



# MPEDA

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# Ensuring trust and sustainability: Unveiling the journey of seafood from ocean to plate through labelling

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## Introduction

**T**rust is the most fundamental and influential factor in the development of any trade. It empowers consumers to have faith in the quality and safety of the food products they purchase.

The product label serves as the primary means of communication between the supplier and the consumer, and the information provided on the label should instill trust in the customer regarding both the product and the supplier. In this digital era, the customer is knowledgeable and aware of the food safety and sustainability of the resources used to prepare the product.

The seafood industry has substantially contributed to the global economy, with fish and seafood product exports reaching \$151 billion in 2020 (FAO 2022). The marine capture fisheries contributed approximately 78.8 million tons of marine fish, including finfish and shellfish in 2020. Unlike other food sectors, seafood relies primarily on natural fish resources and over 85% of fish stocks are either overfished or fully exploited (FAO, 2012).

Therefore, product labelling should provide complete information about the product that can be used as a proxy to formulate management measures for wild fish stocks and provide authentic information to consumers. This article aims to provide comprehensive information on the requirements for seafood labelling and methods to achieve them to ensure trust among consumers and the sustainable exploitation of resources.

## I. Requirements for labelling

### 1) Species name

Seafood labelling deserves special attention among different food products due to the uniqueness of fisheries. Unlike livestock and poultry, fisheries offer a variety of edible fish species (~200) that differ in taste, texture, and nutrients. Therefore, accurate labelling of fish products, including the fish species' names, is essential to provide authentic information to customers. Furthermore, marine fishery resources are limited and need to be sustainably exploited. In the case of livestock and poultry, edible species have been domesticated, breeds / strains have developed, and farming practices have been standardized to produce enough animals/birds to meet consumer demand.

However, when it comes to marine fish and shellfish, most species have not been domesticated, culture practices are not standardized, and the demand is met by wild stocks (Fig. 1). This could lead to the over exploitation of wild germplasm and the collapse of fisheries. Often, instead of the species name, most traders provide the common fish names on the product label. However, common names of fish can sometimes be vague and may refer to a group of species rather than a specific one. Thus, including the fish species name (scientific or Latin name) on the product label could help in assessing the stocks and preventing illegal, unreported and unregulated (IUU) fishing. By providing accurate information, seafood labels empower consumers to make informed choices about the fish species they purchase.

However, accurate identification of fish species and subsequent labelling can be challenging due

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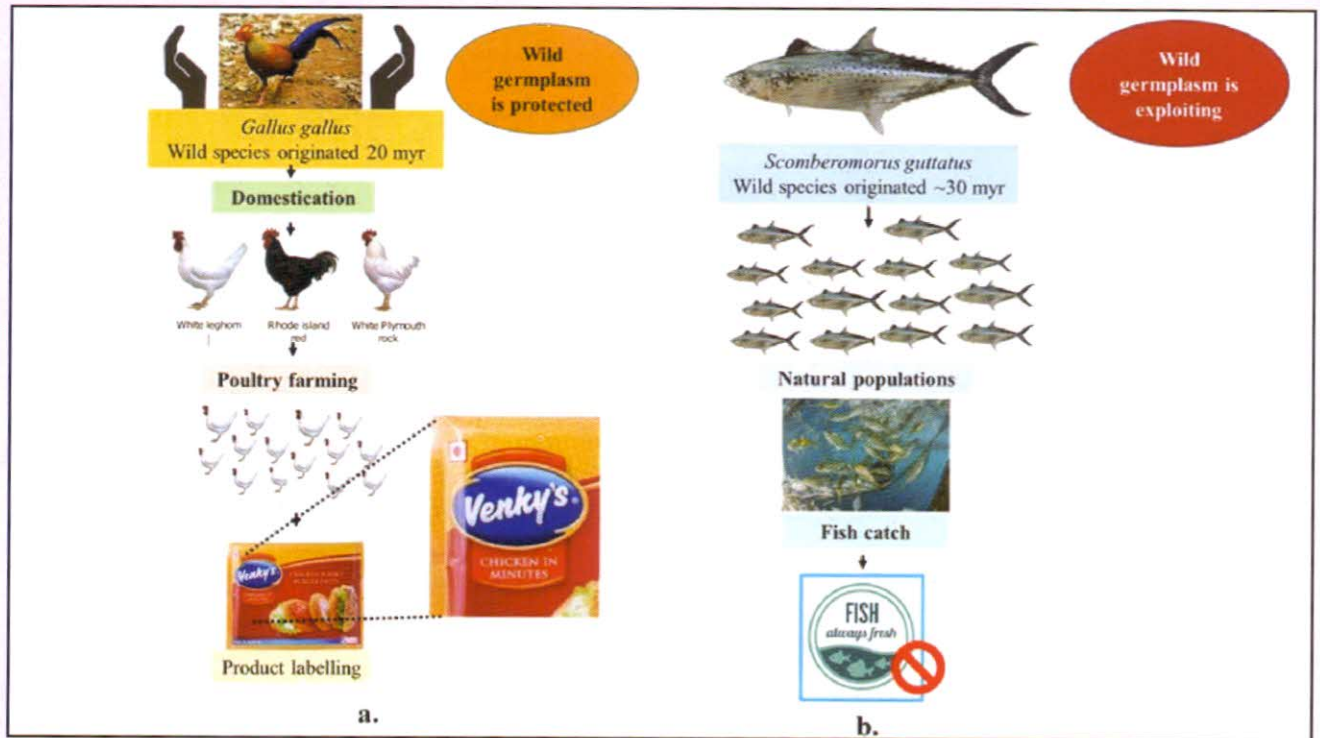


Fig. 1: Illustration of reasoning on why seafood labelling should be different from other meat products. a. illustrates the domestication and breed development in poultry, b. illustrates the exploitation of wild germplasm of marine fish

to morphological ambiguity among species or the loss of external morphological characteristics during processing.

It results in seafood mislabelling or species substitution with an intention or inadvertently. Globally, on average around 8% of the traded seafood items have been reported to be mislabelled, posing a serious threat to consumer confidence in terms of product cost and the

sustainability of fisheries resources (Luque and Donlan 2019).

Additionally, the seafood industry operates globally, resulting in a highly complex supply chain where traceability becomes difficult (Roebuck *et al.*, 2017). In response, the European Union, USA, Japan and other countries revised the guidelines of seafood labelling (Table 1).

Table 1: Seafood labelling requirements by major importing countries

Parameters	European Union	U S A	Canada	Japan	China*	Saudi Arabia**	U A E
Common name	✓	✓	✓	✓	✓	✓	✓
Scientific name	✓	✗	✗	✗	✓	✓	✗
Production method (farmed/wild/caught)	✓	✓	✓	✗	✓	✓	✗
Harvest method (for wild/caught)	✓	✗	✗	✗	✗	✗	✗
Geographic origin	✓	✗	✗	✗	✗	✗	✗
Country of origin/last major processing	✓	✓	✓	✓	✓	✓	✓
Name, registration & address of all facilities involved in production	✗	✓	✓	✓	✓	✓	✗
Name & address of importer	✓	✓	✓	✗	✓	✓	✓
Batch number	✓	✓	✓	✓	✓	✓	✓

\*All information must be provided in both English and Chinese languages; Destination to be marked as People's Republic of China.

\*\*All information must be provided in both English and Arabic languages

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## 1 a. Methods for species authentication

### *DNA Barcoding and associated techniques*

Advancements in DNA barcoding and related molecular techniques have brought about a revolutionary change in seafood authentication. The DNA barcoding approach involves amplifying and sequencing a specific part of the mitochondrial DNA called the cytochrome c oxidase subunit I. Comparison of the resultant COI sequence with the NCBI (National Center for Biotechnology Information) or BOLD (Barcode of Life Data Systems) reference database would allow identifying the species accurately, detecting mislabelling, and combating fraud. Reference DNA barcodes for commercial species have been generated and are available in public databases.

Recognizing the significance of this technique in identifying fish species regardless of the processing method, the International Organization for Standardization (ISO) has developed a standard (ISO/DIS 17174) for species identification using molecular/DNA biomarkers. It is crucial for testing labs to adopt this standard and obtain NABL accreditation to certify the species' name on seafood labels.

However, DNA barcoding requires sophisticated equipment such as DNA sequencers, which many labs cannot afford. As an efficient alternative, associated technologies like DNA mini-barcodes and High-resolution melting (HRM) profile analysis have emerged. DNA mini-barcodes are short sections (~150 bp) within the partial COI region that exhibit enough nucleotide variation to distinguish the species. This variation can be detected through HRM analysis, where mini-barcodes from different species produce distinct melting curves.

## 2. Traceability

The product label should provide information to trace the product's journey from its origin to the consumer through the supply chain, including harvesting, processing and distribution. The following information is essential to trace the product to ensure sustainable utilization of the resources.

### *a) Country of origin*

Food safety regulations, inspection procedures, and quality standards differ among countries. By identifying the country of origin, consumers and regulators can assess whether the seafood product has been produced and handled in compliance with the necessary safety

measures. This information helps to determine whether the seafood has been sourced from well-managed fisheries or sustainable aquaculture operations.

### *b) Production method*

This information is essential to know whether the fish/ fish product is obtained from wild stocks or cultured farms. If it is from capture fisheries, the data may also contain the type of net /catching method used. The information should include whether the cultural practices are certified if it is from a culture farm.

### *c) Harvest date*

Including the harvest date or production date on the label enables tracing the age and freshness of the seafood product. It helps determine the timeline of its journey through the supply chain.

### *d) Country of processing*

Fish caught in one country are often sent to another for processing for lower production costs and advanced technologies. Further, some countries may have preferential trade agreements or duty-free access to specific markets. Thus, exporters often process seafood within those countries to benefit from trade regulations and facilitate market entry. Indicating the country of processing helps to trace the processing steps and ensures accountability in case of any quality or safety concerns.

### *e) Lot number or batch code*

Assigning a unique lot number or batch code to each seafood product allows precise tracking and identification. This number or code can be linked to specific information, such as the source, processing details, and distribution records.

### *f) Certifications or eco-labels*

The Marine Stewardship Council (MSC) Fisheries Standard is the leading international standard for sustainable fishing and has been used globally to assess fisheries sustainability. Suppose the seafood product has obtained Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC) certification; in that case, the supplier should include information on the label. These certifications validate sustainable practices and enhance traceability and credibility.

### *g) Traceability codes or QR codes*

Including traceability codes or QR codes on the label allows consumers to scan and access detailed

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information about the product's journey through the supply chain. It can provide information about the fishing vessel, harvest location, processing details, and other relevant traceability data.

### 2 a. Methods to achieve traceability in seafood supply chain

#### » Documented Chain of Custody

It involves recording and maintaining comprehensive records at each stage of the supply chain, including information about the product, its origin, handling, processing, and distribution. It includes capturing data on fishing vessels, aquaculture farms, processors, and distributors involved in the supply chain.

#### » Unique Identifiers

Assigning unique identifiers to each seafood product helps to track its movement and enables easy identification throughout the supply chain. These identifiers can be in the form of barcodes, QR codes, or RFID tags. They link the associated information, including the origin, species, and production details.

#### » Electronic Data Capture

Employing digital technologies and electronic data capture systems can enhance traceability. These systems can capture data in real-time, facilitating accurate and efficient information recording at various stages of the supply chain. It reduces the reliance on manual paper-based documentation, minimizes errors, and streamlines data management.

#### » Technology-enabled tracking

The exporters advanced technologies, such as GPS (Global Positioning System), satellite tracking, and electronic tagging, can be used to track the movement and location of fishing vessels or aquaculture facilities. This information can be integrated into traceability systems to provide real-time visibility of the product's journey from source to market.

#### » Data sharing and integration

Collaboration and data sharing among supply chain stakeholders are crucial for traceability. Integration of data systems and sharing information through secure platforms enable real-time access to data, ensuring accurate and up-to-date traceability information for all stakeholders involved.

#### » Blockchain technology

Blockchain technology has gained attention for its potential to enhance traceability in various industries, including seafood. It provides a decentralized and immutable ledger that can securely record and track every transaction and movement in the supply chain. Blockchain can ensure transparency, trust, and tamper-proof records, enabling seamless traceability.

#### » Third-party verification and certification

The Organization for International Standardization (ISO) has developed standards for the traceability of marine capture finfish (ISO 12875:2011), molluscs (ISO 18539:2015) and crustaceans (ISO 18537:2015). Third-party verification and certification of the firms for the above standards would help traceability efforts. Independent auditors or certifying bodies can assess and verify compliance with the above criteria.

### Conclusion

In conclusion, seafood labelling is a powerful tool that bridges the gap between suppliers and consumers, enabling trust and promoting sustainability. Accurate species identification and comprehensive traceability provide consumers with the information to make informed decisions and support responsible practices. As the seafood industry continues to evolve, adopting effective labelling practices will be instrumental in ensuring the long-term viability of fishery resources and the satisfaction of conscientious consumers.

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