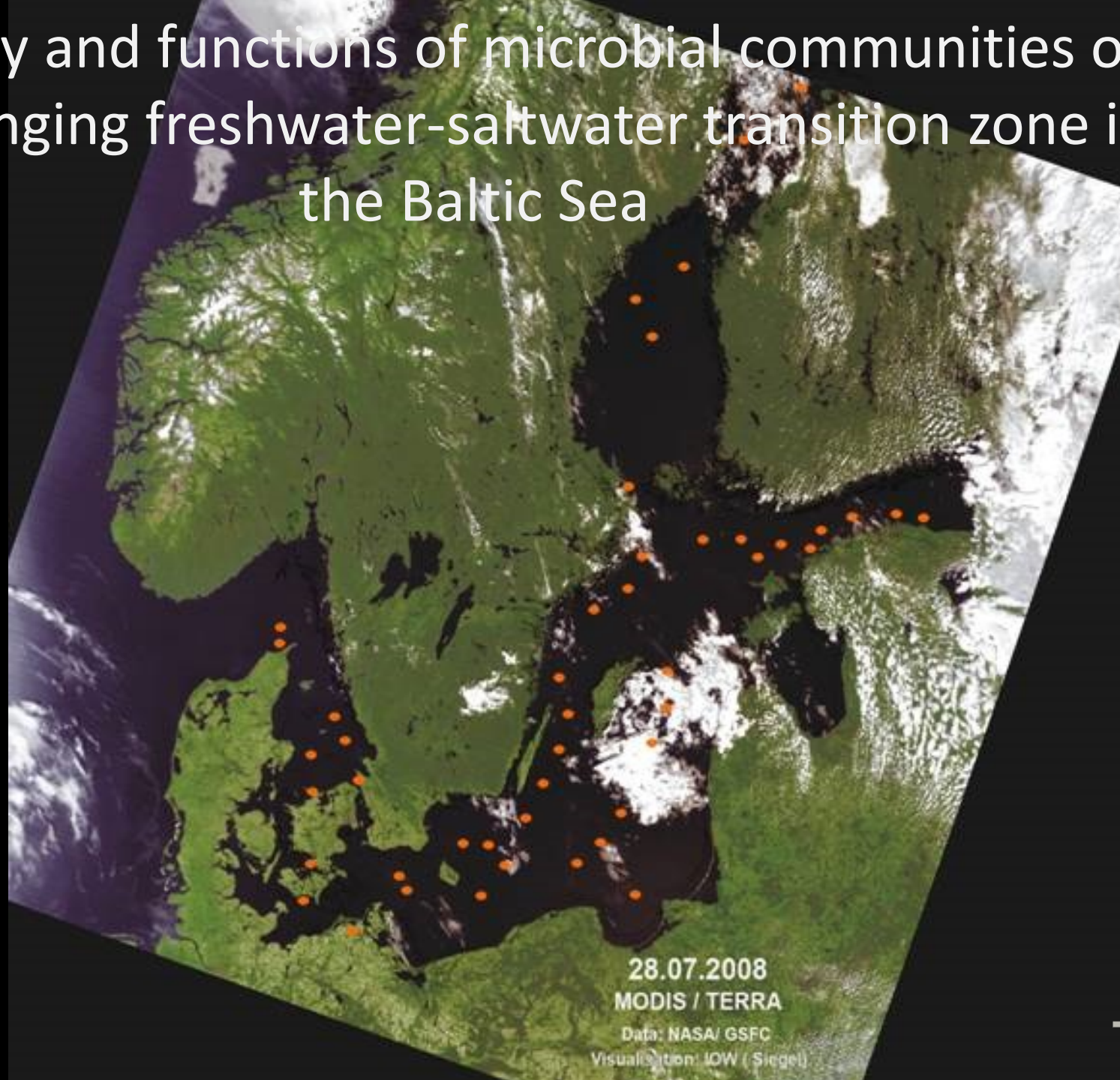
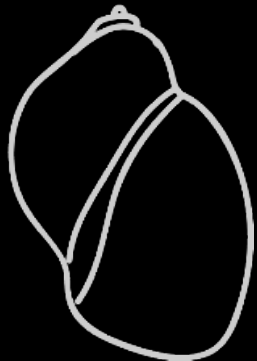


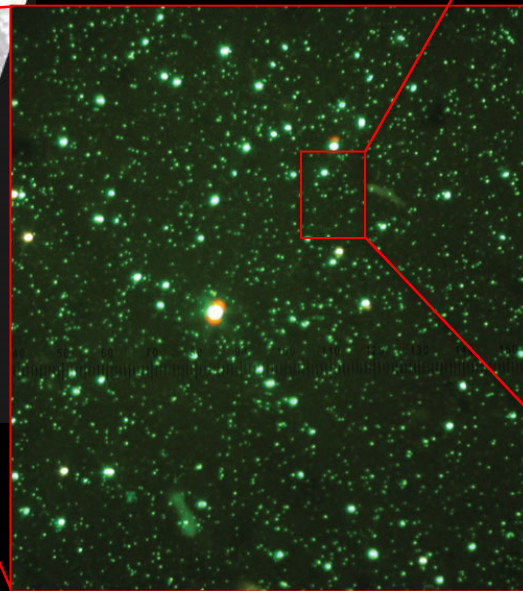
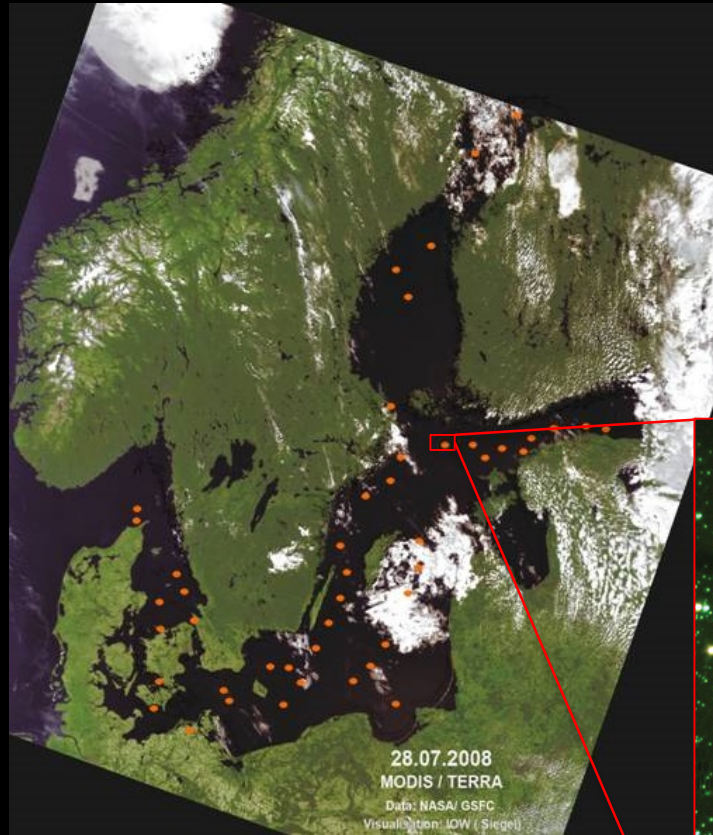
Diversity and functions of microbial communities of the changing freshwater-saltwater transition zone in the Baltic Sea



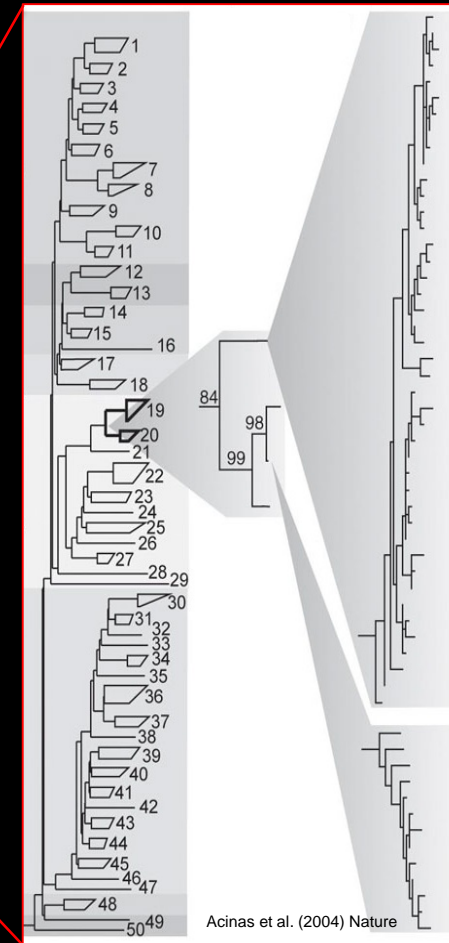
Radix project



Aquatic microbial abundance and diversity

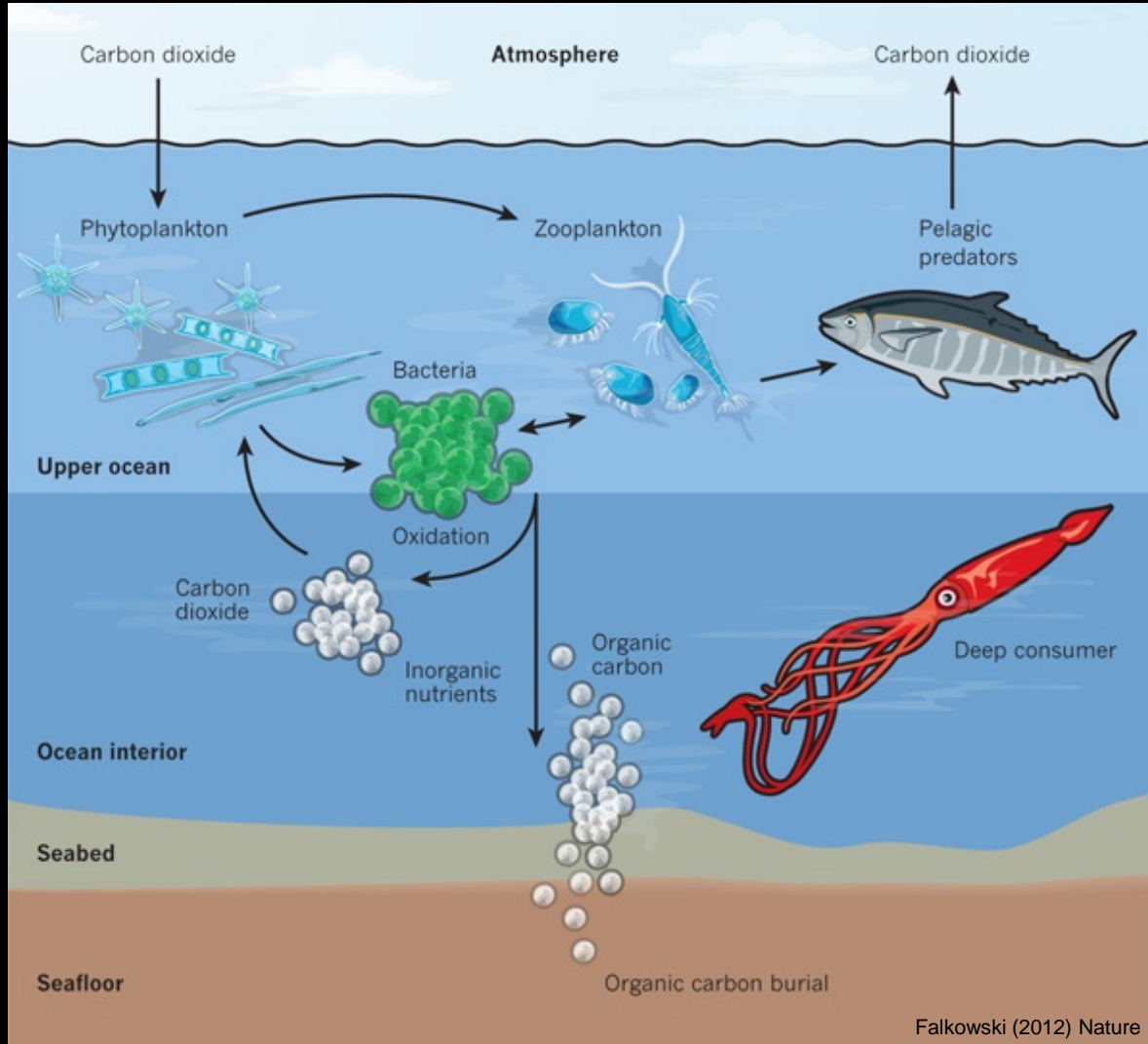


10^8 prokaryotes/L seawater
 10^{28} - 10^{29} cells in the ocean



10^3 - 10^5 species in a
single sample

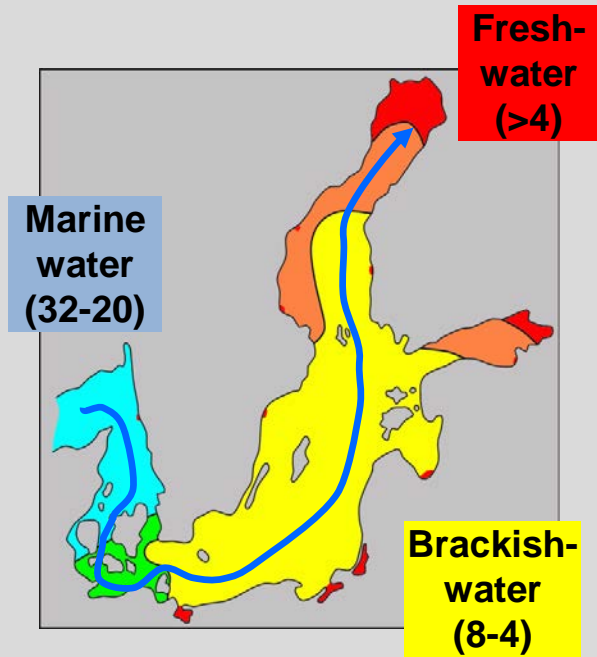
Functions of the bacterioplankton and the marine food web



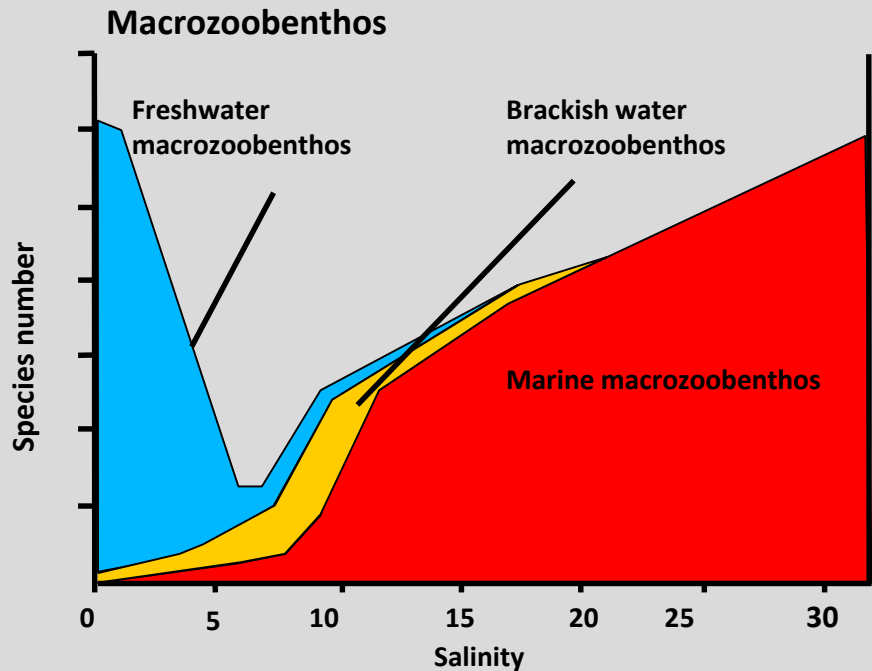
Examples of “exotic” bacterioplankton metabolism:

- Photoheterotrophy
Proteorhodopsin
- Chemolithotrophy
 - sulfur oxidation
 - ammonia oxidation

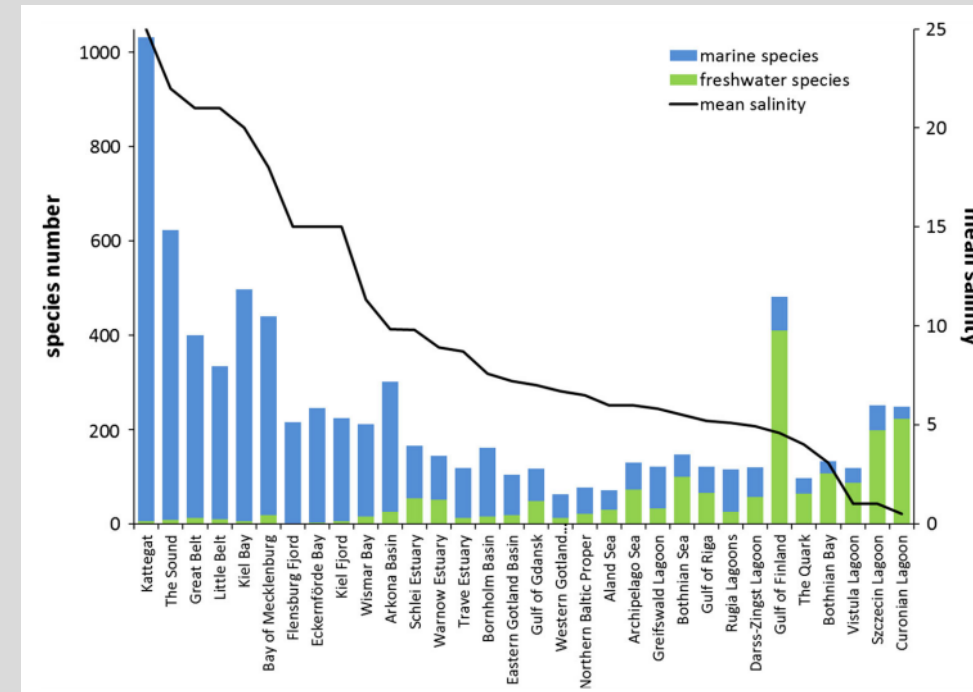
Important feature of the Baltic Sea: Salinity gradient



Hufner & Aladin 2006



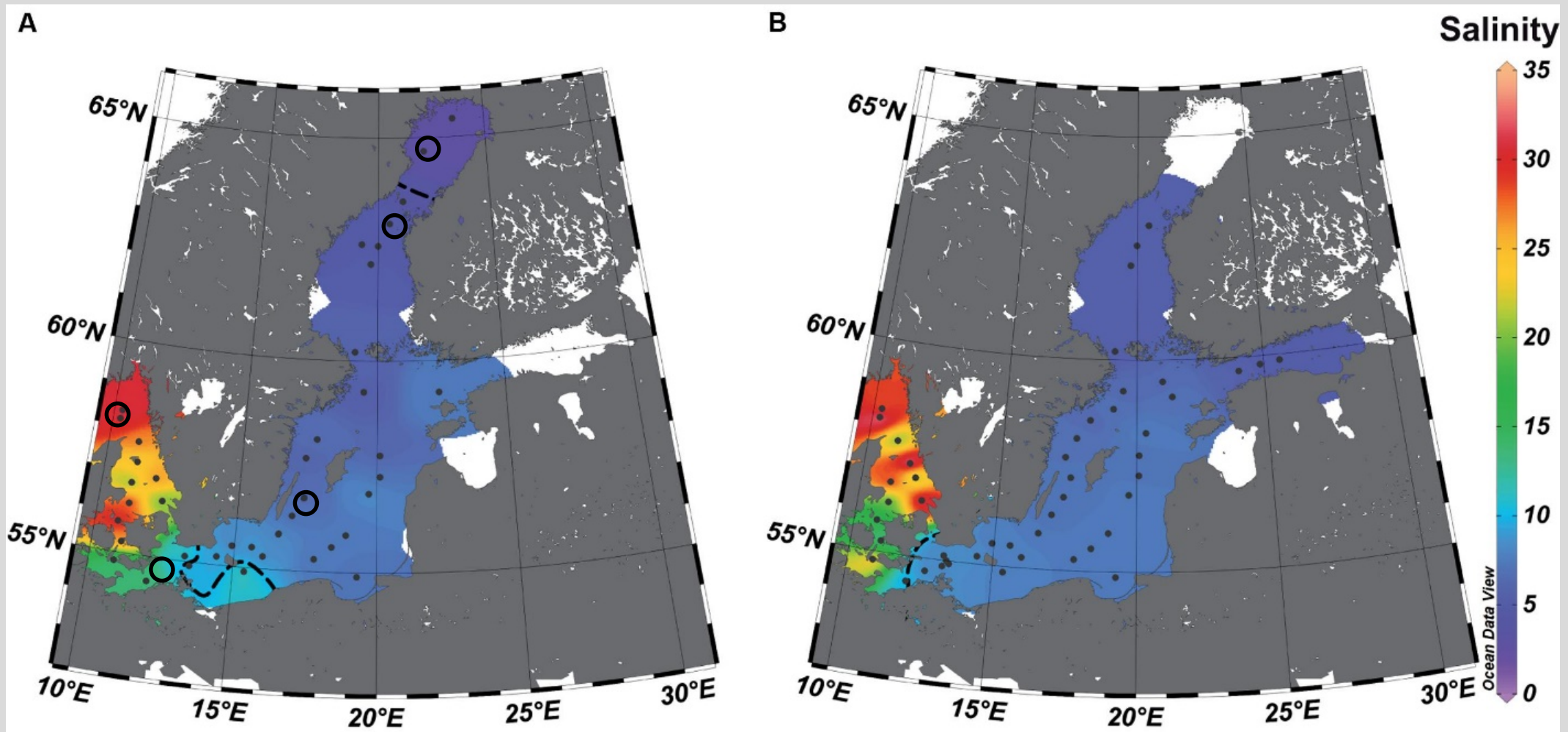
Modified from Remane, 1934



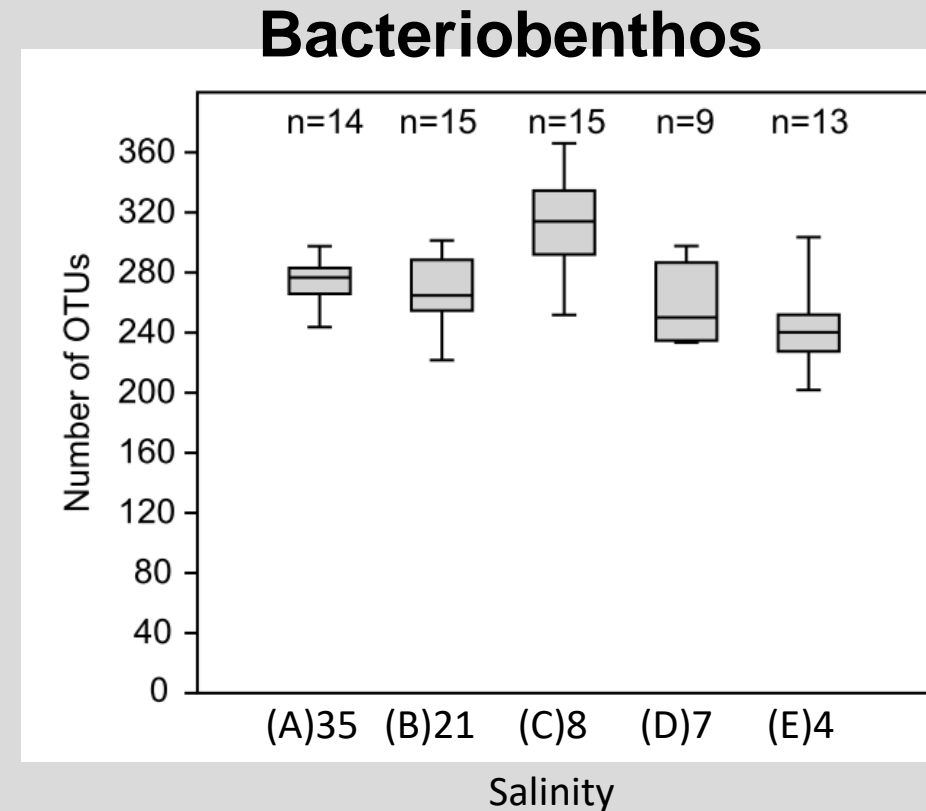
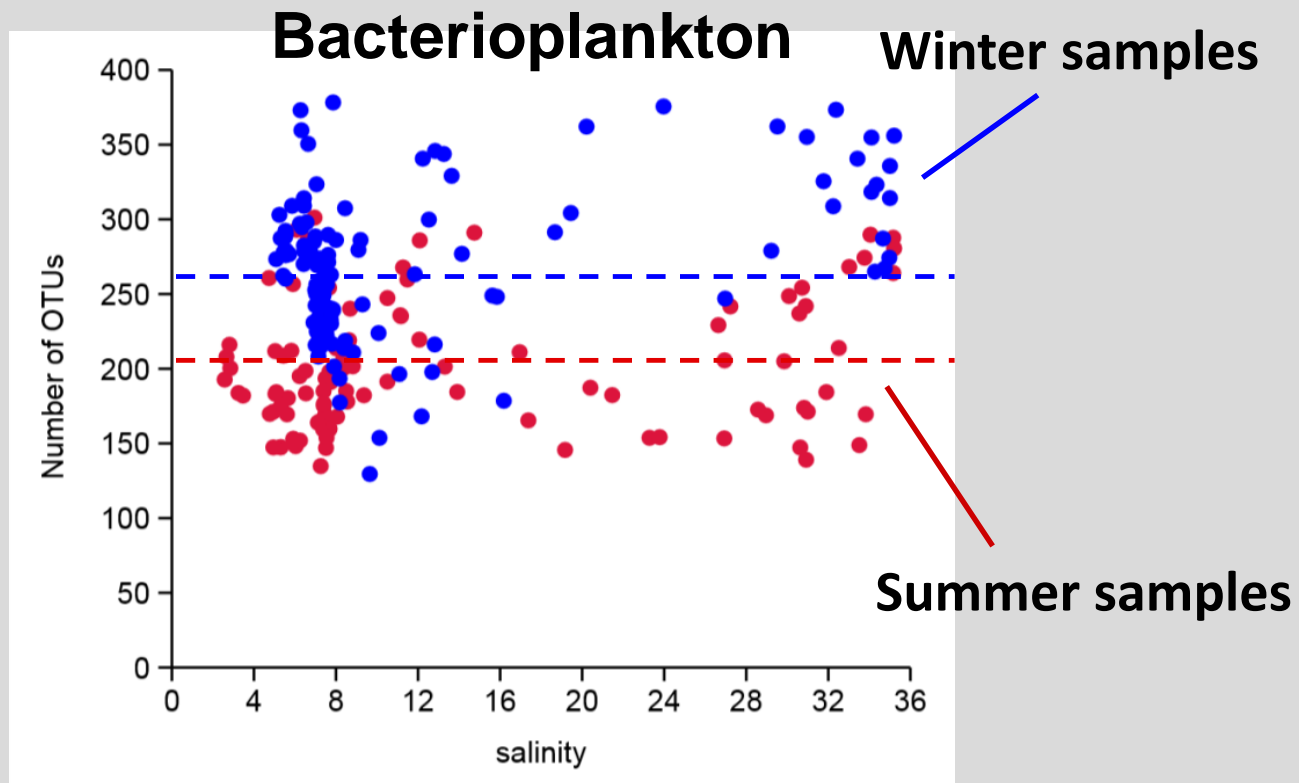
M. Zettler, A. Karlsson, T. Kontula, P. Gruszka, A. Laine, K. Herkül, K. Schiele, A. Maximov, J. Haldin 2014

→ Salinity is a major determinant for the biological life

Bacterial communities in the salinity gradient



Salinity and microbial communities

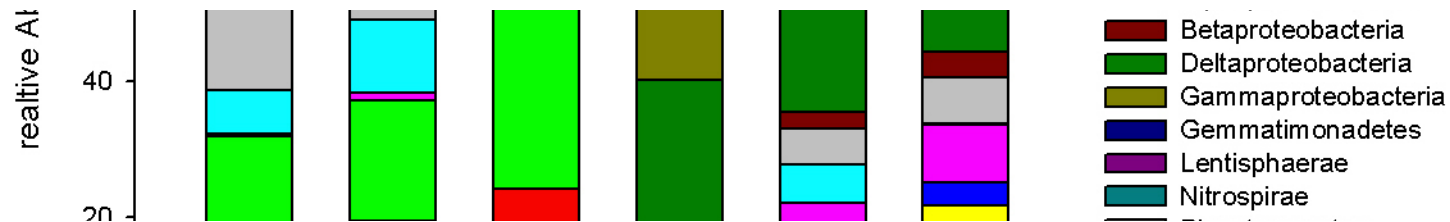


→ No decline in bacterial diversity in the brackish area of the Baltic Sea
in contrast to Remane's principles

Sediment bacterial communities



- Major changes of the pelagic/benthic bacterial community composition along the salinity gradient

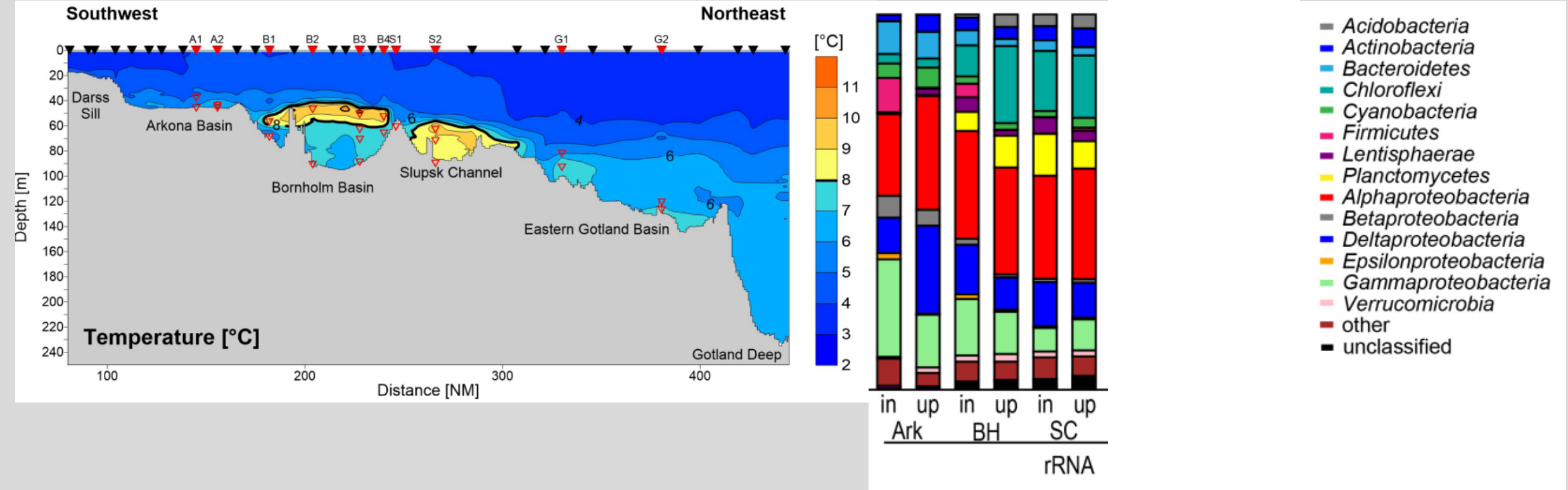


→ Salinity gradient sets the boundaries for bacterioplankton composition

→ Regional environmental conditions (phytoplankton, temperature and nutrients) tune the bacterial community

ine :kish retic ine :kish retic

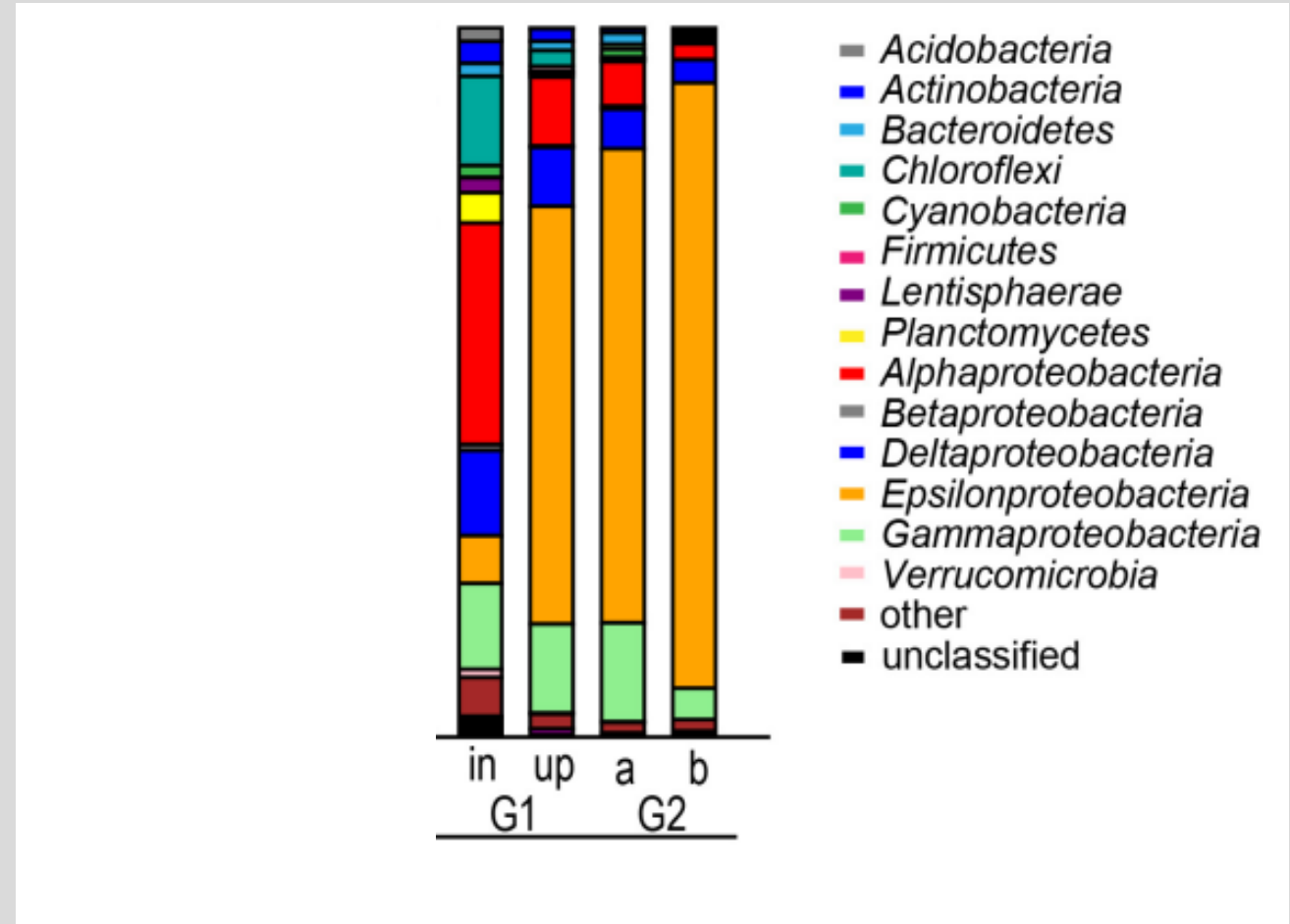
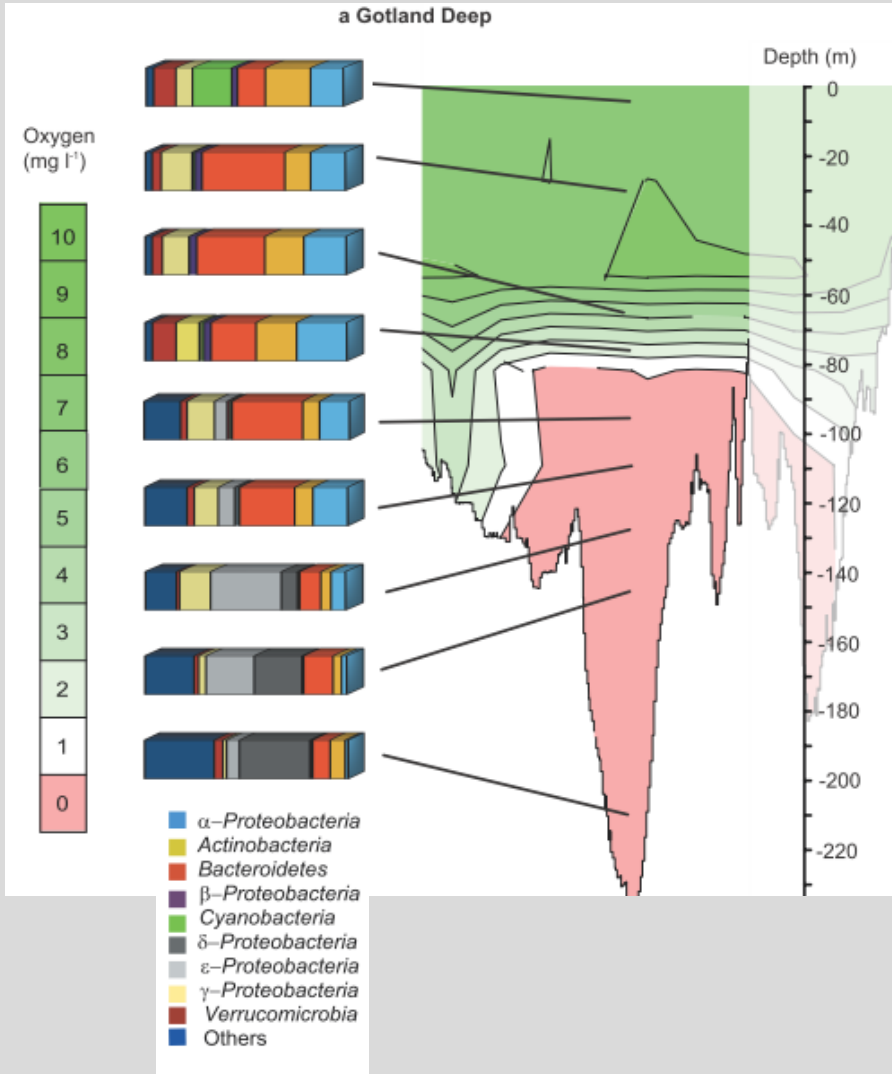
How do bacteria respond to major saline inflow



- Gradual mixing of bacteria

Bergen, Naumann, Herlemann, et al. 2018

Anoxic basins are not a dead zone for bacteria



- Uplift of bacterial communities

Climate change and the Baltic Sea

Heat

CO₂

More precipitation

Physical change:

A warmer, more stratified, lower saline and more acidic water body

Impact on microbial diversity and functions

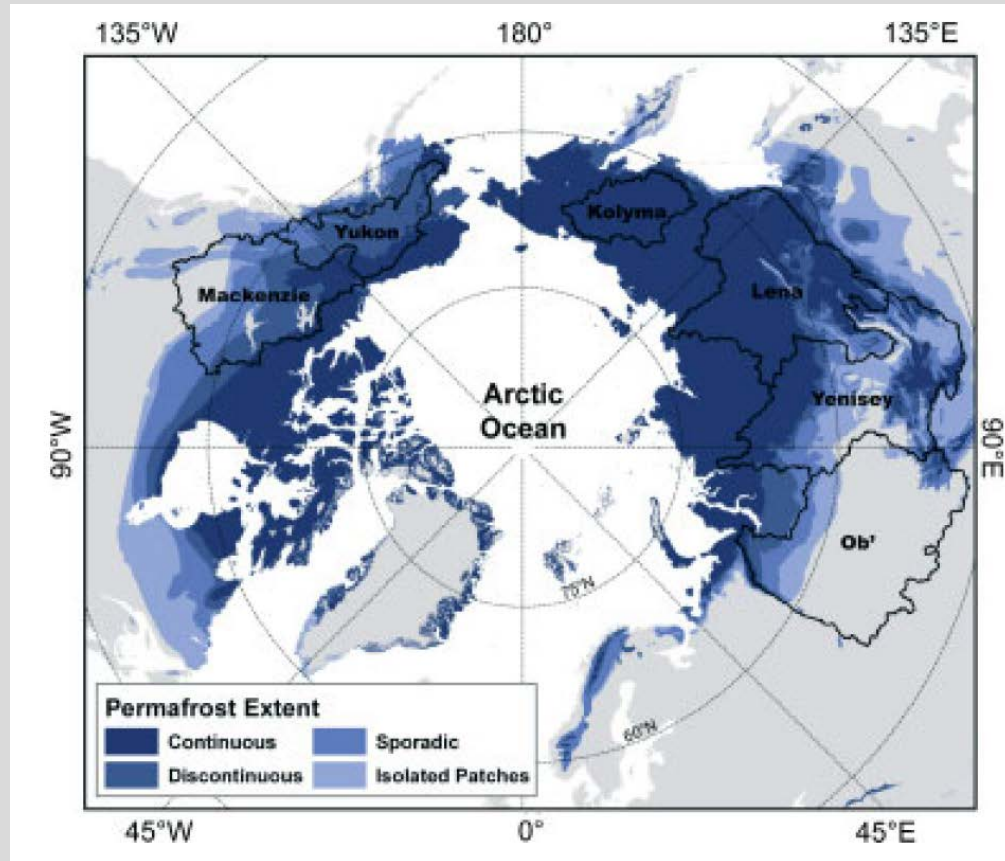
28.07.2008

MODIS / TERRA

Data: NASA / GSFC

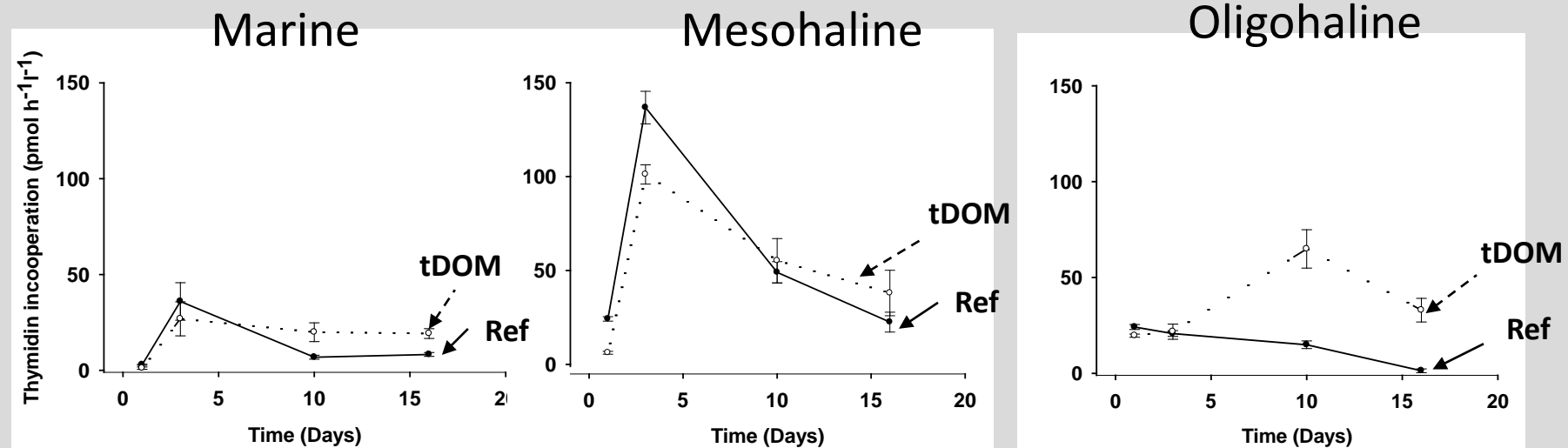
Visualization: IOW / Siegel

Climate change: Increased loads of terrigenous dissolved organic matter



How do bacterial communities in saline gradients react to increased loads of terrigenous carbon?

Brackish microbial community shows a different response to the addition of terrigenous dissolved organic matter



Herlemann, et al. 2017
Herlemann et al. 2014

→ Oligohaline bacterial community has the highest potential to degrade terrigenous carbon (coastal filter)

Conclusions

- Salinity has a strong impact on the bacterial community composition
 - Bacterial diversity does not decrease along the salinity gradient
 - Bacterial communities have different functions depending on salinity
 - Major saline inflow cause mostly gradual mixing of bacterial communities, but also uplift
 - Terrigenous carbon from unpopulated forested areas is mostly utilized in the freshwater-brackish transition zone
- Bacterioplankton dynamics and its consequences on biogeochemical models must be integrated into Baltic Sea research on climate change effects.

