



Międzynarodowa Środowiskowa Szkoła Doktorska
przy **Centrum Studiów Polarnych**
w Uniwersytecie Śląskim w Katowicach

ul. Będzińska 60
41-200 Sosnowiec
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Title of PhD project: “Changes in the structure and distribution of key West Antarctic zooplankton species in the context of the stability of Southern Ocean food webs”

The leading unit: Institute of Oceanology Polish Academy of Sciences, Sopot

Requirements:

1. Master’s degree in biology, oceanography, environmental protection, or related fields;
2. Basic knowledge of polar zooplankton identification (including morphometric laboratory work);
3. Ability to conduct multivariate statistical analyses and use software that requires programming skills (Python and/or R);
4. Proficiency in English sufficient for communication, reading and writing scientific articles, and active participation in international scientific conferences. Knowledge of Polish is not required;
5. Experience in writing scientific texts;
6. Experience in giving oral presentations;
7. Creativity, independence, diligence, and a strong sense of responsibility;
8. Ability to think critically and approach scientific problems from an interdisciplinary perspective, analytical thinking, and enthusiasm for scientific/research work and learning new topics.

Tasks description:

1. Taxonomic analysis of Antarctic zooplankton (identification to species, developmental stage, and sex);
2. Analysis, interpretation, and visualization of environmental measurements (acoustic data, CTD, etc.);
3. Morphometric analysis and biomass estimation of zooplankton;
4. Regular summary of completed laboratory analyses;
5. Statistical analysis based on obtained results and their visualization;
6. Predictive modeling using artificial intelligence tools (e.g., application of neural network algorithms to assess ecosystem risk of food web destabilization in the Antarctic ecosystem);
7. Preparation of scientific articles in English and oral presentations for international conferences (active participation in conferences/lectures/scientific symposia);
8. Collaboration on other scientific tasks carried out by the Department of Marine Ecology at the Institute of Oceanology of Polish Academy of Sciences (IO PAN).



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Summary of a doctoral project:

Previous research conducted in the region of the Antarctic Peninsula—one of the fastest-warming areas on Earth—indicates that the species composition, size structure, and distribution of zooplankton are highly dynamic and closely linked to environmental variability, particularly sea ice extent, water temperature, and phytoplankton productivity. Historically, zooplankton in this region has been dominated by large species, notably Antarctic krill (*Euphausia superba*), which plays a key role in energy transfer to higher trophic levels, including fish, seabirds, and marine mammals. Ongoing climate change is driving shifts in both the composition and distribution of key Antarctic zooplankton species, undoubtedly including krill. Although the shelf region of the Antarctic Peninsula and the South Shetland Islands, due to its hydrological characteristics, serves as an important area for the reproduction and occurrence of large numbers of juvenile krill, data on this subject remain highly fragmented. The influence of water mass structures, ocean currents, and seafloor topography on the formation of high concentrations of various krill developmental stages in certain Antarctic regions is still not fully understood. Current, pronounced changes in the hydrological systems of West Antarctica will undoubtedly impact the spatial distribution of dominant zooplankton species in this region and, consequently, the availability of food for higher trophic levels. Identifying key krill concentration areas is extremely important from the perspective of Antarctic living resource management, especially since Antarctic krill catches in recent years have reached unprecedented—high record—levels.

The proposed research will be based on the integration of unique biological and environmental data from at least two Antarctic research expeditions: PS112 (RV *Polarstern*, 2018) and MSM115 “FINWAP” (RV *Maria S. Merian*, 2023). Taxonomic and morphometric analyses will be conducted on key Antarctic zooplankton species collected using IKMT nets (2018) and RMT8+1 nets (2023) during diel cycles (day and night) in the regions of the Antarctic Peninsula, the South Shetland Archipelago and the Scotia Sea. Complementary environmental data (CTD, acoustic data) from the same research expeditions will enable broader interpretations concerning diel distribution patterns, size/age structure, and the life cycle of krill, thus allowing predictions related to macrozooplankton ecology in a changing Western Antarctica. The study will also utilize available long-term databases on the abundance of dominant Antarctic zooplankton species, such as KRILLBASE. A novel element of the study will be the application of artificial intelligence tools to summarize the entirety of existing knowledge regarding the structure and distribution of macrozooplankton in the study region and to compare it with the contemporary data used in this doctoral dissertation.

Other information: The work will be carried out under supervision of: Katarzyna Błachowiak-Samołyk kasiab@iopan.pl, Institute of Oceanology of Polish Academy of Sciences in Sopot and Anna Panasiuk, a.panasiuk@ug.edu.pl, Faculty of Oceanography and Geography, University of Gdańsk in Gdynia.



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