

# Effects of multiple stressors on the **benthic** ecosystem in the Barents Sea



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## Climate Change and Vulnerable Regions

# Benthos biodiversity = the terrestrial insects

*Pandalus borealis*

Brittle stars

Ctenodiscus stars

Geodia sponges

Giant sea spider

Basket stars

*Cleippides quadricuspis*

Seapen

Carnivore giant  
sponge

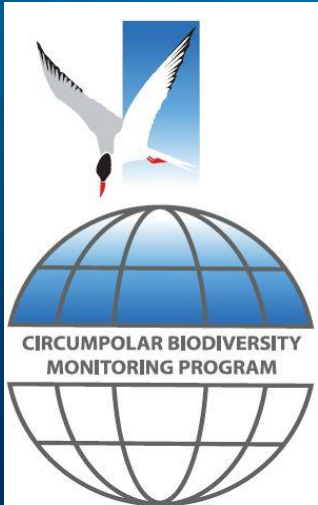
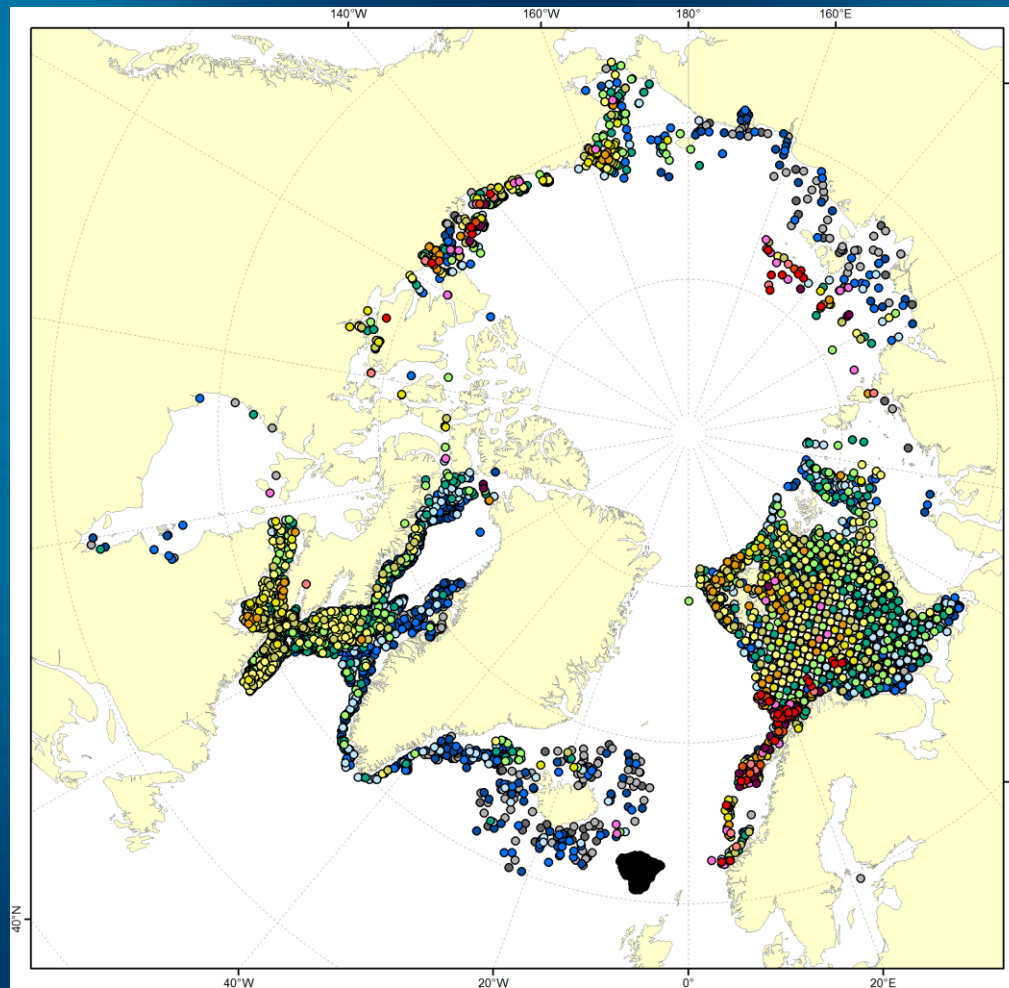
*Eurythenes gryllus*

Slope

Shelf

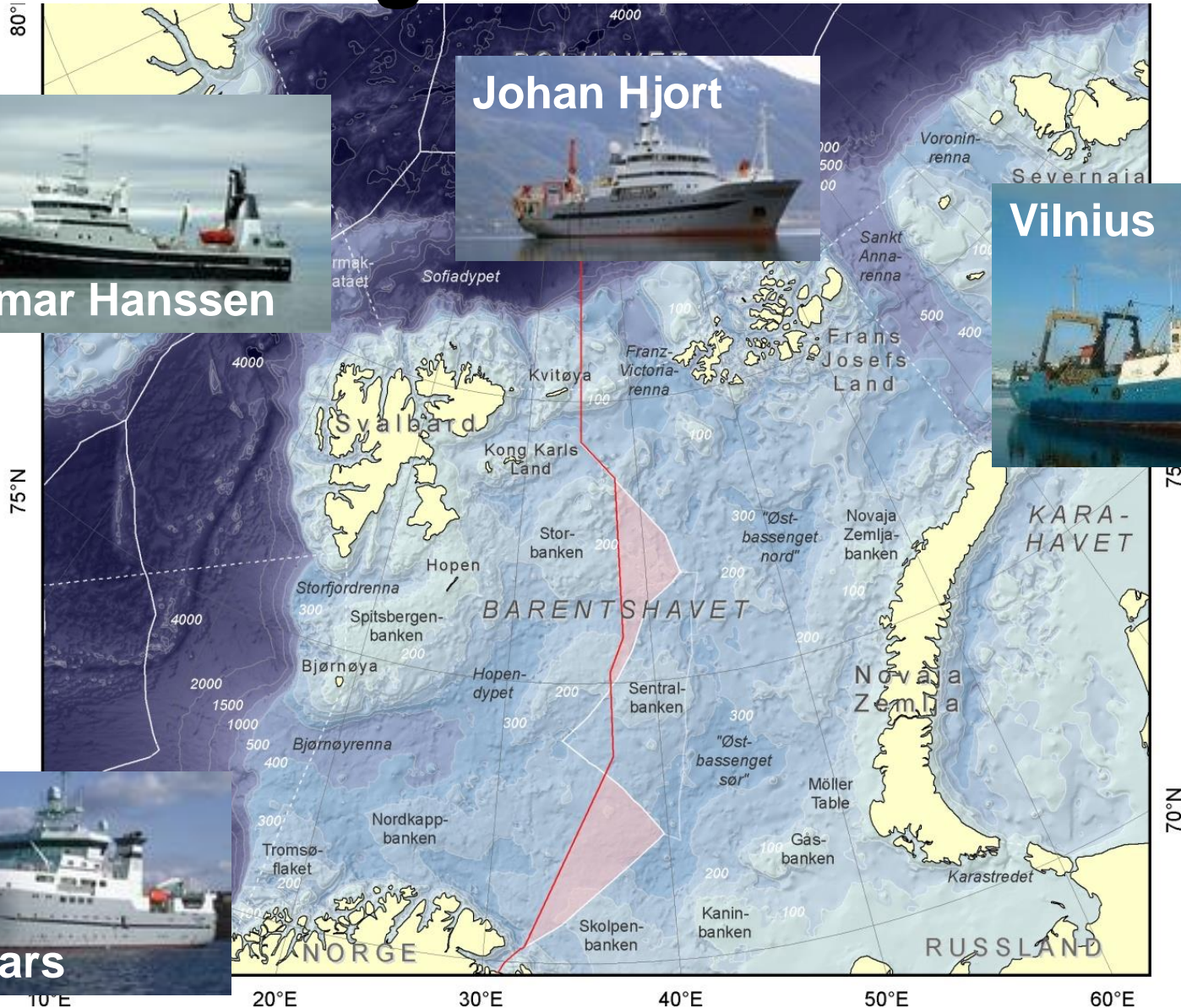
Fjord

# State of the Arctic Marine Biodiversity Report (SAMBR, 2017)



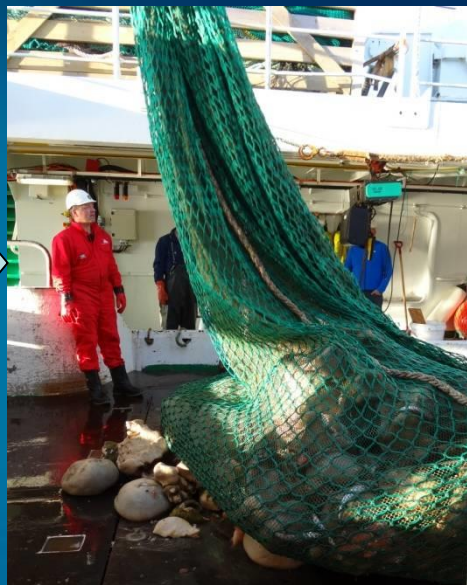


# Join Annual Russian-Norwegian monitoring of the Barents Sea





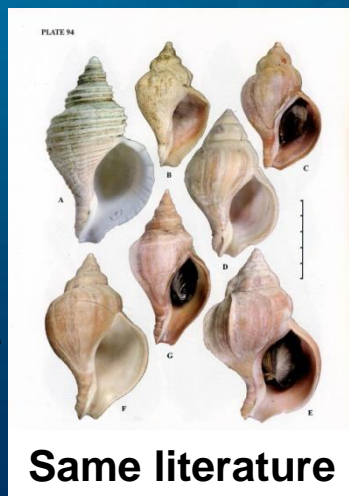
# Time and resource efficient



Standardized knowledge



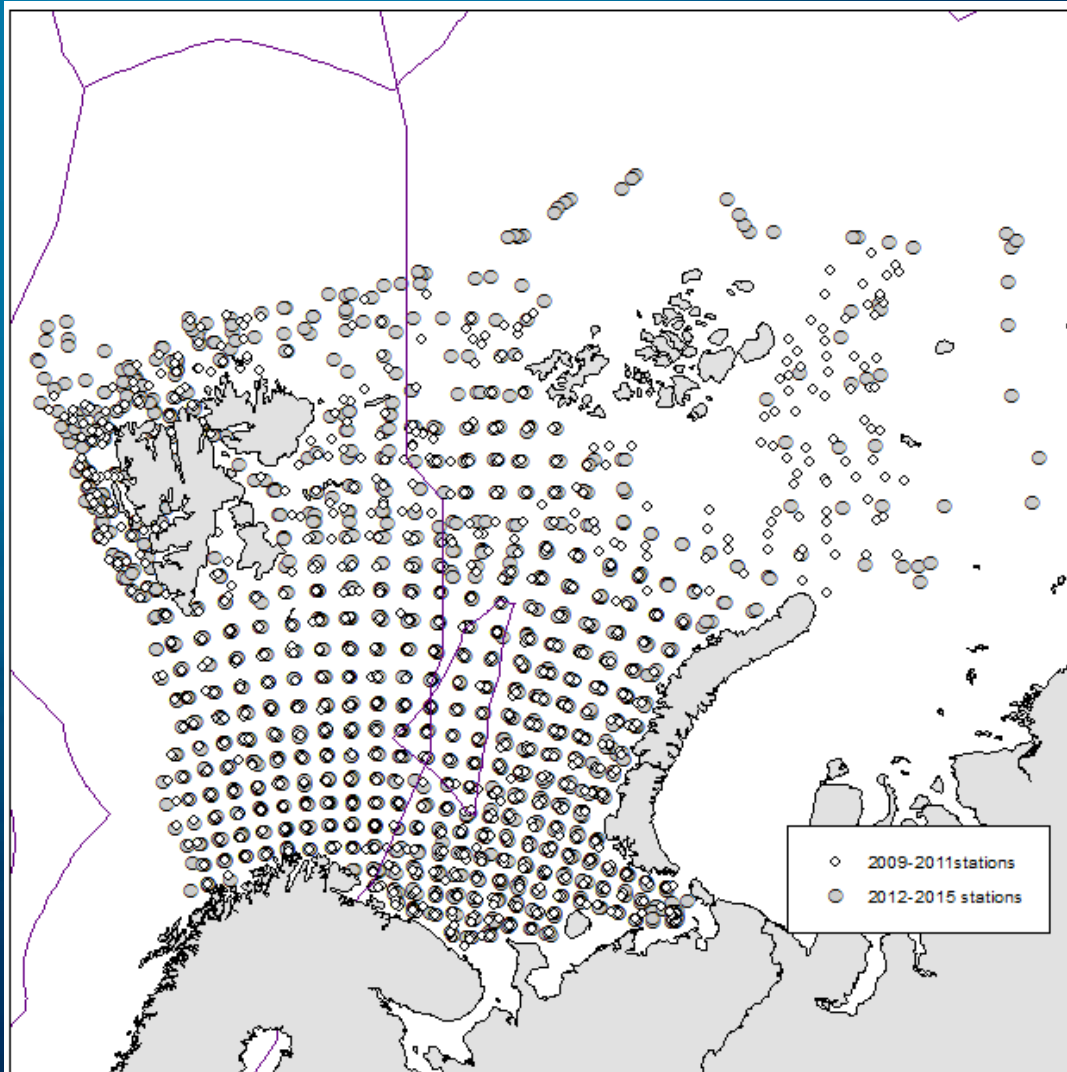
PINRO-IMR  
database (2007)  
S2D database  
(2014)



Same literature



# Long Term Monitoring 2009-2016



- 2280 stations
- 70 T of biomass
- 4.4 mil. individuals
- 467 species/taxa

# Multiple impact on sea bed fauna in a warming Arctic

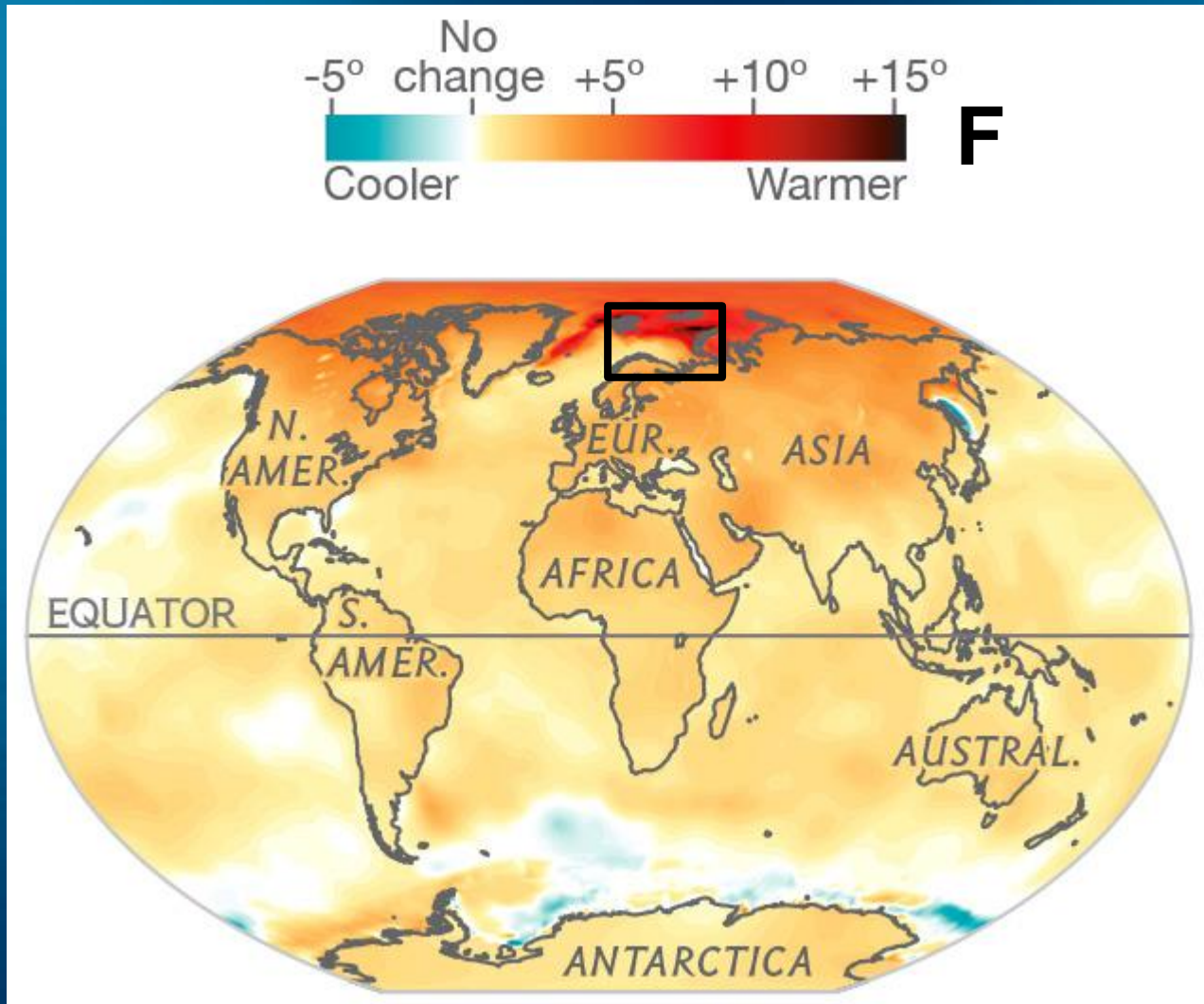
- **Warming and ice loss**
  - **Bottom trawling for fish**
  - **Predation from new species**





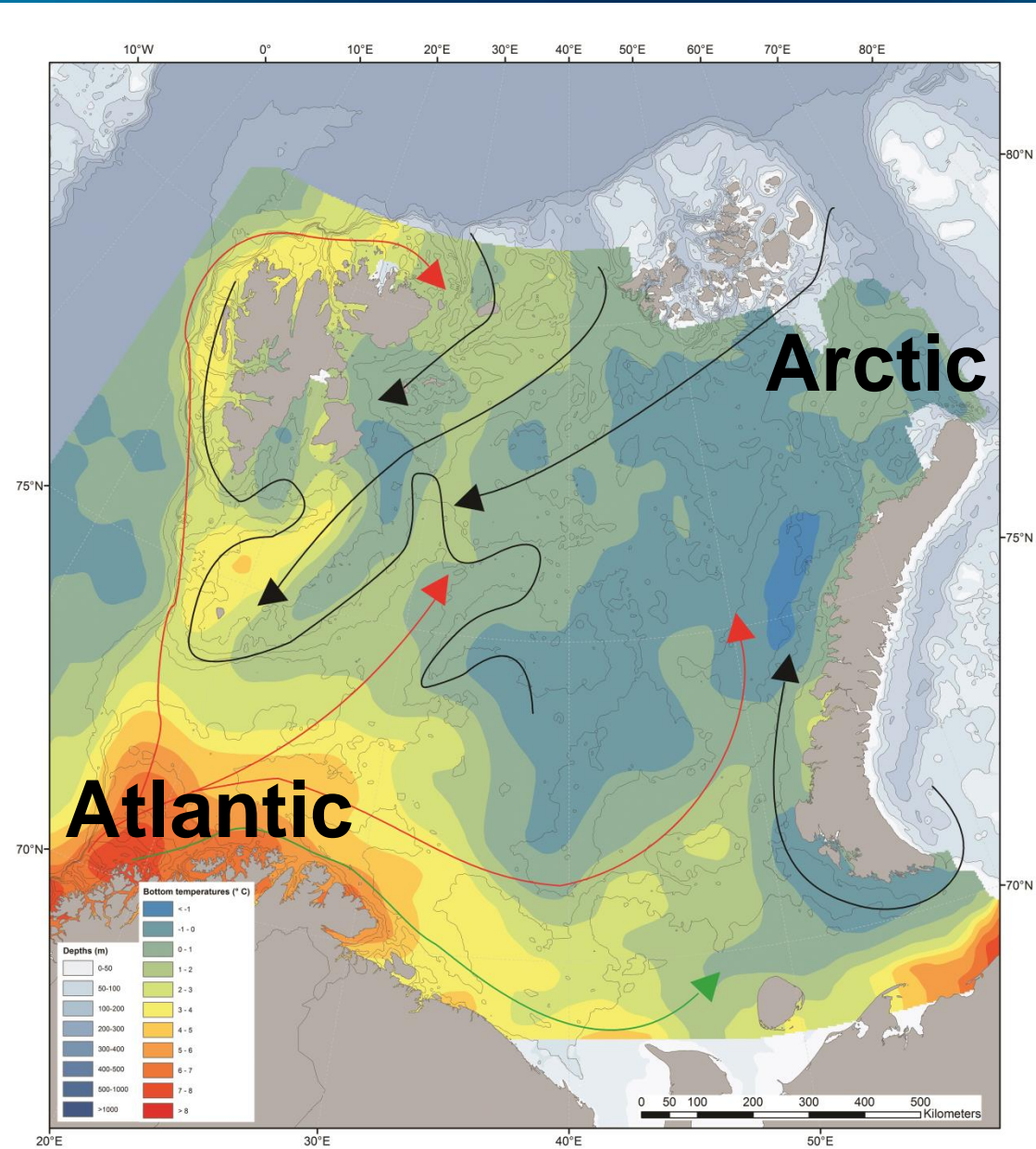
# Climate change

Arctic is warming 2 to 3 times faster than the global average

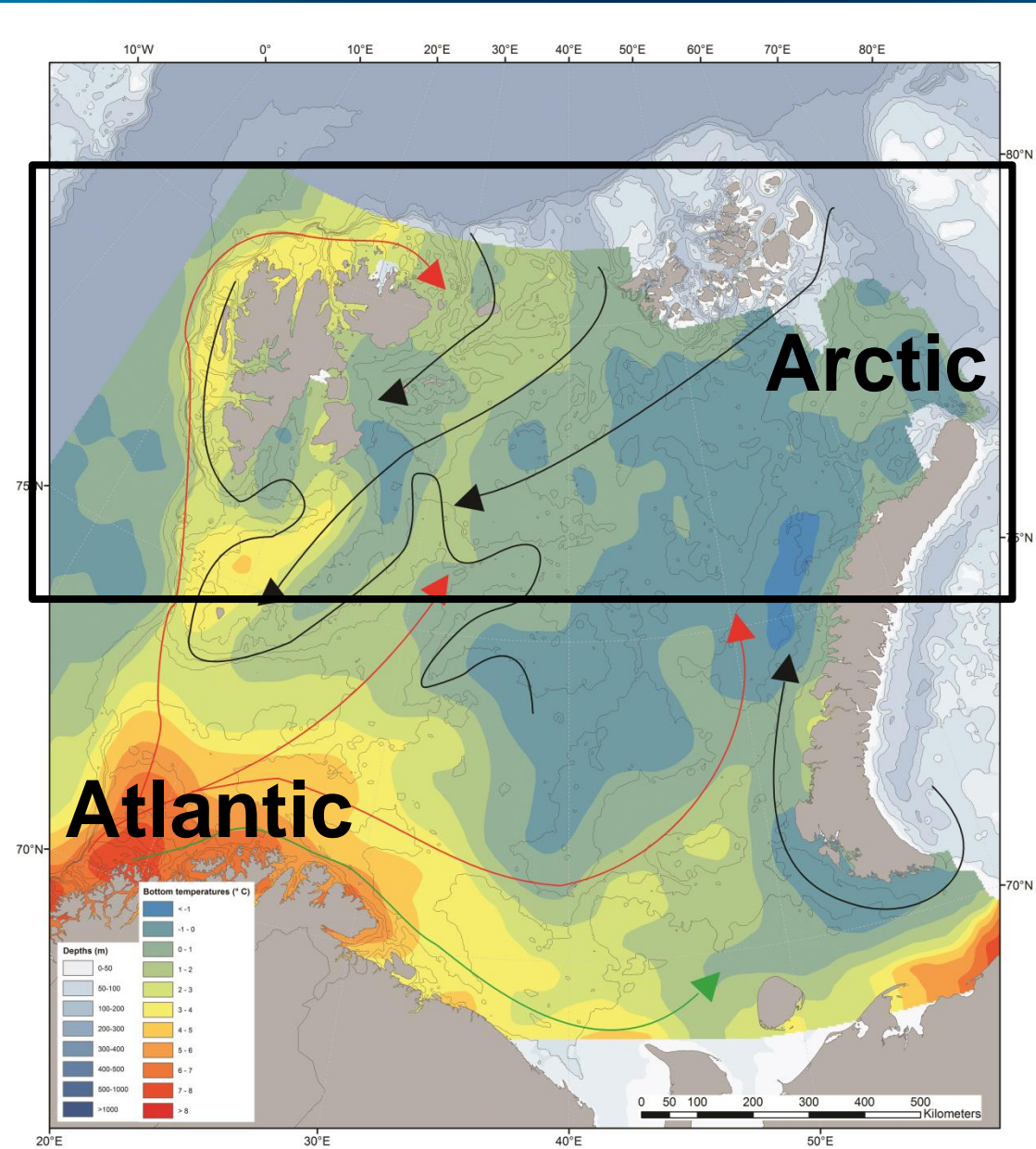




# Stressor: Bottom temperature

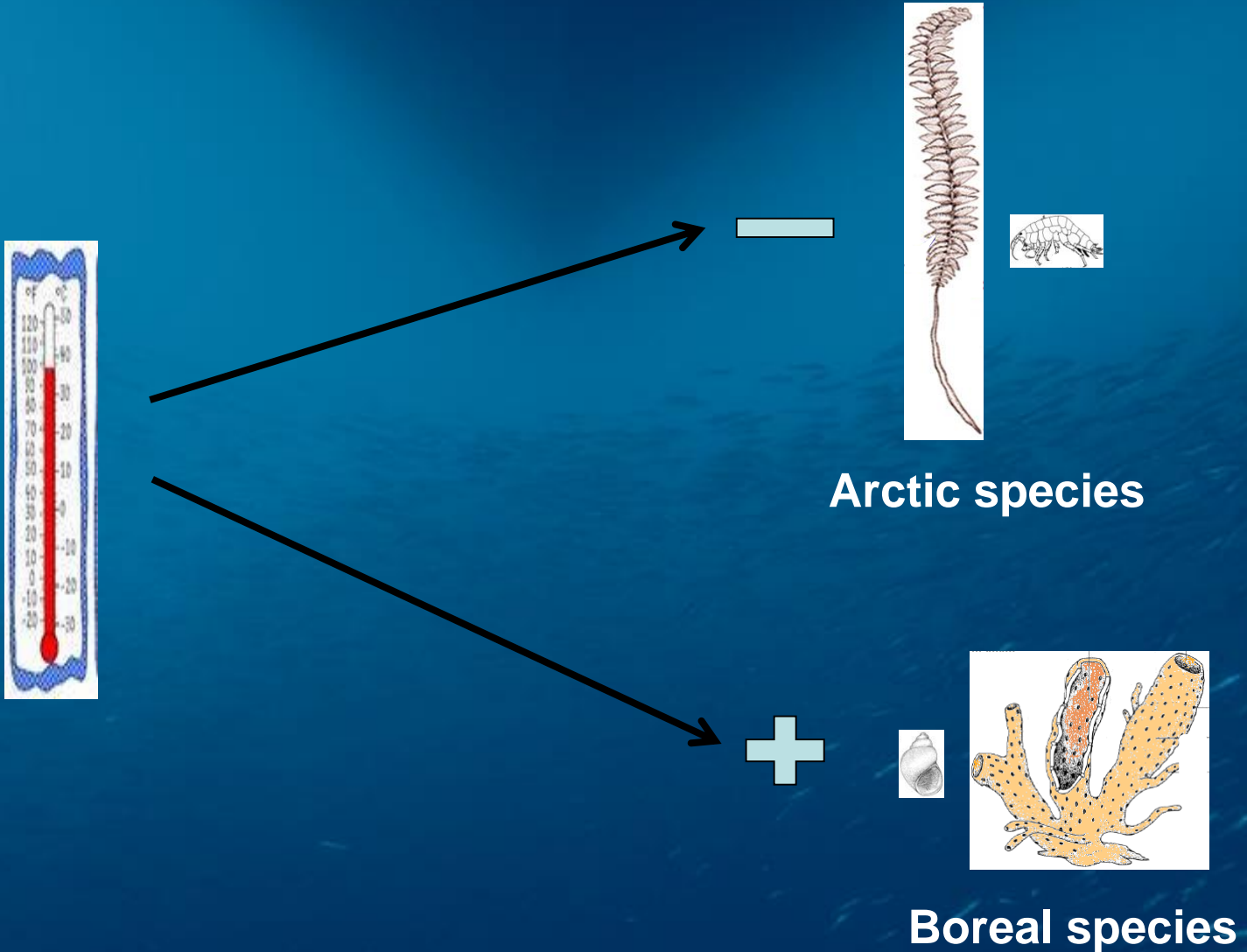


# Stressor: Bottom temperature

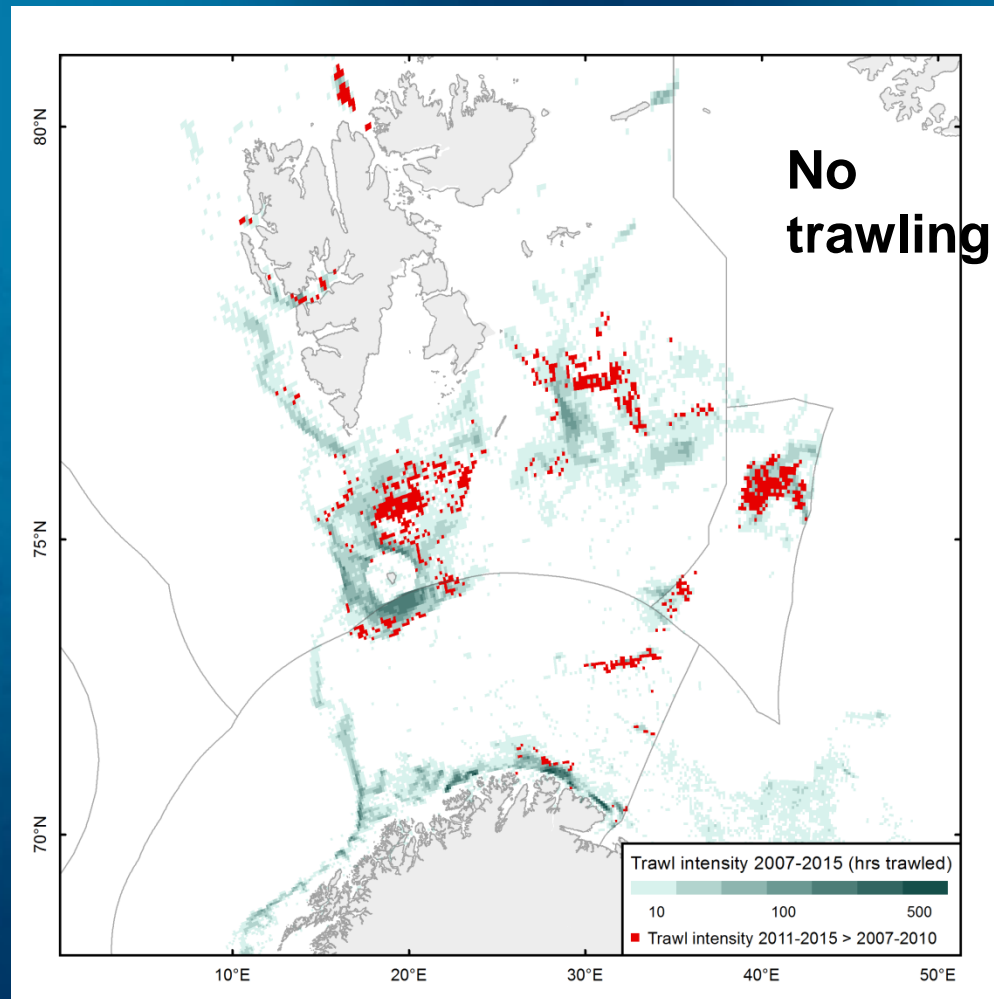




# Sensitivity to warming

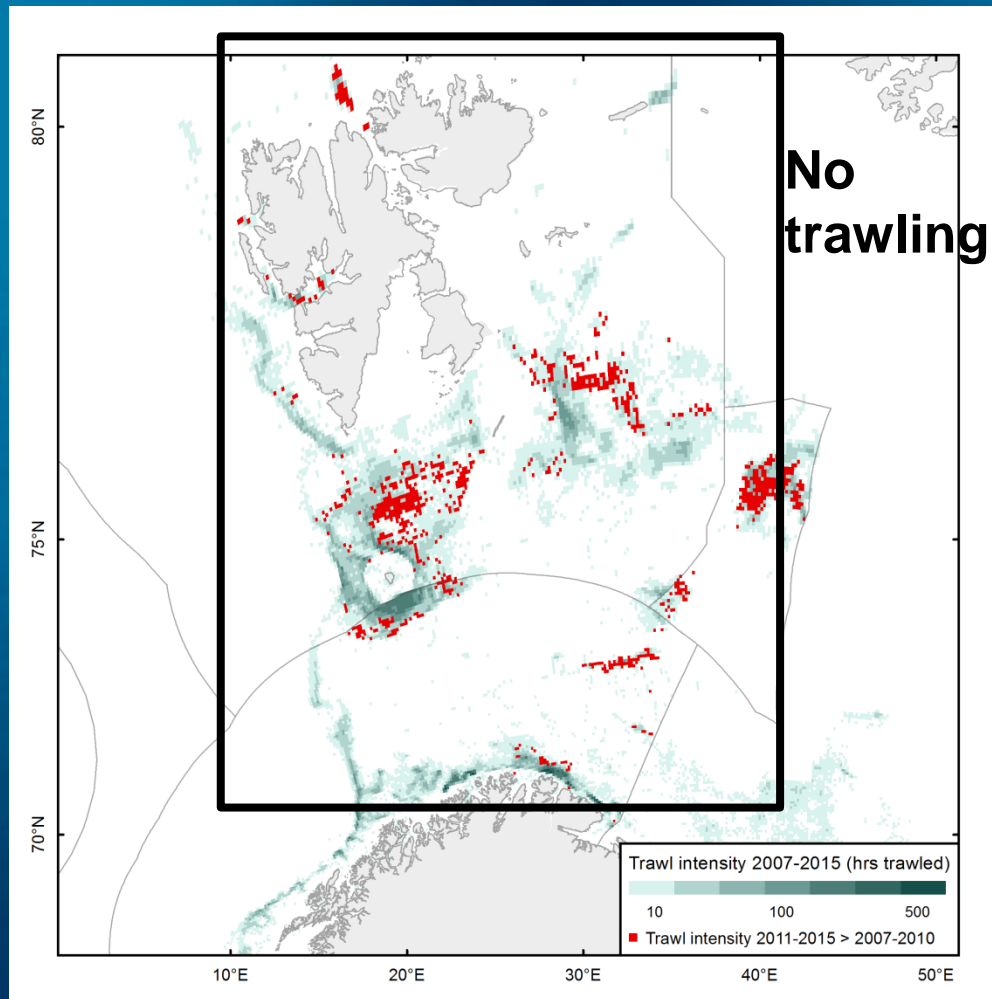


# Stressor: Bottom trawling

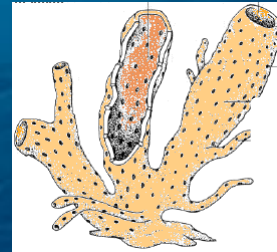
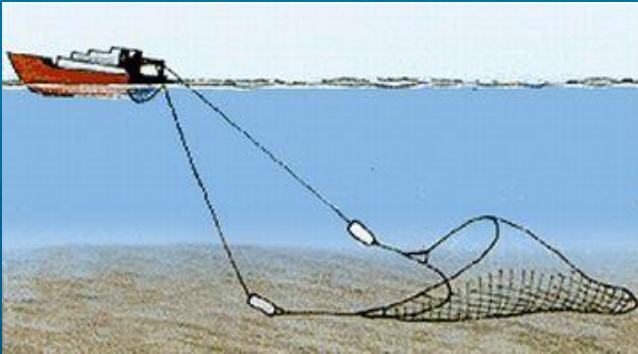




# Stressor: Bottom trawling



# Sensitivity to trawling



**Large-bodied  
upraised species**





# Example of vulnerable species



**Basket stars (40 cm diameter)**



**Sealilies (20 cm arms)**

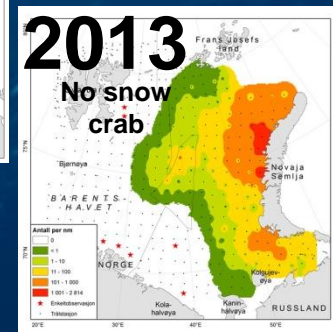
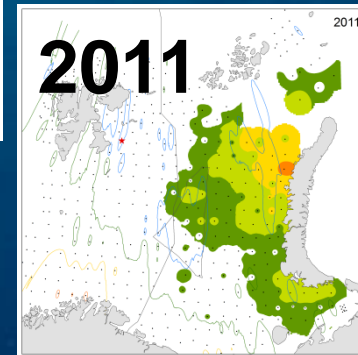
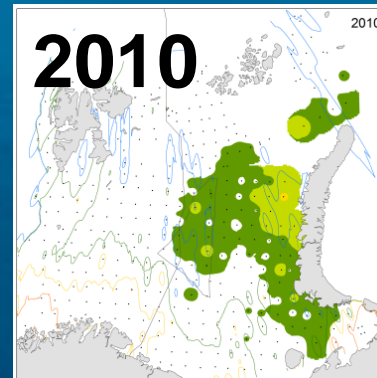
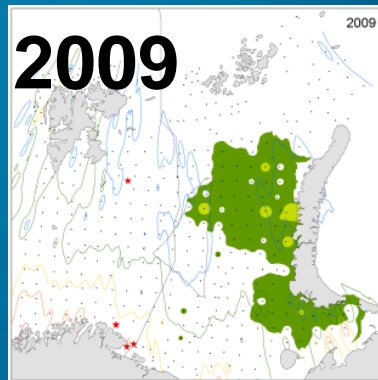
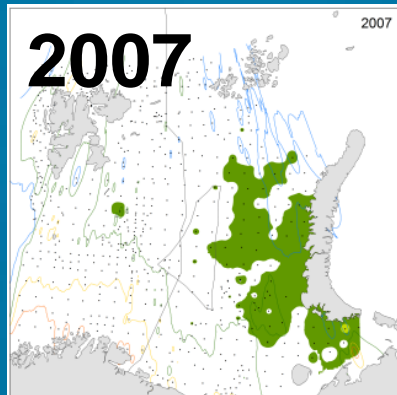


**Sea pens (3 m length)**



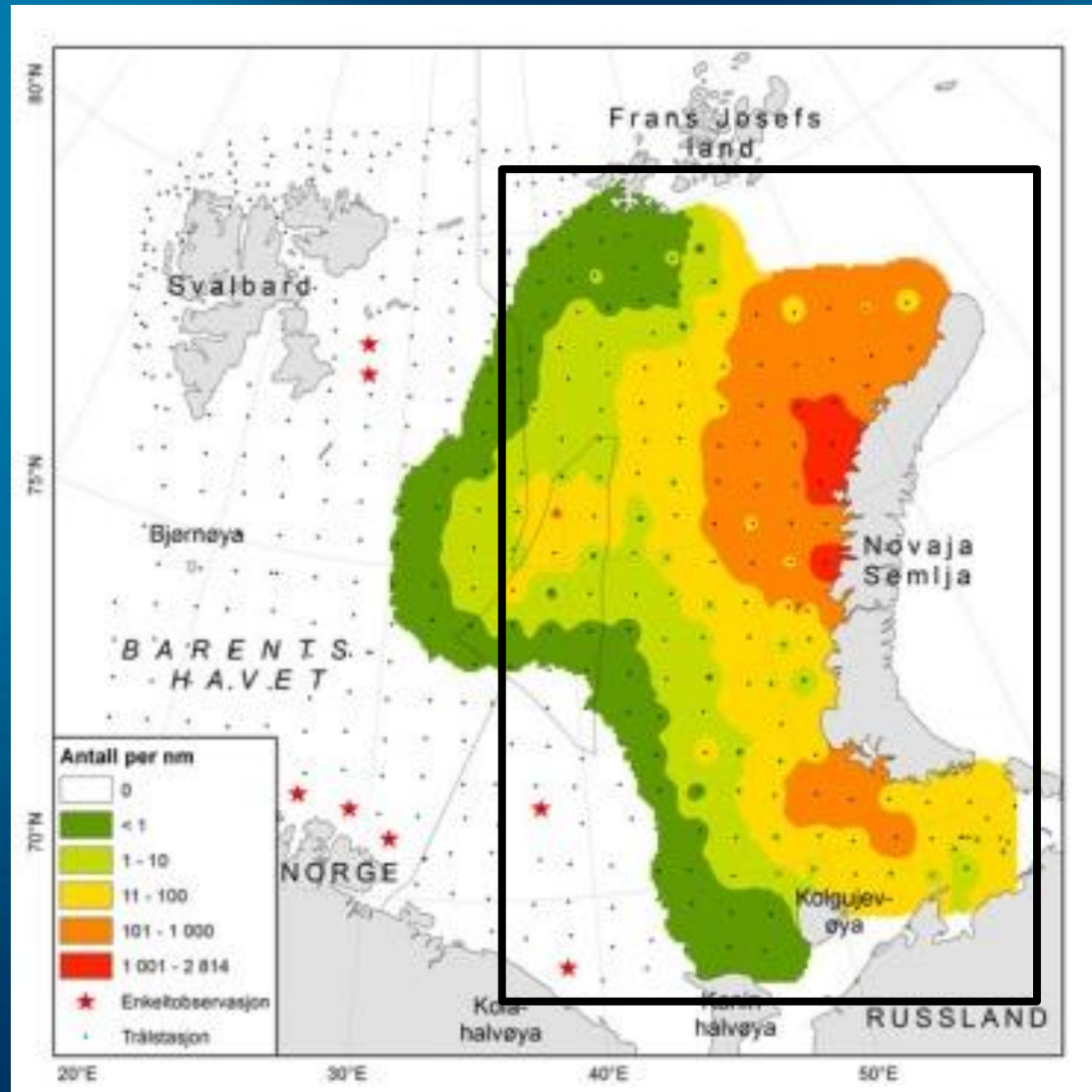
**Sponges (15 kg)**

# Stressor: Snowcrab predation





# Stressor: Snowcrab predation 2013





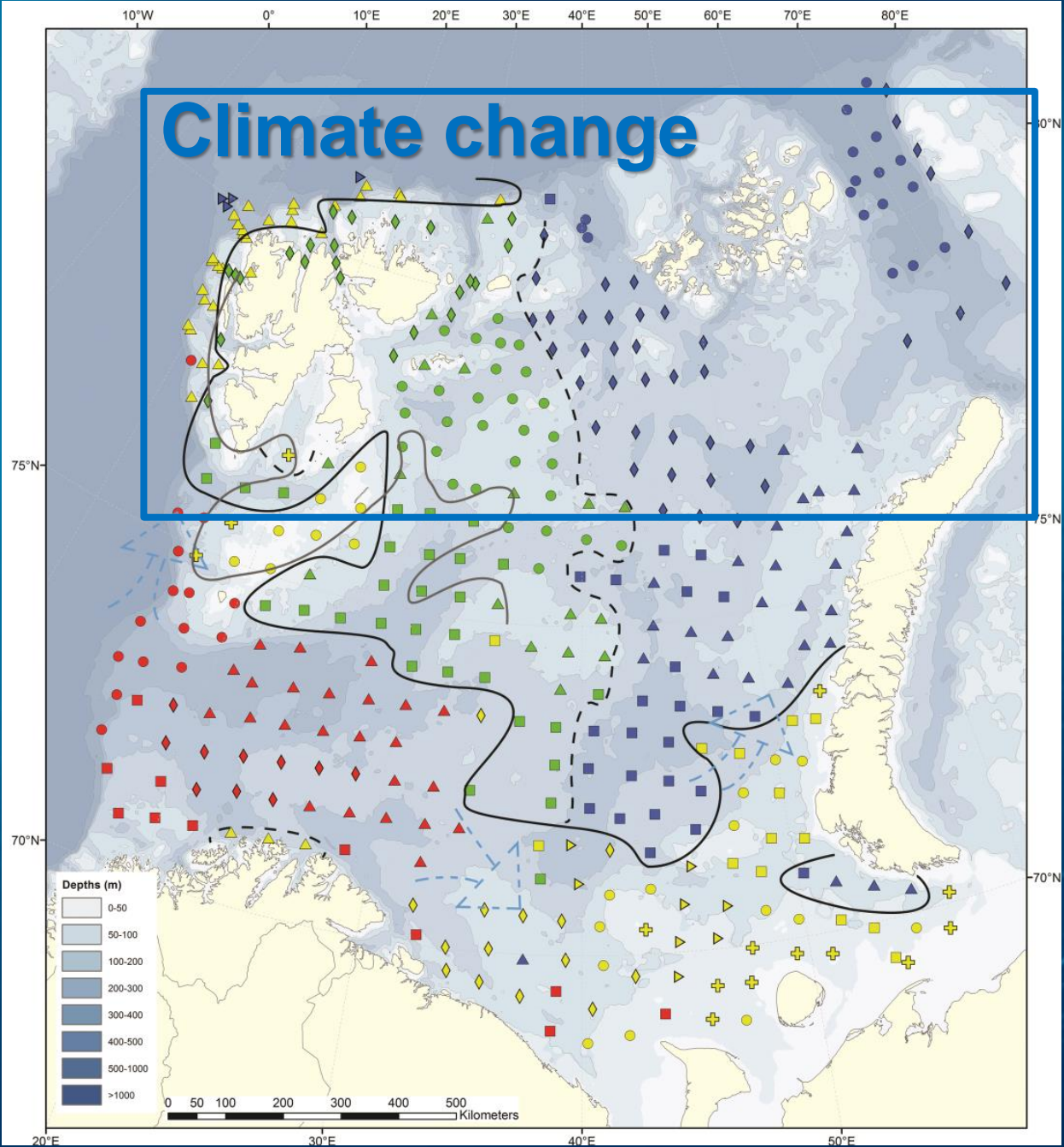
# Snowcrab prey sensitivity



**Small prey  
species**

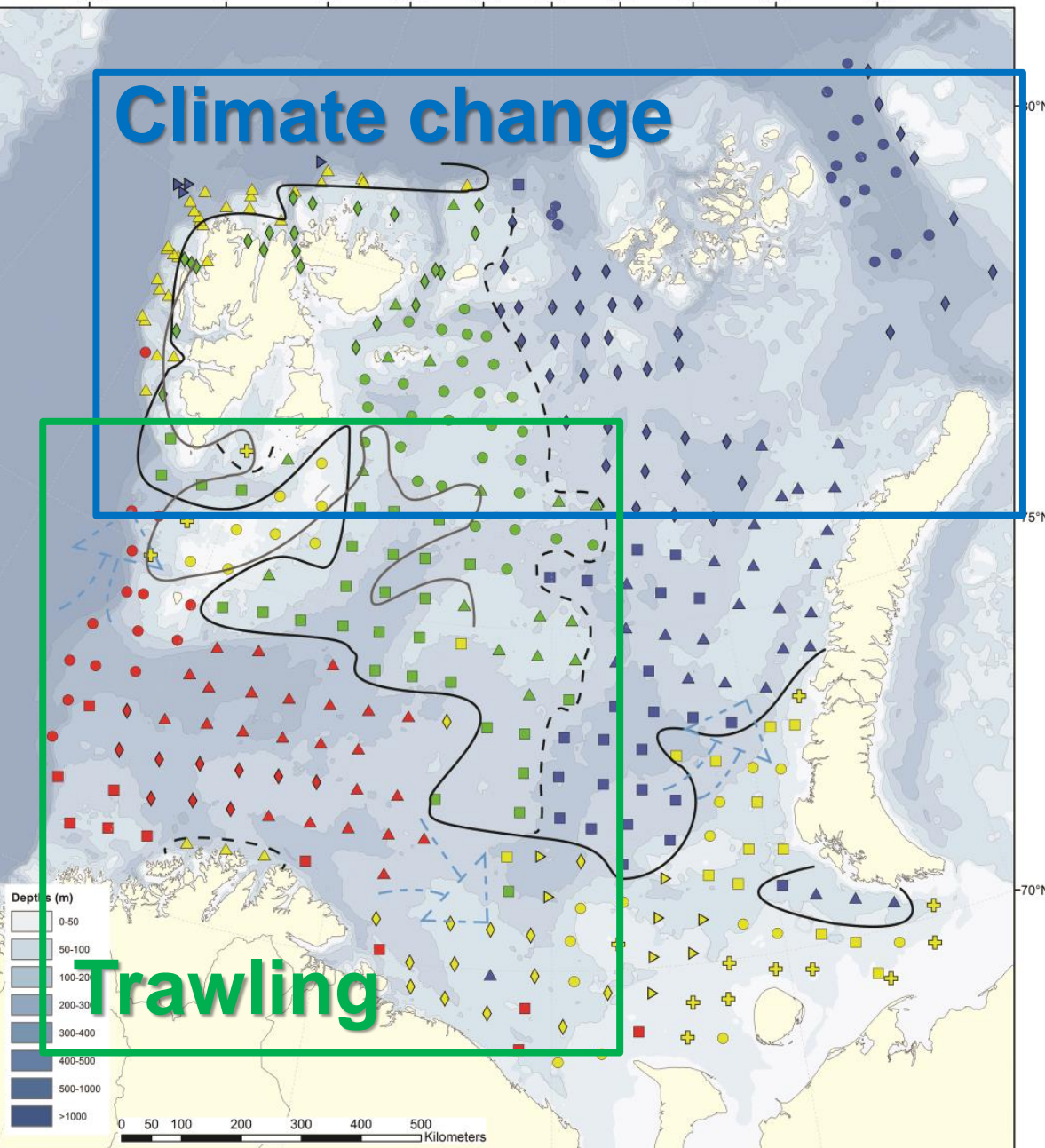


# Climate change



# Climate change

# Trawling

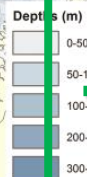




**Climate change**

**Snow crab**

**Trawling**

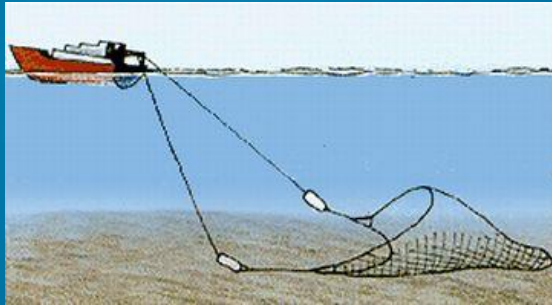


# Multiple stressors and co-sensitive species



Pictures: Vitaliy Syomin

# Combined effect of multiple stressors in the North West

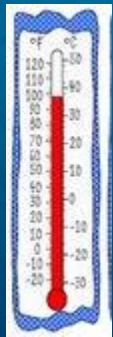
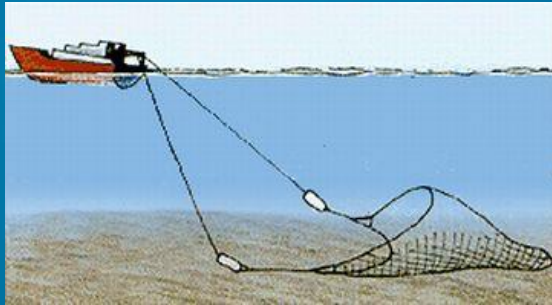


**Large-bodied  
upraised species**





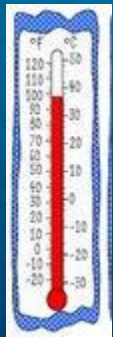
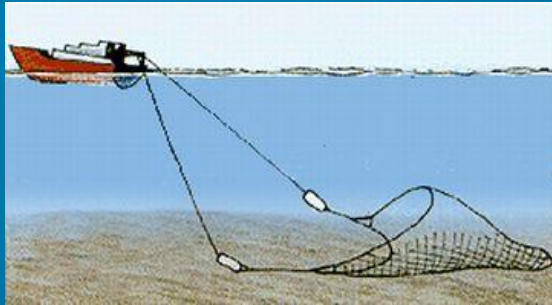
# Combined effect of multiple stressors in the North West



Arctic species



# Combined effect of multiple stressors in the North West



**Large-bodied  
upraised Arctic  
species**

# Combined effect of multiple stressors in the North East

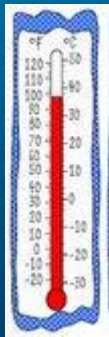


**Small prey  
species**





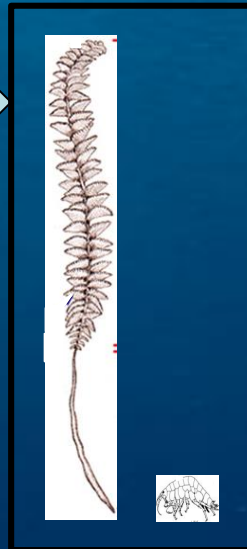
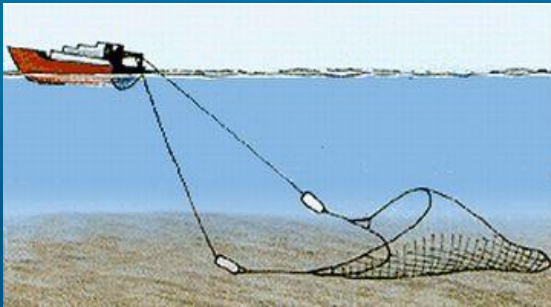
# Combined effect of multiple stressors in the North East



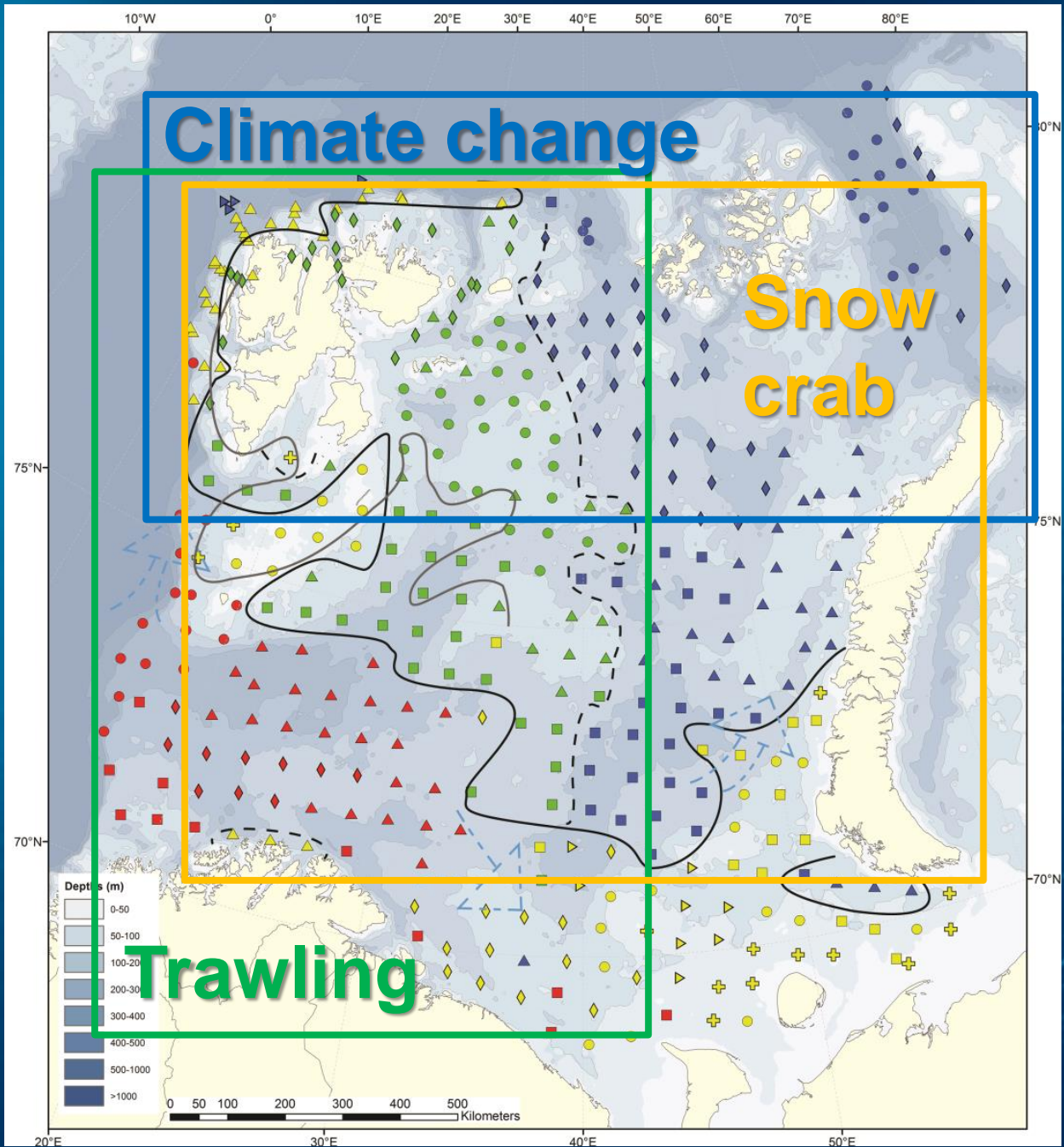
Arctic small  
prey  
species



# Combined effect of multiple impacts on an arctic community



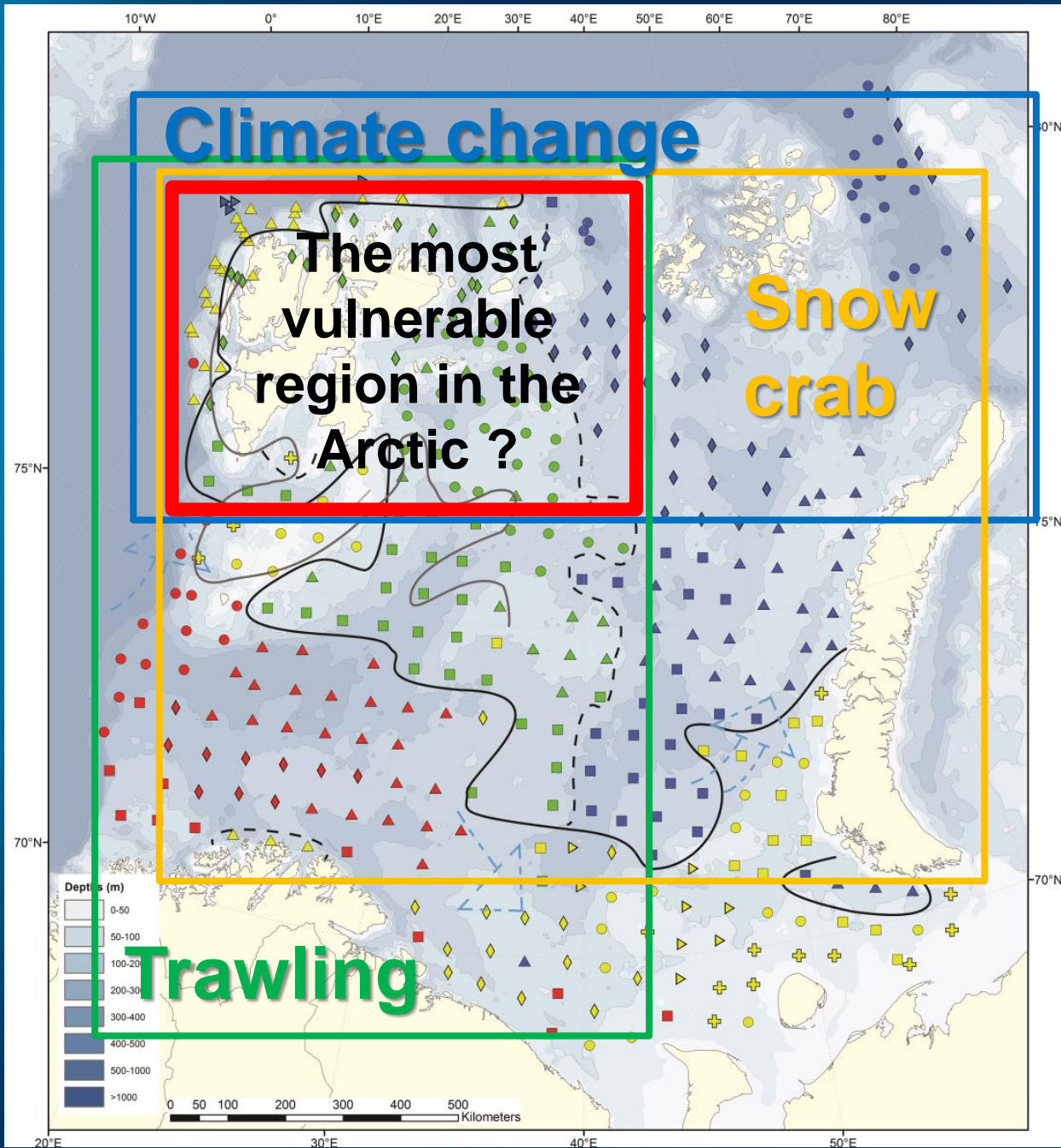
# Future



# scenario



# Future



# Scenario

# Conclusion

**To sustain a biodiverse and healthy ecosystem**

**Need data from time and cost-efficient Long Term Monitoring Programs to understand natural processes and time scales of anthropogenic change**

**Standardized field sampling in time and space**

**Climate-, nature- and social scientists work together**

**Involve stakeholders to use data and understand how to implement the results into (inter)national management plans**

