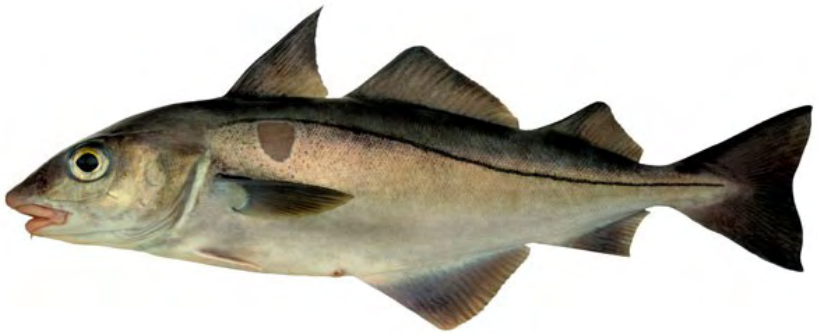
Geographical distribution and abundance of North East Arctic (NEA) haddock (*Melanogrammus aeglefinus*) in a changing climate

Camilla Stegen Landa



Haddock (*Melanogrammus aeglefinus*)

- Gadoid, demersal, boreal fish species
- North Atlantic haddock stocks distributed around western and eastern shelf
- NEA haddock located along the Norwegian shelf and the Barents Sea
- Pelagic eggs and larvae drift from spawning grounds into the Barents sea and settle after 4-5 months
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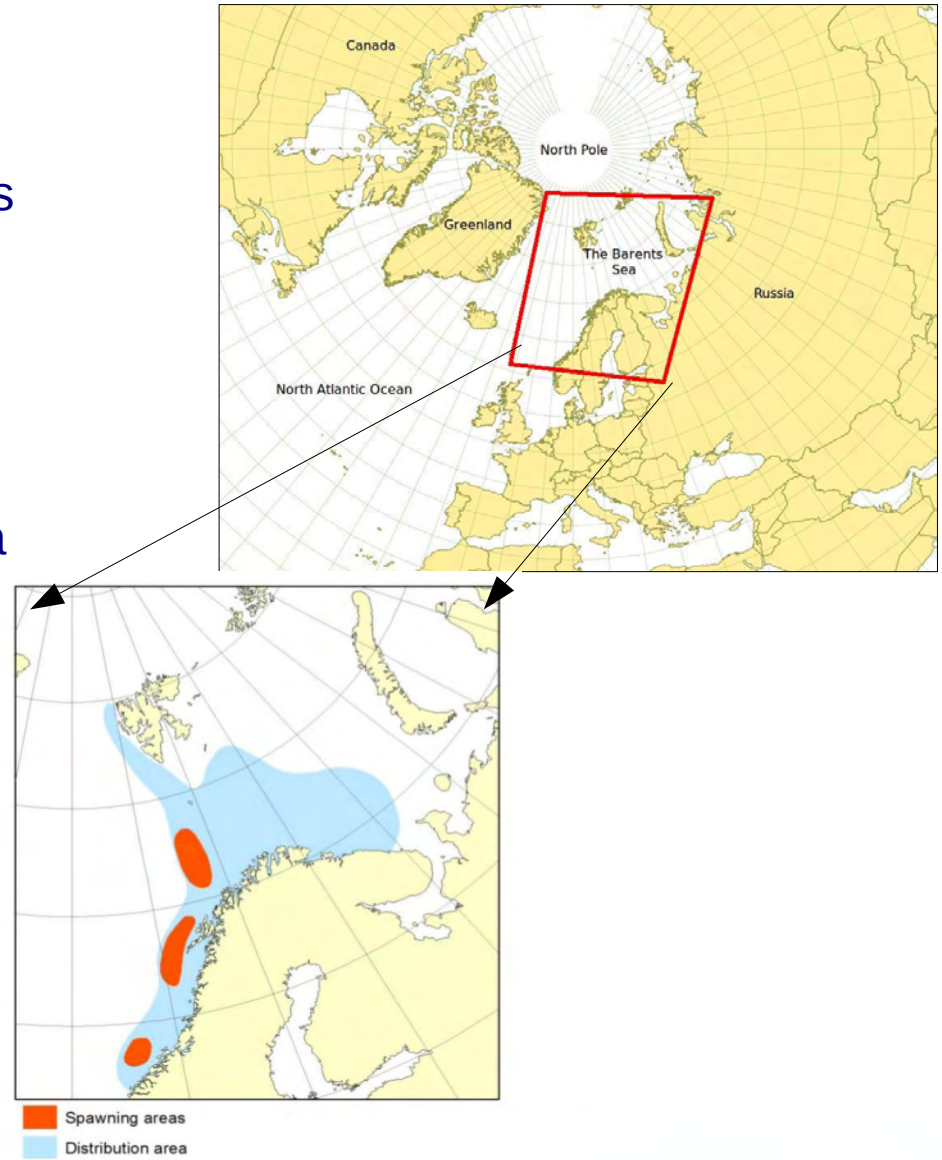

Joint Norwegian-Russian environmental status report, 2008

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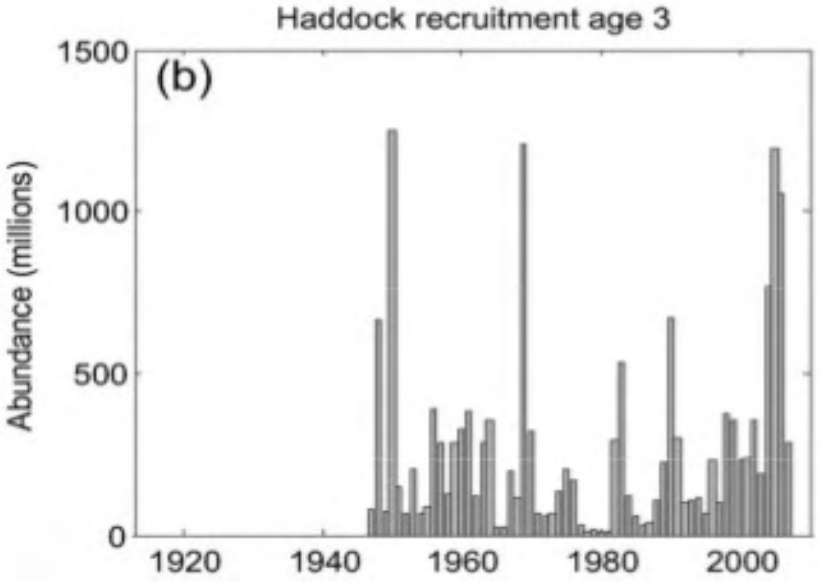
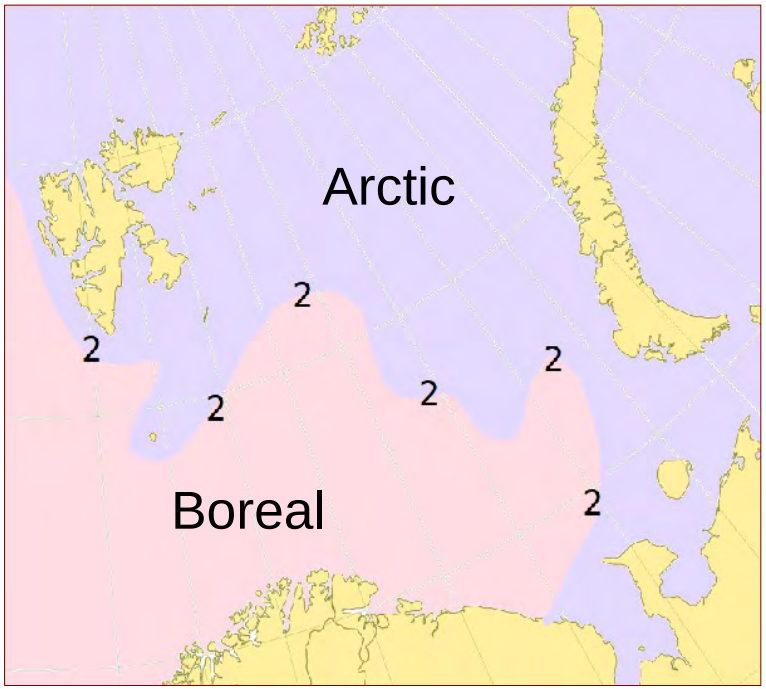


Bogstad et. al (submitted)

Circulation system and temperature fluctuations in the Barents Sea



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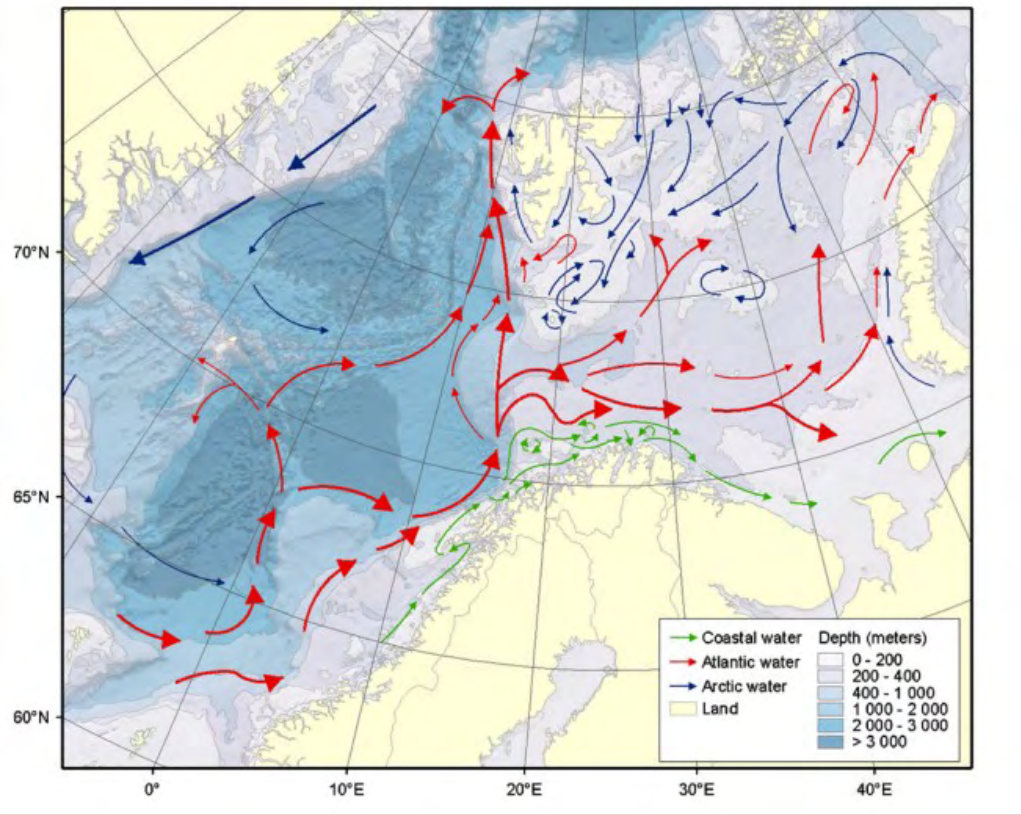

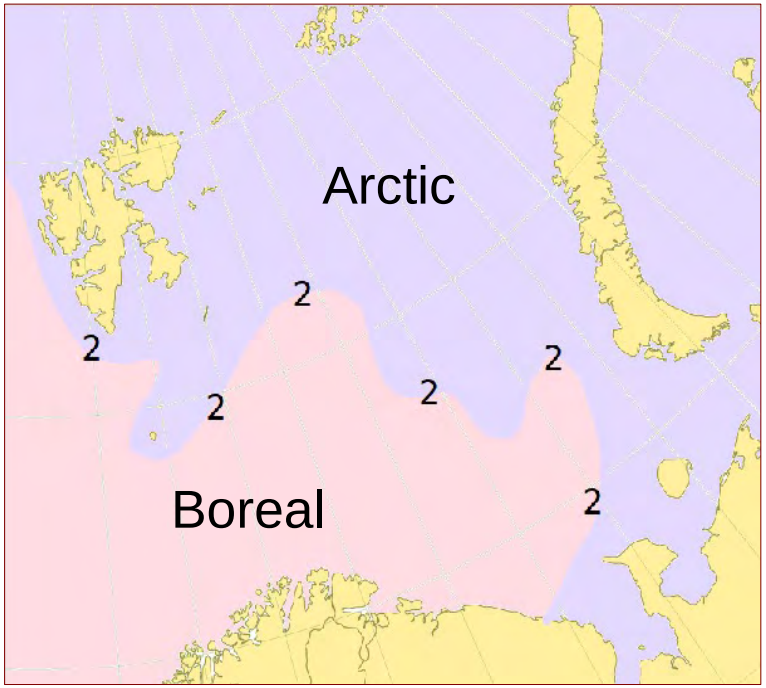

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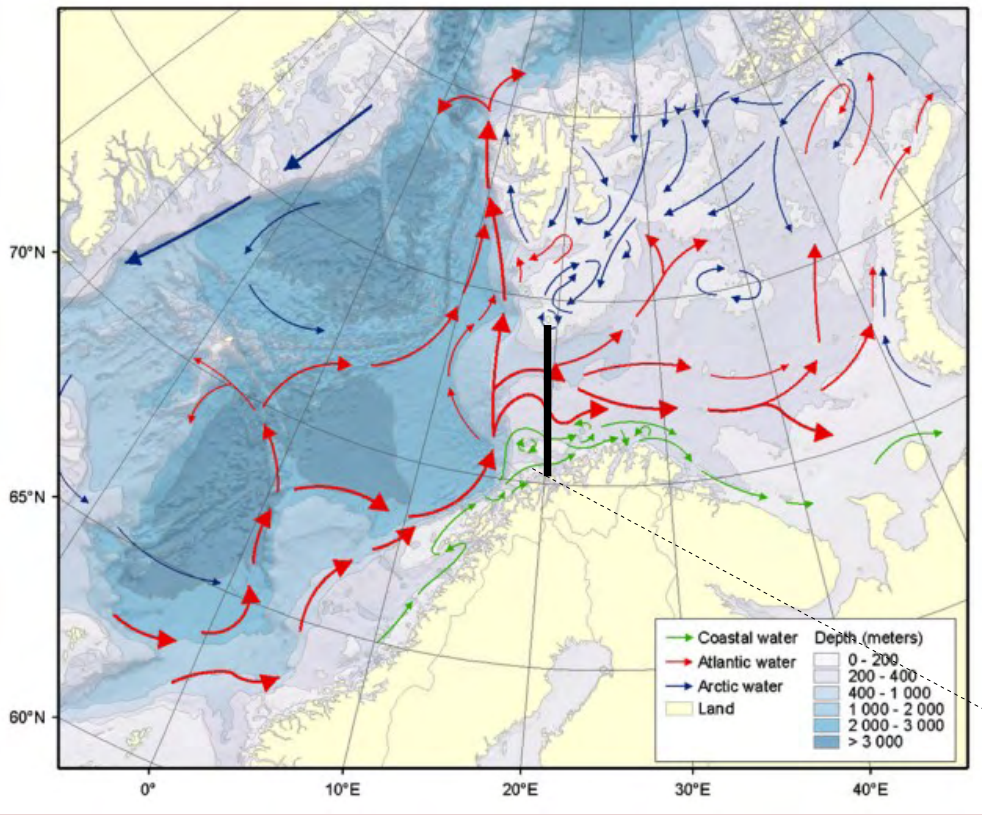

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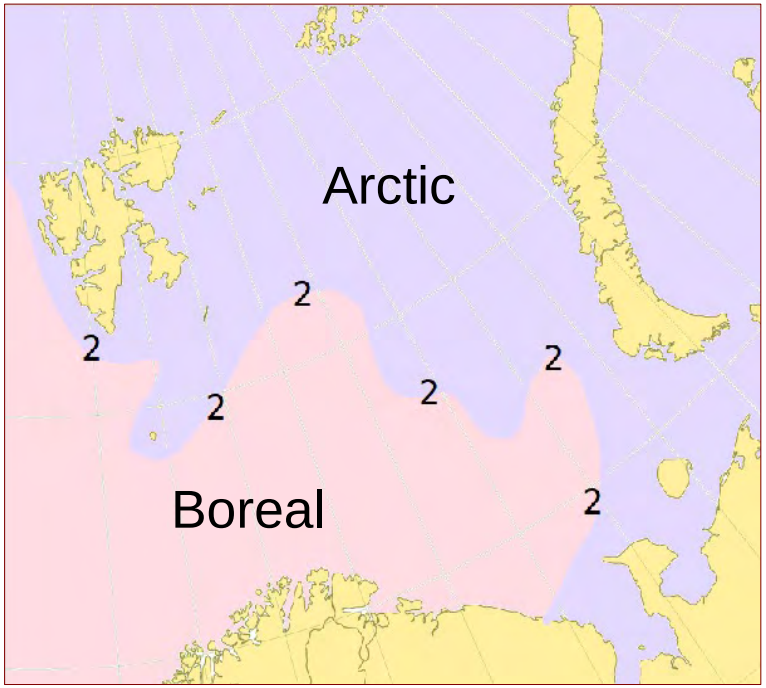
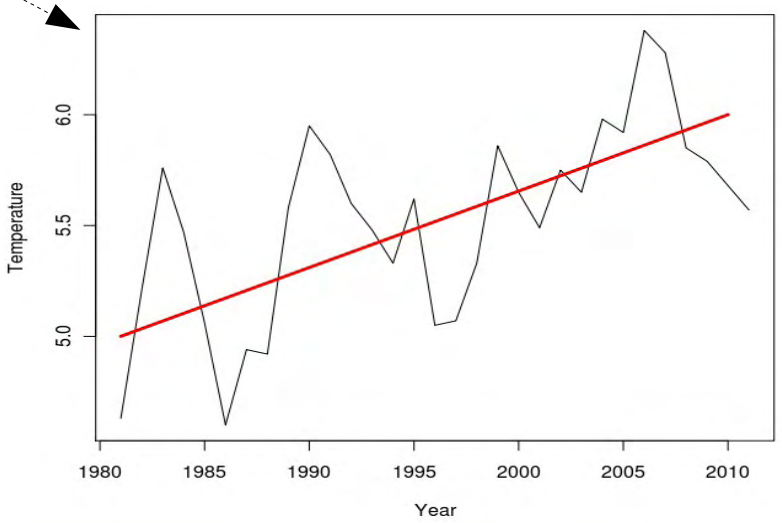
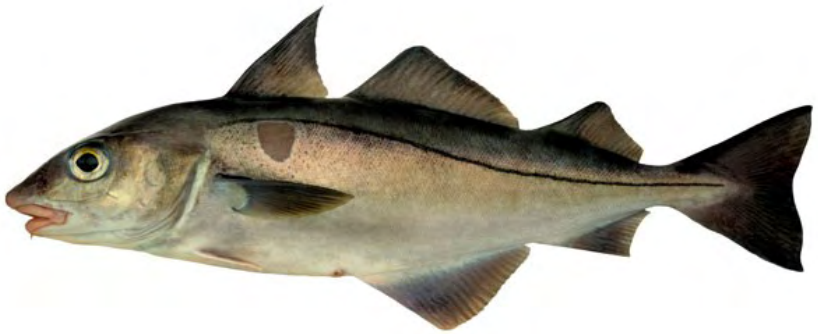




Research questions

- Have temperature affected the abundance of haddock in the period 1981-2011?

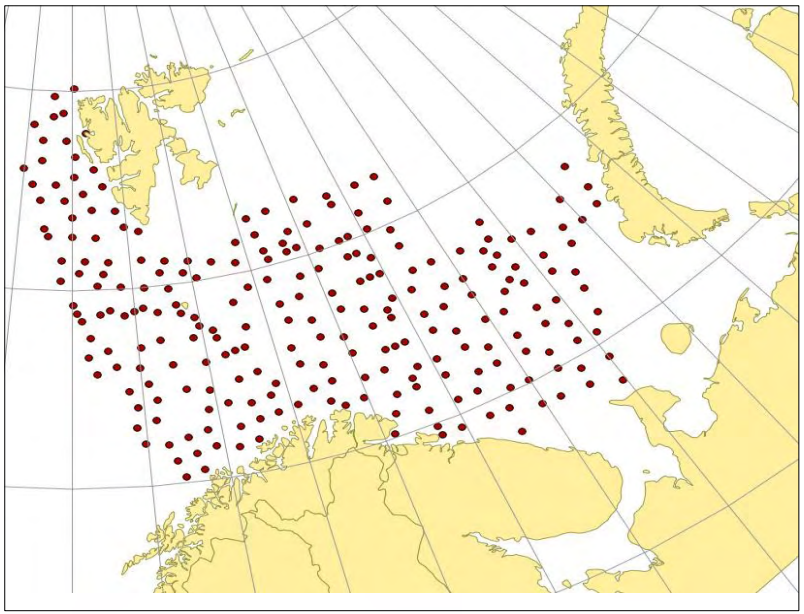
- Have temperature affected the distribution centres of haddock in the period 1981-2011?



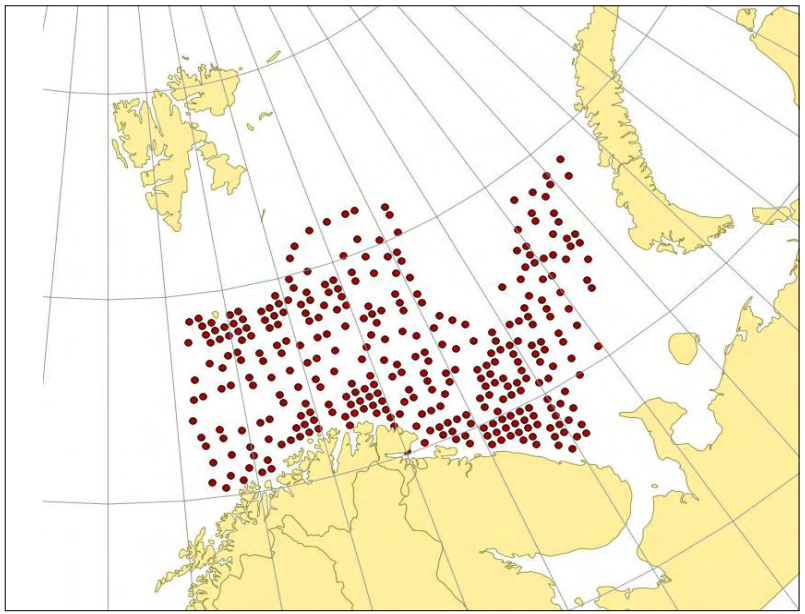
Material

- Data analysis
- Data collected annually since 1981

0-group – August-September

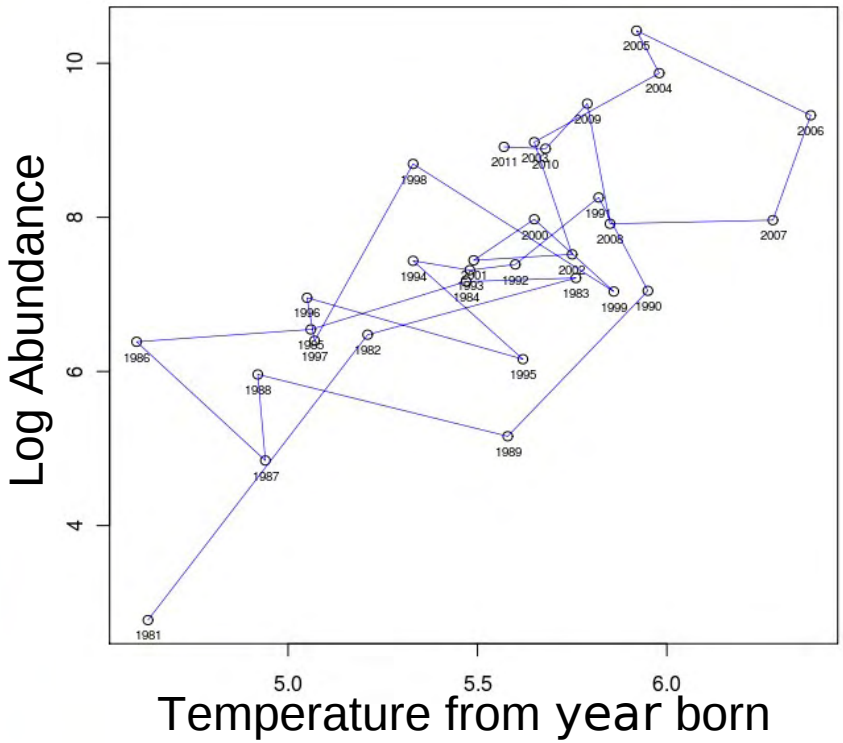


1-9 year old – January-March



Results

Logarithmic abundance of 0-group VS temperature the year when born



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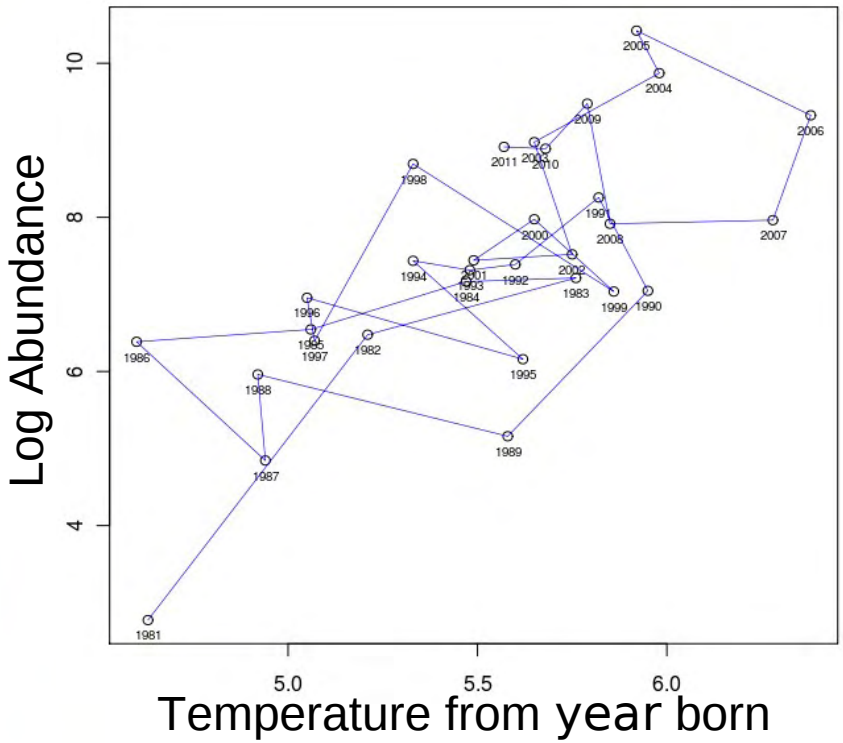

Short term response?

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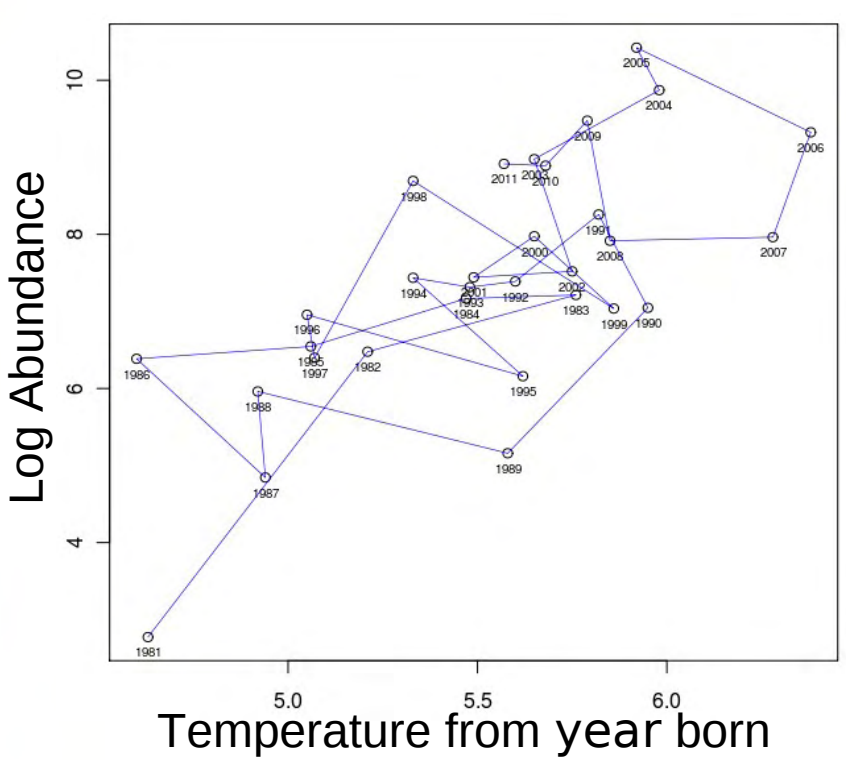

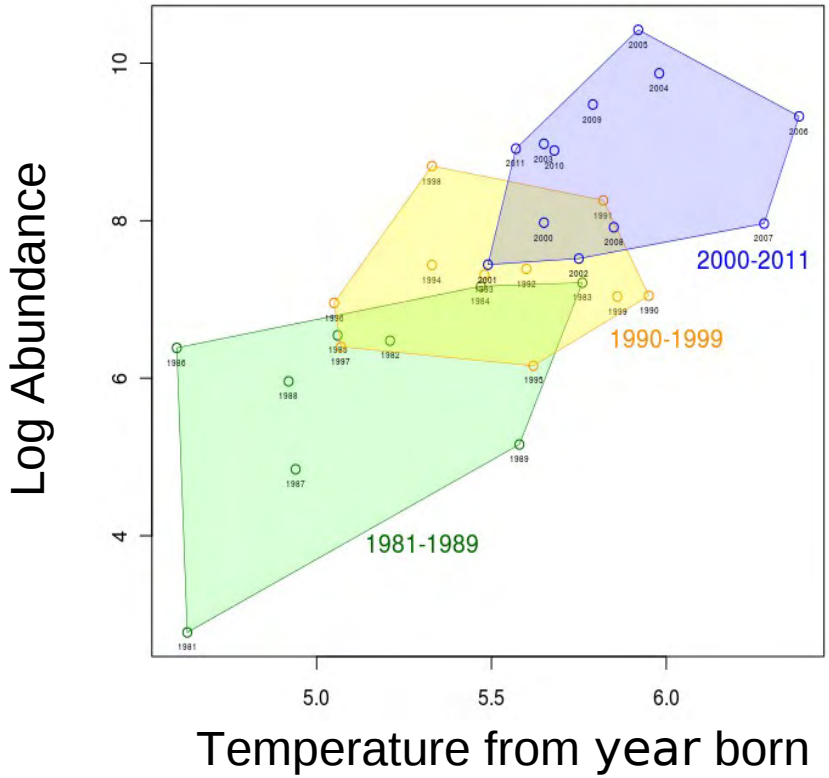

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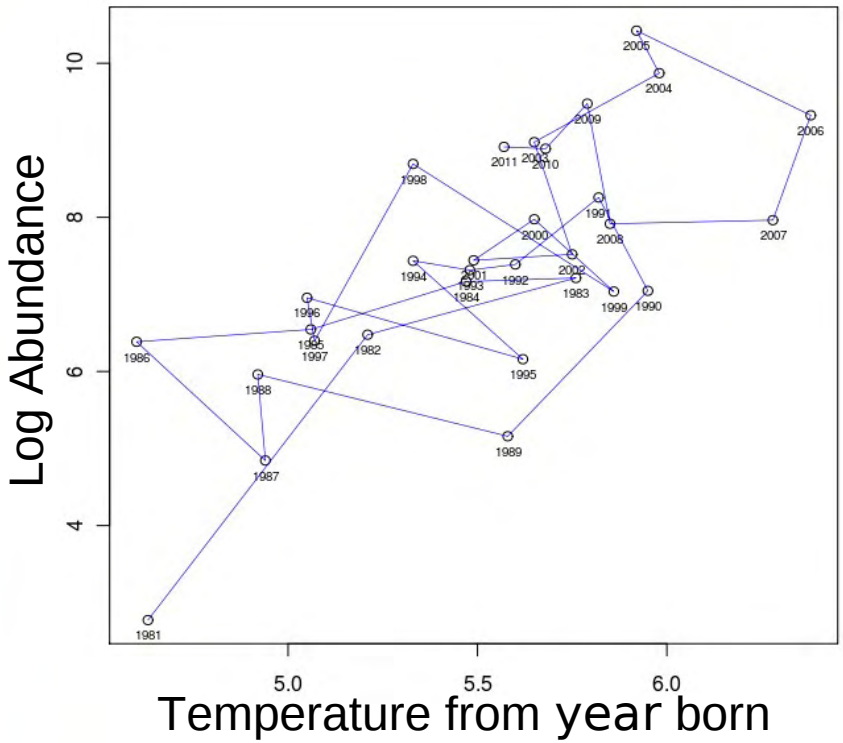
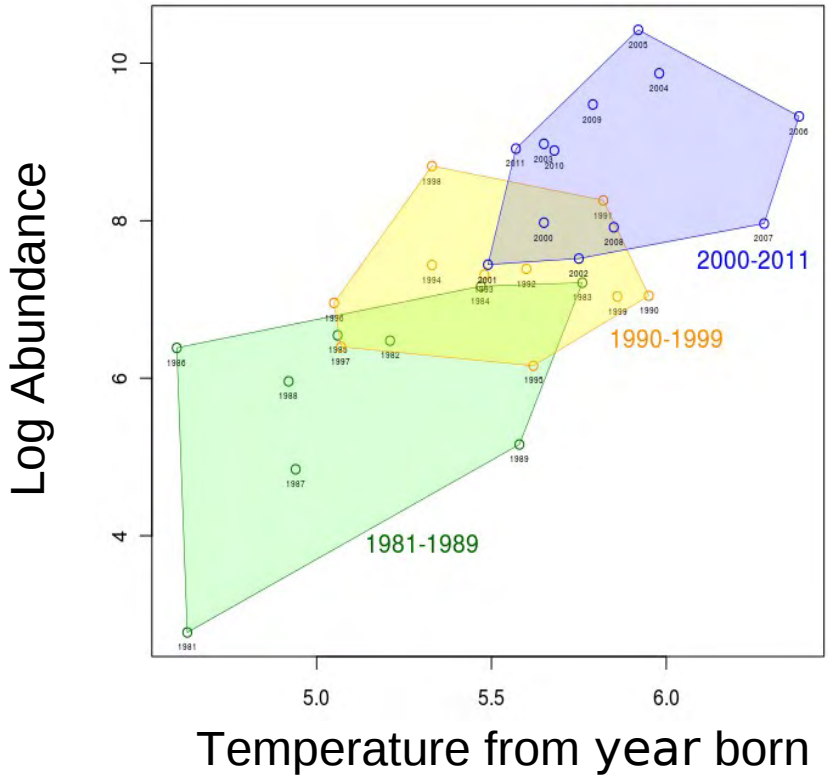
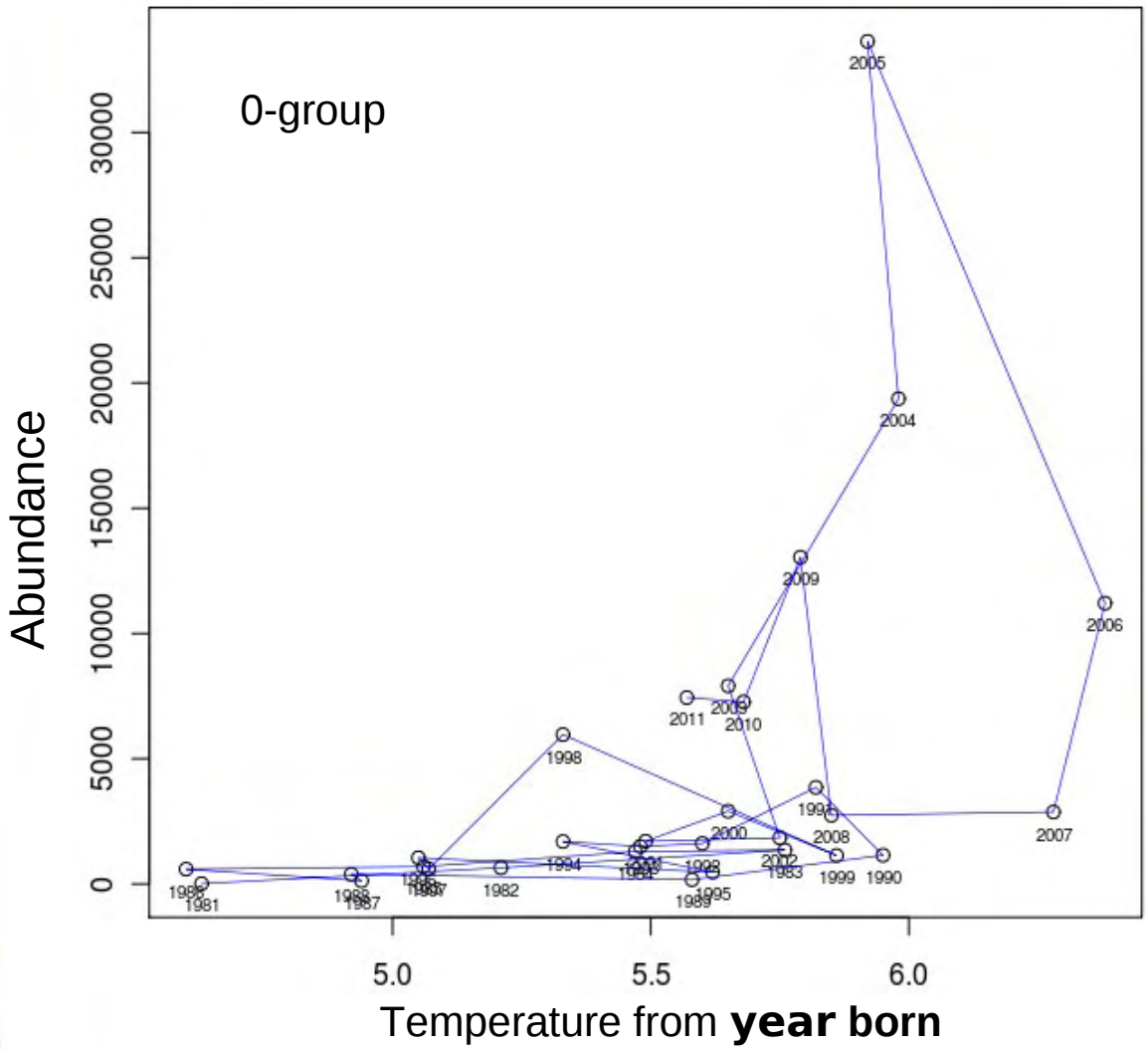




Short term response?

Long term response?

Abundance VS temperature from year when born



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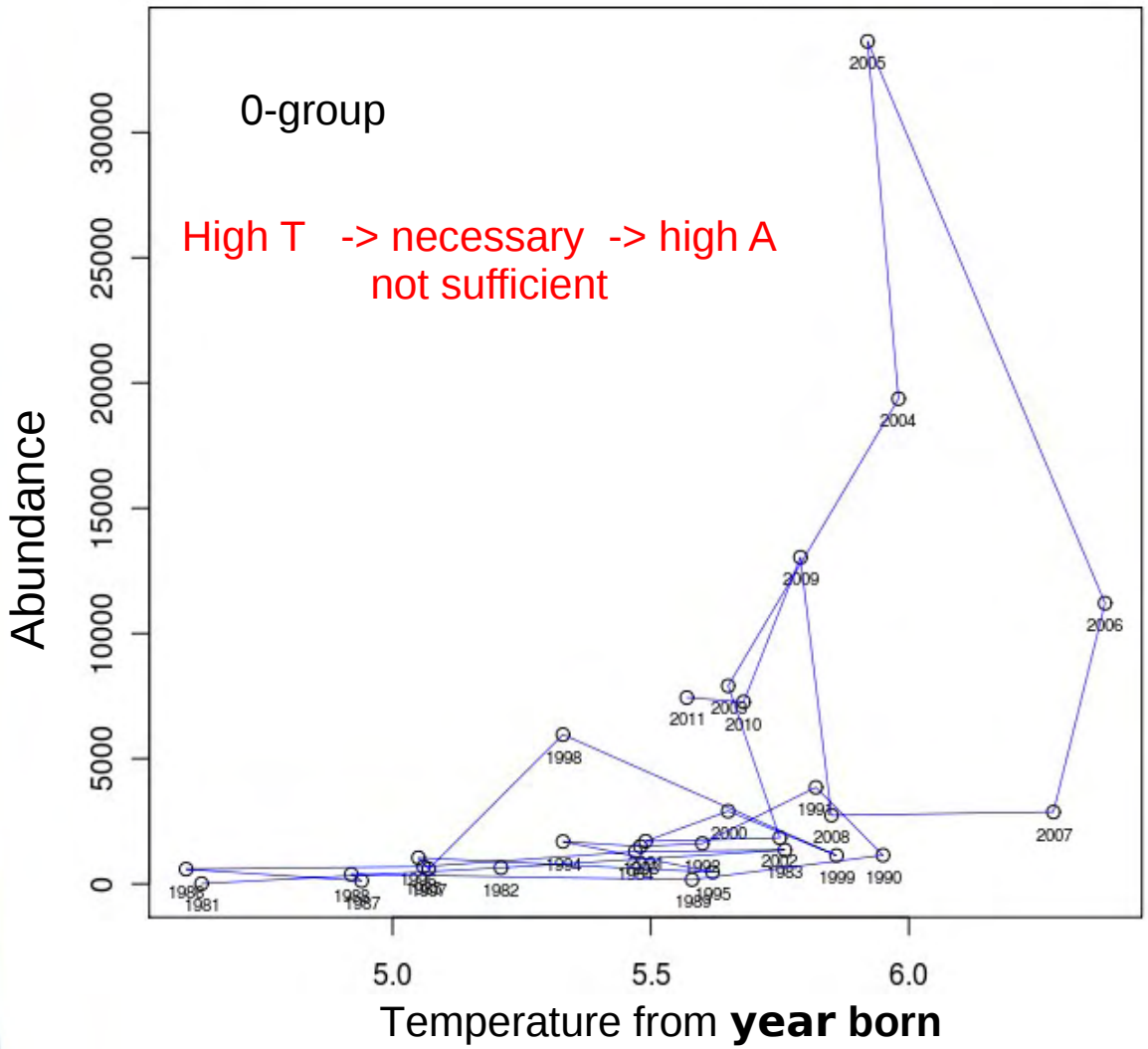

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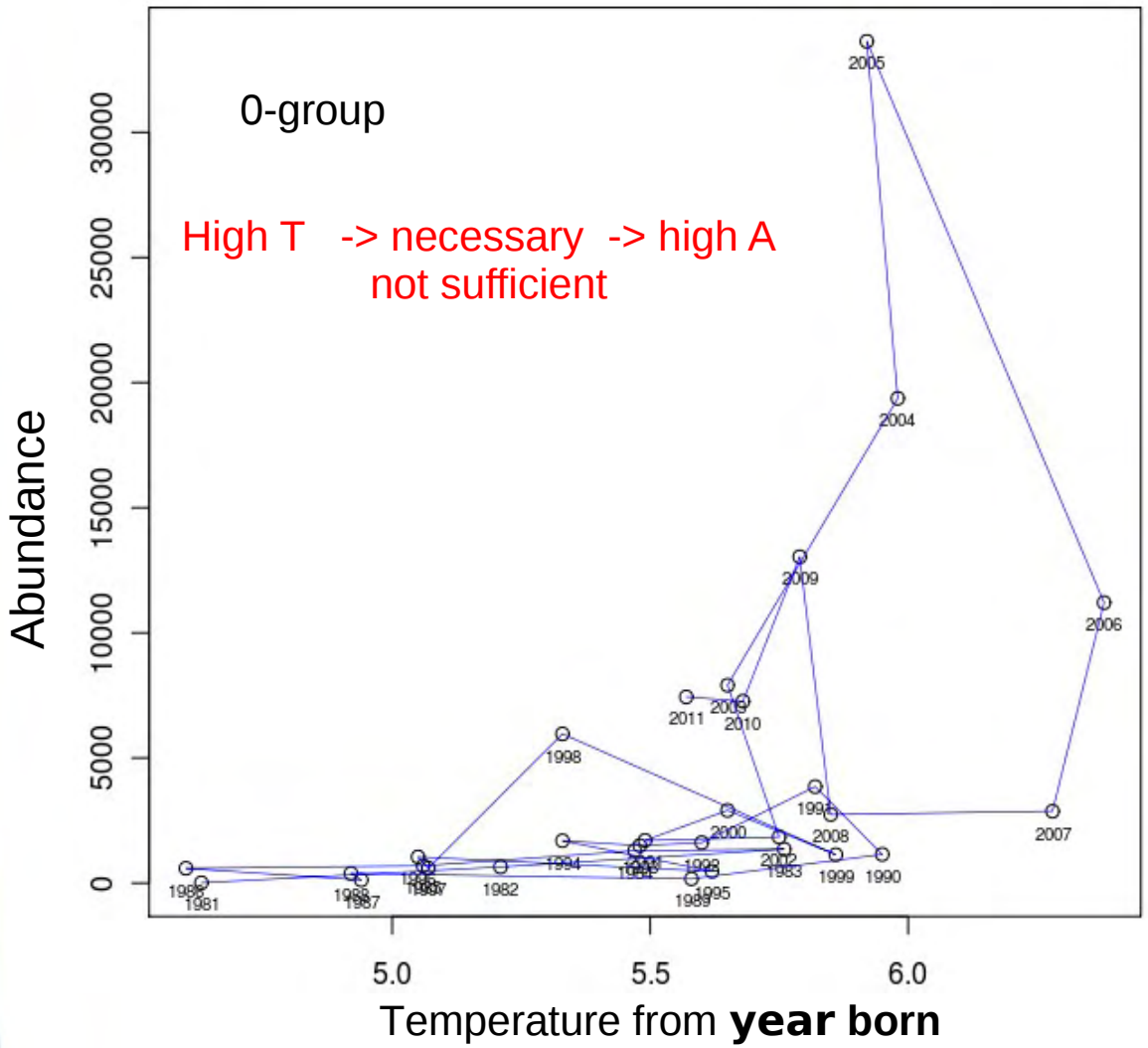
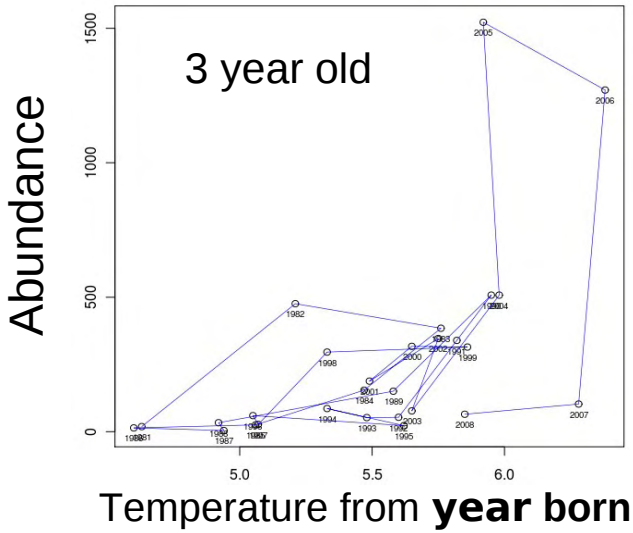
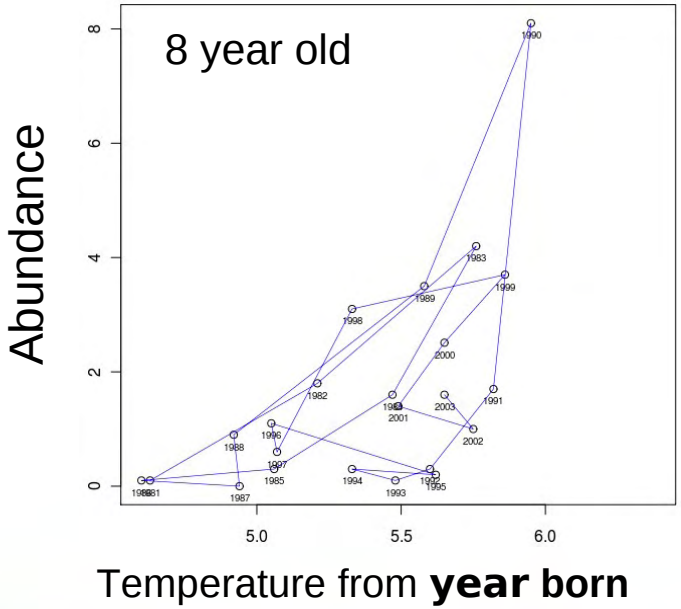
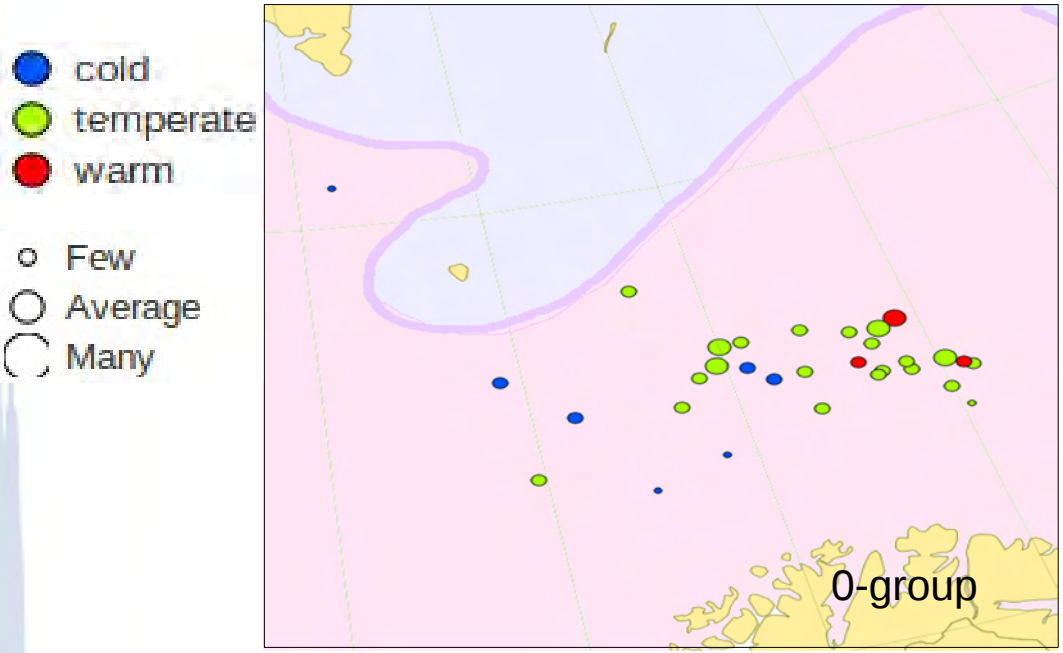






Annual distribution centres in 1981-2011 for age group 0, 3 and 8



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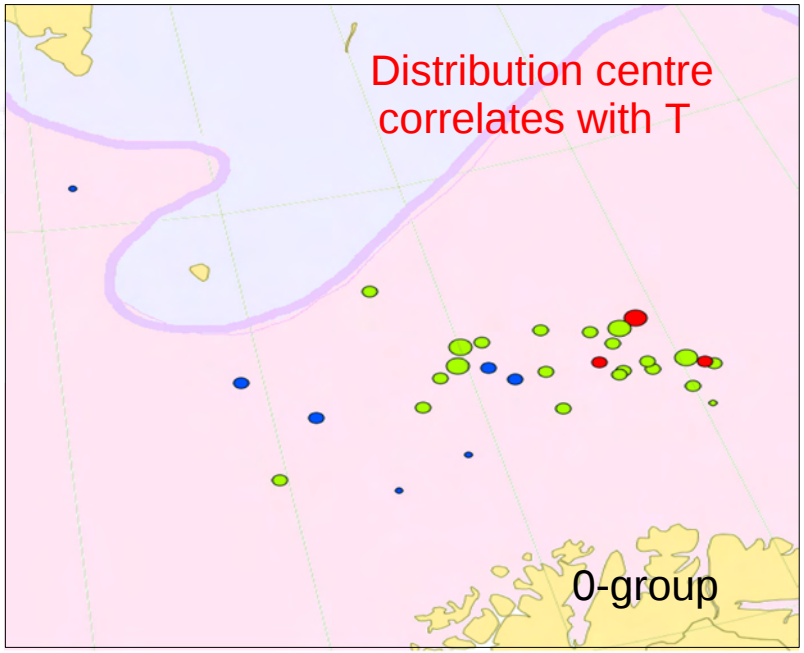
cold
temperate
warm

Few
Average
Many



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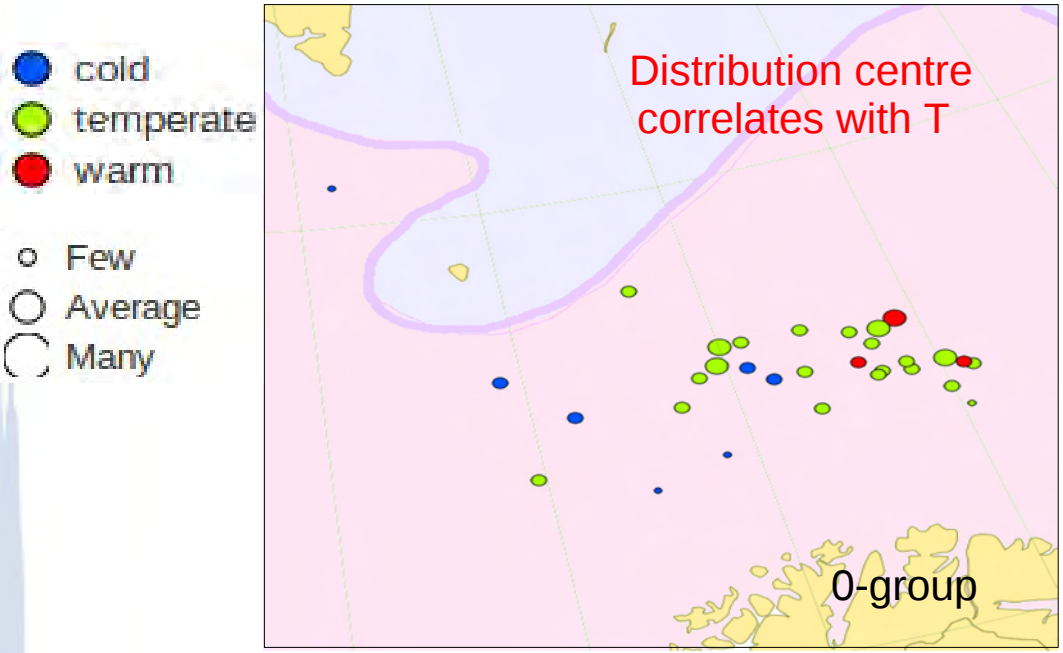

Why?

0-group:

- Strength of inflow
- High survival in the east
- Northward movement of spawning areas

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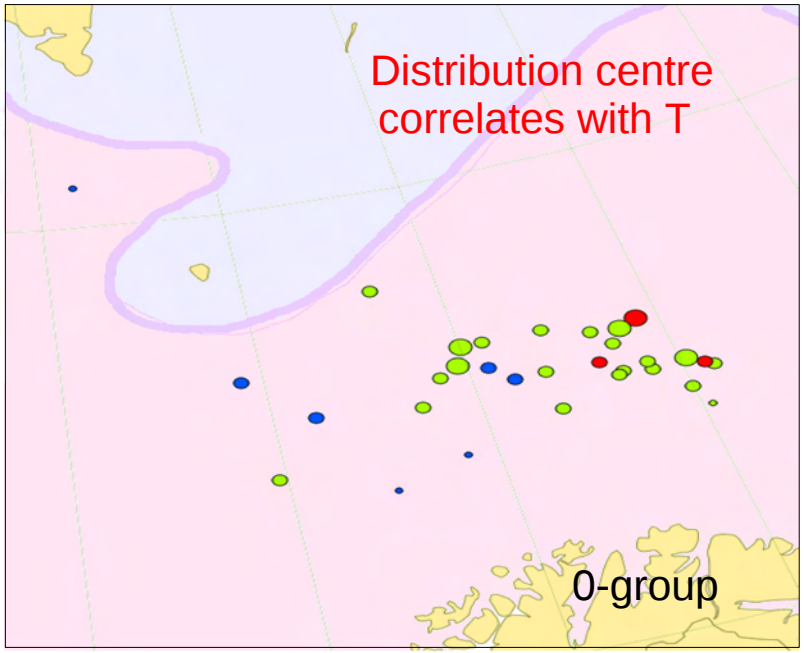

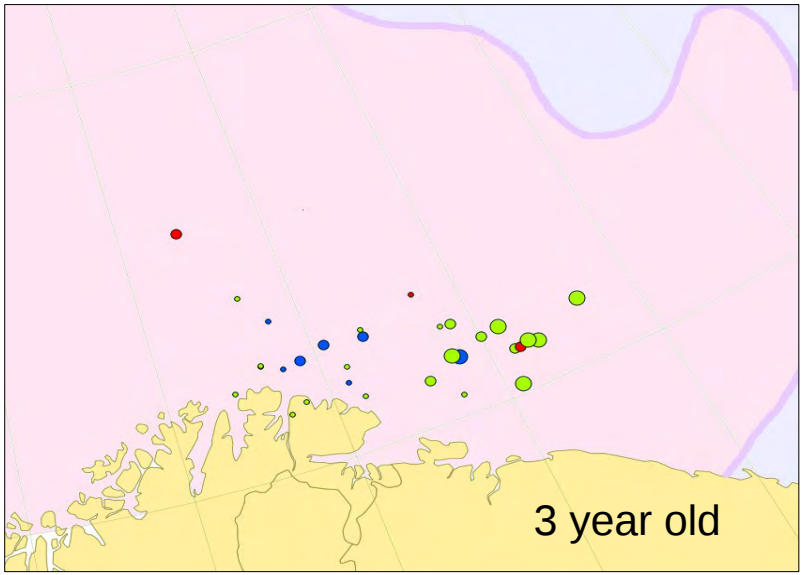

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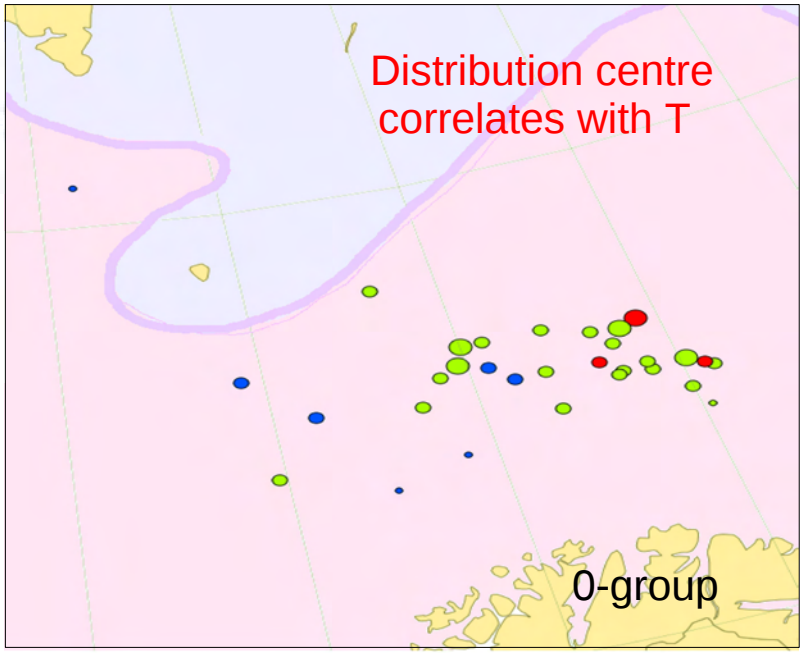

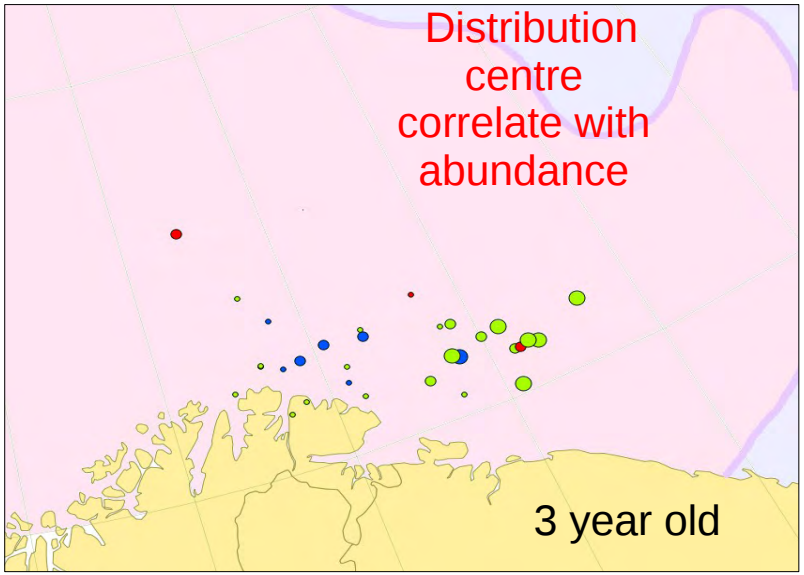

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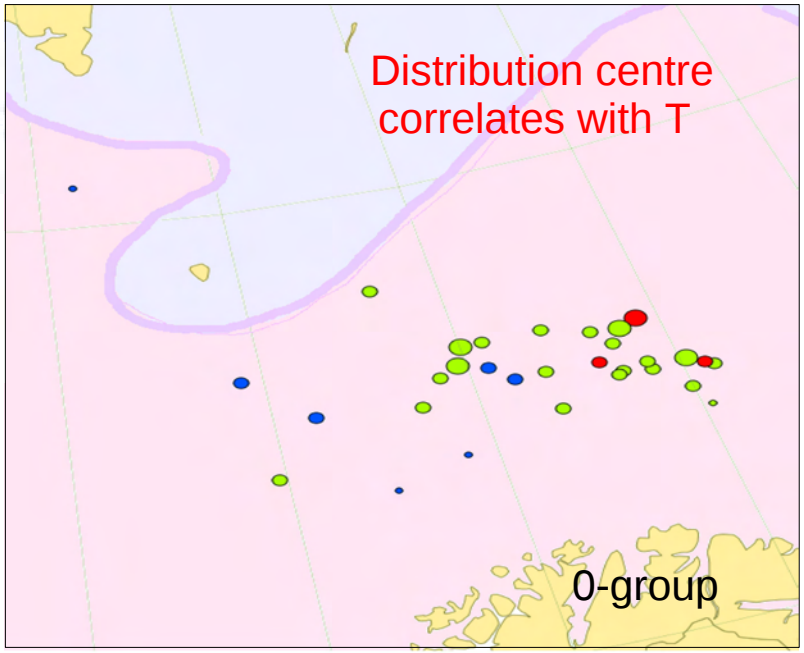

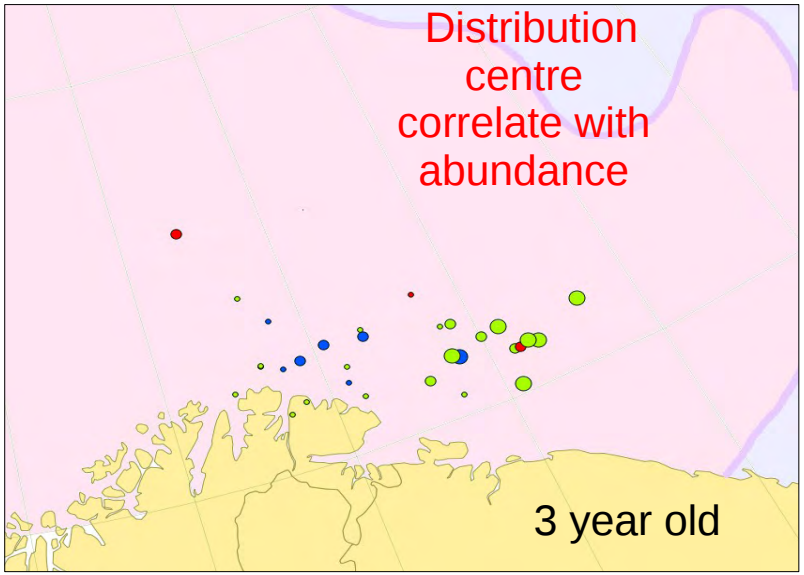

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Age 3:
- Density dependent distribution

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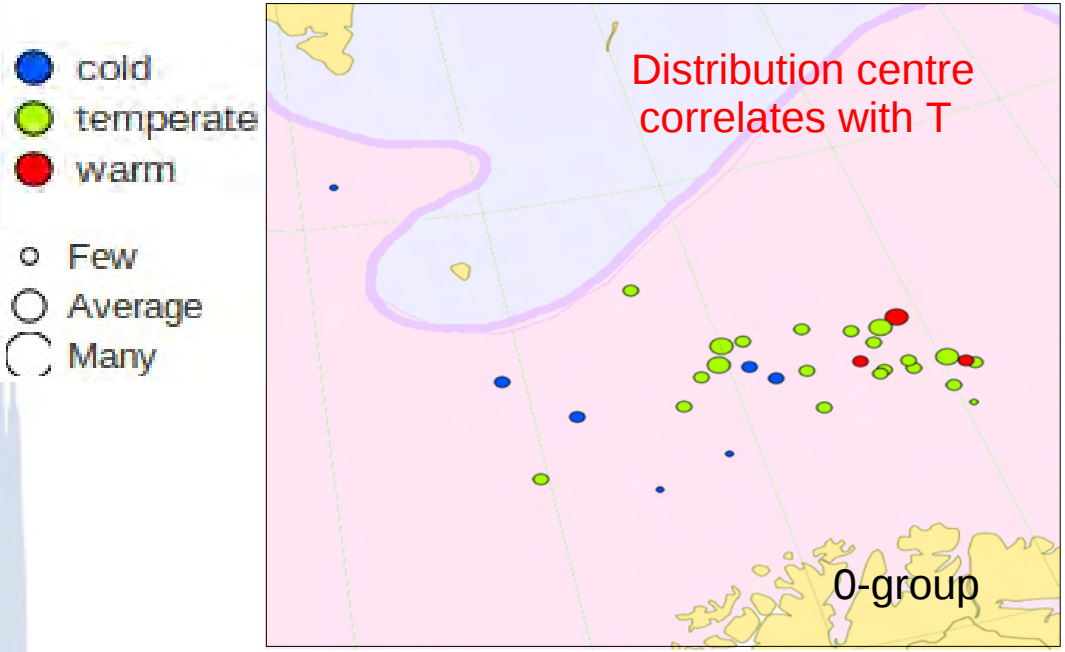

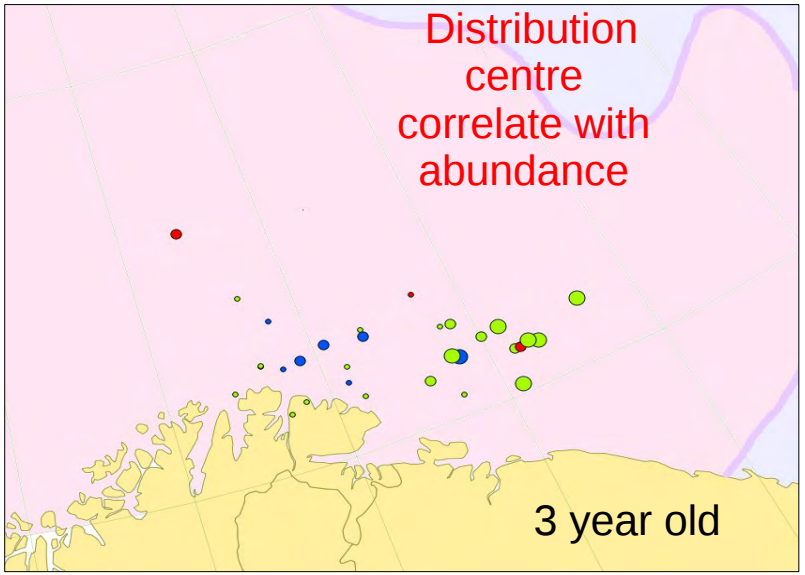

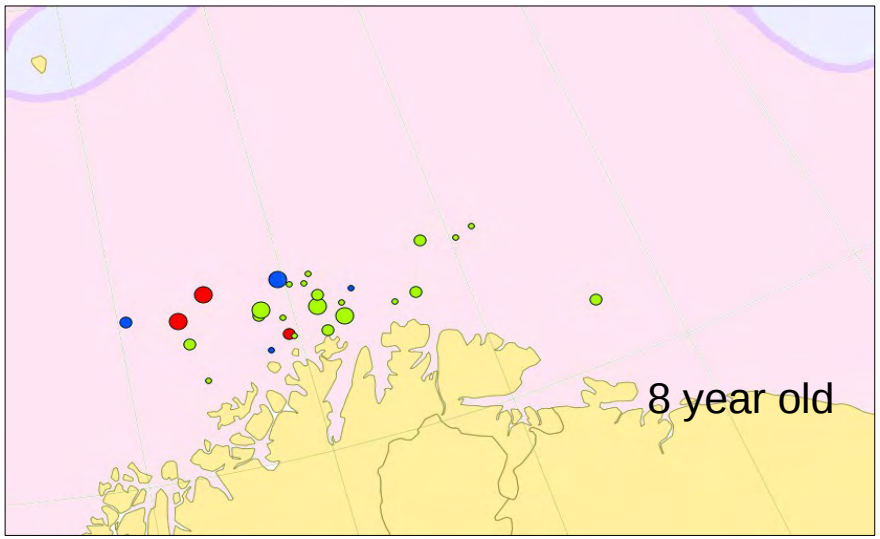

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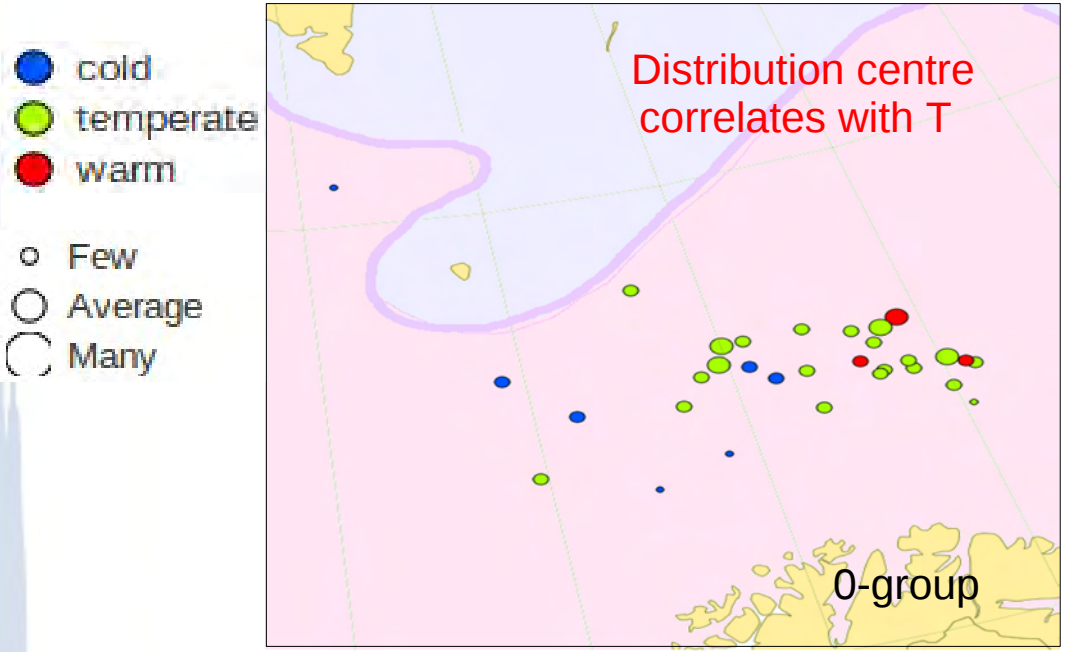

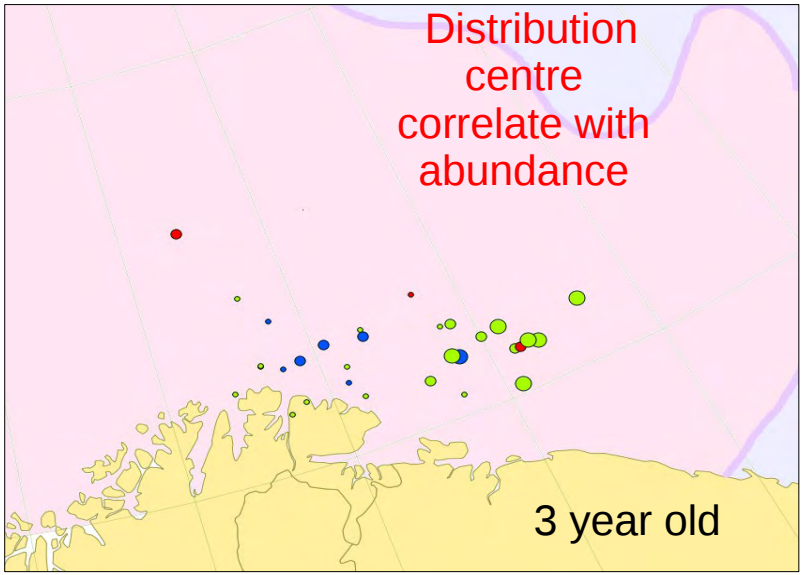

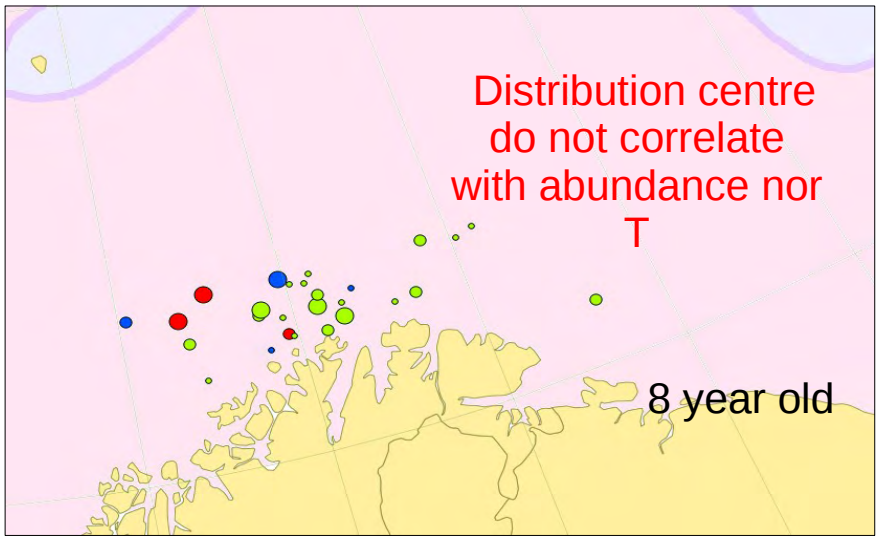

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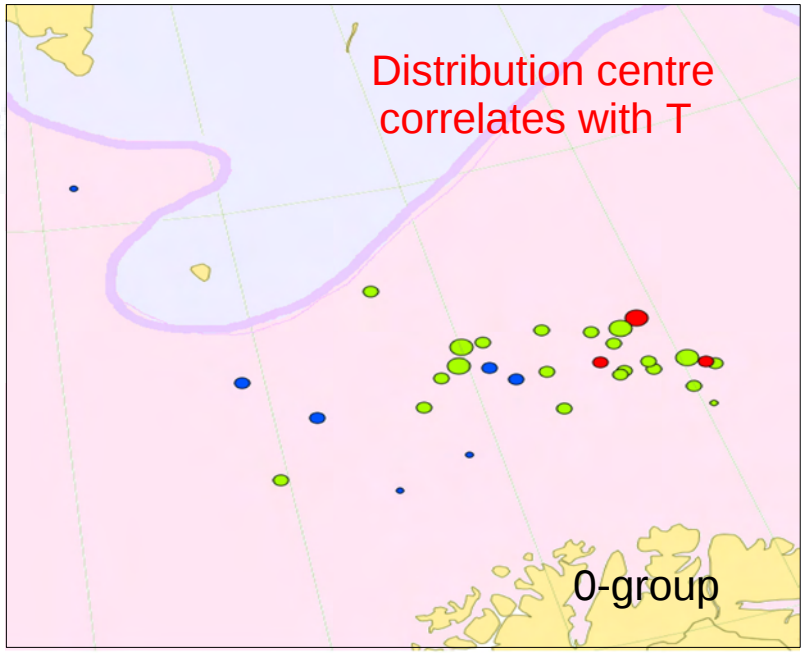

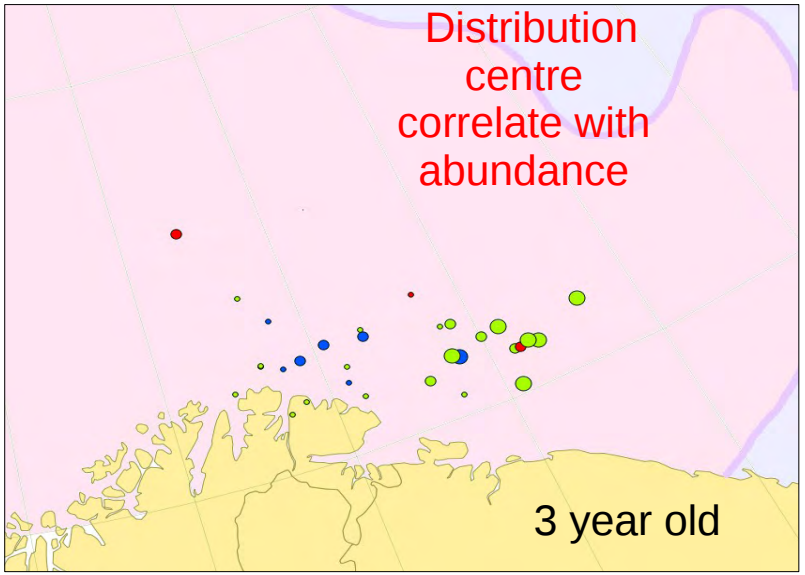

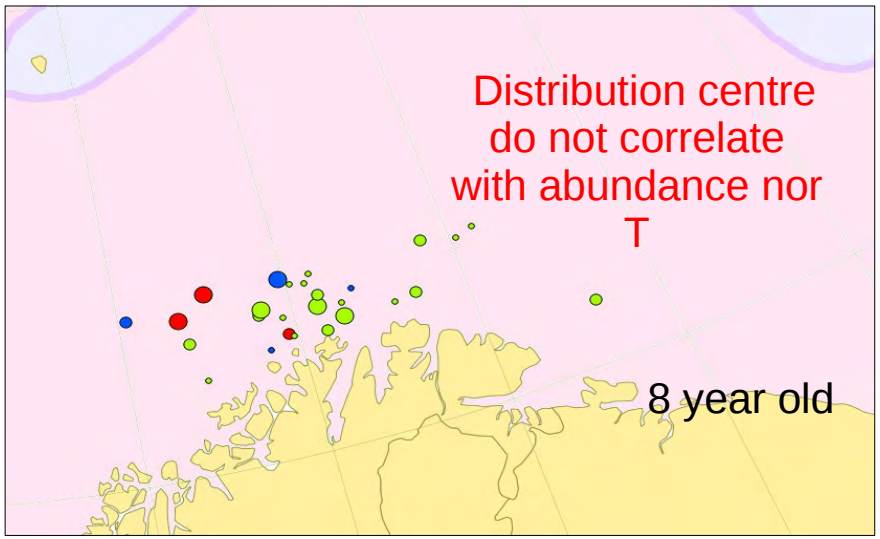

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Age 3:
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Age 8:
- Spawning migration

Conclusions

- Abundance:
  - 0-group abundance increased
  - high temperature necessary but not sufficient for getting a strong year-class
  - temperature the first year of life important for abundance as they become older
  - temperature affects abundance directly and indirectly
  - temperature affects abundance on a short and long time scale

- Distribution:
  - 0-group further east in warm years
  - no significant correlation with distribution centre of older fish with temperature
  - temperature may affect distribution indirectly through its effect on abundance