# Ecosystem-Society Interactions in the Northern Atlantic

## Human Dimensions of Fisheries Collapse

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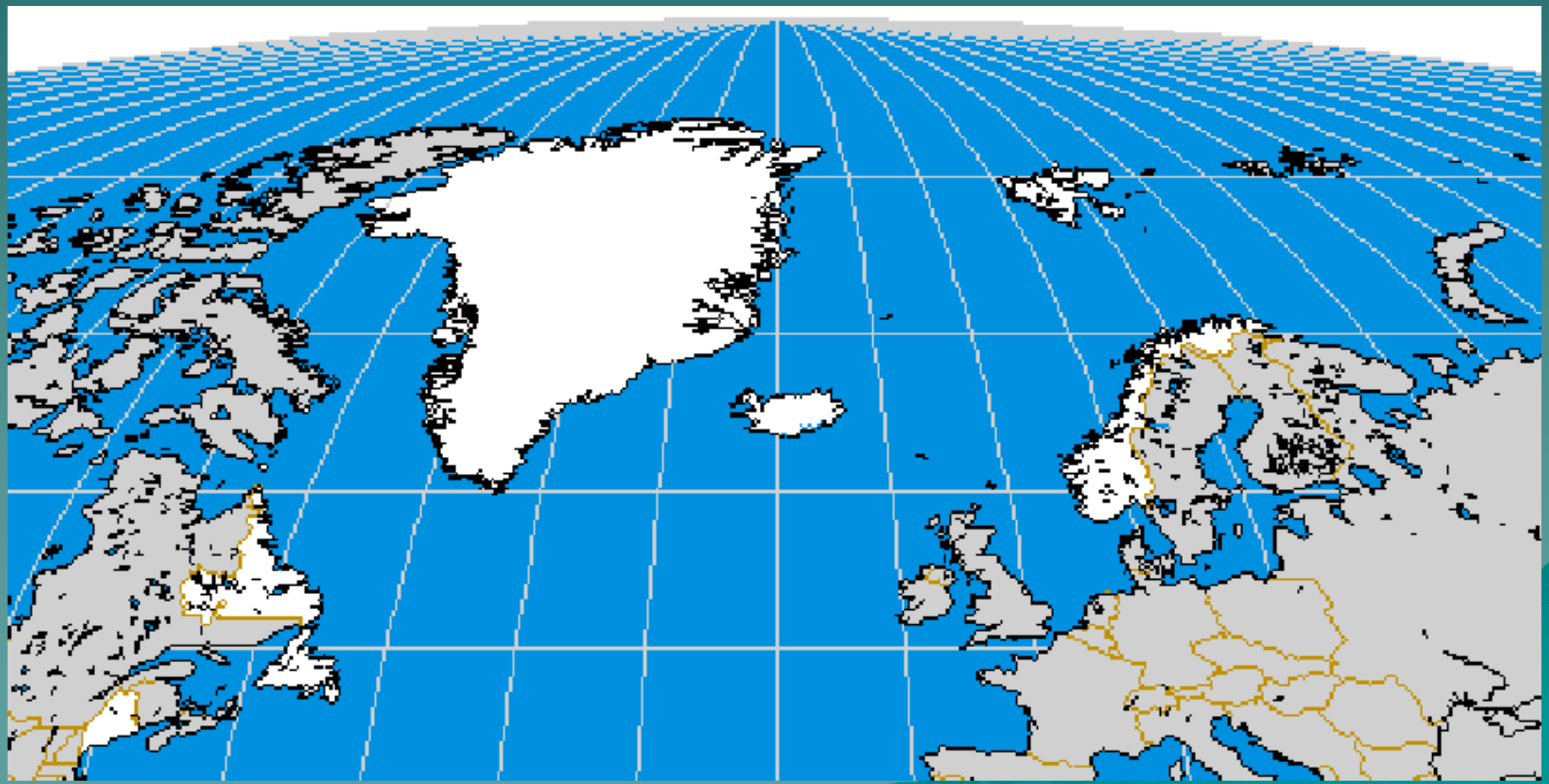
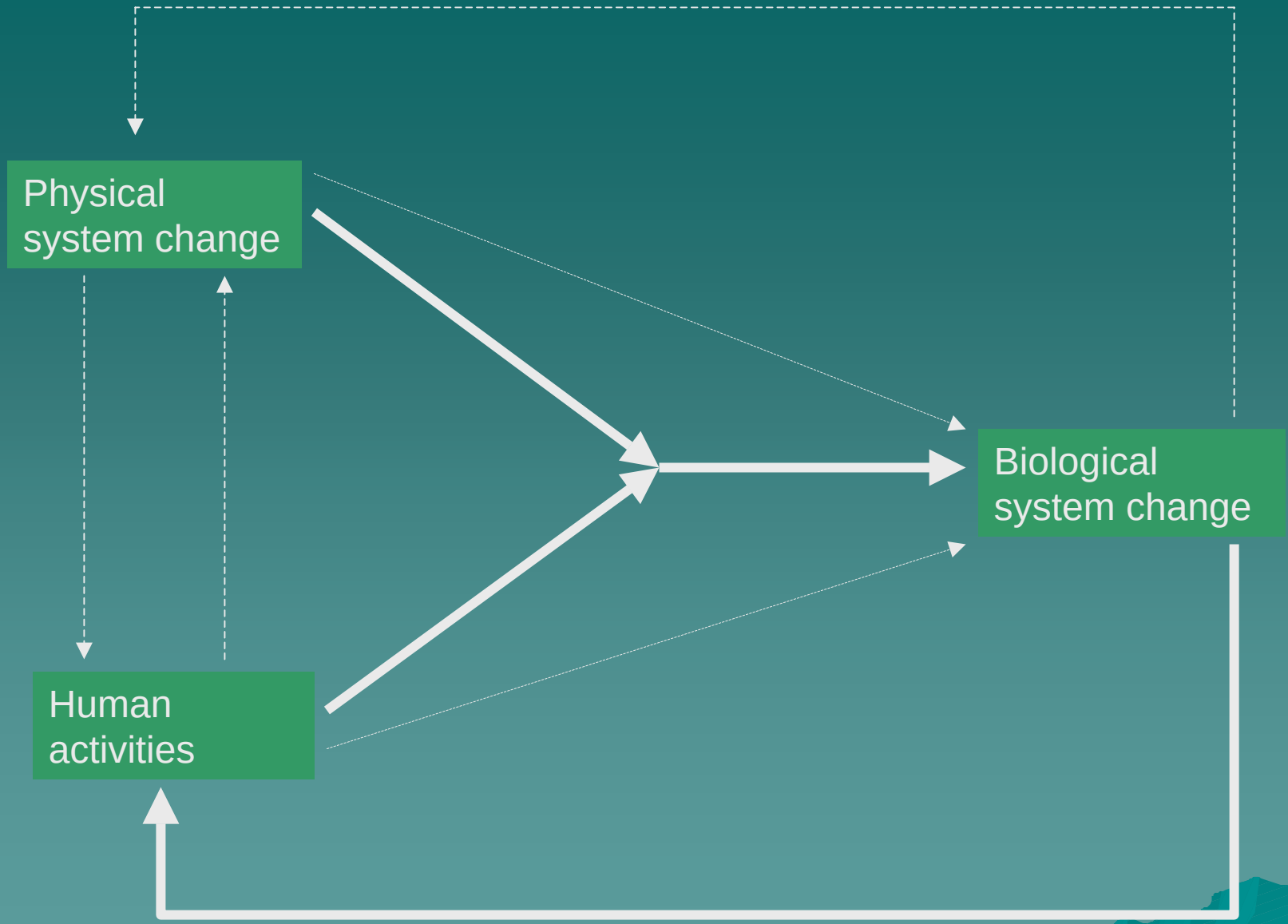
## University of New Hampshire

## North Atlantic Arc project -- NAArc



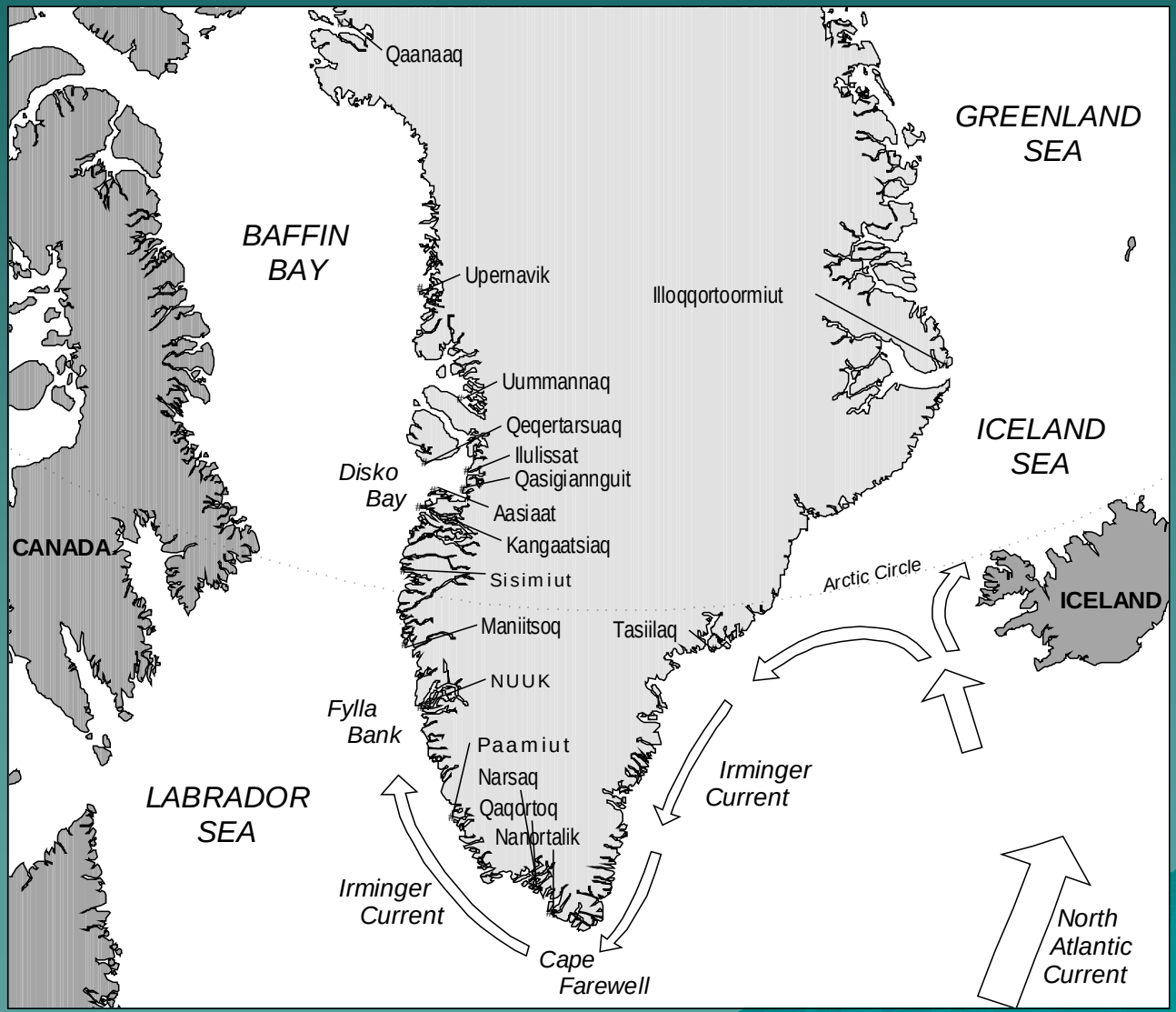

J COWLEY
ZULA 1849


Physical system change
Biological system change
Human activities

# Four case studies

- Major changes have affected longstanding fisheries across the Northern Atlantic.
- These changes involve interactions between physical (ocean/climate), biological and human systems.
- Despite local differences, strong patterns emerge.

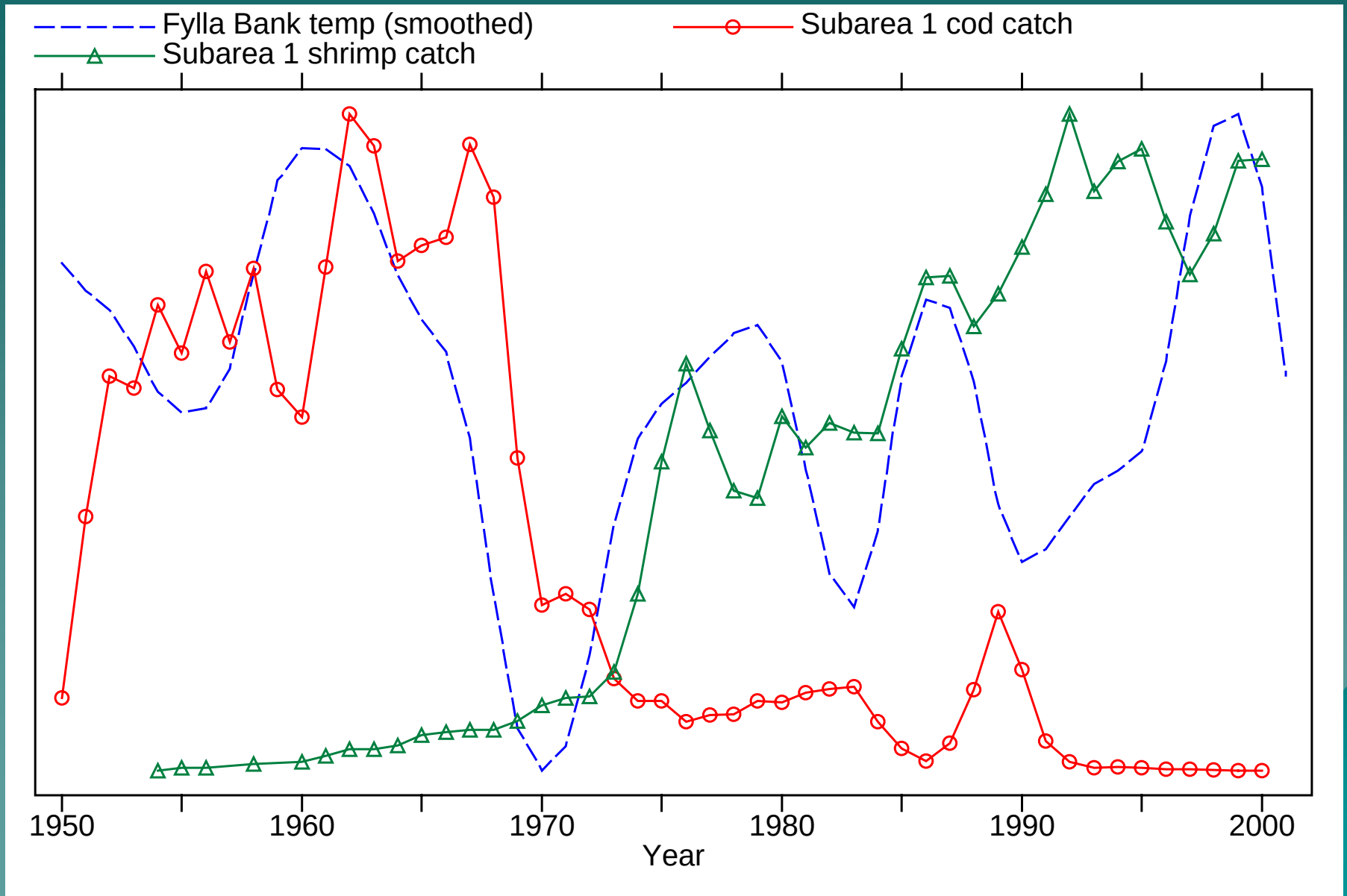
# Sisimiut and Paamiut, West Greenland




Royal Greenland


OVOG
GR.8-259

# Temperature, cod & shrimp catch



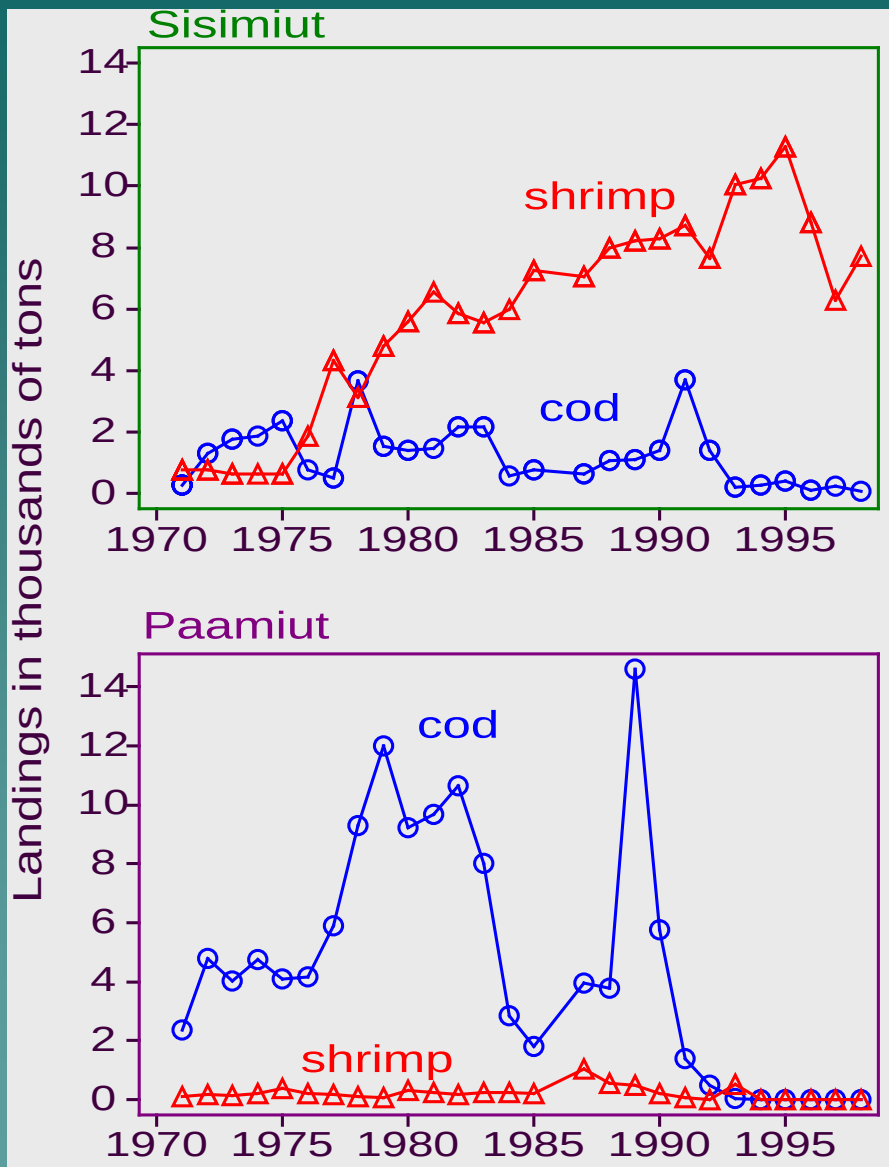
# Sisimiut benefited from the transition

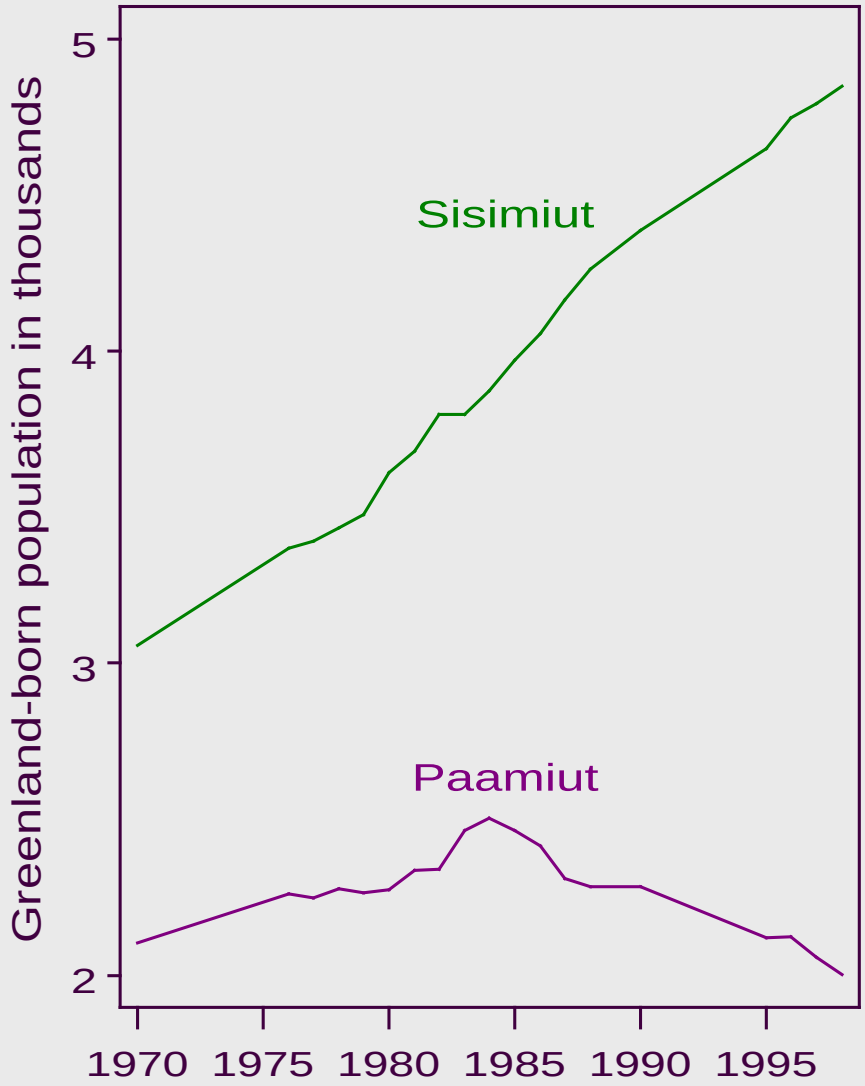
- Pioneered Greenland shrimp fishery, when that resource was found mainly in the north.
- Built up shrimp catching and processing capacity.
- Reached southwards as shrimp were discovered there too.
- Human population grew, economy diversified.

# Paamiut declined during the transition

- Initial development specialized in cod fishing.
- Shrimp were not available nearby.
- When more shrimp were discovered, other ports already had catching/processing capacity.
- Human population declined, economy struggled.

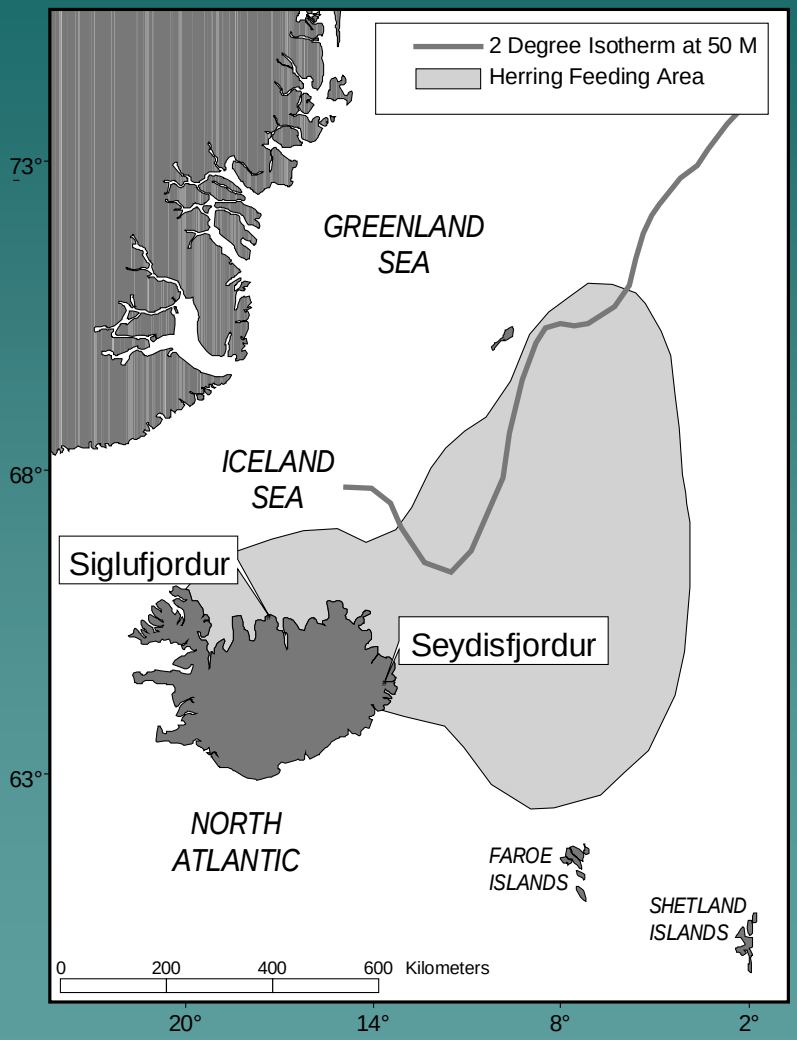
# A tale of two cities



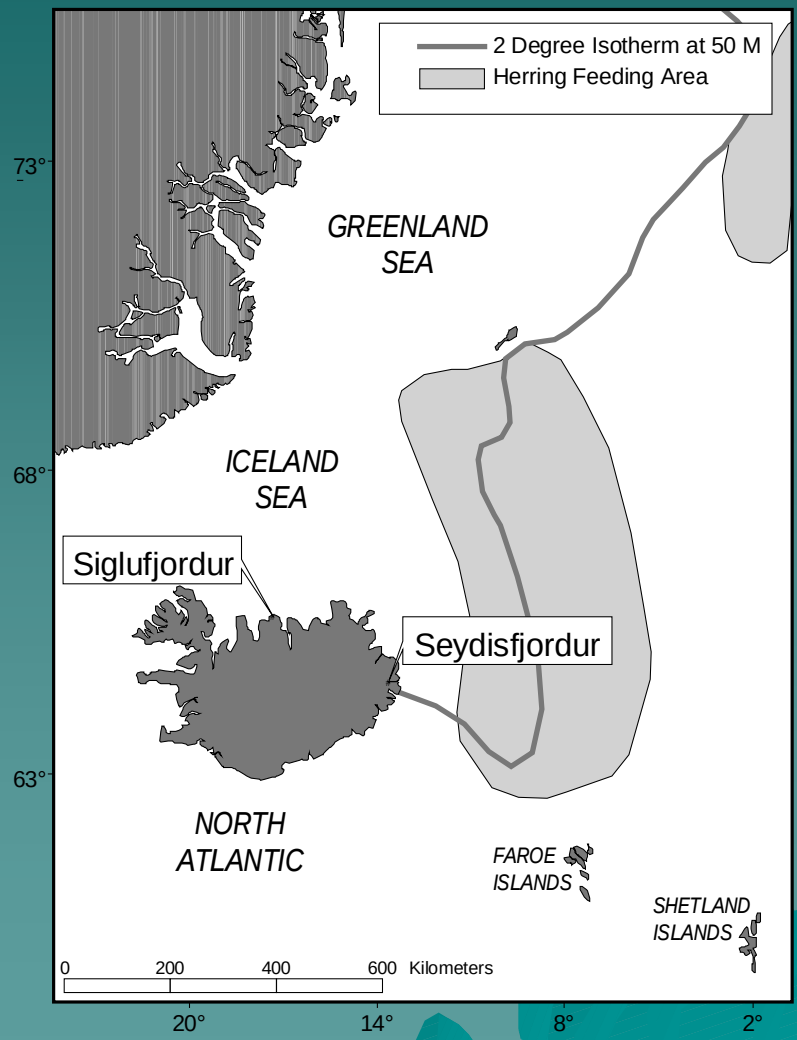



# Siglufjörður, North Iceland

## Traditional




## 1965—66



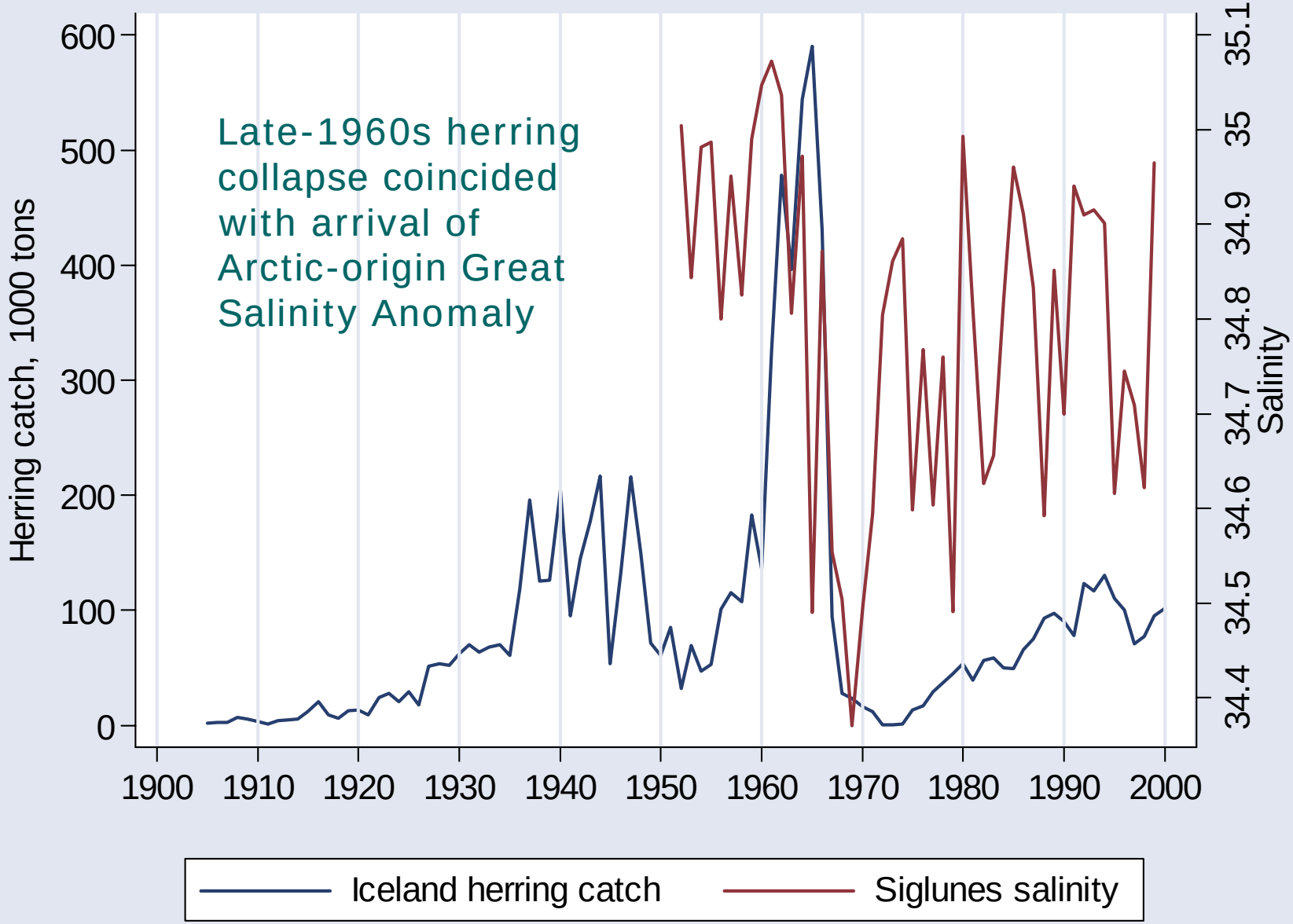

After Vilhjalmsson 1997

“The herring years were special, indescribable. And they will never come again.”

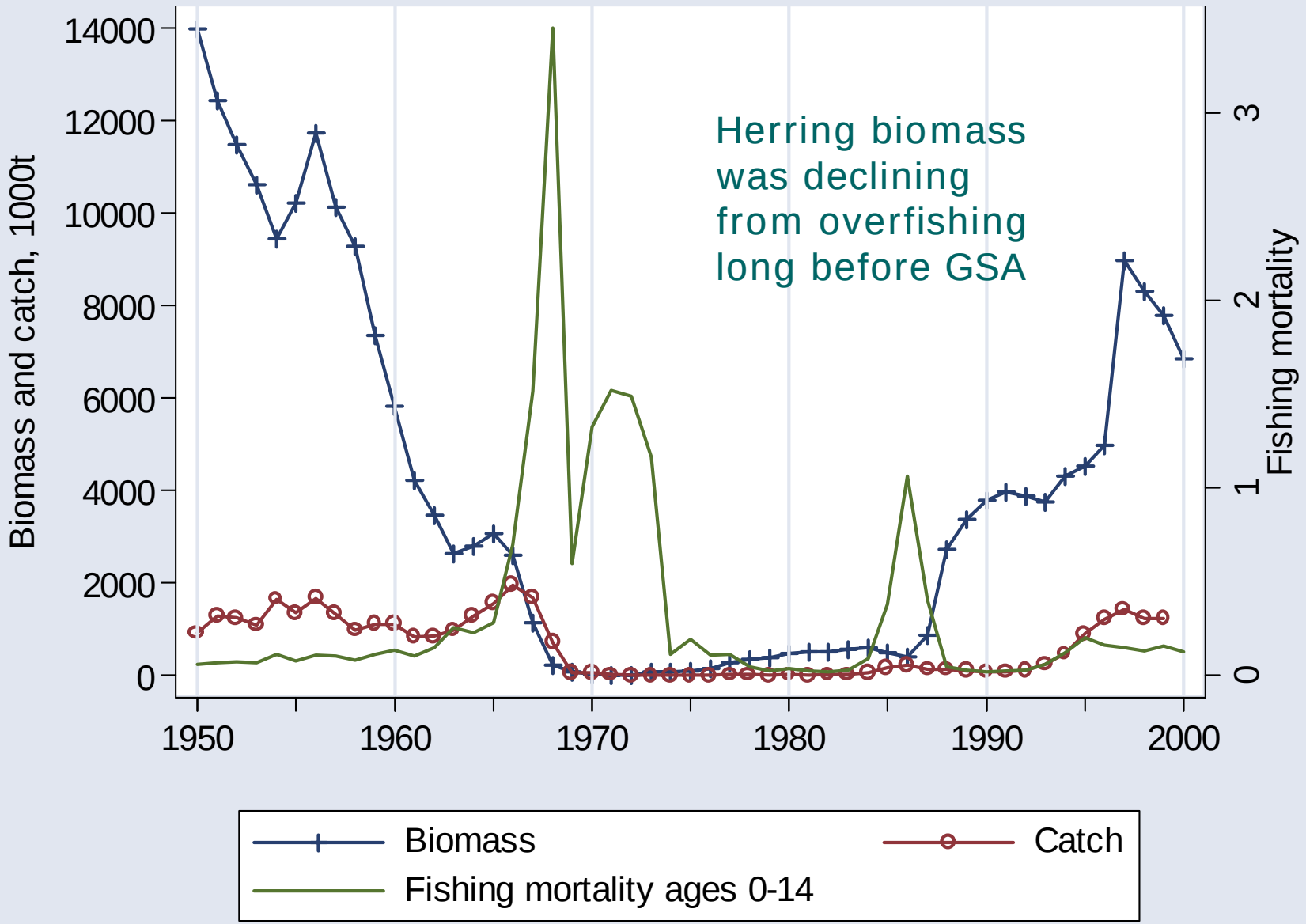
Siglufjörður resident

# Siglufjörður in March 2003

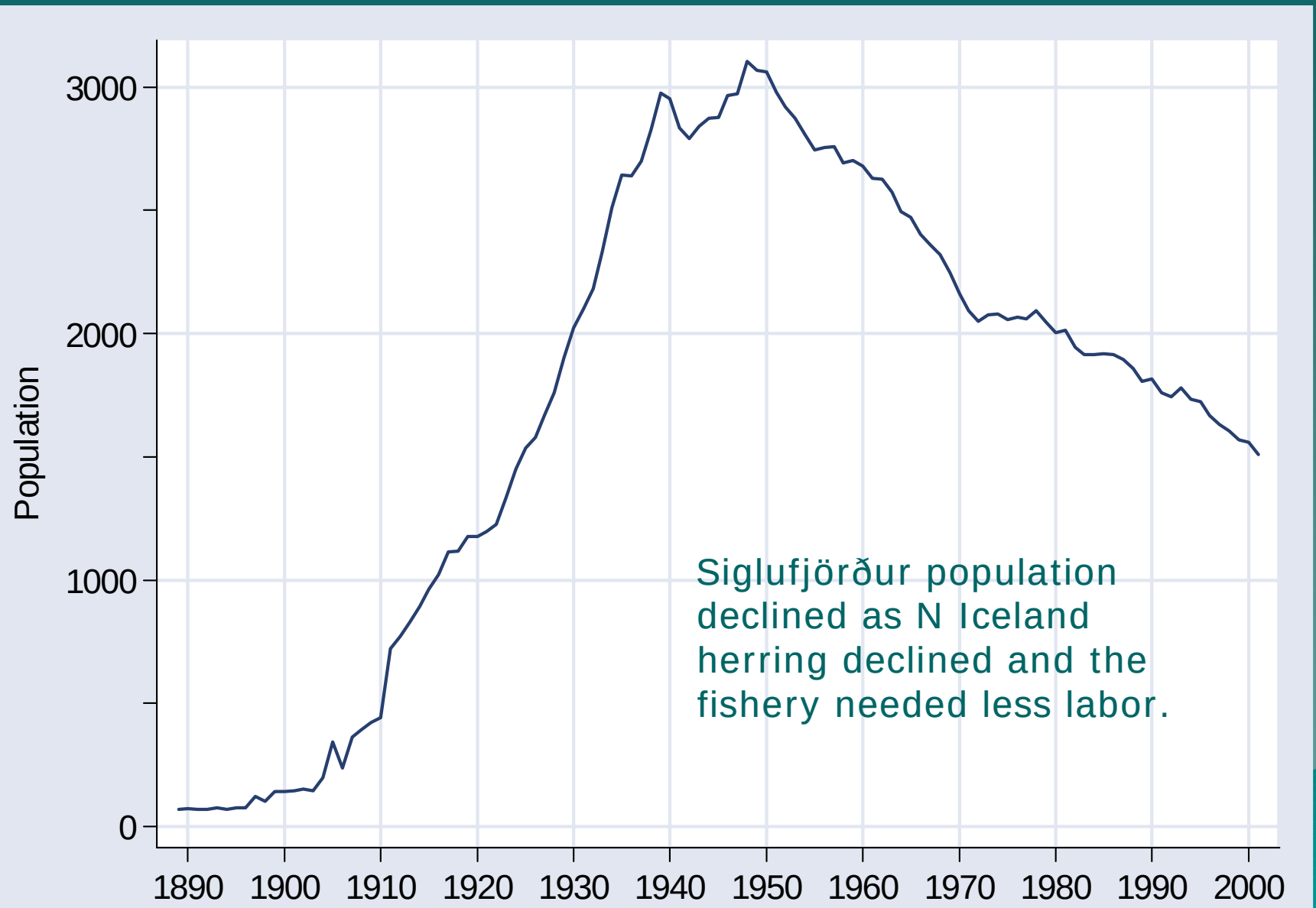
# Herring catch and salinity, 1905–2000



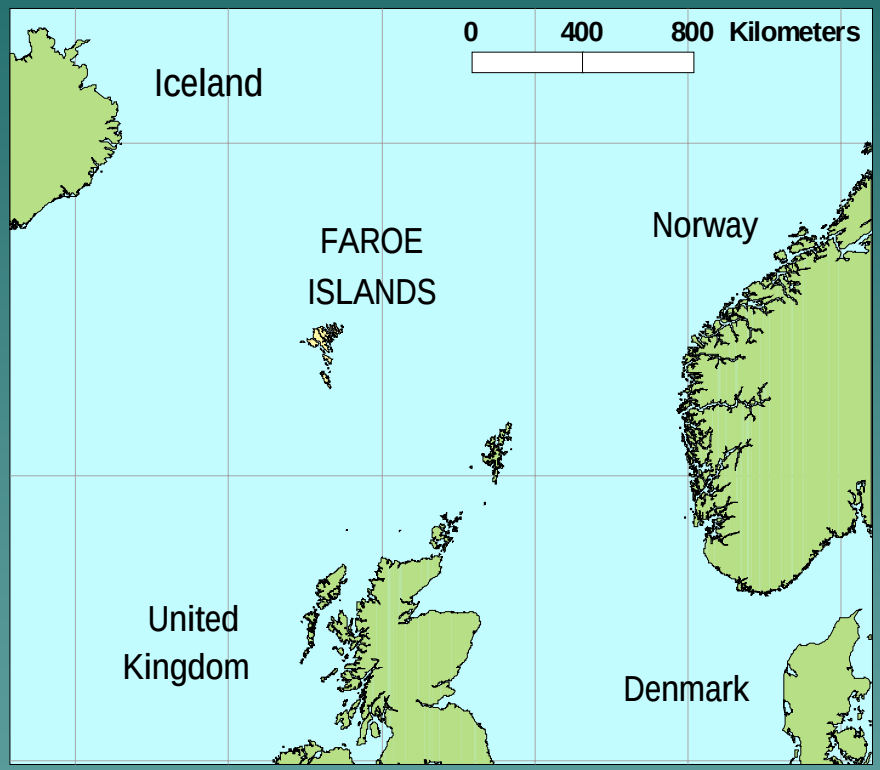
# Biomass, catch and mortality, 1950–2000

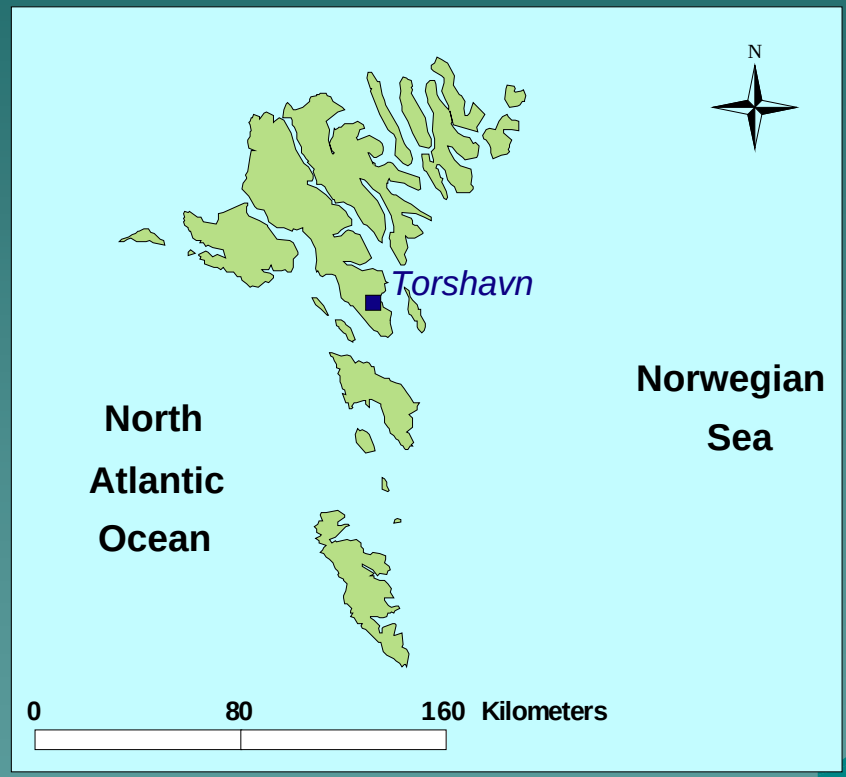


# Population of Siglufjörður, 1890–2000

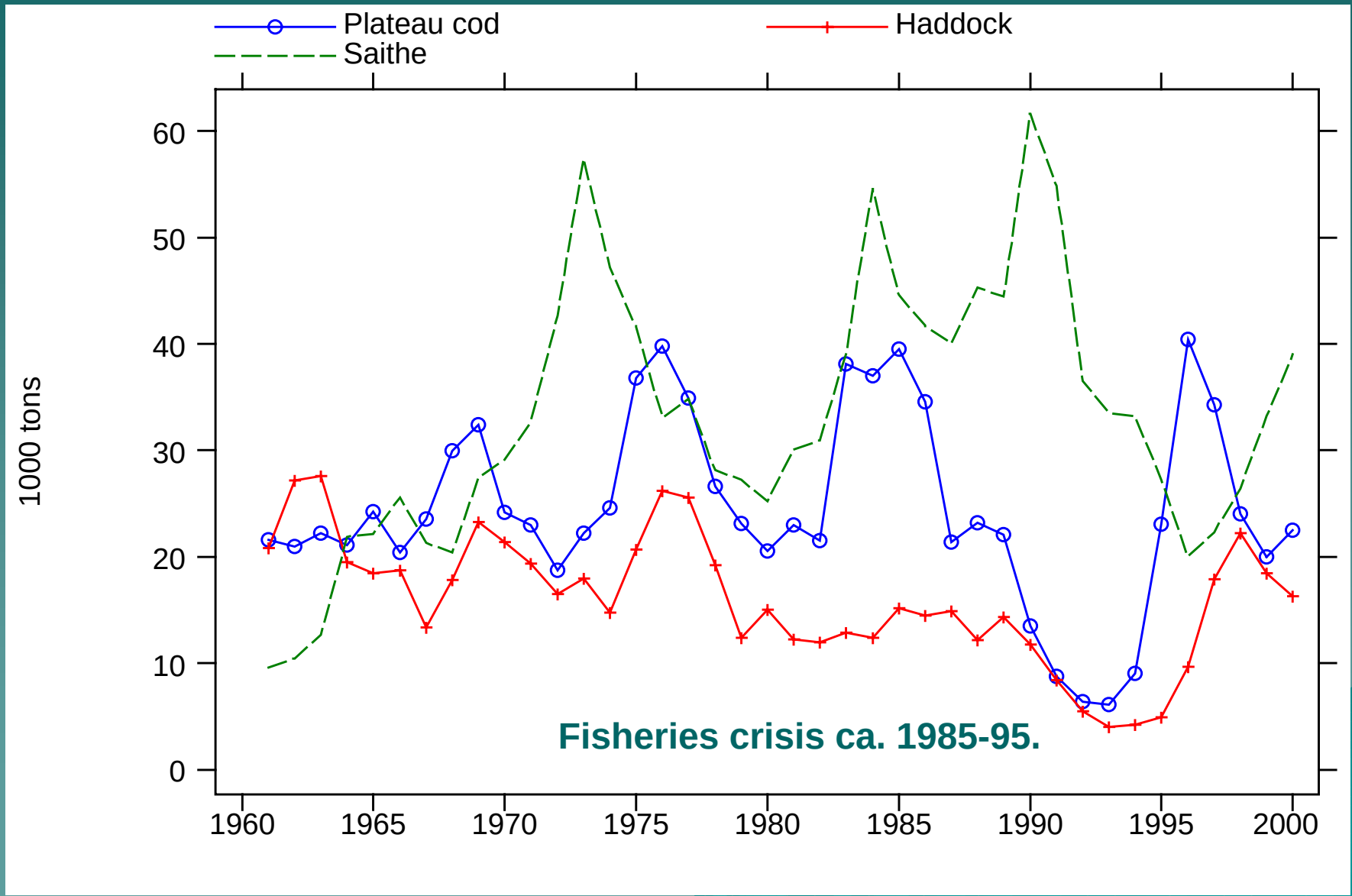


# Faroe Islands, Northeast Atlantic

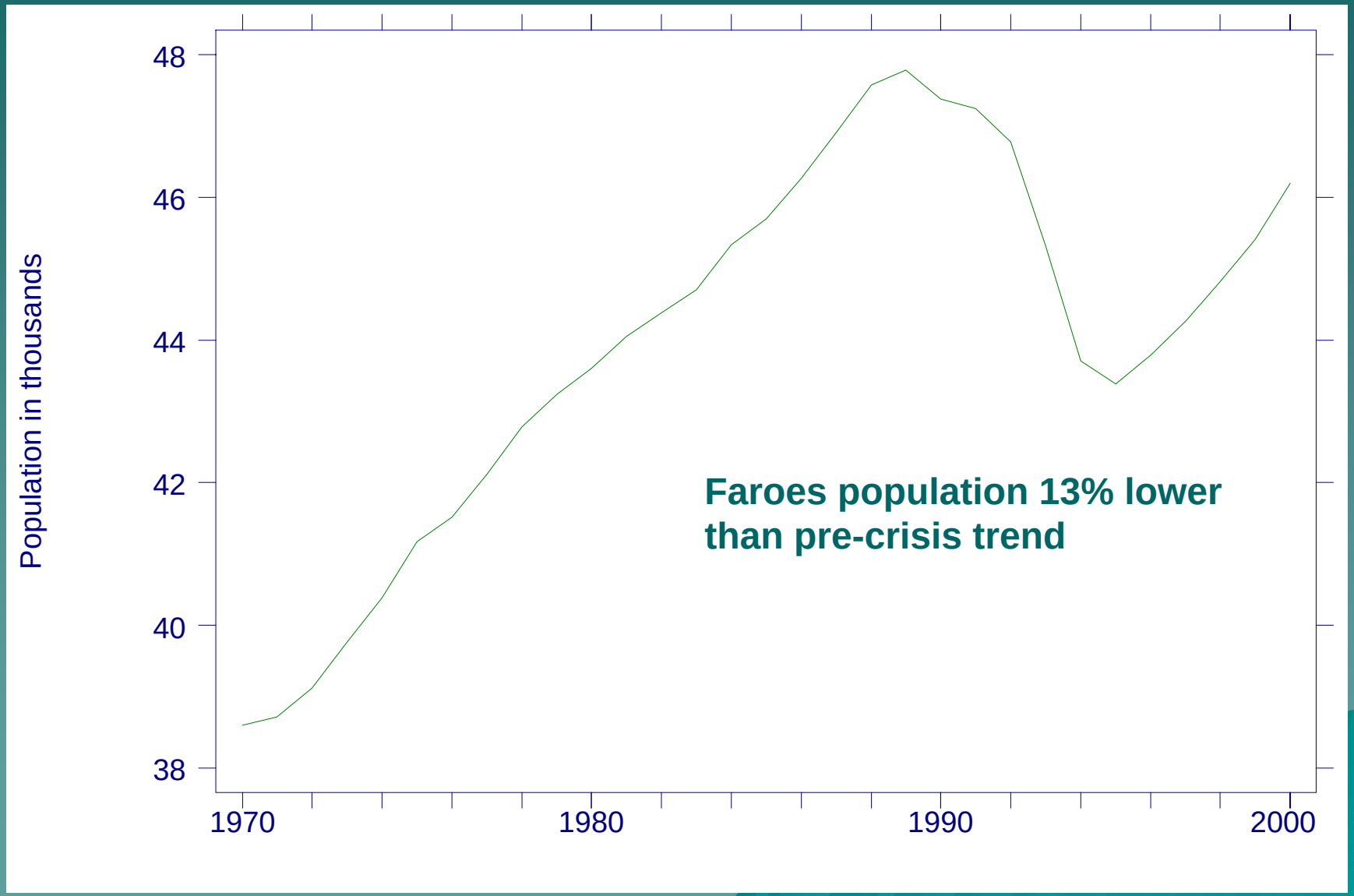


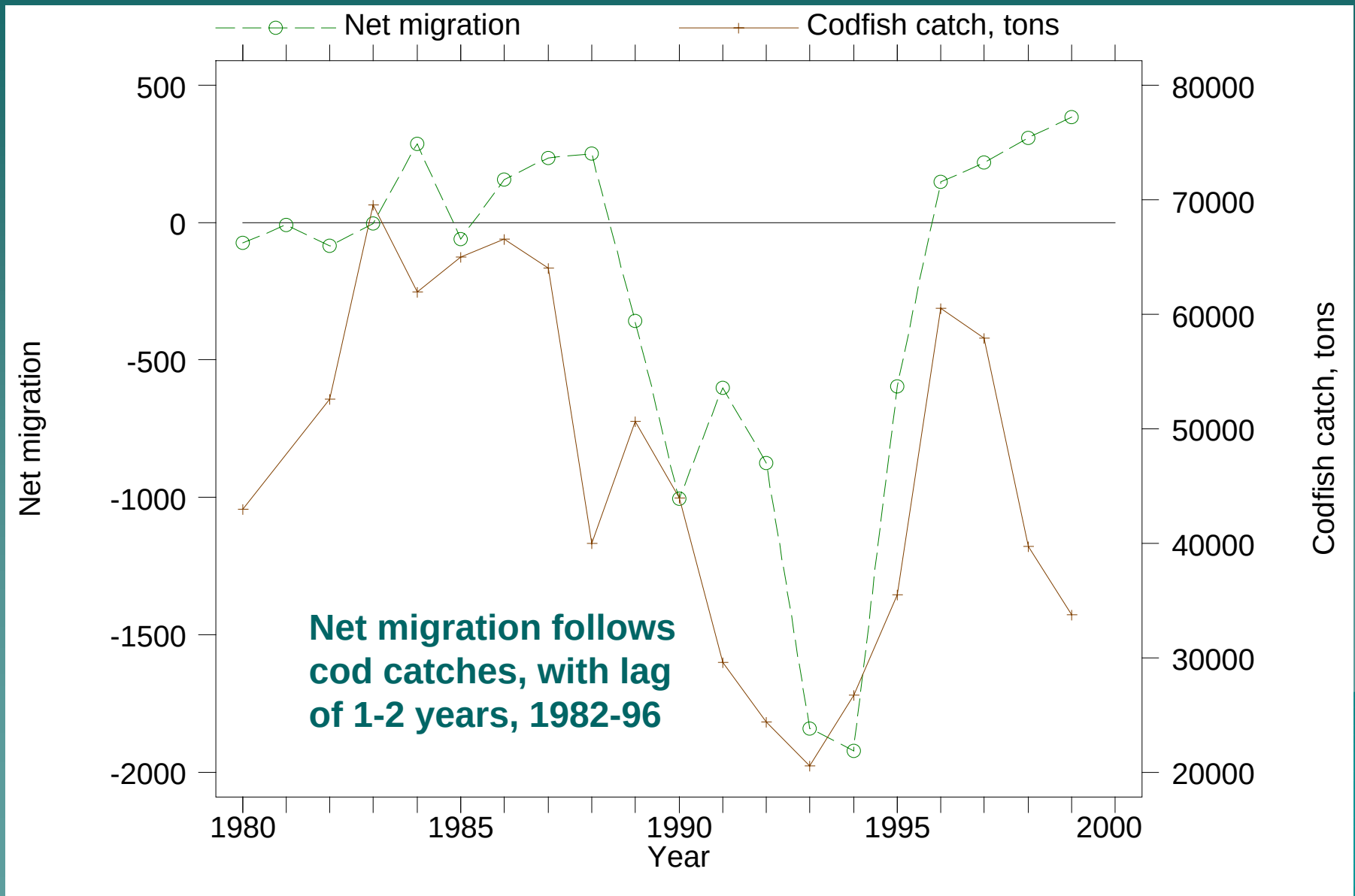
# Faroese landings of demersal fish from home waters, 1961-2000



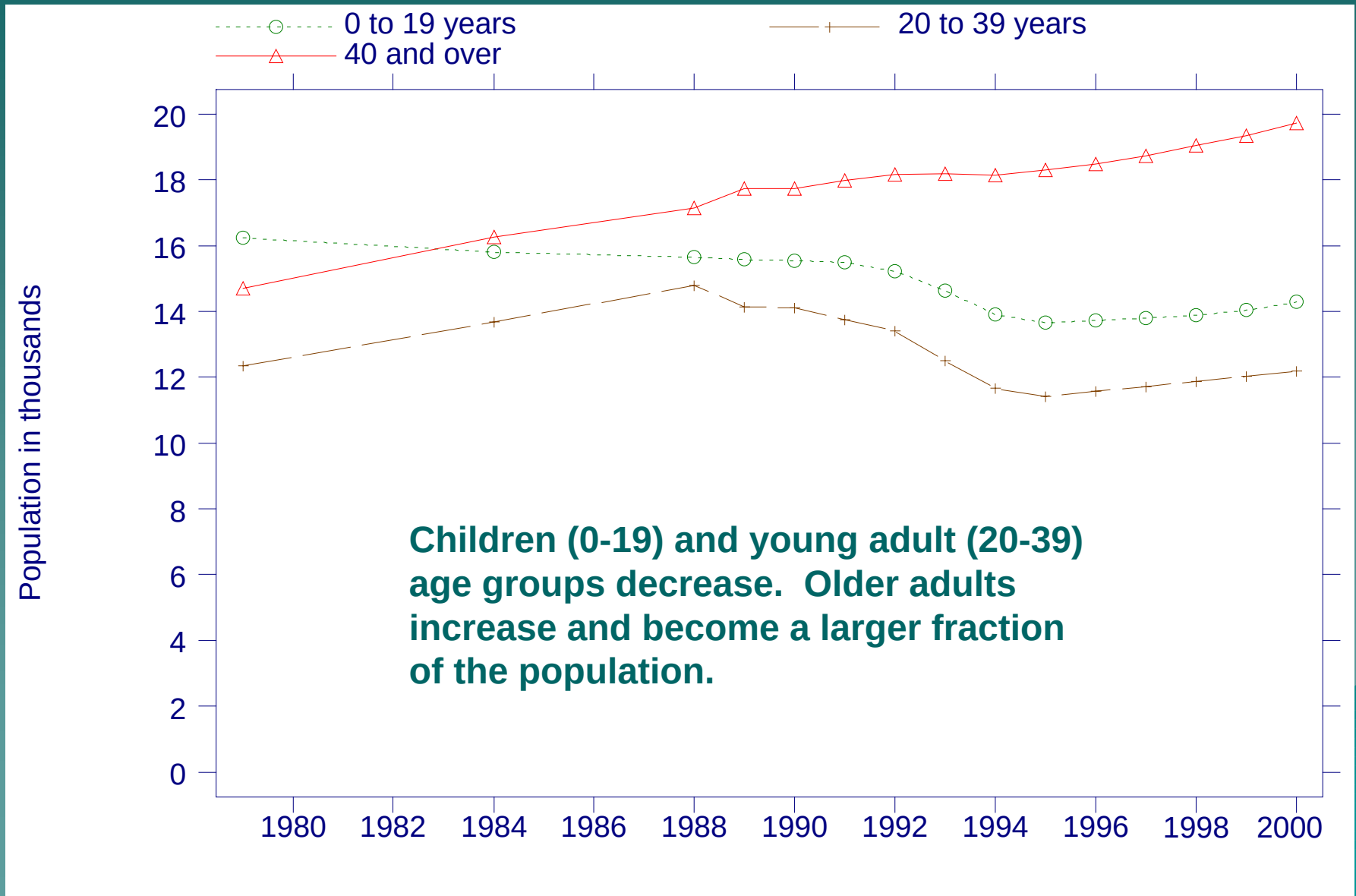
# Faroe Islands total population 1970-2000



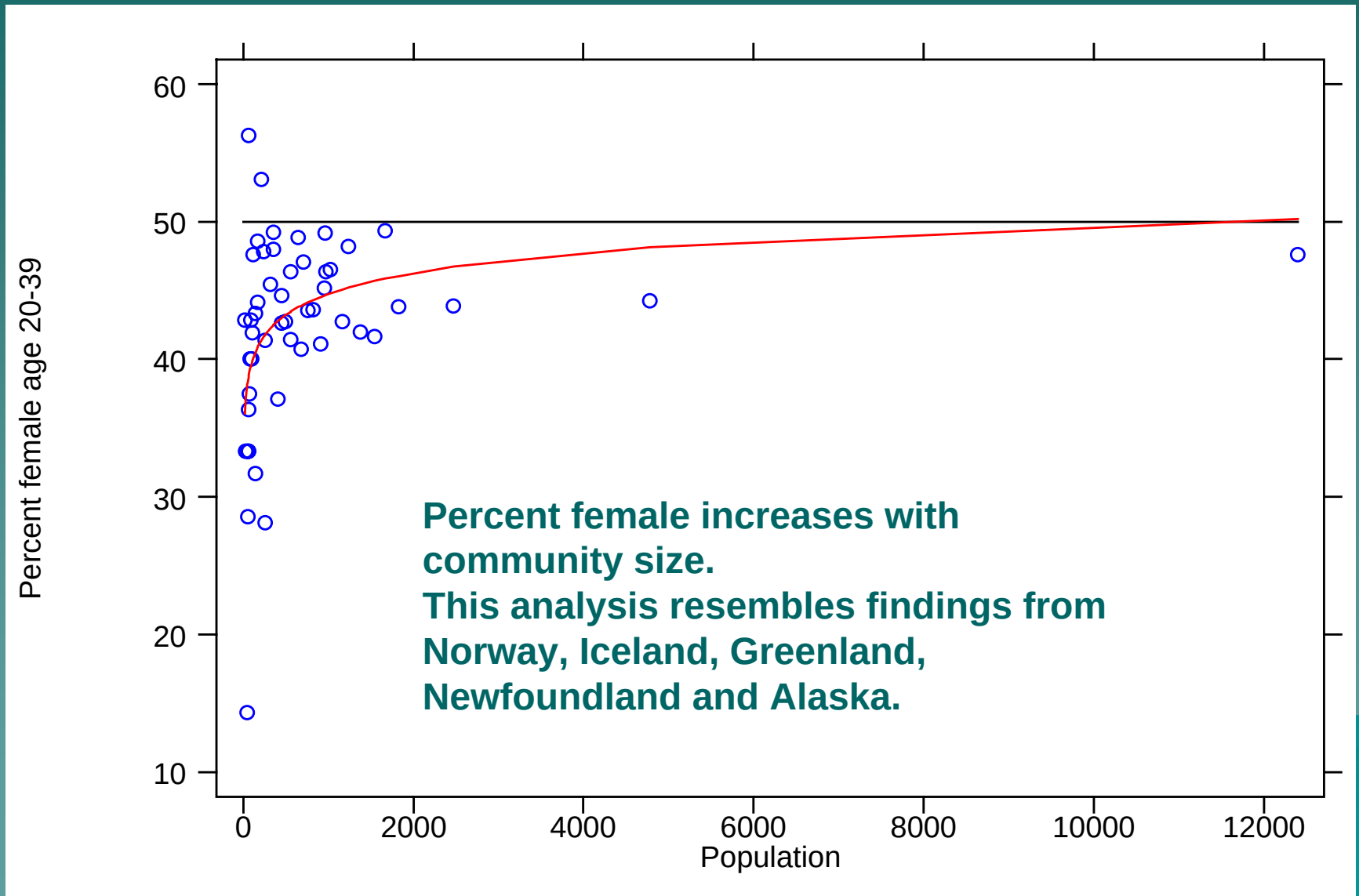
# Faroe Islands cod catch and net migration 1980-2000



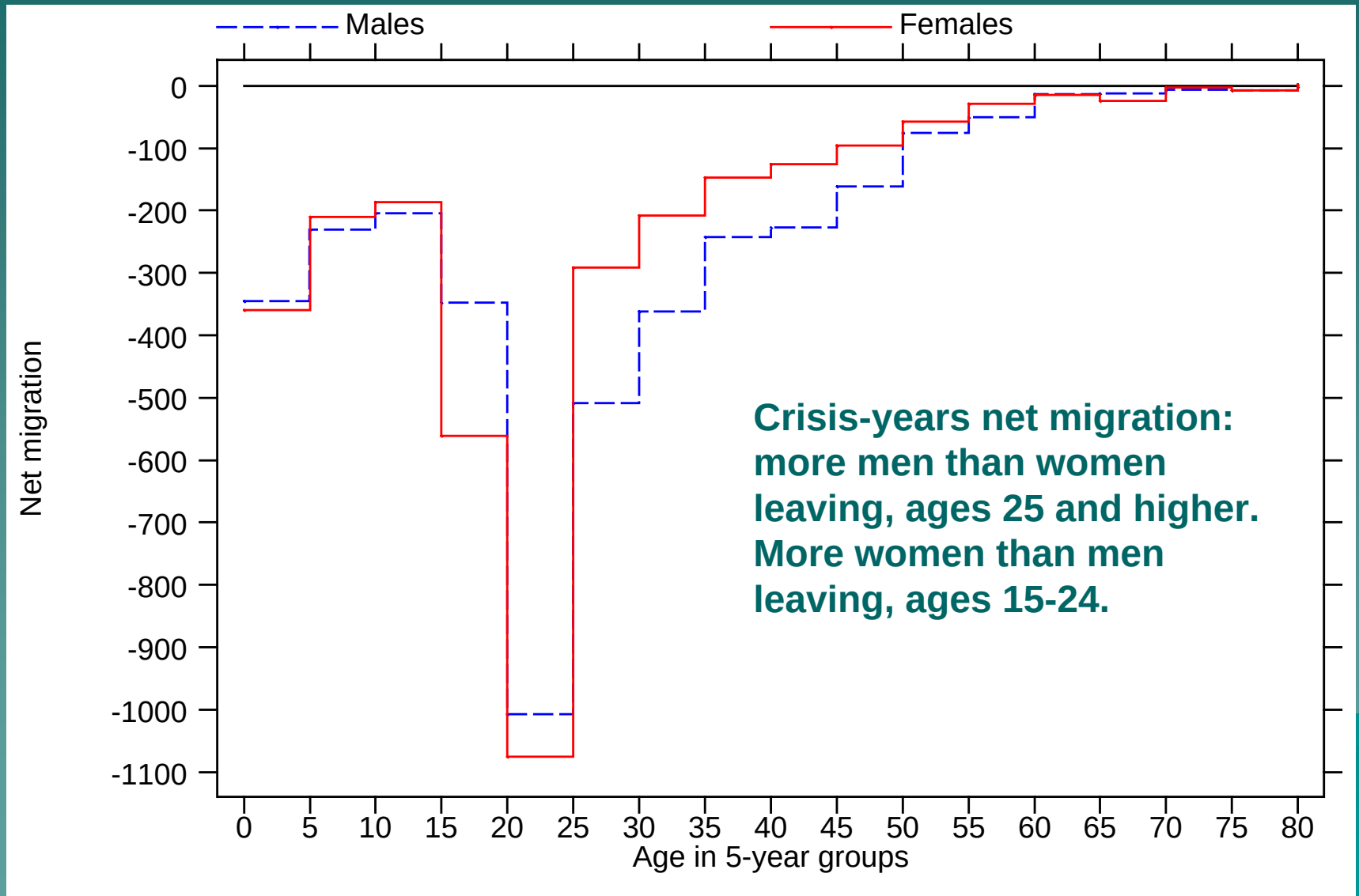
# Faroe Islands population by age group, 1979-2000



# Percent female among 20-39 year olds by municipality population, 1/2001



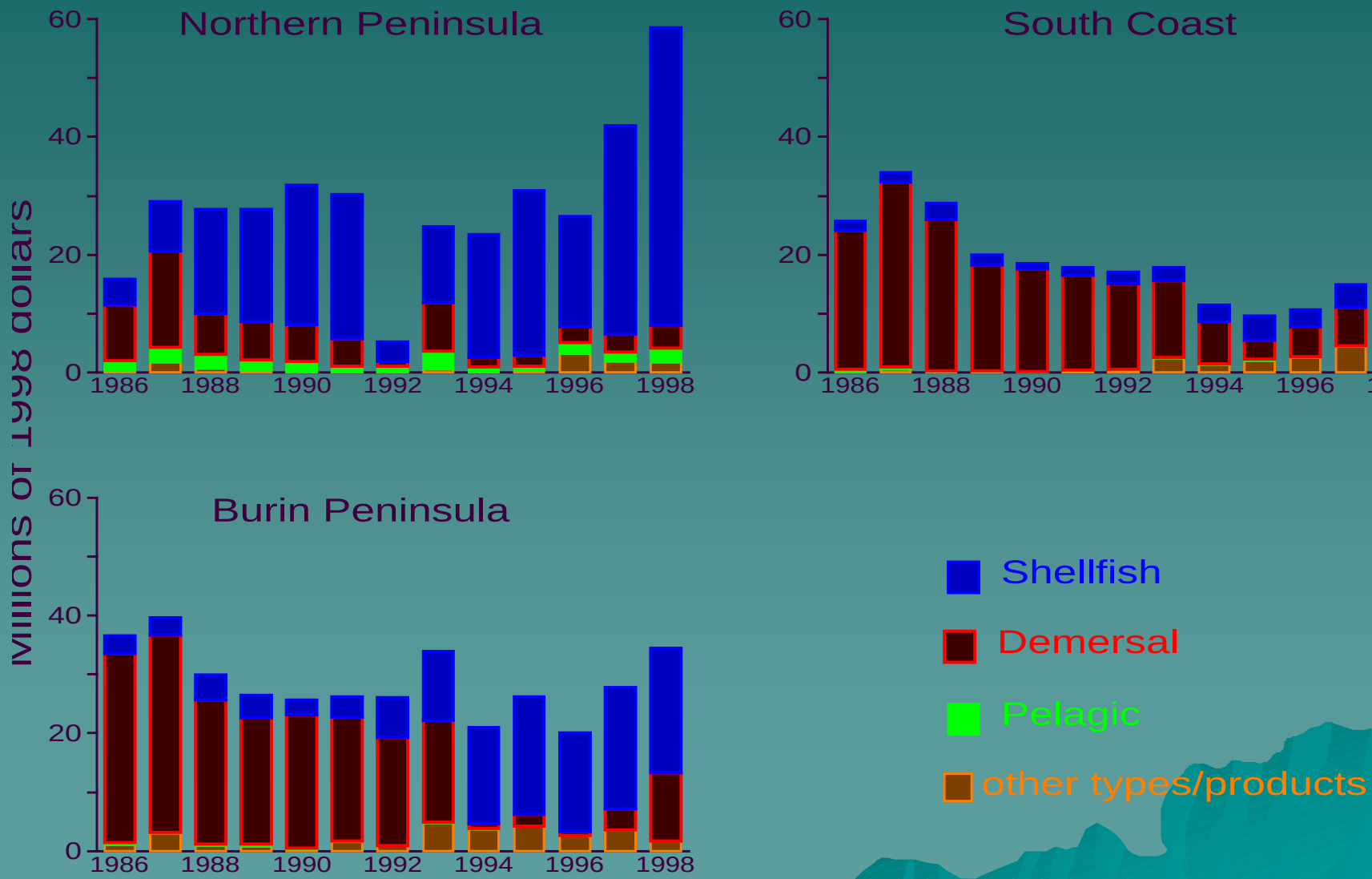
# Net migration by sex and age group, crisis years 1989-95



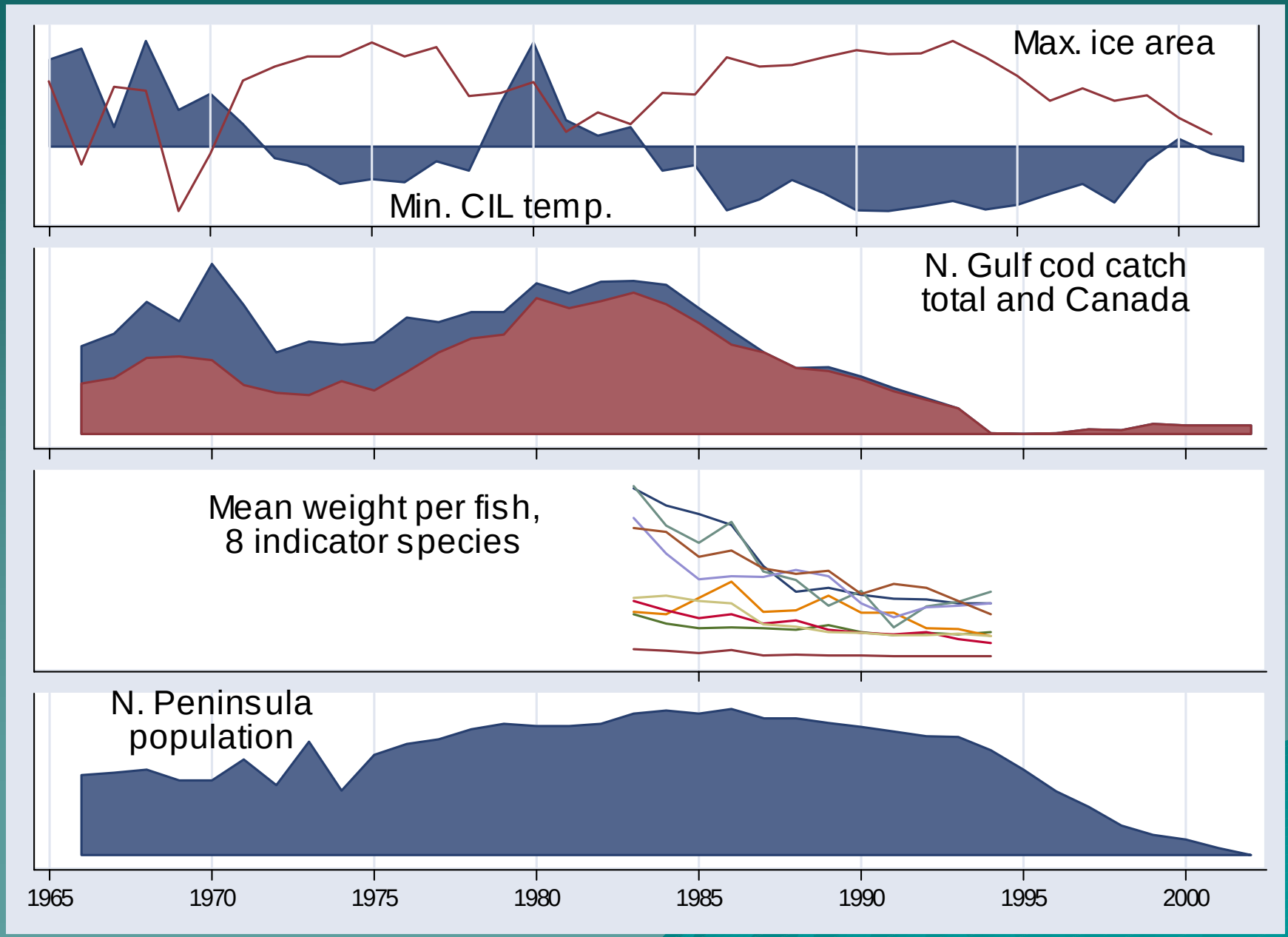
# Newfoundland, Eastern Canada


GA
BRS
GA
BRS
BRS
GA

# Landings value by species type in 3 Newfoundland regions, 1986-1998



# NW Newfoundland and the Northern Gulf of St. Lawrence



# General patterns

# Time plots show “killer spikes” of overfishing followed by steep declines.

- Dramatic spikes mark the arrival of international trawler fleets.
- NW Atlantic cod, and NE Atlantic herring, are among key resources that suffered multi-decade collapse (>99% biomass).
- Many other fish reach historical lows as well.

# Declines often involve interactions between fishing pressure and environmental variations.

- N Atlantic always a variable environment.
- Long-lived species have adapted to decade-scale variations (NAO).
- Fisheries remove older fish, leaving a smaller, less robust population behind.

# Fisheries transform their ecosystems, forcing a shift to new targets.

- Overfishing of predators removes constraints on prey species.
- Overfishing of forage fish removes food of larger fish, mammals and birds.
- Invertebrates grow more abundant as bony fish decline.
- Fisheries turn to crustaceans: shrimp, crab and lobster.

# New fisheries have different social and economic characteristics.

- Depletion of traditional resources drives the fishery:
  - Farther offshore
  - To exploit new species
  - In worse weather
- Larger, expensive vessels required.
- Distant markets control demand, set conditions.
- Fishing becomes more capital-intensive, less labor-intensive.

# As ecosystems change, there are winners and losers on land.

- New fishery might not support the same people and places.
- Wealth tends to concentrate -- across individuals, families and communities.
- There are new advantages, disadvantages, requirements.

# Small places see outmigration and demographic change.

- Net migration is a sensitive indicator.
- Young adults first to leave.
- Birth rates decline too.
- Older, less educated population remains.
- Transfer-payment dependency grows.
- Regional centers expand.

# Social factors influence the differential outcomes among people and places.

- Economic diversification is a difficult goal.
- New fisheries risk depletion, like the old.
- Tourism is “Plan B” everywhere.
- Government investments are vital, but often fail.
- Some communities are more cohesive, effective than others.

THE END