The present-day climate warming has a detrimental impact on coral reefs. The increasing intensity and frequency of tropical cyclones and coral bleaching constitute some of the main threats caused by climate change. Modern reef corals live in symbiosis with algae – dinoflagellates of the *Symbiodinium* group. An increase in seawater temperatures interferes with the photosynthesis processes in the algae, which can result in damage to both algal and coral cells, and ultimately to the expulsion of the algal symbionts by the host. Devoid of algal cells, corals lose their colors – hence the term, "bleaching". Unfortunately, it can lead to the death of entire coral ecosystems.

Coral reefs in the geological past also faced major climate changes, for instance in the Middle Paleozoic. The aim of the presented project is to trace the fossil record of coral bleaching and the increasing influence of major storms on coral ecosystems during the Middle Paleozoic climate shifts. This is possible because corals which manage to survive bleaching events record it in the structure of their skeletons as growth interruptions. The influence of major storms can also be observed in the fossil record of coral reefs – as disrupted sediment with broken and overturned corals. The climate change itself can be traced on the basis of geochemical data. The analysis of oxygen isotopes composition allows us to estimate the paleotemperatures of the seawater in which the corals lived. If the Middle Paleozoic crals were photosymbiotic, their skeletons should record the bleaching-induced growth interruptions as the temperatures increased, analogously to their modern counterparts.

In order to get a broader perspective, the research will be carried out in geological outcrops of Silurian of Gotland (Sweden), and the Devonian of Queensland, New South Wales (Australia) and southern Belgium. Those areas feature multiple outcrops of fossil reefs, which slightly differ in age, which will allow the observation of a continuous record of climate events affecting coral ecosystems. Multiple fossil coral groups that potentially could be photosymbiotic will be analyzed. The results of the observations on fossil coral reefs will be consulted with the researchers who study climate events on modern reefs, at the Sesoko research station in Okinawa (Japan).

Studying fossil coral reefs gives us the opportunity to analyze the long-term impact of climate change. Tracing the influence of climate events on Middle Paleozoic coral ecosystems will allow us to observe how different coral groups responded to them, what adaptations they developed, and which corals could live in symbiosis with algae. This kind of data on fossil corals could prove immensely useful in protecting the modern reefs more effectively and also in predicting their future.