An Assessment of the Biodiversity and Abundance of Deep-Water Species In Exuma Sound

Leo Janigian, Liam Macartney, Caroline Lewis, Gray Hill, Collin McNeely, Alliea Campbell
Advisors: Owen O’Shea and Mackellar Violich

Background
In the deepsea, many new fisheries independent data exist. Due to commercial interests in the deep sea, scientists are always playing catch up to assess the biodiversity of this environment. This is largely due to the propagation by fishermen to the deep sea as shallower and coastal ecosystems become depleted. The primary goal of this research is to create a baseline assessment of the biodiversity and diversity of deep-water species with a particular focus on elasmobranchs. Deep-sea species are X-selected, meaning they have conservative life history characteristics. This means they reach sexual maturity slower, have fewer young, and live longer. Therefore, sharks particularly will have a lower resilience to extrinsic pressures such as overfishing. Continued pressure over prolonged time frames may have the potential to exacerbate population recoveries in certain locations.

Study Site
The Exuma Sound (Figure 1a) is a large expansion of ocean that reaches a maximum depth of 1600 meters. CEI and Island School are in close proximity to Exuma Sound, which makes it logistically easy to sample off the wall. So far we have collected data from six sites within the Exuma Sound (Figure 1b).

Analytical Methods
We have gathered about ninety hours of footage and analyzed 18. The most important metric we use to estimate abundance is called MaxN, which is the number of species on a screen at any given time. This is a conservative measure, allowing a more realistic abundance estimate. All organisms are identified to the highest taxonomic resolution, which is species level in most cases. The sites were separated into two and a shallow strata where the shallow sites range at a depth less than 750m and deep sites are at 750m and deeper.

Methods
The Medusa is a BRUV (Baited Remote Underwater Video) system that can withstand the pressures of the deep ocean. Our sampling and drop sites were haphazardly chosen using the distance from the wall as a proxy for depth. With this we created two zones: shallow and deep (<750m). We also monitored available light, salinity, temperature, and depth using the PAR (Photosynthetic Active Radiation) and CTD (Conductivity, Temperature and Depth) which are attached to the Medusa. The communications module coupled with the transducer’s acoustic signals enable us to broadcast instructions to the Medusa. We monitor rate of decent and ascent.

Results
Overall, the biodiversity and abundance within the Exuma Sound were high, and as depth increased, both biodiversity and abundance increased. Eight taxonomic groups were recorded, including five species of shark, teleosts, squid, lobsters, Bathynomus sp., and other crustaceans. Bathynomus sp. was the most prolific species that we observed through our research. Interestingly, the abundance of Bathynomus sp. increased as the depth increased.

For the sharks, the most prolific species were the Cuban Dogfish (Squalus californicus) and the Gulper Sharks (Centrophorus sp.).

Discussion
High levels of biodiversity sampled here may be attributable to increased opportunity for ecological niches to be exploited, correlated with depth. Both Cuban dogfish and gulper sharks are apex predators and therefore possibly compete for resources. This may have led to competitive exclusion, evidenced here by an inverse relationship in depth occupancy. The scavenging isopod, Bathynomus sp. was more abundant with increasing depth which is perhaps a function of increased foraging opportunities, although this needs to be tested.

Conclusion
We have demonstrated that there is a high abundance and biodiversity in the deep-sea Exuma Sound. This provides critical baseline data for future conservation measures, not only in the Bahamas, but also in the wider Caribbean context.

Literature Cited

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