

Paleoecology, paleogeography, bathymetric distribution, and diversification pattern of fishes and cephalopods in Mesozoic epicontinental seas based on otoliths and statoliths.

In the seas of the Mesozoic, the most common animals were fish and cephalopods. The fossilized fish skeletons of that time are well known for famous sites such as Solnhofen in Bavaria, where they are preserved in extremely good condition and with the smallest details. However, much less we know, about fish and their distribution in other sites, because their partially ossified skeleton, was often dismembered by predators, or eaten by scavengers, and then the remains were scattered by strong currents at the bottom. In the case of cephalopods, we often find fossils of nautiloids and ammonites with an outer, often spiral shell, or belemnites, whose skeleton had been hidden in the soft body, but the remains of their soft-bodied cousins, and especially the ancestors of modern decapod crustaceans (and especially cuttlefishes) and vampiropods (including octopods) are very rare. However, both fish and cephalopods have so-called "ear stones", known as otoliths (in fish) and statoliths (in cephalopods), which are made of calcium carbonate (aragonite, calcite or vaterite) and preserved much better in silicoclastic deposits. They help the animal to figure out what direction they have to swim. These little "ear stones" are well known from the deposits of the Cenozoic. In older layers, they are omitted or ignored, despite their frequent occurrence and as our preliminary research indicates, they have a huge potential to provide information about the variety of fish from different environments and depths in ancient times. We also noticed a significant number of cephalopod statoliths in our samples. In this project, we want to identify the species and types of fish and cephalopods, to which these tiny fossils belong. Based on a comparison with modern counterparts, we will try to learn their lifestyle (which of them lived near the bottom, and which swam in the open water). Moreover, we plan to measure the distribution of stable isotopes of carbon and oxygen in otoliths and statoliths. This will help to reconstruct the environment and how deep in the water these animals lived. This is due to the fact that fish "ear stones" were found, could belong to animals, that lived at different depths and temperatures within one epicontinental sea. What's more, we want to analyze otoliths of fish and cephalopods statoliths from various silicoclastic deposits from the Mesozoic Era and determine whether they can be used to reconstruct ancient prehistoric seas. The material comes from already collected collections and recently found specimens. The current material contains specimens from the Middle Jurassic and early Cretaceous of Poland and we plan to collect potential specimens from the Middle Cretaceous of Great Britain and late Cretaceous from the United States. Such a large stratigraphic and geographical coverage will allow a better understanding of the constant changes in fish and decapod crustaceans diversity throughout almost the entire Mesozoic Era. The project will result in a series of publications which collectively will be included into a PhD dissertation of PI.