

PAPAHĀNAUMOKUĀKEA Marine National Monument

NEWS RELEASE

FOR IMMEDIATE RELEASE

April 26, 2013

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Study Reveals Link Between Algae and Sharks on Healthy Coral Reefs

(Honolulu, HI) – Researchers have completed a study revealing the importance of benthic algae (algae attached to the seafloor) to food webs and fish populations in Papahānaumokuākea Marine National Monument (PMNM), located in the Northwestern Hawaiian Islands (NWHI).

The research found that bottom-dwelling algae served as the base of the food web, culminating in large predatory fishes at the top. Sharks and other large fish consume smaller fishes, which in turn have eaten algae growing on the seafloor.

The findings, published earlier this month in the journal *Marine Biology*, have immediate implications for management of healthy coral reef resources and the restoration of unhealthy reefs, the authors said. Since PMNM ecosystems were found to be heavily dependent on benthic algae, any impacts to other such reefs and their algae – like damage from bottom trawling, coral bleaching or other threats – could trickle up the food web.

“Benthic algae were found to support a majority of the fish production in this coral reef ecosystem,” said Anna Hiltling, lead author and oceanographer with NOAA’s National Centers for Coastal Ocean Science (NCCOS). “Even some coastal tunas, such as the kawakawa, were partially dependent on primary productivity occurring on the reef bottom.”

Large tiger sharks were found to be at the very top of the food web in the NWHI, eating the same fishes and invertebrates as other apex predators, and also feeding on the other apex predators themselves, all of which are ultimately dependent on algae as the base of their food web.

“The question of interest is what forms of algae are responsible for supporting this NWHI ecosystem that is so top-heavy with large predatory fishes,” said Carolyn Currin, a co-author and NCCOS microbiologist. “Those predators don’t eat algae directly, so we use carbon and nitrogen chemical signatures in top predators to find the source at the bottom of their food web.”

For the study, researchers collected nearly 600 samples of algae and fishes in the NWHI, taking tissue biopsies smaller than the size of a pencil eraser. Each tissue biopsy was sampled for carbon and nitrogen stable isotope signatures to determine the food web structure and whether benthic algae, planktonic algae, or both were supporting the productivity of that reef.



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Fishes sampled included herbivores such as surgeonfishes, bottom-feeding predators such as goatfishes (weke) and wrasses, apex predators such as jacks (ulua) and groupers (hapu'upu'u), and several types of sharks, including a number of tiger sharks up to 14-feet-long. Large predators such as sharks and jacks were equipped with electronic tags and released unharmed after biopsy samples were collected.

Randall Kosaki, NOAA Deputy Superintendent of Papahānaumokuākea and a co-author of the report, said the study demonstrates the importance of keeping reefs healthy.

“Anything affecting native algal species, such as sedimentation, dredging or the spread of non-native invasive algae, will ultimately impact the abundance of prized food fish such as snapper or jacks,” Kosaki said. “Taking care of the reef itself will help to ensure healthy fish populations.”

The study, “Evidence for benthic primary production support of an apex predator-dominated coral reef food web,” is available at <http://link.springer.com/article/10.1007%2Fs00227-013-2220-x>.

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Papahānaumokuākea is cooperatively managed to ensure ecological integrity and achieve strong, long-term protection and perpetuation of Northwestern Hawaiian Island ecosystems, Native Hawaiian culture, and heritage resources for current and future generations. Three co-trustees - the Department of Commerce, Department of the Interior, and State of Hawai'i - joined by the Office of Hawaiian Affairs, protect this special place. Papahānaumokuākea Marine National Monument was inscribed as the first mixed (natural and cultural) UNESCO World Heritage Site in the United States in July 2010. For more information, please visit www.papahanaumokuakea.gov.

