

FS SONNE - SO295 "NoduleMonitoring-2"

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



2nd Weekly Report (07. - 13.11.2022)

All beginnings are difficult.

After reaching the working area on November 6th, the AUV transponders were deployed and calibrated. The AUV "Abyss" was then launched (Fig. 1) with the mission to survey and photograph the area disturbed by PATANIA II in 2021.

We then proceeded about 4 nm further south to a reference station where we had already conducted CTD measurements in 2021 to deploy a 7-hour CTD (Fig. 2) with in situ pumps.



Fig. 1: The AUV is released to water.



Fig. 2: CTD on deck after successful sampling.

On November 7 at 7:00 in the morning the ROV "Kiel 6000" - a remotely operated vehicle - was used for the first time during SO295. Unfortunately, due to a partial telemetry failure, the dive had to be aborted before the ROV reached the bottom. After the ROV was back on deck, the necessary repairs were immediately started until the problem was solved the next morning.

The first box corer in the reference area unfortunately came back empty. And that was not the end of the string of bad luck for the day. The AUV had duly reported back from the surface when the mission ended at about 16:00 - but send no sign of life shortly thereafter.

A 'Search and Rescue' maneuver was initiated from the bridge. The possible drift of the device on the surface was calculated and a search path was traced. All available expedition members gathered on the sounding deck to look for the AUV. Finally, as darkness fell, the lights of the AUV could be made out in the water a few miles away and the device was recovered safely. The relief among the scientific community was enormous.

During the night of November 7 to 8, several box corers were driven. The participating scientists, led by Patricia Esquete of the University Aveiro (Portugal), were doubly rewarded that night. First with a very successful box grab and the sampling of the first manganese nodules (Fig. 3) of this expedition and second with a beautiful blood moon (Fig. 4) during the lunar eclipse at about 2:45 am shipboard time.



Fig. 3: Box corer with manganese nodules.



Fig. 4: Lunar eclipse – blood moon

After the box corer, we used the the ship's own OFOS (Ocean Floor Observation System). The device consists of a frame with photo and video cameras that is towed slowly about 1 m above the bottom. This allows us to collect detailed images of the seafloor and quantify the density and diversity of the larger organisms living there. The OFOS-dive extended over a 10-hour period into the next morning.

On the morning of November 11 the ROV was deployed again, and this time reached the bottom at 4,125 m depth (Fig. 5). In addition to sampling sediments and organisms, the task was to find the elevator that had sunk uncontrollably during the first deployment. The elevator, which we use to bring equipment to the seafloor and back to the surface for ROV deployments, was found intact and was recovered at the end of the dive.

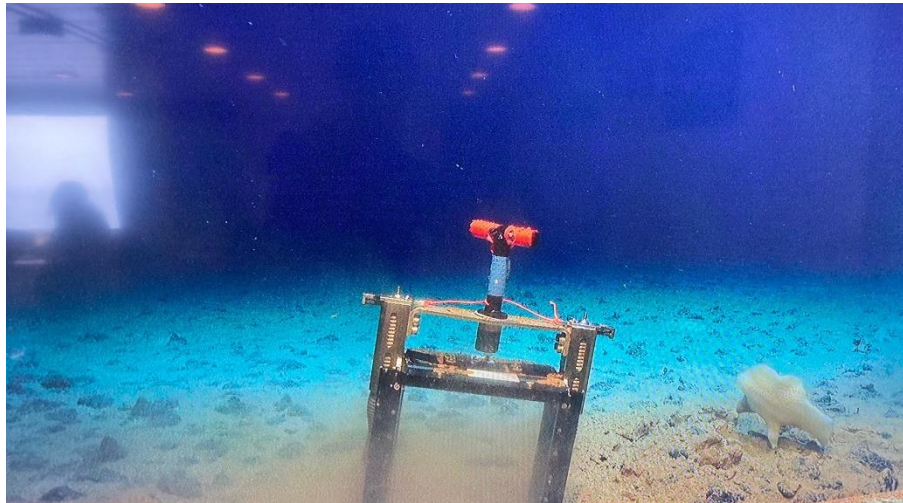


Fig. 5: Sampling with the ROV beside a deep-sea sponge.

Additional ROV dives in the reference area took place on November 9 and 11. Another objective of the dive was to recover recolonization experiments that we had released in previous years. These were frames with artificial manganese nodules attached to them that were placed on the bottom. The artificial nodules are to be used to investigate the recolonization potential of the sessile fauna and whether the provision of hard substrates favors colonization. Unfortunately, the frames could not be found by the ROV. It was noticed that there is a large discrepancy between the coordinates of the last cruises and the current underwater navigation data, which seems to be the reason why the searched equipment and experiments were not at the expected location. On both dives, the ROV team struggled with inaccurate and at times obviously incorrect underwater positioning. We have not found a solution to this problem at this time.

Unfortunately, the AUV also had to abort its 2nd and 3rd missions early on November 9 and 11. After ascending to the surface, the vehicle was recovered. The AUV team suspects a failure in the inertial positioning system that causes the AUV to 'lose its orientation' and abort the mission

The photographs of the first AUV dive in the PATANIA II test area could be evaluated. The traces of the collector prototype are clearly visible in the photographs and also in the side-scan sonar maps. The AUV images also show the frames with the artificial nodules that we deployed in the collector areas in 2021. We are therefore confident that the experiments at this site will be easily located by the ROV.

After taking five box corers and multicorers each in the reference area, the first multicorers were deployed in the PATANIA II test area on November 12. Since the MUC (Fig. 6) is equipped with a camera, we were able to see the PATANIA II tracks well and land the MUC accurately. For the box grabs that were run on November 13, without a camera, we have to trust our luck that it will also land in the collector track. This was the case with the first box grab, while the second box grab still contained nodules. This means for us that we missed the PATANIA II track during sampling. The exact position of the sampling will be determined afterwards based on planned AUV surveys.



Fig. 6: The Multicorer is deployed at sunrise.

The bottom water sampler was tested several times during the week at shallow depths (100m). The device is lowered to the bottom to take water samples close to the seafloor. After a pause to allow the device to align with the bottom current and be surrounded by clear bottom water, five bottles are closed to collect the bottom water. The closing mechanism operates with a wire that is 'burned out' at a pre-programmed time by electro-corrosion. During testing, the closing mechanism had not worked and different adjustments were gradually installed. After a successful test on November 11, the device was finally deployed with success the following night over the course of a seven-hour station.

This week we were able to complete the work in the reference area. Due to the inaccurate underwater positioning, not all objectives could be achieved. In the next days we will dedicate ourselves to the investigation of the disturbed areas in the PATANIA II test area.

After all participants were tested negative for SARS-CoV-2 by PCR test on November 11, the strict hygiene measures could be lifted. Due to the high workload, a well-deserved icebreaker party could not be celebrated yet. The scientists and the team are motivated, in a good mood and are looking forward to the next week.

Greetings on behalf of all participants,

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