The distribution of benthic *Roseobacter* group members in the Pacific is shaped by nutrient availability at the seafloor and productivity in the water column

Marion Pohlner¹, Julius Degenhardt¹, Avril von Hoyningen-Huene², Bernd Wemheuer²†, Bert Engelen¹

¹Institute for Chemistry and Biology of the Marine Environment, Carl von Ossietzky University, Oldenburg, Germany
²Genomic and Applied Microbiology and Göttingen Genomics Laboratory, Institute of Microbiology, Göttingen, Germany
³Centre for Marine Bio-Innovation, The University of New South Wales, Sydney, Australia

**Introduction**

- The *Roseobacter* group represents a significant part of pelagic microbial communities. Members of this group can account for up to 16% of the bacterioplankton in polar and temperate waters.
- Although ~28% of all cultured representatives of the *Roseobacter* group are of benthic origin, their biogeography in sediments is poorly understood.

**Goal**

Describe the abundance, distribution and diversity of *Roseobacter* group members in deep-sea sediments ranging from highly productive to oligotrophic regions.

**Sampling**

- Transect from New Zealand to Alaska along the 180° meridian (RV Sonne cruise SO248; Fig. 1).
- Surface sediments (0-1 cmbsf) were sampled within six oceanic provinces.

**Approach**

Sampling a wide range of environmental conditions from low to relatively high nutrient availability.

**Main questions**

- What is the abundance of *Roseobacter* group members in Pacific deep-sea sediments?
- Which genera can be found in the different provinces?
- Does the nutrient availability influence the community structure of benthic roseobacters?

**Results**

**Increase of nutrient concentrations towards the northern Pacific**

- Chlorophyll concentrations increased to the North (Fig. 2 A).
- TOC and sulfur contents in sediments showed opposing values; both, FeO₃ and MnO₂ concentrations followed the same trend (Fig. 2 B).
- Nitrate concentrations were highest in the Pacific subarctic region, ammonia and phosphate could only be quantified at the northernmost sites (Fig. 2 C).

**Total cell numbers at the seafloor correlate to increasing nutrient concentrations**

- Lowest cell numbers at the edge of the south Pacific gyre and the north Pacific gyre (Fig. 3 A).
- Maximal values in the Bering Sea.
- Relative abundance of roseobacters: 0.7% and 6.3% (CARD-FISH and qPCR; Fig. 3 B + C).

**Oceanic provinces are characterized by specific *Roseobacter* communities based on their nutrient content**

- On average 0.7% and 0.9% *Roseobacter*-affiliated OTUs in the present and active communities.
- OTUs mainly assigned to uncultured members of the *Roseobacter* group (Fig. 4 A).
- Largest proportions of cultured representatives: *Sedimentitalea*, *Boseongiocola* and *Sulfitobacter*.
- Community composition of benthic roseobacters followed trophic state of oceanic provinces with constant clustering of the northern sites (Fig. 4 B).

**Conclusions**

- Most nutrient concentrations increased to the north showing highest values in the Bering Sea.
- The *Roseobacter* community structure is dominated by so-far uncultured members of this group.
- The biogeographical distribution of benthic roseobacters is linked to oceanic provinces with comparable nutrient composition.