

My research focuses on understanding the processes that drive ecosystems on evolutionary time scales. In particular, I am interested in how biotic and geological factors have interacted to give rise to the extraordinary morphological and ecological diversity of marine ecosystems. Because this question is multifaceted, I approach it with a diverse toolkit that focuses on field work, subsequent analytical work on the fossils and rocks from hand samples and thin sections, examination of museum material, and statistical analyses of global databases.

For my field- and specimen-based research, I use two model systems suitable for quantitative analyses: (1) the eco-evolutionary history of Meso- and Cenozoic crustaceans in multiple sedimentary settings and (2) biotic interactions through geologic time. Both model systems are active fields of research and integrate studies on sedimentology, stratigraphy, paleoecology, macroevolution, systematics, phylogeny, biogeography, and taphonomy.

The diverse decapod crustaceans are particularly useful because they display many morphological traits useful for evolutionary questions, have a relatively unexplored fossil record in terms of paleoecology and macroevolution, and are thought to have had strong evolutionary influences on other animals due to their shell-breaking capabilities. The drivers of decapod diversification are largely unexplored. For my research on decapods, I work on many aspects of their fossil record in collaboration with colleagues across the world. This work includes taxonomy and systematics, global and local diversity analyses combined with sedimentology, paleoecology of decapod clades, experimental taphonomy, and body size trends.

In addition to investigating a group of organisms, I also focus on between-group dynamics by studying the impact of biotic interactions (predation, parasitism, and competition) on the evolution of marine ecosystems. Predatory drill holes and scars in shells are, by far, the best quantifiable and most abundant evidences of biotic interactions in ancient marine ecosystems. Such traces are found from the Neoproterozoic to today. Parasitism and competition are also important factors that influence marine ecosystem structure. My collaborative research on biotic interactions uses primarily predatory drill holes caused by gastropods and octopods. I focus on predation of understudied non-molluscan prey to elucidate the diversity of frequently attacked prey, the influence of predators on and the effectiveness of prey morphology, the size of drilling predators through time, and how to best quantify predation intensity. I also study parasitism in crustaceans to uncover and explain patterns through time and the role of competition in shaping communities on the sea floor. Studies can be local or global in nature.

One thing I have learned after ~15 years of research is that there is so much more to explore

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