PhD course in “Models and Methods for Material and Environmental Sciences” (XXXVI cycle)

“Deadfalls of Mesozoic marine reptiles: a taphonomical approach”

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Abstract:

This project focuses on the taphonomic analysis of different Mesozoic marine reptiles from Italy. The study pin the attention on bone preservation, skeletal articulation, histological distribution, scavenging traces, and microbial activity in specimens from several different depositional settings, time intervals, and taxonomic groups. The main aim of this project is to correlate patterns of decay processes in large-bodied pelagic vertebrates and to identify stages and ecological successions in the fossil record similar to the ones observed in modern cetaceans.

In present oceans the sunk and decomposition of whales (whale-falls) represent an important trigger for biodiversity in a very long and specific ecological succession including mobile scavengers (e.g. sharks, hagfish, isopods), specific and opportunistic exploiters of the carcass (*Osedax* polychaetes, mollusks, crustaceans) and microbial colonization of the bone (chemosynthetic bacteria). Moreover, deadfalls of large vertebrates are regarded as pivotal for carbon and phosphorous input in the deep-sea ocean nutrient cycles. Paleontological evidences suggest that similar processes occurred in fossils whales from the Neogene and a few studies pointed out that Mesozoic large marine reptiles could have hosted analog ecological successions.

This PhD project aims to perform tailored taphonomic analysis for each chosen specimen, trying to reconstruct what happened between the death of the animal and its fossilization. Specimens will include representatives of large-bodied marine tetrapods from the Triassic to Cretaceous of Italy, including ichthyosaurs, mosasaurs, thalattosuchians, plesiosaurs, and possibly Triassic diapsids.

The methods to perform morphological and taphonomical analysis include UV-induced fluorescence stimulation in the skeletal material, CT-scan for larger and three-dimensional specimen, histological sections, microfacies analysis, geochemical characterization of bone and matrix, and possibly micro-structural and molecular characterization of soft tissues. Together with the revision of already known material and the description of newly discovered one, this study aims to better understand the paleobiology both of Mesozoic marine reptiles and of the organisms that thrived on their carcasses.