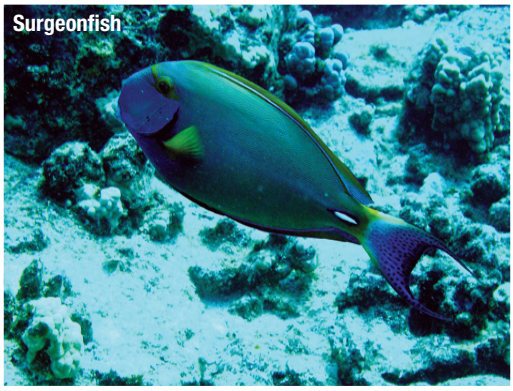
FISHLIFE

Part 5 in a series about inshore fish of Hawaii. The 12-part series is a project of the **Hawaii Fisheries Local Action Strategy**.

THE TURTLE AND THE HARE: REEF FISH VS. PELAGIC

BY SCOTT RADWAY



Surgeonfish

Photo: Scott Radway

Tuna

Photo: Gilbert van Ryckevorsel

TOPIC PELAGIC VS. REEF

WHEN TUNA COME UPON A BIG SCHOOL OF PREY FISH, IT'S FRENETIC. "Tuna can eat up to a quarter of their body weight in one day," says University of Hawaii professor Charles Birkeland. Feeding activity is sometimes so intense a tuna's body temperature rises above the water temperature, causing "burns" in the muscle tissue and lowering the market value of the fish.

Other oceanic, or pelagic, fish, like the skipjack and the mahimahi, feed the same way, searching the ocean for pockets of food fish and gorging themselves.

On a coral reef, fish life is very different.

On a reef, it might appear that there are plenty of fish for eating, but it is far from the all-you-can-eat buffet pelagic fish can find in schooling prey fish. Birkeland explains that reefs are ultracompetitive with scores of species and fish are constantly on guard to predation. Like a bird in the road that darts out of the way of an approaching car, reef fish know to get out of the way of predators, he says. In coral heads and crevices, fish know when to hide.

"On a reef, a fish has to make a mistake to get eaten," Birkeland says.

So no gorging yourself like a tuna.

And that difference means a lot when it comes to fish biology. Largely as a result of the food availability, pelagic fish generally grow at a much faster rate than reef fish. In their first two years, yellowfin tuna can grow to 31 pounds; mahimahi to 20 pounds; and skipjack to 11 pounds. On average, reef fish grow at a rate less than 2 pounds per year.

Another important difference between them is pelagic fish also reach sexual maturity much faster. That is in part

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Reef fish and pelagic fish live in the same ocean, but lead very different lives. Here's a breakdown of the differences between the life cycles of the two groups.

Pelagic Fish

- Can grow up to 30 pounds in first two years
- Early sexual maturity
- Periodically abundant recruitment
- Short life
- Live in schools
- Travel long distances (Hawaii to Philippines)
- Rapid population turnover

Reef Fish

- Grow less than 2 pounds per year
- Postponed first reproduction
- Irregular recruitment success
- Long life
- Often solitary
- Sedentary
- Low mortality for adults, high for juveniles

Source:Charles Birkeland

Why would a skipjack or mahimahi live only 5 to 8 years and a surgeonfish live 30 to 40 years?

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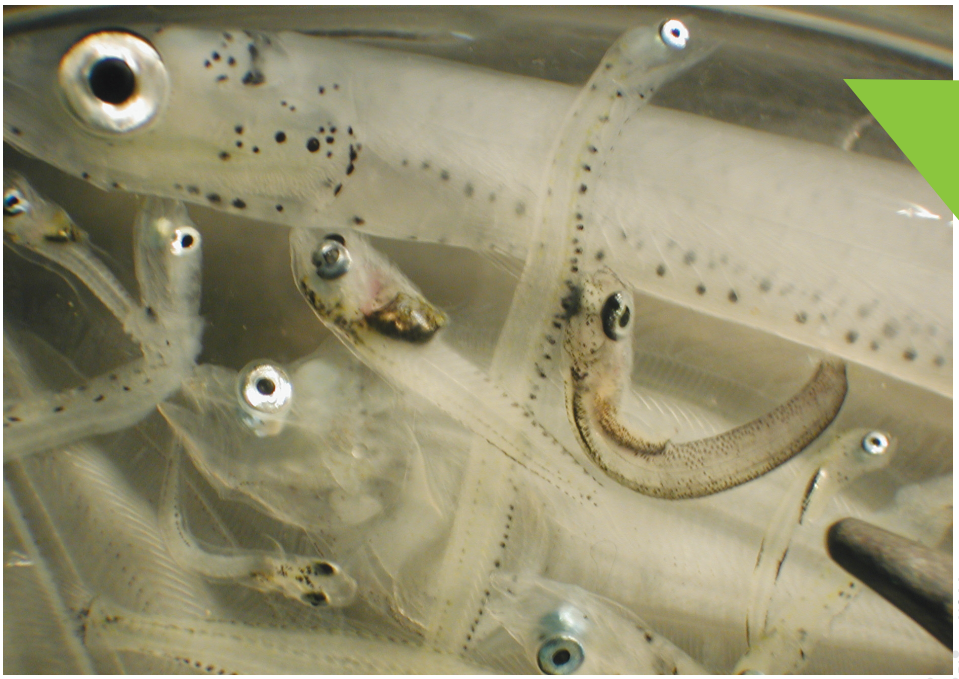

Photo: NOAA

due to food availability. But it is also due to the fact that reef fish are not as successful at producing adult fish. On a reef, most fish spawn in the water column and their larvae then drift offshore and later swim back to shore as they get bigger. That difficult trip offshore lowers reef fish's survival rate. Then they return to a hyper-competitive inshore habitat where food is harder to come by and small fish are eaten.

In some cases, the survivorship of a reef fish in its first year is less than one percent. So even though a fish can spawn tens of thousands, even millions, of fertilized eggs, very few make it to adulthood.

"There are so many big fish on a coral reef that the little fish have a very good chance of being eaten," Birkeland says. "As a result, reef fish need to spawn for many more years than pelagic fish to ensure that their species will survive. The way evolution works, you start getting old once you have a good chance of reproducing."

By comparison pelagic fish, who are more successful at spawning, don't live as long. A skipjack or mahimahi will live 5 to 8 years; surgeonfish can live 30 to 40 years.

Birkeland goes on to say that those differences in growth, reproduction and life span have implications on fishing yield. A pelagic system is driven first by deep-water upwellings of plankton that feed massive schools of fish such as herring and anchovies.

Then fish such as fast-growing tuna eat them. It's a simple and productive system. But on the reef, the system is based on slow-growing coral and populated by scores of interdependent species of slow-growing fish.

Birkeland uses an agriculture analogy to illustrate the differences of productivity of both systems: A pelagic system is like a corn field; a reef is like a rain forest. The latter just can't feed as many people.

Bruce Mundy, a NOAA scientist, adds that reef fish have more complex social structures, which also makes them more vulnerable to overfishing. Many reef fish change sexes over their lifetime, so the larger fish are all male (e.g., uhu) or all female (e.g., moi). So if people target the large fish, they can potentially remove one sex and severely hamper the reproduction cycle.

Because many fish spawn in groups, that also means they are vulnerable to being overfished if people fish them when they are gathered together. Mundy says pelagic fish also aggregate to spawn, but typically not as close to shore and not as close to the majority of fishermen.

Mundy adds that proximity to human populations also means reefs are more vulnerable to pollution, sedimentation and habitat loss from development. He says pelagic systems are not free from pollution, but they are less impacted by far. Pelagic systems because they are simpler and fast growing also recover faster, though by no means are pelagic fish immune to overfishing.

Both need resource management, just different approaches.

HOW LARVAE WILL TRAVEL

When most reef fish spawn, they spawn in the water column and the fertilized eggs drift out to deeper waters. And the return of reef-fish larvae to coastal habitats is an additional time of great risk for their survival not faced by pelagic species, says Bruce Mundy, a NOAA scientist. Mundy adds that at one time, scientists believed that the larvae simply drifted out with the ocean currents and typically were carried away great distances.

But over the last 20 years much research has been done into the complex topic, and it now appears reef larvae have strong swimming abilities for their sizes and even relative to temperate coastal fish and pelagic fish. The fish larvae are often able to stay along the their island chain and return to reefs there, although Mundy warns that does not mean they return to the specific area where they were born. It's not like salmon's homing capabilities, he adds.

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