

Active metal-cycling microbial communities of polymetallic nodules from the Eastern Pacific Ocean

JULIA M. OTTE^{*,1,2}, BATHUAN CAGRI YAPAN², JESSICA VOLZ³, FELIX JANBEN^{1,2}, MASSIMILIANO MOLARI², FRANK WENZHÖFER^{1,2}

¹ HGF MPG Group on Deep Sea Ecology and Technology, Alfred-Wegener-Institute Helmholtz Centre for Polar and Marine Research, Germany

² Max-Planck-Institute for Marine Microbiology, Germany

³ Marine Geochemistry, Alfred-Wegener-Institute Helmholtz Centre for Polar and Marine Research, Germany

* correspondence: julia.otte@awi.de & jotte@mpi-bremen.de

The rising demand for minerals and metals is encouraging the great international interest for alternative sources in the deep sea. Deposits of deep-sea polymetallic nodules attracted the attention for a long time because they are rich in nickel, copper, cobalt, and rare earth elements. The environmental consequences of large-scale mining of polymetallic nodules are currently less known. In 2019 the Belgian and German licence area in the Clarion-Clipperton Zone (Eastern Pacific) were studied to obtain further baseline characteristics of the 4000 m deep polymetallic nodule fields. Here, we present: i) diversity and distribution of the present & active microbial communities of polymetallic nodules and ii) abundance and activity of relevant metal-cycling microorganisms by quantification of extracellular enzyme activity and 16S rRNA amplicon sequencing. Further we aim to enrich potential metal-cycling microorganisms and investigate microbial metabolisms by metagenomic/-transcriptomic from polymetallic nodules. Our results may provide a new set of tools for monitoring ecosystem impacts associated with deep-sea polymetallic nodule mining. New regulations are required to protect these areas from irreversible anthropogenic impacts.