FISHLIFE

Part 8 in a series about inshore fish of Hawaii. The 12-part series is a project of the **Hawaii Fisheries Local Action Strategy**.

WHAT REEF FISH EAT AND WHY THAT'S IMPORTANT

BY SCOTT RADWAY

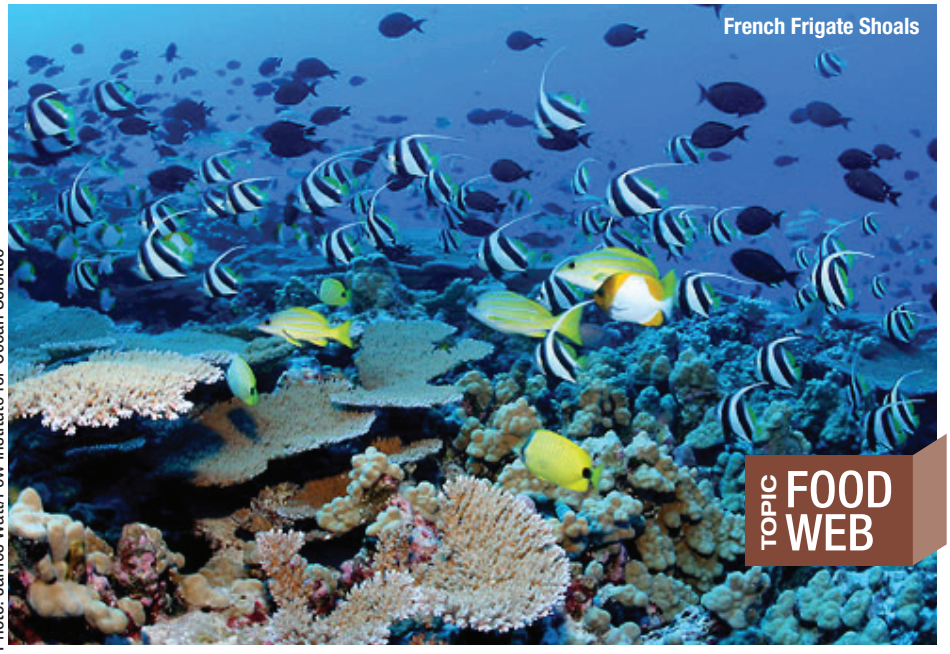

Photo: James Watt/Pew Institute for Ocean Science

FOR DECADES, THE PREVAILING THEORY about coral reef food webs was reef fish ate whatever was available. The implication was, for healthy fish populations, it doesn't matter what kind of fish were out there as long as there were fish.

"It was one of the statements people made and no one ever seriously evaluated it," says Ken Longenecker, a research scientist with Bishop Museum.

So Longenecker did.

Then a PhD student at the University of Hawaii, Longenecker decided to take a fine-tooth comb to the diets of a small group of fish, like gobies and blennies. It wasn't easy. He had to cut open scores of the tiny fish stomaches and then identify what was inside. But when he was done, his findings were an eye-opener. Of the eight fish he analyzed the diets for, on average, there were just 3 to 3.5 species that made of the majority of each fish's prey.

The fish were specific about what they ate.

Longenecker also collected the prey from the area he had collected his fish and there appeared to be a connection between an increased number of targeted prey and bigger fish populations. Longenecker, after his PhD, went on to look one step up the food chain. He examined a goatfish and a hawkfish that ate a lot of fish as part of their diet. What he found is that they, too, ate more specific diets then people realized and he found that they liked some of the blennies and gobies he had studied.

Longenecker was beginning to demonstrate scientifically that if the fish those blennies and gobies ate were plentiful then the the blennies and gobies were likely going to be more plentiful and then perhaps the goatfish people might want to eat would be more plentiful.

"It is the flow of energy through the food web," says Longenecker.

So what does all that science add up to?

"What it comes down to, if you are interested in one particular fish you like to eat, it's not as if you can manage the ocean for that one species. That one species is dependent on hundreds of other species either directly or indirectly," says Eric Conklin, of the Nature Conservancy.

It's the food web, but the twist in a coral reef setting, with thousands of species, is it far more complex than anyone yet understands.

What we do know is you need the coral for shelter. But you also need coral for food and you need microorganisms that such things as small invertebrates and fish can feed on. Then slightly bigger fish can feed on them, and the larger fish on them, on up to the apex predators such as ulua. Each is a critical step in moving food energy up to the big fish.

"Traditional western fisheries management is based off of extremely detailed information on all aspects of a fish's life history, its diet, reproductive capabilities, its mortality estimates," Conklin says. But what Longenecker's research reinforces is the principles that the entire ecosystem, up and down the food chain, also needs to be managed if you want healthy numbers of the fish we like to eat.

"That is why the real trend for coral reef management is to try to preserve intact ecosystems, because we are never going to get to the point that we can say 'Uh-oh we have too few small crabs to produce mantis shrimp, which feed goatfish and on it goes up the food chain.' We are never going to be monitoring coral reef ecosystems on that level," Conklin explains.

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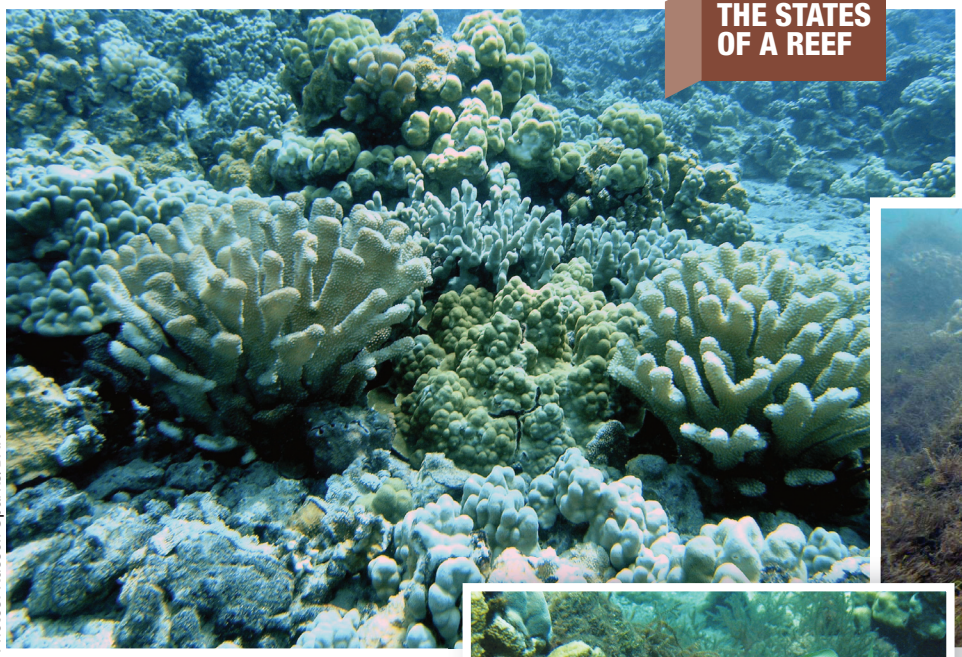
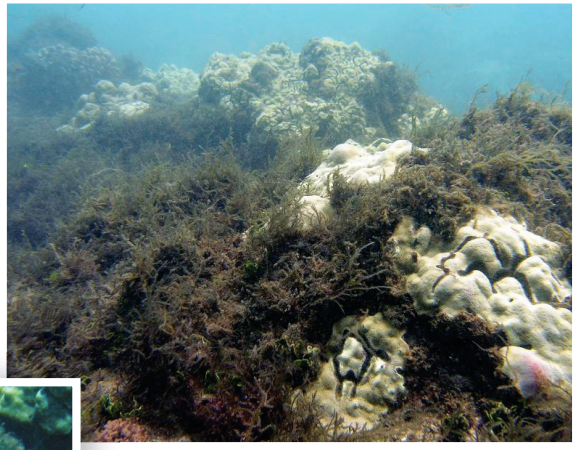
If we protected herbivorous fish, could it help boost ulua populations?

THE STATES OF A REEF



Molokini is a healthy reef with good coral cover and little algal growth.

Maelaea Bay is a reef out of balance and is overgrown with algae.



Kahekili Bay is hurting but still has a chance to recover with enough herbivores.

Photos: Russell Sparks/DAR

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Though ecosystems management is not an entirely new idea. Traditional Pacific Island cultures have demonstrated a keen understanding of that interconnectedness. Take the Native Hawaiian ahupuaa system, which effectively managed the natural environment from the mountain tops to the reef.

One clear indicator of a system out of balance is algal blooms.

"If things start to degrade in a reef environment, you get less living coral and more area covered with seaweed," says Russell Sparks, an Education Specialist with state Division of Aquatic Resources.

Sparks says once the system gets out of balance, algae starts to outcompete living coral and also reduces the sea bottom where new coral can grow. Algal blooms can be a combination of too many nutrients in water from such things as sewage outflows and from a lack of herbivorous fish. One response has been to use "Supersuckers," an apparatus that vacuums up unwanted algae. Another movement is to protect herbivore fish, so they can keep the algae in check.

"It buys us time. You get the herbivores back, but you also need to figure out where the nutrients are coming from. You have to be looking at the larger systems," Conklin says. "The system back in balance is the only long-term solution."

THE SEASCAPERS

Maui's Maalaea Bay has quickly become the poster child for a coral reef system gone wrong. In Maalaea Bay, there was 50 to 75 percent coral cover in 1975. In 1999, there was 18 percent. A 2006 survey reported just 8 percent. In that time, an invasive algae that was never seen outside shallow waters bloomed in areas of 30 and 40 feet. That's why in other less degraded areas on Maui the state is moving to protect a key link in the food chain, herbivores, says Russell Sparks, of the Division of Aquatic Resources. Herbivores can help keep algae in check, so the hope is by protecting families of fish (such as parrotfish, surgeon and chubs) the algal growth can be reduced. Kahekili Bay, which is not yet too far gone, is the target area for this new protection. "If we can get it going at this site, we believe we can stop the declines," Sparks says.

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