Climate change effects on the linkages between environmental factors, zooplankton and pelagic fish in the Norwegian Sea

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Reason for study & aim

Changes in the past two decades in:
• Environmental factors in the Norwegian Sea Ecosystem
• Zooplankton biomass
• The migration route of pelagic fish

Aim

➢ Identify longterm shifts and changes in species composition and abundance in relation to environmental factors using samples and data collected 1995-2017

➢ Fundamental players: Pelagic fish stocks, zooplankton, phytoplankton
The oceanic ecosystem east of Iceland is characterized by dramatic conditions.

Cold and low saline polar currents (EIC) from the north meet warm and saline currents from the south (IC).

Compare a northern area (66.1°N-68°N) to southern area (63-66°N).

Orvik and Niiler, 2002
Samples from a herring survey
- Cruise in May, ~20 days, since 1995
- Transects, acoustics
- Ocean samples (CTD), phytoplankton, zooplankton and pelagic fish
Acoustics to find fish, trawls
WP2 net – Zooplankton, 200, 0-50 m & 0-200 m
Krill net – 1000 m
CTD – temperature, salinity, phytoplankton

Zooplankton (copepods)
Zooplankton

- Zooplankton samples 1995-2017
- Compare north (66.1°N-68°N) to south (63-66°N) in the ocean region east of Iceland

→ *Currently in analysis*: species identification and developmental stages

- Copepoda nauplii
- Calanus hyperboreus
- Calanus finmarchicus

Oil sac (lipids)
Changes in the Norwegian Sea ecosystem

Temperature and salinity in Langanes

Sea temperature is higher during the latter half of the study period

Orvik and Niiler, 2002
Changes in zooplankton biomass

Higher biomass 1998-2002

Migration route of a highly migratory pelagic fish
Norwegian spring-spawning herring (*Clupea harengus*)

Pampoulie et al 2015
Shifts in the migration route of pelagic fish
Norwegian spring-spawning herring (*Clupea harengus*)

Based on results of International research surveys (e.g. IESNS and IESSNS)
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NE Atlantic mackerel (*Scomber scombrus*)

Based on results of surveys (IESSNS) and Olafsdottir et al. (2015).
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First results

• Changes in zooplankton species composition
• Herring and mackerel are shifting their migration route
  • East to west of Iceland
• Temperature and salinity → variable...

→ It might get chilly in Iceland...

Orvik and Niiler, 2002
Thank you!