



# *Long time survey series on O-group in the Barents Sea*

*Elena Eriksen<sup>1</sup> and Dmitry Prozorkevich<sup>2</sup>*

<sup>1</sup> *Institute of Marine Research*

<sup>2</sup> *Polar Research Institute of Marine Fisheries and  
Oceanography (PINRO)*



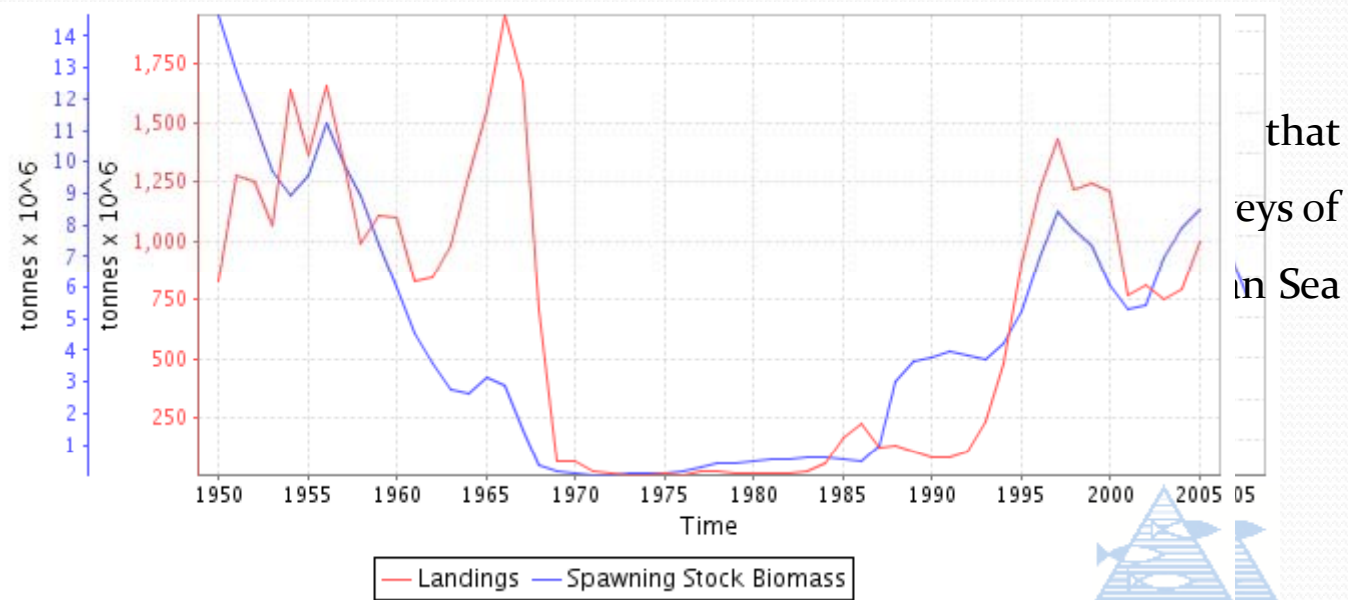
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# Background

Fish stock collapses in 1950-60<sup>s</sup>

Northeast Arctic cod *Gadus morhua* stock

Norwegian spring spawning herring *Clupea harengus*



# Development and methodology

## *Surveying*

The survey has been conducted since 1965 by the Institute of Marine Research, (IMR), Norway, the Polar Research Institute of Marine Fisheries and Oceanography (PINRO), Russia, and the United Kingdom (up until 1976).

Since 2003 the o-group survey has been a part of a Joint Norwegian-Russian ecosystem survey of the Barents Sea, designed and conducted by IMR and PINRO.

The o-group survey is carried out annually in the period August-September, and 2-3 vessels participate from each side.



# Development and methodology

## *Methods of abundance estimation*

- ✓ **1965** Dragesund and Olsen → used echo-sounder for quantitative estimates
- ✓ **1977** Haug and Nakken → “area index”
- ✓ **1984** Randa → “logarithmic index”
- ✓ **2004** Dingsør → “stratified sample mean”
- ✓ **2004-2005** Dingsør and Prozorkevich → updated “stratified sample mean”



# Development and methodology

## *Collecting of data*

The biological data collected during the survey is the basis for estimation of fish abundance.

- ✓ exchanging of hand-written data
- ✓ exchanging of data in electronic form

Two databases (Norwegian and Russian), containing 27 years (1980-2006) of annual survey data.

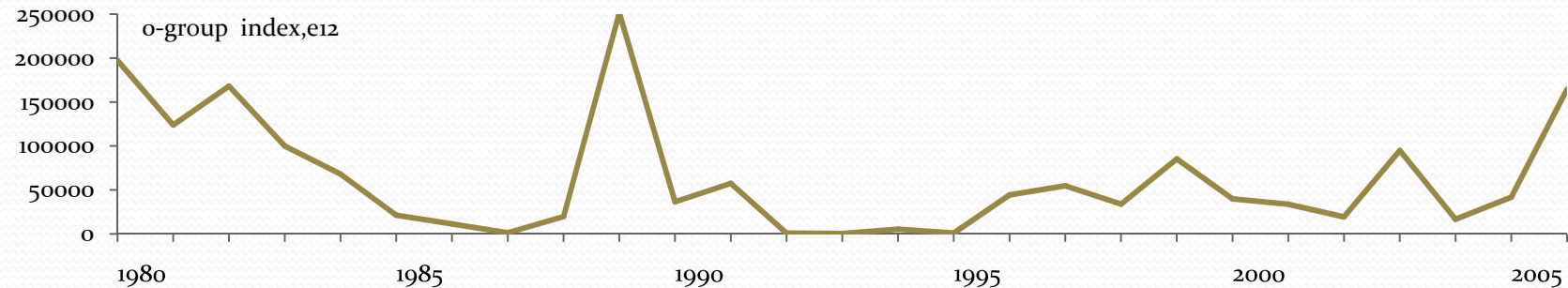
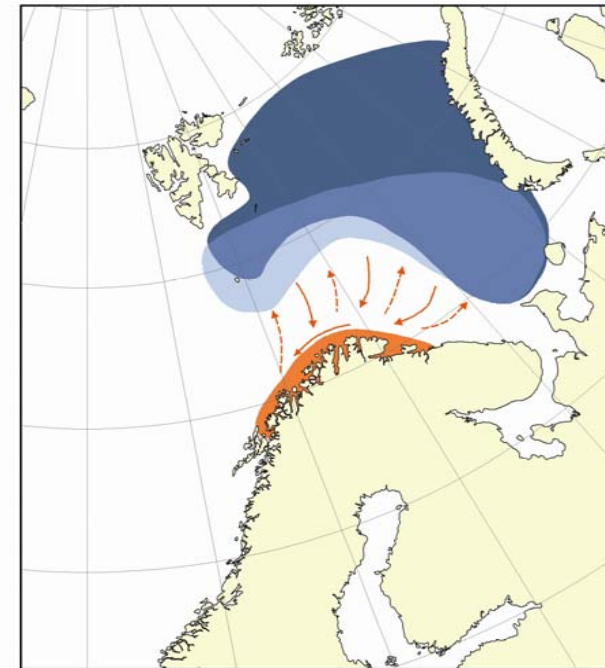
# Materials and methods

## *Quality control of databases and recalculation of o-group indices*

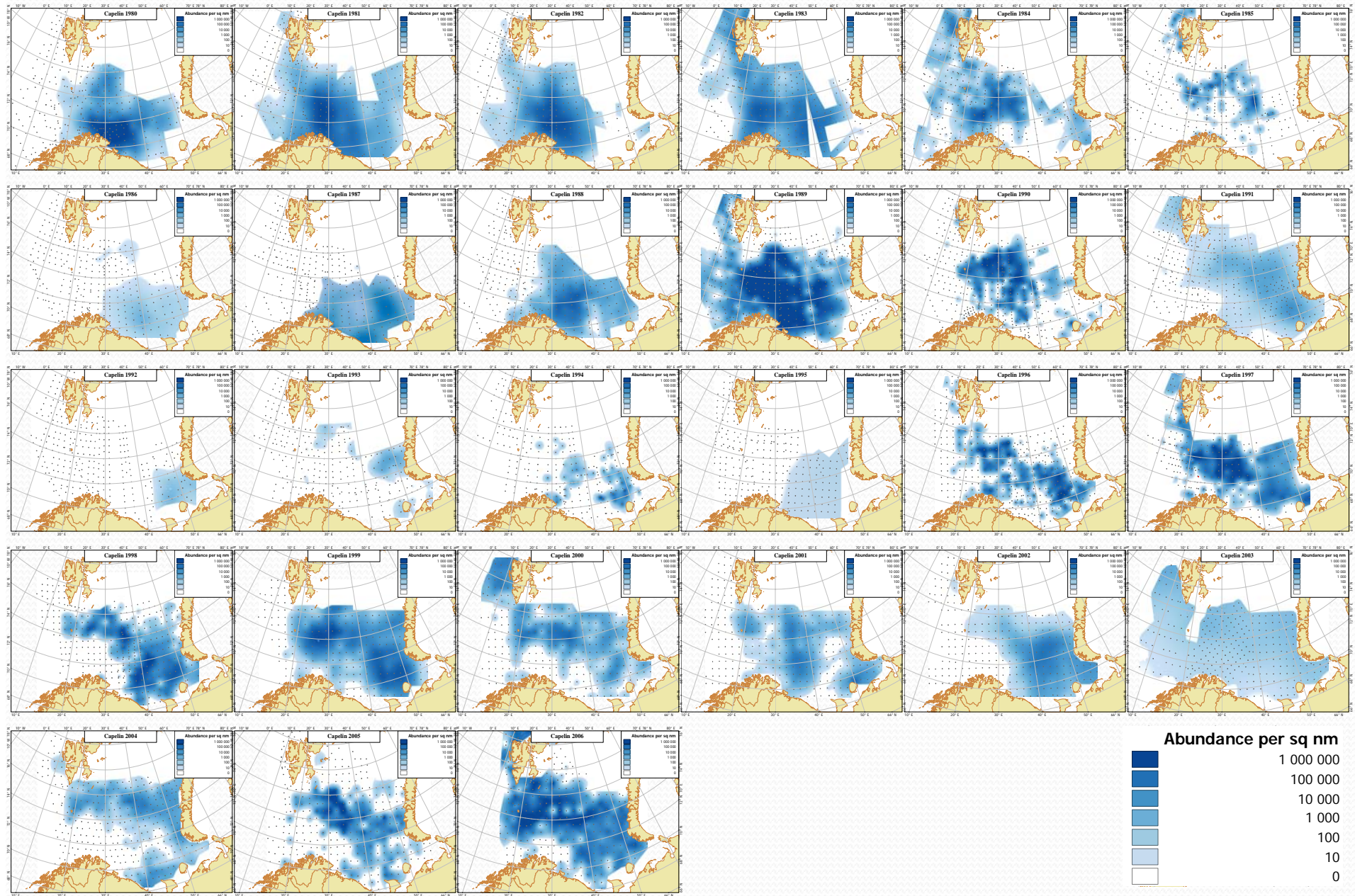
- ✓ Position, trawl distance, trawling depth steps, fish number, length frequencies, and o-group fish coding are examples of variables that have been checked and corrected.
- ✓ Registration of missing data
  - 12 stations in 1982
  - 8 in 1983
  - 132 in 1984
  - 41 in 1995
  - length frequencies for the Russian data in 2002 were registered
- ✓ The corrected dataset (1980-2006) was used to
  - ✓ re-calculate o-group indices, using the updated method of stratified sample mean. New indices are presented in ICES (2007)
  - ✓ recalculated densities of the o-group fishes were used to create distribution maps for 10 fish species for 1980-2006. This work presents historical distribution maps for capelin, herring, cod and haddock

## *Barents Sea capelin (Mallotus villosus)*

- ✓ Capelin is a short-lived pelagic fish and matures at an age of 2-4 years.
- ✓ Mature capelin migrates to the coast of Northern Norway and Russia during February.
- ✓ Spawning areas and time vary from year to year. Spawning can take place from Lofoten to the Kola Peninsula.



# Historical distribution of 0-group capelin (1980-2006)



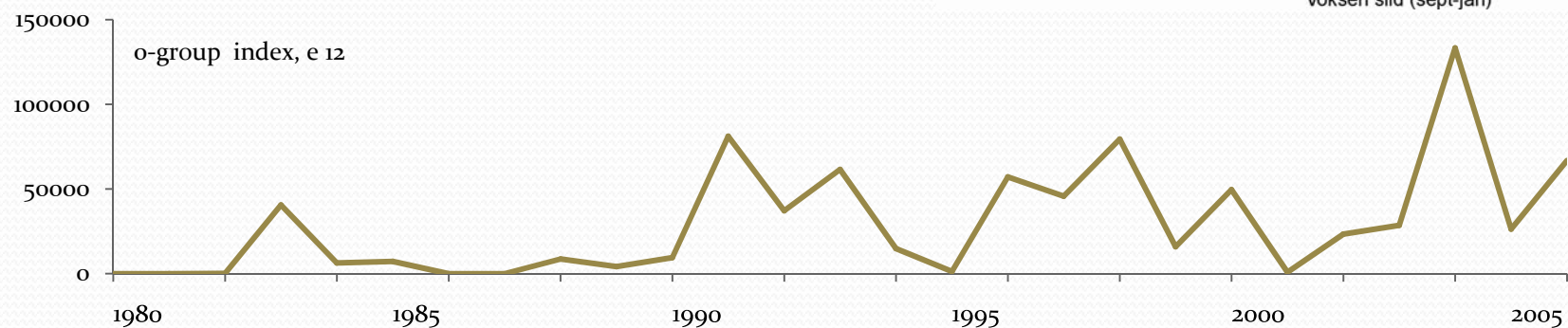
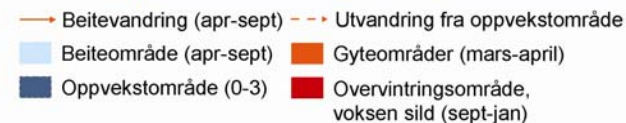
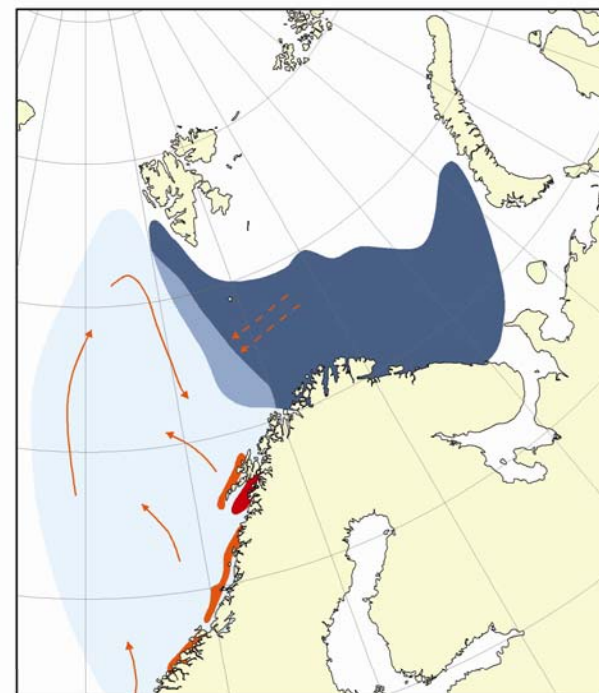


## Norwegian spring spawning herring (*Clupea harengus*)

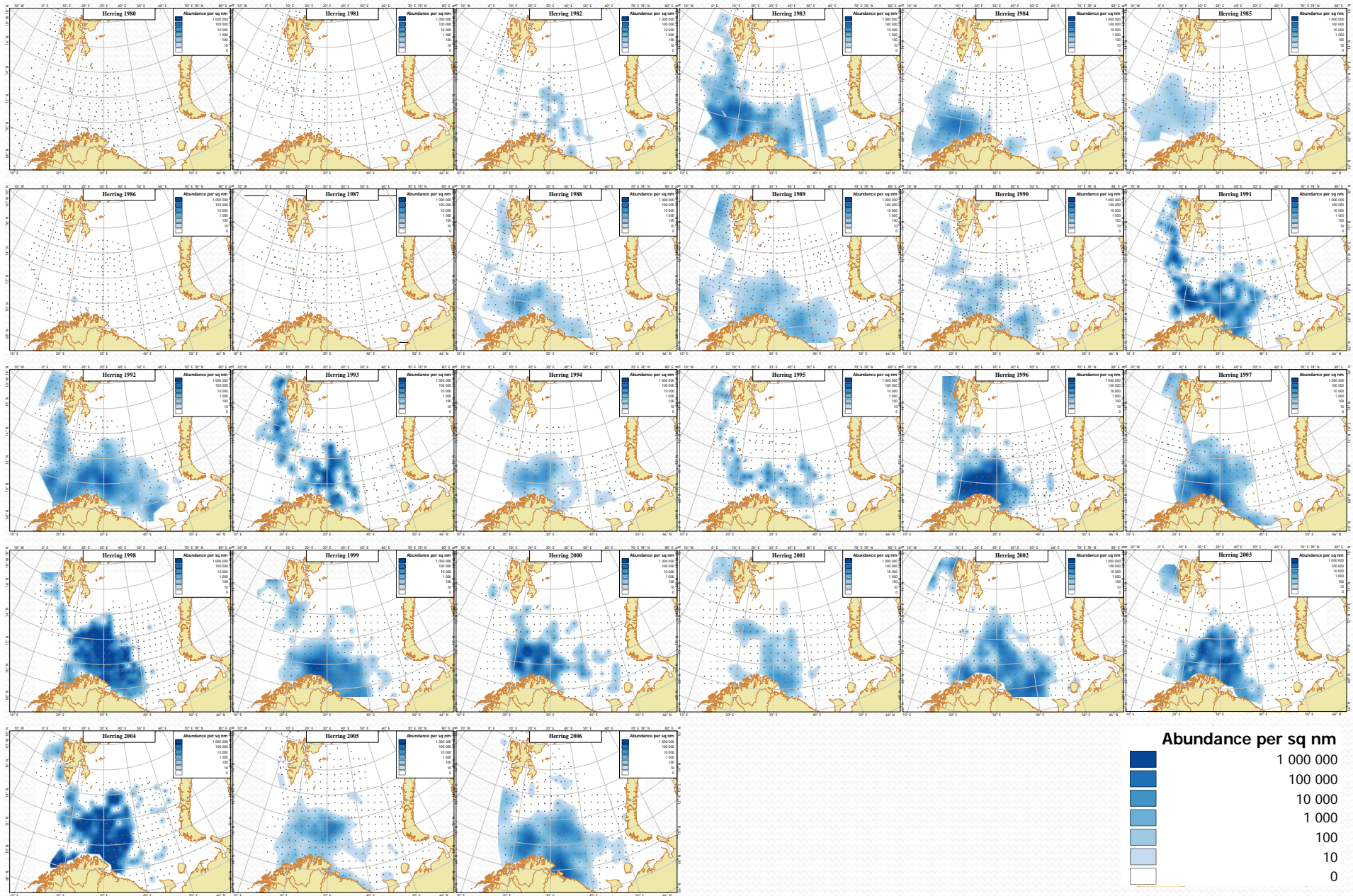
✓ Herring is pelagic steam fish and matures at an age of 5-7 years

✓ Mature herring migrates to the coast of Møre and Nordland during February-March

✓ Larvae of herring are transported by the Norwegian Atlantic current into the Norwegian and Barents Seas. Therefore larval abundance drift into the Barents Sea varied between years

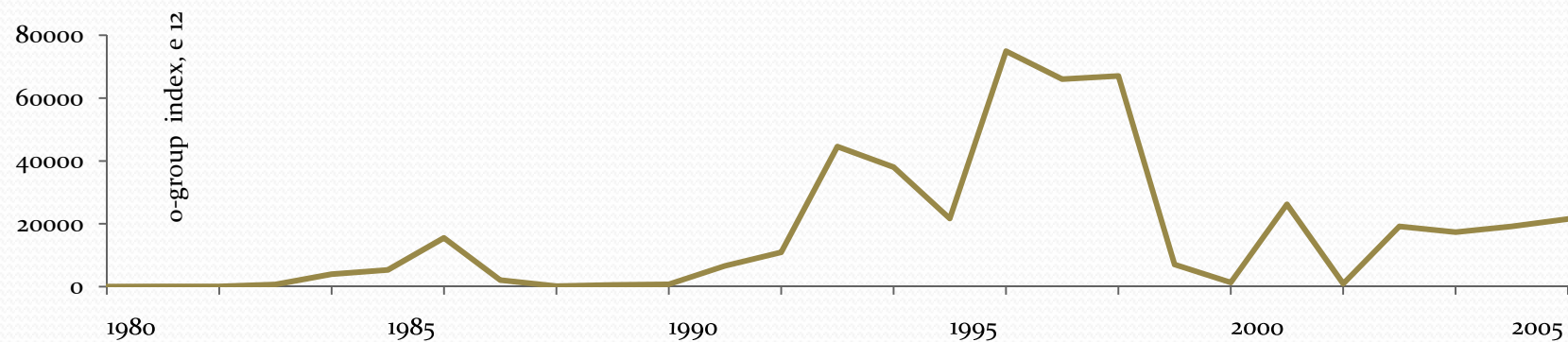
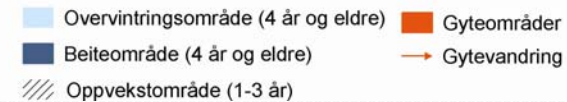
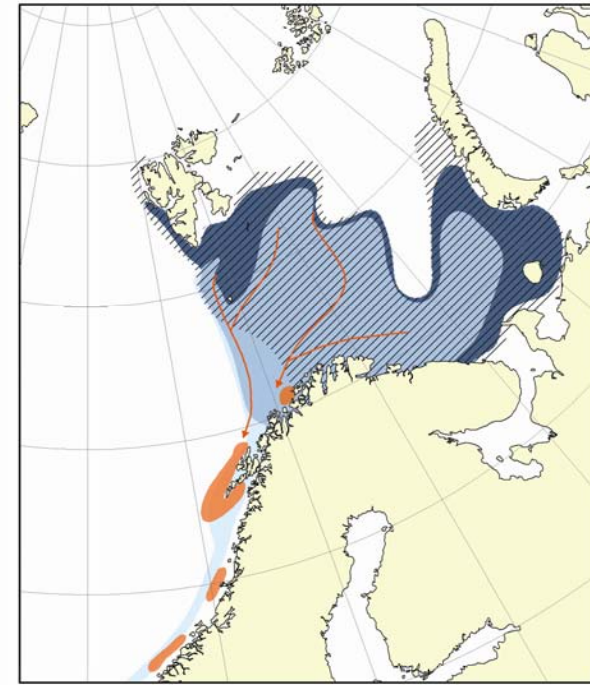


# Historical distribution of o-group herring (1980-2006)

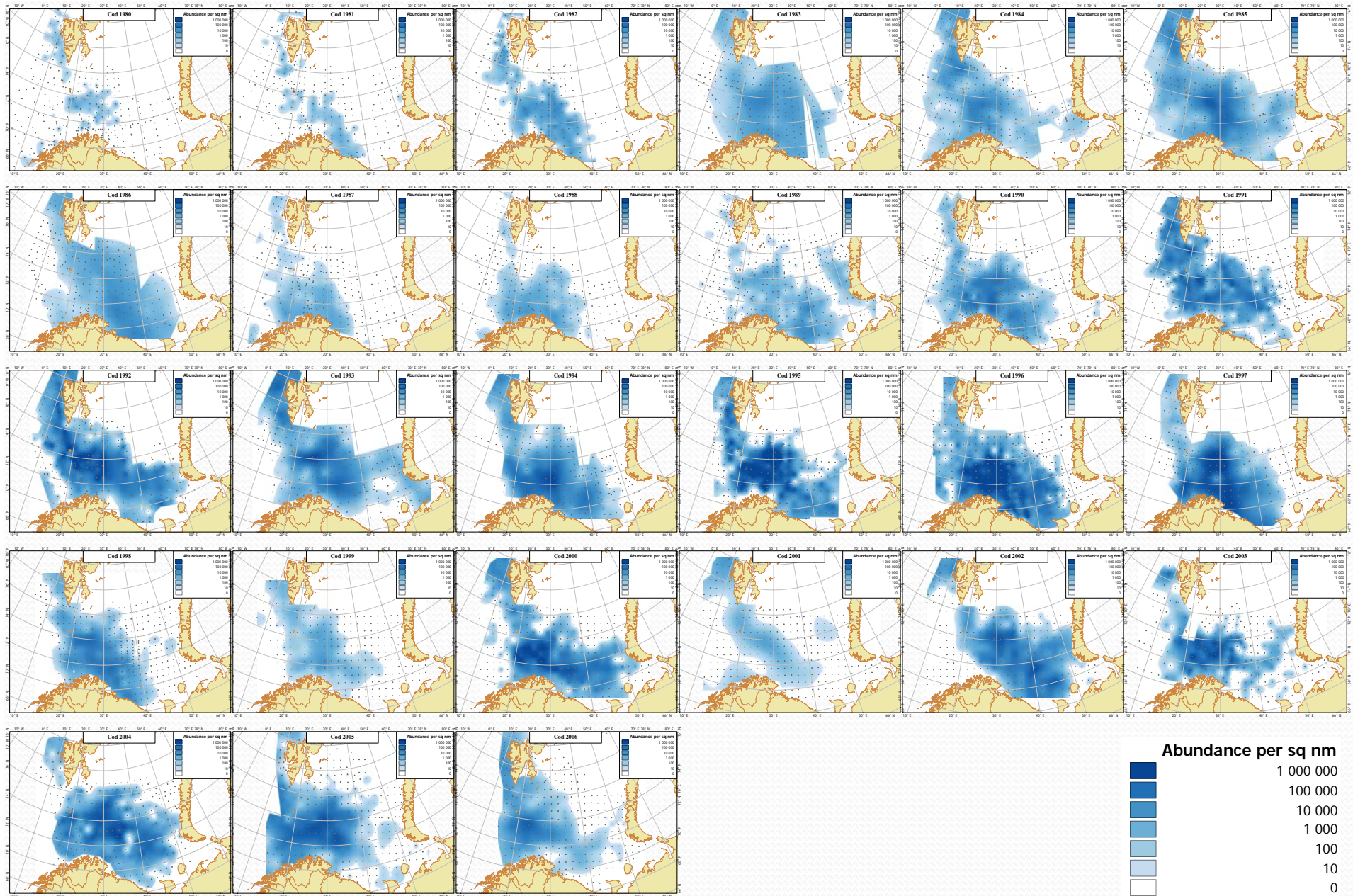


## Northeast Arctic cod (*Gadus morhua*)

- ✓ Cod is demersal fish, and matures at an age of 6-7 years
- ✓ Mature cod migrates to the coast of Lofoten/Vesterålen during February- April
- ✓ Both egg and larvae are transported by the Norwegian Atlantic current into the Barents Sea

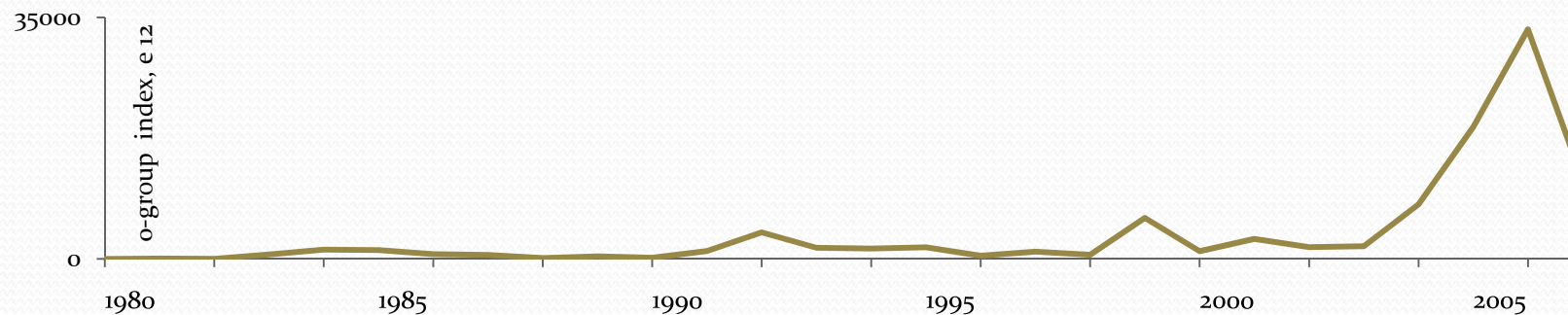


# Historical distribution of o-group cod (1980-2006)

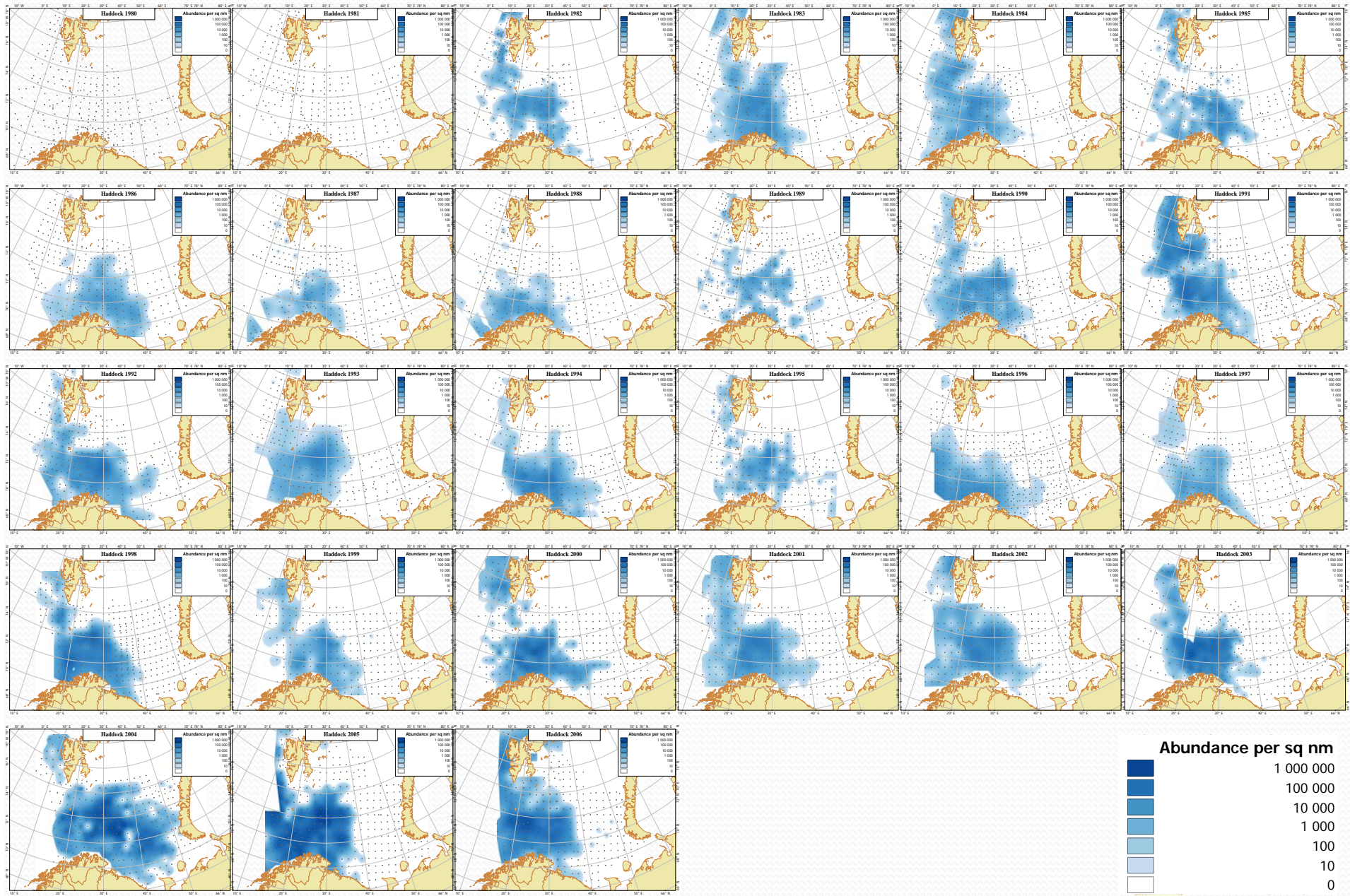


## *Northeast Arctic haddock* (*Melanogrammus aeglefinus*)

- ✓ Haddock is demersal fish, and matures at an age of 6-8 years
- ✓ Spawning areas situated along Norwegian coast, west for Tromsøflaken, and spawning time - March-June
- ✓ Larvae of haddock are transported by the Norwegian Atlantic and coastal currents along Norwegian coast and into the and Barents Seas. Therefore larval abundance drift into the Barents Sea varied between years.



# Historical distribution of o-group haddock (1980-2006)





## Results and conclusions

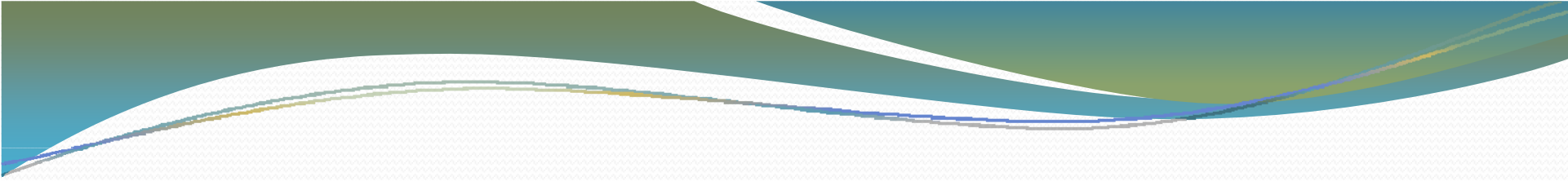
- ✓ o-group indices varied between years and species. Capelin is most abundant o-group fish in the Barents Sea.
- ✓ o-group fish index tends to be positively associated with temperature. Temperature impacts directly (metabolism etc) and/or indirectly (food availability etc) on abundance of o-group fish
- ✓ o-group fish index tends to be positively associated with spatial distribution, and stronger year classes distribute widely in the Barents Sea
- ✓ Spatial and temporal overlap with predators (larger o-group fishes and/or other predators) will impact negatively on o-group abundance



## Results and conclusions

- ✓ Common interests in the Barents Sea fish resources and agreement between Norway and Soviet Union, later Russian Federation, have been the basis for the long cooperation within 0-group fish investigation in the Barents Sea.
- ✓ About 2000 individuals (about 30 researchers and technicians and 12 crew members per year for 43 years) have participated in the 0-group survey
- ✓ About 180 vessels (about 4 vessels per year for 43 years) have participated in survey
- ✓ Long term teamwork between Norwegian and Russian specialists
  - ✓ resulted in enormous biological and environmental data collection
  - ✓ provided the common understanding within surveys design, abundance estimation methods and data collecting
  - ✓ provided the better understanding of fish biology and potential factors influencing survival of fish during first crucial month of its life





A lot of thanks for all scientists, technicians and vessel crew for their contribution to carrying out surveys in the last 43 years, and establishing a solid foundation for future cooperation between Norway and Russia.

# Take care of the unique “kindergarten”

