

**Effects of experimental polymetallic  
nodule mining on deep-sea microbial  
communities and functions  
(DISCOL experimental area,  
tropical SE Pacific)**

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Potential effects on deep-sea benthic microbial communities and biogeochemical functions in response to seafloor disturbance by polymetallic ('manganese') nodule mining were investigated in the DISCOL Experimental Area (DEA). In 1989 the >10 km<sup>2</sup> large DEA in the Peru Basin was disturbed by repeated ploughing, representing the largest benthic impact experiment ever carried out to investigate ecosystem impacts of deep-sea mining. Historical 'plough tracks' and a 5 weeks old track from Epibenthic Sledge sampling ('EBS-track') were studied in Sep. 2015 as part of the JPI Oceans project 'MiningImpact'. Microbial communities and functions were assessed based on sediment analyses, shipboard incubations, and *in situ* flux studies with autonomous benthic chamber and micro-profiler systems. Investigations were carried out by ROV at specific microhabitats in plough- and EBS-tracks and compared to conditions off track and in reference areas outside the DEA.

In the tracks where the disturbance removed parts of the reactive surface layer or even exposed organically poorer and more consolidated subsurface sediments, most microbial and biogeochemical characteristics were affected and resembled conditions in deeper sediment layers, even after 26 years. Microbial biomass, organic matter degradation activity, respiration rates, and microbial secondary production were generally reduced. Microbial community structure in the EBS-track differed significantly from undisturbed surface sediments while communities in the old tracks show indications of recovery over the past decades. Extending the scope of previous DEA post-impact studies to microbiology, the results suggest long-term effects of nodule mining right at the basis of the benthic food web. Further studies are required to assess consequences for higher trophic levels and the suitability of microbial communities and functions as impact indicators for routine monitoring in the context of nodule mining in the deep sea.