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Hilborn Study Redifines Forage Fish Predator Relationships; Suggests Fishing Pressure Lesser Factor

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New research published today in the journal Fisheries Research finds that fishing of forage species likely has a lower impact on predators than previously thought, challenging previous studies that argued forage fish are more valuable left in the ocean.

In 2012 a Lenfest study got wide play claiming that models showed fishing pressure on prey species had big impacts on the abundance of predator species, such as cod and tuna. However, some of the authors of the original model have now joined with other researchers to say it is out of date.

A team of seven respected fisheries scientists, led by Prof. Ray Hilborn, Ph. D., of the University of Washington, found that predator populations are less dependent on specific forage fish species than assumed in previous studies including a 2012 study commissioned by the Lenfest Ocean Program is managed by The Pew Charitable Trusts. The Lenfest Forage Fish Task Force argued that forage fish are twice as valuable when left in the water to be eaten by predators, and recommended slashing forage fish catch rates by 50 to 80 percent.

For fisheries management, such a precautionary approach would have a large impact on the productivity of forage fisheries. As groups such as IFFO (The Marine Ingredients Organisation) have noted, these stocks contribute strongly to global food security, as well as local and regional social and economic sustainability.

However, the new research found multiple omissions in the methodology of the Lenfest study. "When you review the actual models that were used [by Lenfest], there are a few key elements on the biology of these

animals that were not represented, " said Dr. Ricardo Amoroso, one of the study's co-authors. He added that one of the authors' approaches was to "look for empirical evidence of what is actually happening in the field. " Previous studies relied on models which took for granted that there should be a strong link between predators and prey.

Specifically, the Lenfest study and another study using ecosystem models ignored the natural variability of forage fish, which often fluctuate greatly in abundance from year to year. It also failed to account for the fact that predators tend to eat smaller forage fish that are largely untouched by fishermen. Because of these oversights, the new study concluded that the Lenfest recommendations were overly broad, and that fisheries managers should consider forage species on a case-by-case basis to ensure sound management.

"It is vital that we manage our fisheries to balance the needs of the ecosystem, human nutrition and coastal communities, " said Andrew Mallison, IFFO Director General. "These findings give fishery managers guidance based on science, and update some of the inaccurate conclusions of previous reports. "

The Lenfest findings were largely based on a model called EcoSim, developed by Dr. Carl J. Walters, one of the co-authors of the new paper. Dr. Walters found that the EcoSim models used in earlier studies had omitted important factors, including natural variability, recruitment limitations and efficient foraging of predators.

Dr. Walters noted that there were "very specific" issues with previous uses of the EcoSim model. "It was predicting much higher sensitivity of creatures at the top of the food webs to fishing down at the bottom than we could see in historical data, " he said.

This is not the first time ecosystem models used in earlier studies have been questioned. One year after the Lenfest study was completed, two of its authors, Dr. Tim Essington and Dr. Éva Plagányi, published a paper in the ICES Journal of Marine Science where they said, "We find that the depth and breadth with which predator species are represented are commonly insufficient for evaluating sensitivities of predator populations to forage fish depletion. " The new study reaffirmed this finding, noting "several reasons to concur with the conclusion that the models used in previous analysis were insufficient. "

In addition to its critiques of previous research, the researchers found further evidence of the lack of fishing impact on forage fish. Their research indicated that environmental factors are often much more important drivers of forage fish abundance. They also found that the distribution of forage fish has a greater impact on predators than simply the raw abundance of forage fish.

The authors concluded by noting the importance of forage fish as a part of human food supply chains, praising their high nutritional value, both through direct human consumption and as food in aquaculture, as well as the low environmental impact of forage fishing. Cutting forage fishing, as recommended by the Lenfest group, would force people to look elsewhere for the healthy protein and micronutrients provided by forage fish – likely at much greater environmental cost, the authors wrote.

"Forage fish provide some of the lowest environmental cost food in the world – low carbon footprint, no water use, " Dr. Hilborn said. "[There are] lots of reasons that forage fish are a really environmentally friendly form of food. "

It is also well-established that forage fisheries provide substantial health benefits to human populations through the supply of long chain omega-3 fatty acids, both directly through consumption in the form of fish oil capsules, and indirectly through animal feed for farmed fish and land animals.

The paper was authored by Dr. Ray Hilborn, Dr. Ricardo O. Amoroso, and Dr. Eugenia Bogazzi from the University of Washington; Dr. Olaf P. Jensen from Rutgers University; Dr. Ana M. Parma from Center for the Study of Marine Systems -CONICET, Argentina; Dr. Cody Szuwalski from the University of California Santa Barbara; and Dr. Carl J. Walters from the University of British Columbia.

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