Meteor cruise M137, Callao – Callao, 06. – 29. Mai,
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Stefan Sommer and the M137 Team

Despite the short transit between Callao and the first working station of only a few hours, the laboratories and scientific gears were ready for deployment allowing to start with the station work.

The studies at the seafloor are focusing on the shelf area off Callao, where we sample in water depths down to 350 m sediments and conduct flux measurements as well as experiments. We make good progress with flux measurements using the benthic chamber lander (Fig. 1). However, sometimes mother nature wreck up our plans, especially when small crustaceans (*Pleuroncodes monodon*) on the search for oxygen hide in the valve lid of the flux chamber and disturb our measurements (Fig. 1).

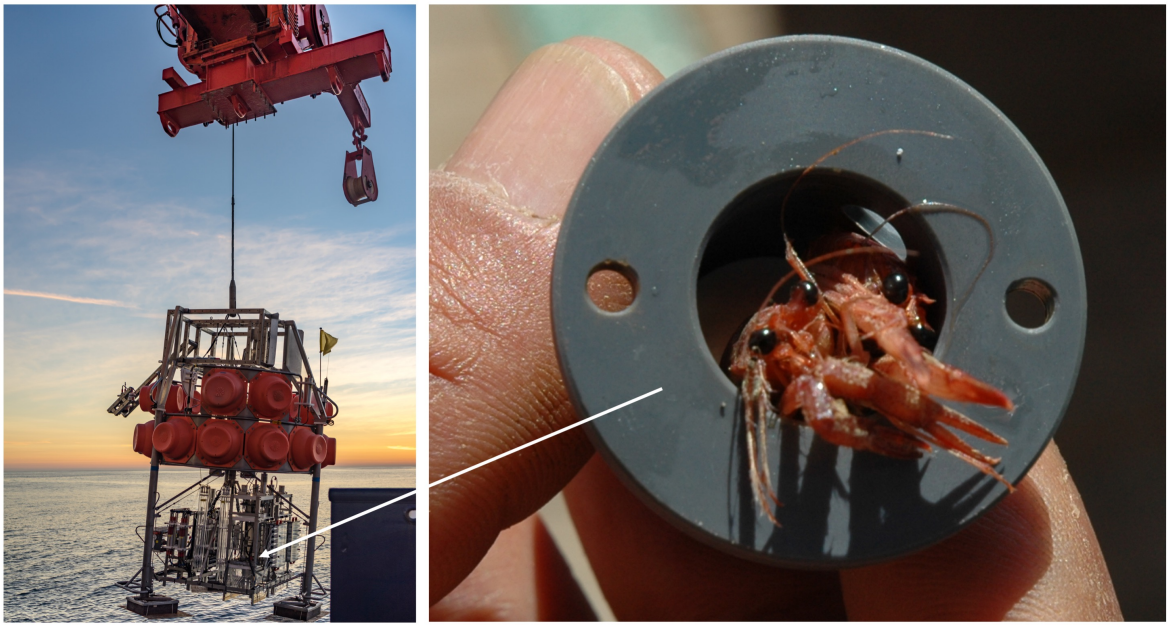

Fig. 1: Crustaceans (Pleuroncodes monodon) hiding in the valve lid of the benthic chamber of the lander (Photos: C. Rohleder, S. Sommer).

Experiments on board of the RV METEOR investigating the turnover of foraminifera and sulphur bacteria represent a major focus of this research cruise. The single celled eukaryotic foraminifera (Fig. 2A) and the filamentous sulphur bacteria (Fig. 2B) are important for the turnover of nitrogen compounds and with regard to sulphur bacteria also for the phosphorous cycling. Therewith, both groups of organisms strongly contribute to the overall nitrogen and phosphorous budget of the Peruvian Oxygen minimum zone (OMZ). Both

groups colonize the surface sediments within the OMZ at high abundances. Sulphur bacteria belonging to the genera *Marithioploca* and *Beggiatoa* often becomes apparent as distinct white patches at the sediment surface, which can be easily detected using a towed camera system. They dominate the appearance of surface sediments from the shallow water down to water depths of 350 m.
Dependent on the bottom water availability of oxygen, nitrate and nitrite, members of *Beggiatoa* are capable to store phosphorous as polyphosphate. Under anoxic conditions this storage is degraded to gain energy whereat phosphate is released resulting in transiently high P-fluxes from the seafloor. First microscopic analyses on board RV Meteor showed that *Beggiatoa sp.* at the anoxic station in 244 m water depth have large polyphosphate inclusions, which are visible as white spots (Fig. 2C) in the vacuoles of these bacteria. The actual organism is hardly to see.

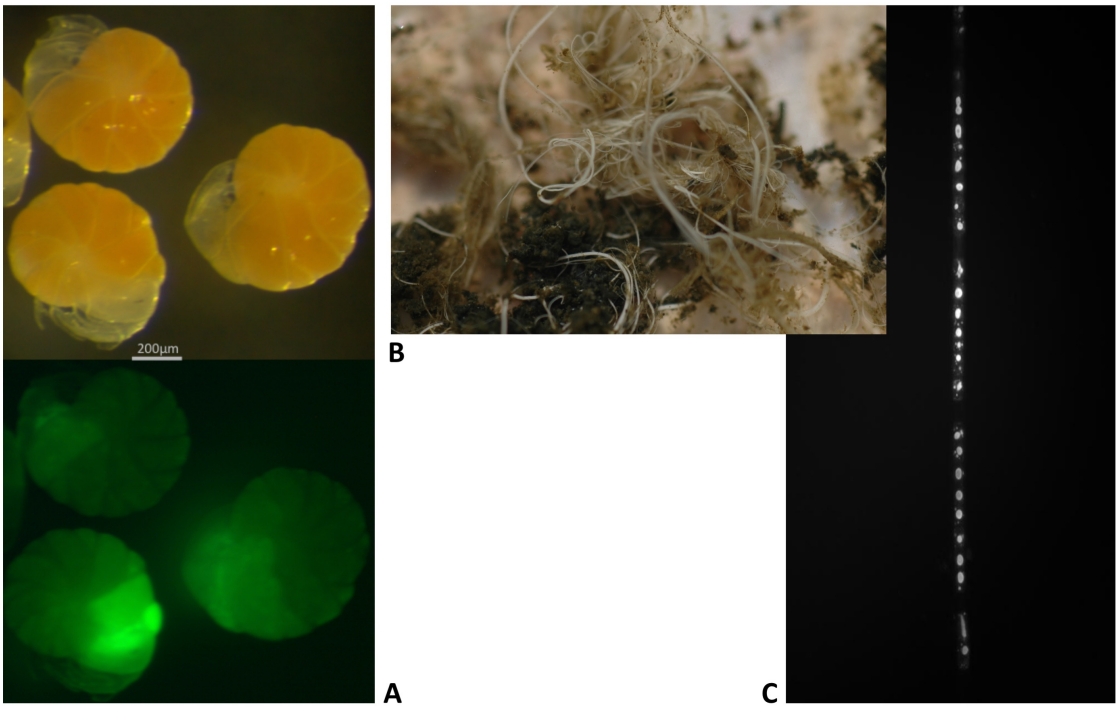

Abb. 2: *A Light- and fluorescence microscopical images of foraminifera; B. Interwoven filaments of Marithioploca and Beggiatoa with sediment particles just after sampling; C. Single Beggiatoa filament with polyphosphate inclusions, which are apparent as white spots. The diameter of the filaments is about 14 µm; (Photos: S. Roy, S. Sommer, S. Langer).*

A group of five scientists are dedicated for the analysis of foraminifera in surface sediments. Foraminifera themselves or in association with bacterial endosymbionts are able to use nitrate or nitrite instead of oxygen to gain energy during the oxidation of organic matter. The investigation of denitrification rates of single species, incubation of the entire sediment system as well as sampling for latter genomic, transcriptonomic and morphological analyses are the focus of these studies. Hence, hundreds of these small organisms need to be picked even under moving ship conditions using a high-resolution binocular.
First rate measurements showed that the species *Bolivina seminuda* und *Cassidulina sp*. in sediments obtained from 248 m water depth had a high nitrate uptake. Remarkably, the much bigger species *Cassidulina sp.* has a smaller uptake rate of about 56 pmol per individual and day compared to 88 pmol per individual and day of the smaller *Bolivina*

*seminud*a. Both organisms favour anoxic sediments as their habitat. Hence, we assume that both species adopted differently to a life under anoxic conditions.
The discovery of an intra-cellular phosphate storage of about 271 pmol per individual in *Cassidulina sp.* is another remarkable result of these investigations. This hints towards the use of an alternative energy source of this species. The abundance of benthic foraminiferans in this water depth amounts up to 600 individuals per cm^2 and therewith might be very important for the overall nutrient budget at this station.

Despite intense station works, the mood on board is very good and the atmosphere is very friendly to which the captain Rainer Hammacher and his entire METEOR team strongly contributes – thank you!

All on board are fine, with best regards,
Stefan Sommer and the entire M137-Team