

FS SONNE - SO295 "NoduleMonitoring-2"

31.10. - 23.12.2022, Port Hueneme - Port Hueneme (USA)



5. Weekly Report (28.11. - 04.12.2022)

On 27.11. an OFOS dive took place in the so-called 'No Nodule' area. The OFOS transect extended over different alternating areas where no or only small nodules occur. It was striking that especially many of the large sea urchins (Urechinidae) were found there (Fig. 1). The highlight was the crossing of a steep approx. 7 m high cliff that appeared in the camera view all of a sudden.



Fig. 1 OFOS image of a large sea urchin within the 'no nodule' area.

On the evening of Nov. 27, the ROV KIEL 6000 team of GEOMAR was able to give the green light for a dive the following morning after extensive maintenance work. Before departing to the second working area, Sabine Gollner, scientist at the NIOZ in the Netherlands, was now able to recover some of her recolonization frames from the 'No Nodule' area to the west of the first working area, where no nodules are largely absent naturally. The station is particularly important for our aim to investigate the potential of providing 'nodule replacement' substrates as a restoration measure after nodule mining. As in a larger mining area, larvae would have to travel greater distances in this area to successfully recolonize and build a new 'hard substrate' fauna. In addition to such applied questions, the experiments also serve us for a better understanding of the dynamics of colonization, composition, and growth of benthic organism communities in nodule ecosystems.

On the night of Nov. 28, 2022, we left the BGR area around 9 p.m. and started the 54-hour transit to the GSR license area.

On the second day after arriving at the second work area, we started ROV dives again to perform measurements and experiments directly on the seafloor (Fig. 2). Again, the main objectives are to quantify the overall activity of sediment communities based on oxygen fluxes, to conduct experiments on benthic food webs, to target sensitive organisms (Fig. 3) and sediments for genetic, ecotoxicological, and biogeochemical studies as undisturbed as possible, and to deploy and recover recolonization experiments. In addition, sampling of heavy metal loads in pore water and near-bottom water bodies will take place.

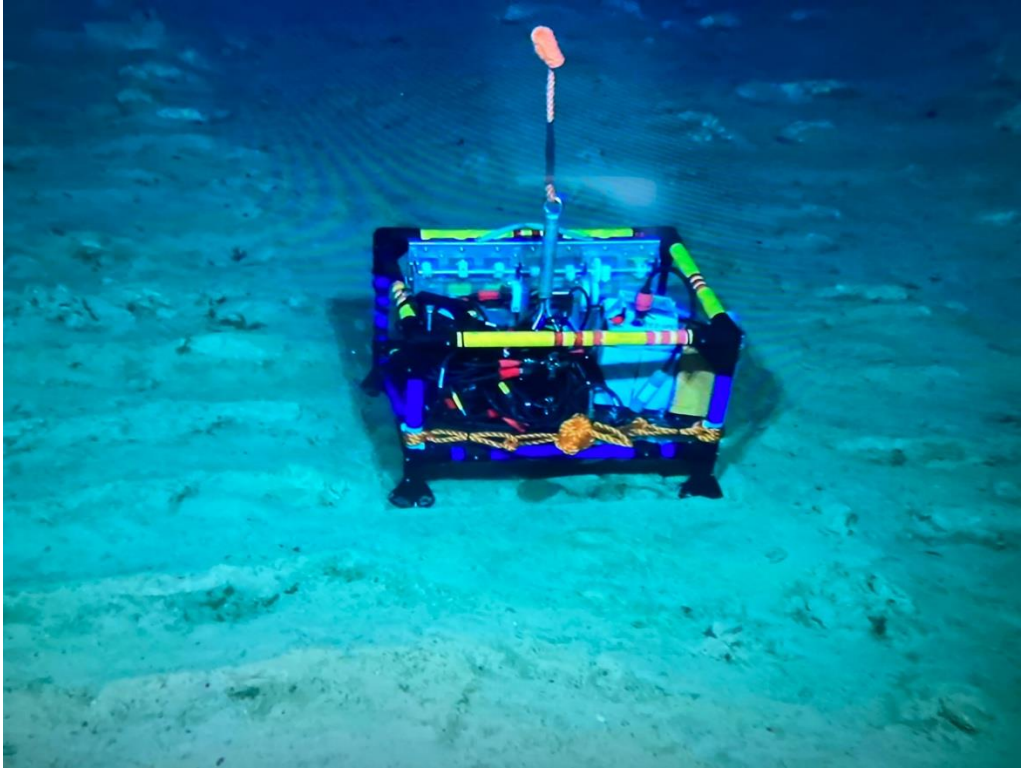


Fig. 2 Instrument for the quantification of oxygen fluxes.



Fig. 3 Sea cucumber (left) and brittle star (right) from the deep sea.

For the extensive work on the seafloor, 3-4 dives per sampling area are required, as in the previous working area. In the remaining three and a half weeks of station time before heading back towards the

U.S.A, 11 dives are planned - a tight program for the ROV team and the scientists involved, which can only be managed if no major technical complications occur, and wind and waves remain in our favor. Even the colleagues not involved in the ROV work have to cope with the tight schedule of dives. Since the ROV dives during the day, mainly for safety reasons, the other work, such as sampling with box and multicorer and with CTD, as well as deployment and recovery of the AUV, must take place during the night hours.

The first dives in the second work area started on December 2, 3, and 4 in the collector impact area where the PATANIA II collector prototype collected nodules in spring 2021. Unlike in the German area, where PATANIA II was manually controlled, the tracks here are distributed much more regularly. Consequently, the work at the seafloor is significantly simplified as tracks where nodules have been collected are easier to find. This saves time and compensates for the fact that the time available at the bottom is somewhat shorter here due to the greater water depth of about 4,500 m, and the resulting, longer descent and ascent times. So far everything is going smoothly, and everyone is keeping fingers crossed that it will continue like this. After a fourth dive on Dec. 5, we continue ROV work in the nearby thick plume impact area.

After the transit to the GSR exploration license area, two AUV dives took place. On the first dive on Dec. 01, the transponders were deployed, and an initial dive was conducted in the Plume Impact area. Due to the bottom conditions of the area, the AUV operated at 9m above the seafloor. Since the navigation of the AUV worked well during the first dive, the dive in the Plume Impact area was repeated in the night from 03.12. to 04.12. at a height of 5m to fill gaps in the photo series (Fig. 4).

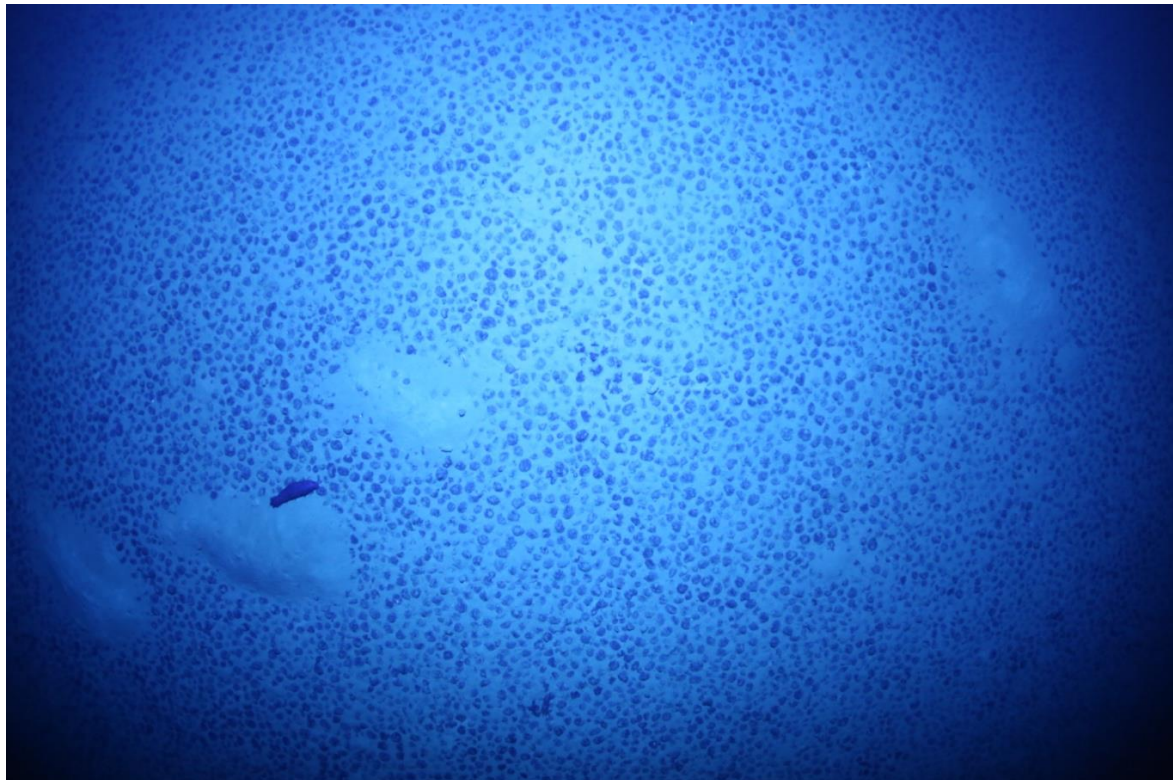


Fig. 4 Image taken by the AUV from the Plume Impact area.

On 1.12. the first two multicorer deployments took place in the collector impact area. Since the multicorer is equipped with a camera, we could see that we were unexpectedly not on top of a PATANIA II track. After the ship moved by one cable length to the east, we arrived at a track and could sample the disturbed sediments successfully.

The second multicorer was also positioned in a track. As expected, there were no nodules in the sampled sediment.

On 02.12. the collector impact area was sampled with two box corers (Fig. 5). With both box cores the PATANIA-II track could be hit (Fig. 6).



Fig. 5 The box corer is prepared for deployment.



Fig. 6 An footprint left by PATANIA II was sampled with the box corer.

The first OFOS dive in the Belgian license area included the Collector Test- and the Thick Plume area. In comparison to the megafauna in the German license area, differences could be observed immediately. For example, the occurrence of small black sea urchins (*Aspidodiadematidae*) was particularly high, both in the Thick Plume- and in the Collector Impact area that was subject to the PATANIA-II (Fig. 7).



Fig. 7 OFOS image of a small black sea urchin on the PATANIA-II caterpillar tracks in the GSR license area.

During the night of 03.12. to 04.12., three box corer deployments took place in the collector impact area.

In the evening and night from 04.12. to 05.12. the last three Multicorers were taken in the collector impact area. During the first sampling, the track caused by PATANIA II could not be hit immediately. Instead, the adjacent thick cover area was sampled.

Greetings in the name of all participants,

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