

A Shark's Paradise  
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Inside the Pacific Remote Islands Marine National Monument lies the Palmyra Atoll. Even though this ring-shaped reef is located in the middle of the Pacific, thousands of miles from any continent, dozens of scientists flock to these warm waters. Since Palmyra is only 4.6 square miles of land, what makes this small atoll unique? Why are the scientists so enthusiastic to come to this remote Pacific island? Underneath its turquoise waters, Palmyra holds a hidden secret. In this seemingly uninhabited corner of the world, what do the waters hold that could be so enticing? The answer: sharks. Palmyra is one of the last predator-dominated marine ecosystems: a shark's paradise, a marine ecologist's dream, a shark scientist's heaven.



*Photo Credit: Tom Calver*

What makes Palmyra rare? First, the human population on the atoll reaches a maximum of 20 inhabitants, all scientists. Palmyra is one of the last places on earth to study the abundance, movement, and behavior of reef sharks in a region that has not been overfished. Scientists are there to get answers to pressing questions regarding shark populations: what are sharks' role as a top predator? How do they impact the health of the reef ecosystem? Is shark behavior influenced by human interactions?

Since scientists have witnessed fewer sharks on the reef over the years, they wonder if the sharks are responding to the increase in human activities on the atoll. Palmyra offers scientists a living laboratory to determine how sharks' behavior responds to these conditions. Based on the results of their experiments, shark scientists worldwide will be able to more accurately estimate the number of sharks by accounting for these behavioral biases. For example, if a particular reef is a popular dive spot, sharks may begin to avoid humans, leading to an underestimation of their

population size. On the other hand, if people rarely dive on a different reef, sharks may be more curious, leading to an overestimation of their population size. Accounting for sharks' behavior will improve our understanding of the true size of shark populations, which is essential to protecting sharks headed towards extinction.

Second, the atoll has an inverted biomass pyramid, a rarity in most marine ecosystems. This means top predators make up most of the biomass for the ecosystem. Overfishing has removed sharks from most reefs, so it is unusual to have an abundance of these top predators. For comparison, in a normal biomass pyramid, the plants represent the largest biomass of the ecosystem, and the top predators represent the lowest biomass. Think of a grassland ecosystem with an abundance of grasses, a smaller amount of antelope and an even smaller amount of lions. The opposite is true in Palmyra. Instead, there are an abundance of sharks, less reef fish, and an even smaller amount of plankton: here the sharks dominate.

Even though shark populations have declined worldwide, sharks are still patrolling the reefs in Palmyra and other parts of the Pacific Remote Islands Marine National Monument. Since Palmyra hosts a large population of sharks, it serves as an essential place for scientists to study these top predators. If sharks are removed from the top of the food web, there are cascading effects throughout the ecosystem. Therefore, sharks are essential to keeping the food web balanced and the health of the ecosystem in check.

Through research in Palmyra, scientists will be able to more accurately estimate the population sizes of sharks, which is necessary to prevent extinction, and investigate how sharks influence overall ecosystem health.