Fisheries Management: Arctic principles

Spatial issues in the Arctic Marine Resource Management

Stockholm 4-6 September 2014

Niels Vestergaard

Department of Environmental and Business Economics

Centre for Fisheries & Aquaculture Management & Economics (FAME)

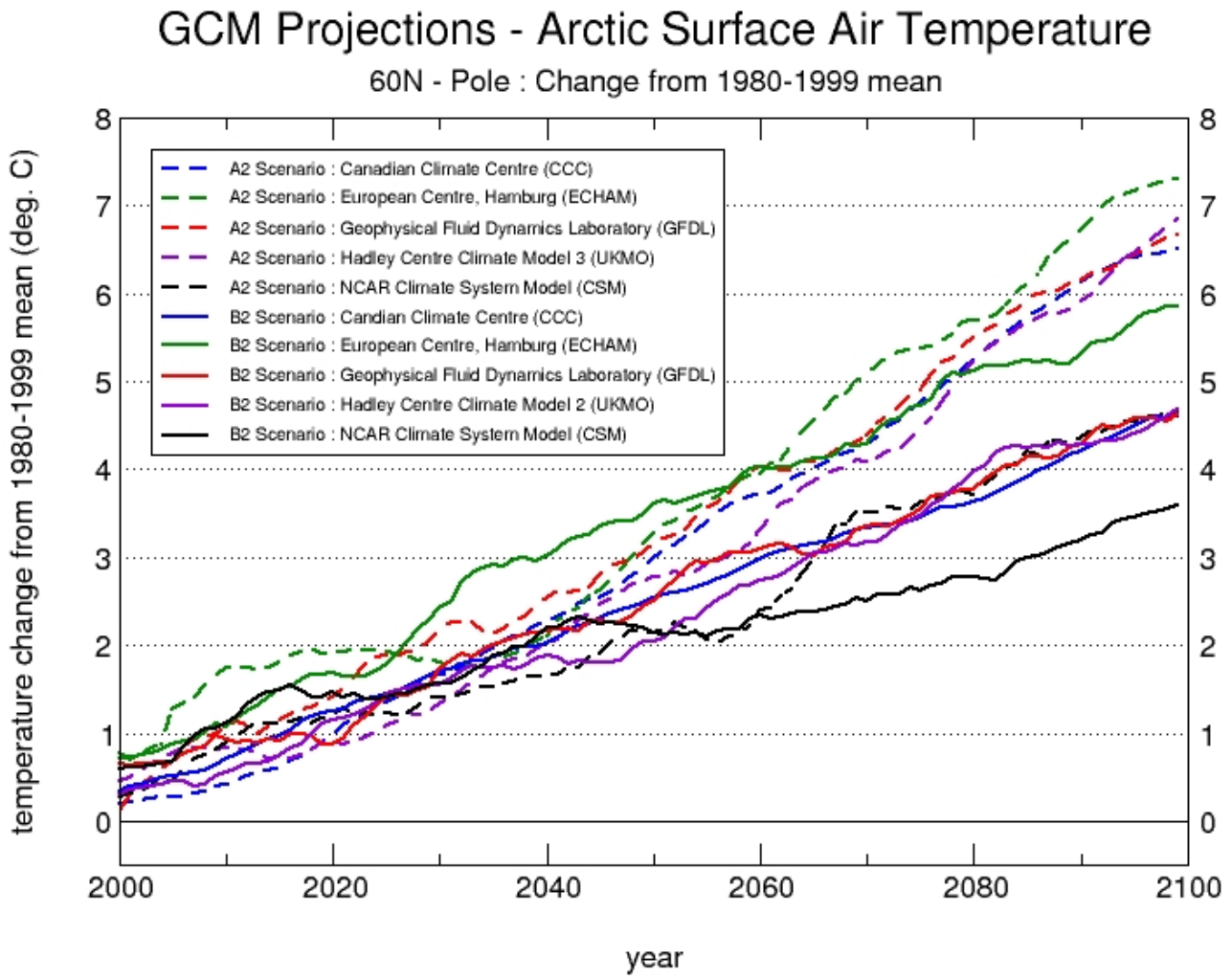
Outline

- Global Warming and the future of Arctic fisheries
- Greenland example from ACIA report
- How has the catches in the Arctic part of North Atlantic developed?
- Other climate impacts: NAO
- Management and Governance challenges!

Global Warming (now called Climate change)

- **Great uncertainty regarding the extent and speed of globale warming**
  - However, temperature rises in the Arctic will substantially exceed the globale rise
  - For sure in the high Arctic, but to the south it is less clear
- **In the North Atlantic, the situation is even more uncertain**
  - Cold-warm water frontiers in this area
- **Temperature will impact other environmental factors**
- **Changes in the configuration of the ocean currents**
- **Changes in habitat conditions**

Arctic Climate Impact Assessment



Impact on fisheries

- **Great uncertainty** about the impact of global warming on the commercial fish stocks and fisheries in the North Atlantic.
- There is **not enough scientific knowledge** to translate predictions of global warming into predications for fish stocks and fisheries with a reasonable degree of confidence.
- This is based on **ACIA work** in 2003-2004.
- I think these conclusions are still valid to a large extent. IPCC has recently included local fish case studies in their reports.

Impact on fisheries

- **Some predictions in terms of directions was made:**
  - Warming might be **beneficial** to the fisheries of the North Atlantic
  - Important species that would probably benefit: **Cod, Herring and Blue whiting**
  - Important species that would decline: **Shrimp and Greenland halibut**
  - Warming will induce a **northward shift** in the range of some species
  - Less ice cover may offer **more access** to fish stocks, both in terms of lower costs and increased fishing

The Greenland off-shore Shrimp fishery

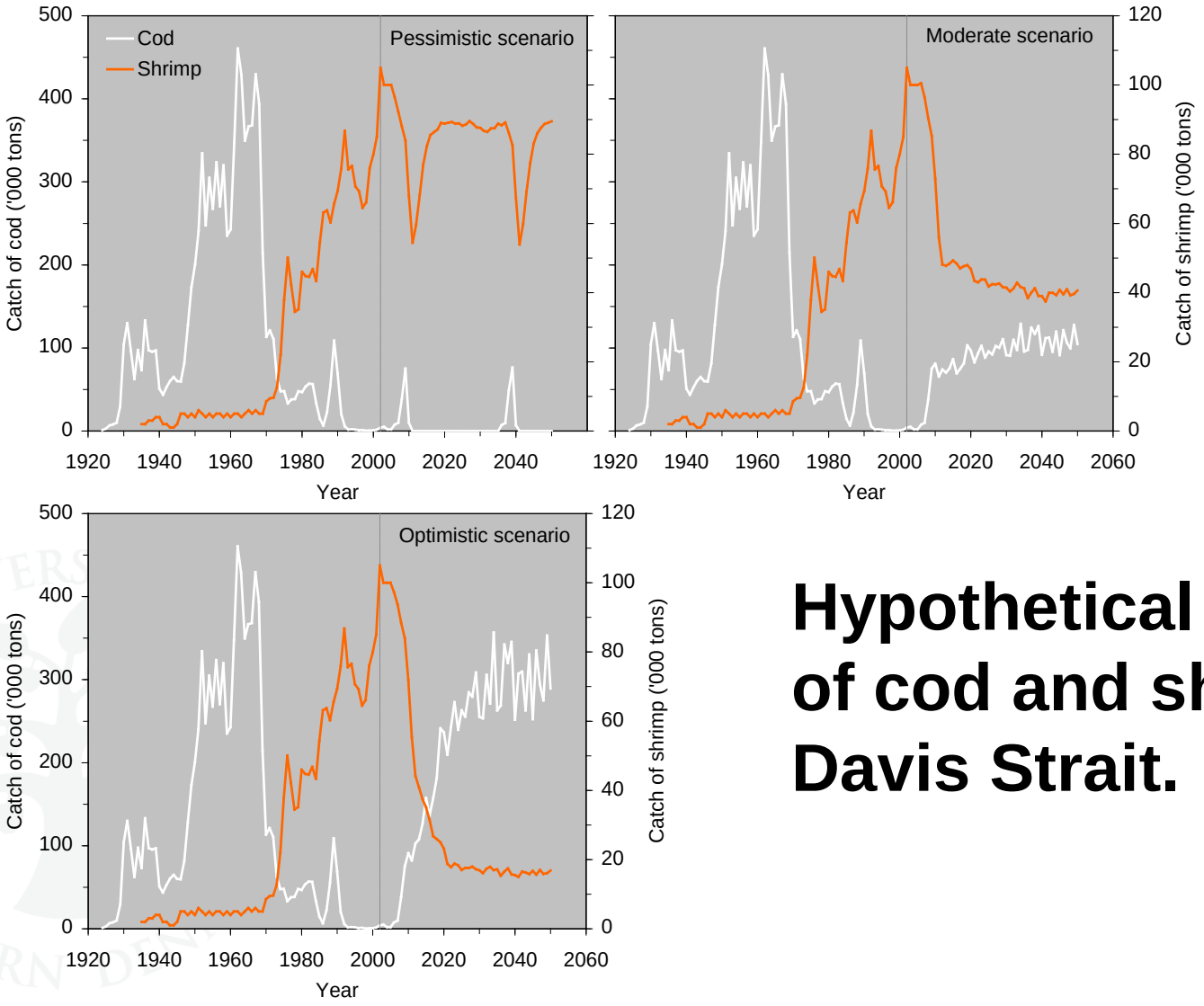
- The fishery covers both **West- and East-Greenland,** but the **main part of the catches** are from **Davis Strait.**
- **The catches** has since 1990 grown from a level about **40.000 tonnes to a recent level around 75.000 tonnes** for the off-shore fleet.
- Around **75% is produced on board and exported** directly to the markets in **Europe and Japan. 25% is landed** for on-shore production in Greenland.
- The **vessels costs well over 100 Mill.kr** each and are **larger than 3000 GT. Size of crew is 25-30 persons.**
- The fishery has been **regulated by ITQs** since 1990**.**

The picture shows the **Shrimp/Prawn trawler, the Polar Nattoralik (2000).** It has **a length of 69.60m and is 15.40m wide.** The Polar Nattoralik **accommodates a crew of 33 people, has a freezing hold capacity of 1,342 m3 and top speed of 16.9 knots. Her factory comprises 3 complete lines** for grading, cooking and freezing of shrimps and a dedicated 'Japan Line' for the packing and freezing of raw Shrimps.

Greenland off-shore shrimp fishery

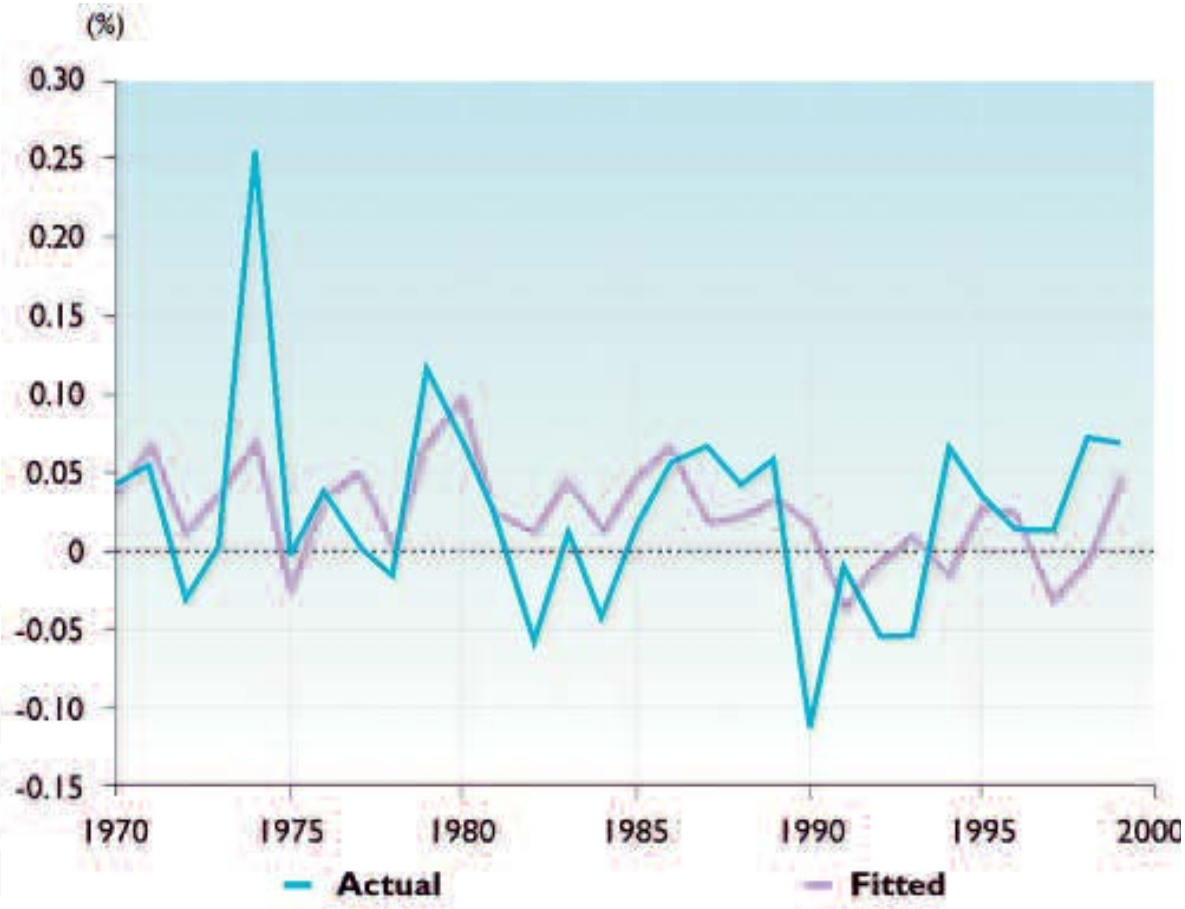
Development in number of vessels:

Number of vessels	1990	2003	2007
Ferskrejetrawlere (small factory trawlers)	17	0	0
Søkogere (factory trawlers)	21	12	11
79-ere (small trawlers)	8	0	0
Ialt	46	12	11



Hypothetical scenario of cod and shrimp in Davis Strait.

GDP in Greenland, 1970–1999: Actual and fitted values.



If fish exports increase permanently by 1%, GDP would increase permanently by 0.286% due to that change.

Figure 12.3.31
Pessimistic Scenario: GDP path relative to the one without global warming
(Index)

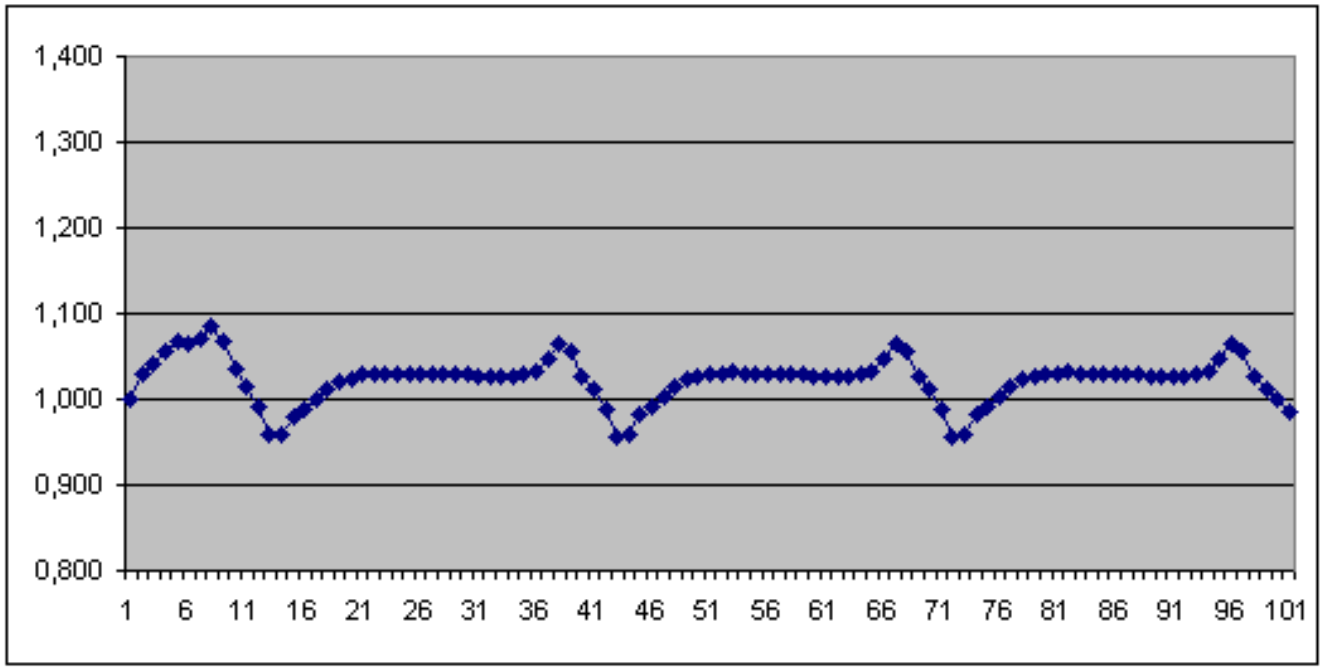


Figure 12.3.32
Moderate Scenario: GDP path relative to the one without global warming
(Index)

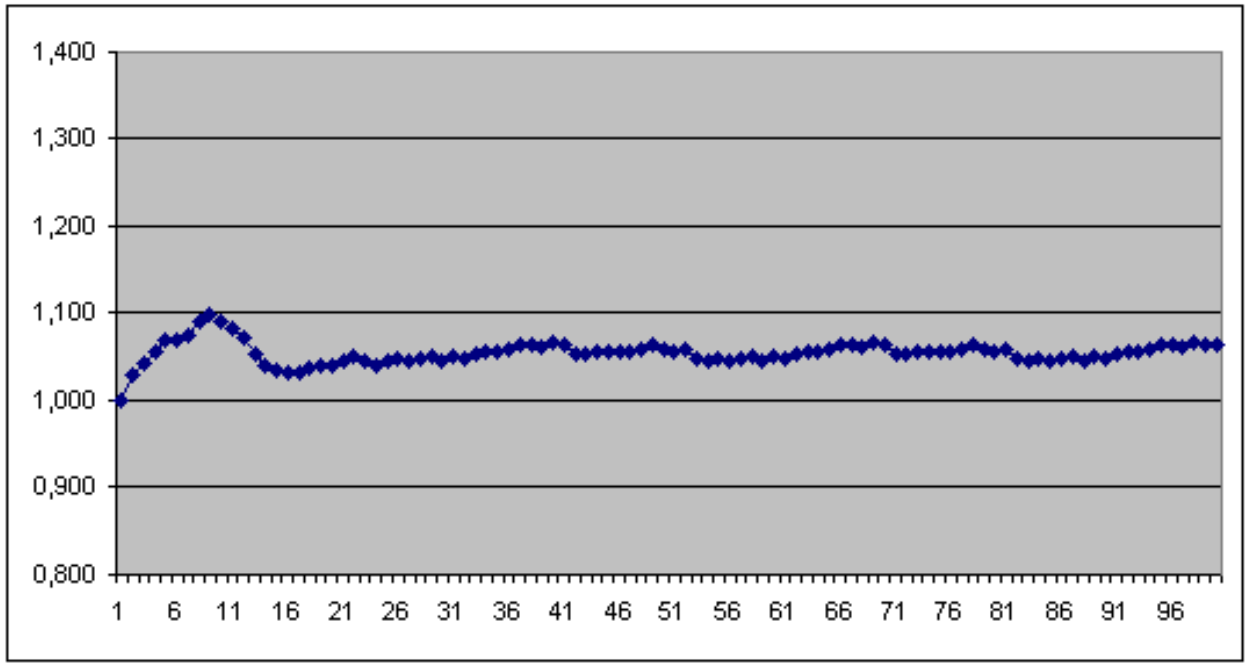
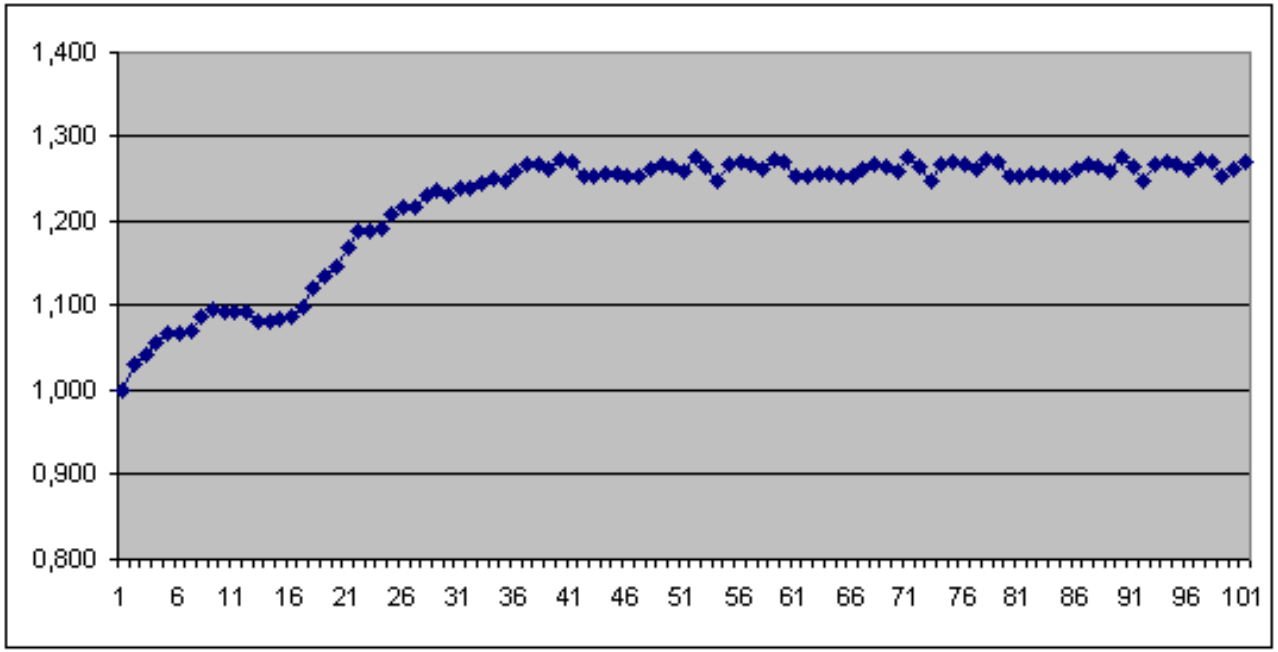


Figure 12.3.33
Optimistic Scenario: GDP path relative to the one without global warming
(Index)



ACIA Conclusions regarding Greenland

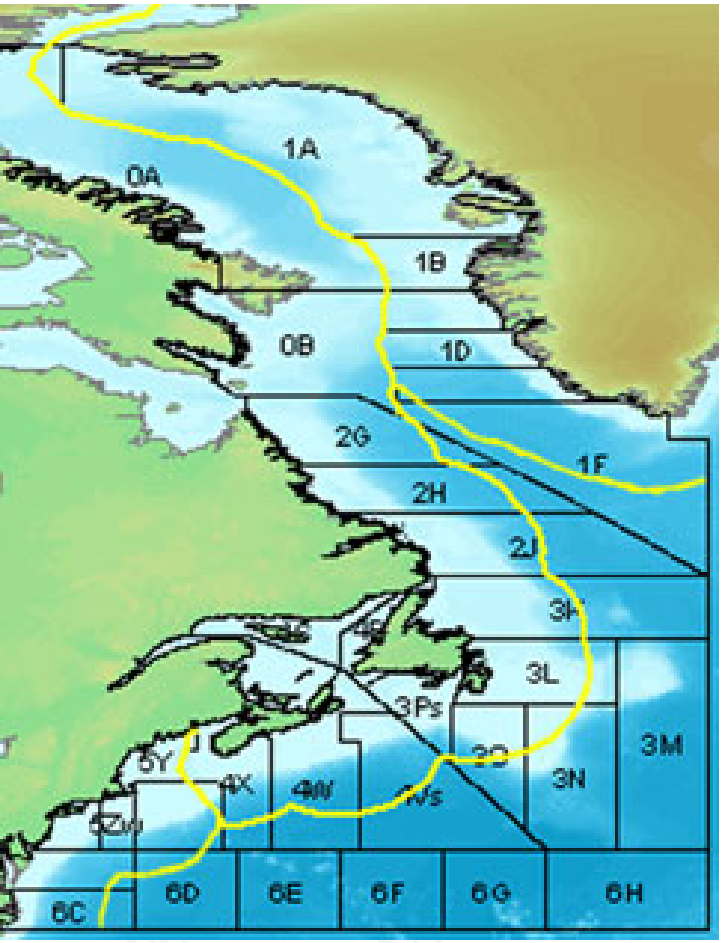
• Available projections suggest that climate change over the next 100 years is very likely to **benefit the most valuable fish stocks at Greenland**. This is particularly likely to be the case for the **cod stock, which could experience a revival to a level, where it could yield up to 300,000 t** on a sustainable basis.

• Climate change and increased predation by cod could lead to a **dramatic fall in the sustainable harvest of shrimp** by up to 70,000 t.

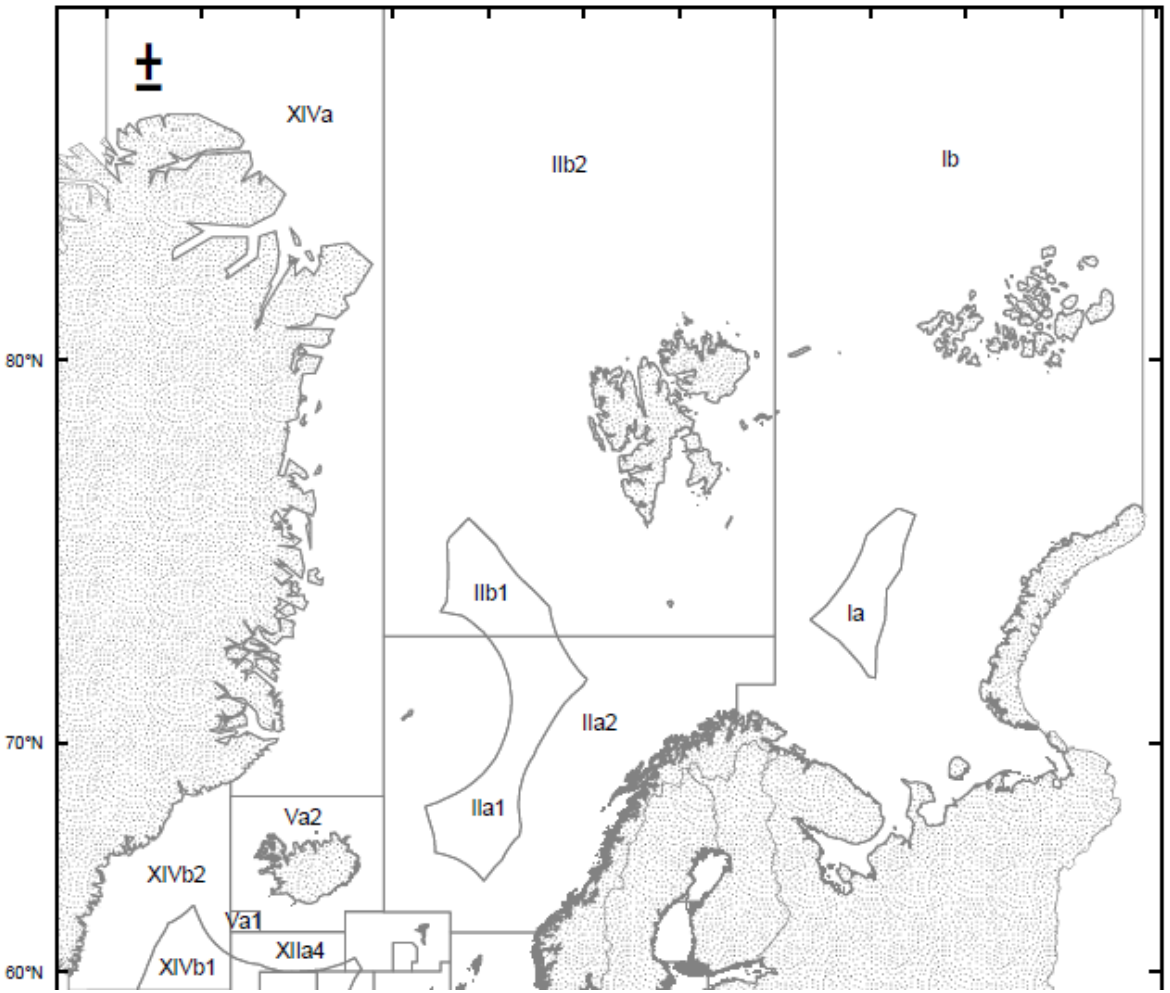
• The value of the **increased cod harvest would greatly exceed losses due to a possibly reduced harvest of shrimp**. In fact, this change could lead to doubling or even tripling of the total production value of the Greenland fishing industry.

• Thus, the projected climate change could have a **major positive impact** on the Greenland fishing industry. However, this is **highly uncertain**.

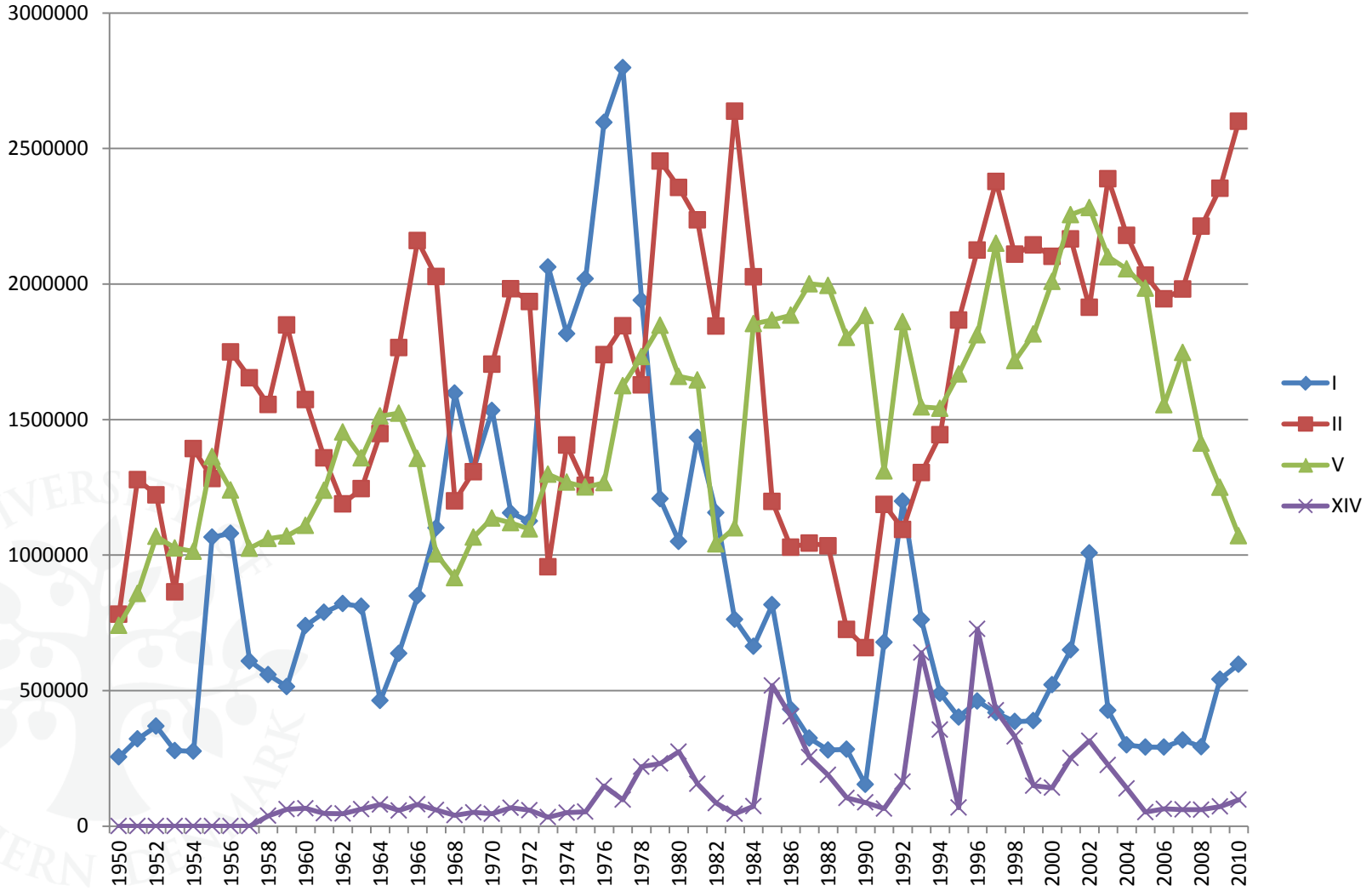
Nafo areas



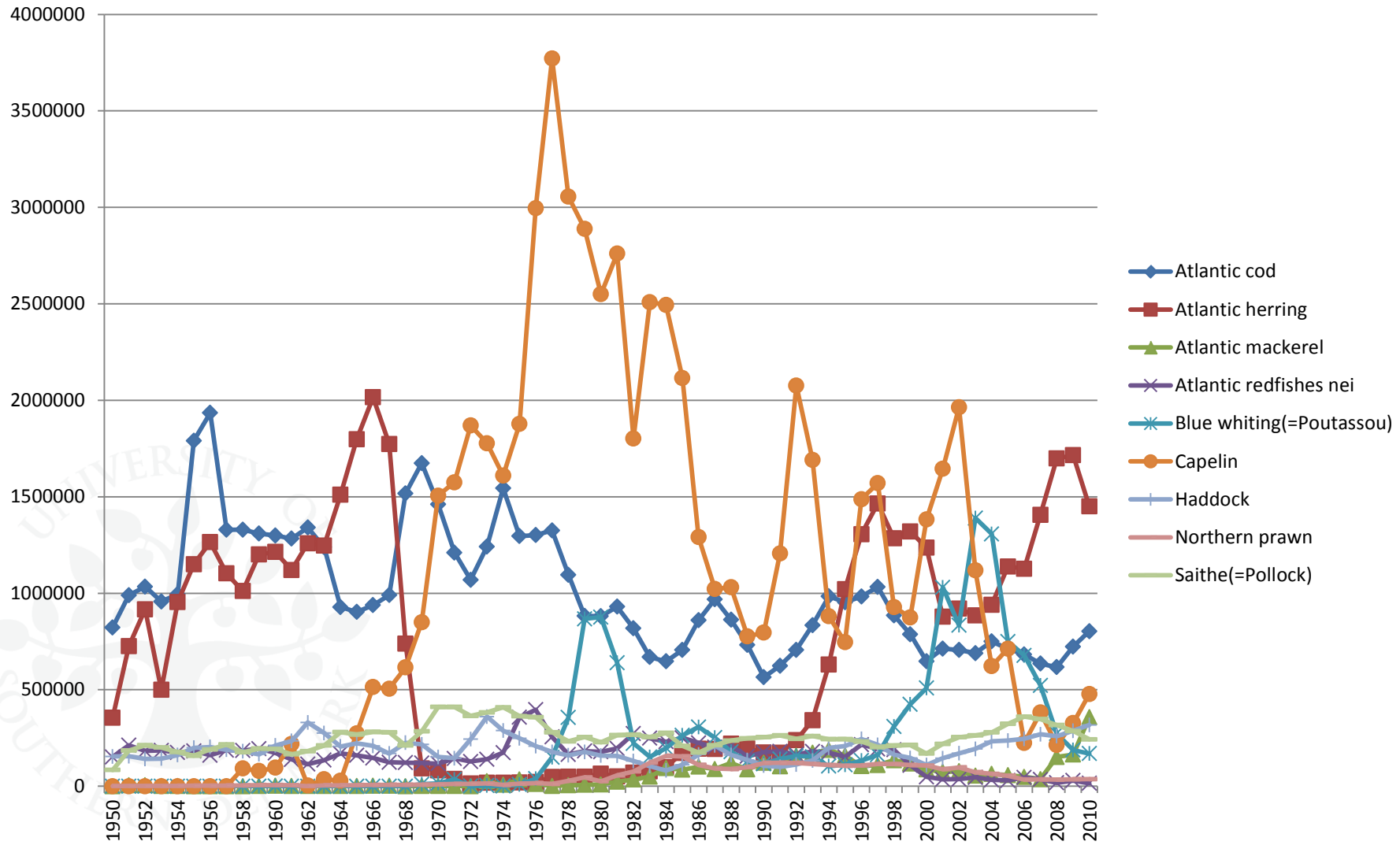
ICES areas



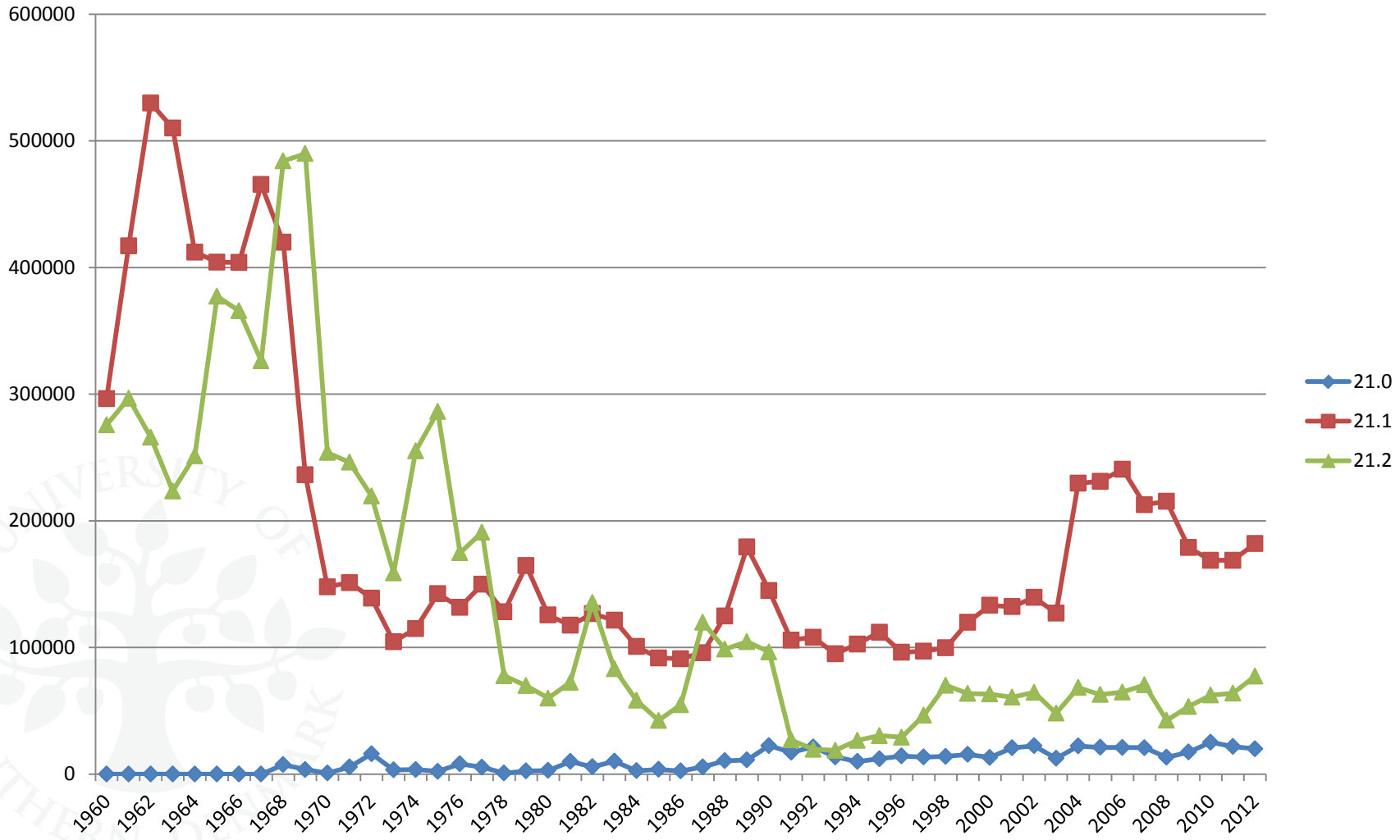
Catches in ICES areas



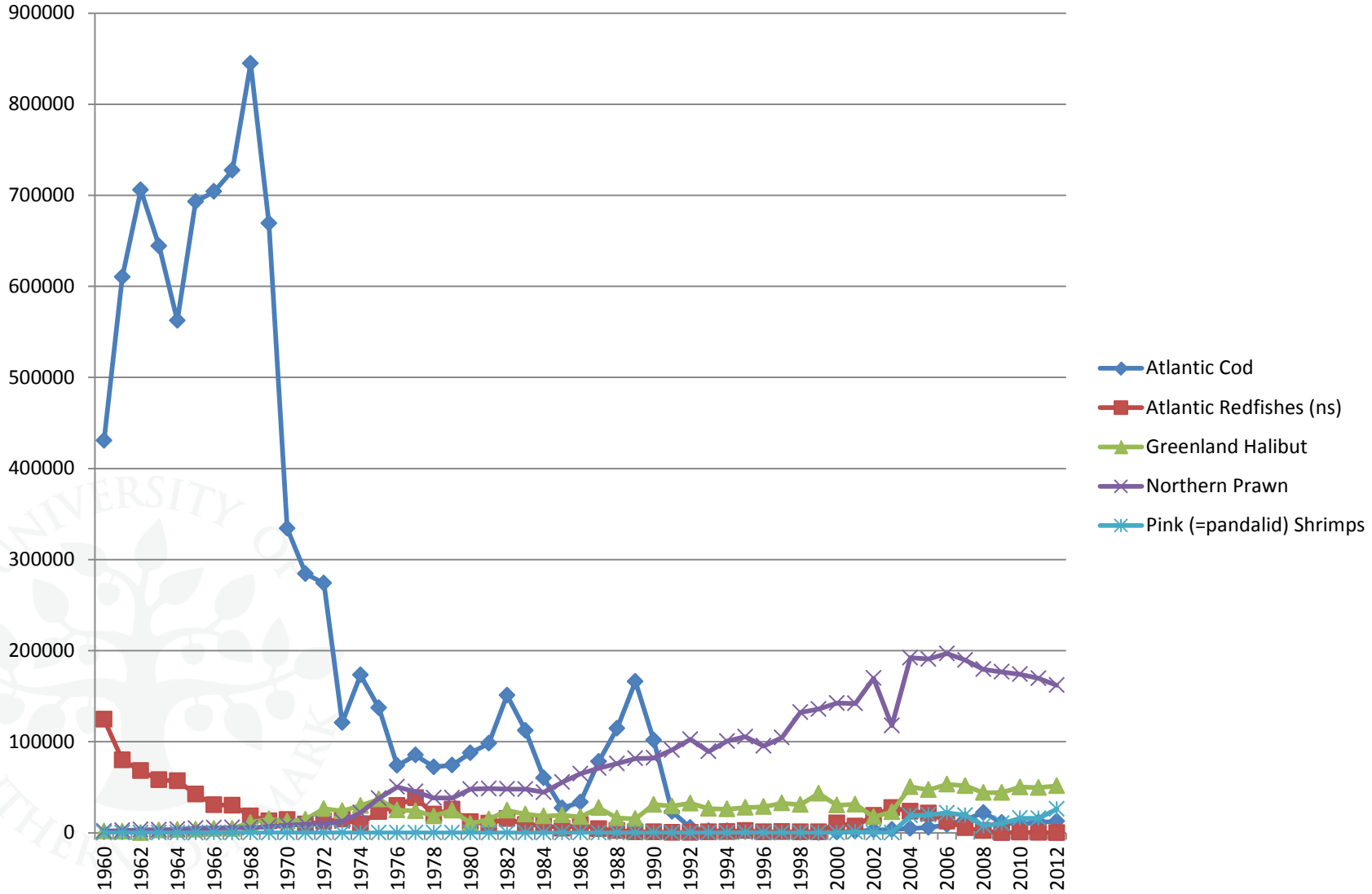
Catches in ICES areas I, II, V and XIVa+b



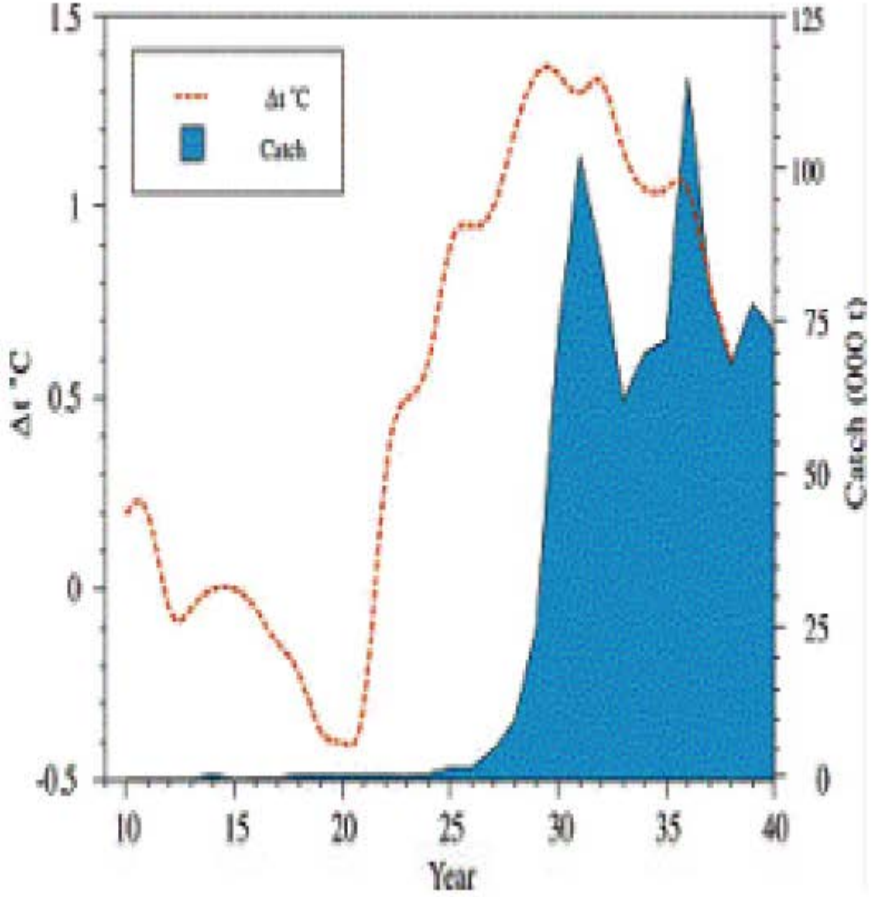
Catches in Nafo areas

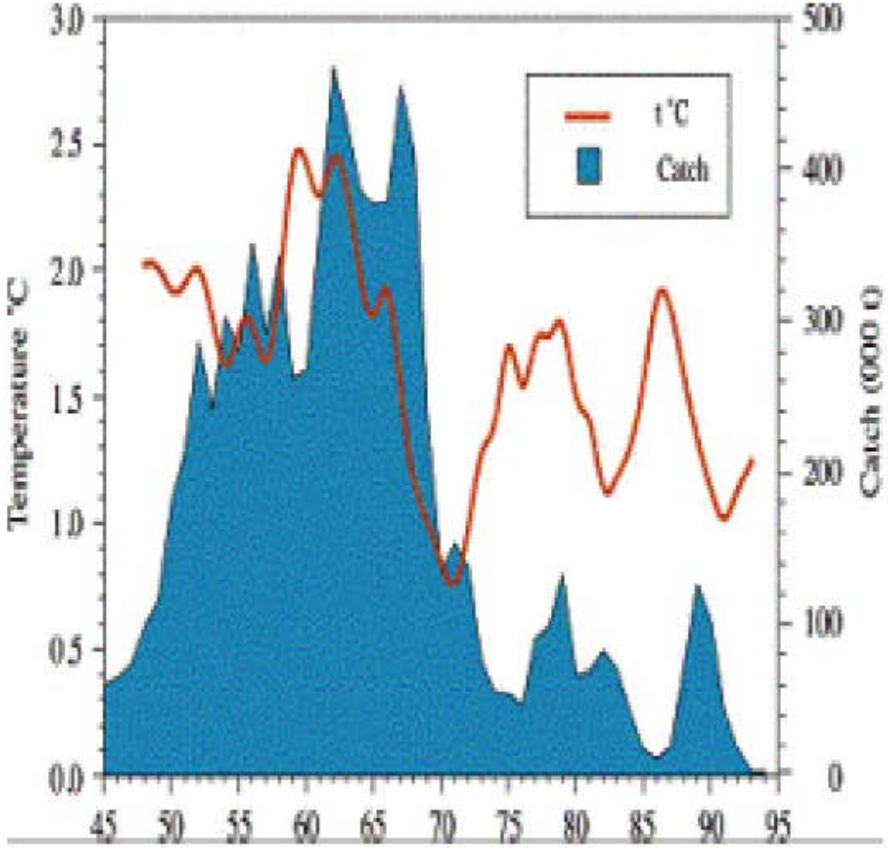


Catches in Nafo areas



Cod at Greenland: Catch and Temperature



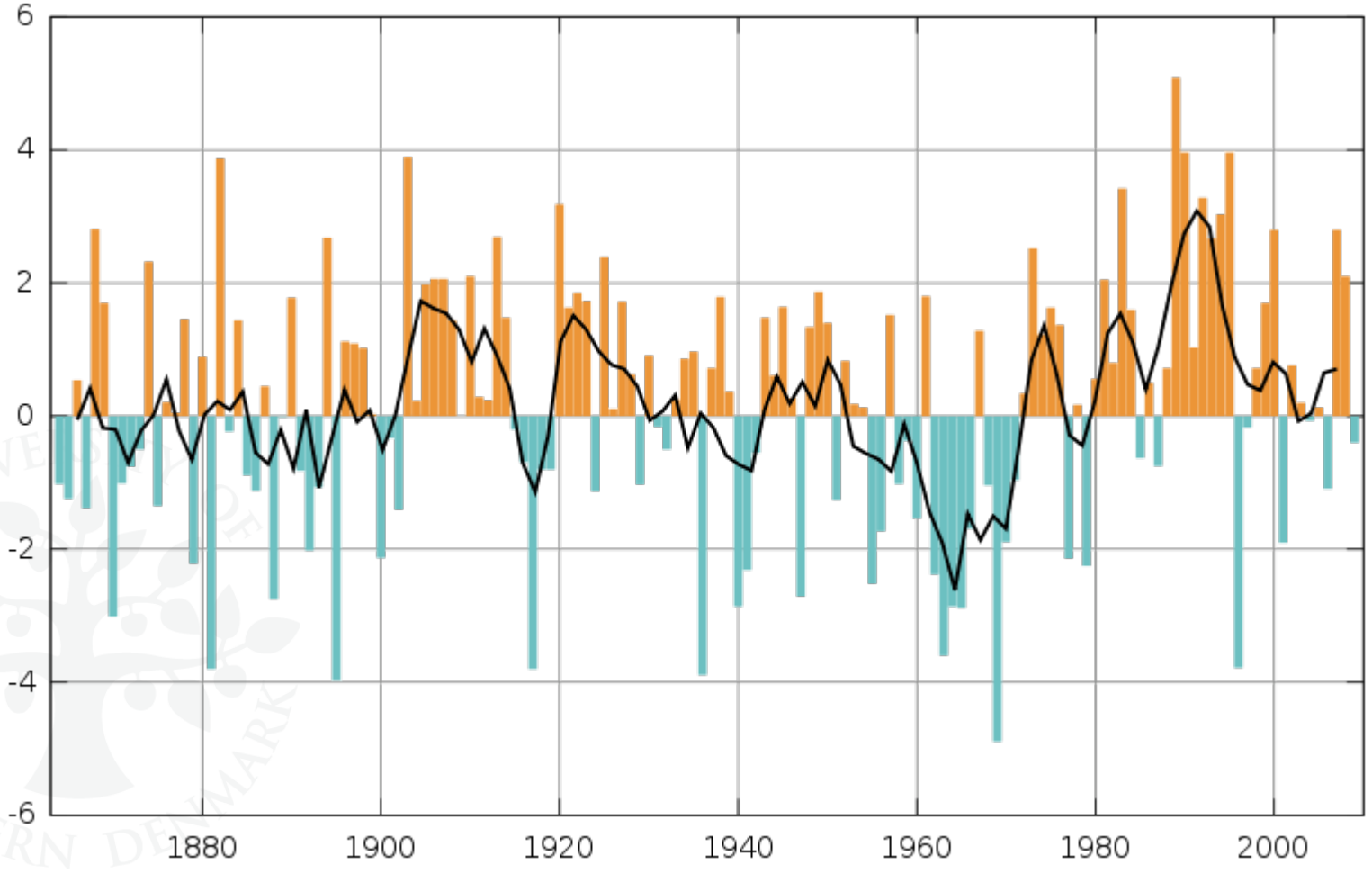


Climate variability in Atlantic Ocean

- **North Atlantic Oscillation (NAO)**
  - Important cause of interannual and interdecadal climate variability in Europe.
  - Index defined as difference between atmospheric pressure in Iceland & Azores.

- **NAO pattern**
  - Negative phase late 1950s thrugh 1960s.
  - Positive phase 1980s & 1990s.

NAO Index



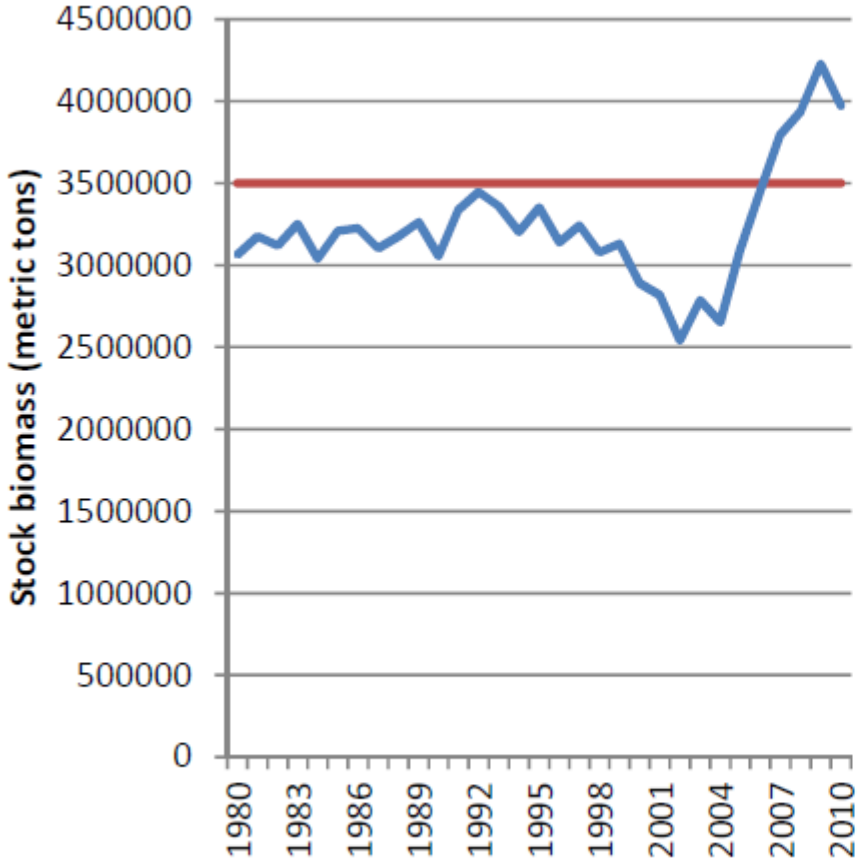
Possible impacts of NAO Index

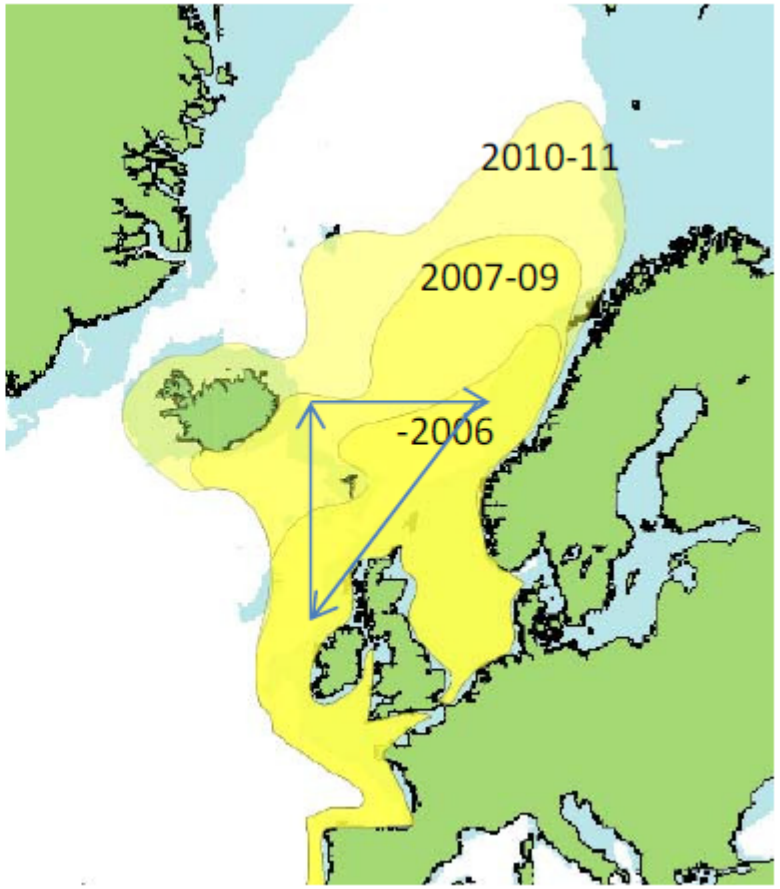
- Until recently, the NAO had been in an overall more positive regime **since the late 1970s, bringing colder conditions to the North-West Atlantic**, which has been linked with the thriving populations of Labrador Sea snow crabs, which have a low temperature optimum.
- The NAO+ warming of the **North Sea reduces survival of cod larvae** which are at the upper limits of their temperature tolerance, as does the **cooling in the Labrador Sea and in David Strait, where the cod larvae** are at their lower temperature limits.
- Though not the critical factor, the NAO+ peak in the early 1990s may have **contributed to the collapse of the Newfoundland cod fishery**.

Basic issues & questions

- **Types of climate variability**
  - Semi-regular cycles (e.g. NAO Index)
  - Irregular, erratic cycles & shifts?
  - Long-term trends (Global Warming)
- **Fisheries modeling and management**
  - How to model fisheries in which the steady-state does not exist?
  - How do the natural variations in resource stocks affect economic phenomena (spatial & temporal patterns of effort, landings, prices)?
  - How do we managed those (shared) fisheries?

“The current Mackerel war”





Socio-economic effects

- The **economic and social impacts** of changes in fish stock availability depend on the **direction, magnitude, and rapidity of changes**.
- The **economic and social impacts** also depend, possibly even more so, on the **ability of the relevant social structures to adapt** to altered conditions.
- **Good social structures** facilitate fast adjustments to new conditions and thus **mitigate negative impacts**.
- **Weak social structures** exhibit sluggish and possibly inappropriate responses and thus may **exacerbate problems** resulting from adverse environmental changes.
- One of the most **crucial social structures** in this respect is the **fisheries management system**.This determines the extent to which the fisheries can adapt in an **optimal manner to new conditions**.

Context to governance challenges

- Significant melting, with projections suggesting an accelerating rate of change**. Reduction of sea ice.**
- Will have **multiple implications on ecosystem health,** resource availability and **accessibility.**
- **Changes in the Arctic** have captured **the world's attention** in terms of broad (even global?) environmental/marine implications **and the potential for new activities in the North.**

Diverse assumptions underlie debate

Range of (often competing) assumptions include:

- **Arctic ”unmanaged” – ”no” governance**
- **Principles exist in range of hard and soft law**
- **Region is data poor and lack scientific knowledge**
- **An RFMO is needed for high-seas areas**
- **Only an new treaty approach will protect Arctic**
- **Coastal and Arctic States have key responsibility and opportunity to manage for sustainability**
- **Arctic is a global public good, needs global governance, non Arctic states have rights to seat at the table.**
- **Etc.**

Fisheries Management: Arctic principles

- **Precautionary approach:** Explorative fishery and information gathering processes.
- **Information gathering stage** to inform future viabilitiy and decision-making for new fisheries.
- **Adaptive management.**
- **Ecosystem based fisheries management approaches (EAF)** and integrated mangement (IM) **and ecosystem based management (EBM).**
- **High Seas: Potential races for fishing** as stocks move north or become more accessible may need **different approaches (Mackerel in Northeast Atlantic).**

Observation

- **Paradox: Markets** are seen as the course for the **overexploitation of the nature, but market based solutions (mixed economy)** can play a role as **institution** between nature and economic activity.
- **Economic incentives** are important for **conservation of nature –** secure a balanced and more **sustainable use.** If we wish that the **owners shall conserve the nature** the owners shall have the incentives to do it.
- **Therefore the social economic value of the ecosystem services** is transformed to income for the owners as **payment for their conservation.**