DESCRIPTION FOR THE GENERAL PUBLIC

Climate change is increasingly affecting the environment on Earth. Temperature rises from year to year, and the carbon dioxide absorbed by the oceans from the atmosphere increases water acidity and changes the course of many chemical reactions. Disturbance of the natural balance of ecosystems will affect both the individual species and whole ecosystems and associated functions. One of the most vulnerable groups of organisms are marine invertebrates forming skeletons and shells consisting of calcium carbonate, such as bryozoans, bivalves, snails, corals or starfish.

Calcium carbonate is an inorganic compound which constitutes the basic ingredient of biominerals produced by many organisms. A variety of shapes, colours, composition and internal properties of these structures are the result of combination of biological and environmental control over the biomineralization process, resulting from long-term adaptation of organisms to their habitats. Change of the sea water parameters may lead to abnormal growth or even dissolve the carbonate skeletons and shells of many key marine species. Calcium carbonate, used by marine organisms to build their skeletons can be in two forms: calcite and aragonite. These minerals are of identical chemical composition yet different crystal structure cause different physico-chemical properties. Calcite is 35% less soluble than aragonite. Additionally, the solubility increases with increasing content of Mg in calcite. This means that the organisms with skeletons made of aragonite or calcite with the large amount of Mg are more vulnerable to changes in ocean chemistry than those that are made from a mixture of calcite or aragonite or calcite with a low Mg content. If the current trend of growth of CO_2 emission continues, we can expect that in the shallow parts of the world ocean will be first unsaturated with aragonite and then next with calcite. Therefore, it is extremely important to understand what type of calcium carbonate skeletons of marine organisms are made of.

The main objective of the project is to investigate the variation in the composition of carbonate skeletons of bryozoans on a global scale, covering all climate zones. Additionally, environmental conditions, particularly temperature, will be analysed in each of the studied regions. The composition of the skeletons will be analysed with the X-ray diffraction (XRD) method. On the basis of the reflection of X-rays passing through the skeleton at different angles, we will find out whether it is constituted of calcium carbonate in the form of calcite, aragonite, or both minerals in various proportions. We will also determine what is the amount of magnesium calcite - an important element affecting the biominerals properties.

The project will focus on bryozoans. This group of organisms is ideally suited for achieving the objective of the study. These aquatic organisms occur in a wide geographical range and their carbonate skeletons are characterized by great diversity. Detailed global analysis will give us the opportunity to recognize the degree to which production of the skeletons is controlled by the environment. **On this basis, we will estimate the impact of climate change on marine organisms, and we will assess their adaptability to the rapidly changing environment.**

Large-scale scope of the proposed project has pioneering character, and its implementation will contribute to a better understanding of the biomineralization process in the marine environment. The final result will be a new knowledge concerning marine organisms producing carbonate skeletons, as well as assess the impact of climate changes on their functioning.