

RV SONNE Expedition SO317 MANGAN 2026

28.12.2025 – 19.02.2026

San Diego – San Diego (USA)

6th weekly report (02.02.2026 – 08.02.2026)



The past week with good weather conditions has allowed us to complete our sampling programme in a no-nodule working area in the north-western part of the BGR contract area. This area represents a different deep-sea habitat to the surrounding, typical nodule-covered regions, and is likely characterised by different benthic biogeochemical conditions and ecosystem dynamics. The topmost unconsolidated, fluffy sediments probably represent drift sediments that cover a layer of small nodules with very low densities at about 3-5 cm depth. Such sedimentary conditions may mimic conditions of thick plume sedimentation after a mining activity. Despite the lack of visible substrate, some typical sessile species of anemones and sponges inhabit this region and were sampled. They appear to be anchored either to deeper nodules or by spicules protruding into the seafloor sediment. They manage to keep themselves clear of the surrounding sedimentation, perhaps in conjunction with activities of other animals such as brittle stars that often seek refuge below them. The biogeochemical conditions and the microbial and faunal compositions in samples taken from this area by ROV, push cores, box cores, multicores and epibenthic sledges will be analysed in the home laboratories in the upcoming months.

Due to an axle fracture in RV SONNE's friction winch carrying the 18 mm fibre-optical cable, which unfortunately cannot be readily repaired at sea, all work with this cable had to be terminated at the beginning of this week. This principally means that we can no longer deploy the ship's video sledge system OFOS to obtain quantitative information on megafauna abundance and composition. The 18 mm working wire was rapidly switched to the ship's heave compensation system, so that we can still obtain good quality, heave-compensated multicores despite the lack of visual video guidance. The none-availability of OFOS is somewhat compensated by video footage obtained from ROV Odysseus and its experienced and professional team (Pelagic Research Services), who consistently provide excellent high-resolution imagery and samples of megafauna from the seafloor.

On Thursday, we transited to the central part of the BGR contract area, which is an area characterised by smaller and more confined flat abyssal plains amidst significant topography. In addition to the extremely high abundance of small nodules, an NNW-SSE trending, ca. 10-cm-thick, plate-like structure of fragile polymetallic crust spanned the otherwise sedimentary seafloor at and beyond our ROV landing position. A rich fauna including many species of sea cucumbers, sea stars, sea urchins, sponges, corals, anemones, crinoids, crabs and fish as well as life traces was observed. A complete sampling programme with all our equipment is intended here to obtain good baseline data and increase our knowledge on

spatial variability in the entire contract area, i.e. in as many different habitats and subareas as possible. The overarching aim is to further validate and/or constrain our presently available resource and habitat/faunal models in this way. As a highlight this morning, a nodule-encrusted tooth of the extinct megalodon shark (*Otodus megalodon*) was recovered as a by-product of the epibenthic sledge.

In addition to our benthic baseline and impact work in the area, one focus of this expedition is the comprehensive characterisation of the water column above the BGR contract area. In addition to physicochemical parameters such as salinity, temperature and oxygen, the distribution and physical and chemical speciation of trace metals (including Fe, Mn, Co, Cu, Cd, Ni, Pb, As and Hg) is being investigated. Other variables include macronutrients and dissolved carbon, as well as the total particle concentrations in the seawater near the seabed. For these purposes, both the SONNE's CTD-rosette with sensors for temperature, salinity, oxygen, turbidity and fluorescence (as an indicator of phytoplankton concentrations) and an ultra-clean trace metal CTD-rosette of GEOMAR are used. GEOMAR's CTD-rosette is specially designed for sampling trace elements and operated with its own metal-free cable/winch and with special sampling bottles. The water samples obtained in this way are processed in a clean room container to minimise the risk of contamination. A total of 12 stations, of which 10 have already been taken, will be used to investigate the spatial variability in the water column over distances of 1 to 300 km. Parallel water sampling from selected locations will also allow a direct comparison of the trace metal concentrations obtained with both sampling methods and provide information about the contamination risks for individual elements.

Initial evaluations of the sensor data show a relatively thin mixed layer at the water surface compared to previous years, with a sharp decrease in temperature and oxygen from a depth of 20-30 m downwards. Besides the very shallow oxygen minimum zone, we observe unusually high (sub)surface water productivity in the area: not only by CTD, but also visually (by ROV), in acoustic echosounder data (Simrad EK60) showing high animal (zooplankton) reflectivity at around 20 m, especially at night, and even by the unusually rapid clogging of the ship's seawater heat-exchange filters. On the one hand, this reflects the fluctuating thickness of the thermocline in the seasonal cycle. Whether there is also a connection with the current La Niña phase in the equatorial Pacific, a weather phenomenon associated with lower water temperatures, especially off the west coast of South America, is still being investigated.

We will round off our work in this central area on Tuesday, and transit back to the Patania II collector impact site to pick up the equipment placed on the seafloor there about 4 weeks ago (a short ocean bottom mooring, a camera lander, passive sampler platforms, and 12 copepod emergence and recolonisation traps). The work programme of SO317 will be completed by Thursday morning, when we embark on our transit back to Ensenada and San Diego.

All participants of SO317 are doing well despite the heavy workloads of the past few weeks, and experiencing mixed feelings as the cruise is slowly coming to a close.

Warm greetings from the SO317 science team in the Pacific,

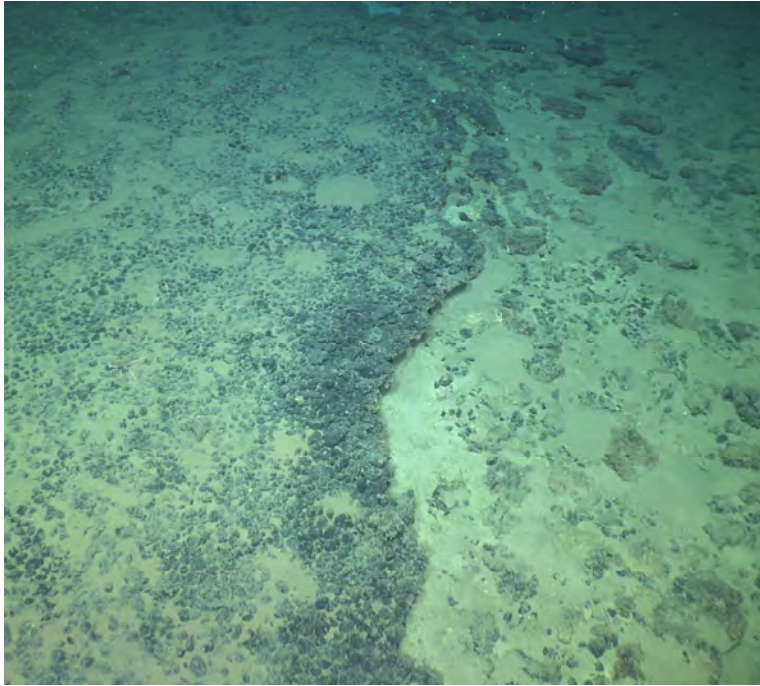
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GEOMAR's ultra-clean trace metal CTD-Rosette is deployed over the starboard side of RV SONNE (left). It is operated on its own 7000-m-long metal-free cable/winch (right) using the ship's crane. Photos: Simone Sturm.



A sea cucumber (sea-pig) and a sea urchin traverse a field of small nodules whilst feeding on decomposing organic matter and microorganisms found in the sediment.



A 10-cm-thick ridge of polymetallic crust crosses our ROV survey area in the central part of the BGR contract area (left). Crusts have been sampled for geochemical analyses (top right). A megalodon tooth served as nucleus for nodule formation (bottom right).



Sponges in thick sediments of the no-nodule area (left). The stalk of a sponge is often used by other animals like this crinoid to climb up higher into the water column where more nutrients are available (right).