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## Small Fish Overtake Big Fish In Food Web

Over-fishing by humans has led to fewer big, predatory fish in the world's oceans, leaving smaller fish to thrive and double their numbers over the past century, scientists reported on Friday.

Tuna, cod, and groupers, among others, have declined around the world by as much as 66 percent while the number of anchovies and sardines has surged in the absence of those bigger fish, said researchers at the University of British Columbia (UBC).

People around the world continue to fish harder, but are coming up with fewer and fewer numbers in their catch, indicating that fishers may have maxed out the ocean's capacity to provide the world with food.

"Over-fishing has absolutely had a 'when cats are away, the mice will play' effect on our oceans," Villy Christensen, professor at UBC's Fisheries Center, told AFP. "By removing the large, predatory species from the ocean, small forage fish have been left to thrive."

Christensen, who presented the research findings at the American Association for the Advancement of Science (AAAS) annual conference in Washington, said his team also found that more than half of the decline in the predatory fish population has taken place over the last 40 years.

Christensen's team examined more than 200 global marine ecosystem models and extracted more than 68,000 estimates of fish biomass from 1880 to 2007 for their study. They did not use catch numbers reported by governments and fishing operators.

"It is a very different ocean that we see out there," said Christensen. "We are moving from wild oceans into a system that is much more like an aquaculture farm."

While small fish are becoming more populous, they are also being used more and more for use as fishmeal in fisheries, Christensen said. "Currently, forage fish are turned into fishmeal and fish oil and used as feeds for the aquaculture industry, which is in turn becoming increasingly reliant on this feed source."

Despite the spike in small fish, the overall supply of fish is not increasing to meet human demand, according to researchers.

"Humans have always fished. Even our ancestors have fished. We are just much much better at it now," Reg Watson, a scientist at UBC, told AFP's Kerry Sheridan.

About 76 trillion tons of seafood were reported in 2006, meaning about "seven trillion individuals were killed and consumed by us or our livestock," said Watson. Fishing efforts have been growing over the past several decades, reaching a collective point of 1.7 billion watts, or 22.6 million horsepower, worldwide in 2006, he added.

In terms of energy use, that would amount to 90 miles of "Corvettes bumper to bumper with their engines revving," he said.

"It looks like we are fishing harder for the same or less result and this has to tell us something about the oceans' health. We may in fact have hit peak fish at the same time we are hitting peak oil," Watson stressed.

Christensen, who urges consumers to shift their attention down the marine food chain from large predatory fish to more unusual fish, echoes that of celebrity chef Jamie Oliver, who suggests we eat more coley, mackerel, dab, pouting, herring and sardines.

"I know you like your fish suppers, but our appetite for the same fish, day in, day out, is sucking the seas dry," Oliver told the Guardian. "I wouldn't bother waiting for the politicians to sort this one out, guys, you can really help from the comfort of your own kitchen ... Lay off the cod, haddock and tuna, diversify and cook up a wider range of fish."

Seafood makes up a large part of the global human diet according to researcher Siwa Msangi of the International Food Policy Research Institute, who told AFP that the rise in demand is being driven mainly by China.

Globally, "meat provides about 20 percent of the per capita calorie intake and of that... fish is about 12 percent," he said. But almost 50 percent of the increase in the world's fish consumption for food comes from eastern Asia, and "42 percent of that increase is coming from China itself," said Msangi.

"China is a driver of both the demand and the supply side. That is really why the management issue becomes so important," he added.

Jacqueline Alder of the UN Environment Program suggests that the world needs to see cuts in the amount of fishers trolling the world's oceans and also a cut in the number of fishing days in order to allow global fish stocks to regain their numbers.

"If we can do this immediately we will see a decline in fish catches. However, that will give an opportunity for the fish stocks to rebuild and expand their populations," Alder told AFP.

Although, when coupled with forecasts about the impact of climate change, projections of future fish numbers decline even further.

"Our study indicates indeed we may get a double whammy from climate change," said Christensen. "In the sense that higher water temperatures... are going to mean there will be less fish in the ocean."

Furthermore, a rise in wild forage fish populations would have damaging effects on marine ecosystems. These fish eat more of the zooplankton in the oceans, which means that the next stage down the food chain -- the plant plankton normally consumed by the zooplankton -- blooms. "You get into a situation where you get a green soup, you get anaerobic conditions [low oxygen levels]. There are clear examples in the Black Sea," said Christensen.

Predatory fish are an vital part in food chains, he added, preventing the spread of disease, for example. "In England some years ago, there was a crisis where they had killed a lot of the predators such as eagles. You had rabbits that got problems with diseases, there was massive die-off, the sick ones were not being eaten by the predators. We see less stable ecosystems if we do not have predators there," he explained.

The sheer drop in top predator fish was also linked, in a separate study presented at the AAAS, to the rise in global fishing capacity. This has increased by 54 percent from 1950 to 2010 with no sign of a decrease in recent years.

"We need to cut back fishing efforts," said Christensen. "Society needs to decide what we want with the ocean -- do we want to turn it into a farm? Or do we want to have something that is more of a natural ecosystem?"

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