



# Counting the fish eaten rather than the fish caught

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Counting fish underwater is more difficult than counting sheep on a pasture but is needed to support fishery management and to enumerate the contribution fish catches currently make to human society in the form of food, income, and revenue. Inland fisheries are particularly challenging to monitor and assess. They take place in variable and structurally complex environments, such as river floodplains and swamps, and are mainly found in resource-poor countries of the global South, and the larger ones (e.g., the Amazon, the Mekong, and the African Great Lakes) straddle national boundaries, requiring interstate collaboration for their governance. Moreover, the fish caught from the myriad smaller lakes, reservoirs, floodplain forests, and river tributaries escape being recorded because they are consumed directly by those who catch them or sold in informal markets in remote areas, far from the gaze of any reporting or management authority. In response to these challenges, Fluet-Chouinard et al. recently reported on a study that assesses fish catches by counting how many fish are eaten (1). Rather than trying to improve how we count fish through ecological surveys or to correct for the weaknesses in catch statistics, as others have previously done (2, 3), they have back-calculated national and global inland fishery harvests using estimates of consumption of freshwater fish from household consumption and expenditure surveys administered to 548,000 households across 42 countries.

The consensus among fisheries scientists working on freshwater fisheries is that difficulties in assessing freshwater fish catches result in them being underreported and consequently undervalued (4). Fluet-Chouinard et al.'s (1) studies reveal that freshwater catches are, on average, likely to be ~65% higher than those officially reported by national governments to the United Nations (UN) Food and Agriculture Organization (FAO). The FAO is charged with compiling and disseminating fishery statistics. Global summaries are published every 2 y in the influential *State of World Fisheries and*

*Aquaculture* reports (5). These statistics are then used by FAO, working with its 192 member countries, to craft appropriate management and policy measures to ensure that fisheries contribute sustainably and equitably to poverty reduction and human nutrition. The "hidden harvests" reported above are concentrated in low-income countries where they represent the equivalent of the total annual animal protein consumption of 36.9 million people (1). This is a significant finding because long-term underreporting of inland fisheries has masked their critical role in feeding the world's poor and has confounded efforts to use catch statistics, with other biological information, to evaluate the impact of overharvest and ecosystem degradation.

In using a household food consumption survey methodology, the study contributes to a rapidly growing policy discussion about the role of fish in nutrition and food security, a discussion which is emphasizing the important contribution that fish—wild, marine, freshwater, and farmed—make to micronutrients such as vitamins A and B12, zinc, and iron (e.g., 6–8). By showing that the world's under-pressure surface freshwaters (9) contain more fish and are more important for nutrition than we previously thought, the authors remind water resource managers and national policy makers and decision makers to add fish to their plans to use water for crops, people, hydropower, and the dilution of pollutants. How water is managed is key to maintaining fish habitat and supporting an important food source. Fish also act as a "bank in the water" (10) for rural households to draw from to meet short-term expenditure needs or to trade for other forms of capital.

The new study comes with numerous caveats, which the authors are conscientious in documenting. Cross-checks with other studies and alternative methodologies—notably from the World Bank, FAO, and WorldFish (11) Big Numbers or Hidden Harvests projects—provide valuable insights here. Fluet-Chouinard et al. (1) highlight the remarkable convergence between their 65% estimate for global underreporting and the

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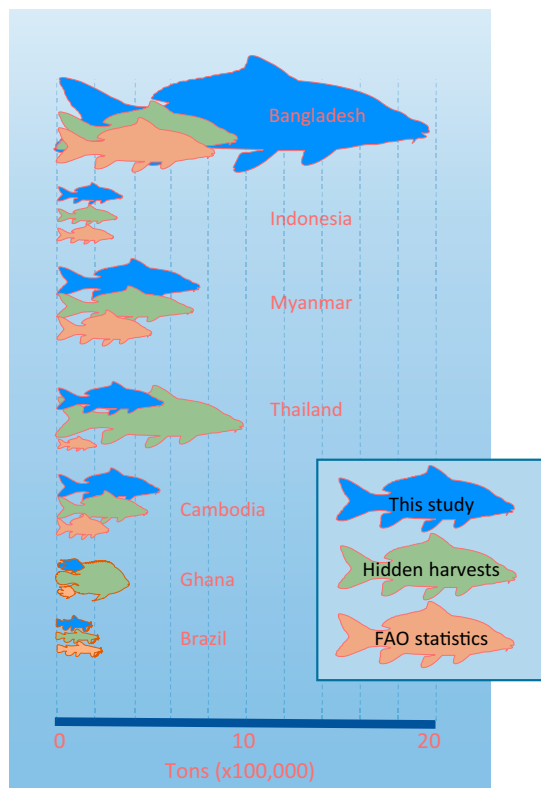
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**Fig. 1. Comparison of inland fishery catch estimates for countries that are represented in both the new study based on household fish consumption data (1), represented as blue fish, and the earlier FAO/World Bank/WorldFish Hidden Harvests study (6) represented by green fish. National catch statistics as reported by countries to FAO are the orange fish.**

estimate of 70% from the Hidden Harvests project, which employed diverse methodologies across case-study countries. Among countries in common between the two studies (Fig. 1), a repeated pattern of underestimation in formal (FAO) catch statistics can be seen, while the two independent studies vary in the agreement of their national production estimates. For Bangladesh, consumption-based estimates from the new study contrast with those from a “reconstruction” approach taken in this particular Hidden Harvests case study, which supplemented official statistics with localized study findings. For Ghana, the Hidden Harvests estimate was largely derived from market surveys around Lake Volta. Much of this catch is immediately exported into neighboring countries (notably Togo), likely through informal, undocumented routes, possibly confounding adjustments to consumption estimates. Clearly, good trade statistics are essential to this estimation exercise, and unfortunately a preoccupation with studying global value chains has led local and regional ones to be understudied (12). This highlights the value of employing a “tapestry” of methods for estimating inland fishery production. Fluet-Chouinard et al. (1) considerably strengthen the case for the central role of consumption studies in this tapestry.

Critically, the accuracy of production estimates is also contingent on being able to separate out the growing contribution of farmed fish from wild at a time when more than half the world’s fish consumed directly by humans are farmed. This attribution issue is particularly fraught in countries with major aquaculture production of the same species that are represented in the wild fishery (e.g., Thailand, where tilapia,

snakehead, and Mekong striped catfish are both farmed and wild). The aquaculture–capture division is further complicated by the blurring of aquaculture and wild fisheries in cases of fishery enhancement from either on-growing of wild-caught juveniles for later harvest (termed ranching or fattening) or from the release of hatchery-reared fish (13).

Does it matter whether fish are farmed or wild? There is a vigorous ongoing debate about the extent to which aquaculture can complement or replace the economic and nutritional contributions of capture fisheries (14), but looking at countries with high dependence on fish for nutrition and with populations at high risk for micronutrient deficiencies or general malnutrition suggests that many of these countries have yet to develop significant aquaculture production and will continue to be largely dependent on capture fisheries, and often inland capture fisheries, for the short to medium term (15, 16). Moreover, aquaculture and fisheries deliver benefits to different people in different ways. With some exceptions—common-pool floodplain waters in Bangladesh (17), for example—the benefits of aquaculture will accrue mainly to those who have access to land. It is the rural landless poor who depend most on common pool resources, such as common grazing land, wildlife and wild plant resources, and inland and nearshore fisheries (18), and thus an equitable inland fish production system will attempt to balance the production and growth potential of aquaculture with the “safety net” function of inland capture fisheries—not to mention the cultural and recreational contributions that such fisheries make (19).

We must stress that the numbers do not tell the whole story of inland fisheries’ societal role and value. Although the authors reasonably surmise that bigger numbers garner greater policy attention, we must also continue to draw on qualitative inquiry in the social sciences and humanities to understand and valorize the role that inland fisheries play. The embeddedness of freshwater fishing in riparian societies and cultures of the Mekong, Ganges, Congo, and Amazon River basins and African Great Lakes regions cannot be conveyed by fish tonnages alone. On Cambodia’s Tonle Sap, the seasonal flood cycle drives a livelihood system that includes rice farming, fishing, and hunting for water snakes (20), and on the African Great Lakes a traditional “trierarchy” of fishing, farming, and herding helps sustain livelihoods in fluctuating climatic conditions (21). In Namibia’s Caprivi region, local identity is defined by engagement in fishing (22). These stories can also resonate with policy makers, where narrative can be as influential as data (23). In governing water resources, a move beyond sectoral approaches seems essential (24), as water, food, energy, livelihoods, nutrition, and health are all tightly coupled to the hydroecology.

A further caveat is that awareness of these contributions of inland fisheries, even backed by bigger numbers, will not necessarily change the political and economic impetus for large-scale water resource management interventions. A recent comparative analysis of five case studies of hydropower development from the Amazon basin (25) concluded that fishers have generally been marginalized or excluded from decision making pertaining to planning, construction, mitigation, compensation, and monitoring of the impacts of hydroelectric dams, despite the accumulating evidence of their importance.

The attempt by Fluet-Chouinard et al. (1) to reconcile high levels of freshwater fish consumption with low reported fish catches brings to mind the biblical story of Jesus feeding 5,000 people with five loaves of bread and two fishes. This could be read as a parable, a miracle, or an extreme case of catch underreporting. Less

flippantly, study of biblical texts on fishing reveal that, in much of the world, the societal role of inland fisheries remains substantially unchanged two millennia later: In the Sea of Galilee (Lake Kinneret) fisheries were socially embedded activities and fish were a valued food, but fisherfolk were reported as poor and marginalized (26). If

bringing the “hidden harvests” of inland fisheries to the surface helps to create a more supportive policy environment for the livelihoods, aspirations, and food systems of the world’s riparian people, and the continued resilience of freshwater ecosystems, then their paper will have contributed to a small miracle.

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