



# **The Global Reach of Seafood Fraud: a Current Review of the Literature**

June 2014

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Seafood fraud, the misrepresentation of seafood, has been discovered all around the world. Seafood fraud can take many forms, including false labeling, species substitution, short-weighting and over-glazing to hide the correct identity, origin or weight of the seafood. Oceana's campaign to Stop Seafood Fraud focuses on a particular type of fraud: species substitution. To date, Oceana has conducted six seafood studies, which revealed mislabeling in 20 states and Washington, D.C., as well as in France. Oceana's [National report](#), released in 2013, is one of the most widely cited reports about seafood fraud in the media. Notably, many other scientists, governments, students and conservation and consumer organizations have conducted studies focused on seafood fraud, including species substitution. Oceana compiled a review of these studies from around the world to assess the global scope of seafood fraud, mislabeling and species substitutions. In this report, we present major findings from the literature review including general trends and alarming examples about the impact of seafood fraud on our oceans, wallets and health.

## **Major findings from the literature review**

**All studies that have investigated seafood fraud have found it** – not a single study has reported 0% fraud overall. The vast majority (91%) of studies focused their sampling at the retail end of the supply chain (restaurants and grocery stores). The few studies that sampled mid-chain were split between landings, distributors, processors, and wholesalers.

Along with six Oceana studies, the review covers 67 peer-reviewed studies, seven government reports and 23 news articles for a total of 103 sources. The review includes mostly surveys of seafood species sold at retail (88 surveys), but also covers instances of fraud such as government investigations of illegal practices in the industry and other observations by scientists, governments, and consumers (14 instances). One literature review from 2008 about seafood mislabeling is also included.

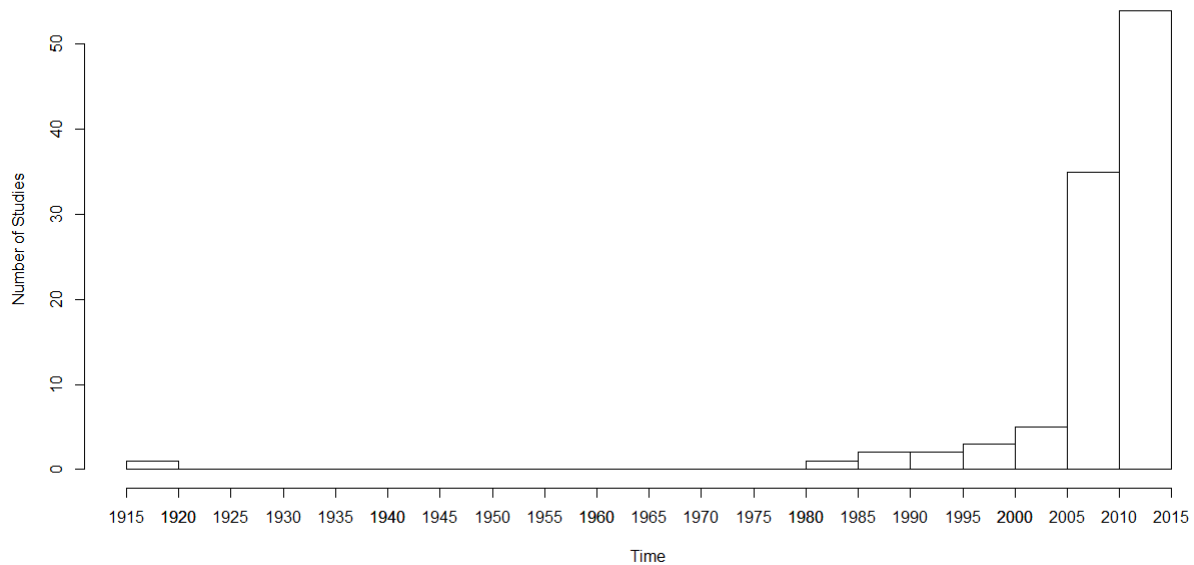
Academics, conservation and consumer organizations, governments, journalists and students have exposed seafood fraud around the world. **To date, studies and investigations have been conducted in 29 countries and on all continents except Antarctica.** In this review, the United States has the highest number of studies on seafood fraud at 39, followed by Spain at 14 and Italy at 11.

Studies vary in size, ranging from three to 4651 samples. The average size of the studies is 150 samples. Oceana's 2013 study is the second largest study of seafood fraud in this review, with 1247 samples (Warner et al. 2013). Although the percentage of seafood fraud found in these studies ranges from 1.5%

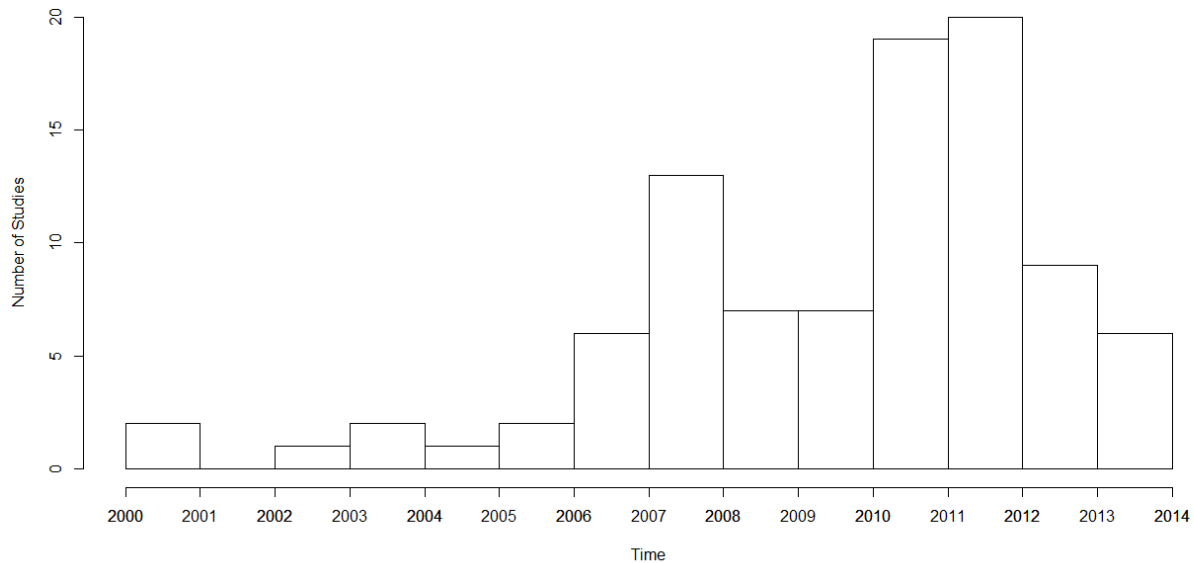
to 100%, **the average level of mislabeling found in these studies is 22%**. This average value is weighted by the sample size.

Seafood fraud is not new and has been in the press for nearly a century. The earliest account of seafood fraud identified thus far comes from a news report from 1915, while the most recent was published in 2014. Figure 1 below displays a timeline of the studies. As you can see, **most studies have been conducted since the turn of the 21<sup>st</sup> century** (see Figure 2). This increase can be attributed to rapid advances in DNA-based technology, the species authentication method used by most researchers today. DNA-based technology has simplified the process of species identification and made it more cost-effective than the previous technique called isoelectric focusing.

**Figure 1: Seafood fraud studies over time**



**Figure 2: Seafood fraud studies over time, 2000-2014**



## Which species are commonly mislabeled?

**Red snapper stands out as a commonly mislabeled fish all over the world:** studies in the U.S., Canada, Columbia and Panama had levels of fraud ranging from 46-100%. Oceana combined the results of 11 studies on red snapper to verify how common red snapper mislabeling is, and 81% of 408 samples of red snapper were found to be mislabeled. To be considered a true red snapper, a sample must be confirmed as the correct species (*Lutjanus campechanus*), according to the U.S. Food and Drug Administration (FDA)<sup>1</sup> and other regional governing bodies. Other species of snapper, as well as white fish such as tilapia, are commonly swapped in for genuine red snapper.

Other commonly mislabeled species include cod, grouper and wild salmon. Seafood fraud is also common in jellyfish, abalone, anglerfish, skate and octopus.

## Seafood mislabeling has negative implications for our oceans, our wallets and our health

**Oceans:** Seafood fraud has negative impacts on our oceans. Notably, a recent academic study found that 20-32% of wild-caught imported seafood in the U.S. comes from illegal, unreported and unregulated (IUU) fisheries (Pramod et al. 2014). Many studies in this literature review demonstrate evidence of illegal seafood being laundered, such as IUCN<sup>2</sup> Endangered sturgeon caviar sold as legal caviar. Other IUCN Endangered or Vulnerable species that have been passed off as more sustainable choices include bluefin tuna, blue and thresher shark and skate. Even products with eco-labels are not immune to fraud – one study found that some Marine Stewardship Council certified Chilean seabass was mislabeled (Marko et al. 2011). Some of the most alarming examples demonstrating the implications of seafood fraud for ocean conservation include:

<sup>1</sup> See FDA <http://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm074504.htm>. Accessed 6 June 2014

<sup>2</sup> International Union for the Conservation of Nature, <http://www.iucnredlist.org/search>

- A study in Brazil found that 55% of 44 samples labeled as "shark" were identified as largemouth sawfish, an IUCN Critically Endangered species prohibited for sale in Brazil. Ambiguous labeling of seafood is a gaping loophole which enables endangered and illegal fish to be sold on the market (Melo Palmeira et al. 2013).
- A study in New Zealand examined 587 shark fin and meat samples that were collected at the dock. It found that 40% of the samples labeled as "lemon fish" (a type of shark) were mislabeled. In addition, a portion of the shark fins came from species prohibited for harvest: hammerhead shark and bronze whaler (Smith and Benson 2001).

**Wallet:** Oceana's literature review demonstrates that in many cases (42 studies), profit is cited as a primary motive behind seafood mislabeling. Many of the studies show that lower cost species are swapped in for more expensive ones, such as passing off tilapia as red snapper. Notably, Oceana examined the direct economic impact of seafood fraud for consumers in [a 2013 report](#). Some of the most alarming examples found about the impacts of seafood fraud on our wallets include:

- In 1989, FDA's Chicago district seized a 45,000 pound lot of oreo dory that was imported from New Zealand and bound for Ohio, labeled as "orange roughy." Although both species come from New Zealand, orange roughy sold for \$6 per pound while oreo dory sold for \$2. The FDA estimates the firm could have realized an unfair profit of about \$150,000 (Foulke 1993).
- Grouper is commonly mislabeled because it is popular, expensive and easily substituted with other types of white flaky fish. Researchers in Spain tested 70 samples of "grouper" and found that a whopping 82.6% of them were mislabeled. Substitutions included Nile perch and wreck fish, both of which cost less than genuine grouper (Asensio et al. 2008a).

**Health:** Several studies point to clear implications of seafood fraud for public health. Escolar and oilfish, related species which cause unpleasant gastrointestinal effects in some consumers, have been passed off as "white tuna" in U.S. sushi bars, as "sablefish" in the Philippines, as "cod" in Hong Kong and as "mackerel" in the Czech Republic. In addition, fish with high mercury levels such as tilefish, king mackerel and shark have been disguised as other species, both in Oceana's studies in the U.S. and in South Africa. The U.S. Food and Drug Administration advises women of childbearing age and children to avoid these fish known to have high mercury levels. Some other alarming examples of public health impacts from seafood fraud include:

- In Chicago, two people became ill when they unknowingly purchased and consumed pufferfish, a species that contains a harmful neurotoxin. The sample was mislabeled as "monkfish." Without honest labeling and supply chain traceability, consumers face the risk of severe health problems (Cohen et al. 2009).
- Researchers in Spain tested 34 samples labeled as "common octopus" (*Octopus vulgaris*) and found that eight were mislabeled (24%) and four had misleading labels (12%). Several labels also featured "octopus" as the main ingredient on the front of the package, but actually listed "squid" in tiny print on the back (Espiñeira and Vieites 2012). This swap is a concern for consumers with seafood allergies.

This review of known seafood fraud studies clearly demonstrates that seafood fraud is a global problem. As demand outstrips supply of popular seafood, unscrupulous players in the seafood trade are more than ready to substitute cheaper or more plentiful species to make a profit. With little oversight, inadequate traceability, transparency and accountability in the global seafood trade, fraudulent and illegal practices abound which harm our oceans, our wallets and our health. **The U.S. and other major seafood trading nations must require boat-to-plate traceability for wild and farmed seafood to combat this global problem and verify legality of product in the supply chain while providing consumers with more information about the seafood they eat.**

## Building the seafood fraud database

To demonstrate the scope of seafood fraud, specifically mislabeling and species substitution, we reviewed the published literature, including peer-reviewed and popular literature as well as public government documents. Oceana used this literature to compile a database and an [interactive seafood fraud map](#) as well as compile information on general trends, presented in this document. The icon locations on the map are based on the general geographic location that the study was conducted, to the level of specificity possible or practical. For example, the 14 metropolitan areas included in Oceana's National report are mapped, but not the surrounding seven states sampled in the study. For studies that did not provide specific sampling locations and only provided the country, icons were placed on the capital city or seat of government for that country. Note that icons on the map do not represent actual retail or sampling locations. As new studies are published and added, the map will be updated. The information in this document is current as of June 2014. If you have questions, comments, or know of additional studies not included here, please email [seafoodfraudmap@oceana.org](mailto:seafoodfraudmap@oceana.org).

**Acknowledgements:** This project was made possible by a grant from Google to use the [Google Maps Engine](#) product. Thank you to Oceana staff who contributed to this effort, including Beth Lowell, Jackie Savitz, Andrew Cooper, Chloe Young, Alexander Bea, Dustin Cranor, Amelia Vorpahl, Brienne Mecum and Heather Lane as well as the many beta-testers. Thank you also to Devin Dotson at American Rivers for help getting started with Google Maps Engine.

**If you would like to reference the map, please use the following citation:**

Golden, R. E. and Warner, K. 2014. The global reach of seafood fraud. Accessed DD-MM-YYYY. <http://oceana.org/en/our-work/promote-responsible-fishing/seafood-fraud/seafood-fraud-map>

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