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## Declining catches reason for pessimism over fish stocks

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**Responsible aquaculture programs can turn around dramatic decline since World War II and ensuring a supply of cheap animal protein**

By Daniel Pauly

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It is difficult not to be a pessimist about the future of the world's fish population. Global marine catches, which had increased rapidly since World War II, stalled in the late 1980s and have been declining ever since. That decline will be difficult to halt.

The rapid depletion of fish stocks is the inevitable outcome of sophisticated industrial technology being thrown at dwindling marine populations as demand rises, fueled by growth in human population and incomes. The decline has so far been masked in the developed world by seafood products that were not previously available, such as farmed salmon, and by massive fish imports from developing countries.

But over-fishing has become a severe problem in the developing world as well. So fisheries worldwide are due for wrenching changes in the near future. A clear indication of the problem is "fishing down the marine food web" -- the increasing tendency to land fish and shellfish from the bottom of marine food chains, often the prey of the larger fish that were previously targeted.

This trend provides low-quality substitutes for the high-quality fish that we were once accustomed to, and will inexorably lead us toward catching plankton, especially jellyfish. Yes, jellyfish, which were once a specialty consumed around East Asia, are now a product caught in the Atlantic as well, and exported across continents.

The fishing industry is, on its own, incapable of reversing the "fishing down" trend, notwithstanding arguments by commentators who should know better. In his recent book *The Skeptical Environmentalist*, for example, the Danish public-policy analyst Bjorn Lomborg cited data reported by the UN Food and Agriculture Organization (FAO) that showed increasing figures for global fish catches. Lomborg used the figures to argue that if catches are up, then the underlying ecosystems must be in good shape, despite all the warnings from experts.

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But Lomborg is wrong, and the experts are right. We now know that the apparent increases in global fish catches in the 1990s were due to massive over-reporting to the FAO by China. We also know that fish catches can remain high (and in fact usually do) even as stocks collapse, as illustrated by cod off Eastern Canada, which yielded good catches until the fishery had to be closed because there were literally no fish left.

But excessive catches are not even the whole story. Many fishing techniques now in use -- bottom trawls foremost among them -- literally tear up the habitat upon which fish depend. As a result, some fish stocks exploited in this manner do not seem to recover, regardless of quotas or other regulations on catches.

Aquaculture, the farming of fish and other aquatic organisms, could in principle ameliorate the coming shortfall. However, aquaculture refers to two fundamentally different kinds of operations.

One type of aquaculture is devoted to the farming of bivalves such as oysters and mussels, or to freshwater fish such as carp and tilapia. It relies on plants (plankton sometimes supplemented by agricultural by-products in the case of freshwater fish) to generate a net addition to the fish food supply available to consumers. Moreover, because this type of aquaculture is based predominantly in developing countries (mainly in China, but also in countries such as the Philippines and Bangladesh), it supplies cheap animal protein right where it is needed.

The second type of aquaculture entails the farming of carnivorous fish such as salmon or seabass, and increasingly, the fattening of wild tuna in captivity. Salmon, seabass, or tuna eat flesh; in ecological terms, they are the wolves and lions of the sea. When fed only vegetable matter, such as soy meal, salmon do not grow well, and end up looking and tasting like tofu. There is no point even trying to feed tuna anything but fish.

The more of this aquaculture there is, the less cheap fish, such as sardines, herring, mackerel, and anchovies, there will be for humans to buy and eat. Farming carnivorous fish increases rather than reduces pressure on wild stocks. It has led to massive imports by developed countries -- where this type of aquaculture predominates -- of fishmeal from fish caught and ground up in developing countries.

One reason why aquaculture's practitioners can get away with this is that the public assumes that all of these operations are similar, and that they all add to the global fish supply. This is simply not the case.

There is still time to save our fisheries, but only if they are reinvented not as the source of an endlessly growing supply of fish for an endlessly growing human population, but as a provider of a healthy complement to grain-based diets. Moreover, such reinvented fisheries will be smaller, and they will rely on fish that move out of marine reserves, the protected ocean areas that we must establish to enable marine ecosystems and the species within them to rebuild some of their past abundance, and to share it with us again.

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