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# How will Fisheries-Induced Evolutionary Changes Impact Food Security?

Mikko Heino

Evolution & Ecology Program, IIASA

University of Bergen, Norway

Institute of Marine Research, Norway



IIASA, International Institute for Applied Systems Analysis



# Fish are luxury food in the developed world



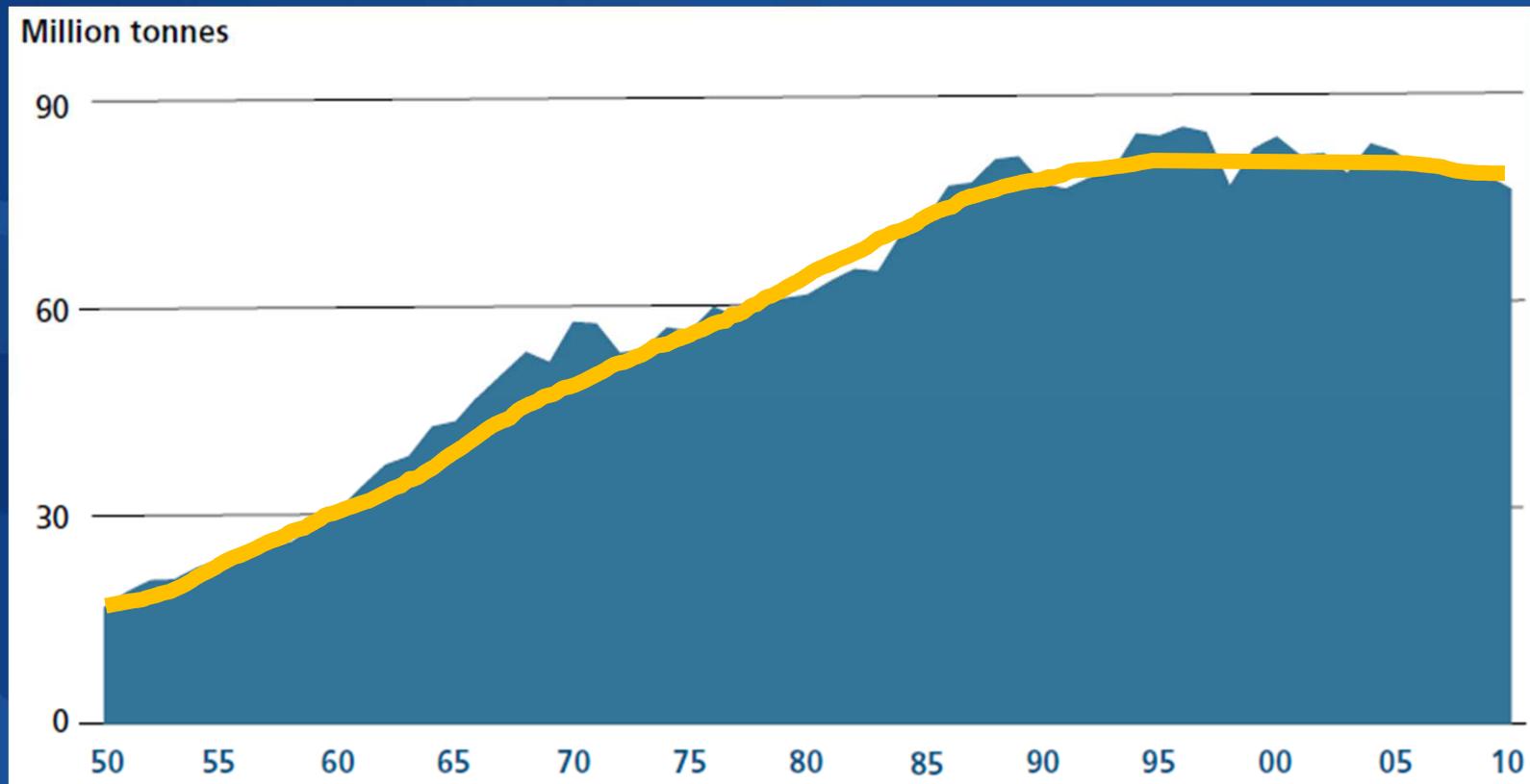
# In the developing world, fish are important for food security



# 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

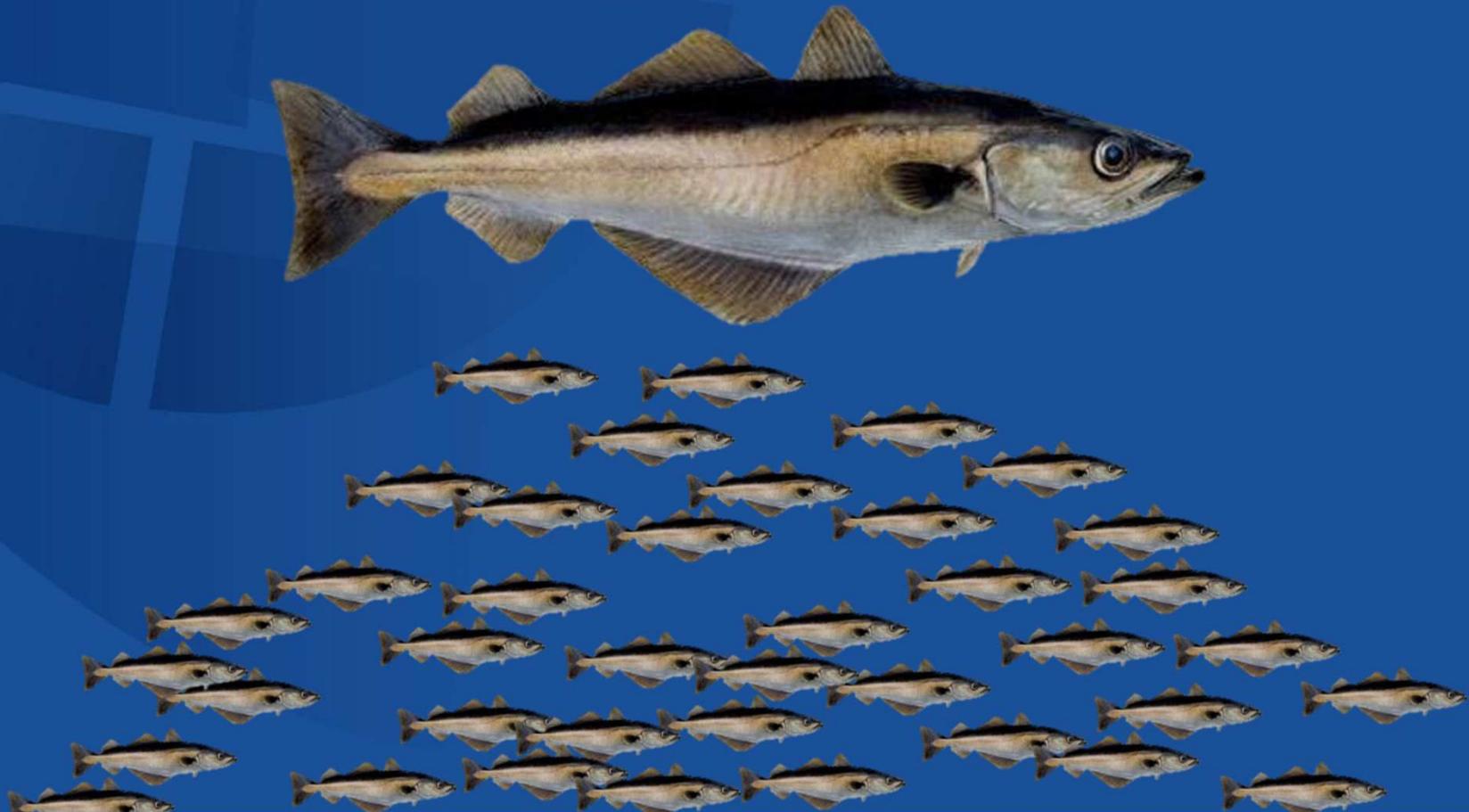


# Marine fishery production is stagnated or declining

- 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



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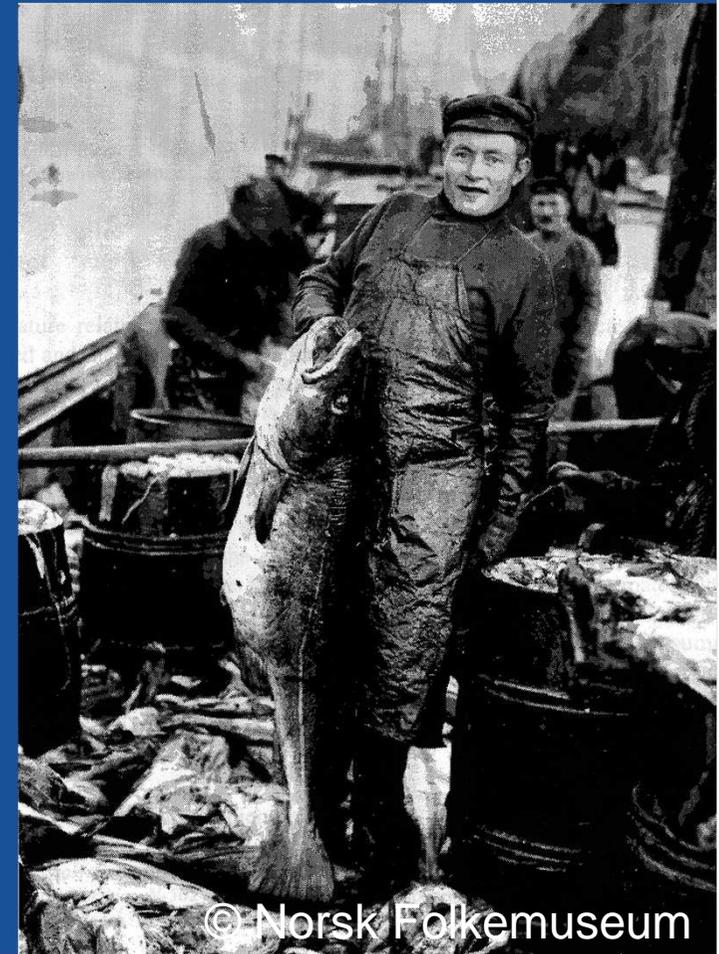
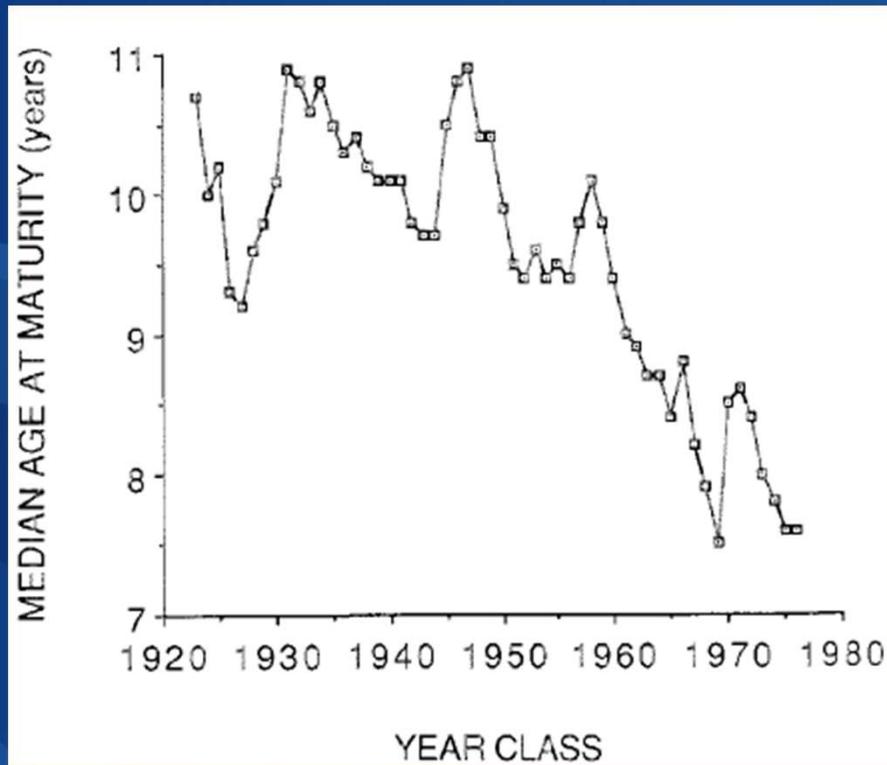
- Growing big is advantageous



... but not in a heavily fished ocean!

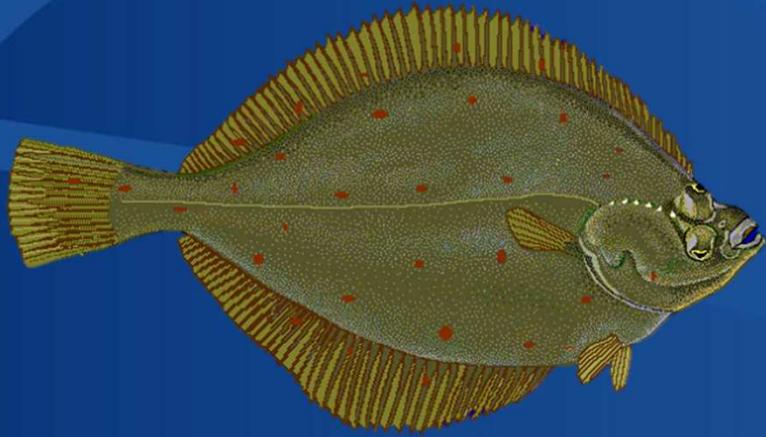
- It takes time – more exposure to risk
  - We like to eat big fish
- Fishing favours small fish that start reproducing early

# Evidence for fisheries-induced evolution



Jørgensen, T. 1990

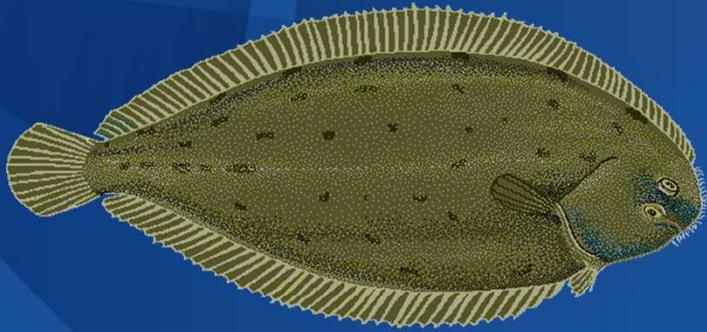
*J. Cons. Int. Explor. Mer* **46**:235



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