

Mining-induced loss of seafloor integrity compromises ecosystem functioning

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The European collaborative project MiningImpact of the Joint Programming Initiative Healthy and Productive Seas and Oceans (JPIOceans) assesses the long-term impacts on the abyssal ecosystem arising from future deep-sea mining activities in order to inform the ongoing drafting of regulations for the exploitation of mineral resources in the Area by the International Seabed Authority (ISA).

During expedition SO242 with RV SONNE in 2015 we have revisited the benthic disturbance experiment DISCOL conducted in 1989 in a nodule field of the Peru Basin in the eastern equatorial Pacific. Back then, seventy-eight 8-m wide criss-crossing plough tracks were drawn across a circular area of approximately 11 km² to mimic the impacts expected to occur in the context of polymetallic nodule mining. 26 years later, we used AUV photomosaics, towed camera platforms and ROV dives to map and identify the physical disturbances in the experimental area. These impacts consist of long linear features, the plough tracks, within which the nodules and the bioturbated sediment surface were removed, exposing the originally suboxic, more compacted sediments as well as patches of turned-over and mixed surface sediments. In addition, solid phase geochemical data, such as ²¹⁰Pb, POC, and porosity, were used to quantify the amount of sediment that resettled from the suspended plume, thereby blanketing the plough marks as well as the nodules and sediment surface between the plough tracks. In this study we relate the different physical changes of the seafloor to the observed changes in e.g., abundance and community structure of benthic fauna and microbes as well as reduced rates of POC degradation and microbial metabolic activity.