

Potential future sources

of raw material:

Whats new?




Mike St. John

Danish Technical University

Department for Aquatic Resources



A potential major new resource for utilization



nature
COMMUNICATIONS

☰ Menu

[nature.com](#) ▶ [journal home](#) ▶ [archive by date](#) ▶ [february](#) ▶ [full text](#)

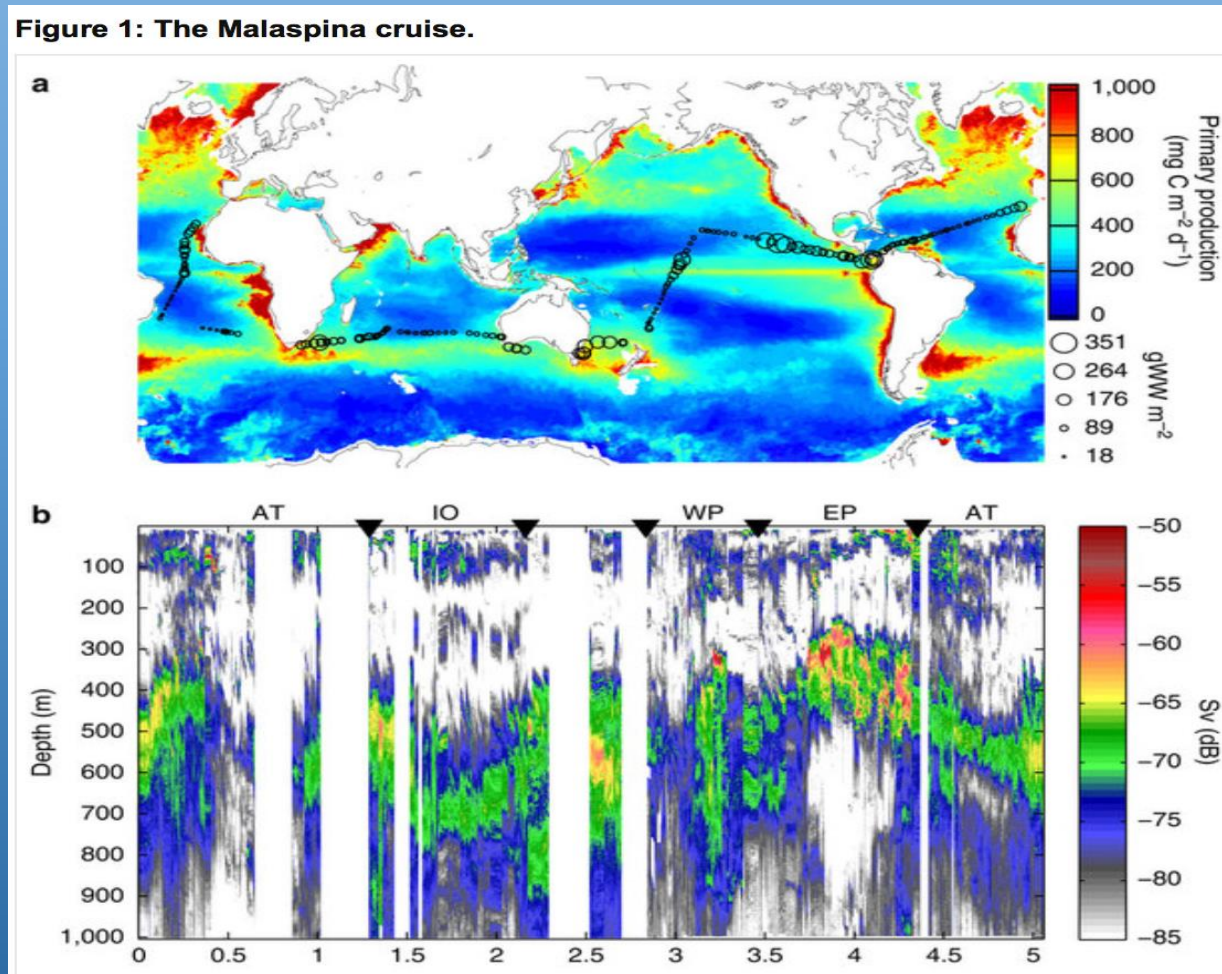
NATURE COMMUNICATIONS | ARTICLE **OPEN**  

Large mesopelagic fishes biomass and trophic efficiency in the open ocean

Xabier Irigoien, T. A. Klevjer, A. Røstad, U. Martinez, G. Boyra, J. L. Acuña, A. Bode, F. Echevarria, J. I. Gonzalez-Gordillo, S. Hernandez-Leon, S. Agusti, D. L. Aksnes, C. M. Duarte & S. Kaartvedt

Xabier Irigoien et al, 2014 NATURE Communications. *Large mesopelagic fishes biomass and high trophic efficiency in the open ocean*

_ recent acoustic observations suggest a biomass of circa 10 BILLION metric tonnes



Mesopelagic Fish Globally

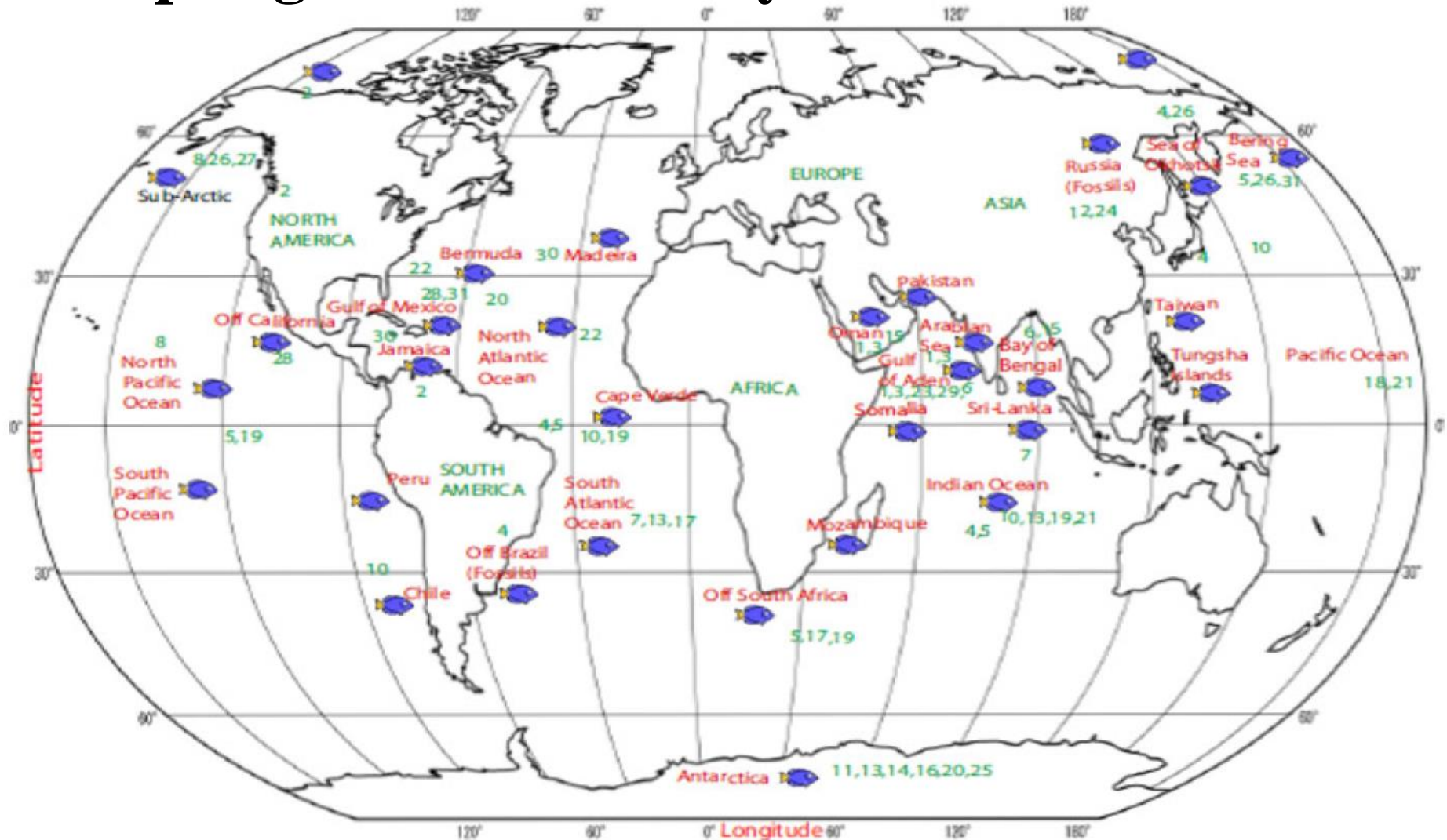
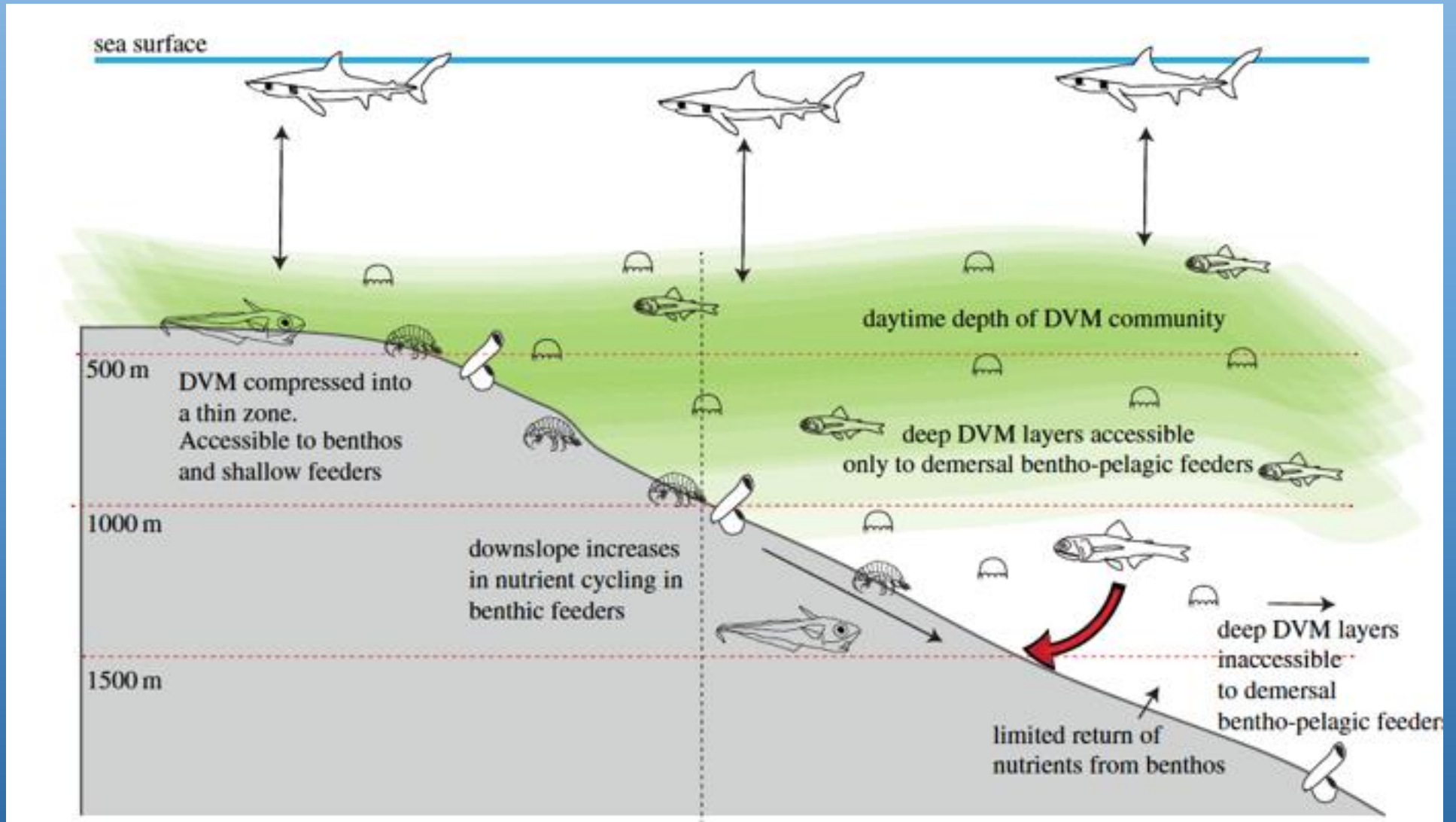


Fig. 3 World map of possible global distribution of myctophids species (marked as numbers) based on literature survey—Refer Table 1 for serial numbers against each species (Created using Adobe Illustrator)

Mesopelagics: Hard to catch but.....



What a catch looks like

St. John et al 2016



FIGURE 1 | Representative sample of mesopelagic fish including *Maurolicus muelleri*, *Sergestes arcticus*, and *Benthosema glaciale* and plankton e.g., *Meganyctiphanes norvegica* in the deep scatter layers of the Irminger Sea in November 2013.

Blue Growth from Mesopelagics Nutrition for Humans



Fish Meal Prices



Data from FAO and IFFO

Mesopelagic Fish Biomass = circa 10 billion metric tonnes

Human population = 7.5 billion

Or circa 1.3 metric tonnes of mesopelagic fish biomass per human on the planet.

- Fish meal conversion factors of Naylor et al. (2009; i.e., raw material input: aquaculture circa 25% conversion efficiency
- Global aquaculture production = 67 million tons (FAO, 2014)
 - **Requires circa 2.7 percent of global estimate of mesopelagic fish biomass**
- Assume that 50% of the existing biomass (5 billion tons) goes to aquaculture
 - 5 billion tons of mesopelagic biomass = 1.25 billion tons of food for humans
 - **Human population circa 7.5 billion = 4.6 kg of fish biomass per person per day**
- St. John et al 2016 *Frontiers in Marine Science*

Blue Growth: Pharmaceuticals from the Mesopelagic

SCIENCE FOR THE CURIOUS
Discover

[MAGAZINE](#) | [BLOGS](#) | [TOPICS](#) | [PHOTOS](#) | [SEARCH](#) | [RSS](#) 

TOPICS

[Personal Health](#) | [Aging](#) | [Sex & Reproduction](#) | [Biotechnology](#) | [Genes & Health](#) |
[Vaccines & Drugs](#) | [Infectious Diseases](#) | [Medical Technology](#) | [Cancer](#) | [Nutrition](#) |
[Mental Health](#) | [Obesity](#)

[Home](#) » [March](#) » [Drugs From the Sea](#)

FROM THE MARCH 1999 ISSUE

Drugs From the Sea

There's only one place left to find the next wave of supermedicines. Fortunately, it's where we should have been looking all along

The marine environment has a vast array of functional chemicals and polymers...

Millions of diverse species



Billions of diverse genes

Genes, proteins, chemicals

Pharmaceuticals
Nutraceuticals

Novel genes

Functional materials

Biomimetics

New materials

Advances in renewables



Other services are affected

- Regional studies have shown as much as 70% of the near the bottom organic carbon in deep oceans is a result of transport by mesopelagic species (Hudson et al., 2014).
- There is a major lack of knowledge of the global composition and distribution of mesopelagic diversity with up to a million undescribed species predicted
- The mesopelagic community supports pelagic species such as tunas, sharks, whales, swordfish as well as seabirds

Caution Caution Caution Caution

Some Blue Knowledge Gaps to fill

To sustainably exploit the mesopelagic community we need knowledge on

(i) Population vital rates (e.g., recruitment, natural mortality and the effects of abiotic and biotic stressors on growth and survival) as the basis for determining population dynamics

★ ★★ **Known Unknown**

(ii) Stock assessments for management of the stocks.

Known Unknown

Some Blue Knowledge Gaps to fill (continued)

(iii) The role of climate change on stocks. **Known Unknowns**

(iv) The role of the community in the food web, and their influence on other fisheries and ecotourism. **Known Unknowns**

(v) The role of individual species and the community on climate regulation . **Known Unknowns**

AND
THE UNKNOWN UNKNOWNs ?????

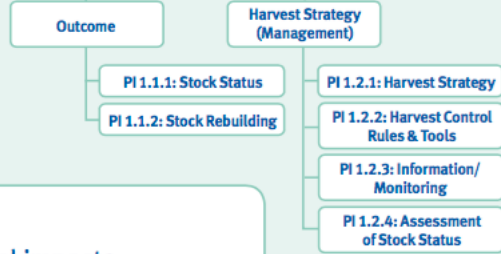


Marine Stewardship Council
Certified sustainable seafood

Many of the previous points are necessary/critical for gaining certification!!!

MSC Fisheries Standard

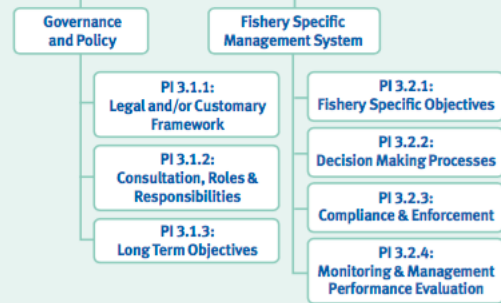
Principle 1
Sustainable fish stocks
Fisheries must operate in a way that allows fishing to continue indefinitely, without over exploiting the resources.



Principle 2
Minimising environmental impacts
Fishing operations need to be managed to maintain the structure, productivity, function and diversity of the ecosystem upon which the fishery depends, including other species and habitats.



Principle 3
Effective management
All fisheries need to meet all local, national and international laws and have an effective management system in place.



Thanks for your attention!



Questions always welcome!!!!