

The oceans of 2050: will there be any fish left?

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It's no secret that I've been pessimistic about the state of our oceans. So when I saw there was a session entitled "2050: Will There Be Fish in the Ocean?" at this year's meeting of the American Association for the Advancement of Science (AAAS), I knew it would be one I'd attend. And while the message wasn't particularly encouraging, it's not all doom and gloom on the seas.

Reg Watson of the University of Tasmania started off by pointing out that humans have always fished; it's just that we've gotten much better about it. Using data from a multitude of sources (predominantly the Food and Agriculture Organization [FAO] and the European Union), the Sea Around Us project aims to study the impact of fisheries on the marine ecosystems of the world, and helpfully provides their data analyses and visualizations for everyone to use.

In order to do this, it was necessary to come up with a metric, a single unit to normalize the data. The University of British Columbia's (UBC) Daniel Pauly, who is Principal Investigator of the project, suggested energy expenditure as a measure of fishing effort, expressed as total engine power and the number of fishing days in a year.

Their data looks at the global picture from 1950, where the main effort took place around the European coast. By the 1980s, European fishing fleets started intensifying their efforts off the coasts of Africa, the Antarctic, and also in the deep ocean. Asian fishing efforts also ramped up around this time and, from the 1990s onwards, there has been a massive increase in fishing effort in the equatorial zones off northwest Africa and in the Pacific off southeast Asia. Around the same time, the global catch stagnated at around 70 million tons a year. Fishing effort was flat from 1950 until 1970, when it began to increase, ramping up to the 2010 level of 4.4 billion kilowatt days, a 54 percent increase over 1950 levels.

Having reached peak fish, the resulting fish stock collapses have meant that maintaining the annual landing of 85 million tons of fish in the 2000s became more and more energy intensive. Forty-seven million tons of fuel were used by the global fishing fleet each year over that decade, which works out to 1.8 tons of fish per ton of fuel, or 13.5lb of fish per gallon. Just as global agriculture has become incredibly dependent on fossil fuels, so too has global fishing, and it's just as unsustainable.

Pauly pointed out that the recent FAO biennial report, which described the world fisheries as stable, was misleading, because it just measured catch, but not energy expenditure or the area being fished, which expands each year both in ocean depth and ocean area. Pauly thinks that consumers aren't feeling this yet, since so much fish is imported from around the world, but that, within a decade, it will be more noticeable in the prices we pay at the supermarket.

Villy Christensen, also of UBC, tried to square the contradictory predictions of life in the future oceans. Unfortunately both these links require a subscription to *Science*, but the abstracts are free. The 2006 study predicted the global collapse of all taxa currently fished by 2048, but the 2009 study (which has many of the same authors) suggests that efforts to rebuild stocks are underway. According to Christensen, the 2009 paper is correct, at least for some regions.

Fixing the problems will require a more holistic approach to fisheries management than in the past, but there are signs that this is beginning to happen. The United Nations Environment Program is starting to work with the FAO to reduce the polarization between agriculture departments and environment departments across fishing nations. Even marginal reductions in fishing efforts now suggest that we could return to current fishing catch levels, but sustainably, by 2050. Unfortunately, not everyone who currently fishes can continue to do so—since that means taking away peoples' livelihoods, reaching sustainability won't be an easy sell.

Changes in fishing methods can also be successful; white sharks off the California coasts have recovered following a ban on drift nets. Increased use of marine protected areas will also be needed, but we can see these at work already—cod are recovering in the Gulf of Maine, for example. Alaskan fisheries are also doing much better since moving to a model that allocates each boat a catch share, rather than a limited number of fishing days. It's not popular with everyone, since it effectively assigns property rights to the fish in the sea, privatizing a public resource. But, if the alternative is collapsed fisheries, then I think on balance it's worth it.