

A New Ecosystem Model for the Peruvian Anchovy

Background

Fishermen catch more Peruvian anchovy than any other fish in the world. The 5 million to 8 million tonnes of annual catch supplies almost one-third of the world's fishmeal, a product fed to animals and farmed fish. Yet biologists say the Humboldt Current—the ocean ecosystem off Peru—lacks the diversity it once had, largely because in the 1970s and '80s fishing caused crashes in the population of anchovies, a critical food source for many species.

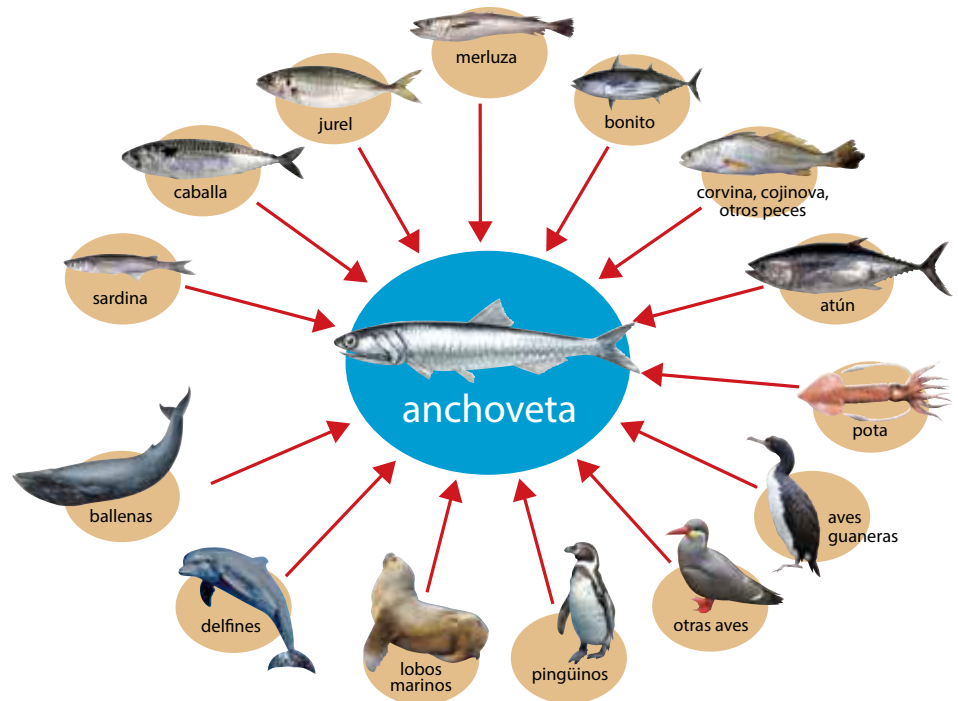
Management of the anchovy fishery has improved in recent years, but it still operates without full knowledge of the rest of the ocean ecosystem. What are the effects on tuna, bonito, and croaker—bigger fish that artisanal fishermen rely on? What about seabirds and marine mammals? What actions would result in more productive, sustainable fisheries?

New Research Tool Takes Broad Ecosystem View

A new study offers the first tool capable of giving detailed, numerical answers to these questions. Drawing on an enormous store of more than 60 years of data gathered by the Peruvian Institute of Marine Research, IMARPE, scientists have created a simulation model of the Humboldt Current ecosystem.

To create the model, the researchers used historic patterns in the data to construct mathematical descriptions of how the ecosystem works. For example, they wrote equations that describe how predator numbers affect prey, and others that describe how fishing or ocean conditions affect various species. By combining these equations, the model can simulate the effects of any number of management scenarios.

Applying the model empowers



Partial model of the Humboldt Current ecosystem. Credit: Patricia Majluf

managers and the public to evaluate the trade-off between fishing for anchovies and leaving them in the water for the many creatures that rely on them as prey.

Diverse Fisheries are More Valuable

This biological information can be combined with socioeconomic analysis to evaluate what actions would most benefit the economy of Peru. To do this, the researchers first tested several fishing scenarios representing different catch levels for anchovies and other species. They then estimated the value that each scenario produced—including from the fishmeal industry, the artisanal fisheries, and the industries that purchase their products.

One key result: the value of a diversified fishery is several times the value of a fishery focused solely on anchovy. This

is largely because many of the big fish caught by artisanal fishermen are sold to restaurants and at fish markets, which add more economic value than the fishmeal industry does by manufacturing a commodity for animal feed.

In the coming months, the research team will work with Peruvian officials, fishermen, and industry to refine its model and economic analysis. Their goal is to make the consequences of management actions clearer, so that Peru can decide on its best course for the world's most productive ocean ecosystem.