



# Catch Reconstruction

## Methods in-depth

### Overview

Fisheries scientists have long recognized the importance of thorough, accurate catch data in understanding the pressures on target species. However, it is often challenging to collect such data for certain types of catch, such as small-scale fisheries and bycatch. Experts are searching for ways to generate better information about these categories.

One promising approach to meet this imperative is “catch reconstruction,” which offers preliminary estimates of catch using a broad range of sources and methods. These estimates are not a substitute for the global data reported by countries to the U.N. Food and Agriculture Organization. Rather, they are a supplement that can indicate important trends and provide guidance on how best to improve data collection.

A global catch reconstruction will be completed in 2014, with estimates from 1950 to 2010 broken down by year and taxon for more than 200 countries and territories. This research is led by the *Sea Around Us* project of the University of British Columbia and supported by The Pew Charitable Trusts.

## Catch reconstruction methodology

The following presents the methods of catch reconstruction in four steps, along with the most common sources of data:

- **Start with official data:** National data, which are also reported to the FAO, generally form the starting point for catch statistics. These data often focus on commercial fishing, especially from the industrial sector, and sometimes from other commercial sectors as well.
- **Identify additional catch data:** By consulting experts and the academic literature, researchers compile a list of catch that is not included in the official data. This list may include whole sectors (e.g., artisanal, recreational) or specific gears or taxa. They then identify sources of relevant data through more extensive consultations and searches of the scientific literature and other documents.
- **Develop “anchor points”:** The additional data described above are used to develop data anchor points in time for each missing category in the fishery. This approach is used because many data sources provide only estimates at a specific point rather than time series.
- **Interpolate and sum:** Linear interpolation is used to fill in the data between each anchor point. For example, if catch records are missing from 1960 to 1965, the catch is not assumed to be zero, but rather interpolated linearly between the catches in 1959 and 1966, unless evidence suggests the fishery stopped. Once all categories are filled in with a catch estimate for each year, the catch reconstruction is complete, and total catch can be estimated. The final data identify catch by sector, taxon, and year.



Father and son set octopus pots off the coast of Spain. The EU fishing fleet includes about 85,000 vessels, varying from local artisanal fishing boats to large ships that operate globally.

### The Reporting Process for FAO Catch Data

To ensure rigor and comparability, the FAO recommends that countries collect catch data directly from fisheries and in a standard format. However, it is challenging to comprehensively gather such data for small-scale fisheries, in part because they are highly decentralized. Reports from developing countries in particular do not always clearly state their methods and assumptions. In some cases, the FAO does not receive any data from a member country for a number of years. Catch reconstruction offers a supplementary source of data for such situations.

## Data sources

- **Per-capita estimates:** Expert judgment and the academic literature can be combined with official nonfishery data to estimate catch. For example, subsistence catch can be estimated by multiplying rates of subsistence consumption by human population. And recreational catch can be estimated from data on the number of tourist visits, combined with estimates based on surveys or official “bag” limits.
- **Underreporting factors:** Similarly, expert judgment and published research can often be used to estimate the rate of underreporting. For example, to reconstruct commercial catch for The Bahamas, researchers multiplied the reported catch by an official’s estimate of the commercial landings not covered by official surveys. For Senegal, researchers derived an underreporting factor for artisanal fishing by dividing the fishing effort observed in a survey of fishers by the official reported effort.
- **Catch per unit effort data:** For fishing fleets known to underreport catch, researchers can derive an alternate estimate by multiplying observed catch per unit effort data from published literature by the number of days fished, as reported by industrial operations or estimated by the government. Industry reports generally provide a conservative estimate of days fished because taxes and fees are often based on this number, which gives an incentive to underreport. (Underreporting of catch per unit effort tends to be less severe than underreporting of catch.)
- **Calculations from enforcement activities:** For illegal fishing, data from law enforcement are sometimes sufficient to estimate the illegal catch at a given point in time. This estimate can then be adjusted for other years based, for example, on annual data on the number of arrests.
- **Estimated starting dates:** If the start date of a fishery is unknown, researchers do not assume it appeared suddenly in the year when the official catch statistics begin. Rather, they make conservative assumptions about the beginning and ending dates. For example, if a fishery existed in 1950, but data were not recorded until 1955, expert opinion might be used to set the catch in 1950 at half of that in 1955. Or a starting year might be chosen based on expert judgment, with catch set to zero that year and assumed to increase linearly until the year of the first catch estimate. This issue is most common for recreational fishing.
- **Bycatch ratios:** Government data and published literature sometime contain ratios of bycatch species to target species for specific fleets or fishing gears. These can be used to estimate total catch, including discards, based on the catch or landings of the target species.
- **New surveys:** In a few cases, researchers conduct surveys to obtain crucial information. For example, hotels in The Bahamas were queried to develop estimates of fish consumption per tourist at hotel restaurants. The amount of fish consumed per visitor was multiplied by hotel occupancy rates to estimate catch.



Photo: Corey Arnold

The day's catch of shrimp and crab for one vessel in Scotland.



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