



Food and Agriculture Organization
of the United Nations



Food Fraud in the Fisheries and Aquaculture Sector



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Food fraud in fisheries and aquaculture

- The sector produced over **185 million tonnes** of aquatic products in 2022, valued at USD 195 billion.
- Increasingly vulnerable to food fraud:
 - the sector's complexity (capture versus farmed, international trade)
 - the wide variety of **species traded (over 12 000)**
 - the involvement of multiple authorities.
- **Food fraud definition:** a deliberate practice intended to deceive others regarding the prescribed specifications or expected characteristics of food to gain an **unfair economic advantage**.

Food fraud studies in the sector

The probability of fraud in this sector is estimated at **21%**, significantly higher than that of meat (13%) and fruits and vegetables (10%) (Marvin *et al.* 2016)

The most frequently reported types of fraud: **species substitution** & **mislabelling** (Donlan and Luque, 2019).

Food fraud studies in the sector

In restaurants, misdescription rates are significantly higher than in retail settings, with **30%** of seafood products mislabelled (Pardo *et al.*, 2016).

In Peru, seafood fraud was detected in 43 percent of samples, with particularly high rates in ceviche (**78%**) and sashimi (**28%**) (Velez-Zuazo *et al.*, 2021).

In the European Union, one-third of mass caterers served mislabelled seafood, with pangasius frequently used as a substitute (Pardo *et al.*, 2018).

In China, **75.5%** of tested seafood products were identified as species outside the expected family (Xiong *et al.*, 2019).

Food fraud studies in the sector

A global study by Oceana (2016) found that **one in five of over 25000 seafood samples tested were mislabelled** under the name of other species, with **fraud occurring at every stage of the value chain.**

Cases were reported in 55 countries across all continents except Antarctica, with hake, escolar, and Asian catfish among the most substituted species.



Alarmingly, 58 percent of substitutions involved species that pose health risks to consumers.

Food fraud cases

Adulteration implies the addition of a fraudulent substance to the final product.

Counterfeit occurs when all aspects of an original high-value aquatic product are replicated in a fraudulent food product, and it is packaged to make it look like the original.

Simulation: involves creating a product that resembles a high-value aquatic commodity without being an exact copy. The creation of a fake version of the original commodity.

Diversion is the sale or distribution of legitimate products outside of their intended markets.

Misbranding is providing false or misleading information on packaging and marketing.

Food fraud cases



Substitution involves replacing a high-value species with a cheaper one for economic gain.



Mislabelling occurs when a legitimate product and packaging are fraudulently used.



Theft occurs when a product is stolen and passed off as if it were legitimately procured.

Examples of **food safety** implications

ADULTERATION:

There is a wide array of substances that may be added to fishery and aquaculture products to alter their appearance, weight, or perceived freshness.

Water, ice glaze, or other fillers are sometimes added to increase product weight



Adulterants that alter the visual appearance of fish products: carbon monoxide (CO) to enhance the red colour of fish flesh



Examples of **food safety** implications

SPECIES SUBSTITUTION

Species substitution is one of the most prevalent forms of food fraud in the fishery and aquaculture sector. It involves replacing one declared aquatic species with another.

Lead to the presence of:

- Toxins (puffer fish), and marine biotoxins
- Heavy metals (mercury in dolphin or shark)

or end up with the incorrect use of products, for example, raw consumption (cases of tilapia).

Economic benefit of fraud: price differential

Mislabelling price differentials of substitute species range from +25 € to -12 € (sturgeon caviar having the greatest).

10 € for yellowfin tuna when used as a substitute for Atlantic bluefin and bigeye tuna.

Atlantic salmon labelled as Pacific salmon with an average profit of 9€.



Tools

Taxonomy

Standards (Codex Alimentarius & private)

Legislation

Analytical methods

Others (mass balance, visual inspections...)

Taxonomy

Misidentification of species

More than **36 000 species** of finfish have been described

The amount of information required to distinguish among them is not always available due to a lack of up-to-date taxonomic guides at the country, regional and global levels.

A list of commercial fish names with cross-referenced to scientific nomenclature, supported by mandatory labelling containing the scientific and commercial name, production method, catch or farming area, and other traceability elements.

FAO provides global-level species catalogues and regional and field species-identification guides through the FAO FishFinder Species Identification and Data Programme

Standards: Codex Alimentarius

- General Standard for the Labelling of Prepackaged Foods ([CXS 1-1985](#)),
- General Standard for the Labelling of Food Additives when sold as such ([CXS 107-1981](#))
- Principles for Traceability / Product Tracing as a Tool Within a Food Inspection and Certification System ([CXG 60-2006](#))
- Codex Code of Ethics for International Trade in Food Concessional and Food Aid Transactions ([CXC 20-1979](#))
- Principles and Guidelines for National Food Control Systems ([CXG 82-2013](#)),
- Guidelines for Design, Production, Issuance and Use of Generic Official Certificates ([CXG 38-2001](#))
- Principles and guidelines for the exchange of information between importing and exporting countries to support the trade in food ([CXG 89-2016](#))
- Guidelines on the prevention and control of food fraud.

Legislation

Documents that offer a foundational structure for addressing food fraud in the sector:

- Codex Alimentarius texts
- *FAO Voluntary Guidelines for Catch Documentation Schemes*
- *Agreement on Port State Measures*
- *the United Nations Convention on Contracts for the International Sale of Goods*
- International Institute for the Unification of Private Law's *Principles of International Commercial Contracts*.

Analytical methods, some examples

- **Analytical techniques for adulteration:** chromatography.
- **Analytical techniques for mislabeling related to geographical origin:** DNA-based techniques, isotope analysis, analytical techniques based on DNA, but also chromatographic techniques and spectroscopy.
- **Analytical techniques for mislabelling regarding production method:** Analytical techniques based on DNA, but also chromatographic techniques and spectroscopy.

Analytical methods, some examples

- **Analytical techniques for mislabelling regarding the fresh product with a product previously frozen:** Spectroscopy, enzymatic methods, electrophoresis, DNA degradation, measurement of volatile composition, also the study of morphology and organoleptic situation, study of microbiological activity, or combination of techniques.
- **Analytical techniques for species substitution:** DNA-based methods
 - DNA barcoding
 - PCR
 - Microarrays

Conclusions and recommendations



Addressing these challenges requires a collaborative effort from all stakeholders.



Stringent regulations and robust traceability systems



Education of the sector and consumer awareness play a crucial role



Scientifically robust analytical techniques



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