

A new study
links overfishing
to undernourishment.



SEPTEMBER 2010

Overfishing Trends and the Global Food Crisis

A Summary of a New Scientific Analysis

Srinivasan, U.T., W.L. Cheung, R. Watson and U.R. Sumaila. 2010. Food security implications of global marine catch losses due to overfishing. *Journal of Bioeconomics*. DOI: 10.1007/s10818-010-9090-9

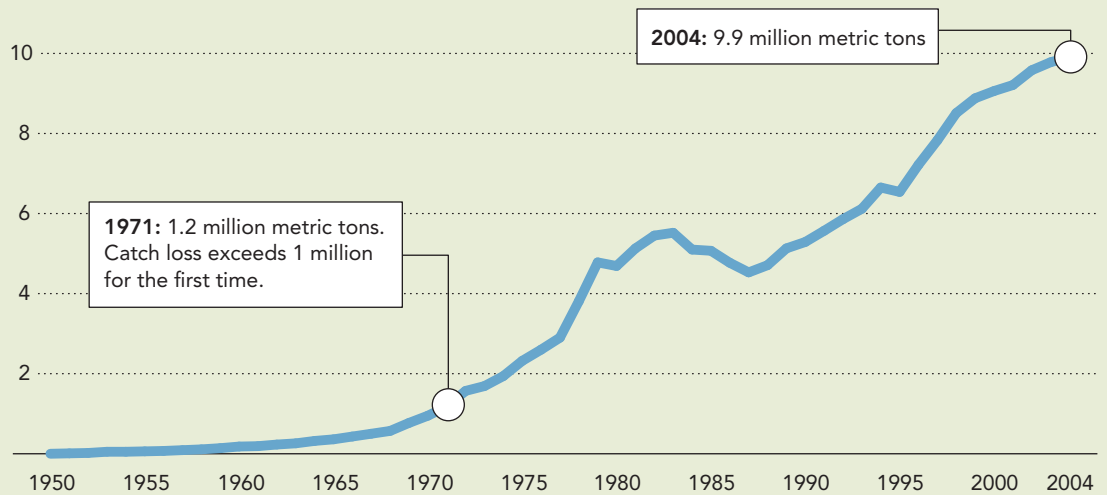
Fish are a vital source of nourishment, especially to people in the world's poorest nations. Widespread overfishing has led to a decline in catch globally; however, the links between overfishing and food security have not been well-understood.

Thara Srinivasan of the Pacific Eco-informatics and Computational Ecology Lab, Rashid Sumaila of the University of British Columbia and their collaborators assessed potential losses, globally and regionally, in fisheries catch (reported landings) and revenue (landed, or dockside, value of the

catch) resulting from overfishing. They found a third to a half of commercial marine species had been overfished during the past half-century, with billions in potential revenue lost. By placing country-level catch loss trends in the context of undernourishment levels in many of the world's poorest countries, the authors estimated that in 2000 the additional catch from sustainable fishing could have helped 20 million people cover their food deficit and avert undernourishment. This *Pew Ocean Science Series* report is a summary of the scientists' findings.

FIGURE 1. GLOBAL POTENTIAL CATCH LOSS (in million metric tons)

Using midlevel criteria, the authors declared a species-EEZ pair as overfished if, after the year of maximum catch, the species stock fell to 50 percent of its maximum level for at least 10 successive years, or 15 in total from 1950 to 2004.



The Costs of Overfishing: Links to Potential Catch Losses and Global Hunger

Advances in the fishing industry—such as more efficient boats or gear—have made it possible for increasing numbers of fish to be caught. Although this larger catch could initially feed more people, increase the share of seafood in people’s diets around the world and generate more revenue, additional fishing effort can lead in time to diminishing returns and an overall decrease in catch as fish stocks are fished beyond their natural replacement rate (*i.e.*, overfished populations are caught beyond their maximum sustainable yield (MSY), an estimate of the largest number of fish that can be removed without affecting their replacement rate).

According to the authors, the difference between actual landings of overfished species and their MSY is the catch loss—the fish that could have been caught had overfishing not occurred. In other words, had fishing practices been more sustainable, then catch, revenue and fish as a food source might have been greater. Therefore, catch loss and revenue loss, as well as the potential to feed more people, are considered lost benefits from overfishing.

Study Methods

Using data from 1950 to 2004, the authors estimated the potential catch lost to unsustainable fishing for 1,066 species of fish and invertebrates caught in 301 exclusive economic zones (EEZs),

the open seas that extend 200 nautical miles from a country’s coastline. The authors first calculated the number of species in an EEZ that had been overfished.

Second, they estimated the potential catch and value (gross revenue) lost to overfishing in 2000. To describe potential catch losses, they estimated the MSY for each overfished species-EEZ pair. When the MSY was greater than the recorded catch, the difference was the catch loss—or the fish that could have been caught had overfishing not occurred. To estimate gross revenue losses, they used landed value price data for each species-EEZ pair.





Finally, they compared potential catch loss numbers to U.N. Food and Agriculture Organization estimates of undernourishment in food-deficit countries. Catch losses were converted into food energy (calories) to estimate the number of people who potentially could have averted undernourishment (*i.e.*, cover their food deficit) had fishing practices been sustainable.

The authors noted, however, that their estimates were intended to be understood indicatively rather than literally, because some stock declines may have been irreversible and the contribution of other factors such as changing ecosystems to stock declines is unknown.

Findings

The authors found that large amounts of potential catch and revenue had been lost to overfishing over the last half-century and that the burden of catch losses fell heaviest on many of the world's poorest people.

- The authors estimated that from 1950 to 2004, 36–53 percent of fish stocks in more than half of the world's EEZs were overfished. By 2004, potential catch losses were estimated to have reached nearly 10 million metric tons (Figure 1).
- In 2000, global estimated catch losses were 7 to 36 percent of the actual tonnage landed, resulting in a landed value loss of \$6.4 billion to \$36 billion (in 2004 U.S. dollars).
- Europe had the highest estimated catch losses, followed by North America, Asia, South America and Africa (Figure 2).
- Considering countries with undernourishment levels greater than 5 percent, the authors estimated that if these countries' waters had not been overfished, the additional fish catch in 2000 could have helped 20 million people avert undernourishment. (Figure 3).
- Total catch in the waters near low-income, food-deficit countries might have been up to 17 percent greater than the tonnage landed there.
- Africa had the highest losses relative to its actual catch in 2000, with catch losses at roughly 10 to 50 percent of the tonnage landed.

FIGURE 2. POTENTIAL CATCH LOSSES BY REGION (in million metric tons)

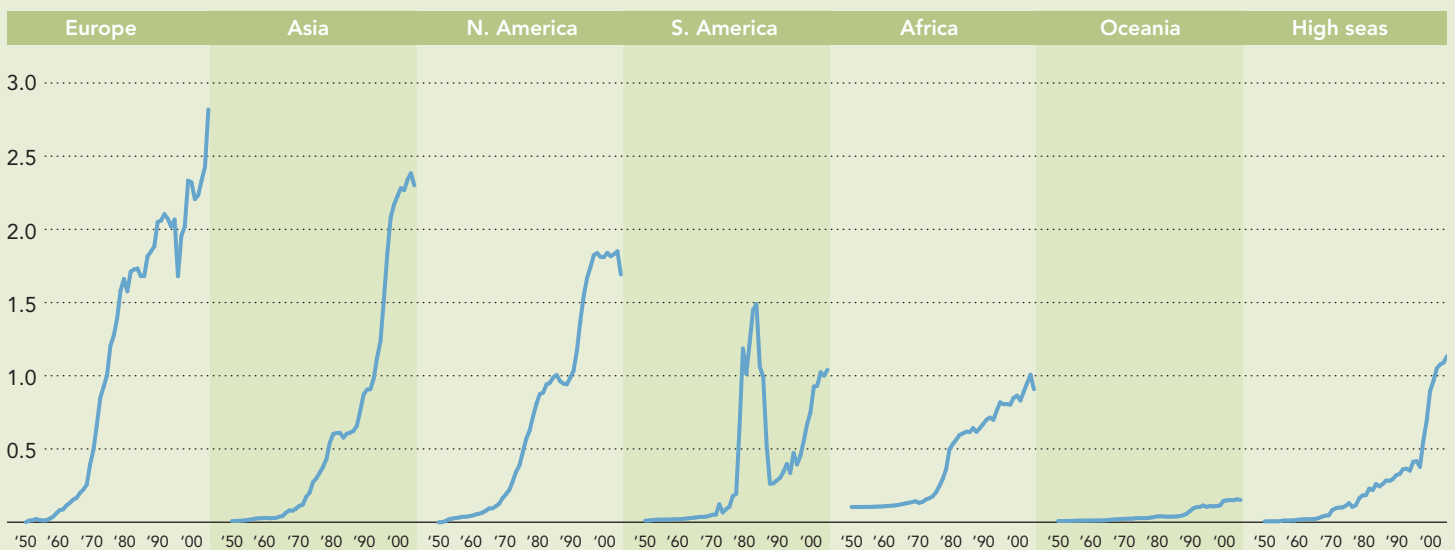


FIGURE 3. CATCH LOSS IMPACT ON GLOBAL UNDERNOURISHMENT LEVELS

If the waters of countries with undernourishment levels greater than 5 percent had not been overfished, the additional fish catch in 2000 could have fed 20 million people, many of them in the world's poorest nations. With better management, the authors found catches in the low-income, food-deficit countries might have been 75 percent greater on average.

NUMBERS OF PEOPLE AFFECTED

In 2000, the number of undernourished people in low-income, food-deficient countries whose food deficit could have been offset by the potential catch loss from their countries' waters (or in Angola's case, their neighbors' waters).



Note: Areas that may not be visible on this map include Kiribati, the Gaza Strip, Seychelles, Maldives, Bermuda, Sao Tome and Principe and Mauritius.

* Because the loss calculated for Namibia exceeded its annual food deficit by a factor of ~11, the authors applied the remainder toward the food deficit of its neighbor to the north, Angola.

Implications

This study shows that the burden of catch losses falls hardest on the world's poor. Although the authors estimated that the largest absolute catch losses over the last 50 years occurred in Europe and North America, where intense, industrial fishing has been practiced the longest, these areas do not have widespread undernourishment, and can offset losses with imports, increasingly from developing countries.

Although many factors can contribute to catch losses, including the rising demand for fish, poor monitoring of fish stocks, capacity-enhancing subsidies and illegal, unregulated or unreported fishing, the authors suggest some of these issues can be mitigated. Options include rebuilding vulnerable fish stocks wherever possible through such efforts as catch quotas or limits, improving monitoring capabilities to track more precisely where and how stocks are being

overfished and providing incentives for good stewardship for fisheries resources.

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