UC SANTA BARBARA

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Rush Hour on Palmyra Atoll

Halfway between Hawaii and American Samoa lies a group of small islands and inlets. Among them is Palmyra Atoll, an almost 5-square-mile ring of coral.

The lagoons of Palmyra — part of the Pacific Remote Islands Marine National Monument — provide sanctuary for a variety of mobile species including sharks, manta rays and turtles.

In a new study, UC Santa Barbara marine biologists applied existing technology in a novel way to monitor animals coming into and going out of a lagoon via a deep channel dredged during World War II. Their work confirmed that the route was an important “highway” for sharks and highlighted the magnitude of their channel usage. It also highlighted the time of day when shark traffic peaks. It turns out rush hour for sharks is between 7 and 8 p.m.

The researchers’ findings appear in the Journal of Experimental Marine Biology and Ecology.

“My research team and I have spent a lot of time on Palmyra around this particular feature, but it wasn’t until we were able to light up that world and extract data that we discovered this huge rush hour of sharks in the evening,” said lead author Douglas McCauley, an assistant professor in the Department of Ecology, Evolution, and Marine Biology. “This matters. It’s important to know for how we deal with sharks and to determine their behavior patterns.”

The researchers used dual-frequency identification sonar, an acoustic camera originally designed for the U.S. Navy by Sound Metrics Corp., to create a sound gate through which the sharks traveled. Marine animal traffic was monitored for 443 hours during a monthlong period.

dual-frequency identification sonar of a shark

“We see this as being an important part of new technology coming online to better track the health of shark populations, better understand their behavior and help do a better job with their conservation,” said co-author Paul DeSalles, a researcher in McCauley’s lab. “Before, we had no way to quantify how often and which sharks were using this space. This study fills in those gaps.”

Acoustic cameras use sonar technology or pulsed sound wavelengths to produce fast-frame, detailed imaging even in low-light, turbid environments. The results surpass the range capture and clarity capabilities of traditional optical cameras.

The acoustic camera made a total of 1,196 shark observations; the maximum number in a single frame was 10. With that data, the scientists were able to compare shark density and directionality of travel across four tidal periods. Although at least seven species of sharks frequent Palmyra, the camera confirmed that smaller-sized sharks —such as the ubiquitous blacktip variety — were the most common, an observation that matched previous visual surveys.

“Through this study, we also were able to confirm that large sharks do indeed transit into Palmyra’s lagoons,” DeSalles said. “The data allowed us to get a quantitative understanding of size classes and when these big sharks are using the channel.”

In fact, the camera recorded a definitive transit of large numbers of sharks from the forereef into lagoons, which hasn’t been directly observed at this site using other methods. According to the researchers, such an observation may be of even greater value in contexts where sharks are more rare and use of alternative data collection methods is untenable.

“Because there are big conservation issues with sharks, it was important for us to get a good report card or health chart started for the healthiest ‘patients’ as well as the sickest,” McCauley noted. “Sharks are in trouble worldwide, so we need to be thinking about new tools and new technologies for studying them, and this one — which wasn’t designed for scientific applications — worked very well.”

About UC Santa Barbara

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