	0	0	0	0	0	3	4	4	12	1	3							
	Orange roughy	*Hoplostethus atlanticus*	0	0	0	0	2	2	< 1	< 1	< 1			1						
	Blackbellied angler	*Lophius budegassa*	0	0	0	0	0	< 1	< 1	< 1	< 1		2							
	Angler (=Monk)	*Lophius piscatorius*	5	6	8	15	29	26	26	27	29		2							
	Monkfishes NEI	*Lophius* spp.	4	19	29	37	22	25	28	19	20		1							
	Beaked redfish	*Sebastes mentella*	0	< 1	2	4	6	71	59	84	94		2	4						
	Golden redfish	*Sebastes norvegicus*	0	< 1	< 1	10	17	56	56	53	52		1	1						
	34–Miscellaneous demersal fishes		**30**	**47**	**57**	**81**	**92**	**200**	**185**	**201**	**220**									
35	Atlantic herring	*Clupea harengus*	2 478	2 738	1 078	1 080	1 733	1 946	1 592	1 515	1 555		8	3						
	European anchovy	*Engraulis encrasicolus*	55	90	37	16	29	18	32	42	47		2							
	European pilchard (=Sardine)	*Sardina pilchardus*	179	223	165	203	169	138	81	71	78		2	1						
	European sprat	*Sprattus sprattus*	67	151	581	322	484	584	469	460	369	1	2							
	35–Herrings, sardines, anchovies		**2 779**	**3 202**	**1 861**	**1 620**	**2 415**	**2 684**	**2 174**	**2 088**	**2 048**									
37	Capelin	*Mallotus villosus*	44	314	2 294	1 838	1 231	868	481	< 1	205		1	1						
	Atlantic mackerel	*Scomber scombrus*	100	415	603	581	654	575	1 023	1 019	1 077		1							
	Atlantic horse mackerel	*Trachurus trachurus*	44	66	168	171	337	165	128	92	93	1		2						
	37–Miscellaneous pelagic fishes		**188**	**794**	**3 065**	**2 590**	**2 222**	**1 607**	**1 631**	**1 111**	**1 374**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 27

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
43	Norway lobster	*Nephrops norvegicus*	12	26	38	49	53	59	54	40	52	1	19	5						
	43–Lobsters, spiny-rock lobsters		**12**	**26**	**38**	**49**	**53**	**59**	**54**	**40**	**52**									
45	Northern prawn	*Pandalus borealis*	8	18	29	117	132	78	51	73	70	2		1						
	45–Shrimps, prawns		**8**	**18**	**29**	**117**	**132**	**78**	**51**	**73**	**70**									
	Total selected species groups		**5 761**	**7 540**	**10 039**	**9 286**	**9 137**	**8 845**	**7 747**	**7 621**	**7 329**									
	Total other species groups		**937**	**1 004**	**1 132**	**1 106**	**1 208**	**923**	**858**	**681**	**704**									
	Total marine capture		**6 698**	**8 544**	**11 171**	**10 392**	**10 345**	**9 768**	**8 605**	**8 301**	**8 033**									
	Total aquaculture		**169**	**258**	**413**	**607**	**926**	**1 438**	**2 093**	**2 362**	**2 633**									
	Total production		**6 866**	**8 802**	**11 584**	**10 999**	**11 271**	**11 207**	**10 698**	**10 663**	**10 666**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II, TABLE 3

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 31

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Sheepshead	*Archosargus probatocephalus*	< 1	< 1	< 1	1	2	< 1	< 1	< 1	< 1	3								
	Grey triggerfish	*Balistes capriscus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			1						
	Snooks (=Robalos) NEI	*Centropomus* spp.	3	6	2	2	2	4	6	1	1						1			
	Common snook	*Centropomus undecimalis*	< 1	3	3	4	5	4	3	8	7					1				
	Black seabass	*Centropristis striata*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Spotted weakfish	*Cynoscion nebulosus*	3	3	4	3	4	2	< 1	< 1	< 1		1	1			1			
	Squeteague (=Gray weakfish)	*Cynoscion regalis*	< 1	< 1	3	3	< 1	< 1	< 1	< 1	< 1			1						
	Red grouper	*Epinephelus morio*	3	6	5	2	2	3	2	1	2		1	2						
	Snowy grouper	*Hyporthodus niveatus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			2						
	Mutton snapper	*Lutjanus analis*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Northern red snapper	*Lutjanus campechanus*	4	6	6	5	7	4	6	9	9			2		1				
	Grey snapper	*Lutjanus griseus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Lane snapper	*Lutjanus synagris*	< 1	2	4	3	3	2	2	1	1						2			
	Gulf kingcroaker	*Menticirrhus littoralis*	2	2	1	< 1	1	< 1	< 1	< 1	< 1					1	1			
	Whitemouth croaker	*Micropogonias furnieri*	0	< 1	2	4	5	3	2	2	2						1			
	Flathead grey mullet	*Mugil cephalus*	3	4	5	9	19	14	11	8	9	3			1					
	Lebranche mullet	*Mugil liza*	1	< 1	1	2	3	2	2	2	2					1				
	Gag	*Mycteroperca microlepis*	0	0	0	0	< 1	1	< 1	< 1	< 1			2						
	Scamp	*Mycteroperca phenax*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Yellowtail snapper	*Ocyurus chrysurus*	< 1	2	2	3	3	4	4	2	2	1				1	2			
	Black drum	*Pogonias cromis*	< 1	< 1	2	< 1	2	2	3	1	1	1					1			
	Vermilion snapper	*Rhomboplites aurorubens*	0	0	0	0	< 1	3	3	4	4	1	1							
	Red drum	*Sciaenops ocellatus*	< 1	1	2	< 1	< 1	< 1	< 1	< 1	< 1	2		1						
	33–Miscellaneous coastal fishes		**23**	**39**	**42**	**42**	**61**	**52**	**47**	**42**	**43**									
35	Gulf menhaden	*Brevoortia patronus*	290	470	603	786	560	480	510	412	361	1								
	Atlantic menhaden	*Brevoortia tyrannus*	25	41	65	59	17	0	0	0	0		1							
	Atlantic thread herring	*Opisthonema oglinum*	2	6	9	5	8	9	3	3	2				1	1	1			

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Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
35	Round sardinella	*Sardinella aurita*	19	38	42	61	119	101	67	81	90						1			
	35–Herrings, sardines, anchovies		**336**	**555**	**721**	**910**	**704**	**590**	**580**	**496**	**453**									
36	Atlantic sailfish	*Istiophorus albicans*	0	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1		1							
	Atlantic white marlin	*Kajikia albida*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Blue marlin	*Makaira nigricans*	< 1	2	< 1	< 1	< 1	1	1	< 1	< 1			1						
	Serra Spanish mackerel	*Scomberomorus brasiliensis*	< 1	< 1	3	4	6	5	2	2	2						1			
	King mackerel	*Scomberomorus cavalla*	5	6	7	7	9	11	9	5	4	1	1		1		2			
	Atlantic Spanish mackerel	*Scomberomorus maculatus*	5	8	10	9	10	8	9	5	4		2							
	Blackfin tuna	*Thunnus atlanticus*	1	2	2	3	4	2	2	1	< 1						1			
	Swordfish	*Xiphias gladius*	< 1	< 1	< 1	3	3	4	3	1	1		1							
	36–Tunas, bonitos, billfishes		**12**	**21**	**25**	**27**	**35**	**33**	**27**	**15**	**13**									
37	Common dolphinfish	*Coryphaena hippurus*	1	2	2	2	4	4	5	3	3				1					
	Fourwing flyingfish	*Hirundichthys affinis*	0	0	0	0	0	0	0	0	0				1					
	Greater amberjack	*Seriola dumerili*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1		1						
	37–Miscellaneous pelagic fishes		**1**	**2**	**2**	**2**	**4**	**5**	**5**	**4**	**4**									
38	Blacktip shark	*Carcharhinus limbatus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Sandbar shark	*Carcharhinus plumbeus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			1						
	38–Sharks, rays, chimaeras		**0**	**0**	**0**	**0**	**< 1**	**1**	**< 1**	**< 1**	**< 1**									
42	Blue crab	*Callinectes sapidus*	21	33	31	39	45	45	34	33	36	1			1		1			
	42–Crabs, sea-spiders		**21**	**33**	**31**	**39**	**45**	**45**	**34**	**33**	**36**									
43	Caribbean spiny lobster	*Panulirus argus*	6	14	21	27	32	30	29	24	23	3		1	1	2				
	43–Lobsters, spiny-rock lobsters		**6**	**14**	**21**	**27**	**32**	**30**	**29**	**24**	**23**									
45	Northern brown shrimp	*Penaeus aztecus*	58	54	59	67	59	57	54	41	45	2								
	Northern pink shrimp	*Penaeus duorarum*	11	11	19	16	10	7	8	7	7	2								
	Northern white shrimp	*Penaeus setiferus*	32	31	33	38	38	52	48	49	51	2								
	Atlantic seabob	*Xiphopenaeus kroyeri*	0	0	2	6	14	29	29	18	18	1	1							
	45–Shrimps, prawns		**101**	**95**	**113**	**126**	**121**	**146**	**139**	**114**	**120**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
52	Queen conch	*Aliger gigas*	0	0	0	0	0	0	0	0	0				5	2	3			
	52–Abalones, winkles, conchs		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
53	American cupped oyster	*Crassostrea virginica*	31	35	37	63	71	72	11	0	0			1		1				
	53–Oysters		**31**	**35**	**37**	**63**	**71**	**72**	**11**	**0**	**0**									
56	Turkey wing	*Arca zebra*	0	0	0	0	0	0	0	0	0					1				
	56–Clams, cockles, arkshells		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
57	Mexican four-eyed octopus and common octopus	*Octopus maya, Octopus vulgaris*	< 1	1	4	8	18	19	33	25	47						1			
	57–Squids, cuttlefishes, octopuses		**< 1**	**1**	**4**	**8**	**18**	**19**	**33**	**25**	**47**									
76	Sea cucumbers NEI	*Holothuroidea*	0	0	0	0	0	< 1	5	4	6					1				
	76–Sea-urchins and other echinoderms		**0**	**0**	**0**	**0**	**0**	**< 1**	**5**	**4**	**6**									
	Total selected species groups		**531**	**796**	**994**	**1 246**	**1 091**	**992**	**911**	**757**	**745**									
	Total other species groups		**141**	**312**	**467**	**723**	**697**	**531**	**399**	**321**	**368**									
	Total marine capture		**672**	**1 108**	**1 462**	**1 969**	**1 788**	**1 523**	**1 310**	**1 078**	**1 113**									
	Total aquaculture		**42**	**72**	**96**	**87**	**76**	**123**	**155**	**188**	**199**									
	Total production		**714**	**1 180**	**1 558**	**2 056**	**1 864**	**1 646**	**1 465**	**1 267**	**1 312**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 4

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 34

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
31	Tonguesole NEI	*Cynoglossus* spp.	0	0	0	0	0	0	< 1	< 1	< 1			1	1		1			
	31–Flounders, halibuts, soles		**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**< 1**									
32	European hake	*Merluccius merluccius*	2	3	9	11	9	11	7	7	7			1						
	Benguela hake	*Merluccius polli*	0	0	< 1	< 1	< 1	2	4	7	7				1					
	Hakes NEI	*Merluccius* spp.	0	< 1	6	< 1	1	1	3	3	3			2						
	32–Cods, hakes, haddocks		**2**	**3**	**16**	**12**	**10**	**14**	**14**	**16**	**17**									
33	[Arius spp.]	*Arius* spp.	0	0	0	0	0	0	0	0	0		1		1	1	1			
	Bigeye grunt	*Brachydeuterus auritus*	3	11	21	26	24	26	29	35	46		2		1		1			
	Bluespotted seabass	*Cephalopholis taeniops*	0	0	0	0	0	0	< 1	< 1	< 1				1					
	Large-eye dentex	*Dentex macrophthalmus*	< 1	5	24	6	2	1	2	2	1	1				1				
	Dentex NEI	*Dentex* spp.	< 1	2	4	8	6	4	4	5	5		1		1		2			
	Sargo breams NEI	*Diplodus* spp.	0	0	< 1	1	2	2	3	3	3						1			
	White grouper	*Epinephelus aeneus*	< 1	1	1	1	< 1	1	7	8	8			1						
	Groupers NEI	*Epinephelus* spp.	< 1	1	4	2	< 1	1	3	3	4						1			
	Lesser African threadfin	*Galeoides decadactylus*	< 1	4	6	12	12	16	24	28	31		1	1	1		2			
	Snappers NEI	*Lutjanus* spp.	2	5	11	8	7	12	14	14	13						1			
	Surmullets (= Red mullets) NEI	*Mullus* spp.	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1						1			
	Morays eels, etc. NEI	*Muraenidae*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Axillary seabream	*Pagellus acarne*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1								
	Red pandora	*Pagellus bellottii*	0	0	4	8	13	9	9	9	11		2				1			
	Common pandora	*Pagellus erythrinus*	0	13	7	2	< 1	5	3	1	2						1			
	Pandoras NEI	*Pagellus* spp.	3	8	8	2	2	1	3	4	2						2			
	Bluespotted seabream	*Pagrus caeruleostictus*	0	0	0	< 1	0	0	< 1	3	2	1								
	Pargo breams NEI	*Pagrus* spp.	< 1	5	5	4	4	3	4	5	6						1			
	Royal threadfin	*Pentanemus quinquarius*	0	0	< 1	1	4	2	20	38	40		1							
	Rubberlip grunt	*Plectorhinchus mediterraneus*	0	3	< 1	2	2	4	7	6	8		1							
	Sompat grunt	*Pomadasys jubelini*	< 1	2	1	< 1	< 1	3	6	4	8						1			
		Pomadasys spp.	0	0	0	0	0	0	< 1	< 1	< 1			1	1	1				

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 4

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 34

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Bobo croaker	*Pseudotolithus elongatus*	< 1	1	3	4	10	18	30	36	39			1						
	West African croakers NEI	*Pseudotolithus* spp.	6	16	35	35	25	27	48	55	60			1	1		3			
	West African goatfish	*Pseudupeneus prayensis*	< 1	2	2	3	4	3	8	3	3					1	1			
	Groupers, seabasses NEI	*Serranidae*	1	4	15	10	7	5	7	4	5					1				
	Porgies, seabreams NEI	*Sparidae*	22	60	72	37	27	11	25	21	19		1			1	1			
	33–Miscellaneous coastal fishes		**41**	**142**	**225**	**175**	**154**	**157**	**260**	**289**	**319**									
34	European conger	*Conger conger*	< 1	< 1	2	2	2	2	1	1	1						1			
	Gurnards, searobins NEI	*Triglidae*	< 1	1	3	2	3	4	3	5	4						1			
	34–Miscellaneous demersal fishes		**< 1**	**2**	**4**	**4**	**5**	**6**	**5**	**6**	**5**									
35	European anchovy	*Engraulis encrasicolus*	4	4	47	113	151	175	97	101	124		2	1						
	Bonga shad	*Ethmalosa fimbriata*	24	44	80	126	149	193	322	372	365		2	3						
	European pilchard (= Sardine)	*Sardina pilchardus*	97	188	572	622	739	743	989	1 120	1 146	2								
	Round sardinella	*Sardinella aurita*	25	54	100	262	338	326	226	117	107		1	4						
	Madeiran sardinella	*Sardinella maderensis*	< 1	1	29	24	103	144	174	137	312		2	3						
	Sardinellas NEI	*Sardinella* spp.	34	56	285	87	238	236	448	424	203			2						
	35–Herrings, sardines, anchovies		**185**	**347**	**1 113**	**1 235**	**1 718**	**1 817**	**2 256**	**2 271**	**2 258**									
36	Frigate tuna	*Auxis thazard*	0	0	0	< 1	6	5	6	5	7						1			
	Plain bonito	*Orcynopsis unicolor*	< 1	1	< 1	< 1	< 1	< 1	< 1	0	< 1						1			
	36–Tunas, bonitos, billfishes		**< 1**	**1**	**< 1**	**1**	**6**	**5**	**6**	**5**	**7**									
37	Atlantic pomfret	*Brama brama*	0	< 1	< 1	1	< 1	< 1	4	8	3			1						
	Carangids NEI	*Carangidae*	3	6	22	8	10	9	19	76	30		1				1			
	Crevalle jack	*Caranx hippos*	< 1	1	7	5	4	6	13	5	5						1			
	Jacks, crevalles NEI	*Caranx* spp.	0	< 1	10	5	6	7	11	18	18		1	1						
	Atlantic bumper	*Chloroscombrus chrysurus*	< 1	2	3	8	9	14	30	28	49						1			
	Scads NEI	*Decapterus* spp.	0	2	12	7	5	7	7	13	15					1				
	Bluefish	*Pomatomus saltatrix*	3	7	12	5	2	2	2	2	1						1			
	Atlantic chub mackerel	*Scomber colias*	3	67	171	197	158	203	327	377	415		1							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 4

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 34

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Amberjacks NEI	*Seriola* spp.	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1				1					
	Atlantic horse mackerel	*Trachurus trachurus*	< 1	3	14	13	< 1	< 1	3	26	19		1							
	Cunene horse mackerel	*Trachurus trecae*	0	0	< 1	23	21	14	17	6	21		1	2		1	1			
	37–Miscellaneous pelagic fishes		**10**	**88**	**252**	**273**	**215**	**262**	**433**	**560**	**578**									
38	Sharks, rays, skates, etc. NEI	*Elasmobranchii*	2	10	24	23	21	25	30	24	25						1			
	Rays, stingrays, mantas NEI	*Rajiformes*	2	3	9	4	12	13	15	16	16					1				
	38–Sharks, rays, chimaeras		**4**	**13**	**33**	**28**	**33**	**38**	**45**	**40**	**40**									
45	Striped red shrimp	*Aristeus varidens*	0	0	0	0	0	< 1	< 1	< 1	< 1	1	1							
	Deep-water rose shrimp	*Parapenaeus longirostris*	0	< 1	8	8	6	3	3	2	4	2	1	1			1			
	Southern pink shrimp	*Penaeus notialis*	< 1	2	7	9	18	17	17	20	24	2	3				1			
	Southern pink shrimp, Giant tiger prawn	*Penaeus notialis, Penaeus monodon, Holthuispenaeopsis atlantic*	< 1	< 1	2	2	5	5	12	33	35			1						
	45–Shrimps, prawns		**< 1**	**3**	**17**	**20**	**29**	**26**	**32**	**55**	**63**									
57	European squid	*Loligo vulgaris*	0	0	< 1	< 1	< 1	< 1	< 1	0	0			2						
	Common octopus	*Octopus vulgaris*	0	9	60	44	32	11	4	< 1	< 1		2	2						
	Common cuttlefish	*Sepia officinalis*	2	4	2	< 1	1	< 1	< 1	< 1	< 1						1			
	Cuttlefishes NEI	*Sepia* spp.	0	0	0	0	0	0	0	0	0	2	2	1			1			
	57–Squids, cuttlefishes, octopuses		**2**	**13**	**63**	**45**	**33**	**11**	**4**	**< 1**	**< 1**									
58	Marine molluscs NEI	*Mollusca*	< 1	7	14	7	3	1	1	< 1	< 1						1			
	58–Miscellaneous marine molluscs		**< 1**	**7**	**14**	**7**	**3**	**1**	**1**	**< 1**	**< 1**									
	Total selected species groups		**244**	**619**	**1 736**	**1 798**	**2 207**	**2 338**	**3 057**	**3 244**	**3 289**									
	Total other species groups		**130**	**455**	**1 127**	**1 149**	**1 011**	**1 139**	**1 318**	**1 316**	**1 549**									
	Total marine capture		**374**	**1 073**	**2 863**	**2 947**	**3 217**	**3 477**	**4 375**	**4 560**	**4 838**									
	Total aquaculture		**0**	**< 1**	**< 1**	**< 1**	**< 1**	**2**	**8**	**8**	**6**									
	Total production		**374**	**1 073**	**2 863**	**2 947**	**3 218**	**3 479**	**4 383**	**4 568**	**4 844**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 5

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 37

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
31	Turbot	*Scophthalmus maximus*	< 1	2	3	3	2	1	< 1	< 1	< 1			1						
	Common sole	*Solea solea*	1	5	5	8	8	6	5	5	5		1							
	31–Flounders, halibuts, soles		**2**	**7**	**8**	**11**	**10**	**7**	**6**	**6**	**6**									
32	Whiting	*Merlangius merlangus*	< 1	2	10	20	19	12	12	10	14			1						
	European hake	*Merluccius merluccius*	12	15	22	37	40	26	21	18	18			10						
	32–Cods, hakes, haddocks		**12**	**17**	**32**	**56**	**59**	**38**	**33**	**28**	**32**									
33	Bogue	*Boops boops*	12	19	23	25	28	28	22	17	14	2								
	Sand steenbras	*Lithognathus mormyrus*	0	0	< 1	< 1	< 1	1	1	< 1	< 1			1						
	Red mullet	*Mullus barbatus*	12	17	20	26	28	25	24	21	21	2	5	9						
	Surmullet	*Mullus surmuletus*	< 1	< 1	2	4	7	8	9	8	8			5						
	Axillary seabream	*Pagellus acarne*	< 1	< 1	< 1	< 1	< 1	< 1	1	1	1			1						
	Blackspot seabream	*Pagellus bogaraveo*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Common pandora	*Pagellus erythrinus*	2	2	6	9	5	7	12	12	12	1	2	1						
	So-iny (redlip) mullet	*Planiliza haematocheilus*	0	0	0	0	0	0	0	0	0			1						
		Saurida lessepsianus	0	0	0	0	0	0	0	0	0			1						
	Brushtooth lizardfish	*Saurida undosquamis*	0	< 1	< 1	< 1	< 1	< 1	< 1	0	0			1						
	Comber	*Serranus cabrilla*	< 1	< 1	0	< 1	< 1	< 1	< 1	< 1	< 1	1								
	Picarel	*Spicara smaris*	8	9	8	8	8	4	2	1	1		2							
	Goldband goatfish	*Upeneus moluccensis*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	33–Miscellaneous coastal fishes		**35**	**49**	**60**	**73**	**77**	**73**	**72**	**63**	**60**									
34	Blackbellied angler	*Lophius budegassa*	0	0	0	0	0	0	< 1	< 1	< 1			2						
	34–Miscellaneous demersal fishes		**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**< 1**									
35	European anchovy	*Engraulis encrasicolus*	118	198	364	562	329	413	348	363	324	2	4	3						
	European pilchard (= Sardine)	*Sardina pilchardus*	112	123	175	258	275	257	226	194	187	1	5	7						
	Round sardinella	*Sardinella aurita*	3	6	8	8	8	12	8	13	14			2						
	European sprat	*Sprattus sprattus*	2	3	17	70	28	61	68	49	55		1							
	35–Herrings, sardines, anchovies		**235**	**329**	**564**	**898**	**639**	**743**	**651**	**619**	**580**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 5

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 37

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Common dolphinfish	*Coryphaena hippurus*	< 1	< 1	< 1	< 1	< 1	3	2	2	2		1							
	Mediterranean horse mackerel	*Trachurus mediterraneus*	33	38	59	125	51	67	49	35	42			1						
	37–Miscellaneous pelagic fishes		**33**	**38**	**60**	**126**	**52**	**70**	**51**	**37**	**44**									
38	Thornback ray	*Raja clavata*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Picked dogfish	*Squalus acanthias*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	38–Sharks, rays, chimaeras		**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
43	Norway lobster	*Nephrops norvegicus*	2	3	4	5	7	4	3	2	2		1	3						
	43–Lobsters, spiny-rock lobsters		**2**	**3**	**4**	**5**	**7**	**4**	**3**	**2**	**2**									
45	Giant red shrimp	*Aristaeomorpha foliacea*	< 1	< 1	< 1	0	< 1	< 1	1	2	2			3						
	Blue and red shrimp	*Aristeus antennatus*	< 1	< 1	1	2	2	2	3	2	2		1	5						
	Peregrine shrimp	*Metapenaeus stebbingi*	0	0	0	0	0	0	0	0	0			1						
	Deep-water rose shrimp	*Parapenaeus longirostris*	8	7	9	15	14	13	19	22	23		2	7						
	Caramote prawn	*Penaeus kerathurus*	< 1	< 1	< 1	3	4	6	6	6	6		1							
	45–Shrimps, prawns		**8**	**9**	**11**	**20**	**19**	**21**	**29**	**33**	**33**									
47	Spottail mantis squillid	*Squilla mantis*	1	3	4	4	4	7	6	4	5		1							
	47–Miscellaneous marine crustaceans		**1**	**3**	**4**	**4**	**4**	**7**	**6**	**4**	**5**									
52	Purple dye murex	*Bolinus brandaris*	0	0	0	0	0	0	< 1	1	2		1							
	Veined rapa whelk	*Rapana venosa*	0	0	0	0	3	3	11	15	12		1							
	52–Abalones, winkles, conchs		**0**	**0**	**0**	**0**	**3**	**3**	**11**	**16**	**14**									
55	Great Mediterranean scallop	*Pecten jacobaeus*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	55–Scallops, pectens		**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
57	Horned octopus	*Eledone cirrhosa*	0	0	0	0	0	0	1	2	1			1						
	Common octopus	*Octopus vulgaris*	5	8	11	17	18	13	10	11	11			1						
	Common cuttlefish	*Sepia officinalis*	2	5	2	6	10	10	11	14	14		1	2						
	57–Squids, cuttlefishes, octopuses		**8**	**13**	**13**	**24**	**28**	**23**	**22**	**27**	**27**									
	Total selected species groups		**338**	**469**	**757**	**1 217**	**898**	**990**	**886**	**836**	**803**									
	Total other species groups		**416**	**447**	**450**	**606**	**570**	**518**	**419**	**331**	**306**									
	Total marine capture		**754**	**917**	**1 207**	**1 823**	**1 468**	**1 508**	**1 305**	**1 166**	**1 109**									
	Total aquaculture		**2**	**9**	**40**	**88**	**233**	**520**	**545**	**786**	**861**									
	Total production		**756**	**926**	**1 247**	**1 911**	**1 701**	**2 028**	**1 850**	**1 953**	**1 970**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 6

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 41

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
31	Patagonian flounder	*Paralichthys patagonicus*	0	0	0	0	0	0	0	0	0	1								
	31–Flounders, halibuts, soles		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
32	Blue grenadier	*Macruronus novaezelandiae*	0	0	0	0	0	0	0	0	0		1							
	Southern hake	*Merluccius australis*	0	0	< 1	1	4	5	2	< 1	< 1			1						
	Argentine hake	*Merluccius hubbsi*	26	142	231	366	535	365	356	373	416		1	2						
	Southern blue whiting	*Micromesistius australis*	0	0	6	117	131	58	13	10	16			1						
	Tadpole codling	*Salilota australis*	0	0	0	< 1	8	9	6	2	2		1							
	32–Cods, hakes, haddocks		**26**	**142**	**237**	**485**	**677**	**436**	**378**	**386**	**434**									
33	Acoupa weakfish	*Cynoscion acoupa*	0	0	0	0	0	18	21	21	21						1			
	Stripped weakfish	*Cynoscion guatucupa*	< 1	3	4	10	14	18	19	16	12		2							
	South American silver porgy	*Diplodus argenteus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1					1				
	Red grouper	*Epinephelus morio*	< 1	1	3	2	1	1	< 1	0	0						1			
	Mutton snapper	*Lutjanus analis*	0	0	0	0	0	0	0	0	0			1						
	Dog snapper	*Lutjanus jocu*	0	0	0	0	0	0	0	0	0		1							
	Southern red snapper	*Lutjanus purpureus*	1	4	11	7	5	6	8	12	12			1						
	Lane snapper	*Lutjanus synagris*	0	0	0	0	< 1	2	2	2	2	1								
	King weakfish	*Macrodon ancylodon*	0	< 1	1	< 1	4	7	12	11	12		1	2						
	Whitemouth croaker	*Micropogonias furnieri*	28	40	69	73	65	83	91	91	89		1	2						
	Lebranche mullet	*Mugil liza*	0	0	0	0	0	0	0	0	0			1						
	Black grouper	*Mycteroperca bonaci*	0	0	0	0	0	0	0	0	0			1						
	Yellowtail snapper	*Ocyurus chrysurus*	< 1	< 1	3	3	4	4	5	4	6			1						
	Red porgy	*Pagrus pagrus*	< 1	2	5	7	2	5	6	8	9		1							
	Brazilian flathead	*Percophis brasiliensis*	< 1	2	3	3	7	8	8	6	8			1						
	Black drum	*Pogonias cromis*	< 1	1	2	1	< 1	< 1	< 1	< 1	< 1						1			
	Argentine croaker	*Umbrina canosai*	2	4	4	10	12	16	15	13	13			3						
	33–Miscellaneous coastal fishes		**36**	**59**	**105**	**116**	**115**	**168**	**188**	**185**	**183**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 6
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 41

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Argentine conger	*Conger orbignianus*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Patagonian toothfish	*Dissostichus eleginoides*	0	0	< 1	< 1	9	8	8	8	7		1							
	Pink cusk-eel	*Genypterus blacodes*	3	2	3	12	26	21	12	5	5			1						
	Blackbelly rosefish	*Helicolenus dactylopterus*	0	< 1	< 1	1	5	3	2	3	< 1					1				
	Blackfin goosefish	*Lophius gastrophysus*	0	0	0	0	< 1	4	3	2	2		1							
	Castaneta	*Nemadactylus bergi*	0	16	7	1	7	2	1	< 1	< 1					1				
	Wreckfish	*Polyprion americanus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1						1			
	Bluewing searobin	*Prionotus punctatus*	0	0	0	0	0	0	0	0	0		1	1						
	Choicy ruff	*Seriolella porosa*	0	0	0	0	1	5	2	2	1				1					
	34–Miscellaneous demersal fishes		**3**	**19**	**11**	**15**	**49**	**43**	**28**	**21**	**18**									
35	Argentine anchovy	*Engraulis anchoita*	9	15	24	18	19	28	14	8	9	2								
	Brazilian sardinella	*Sardinella brasiliensis*	28	66	155	112	68	47	62	46	61						1			
	35–Herrings, sardines, anchovies		**38**	**80**	**179**	**130**	**87**	**75**	**77**	**55**	**70**									
36	King mackerel	*Scomberomorus cavalla*	< 1	1	2	2	2	2	< 1	< 1	< 1					1				
	36–Tunas, bonitos, billfishes		**< 1**	**1**	**2**	**2**	**2**	**2**	**< 1**	**< 1**	**< 1**									
37	Parona leatherjacket	*Parona signata*	0	< 1	< 1	1	2	2	< 1	< 1	< 1						1			
	Bluefish	*Pomatomus saltatrix*	1	9	15	6	5	4	4	4	4				1					
	Atlantic chub mackerel	*Scomber colias*	14	14	10	29	14	14	20	18	10	1			1					
	Rough scad	*Trachurus lathami*	< 1	< 1	< 1	< 1	< 1	1	2	2	1					1				
	37–Miscellaneous pelagic fishes		**15**	**23**	**26**	**37**	**22**	**21**	**27**	**24**	**17**									
38	Plownose chimaera	*Callorhinchus callorynchus*	< 1	< 1	< 1	1	1	2	2	1	2				1					
	Narrownose smooth-hound	*Mustelus schmitti*	0	4	6	7	11	9	5	3	4			1						
	Rays and skates NEI	*Rajidae*	0	0	0	0	0	0	< 1	< 1	< 1		2							
	Angular angel shark	*Squatina guggenheim*	0	0	0	0	0	0	0	0	0		1							
	38–Sharks, rays, chimaeras		**< 1**	**5**	**7**	**8**	**12**	**11**	**6**	**4**	**6**									
42	Southwest Atlantic red crab	*Chaceon notalis*	0	0	0	< 1	1	3	< 1	0	1						1			
	42–Crabs, sea-spiders		**0**	**0**	**0**	**< 1**	**1**	**3**	**< 1**	**0**	**1**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 6

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 41

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
43	Caribbean spiny lobster	*Panulirus argus*	< 1	3	6	7	9	7	7	7	7			1						
	43–Lobsters, spiny-rock lobsters		**< 1**	**3**	**6**	**7**	**9**	**7**	**7**	**7**	**7**									
44	Southern king crab	*Lithodes santolla*	< 1	< 1	< 1	< 1	< 1	< 1	3	2	2		1							
	44–King crabs, squat-lobsters		**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**3**	**2**	**2**									
45	Southern white shrimp	*Penaeus schmitti*	0	0	0	0	0	0	3	4	4					2				
	Southern brown shrimp	*Penaeus subtilis*	0	0	0	0	0	0	0	0	0					2				
	Argentine red shrimp	*Pleoticus muelleri*	2	< 1	< 1	10	14	45	151	185	224		1							
	Atlantic seabob	*Xiphopenaeus kroyeri*	0	6	12	12	8	14	14	13	13				1	1				
	45–Shrimps, prawns		**2**	**6**	**12**	**22**	**22**	**58**	**168**	**201**	**241**									
55	Patagonian scallop	*Zygochlamys patagonica*	< 1	1	2	1	14	56	37	33	45		1							
	55–Scallops, pectens		**< 1**	**1**	**2**	**1**	**14**	**56**	**37**	**33**	**45**									
57	Patagonian squid	*Doryteuthis gahi*	0	< 1	< 1	47	63	47	60	65	97		1							
	Argentine shortfin squid	*Illex argentinus*	< 1	1	20	242	675	600	399	345	491		1							
	57–Squids, cuttlefishes, octopuses		**< 1**	**1**	**21**	**288**	**738**	**648**	**459**	**410**	**588**									
	Total selected species groups		**121**	**342**	**607**	**1 112**	**1 748**	**1 529**	**1 380**	**1 329**	**1 612**									
	Total other species groups		**99**	**204**	**323**	**636**	**450**	**562**	**468**	**353**	**360**									
	Total marine capture		**219**	**545**	**930**	**1 748**	**2 198**	**2 091**	**1 848**	**1 683**	**1 972**									
	Total aquaculture		**0**	**< 1**	**< 1**	**< 1**	**8**	**75**	**80**	**78**	**90**									
	Total production		**219**	**545**	**930**	**1 748**	**2 206**	**2 166**	**1 928**	**1 760**	**2 063**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 7

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 47

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
31	West coast sole	*Austroglossus microlepis*	1	2	< 1	1	< 1	4	2	< 1	2	1								
	Mud sole	*Austroglossus pectoralis*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1		1							
	31–Flounders, halibuts, soles		**1**	**2**	**2**	**2**	**1**	**5**	**2**	**1**	**2**									
32		*Macrouridae*	0	0	0	0	0	0	0	0	0				1					
	Shallow-water Cape hake	*Merluccius capensis*	< 1	< 1	0	< 1	< 1	2	7	15	21	1								
	Shallow-water Cape hake, Deep-water Cape hake	*Merluccius capensis, M.paradoxus*	68	320	736	457	263	296	286	266	287			1						
	Deep-water Cape hake	*Merluccius paradoxus*	0	0	0	0	0	0	2	2	1	1								
	Benguela hake	*Merluccius polli*	0	0	8	6	< 1	< 1	< 1	0	1						1			
	32–Cods, hakes, haddocks		**68**	**320**	**744**	**463**	**263**	**299**	**296**	**283**	**310**									
33	Carpenter seabream	*Argyrozona argyrozona*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		1							
	Geelbek croaker	*Atractoscion aequidens*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Bigeye grunt	*Brachydeuterus auritus*	0	< 1	< 1	4	< 1	3	4	< 1	2						1			
	Santer seabream	*Cheimerius nufar*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1			1						
	South African mullet	*Chelon richardsonii*	0	0	0	0	0	0	0	0	0			1						
	Roman seabream	*Chrysoblephus laticeps*	0	0	0	0	0	0	0	0	0					1				
	Angolan dentex	*Dentex angolensis*	0	0	2	< 1	< 1	0	0	0	0						1			
	Large-eye dentex	*Dentex macrophthalmus*	0	2	19	7	< 1	< 1	3	14	30	1		1						
	Lesser African threadfin	*Galeoides decadactylus*	0	0	0	0	0	0	0	0	0						1			
	Hottentot seabream	*Pachymetopon blochii*	0	0	0	0	0	0	0	0	< 1		1							
	Red pandora	*Pagellus bellottii*	3	< 1	2	< 1	0	0	< 1	0	0									1
		Pomadasys spp.	0	0	0	0	0	0	0	0	0				1					
	West African croakers NEI	*Pseudotolithus* spp.	< 1	2	3	5	3	17	10	2	9						1			
	Panga seabream	*Pterogymnus laniarius*	3	3	8	2	1	4	2	4	3					1				
	White stumpnose	*Rhabdosargus globiceps*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Croakers, drums NEI	*Sciaenidae*	4	2	3	2	3	3	1	0	0			1			1			
	Canary drum (=Baardman)	*Umbrina canariensis*	0	0	0	0	< 1	1	< 1	< 1	< 1					1				
	33–Miscellaneous coastal fishes		**10**	**10**	**36**	**22**	**10**	**31**	**22**	**22**	**46**									
34	Cape gurnard	*Chelidonichthys capensis*	0	< 1	< 1	1	< 1	< 1	< 1	1	< 1				1					
		Chelidonichthys capensis, Chelidonichthys queketti, Trigla lyra	0	< 1	< 1	1	< 1	< 1	< 1	1	< 1		1							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II, TABLE 7

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 47

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Lesser gurnard	*Chelidonichthys queketti*	0	0	0	0	0	0	0	0	0				1					
	Patagonian toothfish	*Dissostichus eleginoides*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Cape bonnetmouth	*Emmelichthys nitidus*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	0				1					
	Kingklip	*Genypterus capensis*	1	2	11	11	5	10	7	5	6	1			1					
	Blackbelly rosefish	*Helicolenus dactylopterus*	< 1	1	< 1	1	1	1	1	1	1	1								
	Orange roughy	*Hoplostethus atlanticus*	0	0	0	0	5	< 1	< 1	< 1	< 1						1			
	Snoek	*Leionura atun*	14	11	11	18	16	12	12	11	10	2								
	Silver scabbardfish	*Lepidopus caudatus*	0	0	2	4	8	5	5	3	4				1					
	Devil anglerfish	*Lophius vomerinus*	0	< 1	6	14	16	19	10	8	9	1			1					
	Largehead hairtail	*Trichiurus lepturus*	1	5	12	8	< 1	2	4	15	26									1
	Cape dory	*Zeus capensis*	< 1	< 1	< 1	1	1	1	2	2	3				1					
	34–Miscellaneous demersal fishes		**17**	**20**	**43**	**61**	**56**	**54**	**41**	**48**	**62**									
35	Southern African anchovy	*Engraulis capensis*	0	148	450	481	185	238	210	285	156		1							
	Whitehead's round herring	*Etrumeus whiteheadi*	0	5	27	41	60	49	51	54	57		1							
	Round sardinella	*Sardinella aurita*	24	34	66	85	20	31	66	66	107									1
	Madeiran sardinella	*Sardinella maderensis*	24	34	66	85	20	31	66	66	107									1
	Pacific sardine	*Sardinops sagax*	364	991	437	85	156	223	99	25	31		1	1			1			
	35–Herrings, sardines, anchovies		**412**	**1 213**	**1 046**	**777**	**442**	**572**	**491**	**496**	**459**									
36	Swordfish	*Xiphias gladius*	< 1	< 1	< 1	3	6	4	4	4	3			1						
	36–Tunas, bonitos, billfishes		**< 1**	**< 1**	**< 1**	**3**	**6**	**4**	**4**	**4**	**3**									
37	Atlantic pomfret	*Brama brama*	0	< 1	< 1	2	1	1	3	< 1	< 1	1			1					
	Leerfish	*Lichia amia*	0	0	< 1	< 1	0	< 1	< 1	0	0						1			
	Atlantic chub mackerel	*Scomber colias*	28	67	85	38	8	10	22	37	6								1	
	Pacific chub mackerel	*Scomber japonicus*	0	0	0	0	0	0	0	0	0				1					
	Yellowtail amberjack	*Seriola lalandi*	0	0	< 1	< 1	< 1	< 1	< 1	2	< 1	1								
	Cape horse mackerel	*Trachurus capensis*	75	82	349	584	511	331	341	219	289		1	1						
	Cunene horse mackerel	*Trachurus trecae*	66	124	170	94	91	38	65	71	122			1						
	37–Miscellaneous pelagic fishes		**169**	**273**	**605**	**718**	**612**	**380**	**432**	**331**	**418**									
38	Cape elephantfish	*Callorhinchus capensis*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1				1					
	Slime skate	*Dipturus pullopunctatus*	0	0	0	0	0	0	0	0	0					1				

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 7

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 47

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
38	Tope shark	*Galeorhinus galeus*	0	0	0	0	0	< 1	< 1	< 1	< 1			1						
	Yellowspotted skate	*Leucoraja wallacei*	0	0	0	0	0	0	0	0	0						1			
	Smooth-hound	*Mustelus mustelus*	0	0	0	0	0	< 1	< 1	< 1	0		1							
	Whitespotted smooth-hound	*Mustelus palumbes*	0	0	0	0	0	0	0	0	0				1					
	Brown ray	*Raja miraletus*	0	0	0	0	0	< 1	0	0	0						1			
	Spotted skate	*Raja straeleni*	0	0	0	0	0	0	0	0	0						1			
	White skate	*Rostroraja alba*	0	0	0	0	0	0	0	0	0					1				
	Shortnose spurdog	*Squalus megalops*	0	0	0	0	0	0	0	0	0				1					
	Shortspine spurdog	*Squalus mitsukurii*	0	0	0	0	0	0	0	0	0						1			
	38–Sharks, rays, chimaeras		**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**1**	**< 1**	**< 1**									
42	West African geryon	*Chaceon maritae*	0	0	3	6	6	4	3	3	4	1		1						
	42–Crabs, sea-spiders		**0**	**0**	**3**	**6**	**6**	**4**	**3**	**3**	**4**									
43	Cape rock lobster	*Jasus lalandii*	20	16	9	7	2	3	2	1	< 1			2						
	Southern spiny lobster	*Palinurus gilchristi*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1		1							
	43–Lobsters, spiny-rock lobsters		**20**	**16**	**10**	**8**	**3**	**3**	**2**	**1**	**< 1**									
45	Striped red shrimp	*Aristeus varidens*	0	0	0	1	2	1	2	5	2						1			
	African spider shrimp	*Nematocarcinus africanus*	0	0	0	0	0	0	0	0	0					1				
	Deep-water rose shrimp	*Parapenaeus longirostris*	0	0	< 1	3	3	2	< 1	< 1	0					1				
	45–Shrimps, prawns		**0**	**0**	**< 1**	**4**	**5**	**3**	**3**	**5**	**2**									
52	Perlemoen abalone	*Haliotis midae*	< 1	2	1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	52–Abalones, winkles, conchs		< 1	2	1	< 1	< 1	< 1	< 1	< 1	< 1									
	Cape Hope squid	*Loligo reynaudii*	< 1	< 1	1	4	6	8	7	9	4		1							
	Angolan flying squid	*Todarodes angolensis*	0	0	0	0	0	0	0	< 1	< 1	1								
	57–Squids, cuttlefishes, octopuses		**< 1**	**< 1**	**1**	**4**	**6**	**8**	**7**	**10**	**4**									
	Total selected species groups		**698**	**1 856**	**2 492**	**2 068**	**1 410**	**1 363**	**1 306**	**1 204**	**1 311**									
	Total other species groups		**145**	**172**	**233**	**211**	**102**	**136**	**176**	**92**	**95**									
	Total marine capture		**843**	**2 028**	**2 724**	**2 278**	**1 512**	**1 499**	**1 482**	**1 296**	**1 405**									
	Total aquaculture		**0**	**0**	**< 1**	**< 1**	**3**	**2**	**4**	**5**	**7**									
	Total production		**843**	**2 028**	**2 724**	**2 279**	**1 515**	**1 501**	**1 486**	**1 301**	**1 412**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II TABLE 8

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 51

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
24	Kelee shad	*Hilsa kelee*	0	0	0	0	0	0	0	0	0									1
	Indian pellona	*Pellona ditchela*	0	0	0	0	0	0	0	0	0							1		1
	Hilsa shad	*Tenualosa ilisha*	9	13	15	9	6	10	12	5	5		2				1			
	24–Shads		**9**	**13**	**15**	**9**	**6**	**10**	**12**	**5**	**5**									
25	Milkfish	*Chanos chanos*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1					1			1	
	25–Miscellaneous diadromous fishes		**0**	**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
31	Leopard flounder	*Bothus pantherinus*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1				1					
	Tonguefishes	*Cynoglossidae*	< 1	< 1	1	1	3	1	1	1	1	2		2			1			
	Flatfishes NEI	*Pleuronectiformes*	6	9	11	13	20	17	36	29	34					1				
	Indian halibut	*Psettodes erumei*	0	0	< 1	< 1	1	4	7	8	12					1				
	31–Flounders halibuts soles		**6**	**10**	**12**	**15**	**25**	**22**	**44**	**39**	**48**									
	Unicorn cod	*Bregmaceros mcclellandi*	5	4	3	1	1	1	< 1	< 1	< 1						1			
32	**32–Cods hakes haddocks**		**5**	**4**	**3**	**1**	**1**	**1**	**< 1**	**< 1**	**< 1**									
33	Yellowfin seabream	*Acanthopagrus arabicus, Acanthopagrus latus, Acanthopagrus sheim*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1							1		
	Goldsilk seabream	*Acanthopagrus berda*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Twobar seabream	*Acanthopagrus bifasciatus*	0	0	0	0	< 1	3	7	9	10							1		
	Yellowfin seabream	*Acanthopagrus latus*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1				1					
	Sohal surgeonfish	*Acanthurus sohal*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Redmouth grouper	*Aethaloperca rogaa*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Rusty jobfish	*Aphareus rutilans*	0	0	0	0	0	< 1	< 1	< 1	< 1								2	
	Green jobfish	*Aprion virescens*	0	0	0	0	0	< 1	< 1	< 1	< 1									1
	Green jobfish / Crimson jobfish / Rusty jobfish	*Aprion virescens, Pristipomoides filamentosus, Aphareus rutilans*	0	0	0	0	0	< 1	< 1	< 1	< 1		1							
	King soldier bream	*Argyrops spinifer*	0	0	0	1	3	7	5	3	3					1				
	Sea catfishes NEI	*Ariidae*	26	29	56	49	76	86	91	64	69		2	1						
	[Arius spp.]	*Arius* spp.	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Green humphead parrotfish	*Bolbometopon muricatum*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Peacock hind	*Cephalopholis argus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				

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Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Golden hind	*Cephalopholis aurantia*	0	0	0	0	0	0	0	0	0									1
	Yellowfin hind	*Cephalopholis hemistiktos*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Coral hind	*Cephalopholis miniata*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Santer seabream	*Cheimerius nufar*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1				1				1	1
	Slinger seabream	*Chrysoblephus puniceus*	0	0	0	0	0	0	< 1	< 1	< 1				1				1	
	Bluespot mullet	*Crenimugil seheli*	0	0	0	< 1	2	2	3	3	3							1	1	
	Painted sweetlips	*Diagramma pictum*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	1
	Spotted sicklefish	*Drepane punctata*	0	0	0	< 1	< 1	1	2	2	3					1				
	Fourfinger threadfin	*Eleutheronema tetradactylum*	0	0	< 1	< 1	< 1	1	2	3	3		1			1				
	White-edged grouper	*Epinephelus albomarginatus*	0	0	0	0	0	0	0	0	0									1
	Areolate grouper	*Epinephelus areolatus*	0	0	0	0	0	< 1	< 1	< 1	< 1								2	
	Duskytail grouper	*Epinephelus bleekeri*	0	0	0	0	0	0	2	1	1							1		1
	Brownspotted grouper	*Epinephelus chlorostigma*	0	0	0	0	0	< 1	< 1	< 1	< 1	1				1				
	Whitespotted grouper	*Epinephelus coeruleopunctatus*	0	0	0	0	0	0	< 1	< 1	< 1					1				
	Orange-spotted grouper	*Epinephelus coioides*	0	0	0	0	1	4	10	13	13								3	1
	Spinycheek grouper	*Epinephelus diacanthus*	0	0	0	0	0	0	0	0	0								1	1
	Blacktip grouper	*Epinephelus fasciatus*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Brown-marbled grouper	*Epinephelus fuscoguttatus*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	Comet grouper	*Epinephelus morrhua*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	White-blotched grouper	*Epinephelus multinotatus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Smallscaled grouper	*Epinephelus polylepis*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Oblique-banded grouper	*Epinephelus radiatus*	0	0	0	0	0	0	< 1	0	0								1	
	Groupers NEI	*Epinephelus* spp.	< 1	2	3	7	16	26	34	37	45	1	1	1			1			
	Summan grouper	*Epinephelus summana*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Greasy grouper	*Epinephelus tauvina*	0	0	0	0	0	1	< 1	< 1	< 1					1				
	Deep-water red snapper	*Etelis carbunculus*	0	0	0	0	0	< 1	< 1	< 1	< 1									1
	Deepwater longtail red snapper	*Etelis coruscans*	0	0	0	0	0	< 1	< 1	< 1	< 1									1
	Longtail silverbiddy	*Gerres longirostris*	0	0	0	0	0	0	< 1	< 1	< 1							1	1	

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Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Common silver-biddy	*Gerres oyena*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Mojarras (= Silver-biddies) NEI	*Gerres* spp.	0	0	< 1	< 1	2	< 1	< 1	1	< 1					1				
	Spotfin flathead	*Grammoplites suppositus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1							1		
	Grunts sweetlips NEI	*Haemulidae (= Pomadasyidae)*	0	1	4	6	11	12	10	10	10					1				
	Bombay-duck	*Harpadon nehereus*	67	83	108	100	146	150	131	74	64	1	1							
	Candelamoa parrotfish	*Hipposcarus harid*	0	0	0	0	0	0	< 1	< 1	< 1									1
	Ponyfishes (= Slipmouths) NEI	*Leiognathidae*	9	15	14	13	10	13	19	14	15						1			
	Ponyfishes (= Slipmouths)	*Leiognathus* spp.	0	0	0	0	0	0	0	0	0	1	2							
	Marbled parrotfish	*Leptoscarus vaigiensis*	0	0	0	0	0	0	0	0	0								1	1
	Emperors (= Scavengers) NEI	*Lethrinidae*	3	11	17	27	44	51	39	58	64		1							
	Snubnose emperor	*Lethrinus borbonicus*	0	0	0	0	0	< 1	1	1	1									2
	Thumbprint emperor	*Lethrinus harak*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				1
	Pink ear emperor	*Lethrinus lentjan*	0	0	0	0	0	5	12	10	11					1			1	2
	Sky emperor	*Lethrinus mahsena*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	2
	Smalltooth emperor	*Lethrinus microdon*	0	0	0	0	0	< 1	< 1	< 1	< 1			1						1
	Spangled emperor	*Lethrinus nebulosus*	0	0	0	0	< 1	5	17	21	23								4	
	Orange-striped emperor	*Lethrinus obsoletus*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Spotcheek emperor	*Lethrinus rubrioperculatus*	0	0	0	0	0	0	0	0	0								1	
		Lethrinus spp.	0	0	0	0	0	0	< 1	< 1	< 1				1					
	Yellowlip emperor	*Lethrinus xanthochilus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Snappers jobfishes NEI	*Lutjanidae*	< 1	2	5	7	12	9	12	18	18		1		1					
	Two-spot red snapper	*Lutjanus bohar*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Blueline snapper	*Lutjanus coeruleolineatus*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Dory snapper	*Lutjanus fulviflamma*	0	0	0	0	0	0	< 1	< 1	< 1							1	2	
	Humpback red snapper	*Lutjanus gibbus*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	John's snapper	*Lutjanus johnii*	0	0	0	0	< 1	2	4	8	8		1		1					
	Common bluestripe snapper	*Lutjanus kasmira*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				1
	Malabar blood snapper	*Lutjanus malabaricus*	0	0	0	0	< 1	< 1	1	3	3		1						1	

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Bluestriped snapper	*Lutjanus notatus*	0	0	0	0	0	0	0	0	0									1
	Five-lined snapper	*Lutjanus quinquelineatus*	0	0	0	0	0	< 1	< 1	0	0					1				
	Humphead snapper	*Lutjanus sanguineus*	0	0	0	0	0	0	0	0	0								1	
	Emperor red snapper	*Lutjanus sebae*	0	0	0	0	0	0	0	0	0		1							
	Snappers NEI	*Lutjanus* spp.	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1		1				
	Humpnose big-eye bream	*Monotaxis grandoculis*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
		Mugil spp.	0	0	0	0	0	0	0	< 1	< 1					1				
	Goatfishes red mullets NEI	*Mullidae*	< 1	< 1	< 1	< 1	1	2	4	5	4				1					
	Yellowstripe goatfish	*Mulloidichthys flavolineatus*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Bluespine unicornfish	*Naso unicornis*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Threadfin and dwarf breams NEI	*Nemipteridae*	0	0	< 1	1	4	4	66	80	95					1				
	Delagoa threadfin bream	*Nemipterus bipunctatus*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Japanese threadfin bream	*Nemipterus japonicus*	0	0	0	0	1	6	6	7	8									1
	Randall's threadfin bream	*Nemipterus randalli*	0	0	0	0	0	< 1	< 1	< 1	< 1									1
	Threadfin breams NEI	*Nemipterus* spp.	0	0	< 1	< 1	2	12	11	14	12			3						
	Giant catfish	*Netuma thalassina*	0	0	0	< 1	< 1	< 1	1	1	2					1				
	Tigertooth croaker	*Otolithes ruber*	0	0	0	0	3	8	8	9	10			1						1
	Smooth dwarf monocle bream	*Parascolopsis aspinosa*	0	0	0	0	0	0	0	0	0									1
	Pearly goatfish	*Parupeneus margaritatus*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Fourlined terapon	*Pelates quadrilineatus*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	Donkey croaker	*Pennahia aneus*	0	0	0	0	< 1	2	5	4	4					1				
	Percoids NEI	*Perciformes (Percoidei)*	3	5	11	14	41	58	23	< 1	< 1			4		1				
	Klunzinger's mullet	*Planiliza klunzingeri*	0	0	0	0	0	6	2	< 1	< 1						1			
	Greenback mullet	*Planiliza subviridis*	0	0	0	0	0	0	0	0	0							1		
	Bartail flathead	*Platycephalus indicus*	0	0	0	0	< 1	1	2	3	4		1		1					
	Blackspotted rubberlip	*Plectorhinchus gaterinus*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	Trout sweetlips	*Plectorhinchus pictus*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	Minstrel sweetlips	*Plectorhinchus schotaf*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	

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			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Sordid rubberlip	*Plectorhinchus sordidus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1		1		
	Sweetlips rubberlips NEI	*Plectorhinchus* spp.	0	0	0	0	0	0	0	0	0					1				
	Squaretail coralgrouper	*Plectropomus areolatus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1			1	
	Roving coralgrouper	*Plectropomus pessuliferus*	0	0	0	0	0	< 1	< 1	< 1	< 1					1			1	
	Blacktip sea catfish	*Plicofollis dussumieri*	0	0	0	0	0	0	0	0	0								1	
	Threadfins tasselfishes NEI	*Polynemidae*	3	2	3	7	6	2	14	6	6						1			
	Blueskin seabream	*Polysteganus coeruleopunctatus*	0	0	0	0	0	0	0	0	0									1
	Yellowbar angelfish	*Pomacanthus maculosus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1					1				
	Smallspotted grunter	*Pomadasys commersonnii*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Javelin grunter	*Pomadasys kaakan*	0	0	0	0	1	4	7	8	8			1	1					
	Saddle grunt	*Pomadasys maculatus*	0	0	0	0	0	0	0	0	0									1
		Pomadasys spp.	0	0	0	0	0	0	0	0	0			1						
	Striped piggy	*Pomadasys stridens*	0	0	0	0	0	< 1	< 1	< 1	< 1						1			
	Moontail bullseye	*Priacanthus hamrur*	0	0	0	0	0	0	< 1	< 1	< 1							2		
	Ornate jobfish	*Pristipomoides argyrogrammicus*	0	0	0	0	0	0	0	0	0									1
	Crimson jobfish	*Pristipomoides filamentosus*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	1
	Goldbanded jobfish	*Pristipomoides multidens*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Blackspotted croaker	*Protonibea diacanthus*	0	0	0	0	0	0	0	0	0			1						
	Haffara seabream	*Rhabdosargus haffara*	0	0	0	0	0	1	2	1	1								1	
	Goldlined seabream	*Rhabdosargus sarba*	0	0	0	0	0	0	0	0	0			1					1	
	Sabre squirrelfish	*Sargocentron spiniferum*	0	0	0	0	< 1	< 1	< 1	< 1	< 1					1				
		Saurida spp.	0	0	0	0	0	0	< 1	< 1	< 1	2		2						
	Greater lizardfish	*Saurida tumbil*	0	0	< 1	< 1	2	3	5	7	5			1					1	
	Blue-barred parrotfish	*Scarus ghobban*	0	0	0	0	0	< 1	< 1	< 1	< 1								2	
	Dusky parrotfish	*Scarus niger*	0	0	0	0	0	0	0	0	0									1
	Gulf parrotfish	*Scarus persicus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1					1				
	Croakers drums NEI	*Sciaenidae*	29	29	70	134	272	230	183	121	113	2		1						
	Thumbprint monocle bream	*Scolopsis bimaculata*	0	0	0	0	0	0	< 1	< 1	< 1								1	

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 51

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Black-streaked monocle bream	*Scolopsis taeniata*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Groupers seabasses NEI	*Serranidae*	2	5	7	10	14	19	7	6	5	1					1			
	White-spotted spinefoot	*Siganus canaliculatus*	0	0	0	0	0	0	< 1	< 1	1							1	2	
	Streaked spinefoot	*Siganus javus*	0	0	0	0	0	0	0	0	0					1				
	Marbled spinefoot	*Siganus rivulatus*	0	0	0	0	0	0	< 1	< 1	< 1									2
	Spinefeet (=Rabbitfishes) NEI	*Siganus* spp.	< 1	< 1	2	5	9	13	17	25	27	1			1					
	Shoemaker spinefoot	*Siganus sutor*	0	0	0	0	0	0	0	0	0									2
	Sillago-whitings	*Sillaginidae*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Silver sillago	*Sillago sihama*	0	0	0	0	0	< 1	< 1	0	0					1				
	Sobaity seabream	*Sparidentex hasta*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Goldband goatfish	*Upeneus moluccensis*	0	0	0	0	0	0	0	0	0							1		
	Goatfishes	*Upeneus* spp.	2	2	4	13	14	13	12	9	10					1				
	Yellowstriped goatfish	*Upeneus vittatus*	0	0	0	0	0	0	0	0	0								1	
	White-edged lyretail	*Variola albimarginata*	0	0	0	0	0	0	0	0	0								1	
	Yellow-edged lyretail	*Variola louti*	0	0	0	0	0	< 1	1	1	1								2	
	33–Miscellaneous coastal fishes		**145**	**188**	**307**	**400**	**698**	**779**	**796**	**674**	**697**									
34	Alfonsino	*Beryx decadactylus*	0	0	0	0	0	0	1	1	1								1	
	Splendid alfonsino	*Beryx splendens*	0	0	0	0	0	0	0	0	0			1						
	Orange roughy	*Hoplostethus atlanticus*	0	0	0	0	0	< 1	< 1	0	0			1						
	Savalai hairtail	*Lepturacanthus savala*	0	0	0	0	0	0	0	0	0									1
	Common pike conger	*Muraenesox bagio*	0	0	0	0	0	0	0	0	0							1	1	
	Pike-congers NEI	*Muraenesox* spp.	26	5	13	9	14	13	11	8	12						1			
		Other trap fish	0	0	0	0	0	0	0	0	0			1						
	Porgies seabreams NEI /	*Sparidae Lethrinus* spp.	0	7	8	14	16	16	13	12	22			1						
	Hairtails scabbardfishes NEI	*Trichiuridae*	23	15	29	42	61	98	146	130	124		4	1						
	Largehead hairtail	*Trichiurus lepturus*	0	< 1	< 1	4	12	28	49	50	38		1							
	34–Miscellaneous demersal fishes		**49**	**26**	**50**	**69**	**103**	**157**	**220**	**201**	**196**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
35	Wolf-herrings NEI	*Chirocentrus* spp.	2	5	6	11	10	9	7	3	6			1						
	Clupeoids NEI	*Clupeiformes (=Clupeoidei)*	28	37	32	47	96	62	102	147	153	1		3						
	Grenadier anchovy	*Coilia dussumieri Coilia macrognathos Coilia mystus*	0	0	0	0	0	0	0	0	0		1							
	Shorthead anchovy	*Encrasicholina heteroloba*	0	0	0	0	0	0	0	0	0								1	
	Buccaneer anchovy	*Encrasicholina punctifer*	0	0	0	0	0	2	3	3	5								1	
	White sardinella	*Sardinella albella*	0	0	0	0	0	0	0	0	0								1	
	Goldstripe sardinella	*Sardinella gibbosa*	0	0	0	< 1	0	0	0	0	0							1		
	Indian oil sardine	*Sardinella longiceps*	64	215	202	241	192	369	487	644	676	1	1	2	1					
	Sardinellas NEI	*Sardinella* spp.	3	7	16	17	21	26	17	20	21	2		3	1					
	Silver-stripe round herring	*Spratelloides gracilis*	0	0	0	0	0	0	0	0	0								1	
	Commerson's anchovy	*Stolephorus commersonnii*	0	0	0	0	0	0	0	0	0									1
	Stolephorus anchovies NEI	*Stolephorus* spp.	2	4	7	8	9	6	22	36	36	1	1	1		1				
	Other Anchovies	*Thryssa* spp.	0	0	0	0	0	0	0	0	0	2		2						
	Orangemouth anchovy	*Thryssa vitrirostris*	0	0	0	0	0	0	0	0	0									1
	35–Herrings sardines anchovies		**98**	**267**	**263**	**325**	**328**	**475**	**639**	**853**	**897**									
36	Wahoo	*Acanthocybium solandri*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Bullet tuna	*Auxis rochei*	< 1	< 1	< 1	< 1	1	2	4	6	4				1					
	Frigate tuna	*Auxis thazard*	< 1	< 1	< 1	2	5	6	26	30	23					1				
	Frigate and bullet tunas	*Auxis thazard A. rochei*	2	3	3	3	8	16	4	6	8	1	1	1						
	Kawakawa	*Euthynnus affinis*	2	4	9	21	31	49	74	80	82		1							
	Dogtooth tuna	*Gymnosarda unicolor*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1		1	
	Black marlin	*Istiompax indica*	< 1	< 1	< 1	< 1	< 1	3	8	7	8					1				
	Indo-Pacific sailfish	*Istiophorus platypterus*	< 1	1	< 1	2	4	9	19	22	30		1							
	Striped marlin	*Kajikia audax*	< 1	2	1	1	2	2	3	2	2			1			1			
	Blue marlin	*Makaira nigricans*	1	2	1	2	3	4	6	4	3			1						
	Striped bonito	*Sarda orientalis*	< 1	< 1	< 1	< 1	< 1	< 1	2	2	3					1				
	Narrow-barred Spanish mackerel	*Scomberomorus commerson*	6	11	18	45	54	63	85	82	93			1				1	2	1
	Indo-Pacific king mackerel	*Scomberomorus guttatus*	2	4	8	12	14	16	18	19	13		2							

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Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 51

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
36	Seerfishes NEI	*Scomberomorus* spp.	0	0	2	3	3	2	3	3	1	2	2				1			
	Longtail tuna	*Thunnus tonggol*	2	5	7	23	39	62	107	98	91			1					1	
	Swordfish	*Xiphias gladius*	< 1	< 1	< 1	2	15	21	20	18	17	1								
	36–Tunas bonitos billfishes		**16**	**33**	**53**	**117**	**181**	**256**	**380**	**380**	**379**									
37	Flat needlefish	*Ablennes hians*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1						1	2		
	Shrimp scad	*Alepes djedaba*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Carangids NEI	*Carangidae*	2	7	18	37	58	57	54	43	46	2	2	3						
	Giant trevally	*Caranx ignobilis*	0	0	0	< 1	2	8	16	25	22					1				
	Bluefin trevally	*Caranx melampygus*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Jacks crevalles NEI	*Caranx* spp.	10	11	14	16	59	47	86	118	193					1				
	Common dolphinfish	*Coryphaena hippurus*	0	0	< 1	< 1	2	5	9	13	18							2		
	Indian scad	*Decapterus russelli*	0	0	0	< 1	< 1	1	1	< 1	< 1								1	
	Scads NEI	*Decapterus* spp.	< 1	2	4	3	4	11	43	67	24				1					
	Brilliant pomfret	*Eumegistus illustris*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Orangespotted trevally	*Flavocaranx bajad*	0	0	< 1	2	7	4	5	5	6								1	1
	Golden trevally	*Gnathanodon speciosus*	0	0	0	< 1	< 1	2	1	1	1					1				
	Black-barred halfbeak	*Hemiramphus far*	0	0	0	0	0	0	0	0	0								1	
	False trevally	*Lactarius lactarius*	0	2	4	5	6	7	6	3	5						1	2		
	Torpedo scad	*Megalaspis cordyla*	0	0	0	1	4	4	4	4	4	3				1				
	Silver pomfret	*Pampus argenteus*	< 1	< 1	< 1	< 1	2	3	4	11	8			1		1				
	Chinese silver pomfret	*Pampus chinensis*	0	0	0	0	0	0	< 1	3	3			1						
	Silver pomfrets NEI	*Pampus* spp.	0	0	0	0	0	0	0	0	0	1	1	2						
	Black pomfret	*Parastromateus niger*	0	2	4	3	3	6	12	23	21	2	1	2		1				
	Longnose trevally	*Platycaranx chrysophrys*	0	0	0	0	0	0	3	2	2									1
	Malabar trevally	*Platycaranx malabaricus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1							1	1	
	Cobia	*Rachycentron canadum*	0	1	1	1	2	5	10	12	12								3	
	Indian mackerel	*Rastrelliger kanagurta*	72	52	93	63	160	91	162	166	189	1		2	1					2
	Talang queenfish	*Scomberoides commersonnianus*	0	0	0	0	1	8	24	39	39			1					1	

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Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Queenfishes	*Scomberoides* spp.	0	0	< 1	< 1	3	2	5	5	6						1			
	Mackerels NEI	*Scombridae*	0	0	< 1	< 1	< 1	< 1	0	0	0	1								
	Great barracuda	*Sphyraena barracuda*	0	0	0	0	0	< 1	1	< 1	< 1				1					
	Yellowtail barracuda	*Sphyraena flavicauda*	0	0	0	0	0	0	< 1	< 1	< 1							1		1
	Pickhandle barracuda	*Sphyraena jello*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	Sawtooth barracuda	*Sphyraena putnamae*	0	0	0	0	0	< 1	< 1	< 1	< 1							1		
	Barracudas etc. NEI	*Sphyraenidae*	0	0	0	0	0	0	0	< 1	0		1							
	Snubnose pompano	*Trachinotus blochii*	0	0	0	0	< 1	< 1	< 1	< 1	< 1					1				
	Indian pompano	*Trachinotus mookalee*	0	0	0	0	< 1	< 1	< 1	< 1	1			1						
	Ribbonfishes	*Trachipteridae*	0	0	0	0	0	0	0	0	0			1		1				
	Arabian scad	*Trachurus indicus*	0	0	0	0	0	0	0	0	0								1	
	Jack and horse mackerels NEI	*Trachurus* spp.	0	2	7	5	2	5	18	27	30					1				
	Bludger	*Turrum gymnostethus*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Hound needlefish	*Tylosurus crocodilus*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	37–Miscellaneous pelagic fishes		**84**	**80**	**145**	**138**	**315**	**266**	**467**	**572**	**634**									
38	Batoid fishes NEI	*Batoidea or Batoidimorpha (Hypotremata)*	0	0	0	0	0	0	0	0	0					1				
	Requiem sharks NEI	*Carcharhinidae*	6	15	30	16	30	17	6	5	4						1			
	Carcharhinus sharks NEI	*Carcharhinus* spp.	0	0	0	0	0	0	0	0	0						1			
	Stingrays butterfly rays NEI	*Dasyatidae*	0	0	0	0	0	< 1	< 1	< 1	< 1	1	1	1						
	Sharks rays skates etc. NEI	*Elasmobranchii*	15	24	38	42	68	70	50	36	38	2	1	2			1			
	Rays stingrays mantas NEI	*Rajiformes*	< 1	< 1	2	2	6	5	10	9	9					1				
	Guitarfishes etc. NEI	*Rhinobatidae*	0	0	0	< 1	1	1	1	1	2						1			
	Various sharks NEI	*Selachii or Selachimorpha (Pleurotremata)*	0	0	0	< 1	3	11	3	1	1						1			
	Scalloped hammerhead	*Sphyrna lewini*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	38–Sharks rays chimaeras		**22**	**40**	**70**	**60**	**107**	**104**	**70**	**52**	**55**									

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
42	Marine crabs NEI	*Brachyura*	0	< 1	< 1	1	10	13	25	31	30					1				
	Pink geryon	*Chaceon macphersoni*	0	0	0	0	0	0	< 1	< 1	< 1						1			
	Chaceon geryons NEI	*Chaceon* spp.	0	0	< 1	< 1	< 1	< 1	< 1	0	0						1			
	Crucifix crab	*Charybdis feriatus*	0	0	0	0	0	0	0	0	0							1		
	Swimming crabs etc. NEI	*Portunidae*	0	0	0	0	0	0	0	0	0	1	1	2						
	Blue swimming crab	*Portunus pelagicus*	0	0	< 1	< 1	2	8	12	11	11								2	
	Indo-Pacific swamp crab	*Scylla serrata*	0	0	0	0	< 1	< 1	< 1	0	< 1									1
	42–Crabs sea-spiders		**0**	**< 1**	**< 1**	**2**	**12**	**21**	**36**	**42**	**42**									
43	St.Paul rock lobster	*Jasus paulensis*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Mozambique lobster	*Metanephrops mozambicus*	0	0	< 1	< 1	< 1	< 1	< 1	1	2					1		1		
	Spiny lobsters NEI	*Palinuridae*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Natal spiny lobster	*Palinurus delagoae*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				1
	Scalloped spiny lobster	*Panulirus homarus*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1								1	2
	Longlegged spiny lobster	*Panulirus longipes*	0	0	0	0	0	0	0	0	0								1	
	Ornate spiny lobster	*Panulirus ornatus*	0	0	0	0	0	0	< 1	3	3								1	
	Pronghorn spiny lobster	*Panulirus penicillatus*	0	0	0	0	0	0	0	0	0								1	
	Tropical spiny lobsters NEI	*Panulirus* spp.	0	< 1	3	2	2	2	5	6	6						1			
	Painted spiny lobster	*Panulirus versicolor*	0	0	0	0	0	0	< 1	< 1	0								1	
	Shovelnose lobster	*Thenus unimaculatus*	0	0	0	0	0	0	0	0	0									2
	43–Lobsters spiny-rock lobsters		**< 1**	**2**	**4**	**4**	**4**	**3**	**7**	**11**	**12**									
45		*Acetes* spp.	0	0	0	0	0	0	0	0	0							1		
	Giant red shrimp	*Aristaeomorpha foliacea*	0	0	0	0	0	0	0	0	0		1							1
	Arabian red shrimp	*Aristeus alcocki*	0	0	0	0	0	0	0	0	0							1		
	Knife shrimp	*Haliporoides triarthrus*	0	< 1	< 1	3	2	2	2	< 1	< 1		1				1			
	Nylon shrimps NEI	*Heterocarpus* spp.	0	0	0	0	0	0	< 1	0	0							1		
	Speckled shrimp	*Metapenaeus monoceros*	0	0	0	0	0	< 1	< 1	0	0								1	1
	Metapenaeus shrimps NEI	*Metapenaeus* spp.	< 1	3	6	8	8	6	5	4	4						1			
	Peregrine shrimp	*Metapenaeus stebbingi*	0	0	0	0	0	0	0	0	0									1

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ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
45	Palaemonid shrimps NEI	*Palaemonidae*	0	0	0	0	0	0	0	0	0		1							
	Parapenaeopsis shrimps NEI	*Parapenaeopsis* spp.	< 1	6	7	12	15	11	9	10	10			1			1			
	Penaeid shrimps NEI	*Penaeidae*	0	0	0	0	0	0	< 1	< 1	< 1	1	1	3					1	
	Indian white prawn	*Penaeus indicus*	0	0	0	< 1	< 1	< 1	< 1	0	0								1	2
	Giant tiger prawn	*Penaeus monodon*	0	0	< 1	14	130	124	111	89	96					1				1
	Green tiger prawn	*Penaeus semisulcatus*	< 1	1	1	1	2	9	11	7	6				1					1
	Penaeus shrimps NEI	*Penaeus* spp.	4	11	17	21	21	18	16	16	15			1						1
	45–Shrimps prawns		**5**	**21**	**32**	**60**	**178**	**170**	**154**	**127**	**130**									
47	Marine crustaceans NEI	*Crustacea*	0	1	4	7	13	16	6	< 1	< 1						1			
	47–Miscellaneous marine crustaceans		**0**	**1**	**4**	**7**	**13**	**16**	**6**	**< 1**	**< 1**									
52	Abalones NEI	*Haliotis* spp.	0	0	0	< 1	< 1	< 1	< 1	0	0						1			
	52–Abalones winkles conchs		**0**	**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**0**	**0**									
57	Cephalopods NEI	*Cephalopoda*	< 1	< 1	4	17	73	66	55	13	16	1	1				1			
	Various squids NEI	*Loliginidae Ommastrephidae*	< 1	< 1	< 1	< 1	4	7	61	106	89					1				
	Octopuses etc. NEI	*Octopodidae*	< 1	< 1	< 1	< 1	1	2	9	11	16				1					
	Big blue octopus	*Octopus cyanea*	0	0	0	0	0	0	0	0	0							1	1	1
	Pharaoh cuttlefish	*Sepia pharaonis*	0	0	< 1	< 1	7	14	15	21	18							2		
	Spineless cuttlefish	*Sepiella inermis*	0	0	0	0	0	0	0	0	0							1		
	Cuttlefish bobtail squids NEI	*Sepiidae Sepiolidae*	3	4	11	5	8	19	60	84	75				1					
	57–Squids cuttlefishes octopuses		**4**	**6**	**16**	**24**	**94**	**107**	**198**	**236**	**214**									
76	White teatfish	*Holothuria fuscogilva*	0	0	0	0	0	< 1	< 1	< 1	< 1									1
		Holothuria spp.	0	0	0	0	0	0	0	0	0									1
	Sea cucumbers NEI	*Holothuroidea*	0	< 1	< 1	< 1	5	2	2	2	2						1			
	Prickly redfish	*Thelenota ananas*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	76–Sea-urchins and other echinoderms		**0**	**< 1**	**< 1**	**< 1**	**5**	**2**	**2**	**2**	**2**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II TABLE 8

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 51

			Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
ISSCAAP code	ASFIS name	ASFIS scientific name	1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
81	Marine shells NEI	*Ex Mollusca*	< 1	1	< 1	< 1	< 1	< 1	1	< 1	< 1						1			
	81–Pearls mother-of-pearl shells		< 1	1	< 1	< 1	< 1	< 1	1	< 1	< 1									
	Total selected species groups		**445**	**693**	**977**	**1 232**	**2 072**	**2 391**	**3 033**	**3 196**	**3 313**									
	Total other species groups		**253**	**317**	**699**	**902**	**1 065**	**1 082**	**1 112**	**1 097**	**1 260**									
	Total marine capture		**698**	**1 011**	**1 676**	**2 134**	**3 136**	**3 472**	**4 145**	**4 293**	**4 573**									
	Total aquaculture		**0**	**0**	**0**	**< 1**	**3**	**33**	**90**	**160**	**173**									
	Total production		**698**	**1 011**	**1 676**	**2 134**	**3 139**	**3 506**	**4 235**	**4 453**	**4 746**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 9

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
22	Short-finned eel	*Anguilla australis*	0	< 1	< 1	< 1	< 1	< 1	< 1	0	0					1				
	22–River eels		**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**0**	**0**									
24	Chacunda gizzard shad	*Anodontostoma chacunda*	0	< 1	< 1	2	2	3	10	10	10					1				
	Indian pellona	*Pellona ditchela*	0	0	< 1	3	7	9	12	15	13						1			
	Hilsa shad	*Tenualosa ilisha*	2	5	9	71	166	207	281	312	320		1	1						
	Toli shad	*Tenualosa toli*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	24–Shads		**2**	**5**	**10**	**76**	**176**	**220**	**303**	**337**	**342**									
25	Barramundi (= Giant seaperch)	*Lates calcarifer*	< 1	< 1	2	5	14	15	11	6	7					1				
	25–Miscellaneous diadromous fishes		**< 1**	**< 1**	**2**	**5**	**14**	**15**	**11**	**6**	**7**									
31	Tonguefishes	*Cynoglossidae*	0	0	2	4	8	8	4	12	16		2	1						
	Flatfishes NEI	*Pleuronectiformes*	< 1	1	3	4	7	12	18	9	9					1				
	Indian halibut	*Psettodes erumei*	< 1	< 1	1	1	6	9	9	5	3					1				
	31–Flounders, halibuts, soles		**< 1**	**2**	**6**	**9**	**21**	**29**	**31**	**26**	**28**									
32	Unicorn cod	*Bregmaceros mcclellandi*	0	0	< 1	< 1	< 1	< 1	2	< 1	< 1					1				
	Blue grenadier	*Macruronus novaezelandiae*	0	0	0	< 1	3	6	3	7	12					1				
	32–Cods, hakes, haddocks		**0**	**0**	**< 1**	**< 1**	**4**	**7**	**4**	**7**	**12**									
33	Unicorn leatherjacket filefish	*Aluterus monoceros*	0	0	0	0	0	0	0	0	0		1							
	Sea catfishes NEI	*Ariidae*	7	9	23	34	62	74	78	66	66			1		1				
	Ruff	*Arripis georgiana*	< 1	< 1	1	2	2	< 1	< 1	< 1	< 1						1			
	Australian salmon	*Arripis trutta*	3	4	3	3	3	3	< 1	< 1	< 1						1			
	Bagrid catfishes	*Bagridae*	0	0	0	0	0	0	0	0	0			1						
	Triggerfishes, durgons NEI	*Balistidae*	0	< 1	< 1	< 1	< 1	< 1	< 1	3	3					1				
	Silver seabream	*Chrysophrys auratus*	< 1	< 1	< 1	2	3	3	1	< 1	< 1			2			1			
	Spotted sicklefish	*Drepane punctata*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	1						1			
	Fourfinger threadfin	*Eleutheronema tetradactylum*	0	0	0	0	0	< 1	3	10	9			1						
	Groupers NEI	*Epinephelus* spp.	< 1	< 1	1	2	2	1	13	19	28		1	1						
	Grunts, sweetlips NEI	*Haemulidae (= Pomadasyidae)*	< 1	< 1	< 1	2	4	4	3	4	5					1				
	Bombay-duck	*Harpadon nehereus*	< 1	< 1	3	5	27	42	77	76	77			2						

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 9

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Ponyfishes (=Slipmouths) NEI	*Leiognathidae*	11	18	32	41	61	63	86	58	67		1			1			1	
	Ponyfishes (=Slipmouths)	*Leiognathus* spp.	< 1	< 1	< 1	< 1	< 1	< 1	4	7	5					1				
	Indian threadfin	*Leptomelanosoma indicum*	0	0	0	0	0	< 1	7	8	7			1						
	Emperors (=Scavengers) NEI	*Lethrinidae*	< 1	< 1	< 1	3	5	7	11	9	9		1							
	Snappers, jobfishes NEI	*Lutjanidae*	0	< 1	1	1	5	8	13	49	33					1				
	Fusiliers NEI	*Lutjanidae (ex Caesionidae)*	< 1	< 1	1	2	7	7	12	< 1	1					1				
	Blacktail snapper	*Lutjanus fulvus*	0	0	0	0	0	0	0	0	0								1	
	John's snapper	*Lutjanus johnii*	0	0	0	0	0	0	0	0	0								1	
	Five-lined snapper	*Lutjanus quinquelineatus*	0	0	0	0	0	0	0	0	0								1	
	Emperor red snapper	*Lutjanus sebae*	0	0	0	0	0	0	0	0	0	1								
	Indo-Pacific tarpon	*Megalops cyprinoides*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Filefishes, leatherjackets NEI	*Monacanthidae*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Mullets NEI	*Mugilidae*	3	4	6	17	27	33	37	28	33					1			1	
	Goatfishes, red mullets NEI	*Mullidae*	0	0	0	0	0	0	0	0	0	1	1	2						
	Chinaman-leatherjacket	*Nelusetta ayraud*	0	0	0	0	0	0	0	0	0	1								
	Delagoa threadfin bream	*Nemipterus bipunctatus*	0	0	0	0	0	0	0	0	0		1							
	Threadfin breams NEI	*Nemipterus* spp.	< 1	1	6	12	38	45	50	39	32			2		1				
	Soldier catfish	*Osteogeneiosus militaris*	0	0	0	0	0	0	0	0	0			1						
	Donkey croaker	*Pennahia aneus*	0	0	0	0	0	0	0	0	0		1							
	Percoids NEI	*Perciformes (Percoidei)*	4	5	9	24	29	39	26	< 1	0						1			
	Flatheads NEI	*Platycephalidae*	< 1	< 1	< 1	1	1	4	3	2	3								1	
	Deep-water flathead	*Platycephalus conatus*	0	0	0	0	0	0	0	0	0	1								
	Bartail flathead	*Platycephalus indicus*	0	0	0	0	0	0	0	0	0					1				
	Gray eel-catfish	*Plotosus canius*	0	0	0	0	0	0	0	0	0	1								
	Eeltail catfishes	*Plotosus* spp.	0	< 1	< 1	1	< 1	1	2	4	8					1				
	Threadfins, tasselfishes NEI	*Polynemidae*	3	2	9	9	14	21	24	10	11	1								
	Javelin grunter	*Pomadasys kaakan*	0	0	0	0	0	0	0	0	0								1	
	Purple-spotted bigeye	*Priacanthus tayenus*	0	0	0	0	0	0	0	0	0	1								

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Slender lizardfish	*Saurida elongata*	0	0	0	0	0	0	0	0	0	1								
	Brushtooth lizardfish	*Saurida undosquamis*	0	0	0	0	0	0	0	0	0		1							
	Croakers, drums NEI	*Sciaenidae*	18	12	33	46	74	91	95	60	59	2	1	2						
	Monocle breams	*Scolopsis* spp.	0	0	< 1	< 1	< 1	< 1	1	2	2					1				
	Groupers, seabasses NEI	*Serranidae*	0	0	< 1	< 1	2	3	9	48	50					1				
	Spinefeet (= Rabbitfishes) NEI	*Siganus* spp.	0	0	0	< 1	< 1	1	7	11	7					1				
	Spotted sillago	*Sillaginodes punctatus*	0	0	0	0	0	0	0	0	0	1								
	Silver sillago	*Sillago sihama*	0	0	0	0	0	< 1	< 1	2	< 1					1				
	Porgies, seabreams NEI	*Sparidae*	< 1	< 1	< 1	< 1	< 1	< 1	1	9	8					1				
	Lizardfishes NEI	*Synodontidae*	0	< 1	5	5	20	22	58	82	82		1	2		1				
	Goatfishes	*Upeneus* spp.	< 1	1	4	7	19	31	47	39	35					1				
	Coral fishes	*Z_Aggregate group coral fishes*	0	0	0	0	0	0	0	0	0	2		1						
	Demersal fish	*Z_Aggregate group demersal fish*	0	0	0	0	0	0	0	0	0	2	1							
	Demersal fish	*Z_Assemblage Trawl demersal fish*	0	0	0	0	0	0	0	0	0			1						
	Demersal fish	*Z_Assemblage demersal fish*	0	0	0	0	0	0	0	0	0			1						
	33–Miscellaneous coastal fishes		**53**	**64**	**143**	**224**	**408**	**508**	**673**	**650**	**641**									
34	Bight redfish	*Centroberyx gerrardi*	0	0	0	0	0	0	0	0	0	1								
	Bluefin gurnard	*Chelidonichthys kumu*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Red moki	*Chirodactylus spectabilis*	0	0	0	0	0	0	0	0	0	1								
	Pink cusk-eel	*Genypterus blacodes*	0	0	< 1	< 1	< 1	1	< 1	< 1	< 1					1				
	Orange roughy	*Hoplostethus atlanticus*	0	0	0	< 1	2	3	< 1	< 1	1					1				
	Snoek	*Leionura atun*	2	2	1	< 1	< 1	< 1	< 1	< 1	< 1						1			
	Pike-congers NEI	*Muraenesox* spp.	2	< 1	< 1	1	4	6	5	4	6					1				
	Latchet (= Sharpbeak gurnard)	*Pterygotrigla polyommata*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Silver gemfish	*Rexea solandri*	0	0	< 1	< 1	2	< 1	< 1	< 1	< 1					1				
	Hairtails, scabbardfishes NEI	*Trichiuridae*	19	13	27	31	28	39	74	80	68	1	1			1				
	Largehead hairtail	*Trichiurus lepturus*	< 1	< 1	2	3	12	10	9	20	10					1				

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Mirror dory	*Zenopsis nebulosa*	0	0	0	0	< 1	< 1	< 1	< 1	< 1				1					
	John dory	*Zeus faber*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	34–Miscellaneous demersal fishes		**24**	**17**	**31**	**37**	**49**	**60**	**90**	**106**	**86**									
35	Spotted sardinella	*Amblygaster sirm*	0	0	0	0	0	< 1	6	6	8			1						
	Dorab wolf-herring	*Chirocentrus dorab*	0	0	< 1	< 1	5	5	1	< 1	2	1								
	Wolf-herrings NEI	*Chirocentrus* spp.	3	5	9	15	21	25	21	13	21					1				
	Herrings, sardines NEI	*Clupeidae*	0	0	0	0	0	0	< 1	1	1	1		1						
	Clupeoids NEI	*Clupeiformes (= Clupeoidei)*	39	56	70	71	76	119	297	309	306					1				
	Grenadier anchovy	*Coilia dussumieri, Coilia macrognathos, Coilia mystus*	0	0	0	0	0	0	0	0	0	2								
	Rainbow sardine	*Dussumieria acuta*	0	< 1	< 1	2	4	4	4	7	5	1								
	Slender rainbow sardine	*Dussumieria elopsoides*	0	0	0	0	0	0	0	0	0	1								
	Anchovies, etc. NEI	*Engraulidae*	13	18	19	29	49	47	71	94	74		1			1			1	
	Fringescale sardinella	*Sardinella fimbriata*	0	0	0	0	0	0	0	0	0			1						
	Goldstripe sardinella	*Sardinella gibbosa*	< 1	1	9	23	29	45	35	39	29	1	1			1				
	Bali sardinella	*Sardinella lemuru*	< 1	< 1	9	26	56	73	35	34	47					1				
	Indian oil sardine	*Sardinella longiceps*	< 1	< 1	27	56	60	37	62	17	18		1							
	Sardinellas NEI	*Sardinella* spp.	0	0	2	24	41	22	12	24	25		1	3		1			1	
	Pacific sardine	*Sardinops sagax*	0	0	0	0	0	0	0	0	0	3								
	Hairfin anchovy	*Setipinna breviceps, Setipinna taty*	0	0	0	0	0	0	0	0	0	1								
	Stolephorus anchovies NEI	*Stolephorus* spp.	9	17	32	58	72	67	93	36	43					1				
	Other Anchovies	*Thryssa* spp.	0	0	0	0	0	0	0	0	0	1		1						
	Small pelagics	*Z_Aggregate group small pelagics*	0	0	0	0	0	0	0	0	0	1	1	1						
	Anchovies	*Z_Assemblage anchovies*	0	0	0	0	0	0	0	0	0			1						
	Pelagic fish	*Z_Assemblage pelagic fish*	0	0	0	0	0	0	0	0	0			1						
	Pelagic fish	*Z_Assemblage trawl pelagic fish*	0	0	0	0	0	0	0	0	0		1							
	35–Herrings, sardines, anchovies		**66**	**98**	**179**	**305**	**414**	**445**	**637**	**580**	**579**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
36	Wahoo	*Acanthocybium solandri*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Bullet tuna	*Auxis rochei*	< 1	< 1	< 1	< 1	< 1	< 1	8	23	10					1				
	Frigate tuna	*Auxis thazard*	< 1	< 1	< 1	1	3	4	60	91	74					1				
	Frigate and bullet tunas	*Auxis thazard, A. rochei*	1	2	6	16	30	52	14	0	0		1	1						
	Kawakawa	*Euthynnus affinis*	2	4	9	19	39	55	75	83	65		1							
	Dogtooth tuna	*Gymnosarda unicolor*	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1					1				
	Black marlin	*Istiompax indica*	< 1	< 1	< 1	1	3	6	8	7	4		1							
	Indo-Pacific sailfish	*Istiophorus platypterus*	< 1	< 1	< 1	1	4	9	9	6	7		1							
	Striped marlin	*Kajikia audax*	< 1	1	< 1	2	1	< 1	1	< 1	< 1			1						
	Blue marlin	*Makaira nigricans*	1	2	< 1	1	3	4	3	3	3			1						
	Striped bonito	*Sarda orientalis*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Narrow-barred Spanish mackerel	*Scomberomorus commerson*	4	8	11	20	28	44	65	76	72	2	2	1						
	Indo-Pacific king mackerel	*Scomberomorus guttatus*	2	3	5	9	11	15	22	27	18	1		2						
	Streaked seerfish	*Scomberomorus lineolatus*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1					1				
	Longtail tuna	*Thunnus tonggol*	< 1	< 1	1	9	18	32	40	39	41		1							
	Swordfish	*Xiphias gladius*	< 1	< 1	< 1	2	6	12	12	12	8		1							
	Large pelagics	*Z_Aggregate group large pelagics*	0	0	0	0	0	0	0	0	0	1	1	1						
	36–Tunas, bonitos, billfishes		**12**	**23**	**37**	**83**	**149**	**237**	**322**	**369**	**305**									
37	Carangids NEI	*Carangidae*	2	8	13	26	29	41	65	86	77	3	1							
	Jacks, crevalles NEI	*Caranx* spp.	8	9	9	17	23	31	65	39	51					1				
	Common dolphinfish	*Coryphaena hippurus*	0	0	0	< 1	< 1	1	4	6	6								1	
	Indian scad	*Decapterus russelli*	4	5	7	20	34	51	53	56	39					1				
	Scads NEI	*Decapterus* spp.	< 1	1	5	22	36	44	110	158	147					1				
	Flyingfishes NEI	*Exocoetidae*	< 1	2	3	2	5	8	7	12	8					1				
	Southern garfish	*Hyporhamphus melanochir*	0	0	0	0	0	0	0	0	0		1							
	Torpedo scad	*Megalaspis cordyla*	2	3	7	14	26	31	44	46	47			3		1				
	Silver pomfret	*Pampus argenteus*	< 1	< 1	3	3	8	11	20	18	15		2	1						
	Chinese silver pomfret	*Pampus chinensis*	0	0	0	0	0	0	< 1	5	4	1								

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Black pomfret	*Parastromateus niger*	< 1	< 1	3	3	8	13	17	32	24	1								
	Demersal percomorphs NEI	*Perciformes (Others)*	6	10	13	13	11	15	31	18	16	1	1	1		1				1
	Bluefish	*Pomatomus saltatrix*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0	< 1						1			
	Cobia	*Rachycentron canadum*	0	0	0	< 1	< 1	< 1	< 1	< 1	2					1				
	Short mackerel	*Rastrelliger brachysoma*	2	4	16	36	63	71	91	10	11	2				1				
	Indian mackerel	*Rastrelliger kanagurta*	6	4	12	19	47	41	113	115	137		1	3						
	Indian mackerels NEI	*Rastrelliger* spp.	12	28	24	68	110	137	139	138	138			1		1			1	
	Blue mackerel	*Scomber australasicus*	0	0	0	0	0	< 1	2	3	3	2								
	Queenfishes	*Scomberoides* spp.	< 1	< 1	< 1	2	4	4	6	7	8			1		1				
	Mackerels NEI	*Scombridae*	< 1	2	7	13	17	18	62	135	124					1				
	Oxeye scad	*Selar boops*	0	0	0	0	0	0	0	0	7			1						
	Yellowstripe scad	*Selaroides leptolepis*	1	2	7	15	30	41	50	30	35					1				
	Amberjacks NEI	*Seriola* spp.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0						1			
	Blackbanded trevally	*Seriolina nigrofasciata*	0	0	0	0	2	2	< 1	< 1	< 1					1				
	Sawtooth barracuda	*Sphyraena putnamae*	0	0	0	0	0	0	0	0	0	1								
	Barracudas NEI	*Sphyraena* spp.	< 1	< 1	2	5	13	14	23	43	46	1				1				
	Barracudas, etc. NEI	*Sphyraenidae*	0	0	0	0	0	0	0	0	0								1	
	Butterfishes, pomfrets NEI	*Stromateidae*	3	4	7	18	20	19	27	24	18					1				
	37–Miscellaneous pelagic fishes		**50**	**86**	**139**	**298**	**484**	**593**	**933**	**984**	**963**									
38	Ghost shark	*Callorhinchus milii*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Rays	*Dasyatidae, Mobulidae, Gymnura* spp.	0	0	0	0	0	6	9	12	4	2	1	1						
	Sharks, rays, skates, etc. NEI	*Elasmobranchii*	16	28	42	54	68	70	51	33	39	3	1						1	
	Tope shark	*Galeorhinus galeus*	0	0	0	0	0	< 1	< 1	< 1	< 1			1						
	Gummy shark	*Mustelus antarcticus*	0	0	0	0	2	3	2	2	3	1				1				
	Longnose sawshark, Shortnose sawshark	*Pristiophorus cirratus, Pristiophorus nudipinnis*	0	0	0	0	0	0	0	0	0	1								
	Rays, stingrays, mantas NEI	*Rajiformes*	1	3	6	11	20	16	9	5	5					1				
	Smoothback guitarfish	*Rhinobatos lionotus*	0	0	0	0	0	0	0	0	0									1

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
38	Hammerhead sharks, etc. NEI	*Sphyrnidae*	< 1	< 1	< 1	< 1	< 1	1	2	2	2					1				
	38–Sharks, rays, chimaeras		**17**	**32**	**48**	**65**	**91**	**96**	**73**	**55**	**54**									
42	Swimming crabs, etc. NEI	*Portunidae*	0	0	0	0	0	0	0	0	0			2						
	Blue swimming crab	*Portunus pelagicus*	0	< 1	2	6	8	13	24	20	20	3	3							
	Indo-Pacific swamp crab	*Scylla serrata*	0	0	< 1	3	5	6	14	1	4					1				
	Crab	*Z_Aggregate group crabs*	0	0	0	0	0	0	0	0	0	2	1						1	
	42–Crabs, sea-spiders		**0**	**< 1**	**3**	**9**	**14**	**19**	**38**	**21**	**24**									
43	Red rock lobster	*Jasus edwardsii*	0	0	0	0	0	0	0	0	0	1								
	Northwest lobster	*Metanephrops australiensis*	0	0	0	0	0	0	0	0	0		1							
	Spiny lobsters NEI	*Palinuridae*	0	0	0	0	0	0	0	0	0			1						
	Australian spiny lobster	*Panulirus cygnus*	7	8	9	11	11	11	7	6	7	1								
	Slipper lobsters NEI	*Scyllaridae*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Flathead lobster	*Thenus orientalis*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Shovelnose lobster	*Thenus unimaculatus*	0	0	0	0	0	0	0	0	0								1	1
	Lobster	*Z_Aggregate group lobster*	0	0	0	0	0	0	0	0	0		2	1						
	43–Lobsters, spiny-rock lobsters		**7**	**8**	**9**	**11**	**11**	**11**	**7**	**6**	**7**									
45	Akiami paste shrimp	*Acetes japonicus*	1	2	1	0	0	0	0	0	0			1						
	Speckled shrimp	*Metapenaeus monoceros*	0	0	0	0	0	0	0	0	0			1						
	Pandalid shrimps NEI	*Pandalidae*	0	0	0	0	0	0	0	0	0	1	1	1						
	Banana prawn	*Penaeus merguiensis*	2	4	6	9	15	24	31	9	14		1			1				
	Giant tiger prawn	*Penaeus monodon*	1	2	1	6	40	73	87	72	75		1							
	Green tiger prawn	*Penaeus semisulcatus*	0	0	< 1	< 1	1	< 1	< 1	< 1	< 1					1				
	Penaeus shrimps NEI	*Penaeus* spp.	< 1	3	9	12	17	13	6	5	1					1				
	Peaneid prawns	*Penaeus* spp., *Metapenaeus* spp.	2	6	14	18	26	28	26	22	18	2	1	3						
	Sergestid shrimps NEI	*Sergestidae*	0	< 1	1	13	13	11	33	45	45					1				
	Penaeid shrimps	*Z_Aggregate group peneaid shrimp*	0	0	0	0	0	0	0	0	0			3						
	Crustaceans	*Z_Assemblage trawl crustaceans*	0	0	0	0	0	0	0	0	0			1						
	45–Shrimps, prawns		**8**	**17**	**34**	**58**	**112**	**151**	**184**	**153**	**153**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
53	Cupped oysters NEI	*Crassostrea* spp.	0	0	< 1	1	< 1	< 1	< 1	< 1	< 1					1				
	53–Oysters		**0**	**0**	**< 1**	**1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
55	Southern Australia scallop	*Pecten fumatus*	0	0	0	0	0	0	1	3	3	1								
	Scallops NEI	*Pectinidae*	1	8	4	13	12	7	2	2	2					1				
	55–Scallops, pectens		**1**	**8**	**4**	**13**	**12**	**7**	**4**	**5**	**5**									
56	Goolwa donax	*Latona deltoides*	0	0	0	0	0	0	0	0	0	1								
	Hard clams NEI	*Meretrix* spp.	0	0	1	2	5	3	< 1	< 1	< 1					1				
	Pipi wedge clam	*Paphies australis*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1				
	Blood cockle	*Tegillarca granosa*	0	0	12	28	22	19	24	45	38					1				
	56–Clams, cockles, arkshells		**0**	**0**	**13**	**31**	**28**	**24**	**25**	**45**	**39**									
57	Cephalopods NEI	*Cephalopoda*	< 1	< 1	< 1	11	10	12	8	< 1	< 1					1				
	Various squids NEI	*Loliginidae, Ommastrephidae*	< 1	< 1	2	11	17	25	35	33	30					1				
	Common squids NEI	*Loligo* spp.	< 1	< 1	4	9	24	27	63	60	38					1				
	Gould's flying squid	*Nototodarus gouldi*	0	0	0	0	0	0	0	0	0	1								
	Octopuses, etc. NEI	*Octopodidae*	0	0	< 1	< 1	9	10	7	15	13					1				
	Needle cuttlefish	*Sepia aculeata*	0	0	0	0	0	0	0	0	0								1	
	Cuttlefish, bobtail squids NEI	*Sepiidae, Sepiolidae*	< 1	1	7	9	27	35	36	36	31			1		1				
	Southern reef squid	*Sepioteuthis australis*	0	0	0	0	0	0	0	0	0	1								
	Indian squid	*Uroteuthis (Photololigo) duvaucelii*	0	0	0	0	0	0	0	0	0		1	1						
	Squids	*Z_Aggregate group squids*	0	0	0	0	0	0	0	0	0	2	1	1						
	57–Squids, cuttlefishes, octopuses		**1**	**2**	**13**	**41**	**87**	**109**	**148**	**144**	**112**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 57

			Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
ISSCAAP code	ASFIS name	ASFIS scientific name	1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
76	Sea cucumbers NEI	*Holothuroidea*	0	0	< 1	< 1	< 1	2	3	3	4			1						
	76–Sea-urchins and other echinoderms		**0**	**0**	**< 1**	**< 1**	**< 1**	**2**	**3**	**3**	**4**									
77	Jellyfishes NEI	*Rhopilema* spp.	0	< 1	2	31	15	64	77	17	32					1				
	77–Miscellaneous aquatic invertebrates		**0**	**< 1**	**2**	**31**	**15**	**64**	**77**	**17**	**32**									
	Total selected species groups		**243**	**362**	**672**	**1 299**	**2 088**	**2 597**	**3 563**	**3 514**	**3 393**									
	Total other species groups		**244**	**461**	**800**	**1 263**	**1 821**	**2 593**	**2 522**	**2 422**	**2 153**									
	Total marine capture		**487**	**823**	**1 472**	**2 563**	**3 909**	**5 190**	**6 085**	**5 936**	**5 546**									
	Total aquaculture		**6**	**21**	**50**	**88**	**251**	**513**	**1 010**	**1 608**	**1 781**									
	Total production		**493**	**844**	**1 522**	**2 651**	**4 160**	**5 703**	**7 095**	**7 544**	**7 327**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 61

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
23	Pink (=Humpback) salmon	*Oncorhynchus gorbuscha*	132	93	96	95	155	192	265	174	420						1			
	Chum (=Keta=Dog) salmon	*Oncorhynchus keta*	83	65	84	149	226	232	185	148	147						1			
	23–Salmons, trouts, smelts		**215**	**157**	**180**	**244**	**381**	**424**	**449**	**322**	**566**									
24	Chinese gizzard shad	*Clupanodon thrissa*	< 1	3	7	12	9	7	11	10	12				1					
	24–Shads		**< 1**	**3**	**7**	**12**	**9**	**7**	**11**	**10**	**12**									
31	Pointhead flounder	*Cleisthenes herzensteini*	0	0	0	0	0	0	0	0	0	2								
	Shotted halibut	*Eopsetta grigorjewi*	0	0	0	0	0	0	0	0	0			1						
	Willowy flounder	*Glyptocephalus kitaharae*	0	0	0	0	0	0	0	0	0	1								
	Flathead flounder	*Hippoglossoides dubius*	0	0	0	0	0	0	0	0	0	1								
	Bastard halibut	*Paralichthys olivaceus*	12	10	12	10	9	10	11	9	9	1	1	2						
	Yellow striped flounder	*Pseudopleuronectes herzensteini*	7	13	23	22	16	17	18	22	23			1						
	Greenland halibut	*Reinhardtius hippoglossoides*	2	9	4	0	0	< 1	11	7	4			1						
	31–Flounders, halibuts, soles		**21**	**33**	**39**	**33**	**25**	**27**	**40**	**39**	**36**									
32	Alaska pollock (=Walleye poll.)	*Gadus chalcogrammus*	199	882	3 289	4 298	3 256	1 444	1 912	2 071	2 010	4	3	2						
	Pacific cod	*Gadus macrocephalus*	45	71	82	180	167	109	152	228	230	3	3	1						
	32–Cods, hakes, haddocks		**245**	**952**	**3 371**	**4 478**	**3 423**	**1 553**	**2 064**	**2 299**	**2 240**									
33	Pacific sandlance	*Ammodytes personatus*	66	94	204	134	101	189	155	110	110					1				
	Filefishes NEI	*Cantherhines (=Navodon)* spp.	0	0	65	286	211	182	177	123	125						1			
	Yellow croaker	*Larimichthys polyactis*	93	115	69	50	153	305	376	333	321					1	1			
	Mi-iuy (brown) croaker	*Miichthys miiuy*	0	0	0	0	0	22	58	58	57					1				
	Red seabream	*Pagrus major*	0	0	0	0	0	0	0	0	0	1		2						
	So-iny (redlip) mullet	*Planiliza haematocheilus*	0	0	0	0	0	90	141	109	108				1					
	Okhotsk atka mackerel	*Pleurogrammus azonus*	121	136	204	105	194	208	89	71	78			1						
	Tiger pufferfish	*Takifugu rubripes*	0	0	0	0	0	0	0	0	0		1	1						
	33–Miscellaneous coastal fishes		**280**	**345**	**542**	**575**	**658**	**996**	**996**	**805**	**800**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 61

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Japanese sandfish	*Arctoscopus japonicus*	13	34	36	15	9	14	12	10	7						1			
	Alfonsino	*Beryx decadactylus*	0	0	0	0	0	1	2	1	< 1		1							
	Daggertooth pike conger	*Muraenesox cinereus*	28	36	33	27	129	268	358	311	305				1					
	Slender armorhead	*Pentaceros wheeleri*	0	20	56	< 1	0	0	< 1	0	0			1						
	Largehead hairtail	*Trichiurus lepturus*	342	505	622	617	964	1 243	1 120	989	996					1	1			
	34–Miscellaneous demersal fishes		**382**	**594**	**747**	**659**	**1 102**	**1 526**	**1 492**	**1 311**	**1 308**									
35	Pacific herring	*Clupea pallasii*	304	367	357	176	205	270	408	448	450	1	1			1				
	Japanese anchovy	*Engraulis japonicus*	364	417	398	343	1 105	1 513	1 194	971	878	1	1	1	1	1				
	Red-eye round herring	*Etrumeus sadina*	65	42	52	43	53	39	77	43	73	1								
	Japanese sardinella	*Sardinella zunasi*	0	0	2	9	10	2	2	1	3					1				
	Pacific sardine	*Sardinops sagax*	228	47	795	4 560	1 646	228	463	1 110	988	1		1			1			
	35–Herrings, sardines, anchovies		**961**	**873**	**1 605**	**5 132**	**3 019**	**2 052**	**2 144**	**2 574**	**2 392**									
36	Japanese Spanish mackerel	*Scomberomorus niphonius*	6	16	20	35	30	53	52	49	45			1	1					
	Seerfishes NEI	*Scomberomorus* spp.	< 1	1	32	89	273	401	419	358	368					1				
	36–Tunas, bonitos, billfishes		**6**	**17**	**52**	**124**	**303**	**454**	**471**	**408**	**413**									
37	Pacific saury	*Cololabis saira*	372	341	309	261	334	419	383	148	96			1						
	Japanese scad	*Decapterus maruadsi*	29	43	67	74	72	38	27	20	20					1				
	Blue mackerel	*Scomber australasicus*	0	0	0	0	0	0	5	0	0			2						
	Pacific chub mackerel	*Scomber japonicus*	338	717	1 672	1 272	1 044	1 031	1 171	1 007	1 213			2		1				
	Japanese amberjack	*Seriola quinqueradiata*	0	0	0	0	0	0	0	0	0		1							
	Japanese jack mackerel	*Trachurus japonicus*	229	455	154	148	304	295	211	196	184		1	1			1			
	37–Miscellaneous pelagic fishes		**966**	**1 557**	**2 201**	**1 754**	**1 754**	**1 783**	**1 797**	**1 371**	**1 512**									
42	Marine crabs NEI	*Brachyura*	16	25	57	91	80	89	132	96	108				1					
	Red snow crab	*Chionoecetes japonicus*	0	0	0	0	14	20	17	13	13				1					
	Queen crab	*Chionoecetes opilio*	0	0	0	0	0	0	0	0	0		1		1					
	Gazami crab	*Portunus trituberculatus*	3	2	14	64	221	331	488	442	476					2				
	42–Crabs, sea-spiders		**20**	**27**	**71**	**156**	**315**	**441**	**637**	**551**	**597**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj.

APPENDIX II, TABLE 10

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 61

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
44	Red king crab	*Paralithodes camtschaticus*	42	63	24	32	38	8	8	16	15	1								
	44–King crabs, squat-lobsters		**42**	**63**	**24**	**32**	**38**	**8**	**8**	**16**	**15**									
45	Fleshy prawn	*Penaeus chinensis*	0	0	27	26	48	92	158	367	204				1					
	Southern rough shrimp	*Trachysalambria curvirostris*	0	< 1	9	68	158	297	300	195	242				1					
	45–Shrimps, prawns		**0**	**< 1**	**36**	**94**	**206**	**388**	**458**	**563**	**447**									
55	Yesso scallop	*Mizuhopecten yessoensis*	16	10	35	128	253	304	305	357	367				1					
	55–Scallops, pectens		**16**	**10**	**35**	**128**	**253**	**304**	**305**	**357**	**367**									
57	Octopuses, etc. NEI	*Octopodidae*	24	42	52	55	71	155	174	157	153					1				
	Neon flying squid	*Ommastrephes bartramii*	0	0	0	0	14	22	7	8	4						1			
	Cuttlefish, bobtail squids NEI	*Sepiidae, Sepiolidae*	52	69	86	133	177	181	137	125	134					1	1			
	Japanese flying squid	*Todarodes pacificus*	429	537	371	267	503	458	265	119	101			2						
	57–Squids, cuttlefishes, octopuses		**505**	**648**	**509**	**455**	**765**	**815**	**583**	**409**	**392**									
58	Marine molluscs NEI	*Mollusca*	120	190	191	369	1 015	857	519	363	361					1				
	58–Miscellaneous marine molluscs		**120**	**190**	**191**	**369**	**1 015**	**857**	**519**	**363**	**361**									
	Total selected species groups		**3 780**	**5 471**	**9 609**	**14 244**	**13 265**	**11 635**	**11 975**	**11 396**	**11 459**									
	Total other species groups		**2 693**	**4 160**	**5 380**	**6 451**	**8 272**	**8 105**	**8 437**	**7 652**	**7 428**									
	Total marine capture		**6 473**	**9 631**	**14 989**	**20 694**	**21 537**	**19 740**	**20 411**	**19 048**	**18 887**									
	Total aquaculture		**213**	**438**	**887**	**1 976**	**6 247**	**11 802**	**17 036**	**20 061**	**20 761**									
	Total production		**6 685**	**10 068**	**15 876**	**22 670**	**27 784**	**31 542**	**37 447**	**39 108**	**39 648**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 11A

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 67

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
31	Kamchatka flounder	*Atheresthes evermanni*	4	6	20	6	0	0	0	0	0	1								
	Arrowtooth flounder	*Atheresthes stomias*	< 1	< 1	< 1	3	10	23	43	33	19	3	1							
	Petrale sole	*Eopsetta jordani*	0	0	0	0	< 1	2	2	2	2	1								
	Rex sole	*Glyptocephalus zachirus*	0	0	0	0	0	0	4	3	1	2								
	Flathead sole	*Hippoglossoides elassodon*	5	5	9	5	9	17	15	10	10	2								
	Pacific halibut	*Hippoglossus stenolepis*	22	39	20	30	36	39	17	13	15		1							
	Rock sole	*Lepidopsetta bilineata*	0	0	13	9	32	33	48	28	15	3								
	Northern rock sole	*Lepidopsetta polyxystra*	0	0	0	0	0	0	0	0	0	4								
	Yellowfin sole	*Limanda aspera*	0	0	66	137	105	85	135	132	107	1								
	Dover sole	*Microstomus pacificus*	0	0	0	0	6	8	6	3	3	2								
	Alaska plaice	*Pleuronectes quadrituberculatus*	0	0	2	3	0	0	0	0	0	1								
	Flatfishes NEI	*Pleuronectiformes*	16	106	90	104	40	15	26	29	25	1								
	Greenland halibut	*Reinhardtius hippoglossoides*	0	< 1	7	< 1	6	3	3	2	2	1								
	31–Flounders, halibuts, soles		**46**	**157**	**227**	**297**	**245**	**225**	**298**	**254**	**197**									
32	Alaska pollock (=Walleye poll.)	*Gadus chalcogrammus*	79	309	976	1 313	1 314	1 358	1 392	1 473	1 474	2	2							
	Pacific cod	*Gadus macrocephalus*	21	40	71	154	260	237	294	177	155		4							
	North Pacific hake	*Merluccius productus*	0	60	166	187	258	267	302	348	290	1	1							
	32–Cods, hakes, haddocks		**101**	**408**	**1 212**	**1 655**	**1 832**	**1 863**	**1 988**	**1 998**	**1 919**									
33	Lingcod	*Ophiodon elongatus*	4	5	5	7	6	3	2	1	2	1	1							
	Atka mackerel	*Pleurogrammus monopterygius*	0	3	19	35	56	54	52	59	61		1							
	33–Miscellaneous coastal fishes		**4**	**8**	**23**	**41**	**62**	**57**	**54**	**60**	**63**									
34	Sablefish	*Anoplopoma fimbria*	3	7	38	34	35	25	18	20	25	2	1							
	Other Rockfish Complex	*Other Rockfish Complex*	0	0	0	0	0	0	0	0	0	1								
	Other Shallow Water Flatfish Complex	*Other Shallow Water Flatfish Complex*	0	0	0	0	0	0	0	0	0	1								
	Rougheye rockfish	*Sebastes aleutianus*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Pacific ocean perch	*Sebastes alutus*	29	209	70	13	25	28	50	62	63	2	3							
	Shortraker rockfish	*Sebastes borealis*	0	0	0	0	0	0	< 1	< 1	< 1		2							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 11A

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 67

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Copper rockfish	*Sebastes caurinus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1	2							
	Dusky rockfish	*Sebastes ciliatus*	0	0	0	0	0	0	0	0	0	1								
	Darkblotched rockfish	*Sebastes crameri*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Widow rockfish	*Sebastes entomelas*	0	0	< 1	0	3	< 1	3	8	11		1							
	Yellowtail rockfish	*Sebastes flavidus*	0	0	< 1	0	2	1	2	4	3		1							
	Quillback rockfish	*Sebastes maliger*	0	0	0	0	0	0	< 1	< 1	< 1		4							
	Black rockfish	*Sebastes melanops*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Blackspotted and Rougheye Rockfish Complex	*Sebastes melanostictus, Sebastes aleutianus*	0	0	0	0	0	0	< 1	< 1	< 1	2	1							
	Vermilion rockfish	*Sebastes miniatus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	2								
	Vermilion and Sunset Rockfish Complex	*Sebastes miniatus, Sebastes crocotulus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Bocaccio rockfish	*Sebastes paucispinis*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Canary rockfish	*Sebastes pinniger*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1	1							
	Northern rockfish	*Sebastes polyspinis*	0	0	0	0	0	0	0	0	0	2								
	Yellowmouth rockfish	*Sebastes reedi*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Yelloweye rockfish	*Sebastes ruberrimus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1	2						
	Shortspine thornyhead	*Sebastolobus alascanus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	34–Miscellaneous demersal fishes		**31**	**217**	**110**	**46**	**66**	**56**	**75**	**95**	**102**									
35	Pacific herring	*Clupea pallasii*	189	201	107	80	85	59	52	19	48		5							
	Pacific sardine	*Sardinops sagax*	0	0	0	0	0	0	16	0	< 1			1						
	35–Herrings, sardines, anchovies		**189**	**201**	**107**	**80**	**85**	**59**	**68**	**19**	**48**									
38	Alaska skate	*Arctoraja parmifera*	0	0	0	0	0	0	0	0	0	1								
	Big skate	*Beringraja binoculata*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Longnose skate	*Beringraja rhina*	0	0	0	0	0	0	0	0	0	1								
	Other skates complex	*Other skates complex*	0	0	0	0	0	0	0	0	0	1								
	Shark Complex	*Shark Complex*	0	0	0	0	0	0	0	0	0	1								
	Skate Complex	*Skate Complex*	0	0	0	0	0	0	0	0	0	1								
	Picked dogfish	*Squalus acanthias*	< 1	< 1	2	3	3	5	< 1	< 1	< 1		1							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 11A

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 67

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
38	Spotted spiny dogfish	*Squalus suckleyi*	0	0	0	0	0	0	0	0	0	1								
	38–Sharks, rays, chimaeras		**< 1**	**< 1**	**2**	**3**	**3**	**5**	**1**	**< 1**	**< 1**									
42	Tanner crab	*Chionoecetes bairdi*	0	0	0	0	1	1	3	1	1		1							
	Queen crab	*Chionoecetes opilio*	0	0	0	0	38	16	22	15	20			1						
	Dungeness crab	*Metacarcinus magister*	9	14	16	16	23	33	25	31	36		1							
	42–Crabs, sea-spiders		**9**	**14**	**16**	**16**	**62**	**51**	**49**	**47**	**58**									
44	Golden king crab	*Lithodes aequispinus*	0	0	0	0	0	0	0	0	0		2							
	Red king crab	*Paralithodes camtschaticus*	0	8	1	0	0	0	0	0	0	1		1						
	Blue king crab	*Paralithodes platypus*	0	0	0	0	0	0	0	0	0			2						
	44–King crabs, squat-lobsters		**0**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**									
45	Ocean shrimp	*Pandalus jordani*	0	0	0	0	6	14	25	26	31		1							
	Spot shrimp	*Pandalus platyceros*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	45–Shrimps, prawns		**0**	**0**	**0**	**0**	**6**	**14**	**25**	**26**	**31**									
55	Weathervane scallop	*Patinopecten caurinus*	0	1	2	5	4	1	< 1	0	< 1	1								
	55–Scallops, pectens		**0**	**1**	**2**	**5**	**4**	**1**	**< 1**	**0**	**< 1**									
56	Intertidal clams	*Intertidal clams*	0	0	0	0	0	0	0	0	0			1						
	Pacific geoduck	*Panopea generosa*	0	0	1	3	3	6	3	3	3	1								
	56–Clams, cockles, arkshells		**0**	**0**	**1**	**3**	**3**	**6**	**3**	**3**	**3**									
57	North Pacific giant octopus	*Enteroctopus dofleini*	0	0	0	0	0	0	0	0	0	1								
	57–Squids, cuttlefishes, octopuses		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
76	Red sea urchin	*Mesocentrotus franciscanus*	0	0	0	0	0	0	0	0	0		1							
	Giant red sea cucumber	*Parastichopus californicus*	0	0	0	0	0	0	0	0	0		1							
		Strongylocentrotus droebachiensis	0	0	0	0	0	0	0	0	0	1								
	76–Sea-urchins and other echinoderms		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total selected species groups		**380**	**1 015**	**1 702**	**2 146**	**2 368**	**2 336**	**2 564**	**2 503**	**2 423**									
	Total other species groups		**22**	**135**	**271**	**224**	**191**	**90**	**90**	**104**	**110**									
	Total marine capture		**402**	**1 150**	**1 973**	**2 370**	**2 559**	**2 426**	**2 654**	**2 607**	**2 533**									
	Total aquaculture		**41**	**33**	**28**	**37**	**71**	**124**	**125**	**128**	**134**									
	Total production		**443**	**1 183**	**2 001**	**2 407**	**2 630**	**2 550**	**2 779**	**2 735**	**2 667**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 11B

CAPTURE FISHERIES PRODUCTION OF PACIFIC SALMON (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 67

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
23	Pink (=Humpback) salmon	*Oncorhynchus gorbuscha*	65	75	66	140	159	154	175	91	208	1	2							
	Chum (=Keta=Dog) salmon	*Oncorhynchus keta*	48	29	38	57	63	61	64	23	30		2							
	Coho (=Silver) salmon	*Oncorhynchus kisutch*	24	25	26	28	25	17	15	9	9	9	10	7						
	Sockeye (=Red) salmon	*Oncorhynchus nerka*	48	52	58	126	151	105	123	107	124		6	2						
	Chinook (=Spring=King) salmon	*Oncorhynchus tshawytscha*	17	15	20	17	11	10	7	4	4	16	11	18						
	Eulachon	*Thaleichthys pacificus*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	23–Salmons, trouts, smelts		**204**	**197**	**209**	**369**	**409**	**347**	**385**	**234**	**375**									
	Total selected species groups		**204**	**197**	**209**	**369**	**409**	**347**	**385**	**234**	**375**									
	Total other species groups		**0**	**< 1**	**< 1**	**< 1**	**0**	**< 1**	**0**	**< 1**	**< 1**									
	Total marine capture		**204**	**197**	**209**	**369**	**409**	**347**	**385**	**234**	**375**									
	Total aquaculture		**41**	**33**	**28**	**37**	**71**	**124**	**125**	**128**	**134**									
	Total production		**245**	**230**	**236**	**406**	**480**	**471**	**510**	**362**	**509**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 12

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Epaulette surgeonfish	*Acanthuridae*	0	5	3	5	6	7	8	15	12								2	1
	Lined surgeonfish	*Acanthurus lineatus*	0	0	0	0	0	0	< 1	0	< 1								2	
	Convict surgeonfish	*Acanthurus triostegus*	0	0	0	0	0	0	0	0	0							1	1	
	Yellowfin surgeonfish	*Acanthurus xanthopterus*	0	0	0	0	0	0	0	0	0							1	1	
	Green humphead parrotfish	*Bolbometopon muricatum*	0	0	0	0	0	0	< 1	0	0									1
	Chocolate hind	*Cephalopholis boenak*	7	13	11	8	20	25	28	< 1	6						1			
	Humphead wrasse	*Cheilinus undulatus*	0	0	0	0	0	< 1	4	0	0									1
	Steephead parrots	*Chlorurus microrhinos*	0	0	0	0	0	0	0	0	0								4	2
	Painted sweetlips	*Diagramma pictum*	0	0	0	0	0	0	< 1	13	20							1		
	Banded grouper	*Epinephelus amblycephalus*	0	0	0	0	0	0	0	0	0							1		
	Areolate grouper	*Epinephelus areolatus*	0	0	0	0	0	0	0	0	0									1
	Duskytail grouper	*Epinephelus bleekeri*	0	0	0	0	0	0	0	0	0							1		
	Orange-spotted grouper	*Epinephelus coioides*	0	0	0	0	0	0	0	0	0									1
	Speckled blue grouper	*Epinephelus cyanopodus*	0	0	0	0	0	0	0	0	0						1			
	Highfin grouper	*Epinephelus maculatus*	0	0	0	0	0	0	0	0	0								1	2
	Camouflage grouper	*Epinephelus polyphekadion*	0	0	0	0	0	0	0	0	0									4
	Deepwater longtail red snapper	*Etelis coruscans*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Slender silver-biddy, Common silver-biddy	*Gerres oblongus, Gerres oyena*	0	0	0	0	0	0	0	0	0						1			
	Pacific longnose parrotfish	*Hipposcarus longiceps*	0	0	0	0	0	0	0	0	0							3	2	3
		Kyphosus sectatrix	0	0	0	0	0	0	0	0	0						1			
	Rivulated parrotfish	*Labridae (ex Scaridae)*	0	0	0	0	< 1	< 1	< 1	9	12									1
	Emperors (=Scavengers) NEI	*Lethrinidae*	2	3	7	15	25	28	43	11	18						1			
	Thumbprint emperor	*Lethrinus harak*	0	0	0	0	0	0	0	0	0							1	1	1
	Grass emperor	*Lethrinus laticaudis*	0	0	0	0	0	0	0	0	0							1		
	Pink ear emperor	*Lethrinus lentjan*	0	0	0	0	0	0	0	0	0							1	2	
	Trumpet emperor	*Lethrinus miniatus*	0	0	0	0	0	0	0	0	0						1			
	Spangled emperor	*Lethrinus nebulosus*	0	0	0	0	0	0	< 1	< 1	< 1						1			

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 12
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Orange-striped emperor	*Lethrinus obsoletus*	0	0	0	0	0	0	0	0	0								1	2
	Longface emperor	*Lethrinus olivaceus*	0	0	0	0	0	0	< 1	0	0								2	3
	Ornate emperor	*Lethrinus ornatus*	0	0	0	0	0	0	0	0	0									1
	Spotcheek emperor	*Lethrinus rubrioperculatus*	0	0	0	0	0	0	< 1	0	< 1								1	
	Slender emperor	*Lethrinus variegatus*	0	0	0	0	0	0	0	0	0									1
	Yellowlip emperor	*Lethrinus xanthochilus*	0	0	0	0	0	0	< 1	0	0							2	2	2
	Fusiliers NEI	*Lutjanidae (ex Caesionidae)*	3	6	30	29	38	58	84	36	32				1					
	Yellow-banded snapper	*Lutjanus adetii*	0	0	0	0	0	0	0	0	0						1			
	Crimson snapper	*Lutjanus erythropterus*	0	0	0	0	0	0	0	0	0							1		
	Blacktail snapper	*Lutjanus fulvus*	0	0	0	0	0	0	0	0	0								1	1
	Humpback red snapper	*Lutjanus gibbus*	0	0	0	0	0	0	0	0	0							3	1	3
	John's snapper	*Lutjanus johnii*	0	0	0	0	0	0	0	0	0									1
	Malabar blood snapper	*Lutjanus malabaricus*	0	0	0	0	0	0	0	0	0		1							1
	One-spot snapper	*Lutjanus monostigma*	0	0	0	0	0	0	0	0	0							1		
	Russell's snapper	*Lutjanus russellii*	0	0	0	0	0	0	0	0	0									1
	Emperor red snapper	*Lutjanus sebae*	0	0	0	0	0	0	< 1	< 1	< 1									1
	Brownstripe red snapper	*Lutjanus vitta*	0	0	0	0	0	0	0	0	0						1			1
	Moonfish	*Mene maculata*	0	3	7	5	8	15	14	11	8						1			
	Humpnose big-eye bream	*Monotaxis grandoculis*	0	0	0	0	0	0	0	0	0								3	1
	Yellowfin goatfish	*Mulloidichthys vanicolensis*	0	0	0	0	0	0	0	0	0						1			
	Orangespine unicornfish	*Naso lituratus*	0	0	0	0	0	0	< 1	< 1	< 1							1	1	1
	Bluespine unicornfish	*Naso unicornis*	0	0	0	0	0	0	< 1	0	< 1						1	1	3	1
	Bignose unicornfish	*Naso vlamingii*	0	0	0	0	0	0	0	0	0							1		
	Ornate threadfin bream	*Nemipterus hexodon*	0	0	0	0	0	0	0	0	0		1							
	Japanese threadfin bream	*Nemipterus japonicus*	0	0	0	0	0	0	0	0	0							1		
	Dash-and-dot goatfish	*Parupeneus barberinus*	0	0	0	0	0	0	< 1	0	0							2		
	Orangefin ponyfish	*Photopectoralis bindus*	0	0	0	0	0	0	0	0	0									1
	Leopard coralgrouper	*Plectropomus leopardus*	0	0	0	0	0	5	24	11	12						2			1

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Javelin grunter	*Pomadasys kaakan*	0	0	0	0	0	0	0	0	0							1		
	Red bigeye	*Priacanthus macracanthus*	0	0	0	0	0	< 1	< 1	1	< 1								1	1
	Purple-spotted bigeye	*Priacanthus tayenus*	0	0	0	0	0	0	0	0	0	1								
	Goldbanded jobfish	*Pristipomoides multidens*	0	0	0	0	0	0	0	0	0									1
	Sharptooth jobfish	*Pristipomoides typus*	0	0	0	0	0	0	0	0	0								1	
	Blackspotted croaker	*Protonibea diacanthus*	0	0	0	0	0	0	0	0	0									1
	Sabre squirrelfish	*Sargocentron spiniferum*	0	0	0	0	0	0	0	0	0									1
	Slender lizardfish	*Saurida elongata*	0	0	0	0	0	0	0	0	0			1						1
	Greater lizardfish	*Saurida tumbil*	< 1	< 1	2	1	7	15	11	0	0									1
	Brushtooth lizardfish	*Saurida undosquamis*	0	0	0	0	0	0	0	0	0	1								
	Croakers, drums NEI	*Sciaenidae*	4	7	27	32	49	83	79	34	51									1
	Lattice monocle bream	*Scolopsis taenioptera*	0	0	0	0	0	0	0	0	0							1		
	Streamlined spinefoot	*Siganus argenteus*	0	0	0	0	0	0	< 1	< 1	< 1							1	3	1
	White-spotted spinefoot	*Siganus canaliculatus*	0	0	0	0	0	0	0	0	0									1
	Goldlined spinefoot	*Siganus guttatus*	0	0	0	0	0	0	0	0	0								1	
	Goldspotted spinefoot	*Siganus punctatus*	0	0	0	0	0	0	< 1	0	< 1							1	1	
	Little spinefoot	*Siganus spinus*	0	0	0	0	0	0	< 1	< 1	< 1								1	1
	Sillago-whitings	*Sillaginidae*	< 1	< 1	7	12	14	22	16	15	14						1			
	Porgies, seabreams NEI	*Sparidae*	< 1	< 1	< 1	< 1	2	14	13	21	27						1			
	Goatfishes	*Upeneus* spp.	2	3	5	7	16	30	68	98	106				1					
	33–Miscellaneous coastal fishes		**18**	**42**	**99**	**116**	**184**	**303**	**394**	**275**	**319**									
34	Largehead hairtail	*Trichiurus lepturus*	< 1	< 1	7	6	9	13	12	10	11									1
	34–Miscellaneous demersal fishes		**< 1**	**< 1**	**7**	**6**	**9**	**13**	**12**	**10**	**11**									
35	Spotted sardinella	*Amblygaster sirm*	0	0	0	0	0	3	20	21	51						1			
	Wolf-herrings NEI	*Chirocentrus* spp.	8	14	20	18	19	24	15	15	16						1			
	Rainbow sardine	*Dussumieria acuta*	< 1	7	44	39	35	29	27	21	17						1			
	Shorthead anchovy	*Encrasicholina heteroloba*	0	0	0	0	0	0	0	0	0	1							1	
	Bluestripe herring	*Herklotsichthys quadrimaculatus*	0	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1						1			

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
35	Goldstripe sardinella	*Sardinella gibbosa*	13	23	42	91	125	154	135	113	139							2	1	1
	Bali sardinella	*Sardinella lemuru*	7	12	24	42	66	29	70	341	330							1	2	1
	35–Herrings, sardines, anchovies		**28**	**56**	**129**	**190**	**245**	**240**	**266**	**512**	**553**									
36	Bullet tuna	*Auxis rochei*	0	0	0	0	0	< 1	11	6	7						1			2
	Frigate tuna	*Auxis thazard*	0	0	0	0	0	45	95	129	110						1		1	1
	Kawakawa	*Euthynnus affinis*	30	24	48	91	99	205	185	150	161							1		2
	Narrow-barred Spanish mackerel	*Scomberomorus commerson*	12	23	38	52	60	99	139	152	167	1	2	1	2				1	1
	Indo-Pacific king mackerel	*Scomberomorus guttatus*	1	3	3	6	10	14	15	26	19							1		
	Seerfishes NEI	*Scomberomorus* spp.	1	3	13	20	23	24	18	17	16					1				
	Longtail tuna	*Thunnus tonggol*	0	0	1	43	54	125	113	174	230						1	1		1
	36–Tunas, bonitos, billfishes		**45**	**53**	**104**	**212**	**245**	**511**	**575**	**654**	**709**									
37	Yellowtail scad	*Atule mate*	0	0	0	0	0	0	0	0	0								1	
	Carangids NEI	*Carangidae*	6	21	55	88	101	112	132	274	266						1			
	Bluespotted trevally	*Caranx bucculentus*	0	0	0	0	0	0	0	0	0									1
	Bigeye trevally	*Caranx sexfasciatus*	0	0	0	0	0	0	0	0	0								1	
	Jacks, crevalles NEI	*Caranx* spp.	2	3	6	13	22	35	68	27	29				1					
	Redtail scad	*Decapterus kurroides*	0	0	0	0	0	0	0	0	0									1
	Mackerel scad	*Decapterus macarellus*	0	0	0	0	0	0	0	0	0								2	3
	Shortfin scad	*Decapterus macrosoma*	0	0	0	0	0	0	0	0	0							1	3	
	Japanese scad	*Decapterus maruadsi*	0	0	0	< 1	< 1	0	0	0	0									2
	Scads NEI	*Decapterus* spp.	43	203	242	264	453	542	494	657	625						1			1
	Rainbow runner	*Elagatis bipinnulata*	< 1	2	6	9	12	13	14	12	12						1			
	Island trevally	*Ferdauia orthogrammus*	0	0	0	0	0	0	< 1	< 1	0								1	1
	False trevally	*Lactarius lactarius*	< 1	< 1	1	1	< 1	5	16	< 1	< 1				1					
	Torpedo scad	*Megalaspis cordyla*	< 1	1	15	26	38	54	58	49	48						1			
	Silver pomfret	*Pampus argenteus*	5	9	10	9	15	30	27	2	3						1			
	Black pomfret	*Parastromateus niger*	4	7	11	12	25	46	58	61	61				1					
	Longnose trevally	*Platycaranx chrysophrys*	0	0	0	0	0	0	0	0	0							1		

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 12

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Short mackerel	*Rastrelliger brachysoma*	24	62	79	101	145	199	201	45	45									5
	Indian mackerel	*Rastrelliger kanagurta*	< 1	< 1	52	70	86	103	166	130	130						1		1	3
	Queenfishes	*Scomberoides* spp.	< 1	< 1	4	9	17	21	22	28	34					1				
	Bigeye scad	*Selar crumenophthalmus*	4	27	46	35	57	135	180	189	180							1	3	
	Yellowstripe scad	*Selaroides leptolepis*	13	22	35	68	111	133	115	102	113						1	1		
	Great barracuda	*Sphyraena barracuda*	< 1	< 1	2	6	14	8	14	0	0					1				
	Hound needlefish	*Tylosurus crocodilus*	0	0	0	0	0	0	0	0	0						1			
	Needlefishes NEI	*Tylosurus* spp.	0	0	5	10	10	14	17	12	14						1			
	37–Miscellaneous pelagic fishes		**102**	**360**	**569**	**722**	**1 106**	**1 449**	**1 581**	**1 590**	**1 560**									
38	Grey reef shark	*Carcharhinus amblyrhynchos*	0	0	0	0	0	0	0	0	0							1		
	Brownbanded bambooshark	*Chiloscyllium punctatum*	0	0	0	0	0	0	0	0	0							1	2	
	Whitetip reef shark	*Triaenodon obesus*	0	0	0	0	0	0	0	0	0							1		
	38–Sharks, rays, chimaeras		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
42	Blue swimming crab	*Portunus pelagicus*	< 1	11	31	46	72	82	131	146	145	1					1			
	Indo-Pacific swamp crab	*Scylla serrata*	< 1	< 1	5	5	10	18	23	6	7				1	1				
	42–Crabs, sea-spiders		**< 1**	**12**	**36**	**51**	**82**	**100**	**154**	**152**	**152**									
43	Ornate spiny lobster	*Panulirus ornatus*	0	0	0	0	0	0	0	0	0		1							
	Painted spiny lobster	*Panulirus versicolor*	0	0	0	0	0	0	0	0	0									1
	43–Lobsters, spiny-rock lobsters		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
44	Coconut crab	*Birgus latro*	0	0	0	0	0	0	0	< 1	< 1									1
	44–King crabs, squat-lobsters		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**									
45	Jinga shrimp	*Metapenaeus affinis*	0	0	0	0	0	0	0	0	0	1								
	Endeavour shrimp, Greasyback shrimp	*Metapenaeus endeavouri, Metapenaeus ensis*	0	0	0	< 1	2	3	2	2	2		2							
	Greasyback shrimp	*Metapenaeus ensis*	0	0	0	0	0	0	0	0	0	1								
	Metapenaeus shrimps NEI	*Metapenaeus* spp.	2	3	17	23	29	40	51	74	92					1				
	Brown tiger prawn, Green tiger prawn	*Penaeus esculentus, Penaeus semisulcatus*	0	0	2	< 1	< 1	1	< 1	< 1	< 1		2							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 71

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
45	Indian white prawn	*Penaeus indicus*	0	0	0	0	0	0	0	0	0									1
	Indian white prawn, Banana prawn	*Penaeus indicus, Penaeus merguiensis*	10	17	31	38	53	65	65	26	27		1							
	Banana prawn	*Penaeus merguiensis*	10	17	31	38	53	65	65	26	27	1						1		1
	45–Shrimps, prawns		**22**	**38**	**82**	**100**	**139**	**175**	**183**	**128**	**149**									
52	Variegated triton	*Charonia tritonis*	0	0	0	0	0	0	0	0	0									1
	Strawberry conch	*Conomurex luhuanus*	0	0	0	0	0	0	0	0	0							1		
	Common spider conch	*Lambis lambis*	0	0	0	0	0	0	0	0	0									1
	Commercial top	*Rochia nilotica*	0	0	0	0	0	< 1	< 1	0	0						1			
	52–Abalones, winkles, conchs		**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**0**	**0**									
56	Blood cockle	*Tegillarca granosa*	< 1	< 1	3	9	16	36	34	49	47						1			
	Giant clams NEI	*Tridacna* spp.	0	0	0	0	0	0	0	0	0						1			
	56–Clams, cockles, arkshells		**< 1**	**< 1**	**3**	**9**	**16**	**36**	**34**	**49**	**47**									
57	Octopuses NEI	*Octopus* spp.	0	0	0	0	0	0	0	0	0					1			1	
	Needle cuttlefish	*Sepia aculeata*	0	0	0	0	0	0	0	0	0		1							
	Cuttlefish, bobtail squids NEI	*Sepiidae, Sepiolidae*	< 1	1	27	45	60	60	40	31	39					1				
	Indian squid	*Uroteuthis (Photololigo) duvaucelii*	0	0	0	0	0	0	0	0	0			1						1
	Mitre squid	*Uroteuthis chinensis*	0	0	0	0	0	0	0	0	0	1								
	57–Squids, cuttlefishes, octopuses		**< 1**	**1**	**27**	**45**	**60**	**60**	**40**	**31**	**39**									
	Total selected species groups		**218**	**563**	**1 054**	**1 451**	**2 085**	**2 887**	**3 239**	**3 399**	**3 539**									
	Total other species groups		**755**	**1 750**	**2 972**	**3 770**	**5 110**	**6 035**	**6 928**	**7 422**	**7 539**									
	Total marine capture		**973**	**2 313**	**4 027**	**5 221**	**7 195**	**8 922**	**10 167**	**10 821**	**11 078**									
	Total aquaculture		**86**	**146**	**232**	**495**	**957**	**2 084**	**3 523**	**4 904**	**5 101**									
	Total production		**1 059**	**2 459**	**4 258**	**5 716**	**8 151**	**11 006**	**13 690**	**15 725**	**16 179**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II, TABLE 13

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 77

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
23	Chinook (= Spring = King) salmon	*Oncorhynchus tshawytscha*	5	3	1	2	< 1	0	< 1	1	1			2						
	23–Salmons, trouts, smelts		**5**	**3**	**1**	**2**	**< 1**	**0**	**< 1**	**1**	**1**									
31	Pacific sanddab	*Citharichthys sordidus*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	God's flounder	*Cyclopsetta panamensis*	0	0	0	0	0	0	< 1	< 1	0						1			
	Toothed flounder	*Cyclopsetta querna*	0	0	0	0	0	0	0	0	0				1					
	31–Flounders, halibuts, soles		**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**< 1**									
32	North Pacific hake	*Merluccius productus*	0	< 1	2	< 1	< 1	1	7	5	7	1	1							
	32–Cods, hakes, haddocks		**0**	**< 1**	**2**	**< 1**	**< 1**	**1**	**7**	**5**	**7**									
33	Sea catfishes NEI	*Ariidae*	< 1	< 1	< 1	< 1	1	3	4	3	3					1				
	Yellowfin snook	*Centropomus robalito*	0	0	0	0	0	0	< 1	< 1	< 1				1					
	Gulf weakfish	*Cynoscion othonopterus*	0	0	0	0	0	0	0	0	0			1						
	Mojarras, etc. NEI	*Gerreidae*	< 1	1	4	12	5	1	< 1	< 1	< 1				1	1				
	Mexican barred snapper	*Hoplopagrus guentherii*	0	0	0	0	0	< 1	< 1	< 1	< 1				1	1				
	Yellow snapper	*Lutjanus argentiventris*	< 1	2	2	4	4	1	< 1	< 1	< 1				1	1				
	Colorado snapper	*Lutjanus colorado*	0	0	0	0	0	0	0	0	0				1					
	Spotted rose snapper	*Lutjanus guttatus*	0	0	0	0	0	< 1	1	1	1						1			
	Pacific dog snapper	*Lutjanus novemfasciatus*	0	0	0	0	0	0	0	0	0				1					
	Pacific red snapper	*Lutjanus peru*	0	0	0	0	0	2	8	7	5			1						
	Bigeye croaker	*Micropogonias megalops*	0	0	0	0	0	0	0	0	0	1								
	Lingcod	*Ophiodon elongatus*	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1	< 1		1							
	Barred sand bass	*Paralabrax nebulifer*	0	0	0	0	0	0	0	0	0		1							
	Panama grunt	*Rhencus panamensis*	0	0	0	0	0	0	< 1	< 1	< 1						1			
	Croakers, drums NEI	*Sciaenidae*	< 1	2	2	3	3	5	1	< 1	< 1						1			
	Cabezon	*Scorpaenichthys marmoratus*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Groupers, seabasses NEI	*Serranidae*	0	< 1	2	< 1	4	3	2	2	2						1			
	33–Miscellaneous coastal fishes		**2**	**6**	**11**	**20**	**17**	**15**	**19**	**16**	**13**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 77

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Red pike conger	*Cynoponticus coniceps*	0	0	0	0	0	< 1	< 1	< 1	< 1				1					
	California scorpionfish	*Scorpaena guttata*	0	0	0	0	0	0	0	0	0	1								
	Gopher rockfish	*Sebastes carnatus, Sebastes chrysomelas*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Chilipepper rockfish	*Sebastes goodei*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Shortbelly rockfish	*Sebastes jordani*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Cowcod	*Sebastes levis*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Black rockfish	*Sebastes melanops*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Blackgill rockfish	*Sebastes melanostomus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1		1							
	Vermilion and Sunset Rockfish Complex	*Sebastes miniatus, Sebastes crocotulus*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Blue rockfish	*Sebastes mystinus, Sebastes diaconus*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Bocaccio rockfish	*Sebastes paucispinis*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Stripetail rockfish	*Sebastes saxicola*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Longspine thornyhead	*Sebastolobus altivelis*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Hairtails, scabbardfishes NEI	*Trichiuridae*	0	0	0	< 1	< 1	< 1	0	< 1	0						1			
	34–Miscellaneous demersal fishes		**0**	**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**1**	**1**									
35	Pacific anchoveta	*Cetengraulis mysticetus*	1	23	70	111	74	92	137	76	158	1	1							
	Californian anchovy	*Engraulis mordax*	16	23	165	207	11	21	62	181	259		1							
	Pacific piquitinga	*Lile stolifera*	0	0	0	0	0	< 1	< 1	0	< 1						1			
	Pacific thread herring	*Opisthonema libertate*	0	7	18	17	33	120	250	223	185			2						
	Pacific sardine	*Sardinops sagax*	90	28	100	404	359	590	264	486	390	2		1						
	35–Herrings, sardines, anchovies		**107**	**80**	**354**	**739**	**477**	**822**	**714**	**966**	**992**									
36	Frigate tuna	*Auxis thazard*	0	0	0	0	0	0	0	0	0						1			
	Blue marlin	*Makaira nigricans*	0	3	5	6	6	4	4	3	3				1					
	Pacific sierra	*Scomberomorus sierra*	0	< 1	4	4	6	8	12	13	12				3					
	Swordfish	*Xiphias gladius*	< 1	2	4	5	8	8	10	8	7						1			
	36–Tunas, bonitos, billfishes		**< 1**	**6**	**12**	**15**	**20**	**20**	**27**	**24**	**21**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 77

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Pomfrets, ocean breams NEI	*Bramidae*	0	0	0	0	0	< 1	< 1	< 1	< 1					1				
	Green jack	*Caranx caballus*	0	0	0	0	0	0	< 1	< 1	< 1				1					
	Pacific crevalle jack	*Caranx caninus*	0	0	0	0	0	0	0	0	0				1					
	Common dolphinfish	*Coryphaena hippurus*	< 1	< 1	< 1	< 1	< 1	7	5	3	5						1			
	Pacific chub mackerel	*Scomber japonicus*	16	14	8	45	46	23	52	88	33		1							
	Pacific jack mackerel	*Trachurus symmetricus*	32	32	23	15	1	< 1	< 1	< 1	8	1								
	37–Miscellaneous pelagic fishes		**48**	**46**	**30**	**60**	**47**	**31**	**58**	**91**	**47**									
38	Big skate	*Beringraja binoculata*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1								
	Scalloped hammerhead	*Sphyrna lewini*	0	0	0	0	0	0	0	0	0		1							
	38–Sharks, rays, chimaeras		**0**	**0**	**0**	**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**									
42	Warrior swimcrab	*Callinectes bellicosus*	0	0	0	0	0	0	0	0	0				1					
	Dungeness crab	*Metacarcinus magister*	6	4	< 1	< 1	< 1	0	8	4	5								1	
	42–Crabs, sea-spiders		**6**	**4**	**< 1**	**< 1**	**< 1**	**0**	**8**	**4**	**5**									
43	Mexican spiny lobster	*Panulirus interruptus*	0	0	0	0	0	0	0	0	0		1							
	43–Lobsters, spiny-rock lobsters		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
45	Crystal shrimp	*Penaeus brevirostris*	1	3	4	4	3	2	1	< 1	1					1	3			
	Yellowleg shrimp	*Penaeus californiensis*	< 1	< 1	< 1	< 1	< 1	4	21	11	15		4				2			
	Penaeus shrimps NEI	*Penaeus* spp.	48	59	49	58	47	40	11	2	2				1					
	Blue shrimp	*Penaeus stylirostris*	0	< 1	0	0	0	4	25	22	28		3				1			
	Whiteleg shrimp	*Penaeus vannamei*	0	0	0	0	< 1	1	8	9	7		2	1			1			
	Pacific seabob	*Xiphopenaeus riveti*	0	0	0	0	0	0	0	0	0			1			1			
	45–Shrimps, prawns		**50**	**62**	**54**	**63**	**52**	**52**	**66**	**45**	**54**									
55	Pacific calico scallop	*Argopecten ventricosus*	0	0	0	4	9	11	6	2	15				1					
	55–Scallops, pectens		**0**	**0**	**0**	**4**	**9**	**11**	**6**	**2**	**15**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 77

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
56	Squalid callista	*Megapitaria squalida*	0	0	0	0	0	0	0	0	0						1			
	56–Clams, cockles, arkshells		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
77	Cannonball jellyfish	*Stomolophus meleagris*	0	0	0	0	0	0	33	19	78					1				
	77–Miscellaneous aquatic invertebrates		**0**	**0**	**0**	**0**	**0**	**0**	**33**	**19**	**78**									
	Total selected species groups		**218**	**208**	**465**	**904**	**624**	**953**	**939**	**1 175**	**1 235**									
	Total other species groups		**79**	**163**	**245**	**324**	**451**	**447**	**429**	**304**	**305**									
	Total marine capture		**297**	**371**	**710**	**1 228**	**1 075**	**1 400**	**1 368**	**1 479**	**1 541**									
	Total aquaculture		**0**	**0**	**< 1**	**4**	**34**	**128**	**209**	**315**	**280**									
	Total production		**297**	**371**	**710**	**1 232**	**1 109**	**1 528**	**1 577**	**1 793**	**1 821**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

APPENDIX II

APPENDIX II, TABLE 14
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 81

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
22	Speckled longfin eel	*Anguilla reinhardtii*	0	0	0	0	0	0	0	0	0					1				
	22–River eels		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
31	Brill	*Colistium guentheri*	0	0	0	0	0	0	0	0	0								1	
	Turbot	*Colistium nudipinnis*	0	0	0	0	0	0	0	0	0								1	
	Southern lemon sole	*Pelotretis flavilatus*	0	0	0	0	0	< 1	< 1	0	0								1	
	New Zealand sole	*Peltorhamphus novaezeelandiae*	0	0	0	0	0	0	0	0	0								1	1
	Flatfishes NEI	*Pleuronectiformes*	2	1	1	2	5	3	2	2	2								2	
	Sand flounder	*Rhombosolea plebeia*	0	0	0	0	0	0	0	0	0								2	
	31–Flounders, halibuts, soles		**2**	**1**	**1**	**2**	**5**	**3**	**3**	**2**	**2**									
32	Blue grenadier	*Macruronus novaezelandiae*	< 1	< 1	27	98	261	167	142	106	100		2							
	Southern hake	*Merluccius australis*	0	0	0	< 1	10	15	7	3	3		3							
	Southern blue whiting	*Micromesistius australis*	0	0	21	18	46	39	31	13	21		1						1	
	Common mora	*Mora moro*	0	0	0	0	< 1	1	1	< 1	< 1								2	
	Red codling	*Pseudophycis bachus*	< 1	< 1	5	8	11	6	5	2	3								2	
	32–Cods, hakes, haddocks		**< 1**	**< 1**	**54**	**124**	**328**	**228**	**186**	**126**	**127**									
33	Surf bream	*Acanthopagrus australis*	0	0	0	0	0	0	0	0	0					1				
	Black bream	*Acanthopagrus butcheri*	0	0	0	0	0	0	0	0	0								1	
	Japanese meagre	*Argyrosomus japonicus*	0	0	0	0	0	0	0	0	0									1
	Australian salmon	*Arripis trutta*	< 1	< 1	2	6	6	4	3	2	3		1						1	
	Teraglin	*Atractoscion atelodus*	0	0	0	0	0	0	0	0	0					1				
	Silver seabream	*Chrysophrys auratus*	7	10	16	10	7	7	7	7	7		4						3	
	Parore	*Girella tricuspidata*	0	0	0	0	< 1	< 1	< 1	< 1	< 1								1	
	Pearl perch	*Glaucosoma scapulare*	0	0	0	0	0	0	0	0	0			1						
	Flathead grey mullet	*Mugil cephalus*	0	0	0	0	0	0	0	0	0		1							
	Chinaman-leatherjacket	*Nelusetta ayraud*	0	0	0	0	0	0	0	0	0								1	
	New Zealand blue cod	*Parapercis colias*	2	0	< 1	1	3	2	2	2	2			1					1	2
	Blue-spotted flathead	*Platycephalus caeruleopunctatus*	0	0	0	0	0	0	0	0	0		1							
	Dusky flathead	*Platycephalus fuscus*	0	0	0	0	0	0	0	0	0								1	

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 81

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
33	Sand sillago	*Sillago ciliata*	0	0	0	0	0	0	0	0	0								1	
	Flinders' sillago	*Sillago flindersi*	0	0	0	0	0	0	0	0	0	1								
	Trumpeter sillago	*Sillago maculata*	0	0	0	0	0	0	0	0	0					1				
	33–Miscellaneous coastal fishes		**9**	**11**	**18**	**17**	**16**	**14**	**12**	**11**	**12**									
34	Redfish	*Centroberyx affinis*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			1						
	Bluefin gurnard	*Chelidonichthys kumu*	2	3	3	3	4	4	4	5	4	1	1						2	
	Black cardinal fish	*Epigonus telescopus*	0	0	0	0	3	2	< 1	< 1	< 1			1						
	Pink cusk-eel	*Genypterus blacodes*	< 1	< 1	< 1	3	17	19	16	17	2	1	2						1	
	Orange roughy	*Hoplostethus atlanticus*	0	0	< 1	49	45	17	8	9	10		4	2						
	Bluenose warehou	*Hyperoglyphe antarctica*	0	0	0	1	2	3	1	< 1	< 1		2							
	Giant stargazer	*Kathetostoma giganteum*	0	0	< 1	2	3	3	3	3	3								2	1
	Blue moki	*Latridopsis ciliaris*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Snoek	*Leionura atun*	< 1	< 1	18	21	23	29	27	21	23								2	
	Porae	*Nemadactylus douglasii*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Tarakihi	*Nemadactylus macropterus*	6	9	5	5	5	6	< 1	0	0			2					1	
	Smooth oreo dory	*Pseudocyttus maculatus*	0	0	0	0	< 1	10	2	0	0		3							
	Silver gemfish	*Rexea solandri*	< 1	< 1	1	5	4	< 1	1	2	3			1						
	Gemfish	*Rexea* spp.	0	0	0	0	0	0	0	0	0	1								
	White warehou	*Seriolella caerulea*	0	0	0	< 1	1	2	1	< 1	< 1								1	
	Silver warehou	*Seriolella punctata*	< 1	< 1	< 1	3	7	10	8	7	9								1	
	Mirror dory	*Zenopsis nebulosa*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1								1	
	John dory	*Zeus faber*	< 1	< 1	< 1	1	1	1	< 1	< 1	< 1								3	1
	34–Miscellaneous demersal fishes		**9**	**13**	**31**	**94**	**117**	**110**	**75**	**66**	**57**									
35	Pacific sardine	*Sardinops sagax*	0	0	0	0	< 1	1	< 1	< 1	< 1	1								
	35–Herrings, sardines, anchovies		**0**	**0**	**0**	**0**	**< 1**	**1**	**< 1**	**< 1**	**< 1**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 81

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
36	Striped marlin	*Kajikia audax*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			1						
	Australian bonito	*Sarda australis*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Swordfish	*Xiphias gladius*	0	< 1	1	1	2	3	3	2	2	1								
	36–Tunas, bonitos, billfishes		**0**	**2**	**2**	**2**	**3**	**4**	**3**	**2**	**3**									
37	Eastern sea garfish	*Hyporhamphus australis*	0	0	0	0	0	0	0	0	0		1							
	Bluefish	*Pomatomus saltatrix*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1								
	White trevally	*Pseudocaranx dentex*	< 1	3	5	4	4	4	3	< 1	< 1		2							
	Blue mackerel	*Scomber australasicus*	0	0	< 1	3	9	11	11	9	8		1						1	
	Yellowtail amberjack	*Seriola lalandi*	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					1		1	2	
	Greenback horse mackerel	*Trachurus declivis*	0	0	< 1	37	29	10	5	8	7								1	
	Yellowtail horse mackerel	*Trachurus novaezelandiae*	0	0	0	0	0	0	0	0	0								1	
	Jack and horse mackerels NEI	*Trachurus* spp.	0	< 1	13	21	43	38	44	37	46								2	
	37–Miscellaneous pelagic fishes		**1**	**3**	**19**	**66**	**84**	**63**	**63**	**54**	**61**									
38	Eastern shovelnose ray	*Aptychotrema rostrata*	0	0	0	0	0	0	0	0	0								1	
	Ghost shark	*Callorhinchus milii*	< 1	1	< 1	1	< 1	1	1	1	1								3	
	New Zealand smooth skate	*Dipturus innominatus*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Rough skate	*Dipturus nasutus*	0	0	0	0	0	1	2	1	1								1	
	Tope shark	*Galeorhinus galeus*	< 1	< 1	< 1	3	3	3	3	3	3								2	1
	Gummy shark	*Mustelus antarcticus*	0	0	0	0	0	< 1	< 1	< 1	< 1								1	
	Spotted estuary smooth-hound	*Mustelus lenticulatus*	< 1	< 1	2	3	2	1	1	1	1								4	
	38–Sharks, rays, chimaeras		**1**	**2**	**4**	**7**	**6**	**8**	**8**	**7**	**7**									
42	Blue swimming crab	*Portunus pelagicus*	< 1	< 1	< 1	< 1	< 1	< 1	0	0	0						1			
	Indo-Pacific swamp crab, Orange mud crab	*Scylla* spp., *Scylla serrata*, *Scylla olivacea*	0	0	0	0	0	0	0	0	0		1							
	42–Crabs, sea-spiders		**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**0**	**0**	**0**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 14

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 81

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
43	Butterfly fan lobster, Glabrous fan lobster, Velvet fan lobster	*Ibacus peronii, Ibacus brucei, Ibacus chacei, Ibacus alticrenatus, Ibacus* spp.	0	0	0	0	0	0	< 1	0	< 1					1				
	Red rock lobster	*Jasus edwardsii*	4	6	4	5	3	3	3	3	3		7							
	New Zealand lobster	*Metanephrops challengeri*	0	0	0	0	< 1	< 1	< 1	< 1	1	1	3							
	Green rock lobster	*Sagmariasus verreauxi*	0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		1			1				
	43–Lobsters, spiny-rock lobsters		**4**	**6**	**5**	**5**	**4**	**4**	**4**	**4**	**4**									
45	Jack-knife shrimp	*Haliporoides sibogae*	0	0	0	0	0	0	0	0	0					1				
	Eastern school shrimp	*Metapenaeus macleayi*	0	0	0	0	0	0	< 1	< 1	1	1								
	Eastern king prawn	*Penaeus plebejus*	0	0	0	0	0	0	0	0	0	1								
	45–Shrimps, prawns		**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**1**									
52	Rainbow abalone	*Haliotis iris*	0	0	0	0	0	0	0	0	0		6						1	
	Blacklip abalone	*Haliotis rubra*	0	< 1	< 1	< 1	< 1	< 1	0	0	0					1	3			
	52–Abalones, winkles, conchs		**0**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**0**	**0**	**0**									
53	Chilean oyster	*Ostrea chilensis*	6	9	9	8	2	< 1	< 1	< 1	< 1		1							
	53–Oysters		**6**	**9**	**9**	**8**	**2**	**< 1**	**< 1**	**< 1**	**< 1**									
55	New Zealand scallop	*Pecten novaezelandiae*	0	< 1	4	4	9	3	< 1	< 1	< 1									1
	55–Scallops, pectens		**0**	**< 1**	**4**	**4**	**9**	**3**	**< 1**	**< 1**	**< 1**									
56	Stutchbury's venus	*Austrovenus stutchburyi*	0	0	0	0	< 1	1	1	0	1								2	
	Equal-sized surf clam	*Crassula aequilatera*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Dosinias NEI	*Dosinia* spp.	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Goolwa donax	*Latona deltoides*	0	0	0	0	0	0	0	0	0		1							
	New Zealand geoduck	*Panopea zelandica*	0	0	0	0	0	0	< 1	< 1	< 1							1		
	Pipi wedge clam	*Paphies australis*	0	0	0	< 1	< 1	< 1	< 1	< 1	< 1									1
	Pahpies spp.	*Paphies* spp.	0	0	0	0	0	0	< 1	< 1	< 1								1	
	Large trough shell	*Spisula murchisoni*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	56–Clams, cockles, arkshells		**0**	**0**	**0**	**< 1**	**< 1**	**2**	**1**	**< 1**	**2**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 14

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 81

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
57	Gould's flying squid	*Nototodarus gouldi*	0	0	0	0	0	0	0	0	0					1				
	Hammer octopus	*Octopus australis*	0	0	0	0	0	0	0	0	0					1				
	Southern reef squid	*Sepioteuthis australis*	0	0	0	0	0	0	0	0	0					1				
	57–Squids, cuttlefishes, octopuses		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
76	Longspined sea urchin	*Centrostephanus rodgersii*	0	0	0	0	0	0	0	0	0					1				
	76–Sea-urchins and other echinoderms		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
91	Giant kelp	*Macrocystis pyrifera*	0	0	0	0	0	0	0	0	0							1		
	91–Brown seaweeds		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total selected species groups		**34**	**49**	**147**	**330**	**576**	**440**	**357**	**275**	**277**									
	Total other species groups		**13**	**32**	**102**	**204**	**209**	**222**	**147**	**121**	**86**									
	Total marine capture		**47**	**80**	**249**	**534**	**785**	**661**	**504**	**396**	**363**									
	Total aquaculture		**6**	**8**	**11**	**21**	**71**	**104**	**111**	**122**	**119**									
	Total production		**53**	**89**	**261**	**555**	**855**	**765**	**615**	**518**	**481**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 15

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 87

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
32	Blue grenadier	*Macruronus novaezelandiae*	0	0	0	0	0	0	0	0	0			1						
	Southern hake	*Merluccius australis*	0	0	4	44	29	28	18	16	9			1						
	South Pacific hake	*Merluccius gayi*	66	97	166	92	196	125	91	71	88	1		1						
	Southern blue whiting	*Micromesistius australis*	0	0	< 1	3	18	24	12	4	< 1			1						
	32–Cods, hakes, haddocks		**66**	**97**	**171**	**139**	**244**	**178**	**122**	**91**	**97**									
33	Chilhuil sea catfish	*Bagre panamensis*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Red sea catfish	*Bagre pinnimaculatus*	0	0	0	0	0	0	< 1	< 1	1		1							
	Lorna drum	*Callaus deliciosa*	0	0	0	0	0	2	8	3	3	1	1							
	Armed snook	*Centropomus armatus*	0	0	0	0	0	0	< 1	< 1	< 1	1								
	Blackfin snook	*Centropomus medius*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	White snook	*Centropomus viridis*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Peruvian weakfish	*Cynoscion analis*	0	3	4	5	7	3	5	3	6		1							
	Cachema weakfish	*Cynoscion phoxocephalus*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Pacific goliath grouper	*Epinephelus quinquefasciatus*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Pacific cornetfish	*Fistularia corneta*	0	0	0	0	0	2	6	3	3		1							
	Cabinza grunt	*Isacia conceptionis*	1	1	3	2	2	4	3	1	2	1								
	Spotted rose snapper	*Lutjanus guttatus*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Pacific red snapper	*Lutjanus peru*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Panama kingcroaker	*Menticirrhus panamensis*	0	0	0	0	0	0	0	0	0			1						
	Flathead grey mullet	*Mugil cephalus*	0	0	0	0	0	0	< 1	< 1	6	1								
	Punctuated snake-eel	*Ophichthus remiger*	0	0	0	0	0	0	1	3	2		1							
	Peruvian rock seabass	*Paralabrax humeralis*	3	5	3	5	4	2	2	4	4		1							
	Brown sea catfish	*Sciades dowii*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	33–Miscellaneous coastal fishes		**4**	**8**	**10**	**12**	**12**	**14**	**26**	**21**	**30**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 15
CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 87

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
34	Pacific bearded brotula	*Brotula clarkae*	0	0	0	0	0	0	< 1	0	< 1		1							
	Patagonian toothfish	*Dissostichus eleginoides*	0	0	< 1	3	14	6	4	2	2						1			
	Pink cusk-eel	*Genypterus blacodes*	0	< 1	3	9	7	5	2	1	< 1			2						
	Pacific tripletail	*Lobotes pacifica*	0	0	0	0	0	< 1	< 1	< 1	< 1			1						
	Largehead hairtail	*Trichiurus lepturus*	0	0	0	0	0	0	< 1	< 1	< 1								1	
	34–Miscellaneous demersal fishes		**0**	**< 1**	**3**	**13**	**21**	**11**	**6**	**4**	**4**									
35	Longnose anchovy	*Anchoa nasus*	0	0	0	0	109	28	10	< 1	< 1						1			
	Pacific anchoveta	*Cetengraulis mysticetus*	0	0	2	37	62	38	19	6	9	1					1			
	Anchoveta (= Peruvian anchovy)	*Engraulis ringens*	345	8 166	4 605	2 147	7 059	8 427	4 875	4 896	5 876	1	2	1						
	Red-eye round herring	*Etrumeus sadina*	0	0	0	0	12	2	4	< 1	2		1				1			
	Thread herrings NEI	*Opisthonema* spp.	0	0	0	0	0	0	0	0	11	1								
	Pacific sardine	*Sardinops sagax*	0	3	807	4 575	2 031	54	< 1	4	1						1			
	Falkland sprat	*Sprattus fuegensis*	0	0	0	0	0	19	21	17	16			1	1					
	Araucanian herring	*Strangomera bentincki*	14	58	81	47	403	472	499	264	344		1				1			
	35–Herrings, sardines, anchovies		**359**	**8 227**	**5 496**	**6 807**	**9 677**	**9 039**	**5 430**	**5 187**	**6 260**									
36	Frigate tuna	*Auxis thazard*	0	0	0	0	0	0	0	0	18				1					
	Frigate and bullet tunas	*Auxis thazard, A. rochei*	0	0	0	0	8	18	53	42	39		1							
	Eastern Pacific bonito	*Sarda chiliensis*	63	84	29	18	25	11	57	124	95						1			
	Pacific sierra	*Scomberomorus sierra*	< 1	< 1	1	1	1	< 1	1	3	3		1							
	36–Tunas, bonitos, billfishes		**64**	**84**	**30**	**20**	**34**	**29**	**111**	**169**	**154**									
37	Southern rays bream	*Brama australis*	0	0	0	0	3	8	28	38	43				1					1
	Green jack	*Caranx caballus*	0	0	0	0	0	0	< 1	< 1	< 1		1							
	Pacific crevalle jack	*Caranx caninus*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Pacific bumper	*Chloroscombrus orqueta*	0	0	0	0	3	5	2	5	4						1			
	Common dolphinfish	*Coryphaena hippurus*	0	0	< 1	2	14	41	59	53	77	1		1			1			
	Shortfin scad	*Decapterus macrosoma*	0	0	0	0	0	9	22	8	16			1						
	Chilean silverside	*Odontesthes regia*	< 1	1	< 1	1	1	1	< 1	< 1	< 1		1							
	Pacific chub mackerel	*Scomber japonicus*	5	16	315	306	339	465	187	313	461	1	2							

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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APPENDIX II

APPENDIX II, TABLE 15

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 87

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
37	Peruvian moonfish	*Selene peruviana*	0	0	0	0	0	2	3	8	27		1				1			
	Yellowtail amberjack	*Seriola lalandi*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Fortune jack	*Seriola peruana*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	Chilean jack mackerel	*Trachurus murphyi*	3	16	474	2 293	3 519	1 802	512	744	828	1								
	37–Miscellaneous pelagic fishes		**9**	**33**	**790**	**2 602**	**3 879**	**2 333**	**813**	**1 170**	**1 458**									
38	Yellownose skate	*Dipturus chilensis*	0	0	0	0	0	0	0	0	< 1						1			
	38–Sharks, rays, chimaeras		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**< 1**									
43	Red rock lobster	*Jasus edwardsii*	0	0	0	0	0	0	0	0	0			1					1	
	43–Lobsters, spiny-rock lobsters		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
44	Blue squat lobster	*Grimothea johni*	0	0	< 1	5	6	3	4	3	3	1	1							
	Carrot squat lobster	*Grimothea monodon*	0	0	3	4	6	3	6	6	6		2							
	Southern king crab	*Lithodes santolla*	0	< 1	< 1	2	2	3	5	4	4							1		2
	44–King crabs, squat-lobsters		**0**	**< 1**	**4**	**12**	**14**	**9**	**15**	**13**	**14**									
45	Chilean nylon shrimp	*Heterocarpus reedi*	1	7	8	4	9	4	5	4	4	1								
	Crystal shrimp	*Penaeus brevirostris*	0	0	0	0	0	< 1	< 1	< 1	< 1		1							
	Yellowleg shrimp	*Penaeus californiensis*	0	0	0	0	< 1	< 1	< 1	< 1	1			1						
	Western white shrimp	*Penaeus occidentalis*	0	0	1	2	1	< 1	< 1	0	< 1			1						
	Penaeus shrimps NEI	*Penaeus* spp.	< 1	< 1	< 1	4	11	10	27	37	34				1					
	Whiteleg shrimp	*Penaeus vannamei*	2	5	6	8	8	< 1	< 1	1	2						1			
	Titi shrimp	*Protrachypene precipua*	0	0	0	0	0	2	6	5	11						1			
	Kolibri shrimp	*Solenocera agassizii*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			1						
	Pacific seabob	*Xiphopenaeus riveti*	0	1	3	2	2	1	< 1	< 1	< 1			1						
	45–Shrimps, prawns		**3**	**14**	**19**	**20**	**31**	**19**	**41**	**50**	**54**									
52	False abalone	*Concholepas concholepas*	3	4	9	15	7	4	3	2	3						1			
	52–Abalones, winkles, conchs		**3**	**4**	**9**	**15**	**7**	**4**	**3**	**2**	**3**									
54	Cholga mussel	*Aulacomya atra*	13	18	24	18	17	14	10	7	7						1			
	54–Mussels		**13**	**18**	**24**	**18**	**17**	**14**	**10**	**7**	**7**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

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CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREA 87

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
55	Peruvian calico scallop	*Argopecten purpuratus*	< 1	< 1	3	13	8	16	36	48	54						1			
	55–Scallops, pectens		**< 1**	**< 1**	**3**	**13**	**8**	**16**	**36**	**48**	**54**									
56	Black ark	*Anadara tuberculosa*	0	0	0	0	0	0	< 1	< 1	< 1			1						
	56–Clams, cockles, arkshells		**0**	**0**	**0**	**0**	**0**	**0**	**< 1**	**< 1**	**< 1**									
57	Patagonian squid	*Doryteuthis gahi*	0	< 1	< 1	< 1	4	14	10	2	< 1						1			
	Jumbo flying squid	*Dosidicus gigas*	0	< 1	< 1	2	71	520	886	905	996		1	1						
	Octopuses, etc. NEI	*Octopodidae*	0	0	< 1	2	5	4	5	3	3						1			
	57–Squids, cuttlefishes, octopuses		**0**	**< 1**	**< 1**	**5**	**79**	**538**	**901**	**910**	**1 000**									
76	Chilean sea urchin	*Loxechinus albus*	3	3	6	20	39	46	33	38	27			2			1			
	76–Sea-urchins and other echinoderms		**3**	**3**	**6**	**20**	**39**	**46**	**33**	**38**	**27**									
	Total selected species groups		**524**	**8 490**	**6 565**	**9 693**	**14 061**	**12 250**	**7 548**	**7 710**	**9 163**									
	Total other species groups		**83**	**143**	**275**	**463**	**651**	**528**	**417**	**369**	**406**									
	Total marine capture		**607**	**8 633**	**6 840**	**10 157**	**14 712**	**12 779**	**7 966**	**8 079**	**9 569**									
	Total aquaculture		**< 1**	**< 1**	**2**	**46**	**268**	**787**	**1 523**	**2 329**	**2 407**									
	Total production		**607**	**8 633**	**6 842**	**10 203**	**14 980**	**13 566**	**9 489**	**10 408**	**11 977**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

APPENDIX II, TABLE 16

CAPTURE FISHERIES PRODUCTION OF AQUATIC ANIMALS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION IN AREAS 48, 58 AND 88

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year) 1950s	1960s	1970s	1980s	1990s	2000s	2010s	Production 2020	2021	Tier 1 U	M	O	Tier 2 U	M	O	Tier 3 U	M	O
34	Mackerel icefish	*Champsocephalus gunnari*	0	0	32	47	1	2	< 1	< 1	< 1	2								
	Patagonian toothfish	*Dissostichus eleginoides*	0	0	< 1	1	3	4	2	2	2	4	1							
	Antarctic toothfish	*Dissostichus mawsoni*	0	0	0	0	< 1	< 1	< 1	< 1	< 1	1			2	2				
	34–Miscellaneous demersal fishes		**0**	**0**	**33**	**49**	**4**	**7**	**3**	**2**	**2**									
46	Antarctic krill	*Euphausia superba*	0	0	48	304	160	120	249	460	368	3								
	46–Krill, planktonic crustaceans		**0**	**0**	**48**	**304**	**160**	**120**	**249**	**460**	**368**									
	Total selected species groups		**0**	**0**	**81**	**353**	**165**	**127**	**252**	**463**	**370**									
	Total other species groups		**0**	**11**	**142**	**128**	**26**	**14**	**15**	**14**	**16**									
	Total marine capture		**0**	**11**	**224**	**481**	**191**	**141**	**267**	**477**	**387**									
	Total aquaculture		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total production		**0**	**11**	**224**	**481**	**191**	**141**	**267**	**477**	**387**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Note: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, highly migratory tunas and sharks, aquatic products (corals, pearls, shells and sponges) and algae.

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**. Licence: CC-BY-4.0.

APPENDIX II, TABLE 17

CAPTURE FISHERIES PRODUCTION OF TUNAS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
36	Skipjack tuna	*Katsuwonus pelamis*	133	185	459	828	1 473	2 143	2 742	2 785	2 872	5								
	Albacore	*Thunnus alalunga*	97	170	178	159	179	163	158	179	154	5		1						
	Yellowfin tuna	*Thunnus albacares*	127	226	452	706	1 113	1 299	1 368	1 576	1 550	2	2							
	Southern bluefin tuna	*Thunnus maccoyii*	17	60	43	34	15	14	13	16	17			1						
	Bigeye tuna	*Thunnus obesus*	10	68	168	242	377	429	387	378	348	1	3							
	Pacific bluefin tuna	*Thunnus orientalis*	23	28	22	19	18	21	13	13	16			1						
	Atlantic bluefin tuna	*Thunnus thynnus*	33	25	20	23	40	32	19	38	39		2							
	36–Tunas, bonitos, billfishes		**440**	**763**	**1 341**	**2 011**	**3 214**	**4 101**	**4 700**	**4 984**	**4 997**									
	Total selected species groups		**440**	**763**	**1 341**	**2 011**	**3 214**	**4 101**	**4 700**	**4 984**	**4 997**									
	Total other species groups		**153**	**233**	**237**	**252**	**236**	**239**	**221**	**146**	**206**									
	Total marine capture		**593**	**996**	**1 578**	**2 263**	**3 450**	**4 340**	**4 921**	**5 130**	**5 203**									
	Total aquaculture		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total production		**593**	**996**	**1 578**	**2 263**	**3 450**	**4 340**	**4 921**	**5 130**	**5 203**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: **www.fao.org/fishery/en/statistics/software/fishstatj**.

APPENDIX II, TABLE 18

CAPTURE FISHERIES PRODUCTION OF SHARKS (THOUSAND TONNES, LIVE WEIGHT EQUIVALENT) AND STATUS OF EXPLOITATION

ISSCAAP code	ASFIS name	ASFIS scientific name	Production (average per year)							Production		Tier 1			Tier 2			Tier 3		
			1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020	2021	U	M	O	U	M	O	U	M	O
38	Pelagic thresher	*Alopias pelagicus*	0	0	0	0	0	0	< 1	< 1	< 1				1					
	Thresher sharks NEI	*Alopias* spp.	< 1	< 1	< 1	< 1	2	3	5	6	5					1				
	Silky shark	*Carcharhinus falciformis*	0	0	0	< 1	13	8	6	7	5	1	2	1						
	Oceanic whitetip shark	*Carcharhinus longimanus*	0	0	0	0	< 1	< 1	< 1	< 1	< 1			1		1				
	Shortfin mako	*Isurus oxyrinchus*	0	0	0	< 1	2	7	9	7	6	1	1	3						
	Porbeagle	*Lamna nasus*	2	4	2	< 1	1	< 1	< 1	< 1	< 1			4						
	Blue shark	*Prionace glauca*	< 1	< 1	1	3	16	56	120	112	105	3	2	1						
	38–Sharks, rays, chimaeras		**2**	**5**	**3**	**4**	**35**	**75**	**141**	**133**	**122**									
	Total selected species groups		**2**	**5**	**3**	**4**	**35**	**75**	**141**	**133**	**122**									
	Total other species groups		**1**	**9**	**11**	**3**	**4**	**14**	**25**	**19**	**18**									
	Total marine capture		**3**	**13**	**14**	**8**	**38**	**89**	**165**	**152**	**140**									
	Total aquaculture		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**									
	Total production		**3**	**13**	**14**	**8**	**38**	**89**	**165**	**152**	**140**									

U = Underfished, M = Maximally sustainably fished, O = Overfished

Sources: FAO estimates and FAO. 2024. FishStat: Global capture production 1950–2022. [Accessed on 15 November 2024]. In: FishStatJ. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

This publication presents an updated methodology, assessment and review of the current status of the world's marine fishery resources. It is based primarily on stock assessments and complementary information, and official catch statistics through to 2021. The introductory and methodology chapters set out the wider context, highlighting evolutions in the landscape of fisheries and stock assessment capacities since the previous edition of this report in 2011. The updated FAO methodology for assessing the state of stocks is presented in detail. A global overview chapter explores major trends, while regional chapters cover the status of stocks across the FAO Major Fishing Areas. Special sections address key issues such as tunas and tuna-like species, deep-sea fisheries in areas beyond national jurisdiction, and highly migratory sharks. Summary tables for each species grouping used in this assessment present the number of stocks assessed, their sustainability classification, and their tier based on the availability and quality of information. The document aims to provide policymakers, academia, civil society, fishers and managers of fishery resources with a comprehensive, objective, and global review of the state of world marine fishery resources.

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