ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

# The Common Fate of Ice and Fish

## Linkages between polar cod, sea ice properties and under-ice communities in the Arctic Ocean

Helmholtz Young Investigators Group *Iceflux*

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IMARES WAGENINGEN UR

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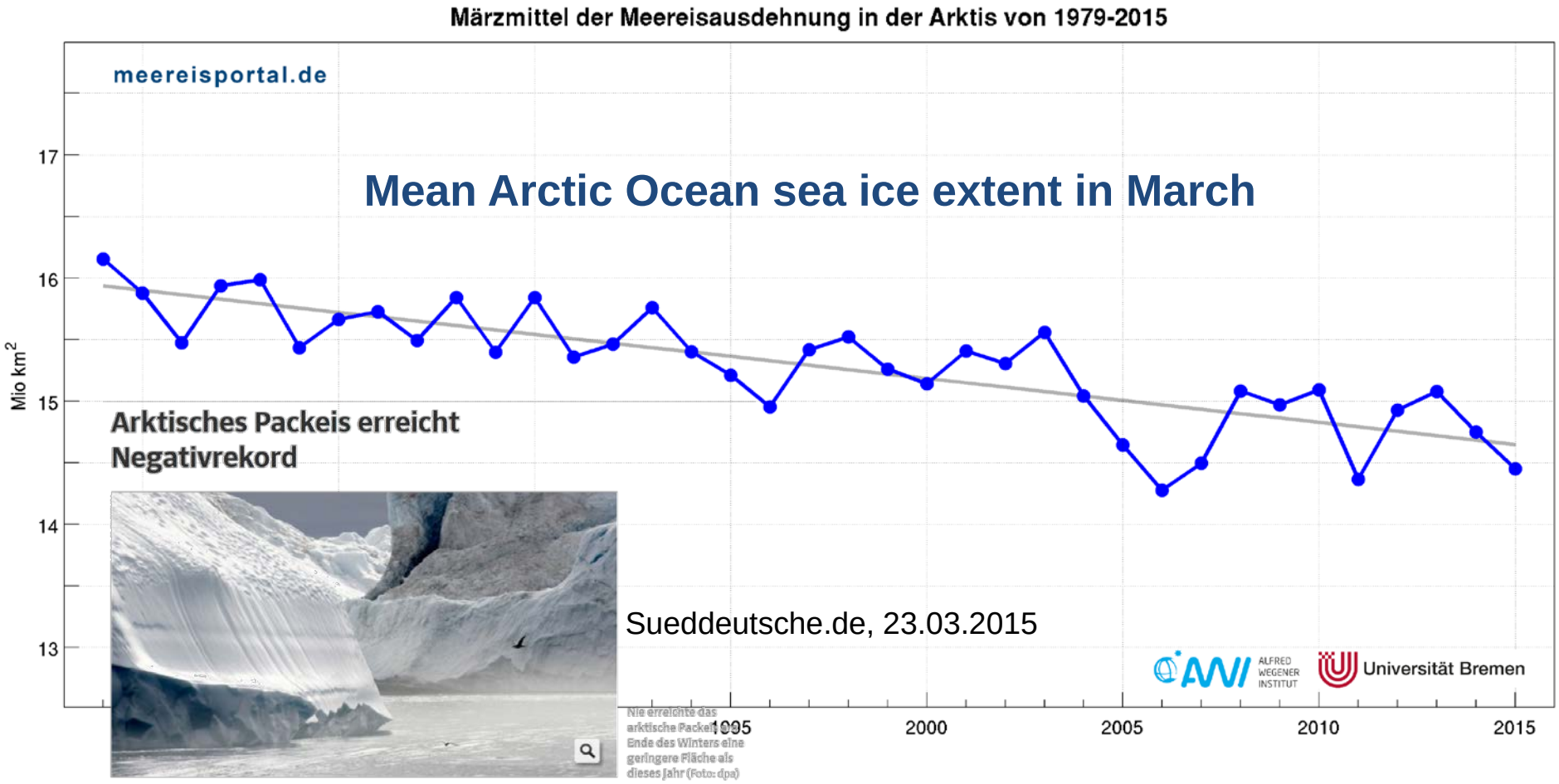
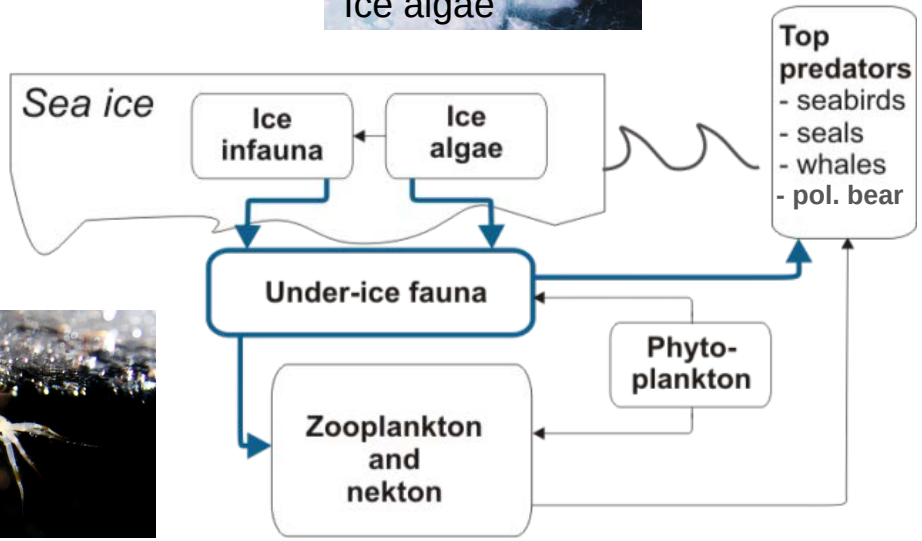
# Sea ice decline in the Arctic




*Arctic pack-ice reaches new record minimum*

# Meereisökosysteme

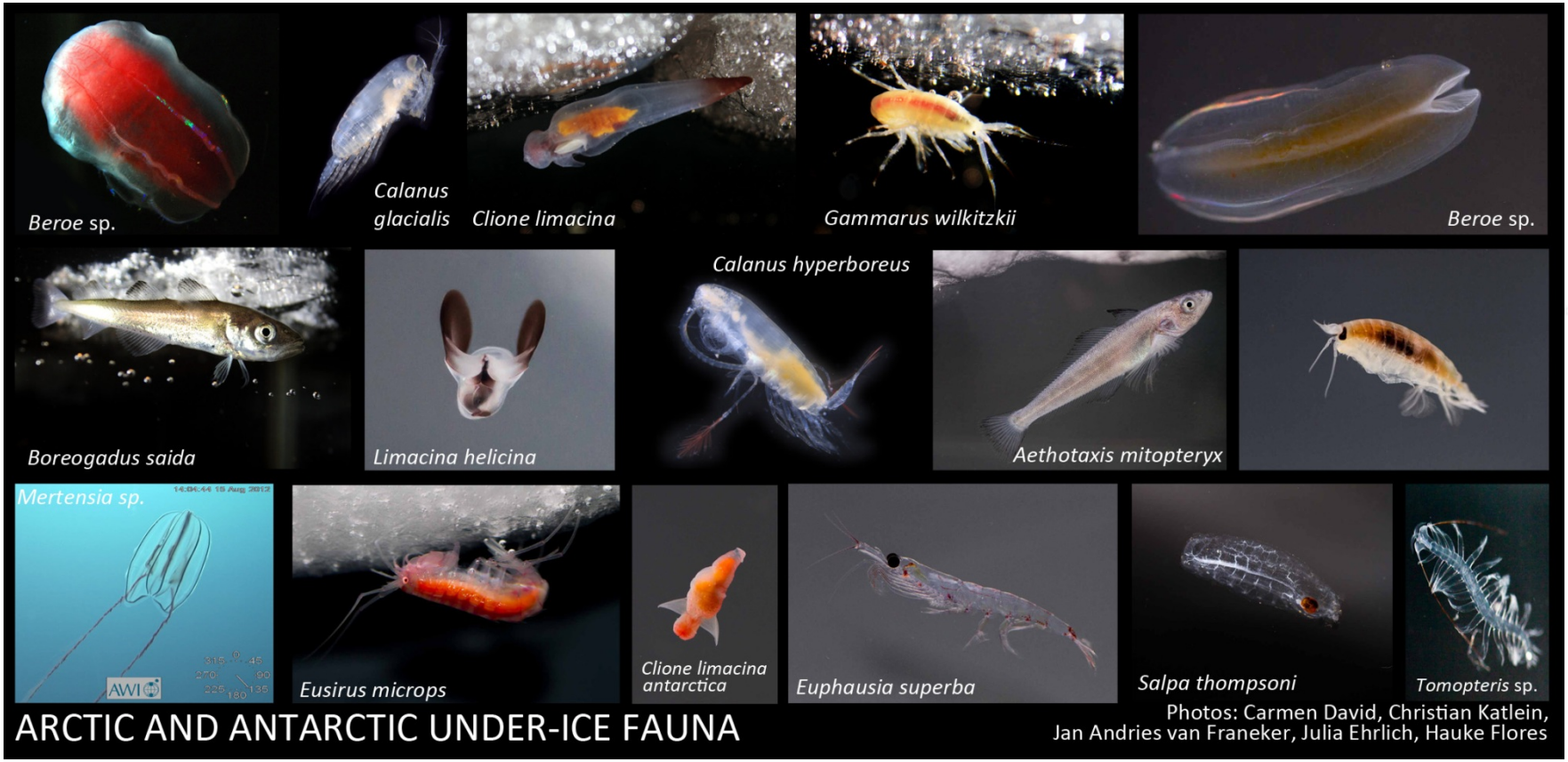




polar bear

ice amphipod

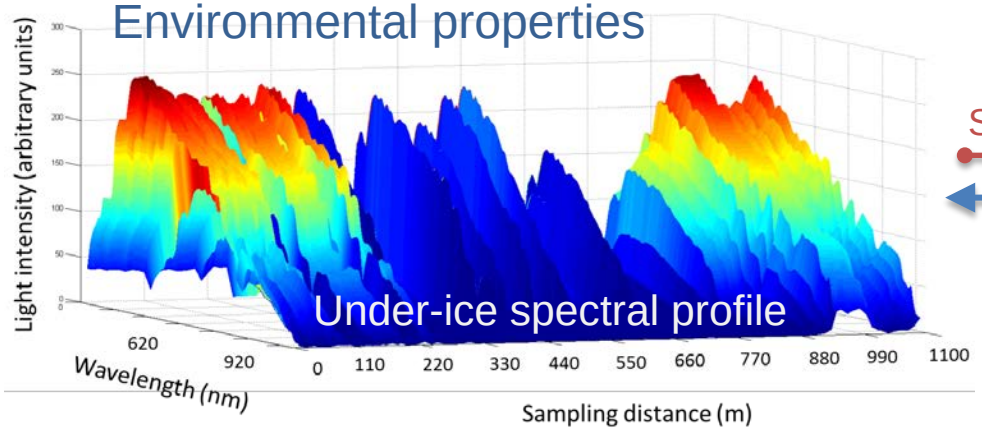
polar cod

# The Arctic sea ice ecosystem



# *Iceflux* Approach

## Environmental properties



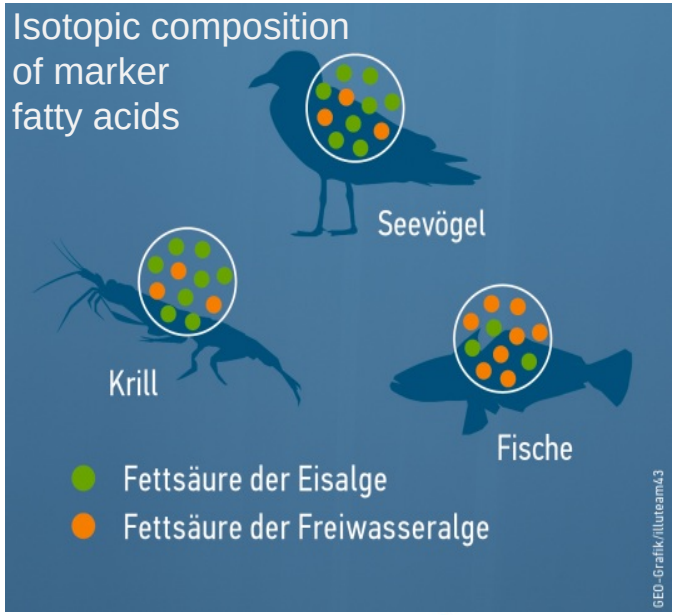

Stat. Mod.

## Ecological key species


Biomarker- analysis

## Field sampling


## Sea ice – ecosystem carbon flux

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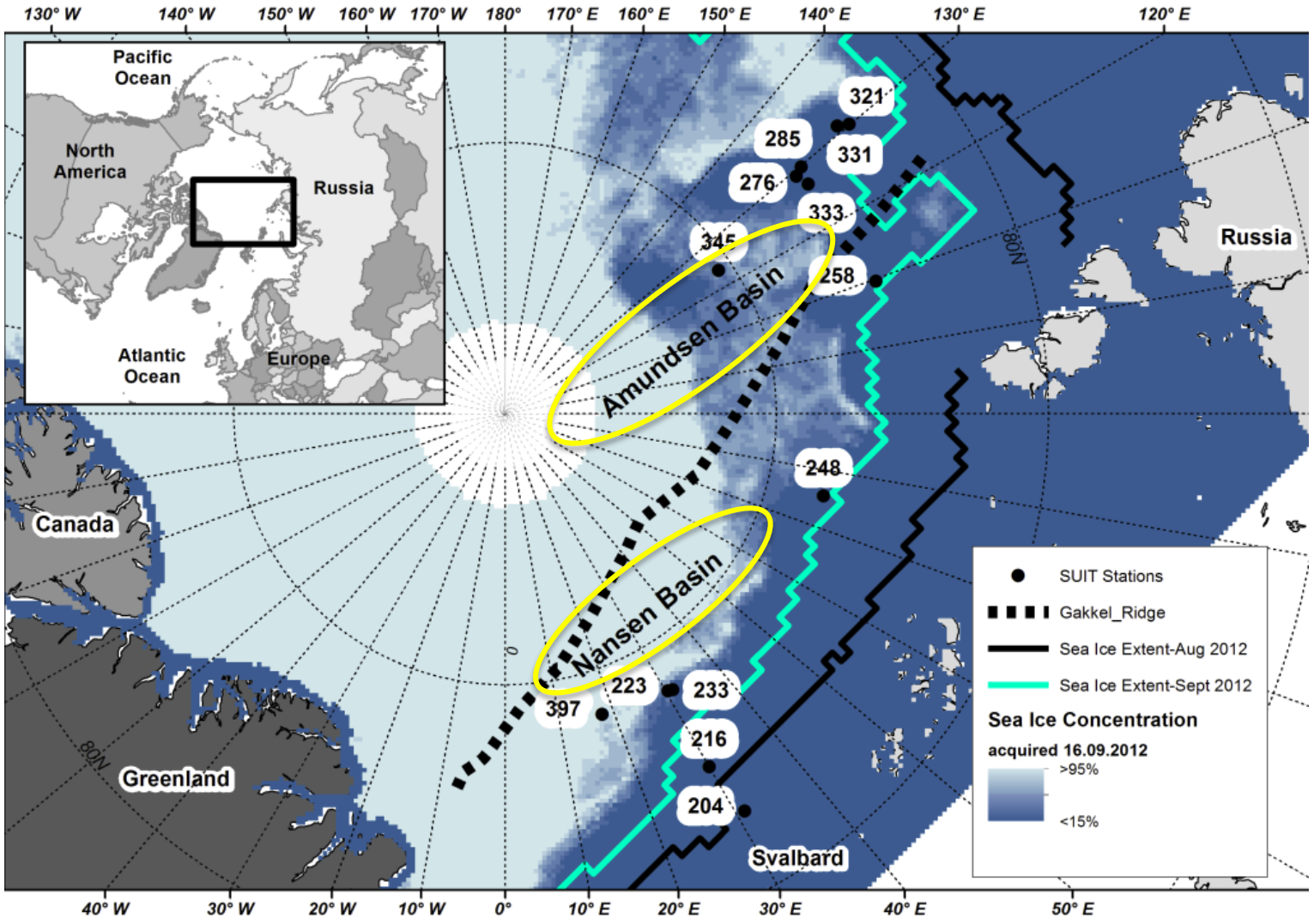
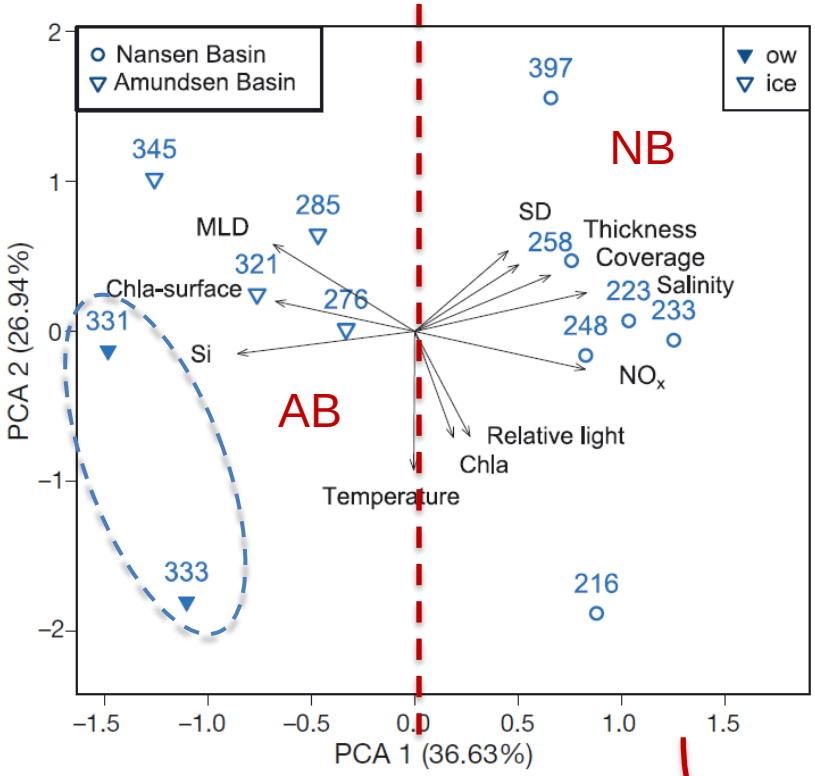
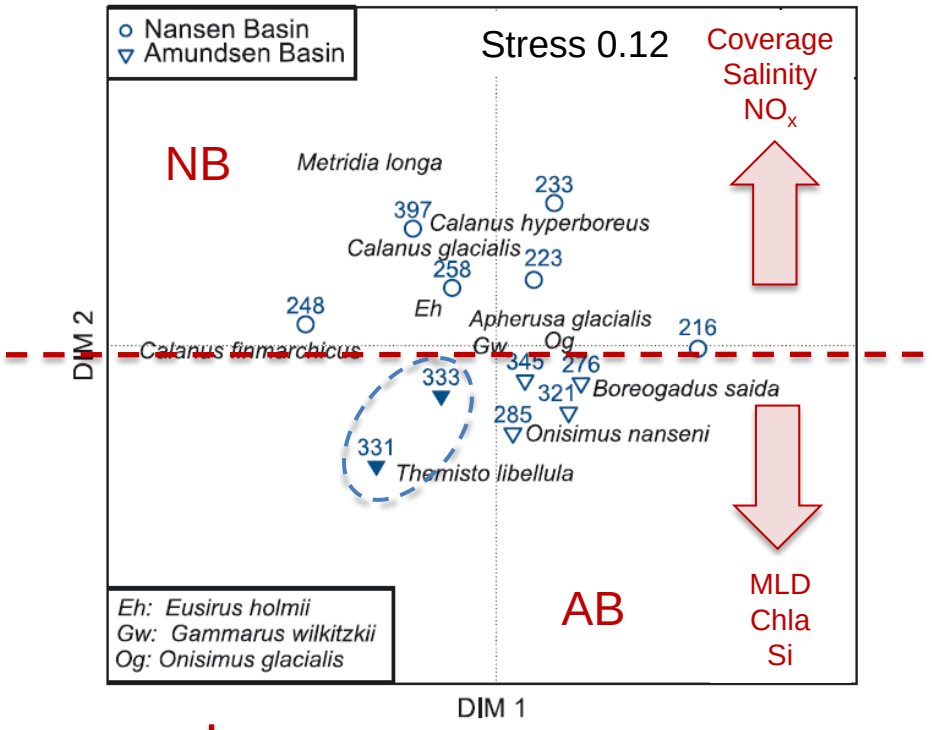
# Eurasian Basin study area




# The Arctic under-ice community

Benjamin Lange  Carmen David




Mantel test r: 0.65 ($p < 0.001$)

David et al. (2015) *Mar Ecol Prog Ser* 522: 15-32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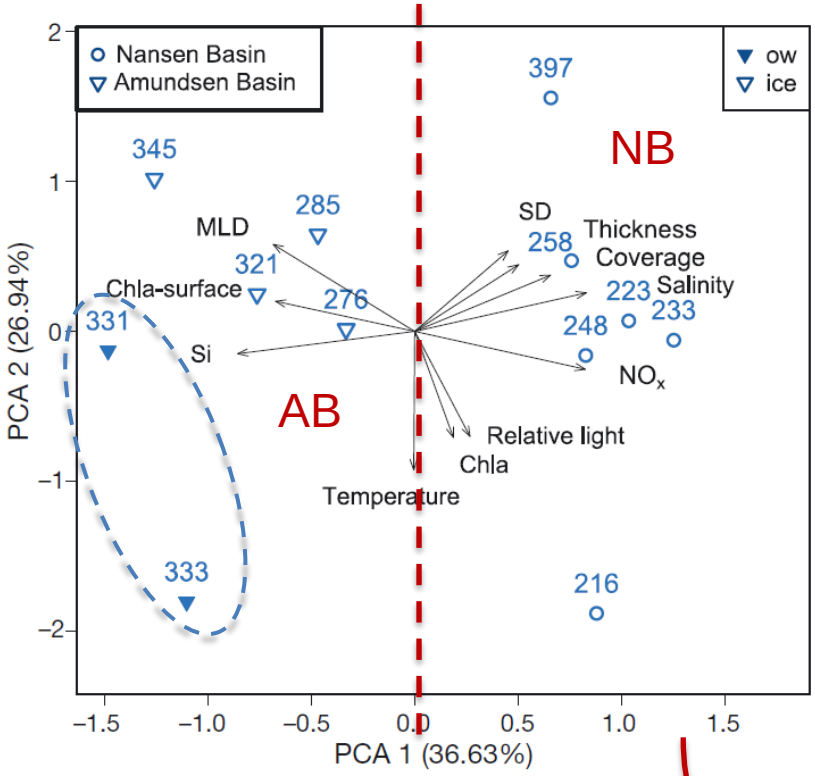


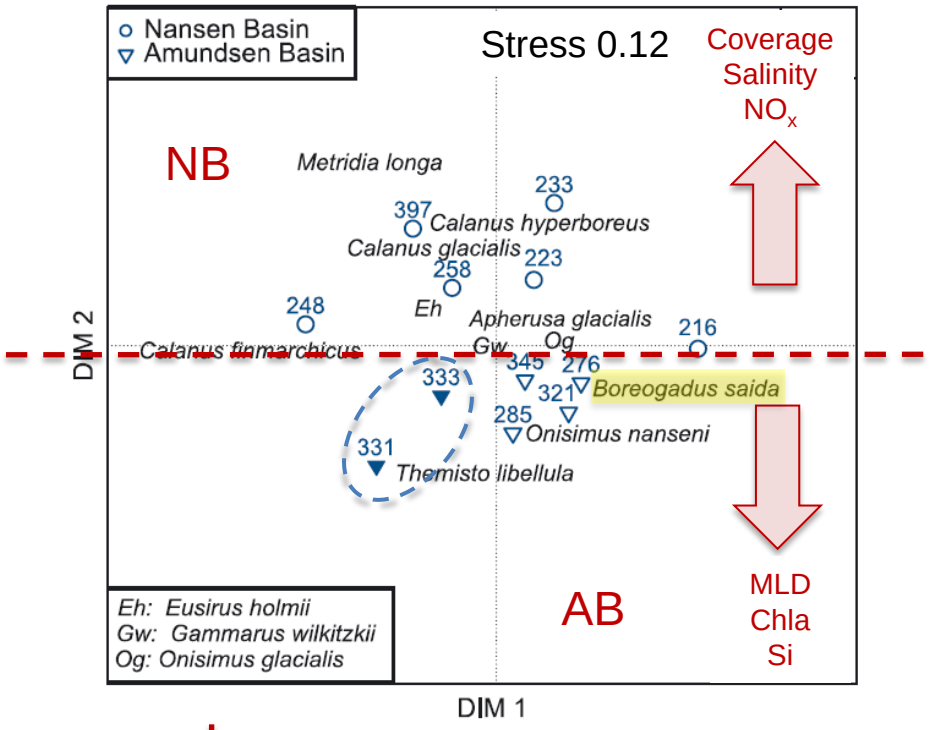


Mantel test r: 0.65 ($p < 0.001$)

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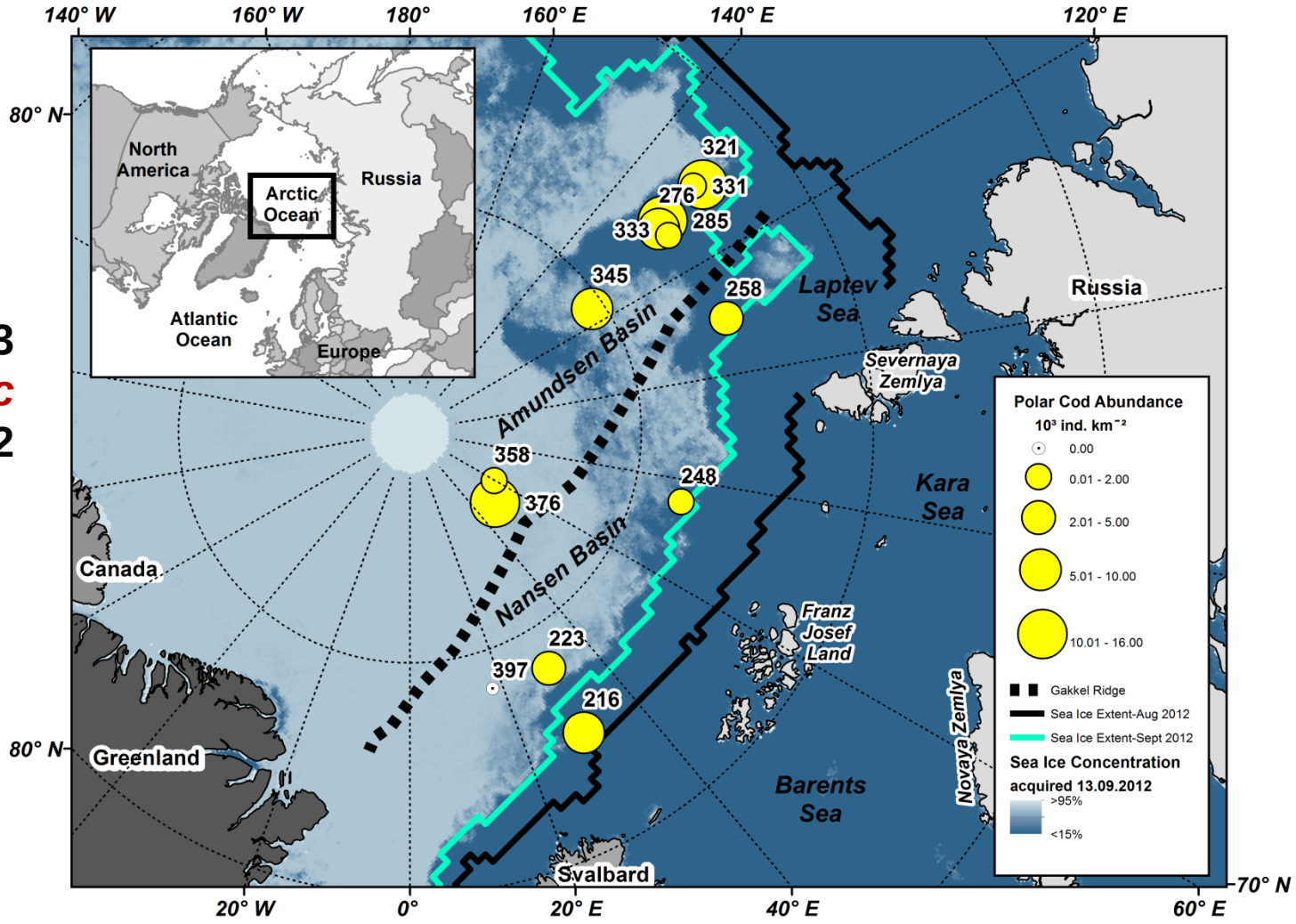
# Polar cod *Boreogadus saida*

- Size up to 40 cm, age up to 7 years
- Key species of the Arctic food web
- Young fish under ice
- Incidential evidence of under-ice populations throughout the Arctic Ocean

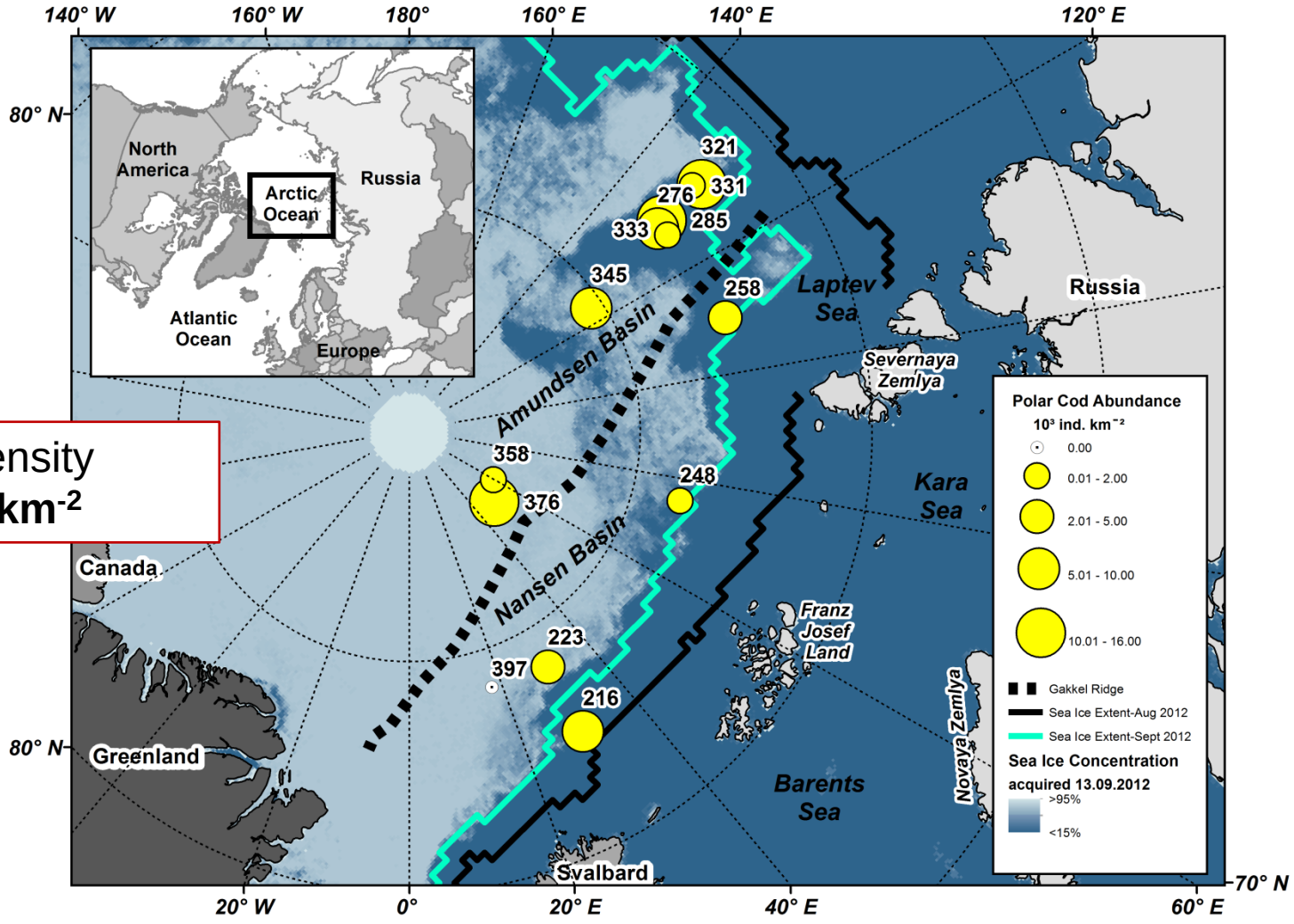
# Polar cod - distribution

**ARK XXVII/3**
***IceArc***
**Aug-Sep 2012**




David et al. (in press) *Pol Biol*

# Polar cod - distribution




Average density
**5400 ind. km$^{-2}$**

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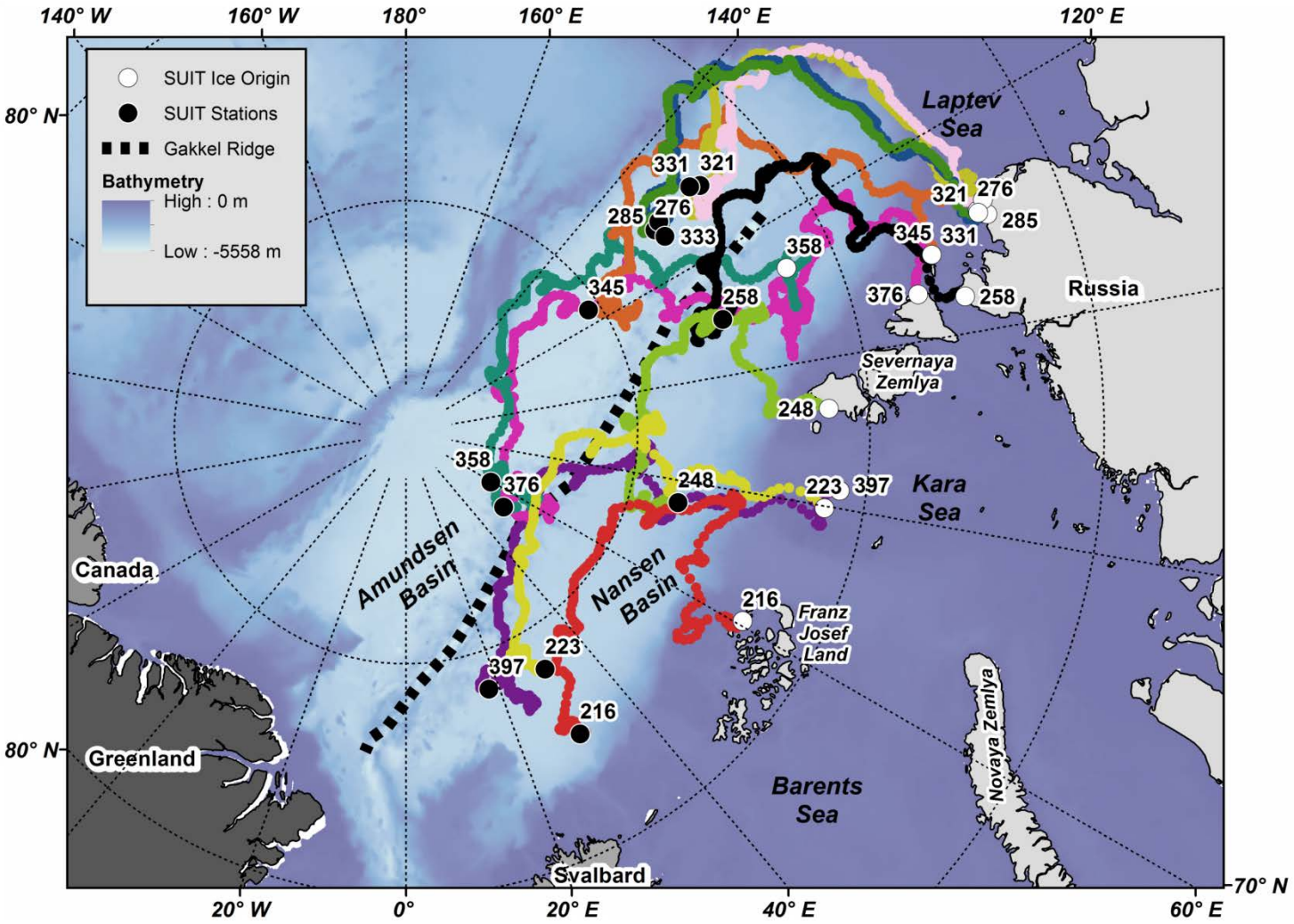
# Sea ice back-tracking

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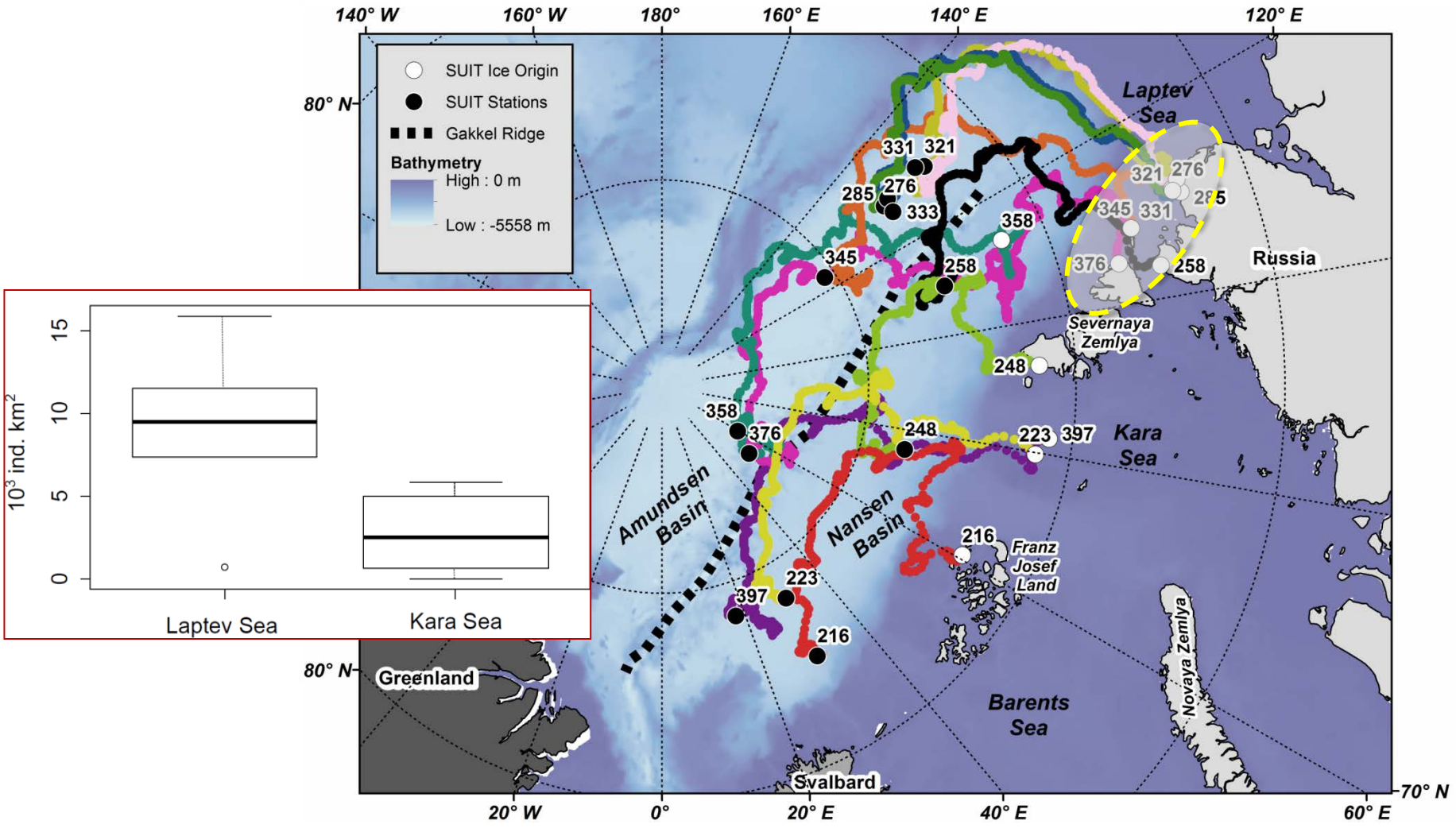


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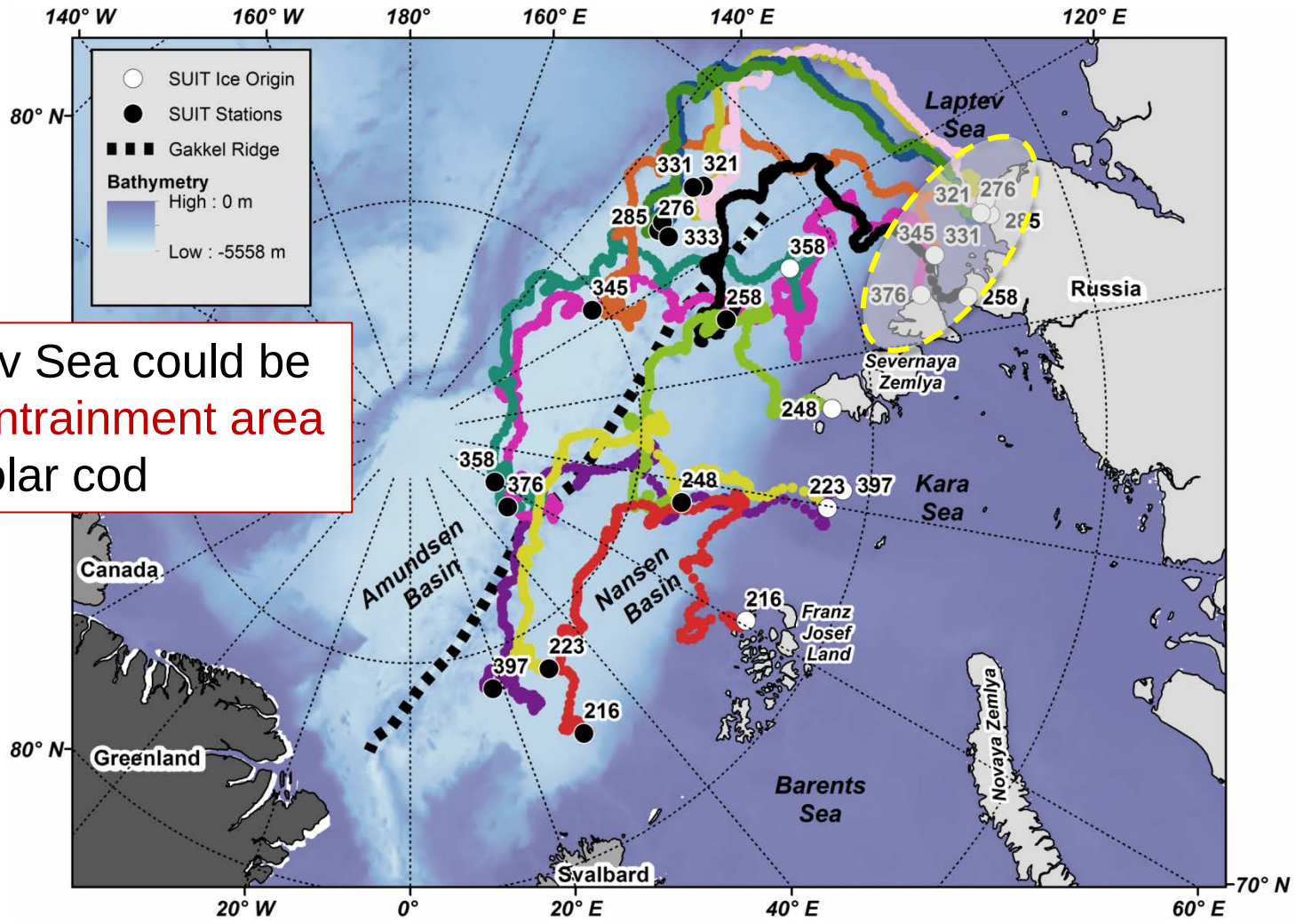
# Sea ice back-tracking




Western Laptev Sea could be an important entrainment area of under-ice polar cod

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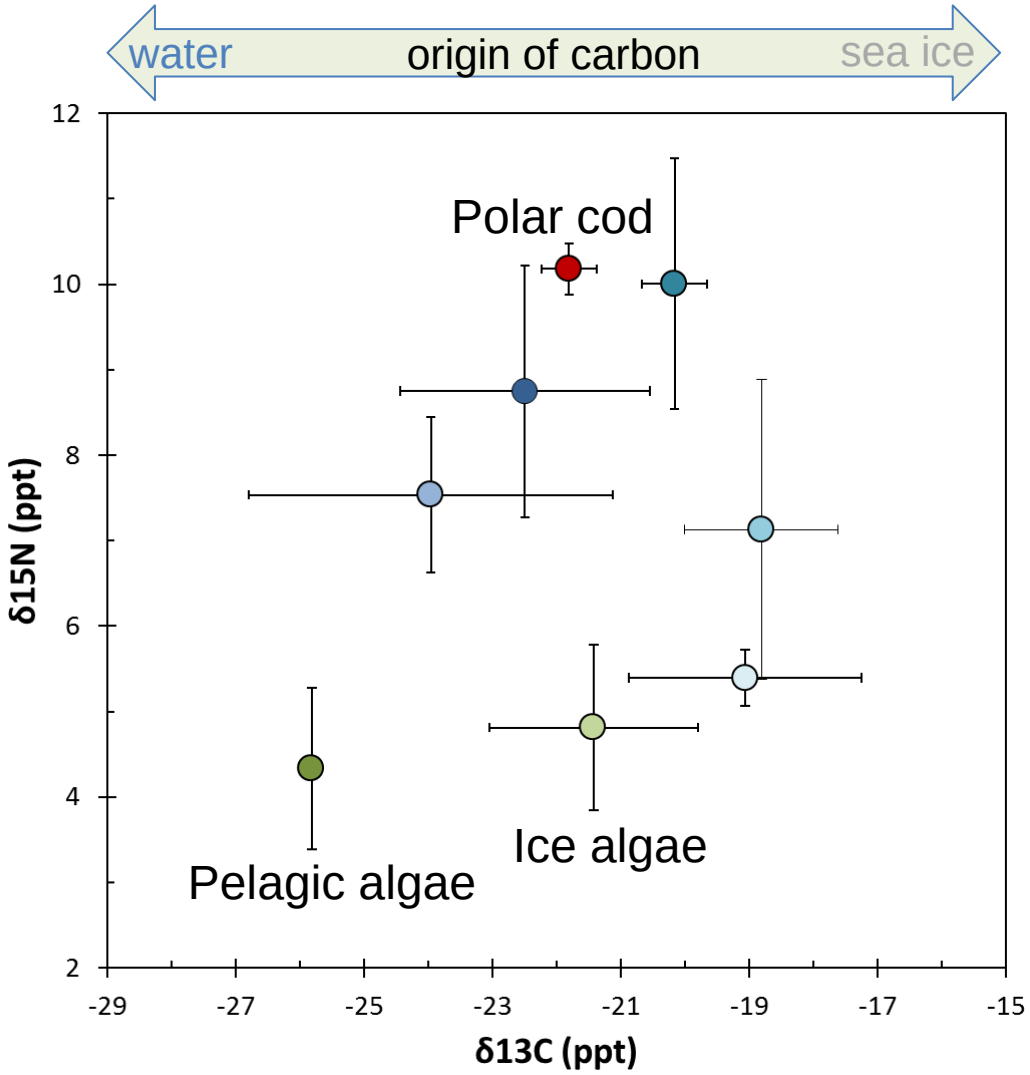
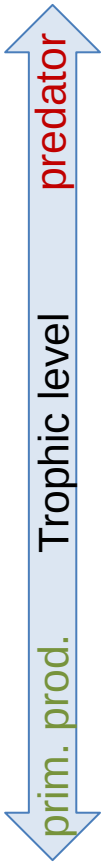
# Trophic flux of sea ice carbon

Doreen Kohlbach

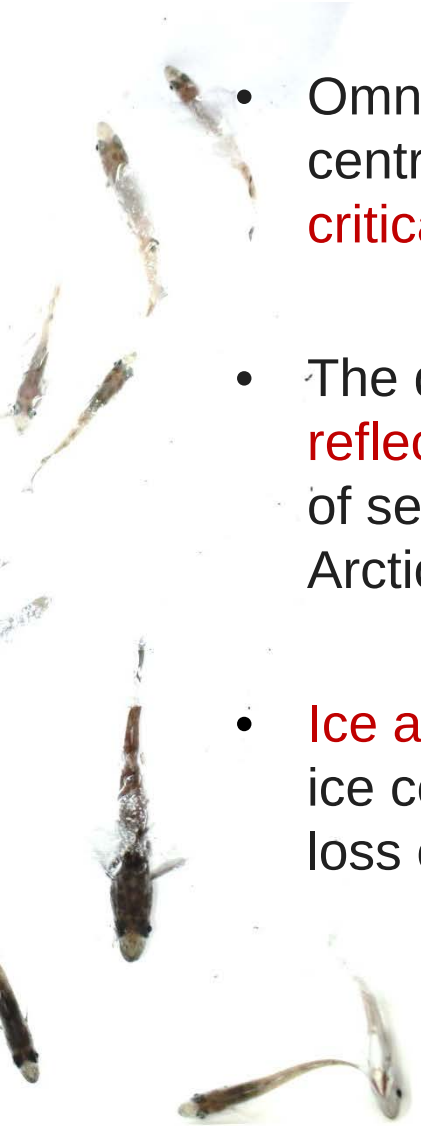



- *Boreogadus saida*
- *Eusirus holmii*
- *Themisto libellula*
- *Calanus glacialis*
- Onisimus glacialis
- *Apherusa glacialis*
- IPOM
- PPOM

Stable isotope composition of sea ice biota

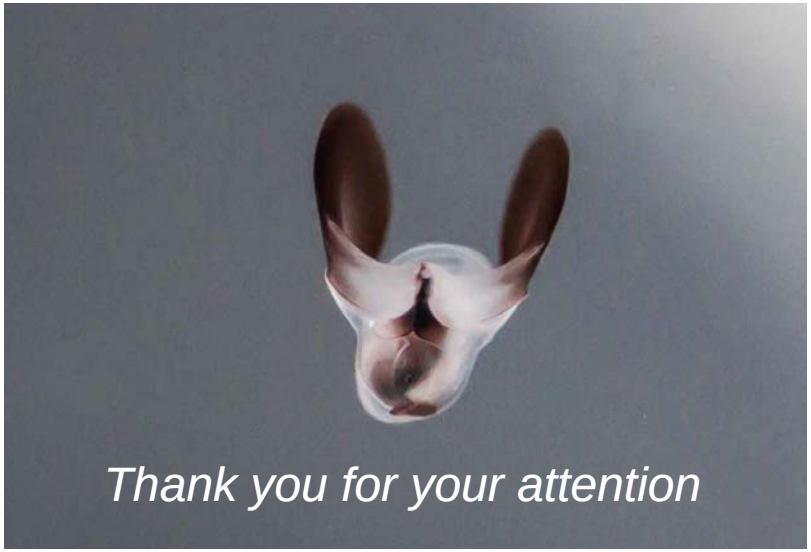
# Conclusions



- Omnipresence and potential population size of polar cod in the central Arctic indicate that under-ice habitats may constitute a critical refuge and a vector of genetic exchange

- The distribution of polar cod and under-ice community structure reflect differences in sea ice habitat properties and the drift history of sea ice, and hence very likely respond strongly to on-going Arctic change

- Ice algal production is an important source of carbon in the under-ice community, further enhancing its susceptibility to continuing loss of sea ice habitats

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