Endangered corals smothered by sponges on overfished Caribbean reefs

April 28 2015

Brain coral (*Diploria labyrinthiformis*) surrounded by three different species of sponges. Credit: Joseph Pawlik, UNCW.

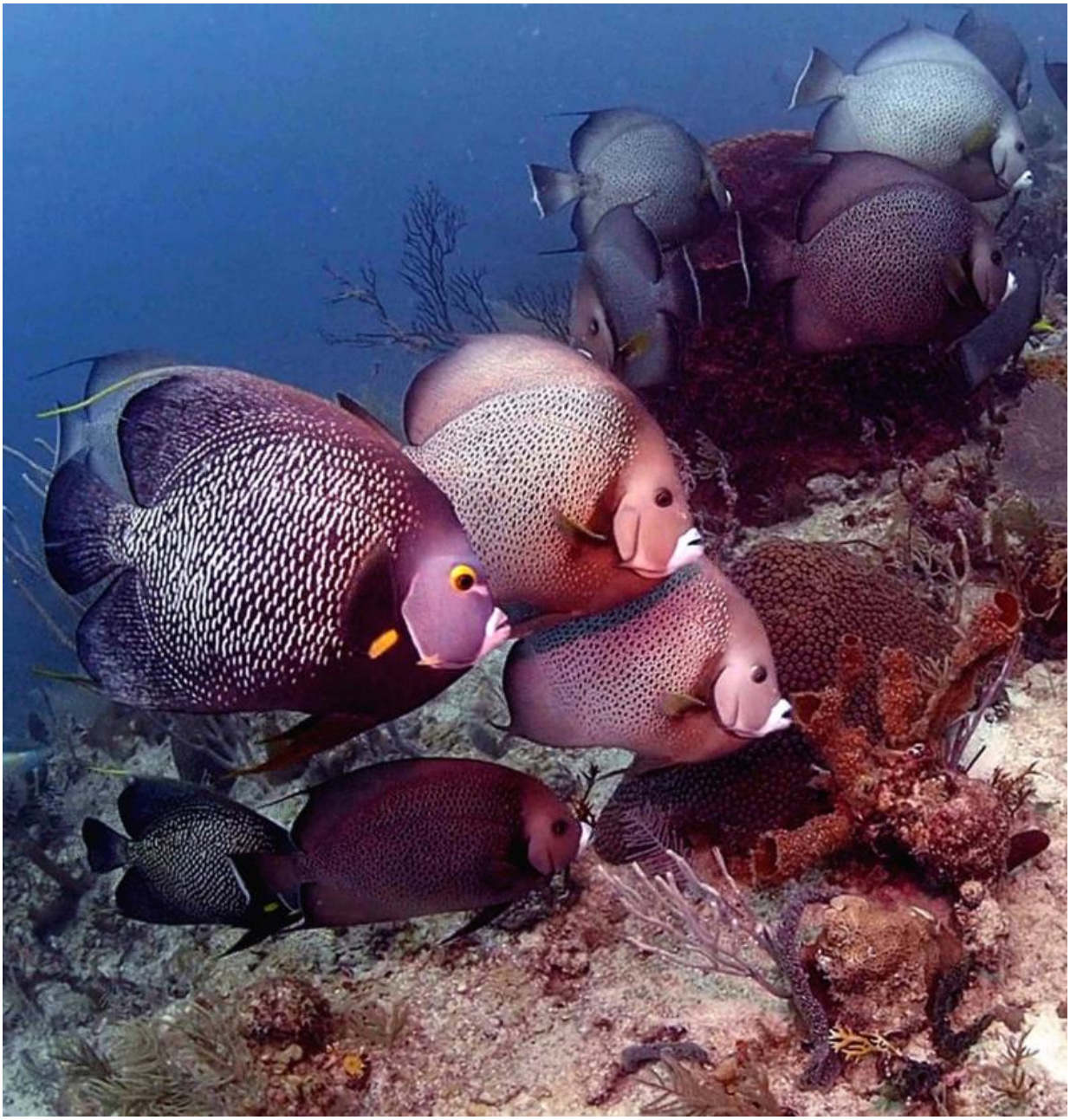
For reef-building corals, sponges do not make good neighbors. Aggressive competitors for space, sponges use toxins, mucus, shading, and smothering to kill adjacent coral colonies and then grow on their skeletons. A recent survey of coral reefs across the Caribbean shows that overfishing removes the predators of sponges, greatly increasing the threat of fast-growing sponges to an already diminished population of corals.

A research team headed by Dr. Joseph Pawlik at UNC Wilmington surveyed reefs from 12 countries across the Caribbean, comparing 25 sites where fish abundance is very low because of decades of intensive fish-trapping with 44 sites where fishes are plentiful because they are protected from fishing. Over 25% of coral colonies at overfished sites were in contact with sponges, more than double the incidence for less-fished reefs. On less-fished reefs, fast-growing sponge species were eaten by angelfishes and parrotfishes, leaving only slow-growing sponge species that are protected from these predators by distasteful chemical defenses.

Corals are particularly threatened on Caribbean reefs, where the combined effects of warming seawater temperatures, storms, and diseases have already decimated populations of these slow-growing creatures. The critical importance of coral reefs for both shoreline protection and fishery habitat has led the United States government to list some reef-building corals under the Endangered Species Act, and the World Conservation Union has included 10 species on its Red List of Threatened Species.

"If the goal is to save the corals that build Caribbean reefs, we have to protect the angelfishes and parrotfishes that eat sponges" says Tse-Lynn Loh, now a Postdoctoral Research Associate at the Haerther Center for Conservation and Research at Chicago's Shedd Aquarium and lead author on the study published today in the open access journal *PeerJ*.

Additionally, the study provides an important validation of ecosystem theory at the community level, with clear indirect effects of overfishing resulting in greater competition between sponges and corals across a broad geographic region.

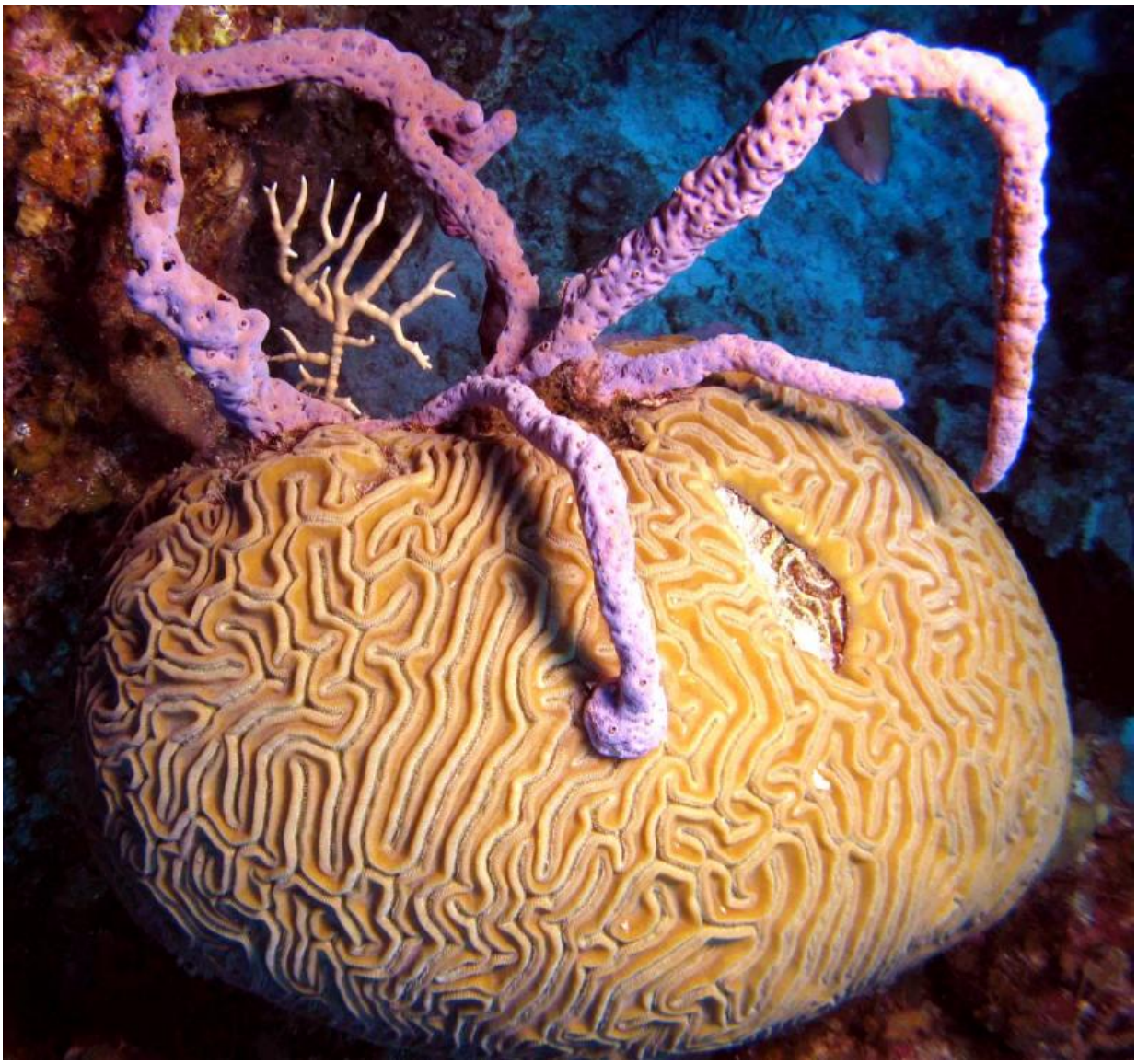


French and Gray angelfishes eating the tube sponge *Callyspongia vaginalis*.

Credit: Joseph Pawlik, UNCW

Corals have more to contend with than just space-stealing sponges. Seaweeds have long been considered the greatest threat to corals on reefs, and the Caribbean-wide survey confirmed that seaweeds cover nearly twice the reef surface as either corals or sponges. But further analysis of the survey data gave an unexpected result: seaweeds were more abundant on reefs where fishes were more numerous. This outcome is contrary to the conventional wisdom that fishes eat seaweeds and keep them in check, a concept that has long been an important justification for protecting reef areas from fishing. Other recent survey studies have reported similar findings, suggesting that the relationship between seaweeds and fishes is more complicated than once imagined. However, for sponges at least, the relationship is clear: overfishing of sponge-eating fishes results in greater sponge overgrowth of corals.

"Caribbean nations can now base their fishing policy decisions on the clear connection between overfishing and sponge-smothered corals." says Pawlik. "Coral conservation requires a healthy population of reef fishes."



Brain coral (*Diploria labyrinthiformis*) overgrown and smothered by the lavender branching sponge *Aplysina cauliformis*. Credit: Joseph Pawlik, UNCW

More information: Loh T, McMurray SE, Henkel TP, Vicente J, Pawlik JR. (2015) Indirect effects of overfishing on Caribbean reefs: sponges overgrow reef-building corals. *PeerJ* 3:e901

dx.doi.org/10.7717/peerj.901