

Megabenthic community structure within and surrounding the DISCOL Experimental Area 26 years after simulated manganese nodule mining disturbance.

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Efforts to satisfy the current need for many high technology elements, such as copper, nickel and yttrium from land-based sources are growing. Potential future sources of some of these elements include the deep sea manganese nodule fields of the Pacific, Atlantic, and Indian oceans. Large swathes of deep-sea seafloor are covered with high densities of 5 – 25 cm diameter nodules – agglomerations of manganese, iron, cobalt, copper, and other metals. In the 1980's these manganese fields were first seriously considered as mining targets, and the "DISturbance and reCOLonization (DISCOL) experiment was started in the tropical Southeast Pacific, to simulate the likely environmental impacts of mining. In September 1989, 'RV SONNE', used a plough device to disturb the top sediment and to remove manganese nodules from the seafloor surface by burying them below the surface. 78 plough tracks of 8 – 16m width were made across a 10.8 km diameter circular area centered at 7°04.4'S 88°27.6'W. Megafauna abundances were assessed prior and post ploughing, both within the disturbed area and at reference stations 6 km from the disturbed area. This disturbance and removal of nodules (and therefore hard substrate) is likely to represent the most significant benthic impact experiment carried out at the deep-sea floor to date.

Research cruises in the 1990s investigated the short-term temporal impact ploughing had on the faunal community in the DISCOL area. Cruises conducted 3 and 7 years after disturbance showed that megafauna communities within ploughed areas remained quite distinct from those observed pre-disturbance or in the reference areas.

In 2016 the 'RV SONNE' revisited the DISCOL site, as part of the 'JPI Oceans' programme 'Ecological Aspects of Deep-Sea Mining.' Here we report the current megafauna community structures observed during expedition SO242-2 within the DISCOL area. 1500 images covering an area of approximately 7400 m² have been analysed. Results show that communities in and near disturbance tracks differ from those found in the undisturbed areas and that the removal of hard substrates from the sediment surface particularly affects the recovery of sessile communities. Over the past 26 years many taxa did not recover, indicating that the experimental disturbances had a long-term effect on seafloor fauna, despite the use of modest disturbance gear compared to mining equipment.