

RV SONNE - SO295 "NoduleMonitoring-2"

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



3rd Weekly Report (14. - 20.11.2022)

During the night of November 13, a search was conducted for a BGR mooring that had been released the previous morning. The mooring had been deployed in 2021 and was equipped with two sediment traps, a hydrophone and acoustic current meters (ADCPs). Unfortunately, the mooring could not be located, although it should have been floating on the surface, judging by the signal from the acoustic trigger.

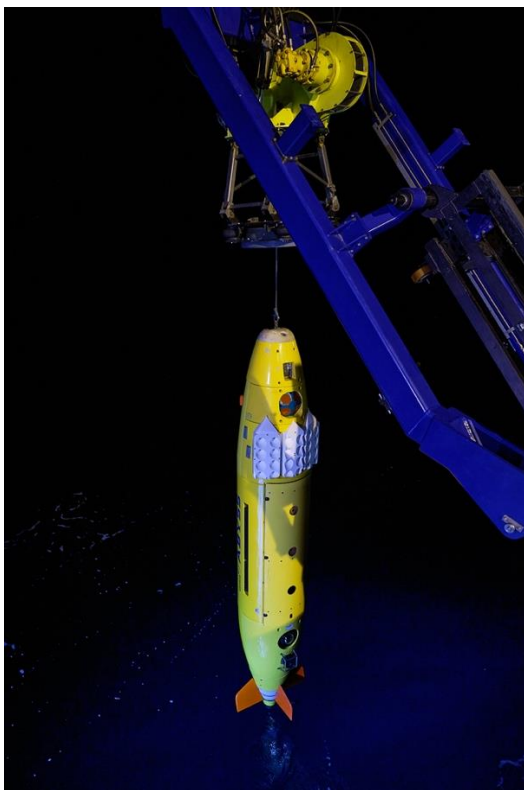


Fig. 1: Recovery of the AUVs at night, Foto: Tim Kalvelage

That same night, the AUV was recovered, its mission having been launched the previous day.

The week's science program focused on the investigation of the PATANIA II Collector Impact Area and the Thick Plume Impact Area located in the immediate vicinity.

Collector Impact Area is the area that was disturbed by PATANIA II in 2021. Here, the manganese nodule collector in 2021 left parallel tracks where the nodules were collected. At the end of each track, PATANIA II left the collected nodules in a pile when turning. In this way, the manganese nodules were removed track by track over an area about 80 m wide and 560 m long, creating a characteristic pattern (Fig.1).

The traces of PATANIA II are still very well visible because in the deep sea the low bottom currents cause very little erosion and the sedimentation rates are low.

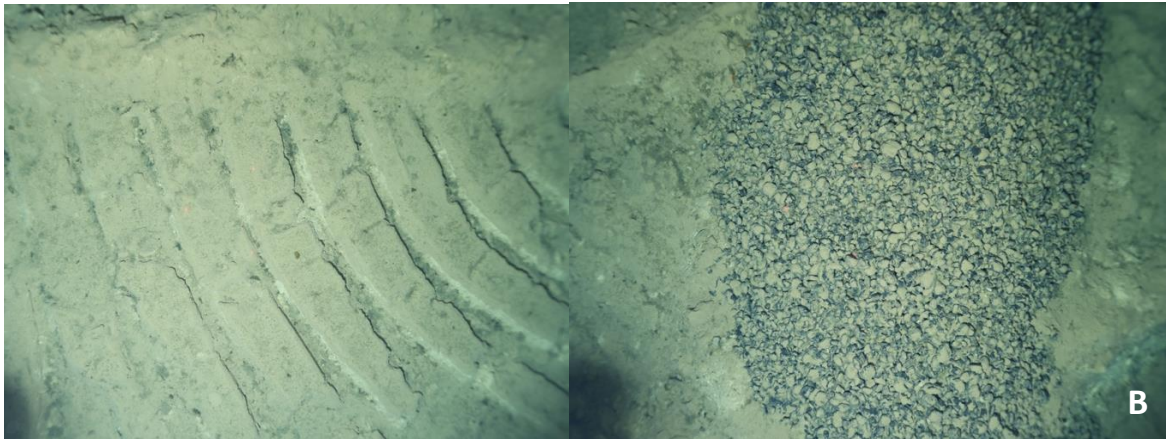


Fig. 2: OFOS Image of PATANIA II track (A) and piles of nodules released by PATANIA II (B)

In the immediate vicinity is the 'Thick Plume Impact Area', where during and after the collector test in 2021 a large part of the resuspended sediments had settled. Drifting in the direction of the prevailing flow direction during the collector test, the sediment was deposited mainly in a northwesterly direction. Using the AUV and OFOS cable-guided camera system imagery, it was determined that all of the manganese nodules were covered by a thick layer of sediment approximately 40 m north of the tracks. This area was selected as the Thick Plume Impact Area for our indirect environmental impact studies of the collector test. In the following days, we sampled both areas with the multicorer and box grab.

In the evening of November 11 we tried again to determine the location and status of the moorings. The main question was whether the mooring could have sunk back to the seafloor due to the implosion of the buoyancy bodies and if so, in which area. To do this, the ship's Posidonia system was used to address the triggers of the moorings. One trigger did not report at all and the other only occasionally. The result was inconclusive.

On November 15 and 19, the bottom water sampler was successfully deployed to sample the water mass immediately above the sediment.

The ROV was used to deploy and subsequently retrieve gauges to determine oxygen uptake by the seafloor during two dives on November 17 and 19. In addition, mesocosm experiments were conducted to investigate matter and energy fluxes in the seafloor food web. Finally, five frames of artificial nodules and real nodules that have been on the deep seafloor since 2021 were recovered, which will be used to study the colonization of hard substrates by organisms. An additional 20 such frames were laid out on the seafloor to determine the effectiveness of artificially deployed substrates as part of potential restoration efforts in the coming years and decades.

The OFOS dives on November 14 and 16 were very successful and provided images of the *Collector Impact Area* and also the *Thick Plume Impact Area*. We were able to determine that there were indeed some organisms on the sediment in the Plume Impact Area and that they had obviously survived the enormous sediment input during the PATANIA II test.

A comparison with OFOS data conducted prior to the PATANIA II test will allow us to quantify faunal survival rates. The numerous life traces also indicate a high activity of megafauna - especially sea urchins, brittle stars, and sea cucumbers in the disturbed area.



Fig. 3: Image taken by the OFOS in the thick plume impact area where nodules are covered by sediments

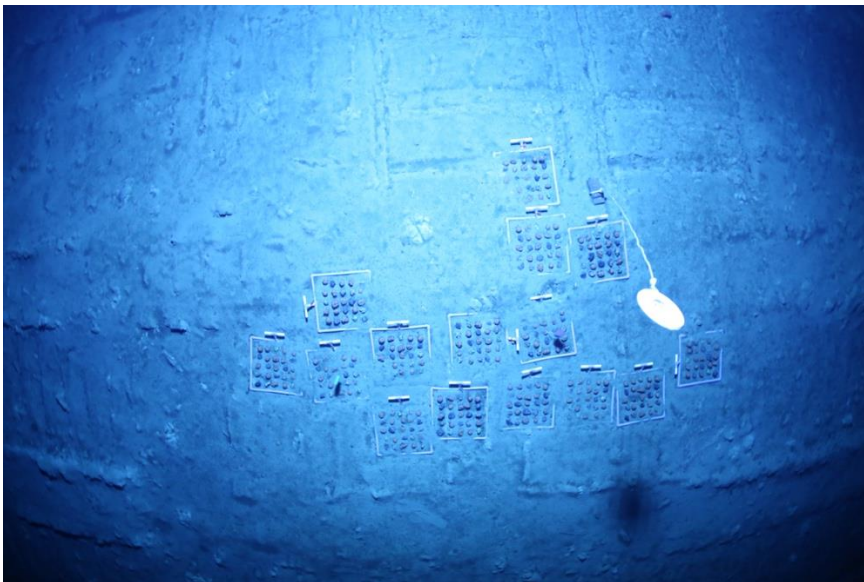


Fig. 4: Image of artificial and real nodules taken by AUV.



Fig. 5: Collection of a frame with artificial and real nodules by ROV.

On November 20 our expedition blog went online with a first contribution (<https://www.oceanblogs.org/so295-miningimpact/>). The colleagues are planning contributions about their scientific work and life on board in the coming weeks.

Greetings on behalf of all participants,

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