

'Small fry' fish just as vulnerable to population plunges as sharks or tuna

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Sardine fishermen haul in a net in Monterey Bay, Calif. Credit: Photo by Jonathan Blair / © Monterey Bay Aquarium

On land, being small and lurking at the bottom of the food chain is a far better strategy for species survival than being big, fierce and perched on top, at least when humans are after you – just ask the mice and grizzly bears.

But talk to sharks and anchovies and they'll tell you a different story,

according to a new study of fisheries collapses led by Stanford researchers.

Analyzing over 200 scientific assessments of fisheries around the globe, the team found that populations of small [fish](#) such as sardines and anchovies were at least as likely to have collapsed at some point in the last 50 years as stocks of large fish. A major cause of population crashes in all fisheries is overfishing.

That finding runs counter to the assumption of many scientists that the dramatic population declines suffered by large predatory fishes, including tuna, sharks and marlins, indicate they are at the greatest risk of extinction, just like large predators on land.

"We were expecting to see a strong pattern with large, top predators showing the highest probability of collapse," said Malin Pinsky, a graduate student in biology at Stanford and one of the researchers. "We were really surprised to find that just isn't the case."

Small [species](#) were up to twice as likely to have suffered a major decline, he said.

Pinsky is the lead author of a paper describing the research, to be published May 2 in the online Early Edition of *Proceedings of the National Academy of Sciences*.

Small fishes are a vital link in the oceanic food chain and when a species suffers a plunge in population, it hits the mammals, birds and other fish that depend on that species for food.

"There are relatively few species at that level in the [food chain](#), so if one of them collapses, it can have a big impact," Pinsky said. "It is a big deal."

Smaller fish tend to be short lived and therefore reproduce and mature faster than large species. As a result, a population drop in a smaller species tends to last about five years, Pinsky said, while larger species need about 15 years to recover.

But not every small fish population bounces back in a few years. The collapse of the sardine fishery in Monterey Bay is a prime example of that, Pinsky said, as it took decades for that stock to recover.

Over 25 percent of the world's fisheries consist of small fish, primarily for use in animal feed, fertilizer and nutritional supplements.

"The important lesson is that all species of fishes can collapse once humans decide to eat or use them, from sardines to swordfish," Pinsky said. "You hear the old adage, 'Don't sweat the small stuff,' but for fisheries, we do have to care about the little guys. This really contrasts with what scientists, managers and the conservation community have often assumed up until now."

Pinsky and Stephen Palumbi, director of Stanford's Hopkins Marine Station and a coauthor of the paper, collaborated on the study with colleagues at Rutgers University and Dalhousie University, in Halifax, Canada. They used two data sets, one compiled by the Food and Agriculture Organization of the United Nations and another housed at Dalhousie, to which researchers around the world contributed.

Together, the two sets are the most comprehensive collection of scientific fisheries data in the world. The data set at Dalhousie was assembled in 2009, Pinsky said, and this study was the first time researchers had been able to use both those data sets to explore the frequency with which various types of fisheries collapse worldwide.

When team members began examining the data, they were seeking to

figure out a way to predict fisheries collapses, in hopes of then developing ways to head them off.

"We looked at everything from small species to really large species and asked how frequently fisheries collapses occur for the whole range," Pinsky said.

"We were not focused on small fishes when we started out, but that was what popped out."

The researchers' other finding was that there are no easy shortcuts to predicting which fisheries are likely to collapse. The only sure method is to monitor the state of a fishery and be alert to signs of overfishing, they said.

"Local managers and fishermen have known about individual fishery collapses for years," Palumbi said. "It took looking at 50 years of data and hundreds of fisheries to realize that these collapses among small species actually add up to a whole lot. Bringing a halt to overfishing is the best way to reduce collapses in the future."

Most of the available data came from [fisheries](#) in the developed world, so some of the findings of the study may not apply to the developing world because of differences in management practices, the researchers said.

Provided by Stanford University

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