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How will Fisheries-Induced Evolutionary Changes Impact Food Security?

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Fish are luxury food in the developed world



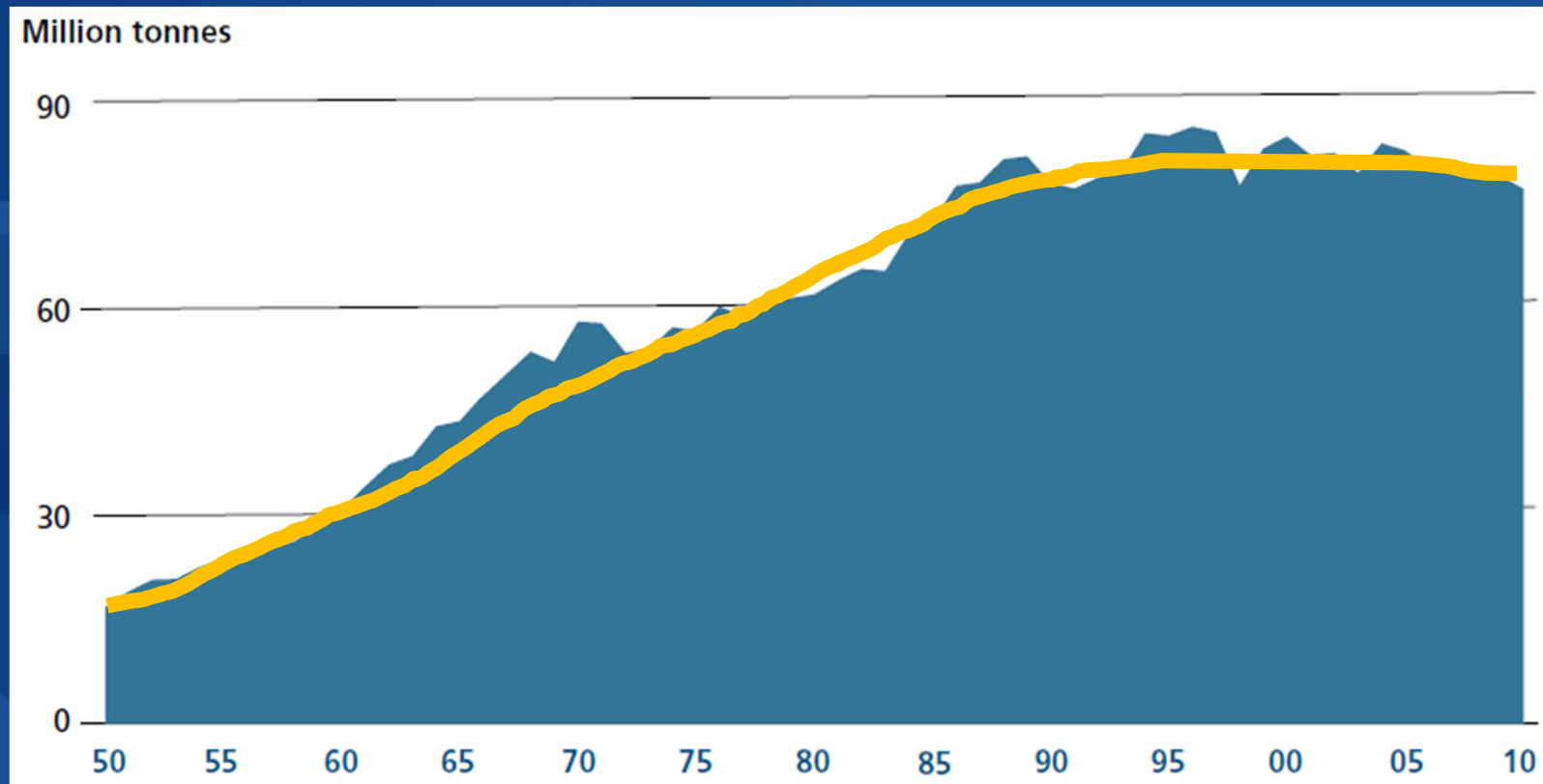
In the developing world, fish are important for food security



In the developing world, fish are important for food security

- In 2009:
 - Fish accounted for 17% of the world population's intake of animal protein
 - Low-income food-deficit countries: 24% of animal protein intake

Marine fishery production is stagnated or declining



Marine fishery production is stagnated or declining

- Can we reverse this trend?
 - Take better care of the resources we have
 - Traditional solutions:
 - Save the small fish
 - Reduce pressure on overfished stocks
- These solutions might not suffice

Fishing has an evolutionary dimension

- Growing big is advantageous



Fishing has an evolutionary dimension

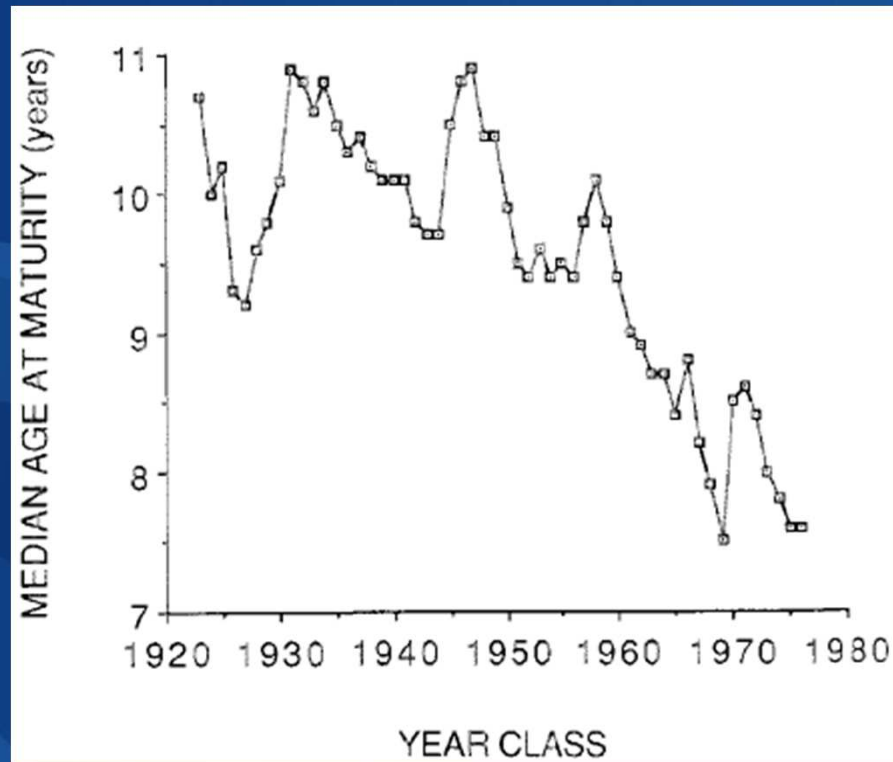
- Growing big is advantageous



... but not in a heavily fished ocean!

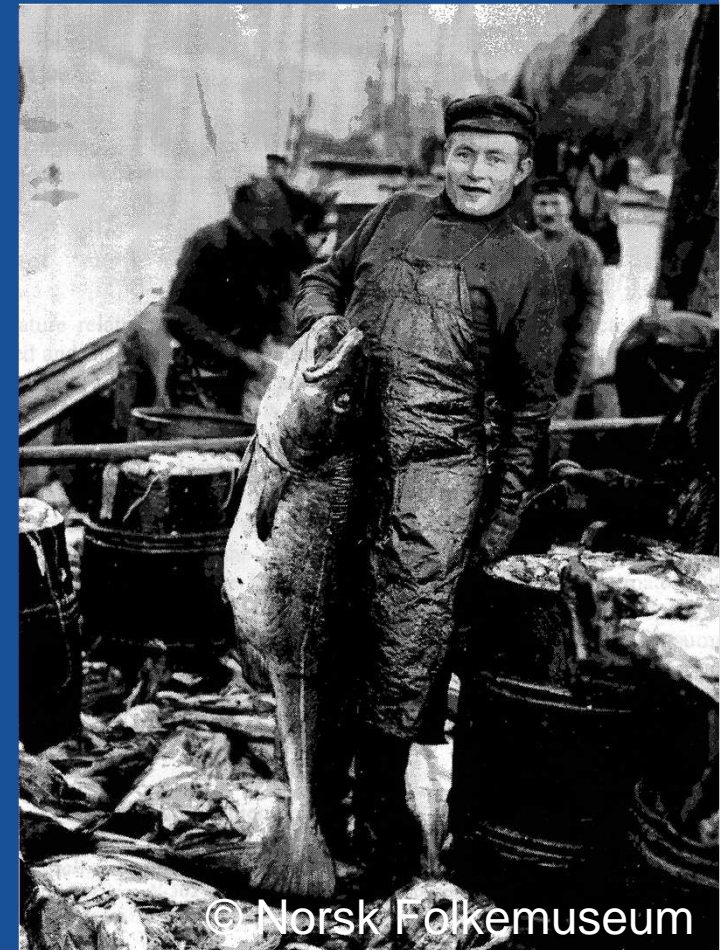
- It takes time – more exposure to risk
 - We like to eat big fish
- Fishing favours small fish that start reproducing early

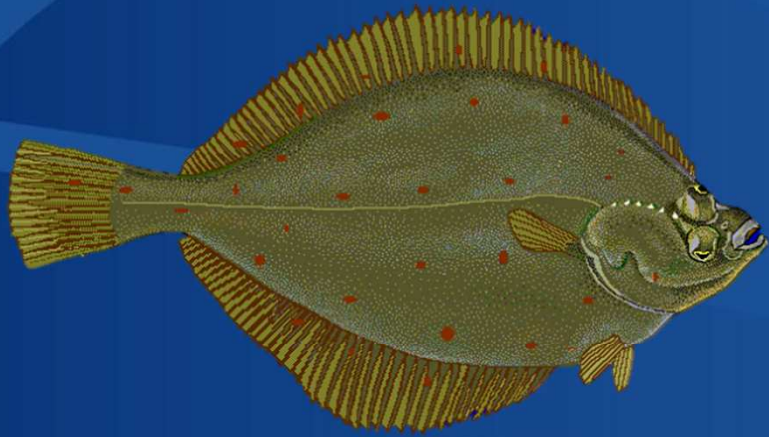
Evidence for fisheries-induced evolution



Jørgensen, T. 1990

J. Cons. Int. Explor. Mer **46**:235

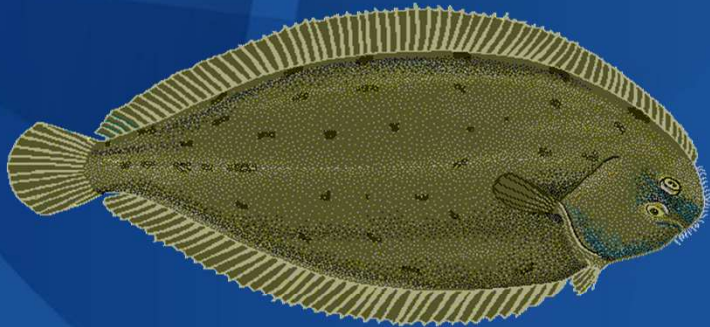




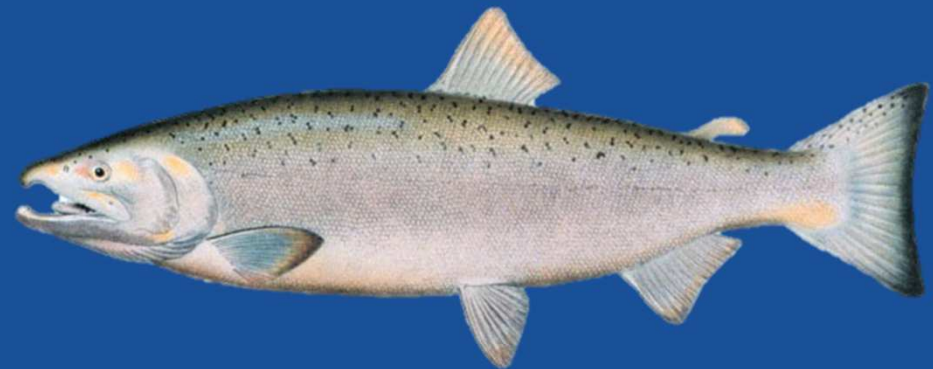
Plaice



Haddock



Sole



Coho salmon

Fish and food?

- Expectations for fish adapted to fishing:
 - They tolerate overfishing better 😊



Fish and food?

- Expectations for fish adapted to fishing:
 - They tolerate overfishing better 😊
 - Individual fish are smaller 😞
 - They produce lower sustainable yield 😞
- These changes are slow but steady



Conclusions

- Fisheries-induced evolution slowly **erodes** the basis for **sustainable, productive fisheries**
- We should minimize such unwanted evolution

Solutions

- Conceptually simple and robust solution:
fishing less
 - ✓ This is often being recommended for many other reasons
 - ✓ Institutional challenges are significant
 - Also quantitative advice needed
 - ✓ Reducing evolution is just one concern
 - ✓ Assess **costs & benefits** of reducing evolution
- Evolutionary Impact Assessments