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Devil in the Data: Study Uncovers Sharp Decline in Global Fish Catches

When researchers reconstructed historical data using modern techniques, they determined that nations have not accurately accounted for past fish catches. But a top U.N. fisheries official disputes the scientists' methodology and conclusions.

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Fishers on boat preparing their nets in Mozambique. [Nasr/Getty World/SSG via Getty Images](#)

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NATIONS AROUND THE world are getting better at accurately tracking and recording their fish catches. That's essential information for fisheries managers, who rely on accurate data to set quotas and implement other regulations to protect the health of fish populations. But a new study finds that improvements in recording and reporting have produced false impressions about global catch trends since the 1990s.

The authors of the research, the University of Western Australia's Dirk Zeller and University of British Columbia's Daniel Pauly, contend that underreporting of past landings and increasingly more accurate reporting in recent years have created the statistical illusion that global catches have remained stable for the past 20 years.

In the study published in the journal *Marine Policy*, Zeller and Pauly retroactively adjusted past reported landings and came to an alarming conclusion: Global catches have been declining steadily for two decades. The researchers gathered data from every seafaring country, collaborating with 400 assistants around the world as part of a project called the Sea Around Us.

“Our reconstructed data have shown that globally, the catches have been declining by about 1.2 million metric tons a year since the mid-1990s,” said lead author Zeller, who heads the Indian Ocean branch of the Sea Around Us.

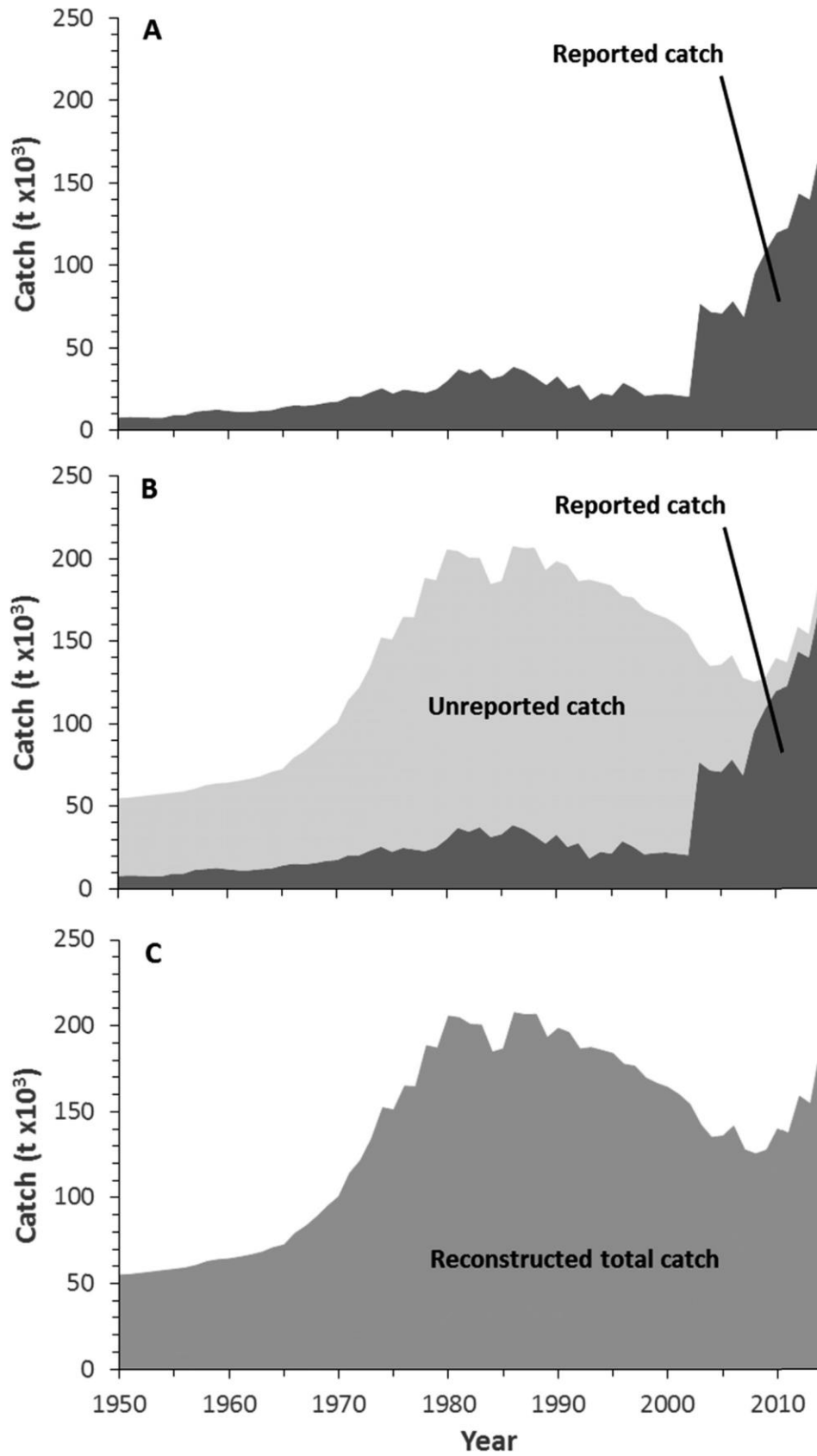
The new study builds upon the researchers previously published research, which has drawn criticism from other fishery scientists, especially among the staff at the United Nations Food and Agriculture Organization (FAO), the entity responsible for the questioned historical data. Manuel Barange, the FAO’s fisheries and aquaculture director, believes Zeller and Pauly have made considerable errors and assumptions in their work.

“We completely disagree with their conclusions of declining global catches,” said Barange, who coauthored a [2017 rebuttal](#) to a 2016 study Pauly and Zeller published in the same journal.

Data from the FAO shows that 86 million metric tons of fish and shellfish were caught in 1996. After that, catches – often termed “landings” – increased slightly and leveled off at just over 90 million metric tons.

“Total landings have been very consistent for 20 years,” Barange said.

But Pauly and Zeller argue this is a chimera. Catches, they believe, have been declining, and year-by-year improvements in the accuracy of data collection have masked this trend with boosted figures that make it appear that landings have remained stable, or even increased.



Marine fisheries catches for Mozambique, (A) Official data as reported by FAO on behalf of Mozambique, clearly showing the sudden and rapid increase in reported catch starting in 2004 as a result of improvements in the national data collection system; (B) Addition of the estimates of unreported catches with emphasis on addressing the presentist bias generated by the improvements in the data collection system in the early 2000s; and (C) Total reconstructed catch, combining reported and unreported catch estimates, and thus providing a more accurate and comprehensive time-series trend in the domestic fisheries. (Science Direct)

Zeller explained that most national fishery agencies that report data to the FAO have used improvements in data collection methodology primarily for current catch reporting but not to reconstruct past catches – a phenomenon described in their new Marine Policy paper as “presentist bias.”

“At best, some of them corrected a few years back,” Zeller said.

So he and Pauly worked backward in time much further – to 1950 – and estimated the landings of recreational fishers and small-scale artisanal fisheries, as well as unreported illegal catches and discarded bycatch. Collaborating with regional assistants in their Sea Around Us program, they calculated that landings in 1996 were actually about 40 percent higher than what the FAO has reported. Using their corrected figure of 130 million metric tons for 1996, and corrected data for every subsequent year, Zeller and Pauly demonstrated that people around the world have been catching fewer fish for more than 20 years.

Zeller says this doesn’t necessarily indicate that fish abundance is declining.

“If fishing effort is decreasing, then that would explain the declining trend,” he said, noting that such seems to be the explanation for decreased landings in the strictly regulated waters of the United States. “However, if effort has remained the same or has increased, it indicates decreasing stocks.”

He says he suspects fishing is increasing among many Asian and African fleets – something he says he is currently investigating as the focus of his next project.

But Barange counters that the Sea Around Us initiative has used “strong assumptions” to reconstruct global catch reports. The FAO, he says, is concerned with accurate data, and he

contends that making corrections backward in time is difficult, if not impossible, to do with reliable accuracy.

“The farther back you go, the more errors you incorporate into your database, and that’s why we have only corrected back as far as we reliably can,” he said. “The implication that a corrected database is better than an uncorrected database is a fallacy.”

Pauly and Zeller closely studied two nations – Mozambique and Tanzania – in preparing their latest paper. They said Mozambique highlights the problems associated with abruptly improving data tracking methods while failing to reconstruct past – and presumably underreported – landing data.

From 1950 through 2003, Mozambique’s fisheries reported landing anywhere from 10,000 to 30,000 metric tons of fish annually. Starting in 2004, after installment of new and improved data collection systems, reported landings increased eight-fold over the previous year. Pauly and Zeller showed how corrections to historical data completely reversed the statistical trend in landings. They calculated that fishing fleets had caught but never reported millions of metric tons of fish over several decades, and the corrected data showed a peak in landings in the 1980s followed by a 30-year decline of roughly 25 percent.

If landings are indeed declining globally in spite of intensified fishing efforts, it would indicate dire problems with fisheries sustainability. Crow White, a professor of coastal marine sciences at California Polytechnic State University who was not involved in the new research, says he recognizes that correcting for catch data errors in the past is a difficult task involving some level of guesswork. But guesswork in reconstructing catches, he says, “is better than nothing.”

Though it isn’t clear how a reconstructed history of global catches could be used to help manage fisheries, White believes that Pauly and Zeller’s work offers “a cautionary message” worth hearing, if not necessarily incorporating into the FAO database.

“Just recognizing there has been unreported fishing and trying to make a correction for that is worth the effort, because if people look at the data and see rising landings, they think, ‘Great, we can put more fishing boats on the water,’” White said. “But if we see stable or declining landings, that’s a very different message.”

DANIEL PAULY DIRK ZELLER, SEA AROUND US SUSTAINABLE FISHING

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