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FOREWORD

Multi-Disciplinary Ecosystem Studies in the Atlantic Sector of the Southern Ocean

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The Antarctic marine ecosystem is unique due to its history, the diversity of its biota, and its high productivity. Antarctic krill is the basic component of this ecosystem which is efficiently used by organisms at higher trophic levels of the ecosystem: seabirds, seals, and whales. At the same time, krill is an important biological resource for mankind, which has a huge commercial potential. It was in Antarctica, as an area of international jurisdiction, that effective mechanisms for protecting the environment and using resources were first developed, implemented in the adoption of the Madrid Protocol of the Antarctic Treaty System and the Convention for the Conservation of Antarctic Marine Living Resources on the Conservation for Antarctic Marine Living Resources (CCAMLR). Russia played a major role in the formation, scientific support, and implementation of these international agreements. In the current situation, which regulates a cautious and careful attitude to marine resources, the urgent task is to develop a contribution to the study, understanding, and conservation of Antarctic marine ecosystems.

The Antarctic Circumpolar Current (ACC) system and the processes at higher latitudes around the Antarctic continent, and in particular, the Weddell Gyre are the oceanographic basis for the functionality of the Antarctic marine ecosystem in its Atlantic Sector. The role of the abiotic and biotic components of this ecosystem in the formation of biological productivity and maintenance of the population of Antarctic krill is currently far from being fully understood.

In recent decades, the Southern Ocean has experienced significant changes associated with global climate trends, but the trends in the circulation of water in different sectors are multidirectional, and their impact on the functioning of the Antarctic ecosystem and on the processes in the whole World Ocean remains insufficiently studied. In particular, it remains unclear how more intense melting of the Antarctic ice sheets, an increase in the amount of floating ice and icebergs, and the negative temperature anomaly accompanying these processes affect the functioning of the Antarctic ecosystem.

This issue of Oceanology presents the results of multidisciplinary studies of the ecosystem of the Atlantic sector of the Antarctic in January–February 2020 and in January–February 2022 on the R/V *Akademik Mstislav Keldysh* (cruises 79 and 87). It includes articles on marine physics, marine chemistry, and marine biology, which jointly compose a comprehensive multidisciplinary approach to the modern view of the process that governs the ecosystem of the study region. The research covered the region of interaction of the Antarctic Circumpolar Current with the high-latitude waters of the Antarctic: especially in the waters of the Weddell Sea Gyre, which is the most productive zone, where Antarctic krill forms in high concentrations. The key areas of study were the Bransfield Strait between the Antarctic Peninsula and the South Shetland Islands and the Powell Basin east of the northern tip of the Antarctic Peninsula. The Powell Basin region plays a linking role between the ecosystems of the large-scale Weddell Sea Gyre in the Weddell Sea, Scotia Sea, and Bransfield Strait by means of accumulating and redistributing krill from the waters of the western branch of the Weddell Gyre. The Antarctic Sound was studied, connecting these water areas rich in krill and salps, the krill's food competitor, which have increased in numbers in recent years due to ice-free winters in the Bransfield Strait. The research has also been conducted in the region of the South Orkney Islands east of the Powell Basin and in the Powell Basin to the east of the Antarctic Peninsula, where the waters of the Weddell Gyre interact with the waters of the Antarctic Circumpolar Current. In this region, conditions are formed for the accumulation of juvenile krill, which can successfully overwinter due to the production of ice algae. The flows of Antarctic Bottom Water were studied in the abyssal channels of the Atlantic, spreading from the Weddell Sea through the Orkney Passage to the Vema Fracture Zone in the Northern Hemisphere.

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Editor of the issue