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# The uncertainty of seafood labeling in China: A case study on Cod, Salmon and Tuna

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ABSTRACT

Exotic marine fish products are increasingly appreciated in China. In this study, 100 samples of Cod, Salmon and Tuna products were collected from supermarkets in Shanghai, Nanjing and Hangzhou. First the information reported on the label were assessed in the light of the Chinese legislation, paying particular attention to the fish names and the geographical origin. Then, a comparative analysis of the official trade denominations adopted by five European countries (Italy, France, Germany, Spain and United Kingdom) for Cod, Salmon and Tuna was performed. Finally, the Chinese names of the species considered in the EU list were verified consulting the available international lists. Overall, 95% of the samples employed just generic names. In particular, 98% of Salmon and 100% of Tuna products were generically labeled while the labeling of Cod products was more diversified, even though 80% reported misleading or fake denominations. The results of this work highlighted the lack of a mandatory legislation on seafood traceability and of an official naming system. In particular, this study propose the introduction of a detailed Chinese naming system based on the Chinese Latin Dictionary for Seafood Names, following the EU approach. In fact, inaccurate labeling can have both economic and health implications for consumers as well as it may distort the true abundance of fish stocks. These drawbacks can be particularly serious considering the pivotal role of China in the global fishery industry.



## 1. Introduction

Since the economic reform and the market opening in 1978, China has experienced an exceptional economic growth that has determined an increase in citizens' purchasing power, provoking profound changes in lifestyle and food consumption [1]. In the last two decades the consumption of food of animal origin has increased, especially in urban areas [2]. In particular, seafood consumption has tripled over the last three decades and high value exotic marine species have become increasingly popular, taking the place of cheaper freshwater fishes, historically consumed in China [3] and [4]. While in the past marine species were consumed only in the coastal provinces, this consumption is gradually moving inland. Salmon (consumed as sashimi and sushi), for example, is currently considered "*the Prada of seafood in China*" because it is foreign, modern and prestigious [4]. In fact, eating fresh salmon has grown as a status symbol in China where it is now among one of the most expensive seafood items on offer in restaurants [5]. The orientation towards imported fishery products was also influenced by the loss of confidence of the Chinese population in domestic foods following food safety scandals [5]. In 2006, ~93% of China imports of unprocessed fish consisted of cod (79%, all frozen), salmon (19%, fresh and frozen) and tuna (2%, all frozen). Interestingly, these products were not only intended for national consumption but also for processing and re-exporting [6]. The increase in the global demand for fish fillets and steaks has led to an impressive development of the Chinese fish-processing sector, which, following these new habits, is now also oriented to products destined to national consumption.

China currently produces 40% of the world seafood production, representing the world leading producer and supplier, with an output of 43.5 million tons in 2013 [7]. Unfortunately, Chinese seafood is often subject to border notifications and import bans because of food safety issues [8–11].

In order to cope with the worldwide recalls and to reestablish consumers' confidence in domestic foods, China's government has tried to overhaul the national food safety system [8].

In 2009, China took the first real step towards a stringent regulation of food safety in the country, by issuing the Chinese Food Safety Law, (FSL) which was subsequently enhanced by 2000 national standards, 2900 industrial standards, and over 1200 local

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standards regarding food, additives and labeling [12]. Then, on April 2015, the Standing Committee of China's legislative body and the National People's Congress adopted a revised version of the national FSL, which become effective as of October 1 2015. The new FSL has the objective to strengthen the protection of Chinese consumer health and imposes more strict penalties for food safety related violations [13].

Despite these important changes, the fishery sector still suffers from significant legislative and managerial shortcomings. In particular, unlike most of the Western countries, China still lacks specific provisions for the labeling of fishery products and an official reference list of seafood trade names. In fact, with the exception of some basic compulsory labeling requirements established by the GB7718-2011 standard [14] and by the Decision General Order no. 123 of 2009 [15] (Table 1), only a few standards (mandatory and voluntarily) (Table 2), have been issued.

The European Union (EU) is currently considered as the global leader in food traceability [16]. In the case of the fishery industry, traceability and labeling are just two aspects of the complex EU's legal framework, that deals with many other topics such as the surveillance of fish stocks and the fight against illegal fishing activities [17]. In fact, the promotion and implementation of legal and sustainable seafood trade also passes through a consistent naming and labeling of seafood species [18–21].

This work, by assessing the labeling conformity of three newly appreciated seafood species, Cod, Salmon and Tuna, in the light of mandatory and voluntary regulations implemented in China, represents a preliminary attempt to assess the current legislation adopted by this country to regulate the seafood market. Contemporary the Chinese commercial denominations used for these species were compared to commercial designations officially adopted by 5 European Member States (MSs) (Italy, France, United Kingdom (UK), Germany and Spain) and by international lists such as the FAO Fisheries and Aquaculture Statistics and Information Service (ASFIS) [22], FishBase [23] and the Latin-Chinese Dictionary of Fish Names (LCDFN) [24] to assess similarities and discrepancies. Finally, possible implementations for the creation of a Chinese seafood naming standardized system through the introduction of an EU-style approach are suggested.

## 2. Materials and methods

### 2.1. Samples collection

One hundred fish samples, fresh, frozen and processed, either in bulk or packaged, were purchased in 2014 (Table 3). The samples were collected in Shanghai (SH), Nanjing (NJ) and Hangzhou (HZ): for each city 5 supermarkets, belonging to different postal districts, were randomly selected. The samples were collected if reporting the ideograms 鳕 (*Xue*) or 金枪鱼 (*Jin Qiang Yu*) (alone or associated with other terms) which correspond to the English terms Cod and Tuna, respectively. In the case of Salmon different names are used depending on the location: 大马/麻哈鱼 (*Da Ma Ha Yu*) or 鲑鱼 (*Gui Yu*) in the Provinces of Heilongjiang, Jilin and Liaoning and 三文鱼 (*San Wen Yu*) in the cities of SH, NJ and HZ (Yangtze Delta Region).

The labels of the packaged products were analyzed. In case of fish sold in bulk, the billboards displaying the product information were photographed. Finally, all the samples were logged with an internal code and filed.

### 2.2. Label inspection

All the information reported on the labels or on the billboards was translated to English by a Chinese native speaker, also with the use of multimedia translation tools [25,26]. The information reported on the labels of packaged samples was assessed in the light of the Chinese general mandatory National Standard GB7718-2011, while information regarding bulk products (mainly reported on billboards) was assessed according to the Decision General Order No. 123 of 2009 which should be applied to *"foods produced (sub-packaged) and distributed within the borders of the People's Republic of China"* (Table 1). Moreover, Chinese national (mandatory or voluntary) and professional voluntary standards on fishery products were also analyzed (Table 2). In addition, the information on geographical origin were assessed.

### 2.3. Analysis of the denomination adopted for Cod, Salmon and Tuna

#### 2.3.1. European official lists of seafood denominations

The official list of 5 MSs, namely Italy [27–31], France [32], UK [33], Germany [34] and Spain [35], were analyzed. In particular, only those names that, translated from the official language of the MS to English, matched with Cod, Salmon and Tuna were considered (Table 4). Moreover, in order to better clarify the different national approaches for the management of seafood labeling, the ratio among the total number of commercial denominations used for Cod, Salmon and Tuna species and the corresponding number of species present in each lists, was calculated (Table 1SM), as in [36]. This ratio can be considered as an Index (Species Index, SI) that reflects the accuracy of each analyzed list in managing the commercial nomenclatures. In fact, an $SI > 1$ means that the trade names are more than the species and therefore the same species can be commercialized with more than one trade name. On the contrary, in the case of an $SI < 1$, the number of species is higher than that of the denominations. This means that different species share the same commercial designation. The most accurate situation ($SI = 1$) is reached when the MS assigned to each species a unique trade name. Moreover, since in some cases the MS assigned the same commercial designation to an entire genus, a second Index (Genus Index, GI) was calculated taking into account the number of trade names in relation with all the species belonging to a specific genus (Table 1SM).

#### 2.3.2. International lists of seafood denominations in Chinese

International lists, such as ASFIS [22], Fishbase [23] and the Latin-Chinese Dictionary of Fish Names [24] were investigated to assess the Chinese names for Cod, Salmon and Tuna species found in the EU lists analyzed. The Indices (SI and GI) were then calculated (Table 2SM).

## 3. Results and discussion

### 3.1. Samples collection

In this survey, 100 samples of fish products (46 of salmon, 38 of cod and 16 of tuna) were collected. Among these, 43% were fresh, 30% frozen and 27% variously processed. Forty-two percent of them were packaged (64% processed and 36% frozen) and 58% in bulk (70% fresh and 30% frozen) (Table 1). Despite the number of samples is small, if compared to the overall amount of fishery products traded from China, the outcomes of the present analysis could represent a first step into the main issues affecting the sector. Moreover, they could be useful to focus further studies on high prized products that, worldwide, are often affected by labeling non-conformities [37].

### 3.2. Chinese label inspection: trade name and origin

All the products presented a label in Chinese, while a small