



Widespread Seafood Fraud Found in L.A.

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Executive Summary

Seafood is one of the most popular and healthy protein sources available. Yet, consumers are routinely given little or incorrect information about the seafood they are eating.

As seafood imports continue to increase in the United States, the path from fishing boats to our plates becomes more complex and opens the door for illegal activity. Seafood fraud encompasses any illegal activity that misrepresents the seafood you purchase, including mislabeling or substituting one species for another.

Seafood fraud impacts consumers' pocketbooks and the business of honest seafood vendors and suppliers. Seafood mislabeling may also pose health risks in the form of allergens, contaminants or pathogens in substituted species. Seafood fraud threatens not only our health, but the health of our oceans, as illegally harvested or overfished species may be substituted for those that are legal and sustainable.

As part of our new campaign to stop seafood fraud, Oceana recently investigated seafood mislabeling in Los Angeles and Orange counties in California and found widespread mislabeling. In May and December of 2011, Oceana staff and supporters collected 119 seafood samples from grocery stores, restaurants and sushi venues in Southern California. The targeted species included those that were found to be mislabeled from previous studies and those with regional significance, namely wild salmon, Dover or other regional soles, red snapper, yellowtail and white tuna. Eighteen types of seafood were collected and analyzed to determine if the seafood was properly labeled under both California and federal law.

Key Findings:

- **Overall, 55% of the samples collected (65 out of 119) were mislabeled according to federal guidelines.** Even following the standards of a California law that allows 13 species of rockfish to be labeled as "Pacific red snapper," the percentage of mislabeled fish would be reduced by only one percent, to 54%. Fraud was detected in 11 out of the 18 different types of fish collected, with snappers, white tuna and yellowtail being the most frequently mislabeled.
- **Every single fish sold with the word "snapper" in the label (34 out of 34), was mislabeled according to federal guidelines. Even according to California law, only one "Pacific red snapper" was labeled properly.**
 - o None of the ten species substituted for snapper in our study are among the 47 fish species that the U.S. Food and Drug Administration (FDA) allows to be marketed nationally as "snapper."
 - o Pacific rockfish comprised roughly half of the species mislabeled as snappers, but only one sample was both properly labeled under California (but not federal) law as "Pacific red snapper" *and* was one of the 13 species allowed to be sold by this name under California law.

- o Consumers buying fish labeled as “red snapper” (or any other type of snapper) in Southern California could receive anything from farmed tilapia to pollock, in addition to any one of the overfished or vulnerable rockfish species.
- **Nearly nine out of every ten sushi samples from our targeted sampling were mislabeled.** The amount of seafood mislabeling detected (according to FDA standards) varied greatly among the three types of retail venues sampled, with sushi venues ranking the highest at 87%, grocery stores the lowest at 31% and restaurants in the middle at 45%.
- **Eight out of nine sushi samples labeled as “white tuna” were actually escolar, a snake mackerel species that carries a health warning for its “purgative” effects.** Escolar was also substituted for both samples labeled as “ono.”

The types of fraud uncovered in our study include: confusing and misleading use of vernacular terms; disguising well-managed, vulnerable and overfished species under a single name; substituting one fish that carries a health warning for another; and economic fraud, where cheaper or less desirable fish are substituted for the marketed fish in pursuit of higher profits.

Full traceability of seafood from boat to plate and providing more information for consumers about the seafood they are purchasing are the ultimate solutions we need to stop seafood fraud. In the meantime, increased inspection, specifically for seafood mislabeling, at the border and in the domestic seafood industry is needed to discourage dishonest practices along the increasingly obscure seafood supply chain.

Introduction

Seafood is one of the most popular foods in the U.S., yet consumers know little about the seafood they are eating. While this report focuses on mislabeling (substituting one species of fish for another), other types of fraud include providing less fish than what is indicated on the packaging and adding excessive water or breeding to seafood.

Following recent studies that found seafood mislabeled as often as 25% to 70% of the time for fish like red snapper, wild salmon and Atlantic cod, Oceana launched a dedicated campaign to Stop Seafood Fraud in May 2011. Later that year, *The Boston Globe* and Oceana conducted separate studies on the seafood sold in the Boston area, which revealed that up to 48% of the seafood sold in grocery stores and restaurants was mislabeled, disguising species that were often less desirable, cheaper or more readily available.^{1,2,3}

The U.S. imports 84% of its seafood, ranking second among the world’s top seafood importing nations.⁴ The complex and often obscure path that seafood takes from boat to plate opens the door for illegal activity, making it easy to hide where fraud occurs along the supply chain. A U.S. government audit in 2009 revealed that of the 84% of seafood imported into the U.S., only 2% was inspected and less than 0.001% specifically for seafood fraud.⁵ In response to heightened media attention to the issue of seafood fraud, key federal agencies responsible for seafood inspections have recently announced plans for increasing capacity to address this issue.^{6,7}

¹ Abelson, J. and B. Daley. 2011. On the menu, but not on your plate. *The Boston Globe*, October 23.

² Abelson, J. and B. Daley. 2011. Fish supply chain open to abuses. *The Boston Globe*, October 2.

³ Warner, K. 2011. Seafood Fraud Found in Boston-Area Supermarkets. Oceana. http://oceana.org/sites/default/files/Boston_Seafood_Testing_Report_FINAL.pdf.

⁴ Food and Agriculture Organization of the United Nations (FAO). 2011. The State of the World’s Fisheries and Aquaculture. Accessed 3/28/12: <http://www.fao.org/docrep/013/i1820e/i1820e01.pdf>.

⁵ Government Accountability Office (GAO). 2009. SEAFOOD FRAUD - FDA Program Changes and Better Collaboration among Key Federal Agencies Could Improve Detection and Prevention. GAO 09-258. Accessed 3/25/12: <http://www.gao.gov/new.items/d09258.pdf>.

⁶ Abelson, J. 2012. Bid to fight mislabeled fish gets ramped up; FDA launching effort to perform DNA tests. *Boston Globe*, March 13.

⁷ Lindsay, J. 2012. That’s fishy: Feds fight fraud in seafood sizes. *Associated Press*, March 15.

Seafood sold in interstate commerce is regulated by the FDA.⁸ Under the Federal Food, Drug & Cosmetic Act, “misbranding” of seafood in interstate commerce is illegal; seafood is “misbranded” if its labeling is misleading or if it is sold under the name of another food.⁹ One of the tools used to guide seafood labeling is the FDA Seafood List, which lists the acceptable market names, scientific names and scientific common names for roughly 1,700 species of seafood sold in the U.S.¹⁰

Labeling seafood with something other than the acceptable market name may be considered misbranding. The FDA Seafood List also includes “vernacular” names for some seafood species, which are those that may be widely known locally, but not used or not recognized as the same species elsewhere. The FDA’s general policy on vernacular names is that they are unacceptable market names for seafood.

An example of a vernacular name is the name “Pacific red snapper” or “red snapper,” which is often used within California to refer to Pacific rockfishes. In fact, California law allows 13, but only 13, different species of Pacific rockfish sold within the state to be labeled with the specific wording “Pacific red snapper.”¹¹ However, in most other states “red snapper” refers to a specific reef species, *Lutjanus campechanus*, which is only found in the western Atlantic and Gulf of Mexico in tropical and semi-tropical waters. Because of the potential for confusion, the FDA allows only this species to be labeled “red snapper” nationally and FDA policy is very clear that labeling rockfish as “red snapper” is a violation of federal law:

BACKGROUND:

The name “red snapper” has been preempted by many years of consistent consumer usage as meaning only the fish, *Lutjanus campechanus*. Because of the high esteem in which this fish is held by consumers, and the relatively limited catch, there have been numerous attempts to substitute other, less expensive fishes for this species. Substituted less desirable species have included members of the family Lutjanidae [other snapper species], groupers, a number of West Coast rockfishes of the genus *Sebastes*, and other species. The West Coast rockfishes have, until relatively recently, been distributed mostly locally, and thus have been beyond the reach of the Federal Food, Drug, and Cosmetic Act. Some of the states on the Pacific Coast have officially sanctioned “red snapper” as an alternative name for such members of the *Sebastes* genus, although these fishes are quite different in appearance, flavor and texture, and are generally regarded by consumers familiar with *Lutjanus campechanus* as inferior.

POLICY:

The labeling or sale of any fish other than *Lutjanus campechanus* as “red snapper” constitutes a misbranding in violation of the Federal Food, Drug, and Cosmetic Act.¹²

However, because the FDA cannot regulate mislabeling of seafood until it crosses state lines, the FDA cannot prevent rockfish caught and sold within California from being labeled as “red snapper” or “Pacific red snapper.” The inconsistent use of vernacular names as market names for seafood only generates confusion for customers trying to make informed seafood choices.

⁸ Except for catfish, which is regulated by the U.S. Department of Agriculture.

⁹ 21 U.S.C. §§ 331(b), 343.

¹⁰ US Department of Health and Human Services, Food and Drug Administration (2010). Guidance for Industry: The Seafood List –FDA’s Guide to Acceptable Market Names for Seafood Sold in Interstate Commerce. Accessed 3/28/12: <http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/Seafood/ucm113260.htm>.

¹¹ CAL. CODE REGS. tit. 14, § 103. See Appendix A2 for list of rockfish species.

¹² FDA Compliance Policy Guide CPG Sec. 540.475 Snapper – Labeling. Accessed 3/28/12: <http://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm074504.htm>.

Our Study

Oceana staff and supporters sampled seafood in Los Angeles and parts of Orange County in May and December of 2011. Within these counties, coastal towns were targeted as well as the downtown and Hollywood areas of L.A. County, since these locations had restaurants serving the most seafood of interest.

Fish samples were collected from grocery stores, restaurants and sushi venues. Most of the restaurants and all of the sushi venues visited were in L.A. County. Restaurants and sushi venues included those that were Zagat rated for “Most Popular” and “Seafood” and those recommended by Yelp or others. Grocery stores were selected based on proximity to targeted restaurants and sushi venues.



From maps.google.com

A total of 119 samples were collected from three types of retail establishments: 45 from grocery stores, 31 from restaurants and 43 from sushi venues. The targeted species included those that were found to be mislabeled from previous studies and those with regional significance, namely wild salmon, Dover or other regional soles, red snapper, yellowtail and white tuna. These targeted species made up the bulk of the samples, but our collection efforts included a total of 18 different types of fish, based on the label as sold.

Types (and Number) of Fish Purchased in Los Angeles and Orange Counties					
snapper (34)	salmon (20)	sole (16)	tuna (13)	yellowtail (7)	halibut (6)
Chilean sea bass (5)	butterfish (3)	cod (3)	flounder (2)	mahi mahi (2)	ono (2)
swordfish (2)	bass, striped (1)	grouper (1)	haddock (1)	skate (1)	wahoo (1)

Note: Red bold typeface indicates fish types where fraud was detected.

Forensic DNA analysis for fish species identification was conducted by two different laboratories. The majority of the samples were analyzed by DNA “barcoding.” This technique involves extracting a short DNA sequence from a gene found in all animals, which is then compared to a catalogue of more than

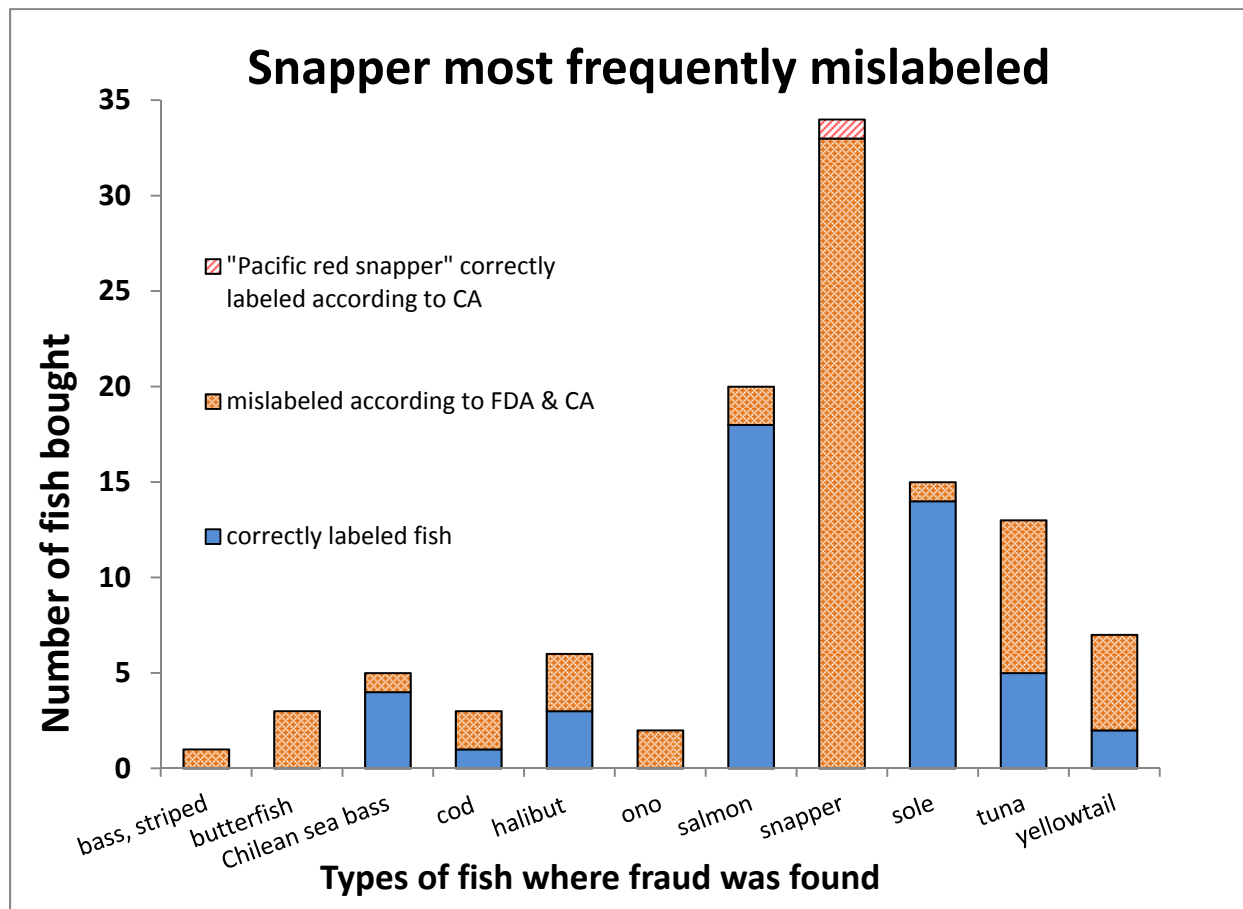
8,000 fish species. Select samples were analyzed or reanalyzed using other forensic genetic techniques at a second lab.

Overall Results

Overall, 55% of all samples collected were mislabeled according the FDA's list of acceptable market names for seafood (See Appendix Table A1). Every single fish sold with the word "snapper" in the label, 34 out of 34, was mislabeled according to those federal guidelines.

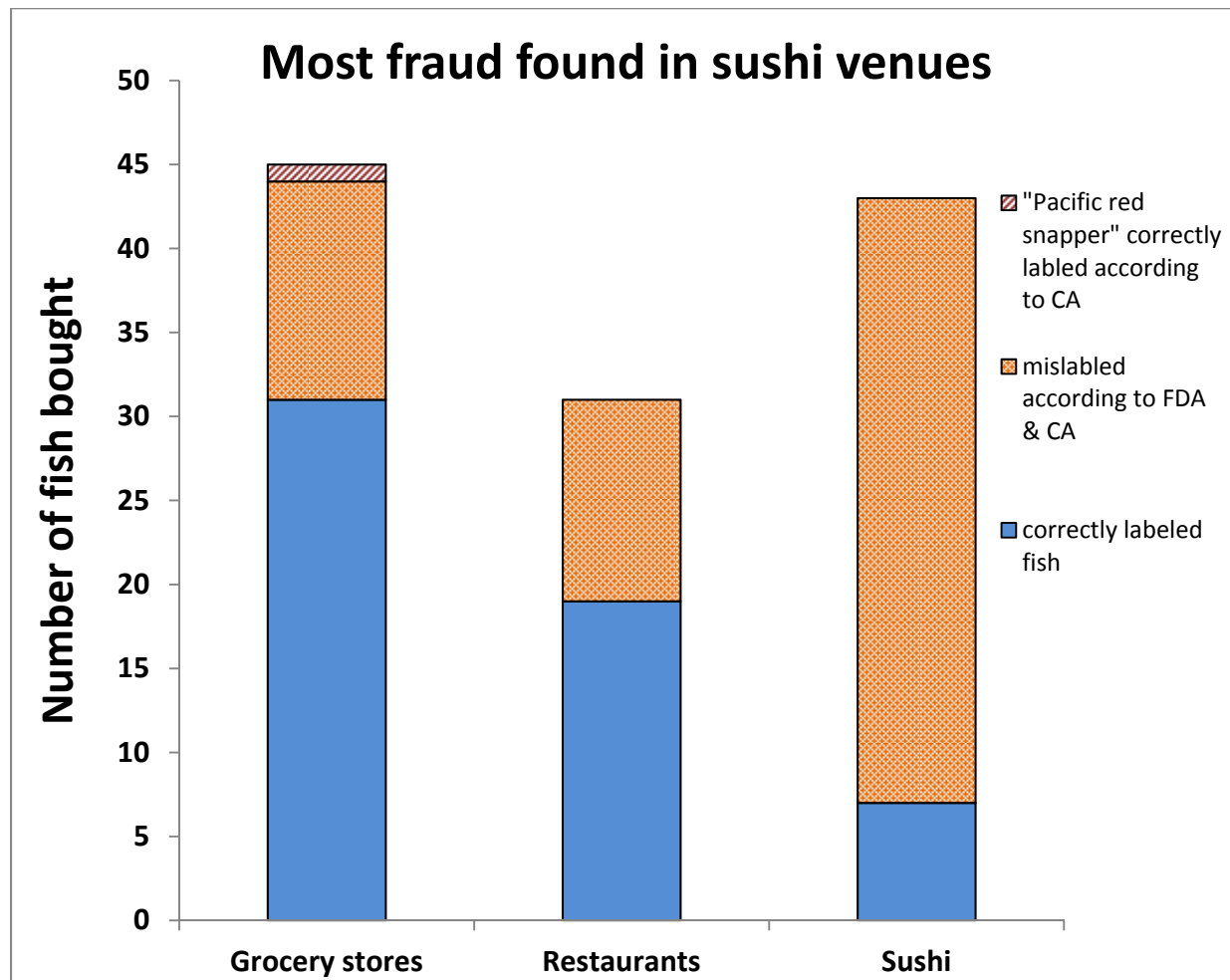
Even if we consider the California law that allows 13 species of rockfish to be labeled as "Pacific red snapper," this only reduces the total percentage of mislabeling by 1% (to 54% of all samples collected).

Other fish commonly mislabeled in the study were tuna, with eight out of 13 species mislabeled, particularly those labeled "white tuna" followed by five labeled "yellowtail." Three fish in each of the categories of "sole," "halibut" and "butterfish" sampled were mislabeled, but the fraction was highest for butterfish (100%) and lowest for soles (20%). Two of each of the samples in the "wild salmon," "cod" and "ono" categories were mislabeled, with the lowest fraction in salmon (10%) and highest in ono (100%). One out of five Chilean sea bass samples were mislabeled, as was the only "striped bass" sampled. We found no mislabeling in the small number of samples (one to two) of the remaining fish types sampled (swordfish, flounder, mahi mahi, grouper, haddock, skate and wahoo).



BY RETAIL VENUE:

The amount of seafood mislabeling detected (according to FDA standards) varied greatly among the three types of retail venues sampled, with sushi venues ranking the highest at 87%, grocery stores the lowest at 31% and restaurants in the middle at 45%.



Grocery

Fish samples were purchased from 32 grocery stores representing nine brands or banners. Out of the eight fish types sampled in grocery stores, mislabeling was restricted to snappers and salmon. The two mislabeled salmon samples were both obtained from grocery stores; chum and farmed Atlantic salmon were substituted for wild sockeye salmon. Oceana found grocery stores sold only rockfish species as snappers, but over half were a single species, Pacific ocean perch (*Sebastes alutus*), which is not on the list of rockfishes that under California law may be sold as "Pacific red snapper" (and not actually a perch at all).

Sushi

We collected ten types of fish from 21 sushi venues. Half of the snapper samples bought in sushi venues were actually tilapia, with the remainder comprised of rockfish and seabream. All the mislabeled white tuna, yellowtail, halibut and ono samples were restricted to sushi venues, as were the single mislabeled samples of striped bass and rock cod. Escolar, a fish with certain "purgative" properties that the FDA

advises against selling,¹³ was substituted for all samples labeled “white tuna” or “ono,” while flounder was substituted for all mislabeled halibut samples. Most of the mislabeled yellowtail samples were a species of Japanese amberjack (*Seriola quinqueradiata*) widely referred to as “hamachi” in sushi restaurants, but not a species recognized by FDA as acceptable to market under the name “yellowtail.” Seabream was substituted for striped bass, rock cod and snapper, while sablefish was mislabeled as “butterfish.”

Restaurants

We collected the greatest number of fish types (15) from 21 non-sushi restaurants and the greatest number of the mislabeling detected was from snappers and soles. Snapper purchased in restaurants comprised the greatest number of substituted species, with half being mislabeled rockfish (none of which conformed to the California law for both allowed species and labeling) and the rest comprised of bass, pollock and seabream. One of the three mislabeled soles was actually Asian “sutchi catfish,” while the other two, labeled “Dover sole,” were actually common sole (*Solea solea*). Sablefish was substituted for our other two mislabeled butterfish from restaurants, while Antarctic toothfish stood in for Chilean sea bass (an acceptable market name for Patagonian toothfish) and Pacific cod for lingcod.

Discussion

SNAPPER FRAUD:

According to federal guidelines, 47 species from the Lutjanidae family may be sold as “snapper,” but that is not an acceptable market name for any other species. Under the California law mentioned previously,¹⁴ 13 specific rockfish species (Sebastidae family) can also be labeled as snapper, but only when specifically labeled as “Pacific red snapper” and – because of the conflict with federal laws about labeling – only when the fish are caught in California waters and sold in California. Of the 34 “snapper” samples collected, there were none from the Lutjanidae family. Of the 18 rockfish samples collected that were labeled as some kind of snapper, only one complied with the California law (i.e., it was correctly labeled “Pacific red snapper” and was one of the 13 species of rockfish that California allows to be labeled as such). Eight of the rockfish samples did not comply with the California law because they were not one of the 13 “approved” rockfish species, and the nine remaining samples did not comply with the California law because they were labeled as “red snapper” rather than “Pacific red snapper” at the point of sale, which is inconsistent with both Federal and California laws (see Appendix A2).

In addition to misleading consumers, mislabeling rockfish as snapper poses ecological problems. Rockfish are long-lived fish – some have even been found to be over 200 years old – that are late to mature and reproduce, making them vulnerable to overfishing. Incomplete and uncertain data about rockfish populations makes it hard to judge the health of the different species, and it is difficult to know which of the more than 70 species can be sustainably fished. Moreover, even the same species of rockfish may be doing well in some areas and not in others. For example, Pacific ocean perch caught in Alaska is from a healthy stock,¹⁵ while it is overfished off the West Coast.¹⁶ In any case, Pacific ocean perch, a rockfish substituted for snapper in this study, cannot, under either federal or California law, be labeled as “snapper” or even “Pacific red snapper.”

¹³ FDA. 1992. Based on Health Hazard Evaluation No. 2841, Health Hazard Evaluation Board, CFSAN, FDA. FDA Bad Bug Book, Accessed 3/28/12:
<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071191.htm>.

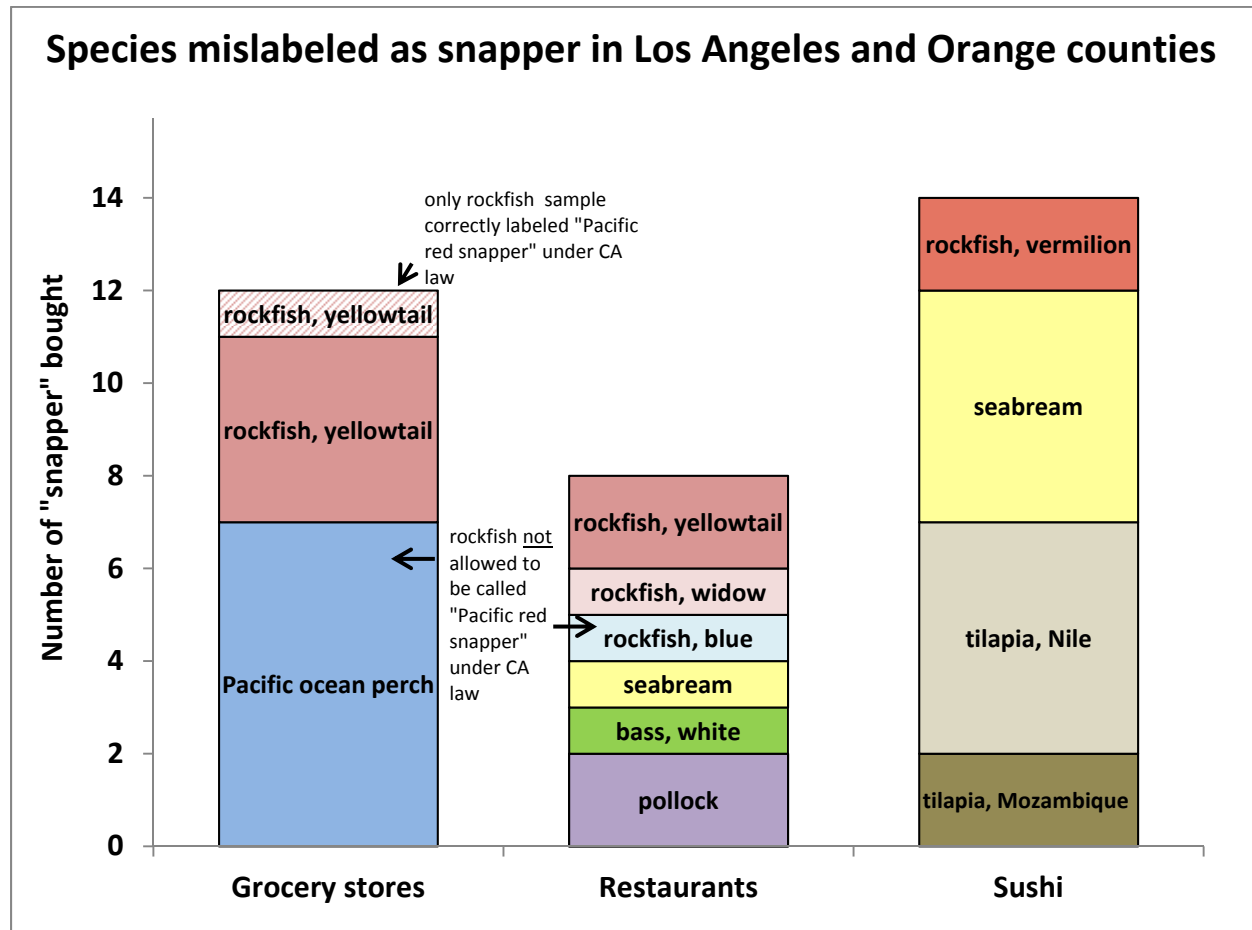
¹⁴ CAL. CODE REGS. tit. 14, § 103.

¹⁵ Hanselman, D., S. K. Shotwell, P. J. F. Hulson, J. Heifetz, and J. N. Ianelli. 2011. Assessment of the Pacific Ocean perch stock in the Gulf of Alaska. Alaska Fishery Science Center, NOAA. Accessed 4/2/12:
<http://www.afsc.noaa.gov/REFM/docs/2011/GOApop.pdf>.

¹⁶ Hamel, O. S. and K. Ono. 2011. Stock Assessment of Pacific Ocean Perch in Waters off of the U.S. West Coast in 2011., NOAA Fisheries Service. Accessed 3/28/12:
http://www.pcouncil.org/wpcontent/uploads/Pacific_Ocean_Perch_2011_Assessment.pdf.

To determine whether a severely overfished rockfish is being sold, consumers need to know what species it is and where it was caught. The mislabeling of any and all species of rockfish as “snapper” hides these important facts from the consumer. Mislabeling blurs the lines between species, making it difficult to determine if the fish being sold comes from a sustainable fishery. And labeling rockfish as unrelated but pricey and in-demand species such as snapper only increases the pressure on these already vulnerable rockfish populations.

What is clear from our sampling is that people buying fish labeled “red snapper” (or any other type of snapper) in Southern California could be getting anything from farmed tilapia to pollock, in addition to any one of the overfished or vulnerable rockfish species.



OTHER FRAUD:

The majority of the mislabeled fish Oceana detected in Southern California constitute true economic fraud, because a lower priced species was substituted for the desired species for economic gain. Examples from this study include substituting farmed Atlantic and chum salmon for wild sockeye salmon; escolar for white tuna; farmed Asian sutchi catfish for wild sole; flounder for halibut; and tilapia, seabream and pollock for red snapper.

On the other hand, some of our mislabeled species may not represent large price differences from the correctly labeled species. That is likely the case where Japanese amberjack (*Seriola quinqueradiata*) was sold as yellowtail/hamachi, and where fish advertised as Dover sole was actually European Dover Sole (*Solea solea*), often called common sole (a name which, for ease of reference, we use here).

Nevertheless, this mislabeling may create confusion for consumers when two or more fish species have the same name or for those who are trying to discriminate among different species that are identically labeled.

For example, knowledgeable sushi consumers may expect to receive the Japanese amberjack (*Seriola quinqueradiata*) when ordering yellowtail/hamachi rather than the amberjack that FDA allows to be called yellowtail in the U.S.: *Seriola lalandi*. It only adds to the confusion that some restaurants in our study also sold *S. lalandi* as “hamachi.” Similarly, the misnaming of sablefish as “butterfish” may lead some to avoid this dish, mistaking it as a vernacular name for escolar and not one of the eight different species of pompano and pomfret that the FDA allows to be marketed as butterfish. In fact, conservation-minded consumers may prefer sablefish over other options, as it is from a well-managed fishery in the north Pacific and commands a high price when properly labeled.

The FDA and United Nations Food and Agriculture Organization recognize only one species as Dover sole, *Microstomus pacificus*, a sole from the Pacific Ocean. The name “Dover sole” is derived from an historic Dover fishing port in the United Kingdom where another prized species, *Solea solea*, was once landed and which was substituted for some “Dover sole” in our study. The substituted species, *S. solea*, is usually known as common sole, a fish from the Atlantic and Mediterranean and often referred to as “Dover sole” in Europe and some U.S. restaurants. Although FDA’s Seafood List uses an alternative scientific name for the species, *Solea vulgaris*, and gives its scientific common name as “European Dover Sole,” that does not change the fact that “Dover sole” is not an acceptable market name for this fish under federal law and has the potential to mislead consumers about what they are buying.¹⁷ The two *Solea solea* fish samples labeled “Dover sole” that we tested were the highest priced seafood dishes collected in our study, likely due to the fact that they were imported, while the correctly labeled (and local) Dover sole, *Microstomus pacificus*, was typically \$15 to \$30 less expensive.

“White tuna”

Imagine a woman of childbearing age who has knowledge of the FDA advisory for methylmercury in seafood that recommends limiting consumption of white tuna to six ounces per week.¹⁸ She also knows that the omega fatty acids in white tuna are healthy and tries to consume six ounces per week in her sushi. Imagine her surprise and distress to learn she is actually ingesting a fish with another type of advisory altogether for more immediate health effects – and one she is not aware of. The FDA allows only one species to be marketed as “white tuna” and only then when this species, *Thunnus alalunga*, is in a can.¹⁹ Sold in other forms (e.g. fresh or frozen), *Thunnus alalunga* may be marketed only as “tuna” or “albacore tuna.”

Substituting escolar for white tuna is not only fraudulent but potentially dangerous. Escolar or oilfish (*Lepidocybium flavobrunneum*) is not a tuna species at all, but is instead a snake mackerel species that contains a naturally occurring toxin, gempylotoxin, that can cause troubling and severe gastrointestinal problems for those who eat too much. Because of the health problems associated with escolar, Italy and Japan have banned it, several other countries have health advisories for it²⁰ and the FDA advises against the sale of it:

¹⁷ The scientific name used in the FDA Seafood List for European Dover sole, *Solea vulgaris*, is not considered a current acceptable scientific name. See World Register of Marine Species (WoRMS). Accessed 4/12/11: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=154712>. FDA can correct these types of issues by regularly updating the Seafood List.

¹⁸ FDA/EPA 2004. What You Need to Know about Mercury in Fish and Shellfish. Accessed 4/11/12: <http://www.fda.gov/food/foodsafety/product-specificinformation/seafood/foodbornepathogenscontaminants/methylmercury/ucm115662.htm>.
¹⁹ (21 CFR 161.190¹⁶).

²⁰ European Food Safety Authority. 2004. Opinion of the Scientific Panel on Contaminants in the Food Chain on a request from the Commission related to the toxicity of fishery products belonging to the family of Gempylidae. *The EFSA Journal* 92:1-5. Accessed 4/2/12: <http://www.efsa.europa.eu/de/scdocs/doc/92.pdf>.

FDA Statement on Consumption of Escolar and Oilfish: There are naturally occurring toxins in some species that do not involve marine algae. **Escolar** (Scientific Name *Lepidocybium flavobrunneum*), and its relative **Oilfish** or Cocco (Scientific Name *Ruvettus pretiosus*) contains a strong purgative oil, that when consumed can cause diarrhea known as Gempylid Fish Poisoning or Gempylotoxism. FDA advises against the sale of the fish in intrastate/interstate commerce, and requests that seafood manufacturers/processors should inform potential buyers/sellers, etc. of the purgative effect associated with the consumption of these fish.²¹

Conclusions

The types and breadth of seafood fraud uncovered in Southern California should give all local seafood lovers pause. Our testing indicates that consumers in the area have a roughly 50/50 chance of getting the actual seafood item they were sold when purchasing certain types of fish. Their chances of not being defrauded appear to vary depending on where they purchase their seafood. Even major grocery store chains, which have the most seafood labeling requirements among seafood retail outlets, engage in seafood substitution, either knowingly or unknowingly.

The types of fraud uncovered in our study encompass confusing and misleading use of vernacular terms; disguising well-managed, vulnerable and overfished species under a single name; substituting one fish that carries a health warning (gempylotoxin in escolar) for another (mercury in white tuna); and economic fraud, where cheaper or less desirable fish are substituted for the marketed fish in pursuit of higher profits at any cost.

Seafood vendors who mislabel fish harm honest fisherman who play by the rules. Seafood mislabeling also confuses concerned and educated seafood consumers who care about the ocean and want to choose their seafood wisely.

Unfortunately, the type of seafood fraud uncovered in Southern California is not restricted to this locale, but is on par with the levels found in the Boston area last fall and reported in the peer reviewed literature and popular press in other locations, both in the U.S. and abroad. With a global commodity like seafood, the ultimate solution to this problem is full traceability of the product from boat to plate and providing more information to consumers about the seafood they are purchasing. In the meantime, increased inspection, specifically for seafood mislabeling, at the border and in the domestic seafood supply is needed to discourage dishonest practices along the increasingly obscure seafood supply chain.

Acknowledgements

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Oceana is the largest international advocacy group working solely to protect the world's oceans. Oceana wins policy victories for the oceans using science-based campaigns. Since 2001, we have protected over 1.2 million square miles of ocean and innumerable sea turtles, sharks, dolphins and other sea creatures. More than 500,000 supporters have already joined Oceana. Global in scope, Oceana has offices in North, South and Central America and Europe. To learn more, please visit www.oceana.org.

²¹ FDA 1992. Based on Health Hazard Evaluation No. 2841, Health Hazard Evaluation Board, CFSAN, FDA, FDA Bad Bug Book, Accessed 3/28/12: <http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071191.htm>.

Appendix Table A1:

List of mislabeled fish samples collected in Los Angeles and Orange counties.

Types of Fish (#fraud/#total)	Fish Name as Labeled	Species ID	Scientific Common Name (FDA market name in parentheses)	Retail Code ¹	City
snapper (34/34) CA - 33/34	snapper	<i>Pagrus major</i>	madai (porgy or seabream)	S	Hollywood
	snapper	<i>Pagrus sp</i>	seabream	S	Los Angeles
	snapper	<i>Pagrus sp.</i>	seabream	S	Redondo Beach
	snapper	<i>Oreochromis niloticus</i>	tilapia, Nile	S	Long Beach
	snapper, black	<i>Sparus aurata</i>	bream, gilt headed bream	S	Manhattan Beach
	snapper, Japanese	<i>Pagrus major</i>	madai (porgy or seabream)	R	West Hollywood
	snapper, Japanese	<i>Oreochromis mossambicus</i>	tilapia, Mozambique	S	Garden Grove
	snapper, Japanese	<i>Oreochromis mossambicus</i>	tilapia, Mozambique	S	Costa Mesa
	2 snapper, Pacific red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Laguna Beach
	2 snapper, Pacific red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Laguna Beach
	2 snapper, Pacific red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Mission Viejo
	2 snapper, Pacific red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Mission Viejo
	2 snapper, Pacific red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Los Angeles
	* snapper, Pacific red	<i>Sebastes flavidus</i>	rockfish, yellowtail	G	Venice
	snapper, red	<i>Morone chrysops</i>	bass, white	S	Long Beach
	snapper, red	<i>Sparus aurata</i>	bream, gilt headed bream	S	Manhattan Beach
	2 snapper, red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Westchester
	2 snapper, red	<i>Sebastes alutus</i>	perch, Pacific Ocean	G	Baldwin Hills
	snapper, red/Boston	<i>Pollachius virens</i>	pollock	R	Los Angeles
	3 snapper, red	<i>Sebastes mystinus</i>	rockfish, blue	R	San Clemente
	4 snapper, red	<i>Sebastes miniatus</i>	rockfish, vermilion	S	Hollywood
	4 snapper, red	<i>Sebastes miniatus</i>	rockfish, vermilion	S	Newport Beach
	4 snapper, red	<i>Sebastes entomelas</i>	rockfish, widow	R	Malibu
	4 snapper, red	<i>Sebastes flavidus</i>	rockfish, yellowtail	G	Manhattan Beach
	4 snapper, red	<i>Sebastes flavidus</i>	rockfish, yellowtail	R	Redondo Beach
	4 snapper, red	<i>Sebastes flavidus</i>	rockfish, yellowtail	R	Redondo Beach
	4 snapper, red	<i>Sebastes flavidus</i>	rockfish, yellowtail	G	Long Beach
	4 snapper, red	<i>Sebastes serranoides/S. flavidus</i>	rockfish, yellowtail/olive	G	Dana Point
	snapper, red	<i>Oreochromis niloticus</i>	tilapia, Nile	S	Long Beach

	snapper, red	<i>Oreochromis niloticus</i>	tilapia, Nile	S	Long Beach
	snapper, red/ Boston	<i>Pollachius virens</i>	pollock	R	Malibu
	snapper, red/ izumidai	<i>Oreochromis niloticus</i>	tilapia, Nile	S	Venice
	snapper, red/ white fish	<i>Oreochromis niloticus</i>	tilapia, Nile	S	Los Angeles
	snapper, rockfish	<i>Sebastes flavidus</i>	rockfish, yellowtail	G	Laguna Beach
tuna (8/13)	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	Redondo Beach
	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	Manhattan Beach
	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	West Hollywood
	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	Hollywood
	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	Los Angeles
	tuna, white	<i>Lepidocybium flavobrunneum</i>	escolar	S	Long Beach
	tuna, white/ ono	<i>Lepidocybium flavobrunneum</i>	escolar	S	Santa Monica
	tuna, white/ ono	<i>Lepidocybium flavobrunneum</i>	escolar	S	Costa Mesa
yellowtail (5/7)	yellowtail	<i>Seriola quinqueradiata</i>	buri (amberjack)	S	Los Angeles
	yellowtail	<i>Seriola quinqueradiata</i>	buri (amberjack)	S	Torrance
	yellowtail	<i>Seriola quinqueradiata</i>	buri (amberjack)	S	Los Angeles
	yellowtail	<i>Thunnus alalunga</i>	tuna, yellowfin	S	Manhattan Beach
	yellowtail/ hamachi	<i>Seriola quinqueradiata</i>	buri (amberjack)	S	Venice
butterfish (3/3)	butterfish	<i>Anoplopoma fimbria</i>	sablefish	S	Redondo Beach
	butterfish	<i>Anoplopoma fimbria</i>	sablefish	R	Los Angeles
	butterfish	<i>Anoplopoma fimbria</i>	sablefish	R	Seal Beach
halibut (3/6)	halibut	<i>Paralichthys dentatus</i>	flounder, summer	S	West Hollywood
	halibut	<i>Paralichthys lethostigma</i>	flounder, summer	S	Long Beach
	halibut, Pacific	<i>Paralichthys dentatus</i>	summer flounder	S	Santa Monica
sole (3/15)	5 sole, Dover	<i>Solea solea/S. vulgaris</i>	sole, common	R	Los Angeles
	5 sole, Dover	<i>Solea solea/S. vulgaris</i>	sole, common	R	Beverly Hills
	6 sole, wild Atlantic/sole, Dover	<i>Pangasianodon hypophthalmus</i>	catfish, striped	R	Newport Beach
cod (2/3)	cod, lingcod	<i>Gadus macrocephalus</i>	cod, Pacific	R	El Segundo
	cod, rock	<i>Pagrus major</i>	madai (porgy or seabream)	S	Newport Beach
ono (2/2)	ono	<i>Lepidocybium flavobrunneum</i>	escolar	S	Long Beach
	ono	<i>Lepidocybium flavobrunneum</i>	escolar	S	Long Beach

salmon (2/20)	salmon, sockeye	<i>Salmo salar</i>	Atlantic salmon	G	Laguna Beach
	salmon, sockeye	<i>Oncorhynchus keta</i>	salmon, chum	G	Seal Beach
bass, striped (1/1)	bass, striped	<i>Pagrus major</i>	madai (porgy or seabream)	S	Los Angeles
Chilean sea bass (1/5)	Chilean sea bass	<i>Dissostichus mawsoni</i>	toothfish, Antarctic	R	West Hollywood

¹ Retail codes for where seafood was purchased: G: grocery; R: restaurant; S: sushi venue.

² Rockfish with correct label ("Pacific red snapper"), but not one of the 13 rockfish species allowed to be sold with this label under California law (See A2 below).

³ Rockfish without the correct label, "Pacific red snapper" and not one of the 13 rockfish species allowed to be sold as "Pacific red snapper" under California law.

⁴ Rockfish without the correct label, "Pacific red snapper", but one of the 13 rockfish species allowed to be sold as "Pacific red snapper" under California law.

⁵ *Solea solea* is the scientific consensus name for the (older) synonym *S. vulgaris*, the latter of which FDA lists as "European Dover sole" in the FDA Seafood List (2011 Update).

⁶ *Pangasianodon hypophthalmus*, is the correct species name for a type of Suchti catfish marketed as "Pangasius" in the U.S.

* The only rockfish sample sold that was both properly labeled as "Pacific red snapper" and was one of the 13 species allowed to be sold under this name by California law.

A2: Rockfish species listed in California Code of Regulations.

CAL. CODE REGS. tit. 14, § 103. Common names for market fish

(a) The following common names may be used as alternates for designated names:

(1) Pacific red snapper:

Sebastes entomelas (widow rockfish)

Sebastes flavidus (yellowtail rockfish)

Sebastes goodei (chilipepper)

Sebastes jordani (shorbelly rockfish)

Sebastes levis (cowcod)

Sebastes melanops (black rockfish)

Sebastes miniatus (vermillion rockfish)

Sebastes ovalis (speckled rockfish)

Sebastes paucispinnis (bocaccio)

Sebastes pinniger (canary rockfish)

Sebastes ruberrimus (yelloweye rockfish)

Sebastes rufus (bank rockfish)

Sebastes serranoides (olive rockfish)