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Commercial Fleets Reduced Big Fish by 90%, Study Says

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In just 50 years, the global spread of industrial-scale commercial fishing has cut by 90 percent the oceans' population of large predatory fishes, from majestic giants like blue marlin to staples like cod, a new study has found.

Oceanographers not connected with the study say it provides the best evidence yet that recent fish harvests have been sustained at high levels only because fleets have sought and heavily exploited ever more distant fish populations.

Other studies had shown such trends for individual species and some coastal fisheries, but experts said this was the first systematic study to measure the effect throughout the oceans.

The study is to appear on Thursday in the journal *Nature* and is online at www.nature.com.

The authors, from Dalhousie University in Halifax, Nova Scotia, said they hoped the findings would spur countries to honor a declaration most signed last summer at the World Summit on Sustainable Development in Johannesburg, which called for restoring stocks by 2015.

American fisheries officials and representatives of the fishing industry said that declines in fish stocks were inevitable but that progress was being made in stemming damage to the most depleted stocks.

The study, drawing on decades of data from fishing fleets and research boats, paints a 50-year portrait of fish populations under siege as advances like sonar and satellite positioning systems allowed fleets to home in on pockets of abundance.

Even as sought-after species like tuna and swordfish declined, many other less popular fishes also dropped enormously in numbers as they were caught unintentionally on long lines of baited hooks or in bottom-scouring trawls.

"With all this technology together, the fish hardly have a chance," said the lead author, Dr. Ransom A. Myers, who spent 10 years combing archives of information from Japanese long-line fleets, research trawling expeditions and other sources.

But representatives of the seafood industry called the study unnecessarily alarmist.

Glenn R. Delaney, a consultant to American fishing companies and a government-appointed member of the International Commission for the Conservation of Atlantic Tunas, said some fleets had overfished in the past and some continued to do so, particularly rogue vessels connected mainly to Taiwanese companies. But he said that major ocean fisheries were being managed better now.

The study was financed mainly by the Pew Charitable Trusts, a foundation that has long promoted efforts to alert the public to problems with the oceans. It was extensively reviewed by experts from the industry and other institutions before appearing in *Nature*, the authors said.

The authors and other experts said recent improvements in stocks of some species, like swordfish, were creditable but reflected only a tiny increase in populations that remained the dimmest shadow of what they were two generations ago.

This level of depletion not only threatens the livelihood of fishers and an important source of protein, but could also unbalance marine ecosystems, experts and the study's authors said.

In some places, the study found that when top predators were removed, competing species thrived and filled the gap in the food web. When cod declined in the Grand Banks east of Canada in the 1950's, flatfish numbers soared, and when populations of blue marlin plunged in the tropical Atlantic as they were caught on tuna hooks, sailfish and then swordfish

became abundant.

But in each case, the statistics showed, the replacement species were quickly decimated by overfishing or by accidental catches. That left the oceans largely bereft of big predators as a whole.

One remarkable aspect of the new study is the 50-year statistical portrait it paints that reveals not just the extent of the damage, but also the pattern, with charts showing year by year how, as oceangoing fleets fanned out, catches boomed each time they reached new waters, then plummeted in their wake.

In almost all exploited areas, it generally took just 10 or 15 years for populations to crash. One measure was fish caught per 100 hooks on the Japanese lines. The study said the rate went from 10 fish per 100 hooks to 1 or less in that period.

"This shows that the reason we've had so much tuna and swordfish, the only reason this has been sustained, is because boats kept going farther and farther away," said Dr. Jeremy B. C. Jackson, a professor at the Scripps Institution of Oceanography. Dr. Jackson has conducted other studies showing declines and ecological effects in coastal waters but was not involved in the new work.

"The problem now is there's no place left to go," he said. "There are a lot of people out there willing to fish the last fish. But that's just not going to work."

One of the biggest concerns is the potential effect on global ecosystems, said Dr. Boris Worm, the second author of the study. He is affiliated with Dalhousie and the University of Kiel in Germany.

"You can't cut off the head of an ecosystem and expect it to behave the same way," he said. "From all we've studied in parts of the ocean, you can end up with things being less stable, less predictable, and maybe less hospitable."

He said that for most fish species, recovery was possible, even from such low numbers.

"On land, we did it with buffalo," Dr. Worm said.

"They went from 30 million to a thousand," he added, "and we saved them because we wanted to. With fish we haven't thought the same way yet."

There are already efforts underway to curb overfishing, create reserves that serve as nurseries for valued species and encourage consumers to avoid the most endangered fishes.

Fishing industry representatives also note that tuna and swordfish populations are stabilizing in many places. But the authors of the study and other experts note that most of these efforts are voluntary and grossly insufficient.