

# SO 262: Expedition MANGAN 2018 with RV SONNE

## Weekly Report No. 5 (30<sup>th</sup> April to 6<sup>th</sup> May 2018)

The past week has been dedicated to the detailed exploration of a manganese nodule field that was identified as being economically interesting based on backscatter data deriving from a multibeam survey that was carried out in 2008. Nodule abundances in kilograms per square meter were determined based on a grid of 41 box core samples spread out through a 500 square kilometer area. Small nodules (1 to 4 centimeter diameter) that cover approximately one third of the analysed area show abundances varying between 10 and 25 kg/sqm (average: 17.4 kg/sqm), whereas fields with large nodules (4 to 19 centimeter) show considerably higher abundances varying between 21 and 36 kg/sqm (average: 27.1 kg/sqm). There is a clear relationship with topography. Small nodules are mainly found in areas that lie 50 meters above the surrounding terrain, whereas larger nodules predominate in the deeper plains. Overall, the average nodule abundances in fields covered by small nodules are comparable to those of our prospective areas PA-1 und PA-2, that lie approximately 80 and 130 kilometers westwards, respectively. However, the average abundance of large nodules with a value of 27 kg/sqm is distinctly higher than in PA-1 (ca. 22 kg/sqm). The newly explored area thus represents an extremely promising manganese nodule deposit.



In addition to box core sampling, video sledge deployments were carried out along two twelve-kilometer-long profiles. The aim was to map the seafloor at 4100 meters below sea level photographically and to test whether the nodule abundance data obtained from the box core samples can be transferred to larger spatial areas. Several abrupt changes in nodule size within ranges of a few meters only were observed. The video sledge, which is towed by an optical fibre cable at about three meters above the seafloor, has now been upgraded with a side-scan sonar. This instrument captures the backscatter signal within a range of 35 meters on both sides of the sledge, which in turn can be used to determine characteristic features of the seafloor. The acoustic sonar signal additionally provides information on seafloor topography within a width of 25 meters on both sides of the profile. In this way, a steep cliff with a height of approximately 10 meters and with outcropping basaltic rocks could be identified. Such steep slopes are part of the horst and graben structures of the oceanic crust. They were formed during the tectonic opening of the East Pacific Rise approximately 20 million years ago and have an extent of several tens to hundreds of kilometers in a north-to-south orientation. Such observations show that a high-resolution mapping of nodule fields is necessary before a collector test or future mining can take place.

The biologists of the German Centre for Marine Biodiversity Research (DZMB) have also sampled box core sediments for the analysis of macrofaunal diversity (larger than 0,3

millimeter). First impression show that the same taxa are present in this new area compared to the areas that we have analysed extensively further to the west in PA-1, PA2 and in the "Preservation Reference Zone". This indicates that no major changes in species communities occur over spatial ranges of several tens to about 100 kilometers. This is not surprising as the conditions on the seafloor of deep-sea plains are relatively uniform over such distances and large morphological obstacles are not present.

The lander has now been deployed nine times in total, with most deployments lasting for 36 hours each. Excellent footage of seafloor scavengers such as various fish and amphipods has been obtained. These videos obtained from different areas show that relatively few fish species dominate the scavenger population. Photos, stories and comments related to these studies are being placed on a blog website and updated regularly by colleagues of the Heriot-Watt University: see <https://mbebist.wordpress.com/>.

As highlight, a young whale shark with a length of about two and a half meters visited us on Friday morning.

With best regards from RV SONNE,  
Carsten Rühlemann

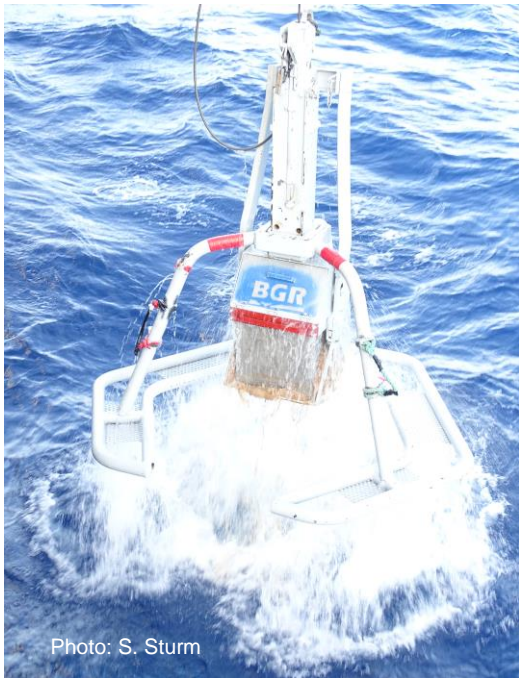


Photo: S. Sturm

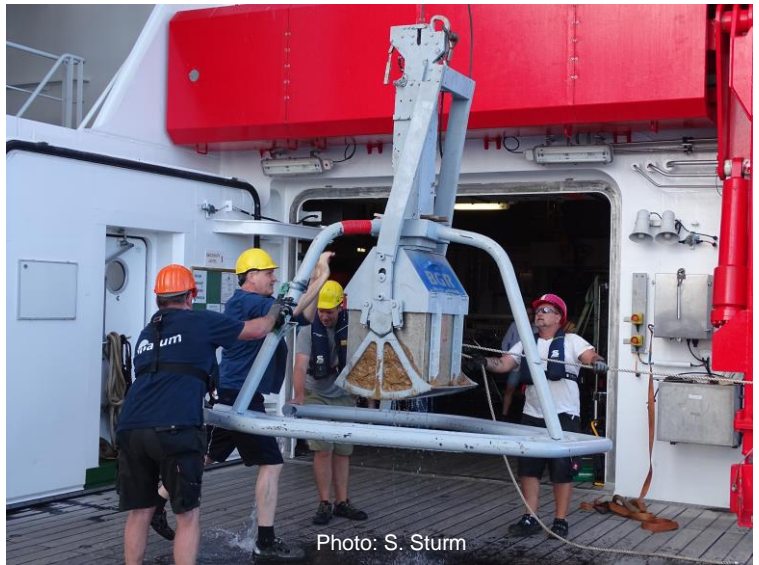


Photo: S. Sturm

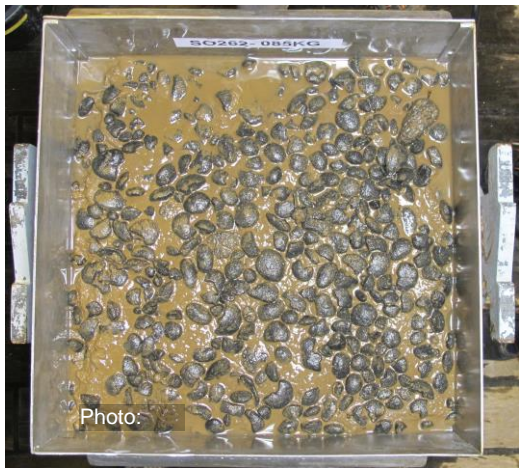


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Photo: S. Sturm



Photo: B. Gillard

Top: Recovery of the box corer after deployment at a water depth of 4100 m. Middle right: Curious scientists inspecting a seafloor sample. Middle left: top view of a box core, representing a 50 x 50 cm seafloor sample with manganese nodules. Bottom: young whale shark visiting RV SONNE.

