The Late Devonian and the Middle Cretaceous are crucial periods in Earth's history and especially interesting in terms of macroevolutionary changes in marine vertebrates' faunas at this time. Both of these intervals were abundant in the deposition of organic-rich rocks connected with volcanic-controlled climatic warming and anoxic condition development in the marine and oceans. These intervals are distinguished by unexpected losses in top predators represented by very characterized placoderm fishes and fish-shaped marine reptiles which lost during these catastrophic events, respectively. The Devonian period is widely known as "the Ages of Fishes" as it spawned a remarkable variety of fish. However, it was also crucial times during their early phase of evolution interrupted by at least two mass extinctions. The end-Devonian (Hangenberg event. ca 359 Ma) was the time of the one severe extinction of vertebrates, but what is important is equally affected both marine and nonmarine faunas and is a bottleneck in the evolutionary history of vertebrates. During Hangenberg crisis the totally extinct all top predatory placoderm fishes with the largest known predators of the time, such as *Dunkleosteus*. The Cenomanian-Turonian Mass Extinction is the second-order event of marine extinction and is among the best studied of any mass extinctions. This event is clearly connected with submarine volcanic-controlled climatic warming and anoxic condition development in the oceans. However, one of the more important changes at this time is the total extinction of the fish-shaped or dolphin-shaped marine reptiles ichthyosaurs, which were nektonic, very mobile, and adapted to cruising long distances, and their physiological adaptation to air breathers makes them more tolerant to oxygenation of the water column. Therefore remains a mystery why ichthyosaurs become extinct roughly 28 million years before the end-Cretaceous mass extinction.

Both placoderms, as well as, ichthyosaurs were long-lived predators occupying the highest trophic level. Therefore they could be more sensitive and exposed to toxic metals (such as mercury) bioaccumulation and their biomagnification in the trophic pyramid. If it was one of deciding factors? This question is open and is one of the main topics of this research proposal. Extensive volcanic activity during these periods should deliver huge amounts of highly toxic Hg to aquatic environments. However, the organic form of Hg with one methyl group called methylmercury (MeHg) is more toxic and dangerous to living organisms because it is almost entirely absorbed by the body and flows into the blood, and methylmercury (besides dimethylmercury) is the most toxic form of Hg. Today methylmercury (MeHg) is a globally relevant environmental neurotoxic pollutant that is bioaccumulated and biomagnified in the food chain and concentrates in organisms occupying the upper levels of the trophic pyramid (including fish, birds, and mammals). Methylmercury has received global attention since the poisoning of thousands of people in southern Japan (Minamata and Niigata) in the mid-1950s. Nowadays, mercury methylation takes place in both aerobic and anaerobic environments. However, it is more effective under anoxic conditions, such as prevailed during end-Devonian and end-Cenomanian biotic overturns.

Therefore, this project concerns the possibility of mercury pollution during greenhouse climatic changes and stretching anoxic conditions at the end-Devonian and end-Cenomanian should be key as analog today climatic changes, declining oxygen in the global ocean, and anthropogenic mercury pollution, as well as being the starting point to conceptual basis for similar studies conducted in other areas and timeframes. What is important, anthropogenic environmental pollution by methylmercury and other forms of mercury is a significant problem today. Therefore any attempt to understand Hg cycling in a geological timescale could be essential for a better understanding of the global ecosystem as a whole and for maintaining the sustainability of planet Earth in the future.