

The Arctic and Antarctic lie at opposite ends of the Earth, yet they are home to organisms whose evolutionary history may connect these two distant worlds. Among them are little-known, tiny marine animals called **ostracods**, which belong to **zooplankton** – small organisms that drift in the water and are carried by ocean currents. Ostracods became the focus of the “Bipolarity” project, which aimed to determine how similar populations living in the Arctic and Antarctic really are. The study compared not only the appearance of these animals, but also their age, sex, distribution and changes over time, as well as their unique DNA “barcodes”. Conducting the research simultaneously in both polar regions offered a new and broader perspective on these organisms. The project was the first study of ostracods to **combine such a wide range of information**, drawing on material collected during numerous polar expeditions as well as both contemporary and historical collections, including specimens collected several decades ago. The research involved renowned European scientific institutions, including the Natural History Museum in London, where the doctoral researcher undertook a placement funded through the NAWA programme, the Alfred Wegener Institute in Germany, and the Norwegian Polar Institute. One of the most intriguing questions addressed by the project concerned a phenomenon known as **bipolarity**. This refers to situations in which the same or a very closely related species occurs in both the Arctic and Antarctic – at opposite ends of our planet. A detailed analysis of previous studies, however, showed that many organisms considered as bipolar -lack genetic confirmation of this pattern. Only around 25% of previously reported cases had been supported by molecular data. Even more surprising was the result of an analysis of species recorded from both the Arctic and Antarctic: among the taxa previously considered bipolar, only around 10% actually met the criteria for such a distribution. This means that a map showing where an organism occurs does not always tell the full story of its history. To establish whether we are truly dealing with the same species at both ends of the world, we also need information encoded in its DNA. The project also provided important insights into the **biology of ostracods**. An analysis of a vast dataset collected during numerous polar expeditions showed that **females clearly outnumber males** in these populations. In both the Arctic and Antarctic, females account for around 60–70% of adult individuals. This means that, on average, there are approximately 1.5 to 2.3 females for every male. A similar female predominance was observed regardless of species, depth or season. These findings demonstrate the importance of taking both sex and age into account when studying changes in animal populations and their environment. One of the project’s most intriguing discoveries emerged during what initially appeared to be routine microscopic observations. Some Arctic ostracods, accounting for around 16% of the population studied, displayed characteristics of both males and females – a phenomenon known as **intersexuality**. Is this a natural feature of these populations, or could it be a signal of environmental change? At present, there is no definitive answer. Particularly interesting, however, is the fact that an analysis of historical specimens from Antarctic waters revealed no such cases. This finding highlights the need for continued monitoring of ostracods and other planktonic organisms, particularly in rapidly changing polar environments. To reliably determine the relationships and distribution of the organisms under study, information **encoded in their DNA** also proved essential. As part of the project, complete **mitochondrial genomes** were obtained for five dominant ostracod species, including representatives of the bipolar genera *Boroecia* and *Obtusoecia*. Analysis of these genomes revealed characteristic features of their organization that are of particular interest for understanding the evolutionary history of these animals. In the future, these findings may also help us better understand how organisms adapt to life in extremely cold environments. Throughout the project, its results were widely presented at scientific conferences and events dedicated, among other topics, to early-career researchers and women in science. The genetic data generated by the project were also made available through open-access databases, including **GenBank**, allowing them to be used in future research.

The “Bipolarity” project demonstrates that answers to **major questions** about changes taking place on our planet can also be found in the world of **small and often overlooked organisms**. By combining observations, historical material and modern genetic approaches, the project has provided new insights into the lives of ostracods at both ends of the world and laid the foundations for continued monitoring of changes taking place in polar ecosystems.