

Sedimentary ancient DNA for sea ice reconstructions: a case study from the Yermak Plateau (Svalbard).

Joanna Pawłowska^a, Ngoc-Loi Nguyen^a and Jan Pawłowski^a

^aDepartment of Paleocceanography, Institute of Oceanology PAN, Sopot, Poland, pawlowska@iopan.pl

Sea ice is a critical component of the Arctic ecosystem, but it is probably one of the least well-documented and understood components, especially on historical and geological timescales. In the past, large climate-induced reorganizations of environmental conditions were associated with significant changes in sea ice cover. Despite its importance for the Arctic ecosystem, the variability of sea ice cover is relatively poorly documented over geological timescales. The tools to document the evolution of sea ice conditions are few and have limitations.

There were few attempts to test the utility of sedimentary ancient DNA (sedaDNA) in sea ice reconstructions; however, they were based on the comparison between eDNA and other proxy records. Herein, we present the sedaDNA record from the Yermak Plateau spanning the last ca. 180,000 years. We focus on planktonic organisms: foraminifera and radiolaria, two well studied groups, commonly used as paleoceanographic proxies; and MAST (Marine STRamenopiles), a poorly studied group, which was not used systematically in paleoreconstructions. We strengthened our study by establishing a statistical correlation between the presence of selected planktonic ASVs and specific sea-ice conditions. We propose potential indicators of marginal and extended ice cover and ice - free conditions.

Our study is a further step towards the application of sedaDNA in the reconstructing past climatic and environmental changes. The sedaDNA approach has the potential to become a useful tool in sea-ice reconstructions in the Arctic regions, especially in environments where other approaches are limited.

The research leading to these results has been funded by the Norwegian Financial Mechanism for 2014-2021, project no. 2019/34/H/ST10/00682 in the framework of project 'Sedimentary ancient DNA - a new proxy to investigate the impact of environmental change on past and present biodiversity in Nordic Seas'.