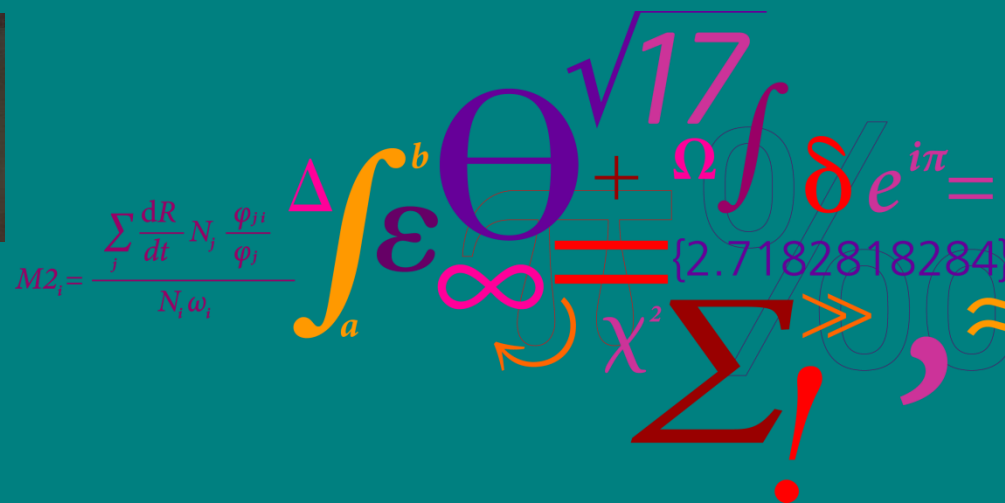


Do forage fisheries impact other parts of the ecosystem?



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How can fisheries impact the ecosystem?

- Direct bycatch mortality
- Disturbance where the forage fish or predators change behaviour in response to fishing



Can fishing decrease stock productivity?

- There are numerous examples of stocks showing prolonged low recruitment after a period of high fishing pressure



- Often these patterns start out with a series of 2-3 poor recruitment years linked to poor climatic conditions and sustained catches
- A few have not returned after fishing was reduced

Do forage fisheries impact stocks much?

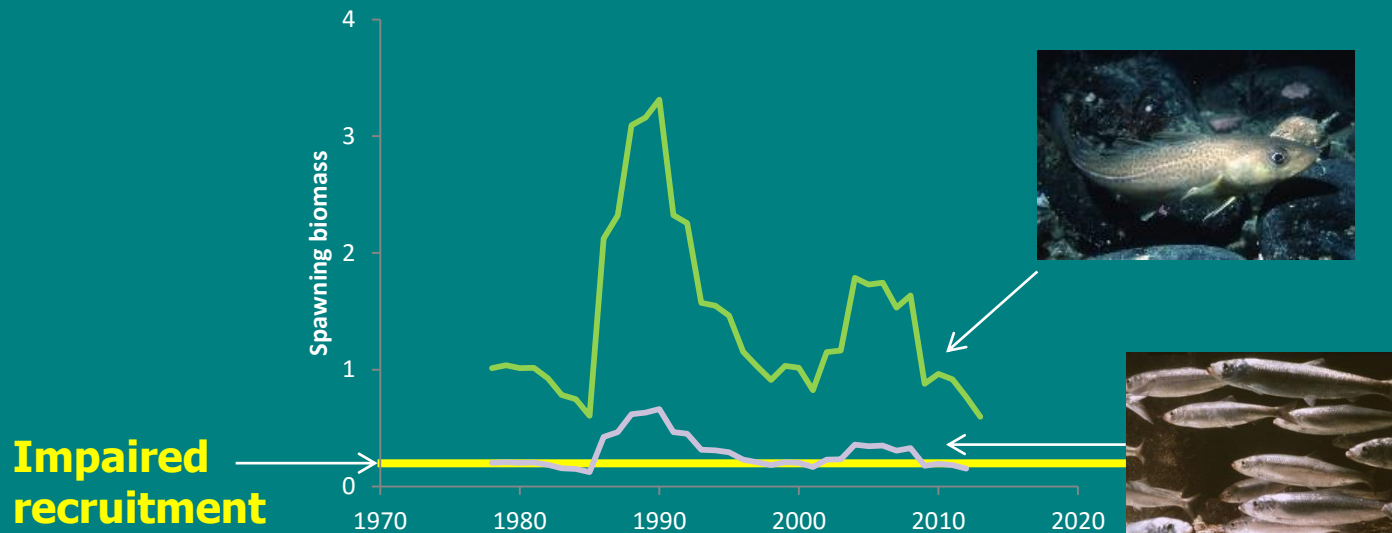
Fishing in % of total mortality for 2-year olds		
North Sea stock	Average 1974-1999	Average 2000-2013
Herring	45%	20%
Northern sandeel	31%	16%
Southern sandeel	44%	45%
Norway pout	45%	10%
Sprat	54%	65%

- **When 50% of the mortality is fishing, half the individuals dying are caught by us**
- **If there are 1000 fish, 275 survive one year (on average across these stocks)**
- **Not catching any would allow 520 to survive one year**
- **For younger fish, the proportion dying from non-fishing is substantially higher**



Do forage fisheries impact stocks much?

- MSY exploitation must never produce more than 1 year in 20 with impaired recruitment
- For stock like cod and haddock, MSY exploitation produces less than 1 year in 100 with impaired recruitment
- For small pelagic stocks, MSY exploitation produces almost exactly 1 year in 20 with impaired recruitment



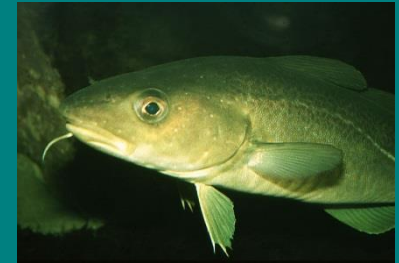
What happens to fish when prey abundance decreases severely?

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Is there any evidence of this happening in real life?

- Strong effects on growth are found in cases where there is little alternative food



- In areas with abundant alternative prey, fish tend to show weak or no relationship with food abundance
- When an effect is found, it is usually linked to low prey abundance or high predator abundance

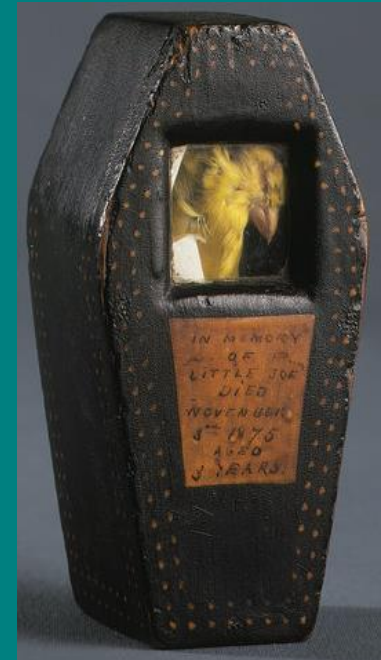
What happens to mammals when prey abundance decreases severely?

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What happens to seabirds when prey abundance decreases severely?

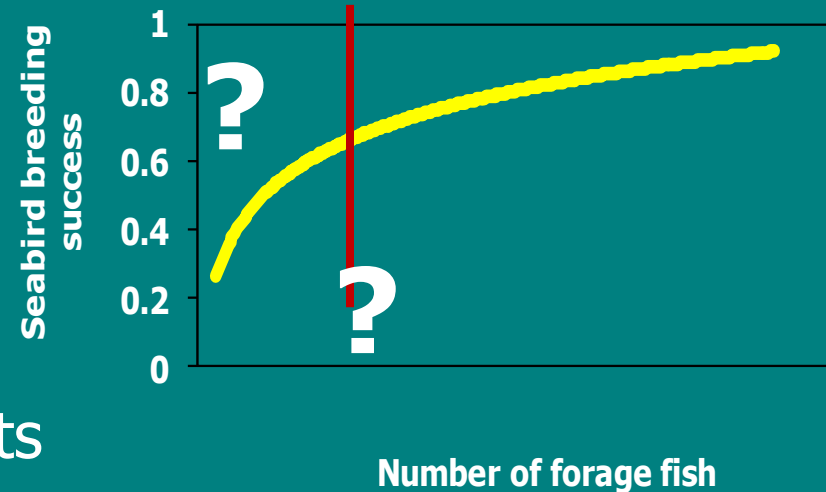
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When are changes severe?



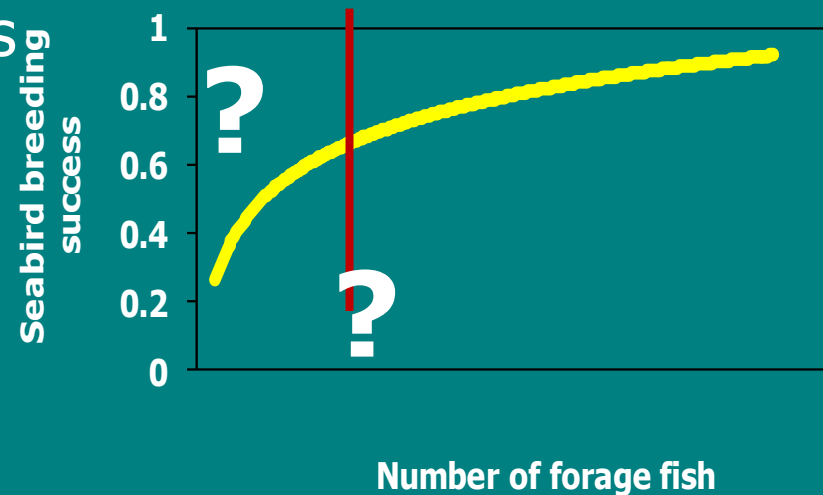
- There is no general rule on when changes in predator performance are 'severe'
- Changes which conflict with objectives such as retaining seabird populations or retaining growth in more valuable predatory fish are usually defined as severe
- Evaluating whether changes results in risk to sustainability of local stocks is done by scientists
- Deciding whether the stock is important is a policy decision



Have severe changes been observed in stocks around Denmark?



- The changes observed in the North Sea have not had a substantial effect on growth of predatory fish (with the possible exception of saithe)
- In the Baltic Sea, cod growth has decreased together with the abundance of sprat and alternative prey
- Changes in Firth of Forth have a demonstrated effect on breeding of kittiwakes and other seabirds



Do we need to worry about the ecosystem in forage fish fisheries?

- Forage fish are more sensitive to the environment than other fish and more variable
- They are less resilient to high fishing pressure than other fish
- Fishing forage fish sustainably carries a risk to recruitment and dependent predators which is higher than in e.g. cod fisheries
- Local effects are always possible
- Generally, stakeholders valuing dependent predators differ from those valuing forage fish, complicating decision making
- Setting priorities is a policy task



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http://ec.europa.eu/fisheries/efs/emff/index_da.htm

Thank you

