

Study finds tropical fish moving into temperate waters

December 19 2014, by Mark Floyd



Tropical herbivorous fish are beginning to expand their range into temperate waters – likely as a result of climate change – and a new international study documents the dramatic impact of the intrusion in the Mediterranean Sea.

Temperate waters are typically dominated by algal "forests" and have naturally low levels and limited diversity of herbivores, the researchers say. But as tropical fish move into these waters, they are consuming much of the plant life and changing the habitat as well as the manner in which different species interact.

Results of the study, which was funded primarily by the Pew Foundation, have just been published in the *Journal of Ecology*. It builds on a previous study documenting the move of tropical fish species into temperate waters that recently was published in *Proceedings of the Royal Society B*.

"The introduction of tropical fish into more temperate regions is troubling and this new study gives a vivid example of what can happen when non-native species occupy a new ecosystem," said Fiona Tomas Nash, a courtesy professor of fisheries and wildlife at Oregon State University and a co-author on both studies.

"We now know that the arrival of tropical fish into temperate areas is occurring on an increasing basis around the world," she added. "This is the first attempt to characterize what impacts these fish are having – and the mechanisms driving these impacts."

In this latest study, an international research team surveyed roughly 1,000 kilometers of coastline in the eastern Mediterranean to study two species of [tropical fish](#) called rabbitfish. They were introduced to the region through the Suez Canal and now have become a dominant component of the total fish biomass in the southernmost part of the eastern Mediterranean.



Area where rabbitfish are absent.

This part of the Mediterranean has two distinct areas – one with warmer regions that attract abundant numbers of rabbitfish, and colder regions where they are very rare or completely absent. Where abundant, their damage has been striking: a 65 percent reduction in canopy algae, a 60 percent reduction in overall benthic biomass (algae and invertebrates) and a 40 percent decrease in the total number of plant and animal species.

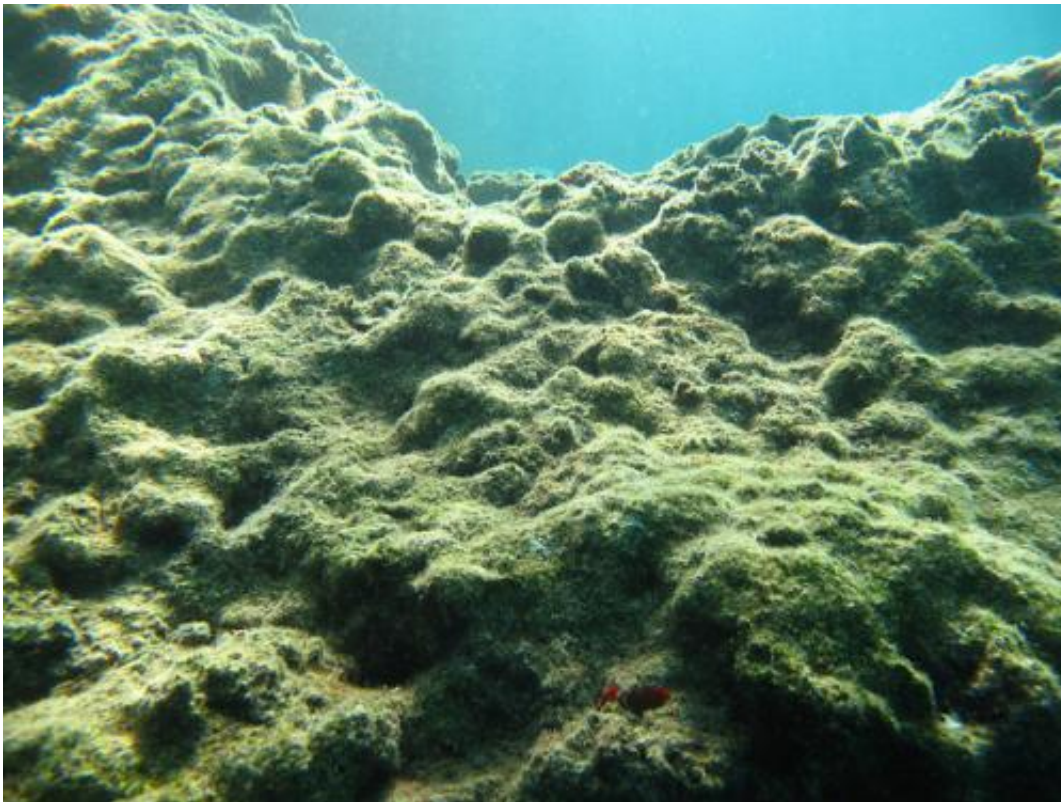
"The fear is that if the colder regions warm just a bit through climate change or some other mechanism, rabbitfish will begin moving into those areas as well," Tomas Nash said.

To learn more about how the rabbitfish changed the ecosystem, the

researchers videotaped fish feeding in the Mediterranean off Turkey in two areas – one dominated by tropical rabbitfish and the other dominated by native temperate fish. They were surprised by what they found. Native temperate herbivorous fish actually had higher consumption rates than the tropical rabbitfish. "We did not expect to see that," Tomas Nash said.

But while native fish targeted only adult macroalgae, the two species of rabbitfish fed complementarily – one targeted the mature kelps while the other fed almost exclusively on emerging algal "recruits," or juvenile plants.

"The result is that one species denudes the forest and the other prevents it from recovering," said Tomas Nash, who also has a faculty appointment with the Mediterranean Institute for Advanced Studies in Spain.



Tropical fish are moving into new landscapes and causing devastating effects.

A study off Japan by collaborators found that the introduction of tropical species there, including rabbitfish and parrotfish, resulted in the loss of kelp forests and the emergence of non-native corals in as little as 20 years.

In the first paper, the researchers outlined how tropical herbivorous fish primarily along west boundary currents are moving into temperate zones, including South Africa, Brazil, the Gulf of Mexico, Australia and Japan, as well as the Mediterranean. Other areas, including the Pacific Northwest of the United States, have not seen sustained spread of [tropical species](#) likely due to prevailing currents and because surface waters are too cold due to seasonal upwelling.

The researchers found algal forests in the waters off Greece had not been severely affected because only the rabbitfish that feeds on adult algae is present and in relatively low densities. They have just begun studies of rabbitfish and chub arrivals in Australia.

"The greatest damage that we documented was off Turkey, which may be serving as the proverbial canary in the coal mine," Tomas Nash said. "The barrenness of the underwater habitat is unique and quite striking – it is spread over hundreds of kilometers."

Provided by Oregon State University

Citation: Study finds tropical fish moving into temperate waters (2014, December 19) retrieved 24 April 2024 from <https://phys.org/news/2014-12-tropical-fish-temperate.html>

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