Meiofauna response to physical disturbance at the DEA: the importance of scale to identify long-term effects

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Polymetallic nodules in deep-sea habitats of the Pacific Ocean will be subject to commercial exploitation in the near future but the potential effects of such mining activities on benthic life are difficult to assess. Here we present results from a recent revisit onboard RV SONNE (leg SO242/2) to the site of the "DISturbance and reCOLonization experiment" (DISCOL), a large scale benthic impact study initiated in 1989 in a polymetallic nodule area in the Peru Basin (tropical south-eastern Pacific). The area was artificially disturbed by a plow harrow to simulate manganese nodule extraction. In 2015, Meiofauna samples were collected and analysed at two different spatial scales in the framework of the JPI Oceans' programme 'Ecological Aspects of Deep-Sea Mining' to study the response and recovery rate of benthic faunal communities.

At a macroscale, meiofauna densities and community composition were compared between two stations within the DISCOL experimental area (DEA) and three undisturbed reference stations. No long-term disturbance effects could be identified, most likely because high sediment heterogeneity in the disturbed and reference sites resulted in large variation in meiofauna communities.

However, additional ROV push core sampling at selected microhabitats within the disturbance tracks (white patches, ripple crests and ripple valleys) revealed significant differences at a microscale for two out of three tracks. Meiofauna abundances were significantly reduced at all sites compared to outside track control samples with the exception of ripple valleys. Lowest densities were found at the white spot habitats where disturbances in 1989 exposed deeper sediment layers and where lowest pigment and organic matter contents were found. The study demonstrates that physical disturbances as they will be associated with mining will most likely result in long-term impacts on meiofauna communities in nodule areas. However, the results also show that detailed investigations at small spatial scales may be required to discriminate disturbance effects on meiofauna communities from natural variability.