

Termination of Whaling in South Georgia Recorded in Marine Sediments

Wojciech MAJEWSKI^{1,✉}, Witold SZCZUCIŃSKI², Joanna PAWŁOWSKA³,
Małgorzata SZYMCZAK-ŻYŁA⁴, Ludwik LUBECKI⁴, and Przemysław NIEDZIELSKI⁵

¹Institute of Paleobiology, Polish Academy of Sciences, Warszawa, Poland

²Adam Mickiewicz University, Institute of Geology, Geohazards Research Unit, Poznań, Poland

³Institute of Oceanology, Polish Academy of Sciences, Department of Paleoceanography,
Laboratory of Environmental DNA, Sopot, Poland

⁴Institute of Oceanology, Polish Academy of Sciences, Department of Paleoceanography,
Laboratory of Marine Chemical Markers, Sopot, Poland

⁵Adam Mickiewicz University, Faculty of Chemistry, Department of Analytical Chemistry,
Poznań, Poland

✉ wmaj@twarda.pan.pl

Polar ecosystems are environmentally sensitive and have attracted relatively little research, particularly in the Southern Hemisphere, where human presence dates back two centuries only. Initially, it was seal hunters who penetrated the sub-Antarctic seas. At the beginning of the 20th century, South Georgia, the largest sub-Antarctic island, became known as “the gateway to Antarctica”. The first whaling station, Grytviken, was established there in 1904. The subsequent six decades of its operation nearly exhausted the local environment. Years after its closure, an unprecedented post-industrial recovery of both terrestrial and marine ecosystems was observed.

In late 2019, we recovered a short sediment core (Fig. 1) from the middle of King Edward Cove. This sheltered harbor is located off the former Grytviken whaling station, in a side inlet of Cumberland Bay. Using this core, we were able to reconstruct levels of contamination and biotic succession from the 1940s, when whaling was still ongoing, to the present day. We studied the geochemical composition of the sediment, as well as the concentrations of anthropogenic organic markers, foraminiferal microfossils, and sedimentary ancient DNA (Majewski et al. 2024). Three distinct phases were identified in the record. The early phase, predating c. 1970



Fig. 1. The sediment core from King Edward Cove with the brighter, upper layer representing well-oxygenated sediments that were deposited after the year 2000 (photo by Piotr Rozwalak).

and including the whaling period, was characterized by anoxic sediment, heavy metal contamination and a high presence of organic markers, as well as a lack of foraminiferal microfossils. The DNA signature was also distinct, with the zoobenthos dominated by polychaete annelids. After whaling ceased, it took only a short time for the contamination to decline and for a healthy marine ecosystem with diverse foraminifera to be established. However, recovery of the macrozoobenthos, as evidenced by the abundance of cnidarians, was delayed by several years. In the most recent period, which began around the year 2000, subbottom conditions in King Edward Cove changed again and became more oxygenated. This resulted in the foraminiferal community being dominated by calcareous taxa. Sessile cnidarians declined and were eventually overtaken by nematodes. This latest environmental change was unexpected and unlike anything observed at similar locations throughout Cumberland Bay. It appears to have been caused by frequent water mixing due to increased traffic from large cruise ships bringing visitors to the remains of the Grytviken whaling station. It seems that, after only three decades of ecosystem recovery, increased tourism is putting further pressure on the environment of King Edward Cove.

The study was funded by a grant from the National Science Center 2018/31/B/ST10/02886.

References

- Majewski, W., W. Szczuciński, J. Pawłowska, M. Szymczak-Żyła, L. Lubecki and P. Niedzielski (2024), Environmental degradation and recovery after termination of whaling in sub-Antarctic fjord, South Georgia, *Sci. Total Environ.* **957**, 177536, DOI: 10.1016/j.scitotenv.2024.177536.

Received 3 September 2025

Accepted 20 October 2025