

Researchers evaluate the effects of warm waters on little fish

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The blue-headed wrasse proved to be a good species to study and understand the impacts of the Gulf Stream and warm Caribbean waters on larval development. (Photo by UM Rosenstiel Student Evan D'Alessandro)

Warm Caribbean waters may provide a toasty growing area for larval fish, but that's not enough to ensure a flourishing fish population.

That's the conclusion of research published in this month's edition of Marine Ecology Progress Series by Dr. Su Sponaugle and colleagues from the University of Miami Rosenstiel School. The scientists studied the petite, yet eye-catching blue-headed wrasse in the upper Florida Keys to monitor larval settlement success.

"The key to any larval reef fish's survival is to find food, avoid predation, and get to a reef to settle," Sponaugle said. Fish larvae remain at sea for several weeks before returning to the reef to settle and join

adult populations. What goes on during this time in the plankton is largely unknown. "What we found is that warm summer waters here are conducive to rapid larval growth, but other factors sometimes interfere, leading to highly variable settlement rates."

According to Sponaugle, it is important to understand how a fish population is replenished if we want to attempt to manage or conserve it. "We need to know how larvae grow and survive. We need to understand not only the biological processes but also the physical processes that create the patterns we observe on the reef," she said.

Sponaugle, Kirsten Grorud-Colvert from Rosenstiel School, and Deanna Pinkard, now at NOAA Southwest Fisheries Science Center, counted and collected juvenile wrasse over four years in a project primarily funded by the National Science Foundation. The scientists examined their ear stones or otoliths to learn more about timing of spawning, settlement, and events occurring during larval life. Otoliths bear rings much like a tree, with one new ring deposited daily, allowing the scientists to determine larval age and growth at any given point during larval life.

"The interesting thing about the system here in the Keys is that it's very dynamic," Sponaugle said. "In addition to the powerful Florida Current fringing the reefs, recirculating eddies pass by, sometimes delivering larvae to the reef and other times flushing larvae away. While fast larval growth should lead to high rates of larval survival and settlement to the reef, this oceanographic complexity disrupts the relationship.

Additionally, the lower nutrients of warm tropical water compared with cooler temperate regions can be a problem for larvae that need more food than usual to sustain their increased metabolism. These challenges are large enough that even with warm water boosting larval development, conditions are not optimum for successful larval settlement."

The blue-headed wrasse is common in the Caribbean and plays an important ecological role in tropical food webs. Its abundance makes it a useful model for other reef fish larvae. With its distinctive cerulean blue head, white mid-stripe, and yellow hindquarters, it is known for changing its gender at will. A male wrasse usually lives with a harem of a dozen or so solid yellow-colored females. If the male dies, the largest female will transform, over a week, into a male, changing color, sex organs, and behavior to act as the new male over the remaining females.

Source: University of Miami Rosenstiel School of Marine & Atmospheric Science

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