

Novel Methods for Tracking Shell-Crushing Predation in the Florida Keys

Matthew J. Ajemian¹, Philip M. Souza², Christina Marconi Souza², Cecilia M. Hampton¹, Liberty L. Boyd¹, and Andrew S. Kough³

¹Harbor Branch Oceanographic Institute, Florida Atlantic University, Fort Pierce, FL, USA

²Marine Science Institute, University of Texas, Port Aransas, TX, USA

³Shedd Aquarium, Chicago, IL, USA

The effects of large, mobile predators on marine benthic communities remain unclear in many coastal ecosystems. While dynamic and challenging to study, key behaviors such as shell-crushing predation can be used as proxies of ecological interactions for molluscivorous species (crabs, fishes, turtles, etc.). Additionally, due to the highly audible nature of this process, these elusive interactions can be captured in real-time using passive acoustic technology. In this presentation we recount our recent (2023–2025) research efforts to assess the dynamics of this process in the Upper Florida Keys, targeting queen conch (*Aliger gigas*) aggregations in back-reef habitats. There, passive acoustic recorders were deployed and paired with underwater time-lapse cameras, both of which provided near-continuous monitoring of the surrounding environment over an approximately 2-week period. Thus far, our recorders have successfully documented foraging in multiple species including the whitespotted eagle ray (*Aetobatus narinari*) and nurse shark (*Ginglymostoma cirratum*), with confirmed predation on queen conch by loggerhead sea turtles (*Caretta caretta*). These validated predation events are providing acoustic “templates” to facilitate the development of detection-classification systems to identify additional predation events that cannot be confirmed with camera footage (e.g., nighttime). Such developments will enable us to study predation patterns over broad temporal and spatial scales. Many shell-crushing predators regurgitate shell fragments after foraging events, so we have also been opportunistically collecting these regurgitates for forensic analysis. This aspect entails swabbing fragments for trace predator DNA (presumably shed from the buccal cavity during consumption), which we have developed proof-of-concept for in captive experiments. Taken together, we hope our multi-faceted approach will support unprecedented opportunity to study patterns of predation on queen conch and other shelled invertebrates in the Florida Keys and beyond.