

## Article

# Towards the Introduction of Sustainable Fishery Products: The Bid of a Major Italian Retailer

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**Abstract:** Intense fishing pressure has been depleting marine resources worldwide. At a time when almost a third of world stocks are overexploited, the demand for fish and seafood is growing both due to the increasing world population and to rising per capita consumption. Over the past few decades, the demand for fish products has in turn grown considerably in Italy, although concern about sustainable fisheries here is not perceived as keenly as in Northern European countries, where certified fish and seafood products coming from sustainable fisheries are widely available. In this study, 248 fish and seafood products sold by a major Italian retailer were evaluated in terms of geographic origin, gear used, species conservation status, and stock status to gain information in view of the introduction of sustainable fishery products in Italy's outlets. A literature review illustrated that most species came from some of the most intensely exploited fishing grounds in the world, where they are usually caught by trawls. The results highlighted the importance of supplying seafood products coming from sustainable sources and fisheries through the adoption of eco-labels and certification schemes. Finally, the present study stresses the urgency to promote more responsible fish and seafood consumption in Italy.

**Keywords:** seafood; Italy; retailer; sustainability; certification

## 1. Introduction

Over the past century, human activities have severely affected aquatic life worldwide. Fish and seafood supply nearly 17% of the world's animal protein intake, and intense fishing pressure has led to a precipitous decline of several fish stocks [1,2]. According to the most recent FAO report [2], the global total capture fishery production in 2014 was 93.4 million tonnes, of which 81.5 million were from marine waters and 11.9 million from inland waters. The steep growth of the world population has involved an increase in per capita fish and seafood consumption that translates into a continuously increasing demand for aquatic food resources [3,4]. However, it has been estimated that 31.4% of fish stocks are being fished at a biologically unsustainable level [2,5]. Recently, the depletion of fish stocks due to overfishing and the failure of fishery management programs has become a major concern of government agencies, environmental non-governmental (ENGO) corporate partnerships, and retailers [6–8]. Several advocacy groups have promoted awareness campaigns aimed to encourage sustainable fisheries and the responsible consumption of fish and seafood. These actions have increased consumer awareness and the demand for certified seafood products [7,9,10]. Clearly, a greater awareness of the importance of buying sustainable fish and seafood would ensure long-term access to aquatic resources.

Italy is one of the largest consumers and importers of fish and fishery products in the world [2,11]. During the past decades, the Italian fish and seafood market has witnessed a substantial increase in the total demand for these products, mainly as a result of higher per capita consumption due to a greater propensity to consume fish proteins, to a greater emphasis on healthier products, and to higher living standards [12,13]. Italy has long been a “net importer” of fish products, especially since the mid-1990s, when an increase in imports was driven by a reduction in domestic production [14]. For instance, in 2015, Italy imported more than \$5 billion worth of fish and seafood products, especially from Spain, the Netherlands, and Denmark, principally consisting of prepared or preserved tuna and skipjack [2,15]. However, whereas fishery sustainability has been a widespread concern in Northern European countries, Southern European countries, Italy included, have been less interested [7]. A variety of fish and seafood certification schemes and eco-labels have recently been developed to encourage environmentally sustainable fishing practices [16]. Among these, the Marine Stewardship Council (MSC), which provides labels for sustainable fishery products, has been recognized as the world’s most comprehensive fishery certification schemes [6,17]. Briefly, fisheries seeking certification are required to meet MSC standards, which are based on three major principles: sustainable fish stocks, environmental impact minimization, and effective management [17,18]. Of particular note, the MSC eco-label also certifies the entire supply chain, ensuring that seafood products can be tracked from ocean to plate and from plate to ocean by offering seafood products that bear high quality information including fish provenance, FAO fishing areas, and fishing methods [17,18]. To date, more than 230 fisheries worldwide have obtained MSC certification and a further 88 have begun the process [18]. However, most MSC-labelled products are sold in a limited number of countries, such as the United States, Germany, the Netherlands, and the United Kingdom [18]. In Mediterranean countries, fisheries certified according to MSC standards are still few in number, and the few products bearing environmental certification labels have limited market diffusion. In Italy, some widely consumed fish and seafood products (chiefly canned tuna, sardines, and anchovies) bear the Friends of the Sea (FOS) eco-label [19]. The feasibility of applying FOS standards to artisanal and traditional anchovy fisheries in Southern Italy [20] or to the “fasolari” fishery in the Northern Adriatic [21] is currently being assessed. However, the FOS scheme is largely based on official data rather than the direct engagement of managers and certifiers. In addition, the FOS certification focuses on stock sustainability and does not include the provision that products come from a fishery that is both sustainable and sustainably managed [7]. WWF labelling criteria consider it as “semi-compliant” [22].

Recently, Carrefour Italy, a major food retailer, has announced its intention to sell sustainable fishery products—in particular, products bearing the MSC label, whose requirements [18] include, in addition to the sustainability of product sources and fisheries, the provision of information such as origin and provenance, fishing gear used, and stock status. The present study assesses the relevant information regarding the fish and seafood products sold by Carrefour Italy in 2015, examines the main aspects regarding their sustainability, and discusses the importance of consumer information and awareness.

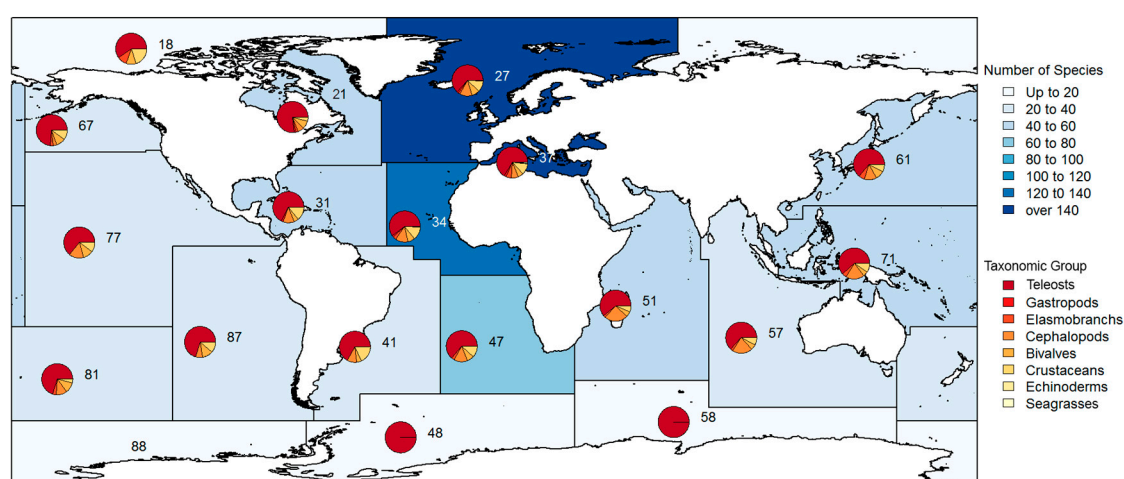
## 2. Materials and Methods

A list of fish and seafood products sold in 2015 by Carrefour Italy was provided by the company. Species were then examined for origin and provenance in relation to the FAO Major Fishing Areas and the gear type used. This information was collected from the EU Database on marketed fishery and aquaculture products and FAO Fisheries and Aquaculture—Species Fact Sheets. The origin of the different species was mapped on a global scale based on FAO Major Fishing Areas using the R packages *rgdal* [23], *maptools* [24], and *sp* [25,26]. Species were divided into taxonomic groups (Teleosts, Elasmobranchs, Crustaceans, Cephalopods, Gastropods, Bivalves, Echinoderms, and Seagrasses). The geographical distribution of the different taxonomic groups was mapped according to an increasing blue gradient. Then, the distribution of the fishing gears used to catch the species was evaluated for all taxonomic groups divided by IUCN (International Union for Conservation of Nature) conservation status. A review of the literature was made to collect

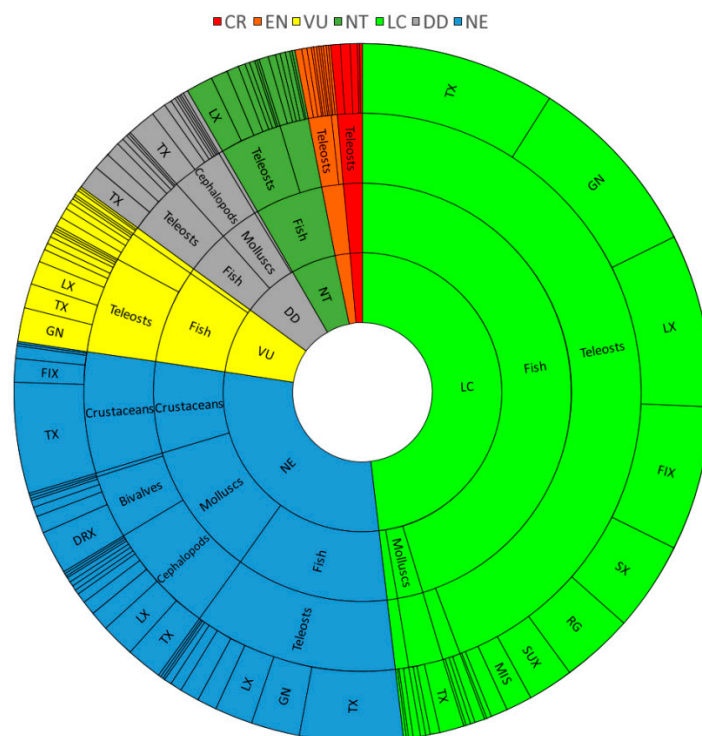
sustainability information, with particular emphasis on IUCN status [27] and stock status. These data were obtained from a variety of sources, including the International Council for the Exploration of the Sea (ICES), the Scientific, Technical, and Economic Committee for Fisheries (STECF), and the International Commission for the Conservation of Atlantic Tunas (ICCAT), and scientific publications.

### 3. Results

Fish and seafood products sold by Carrefour Italy in 2015 comprised 248 marine species belonging to eight taxonomic groups (Table S1). Fish were the most abundant group (154 Teleosts and 9 Elasmobranchs), followed by Molluscs (32 Cephalopods, 20 Bivalves, and 2 Gastropods), Crustaceans ( $n = 29$ ), Echinoderms ( $n = 1$ ), and Seagrasses ( $n = 1$ ). Most species were caught in the North East Atlantic (FAO 27, 61.7%; Figure 1), the Mediterranean Sea (FAO 37, 58.5%; Figure 1), and the Central East Atlantic (FAO 34, 50.4%). The most common gear types used were trawls, particularly bottom trawls (Figure 2). Based on IUCN conservation status, 101 of 248 species were listed as Least Concern and 97 as Not Evaluated (Figure 2 and Table S1). A few species were listed as Data Deficient ( $n = 19$ ), Near Threatened ( $n = 11$ ), Vulnerable ( $n = 11$ ), Endangered ( $n = 4$ ), and Critically Endangered ( $n = 2$ ). The review of the literature showed that, in some areas (e.g., the Mediterranean Sea), most species came from exploited and/or overexploited stocks (Table S1) and that the information on stock status was poor or highly uncertain for 16% of species.



**Figure 1.** Map showing the geographic distribution of the eight taxonomic groups (Teleosts, Gastropods, Elasmobranchs, Cephalopods, Bivalves, Crustaceans, Echinoderms, and Seagrasses) in the FAO Major Fishing Areas according to an increasing blue gradient (light blue = fewer species; dark blue = more numerous species).



**Figure 2.** Multi-level pie chart illustrating the different fishing gears \* used to catch the species investigated. Species are divided by taxonomic groups (Teleosts, Elasmobranchs, Crustaceans, Cephalopods, Gastropods, Bivalves, Echinoderms, and Seagrasses) and IUCN conservation status (CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient; NE, Not Evaluated). \* Gear type acronyms adapted and defined according to FAO code list: DRX = dredges; FG = falling gear; FIX = traps; GN = gillnets; HAR = harpoons; HMX = harvesting machines; LN = lift nets; LX = hooks and lines; MIS = miscellaneous; RG = recreational fishing gears; SUK = surrounding nets; SX = seine nets; TX = trawls.

#### 4. Discussion

The present study examines the origin and provenance of fish and seafood products sold in 2015 by a major food retailer, Carrefour Italy. Fish accounted for the largest taxonomic group. Most fish products came from the Eastern Atlantic (FAO 27 North East Atlantic and FAO 34 Central East Atlantic Major Fishing Areas) and the Mediterranean Sea (FAO 37), which are among the principal and most productive fishing areas in the world [28,29]. Notably, the North East Atlantic has historically supported the industrial and commercial fisheries of several North European countries, which have traditionally targeted Atlantic cod, herring, and mackerel. This area also supplies 77.4% of EU catches [30] and some products imported by Italy, such as fresh and farmed salmon, dried cod, prepared and preserved fish, frozen Norway lobster, and fresh and frozen scallops [31–34]. In contrast, the high species diversity and richness of the Central East Atlantic has only recently begun to attract foreign fleets [35,36]. Imports from this area usually comprise canned tuna, frozen cuttlefish and squid, prepared and preserved mackerel, and anchovies [31,32,34,37]. As regards the Mediterranean Sea, it is traditionally exploited by EU and non-EU Mediterranean commercial fleets, whose intense fishing efforts have depleted the stocks of several target species. Indeed, approximately 85% of the fish stocks assessed by the STECF are overexploited in this area [11,13,38]. In Italy, the demand for fish and seafood is met partly by fish (caught or farmed) that are locally marketed fresh, and increasingly by imports from the above-mentioned fishing areas [14].

The present work highlights that trawlers are the fishing gears used most commonly to catch the commercial species sold by Carrefour Italy. Notably, bottom trawlers target a wide range of demersal species such as cod, hake, flatfish, and shrimp. In this multi-species fishery, even though all target species are subject to the same fishing effort, the less abundant and more vulnerable species

may take a long time to recover from intense trawling activity. In addition, it has recently been documented that multi-species bottom trawl fisheries are characterized by high discard rates of undersized commercial species (i.e., juveniles, [39–41]) and accidental catches of non-target species with low or no market value, such as sharks, sea turtles, and marine mammals [42]. Thus, marine organisms at risk of decline may be caught together with species whose populations can withstand their fishing effort. Consumers should therefore be informed whether a fish or seafood product comes from a mixed and/or multi-species fishery, which has the potential to inflict further damage on vulnerable stocks, protected species, and/or species of conservation concern.

Data analysis showed that the majority of fish and seafood species sold by Carrefour Italy were globally Least Concern and Not Evaluated species according to the IUCN conservation status. As regards Least Concern species, Fish were the most numerous taxonomic group. Although significant declines have not been globally recorded for their stocks, this does not exclude the possibility that some species may be severely threatened locally, as demonstrated by the Near Threatened status of European pilchard (*Sardina pilchardus*) in Europe. Indeed, this small pelagic fish is a major commercial species in the North East Atlantic and the Mediterranean Sea, and together with anchovies is among those subject to the most intense commercial exploitation and landing by Italian fishing fleets [12,32,33]. Accordingly, these species are considered overexploited, especially in the Adriatic Sea, i.e., Geographical Sub-Areas (GSAs) 17 and 18 [13,43]. The Northern Adriatic pelagic pair trawl fishery targeting anchovies and sardines, managed locally by “Consorzio Mare Adriatico,” is currently being evaluated as the first fishery in Italy and in the Mediterranean Sea to apply for the MSC eco-label (see MSC announcement in [44]). As regards the species categorized as Not Evaluated, most were Molluscs. Although a large number of Mollusc species have not yet been examined by the IUCN, some are important target species of commercial fisheries and may be subject to intensive fishing pressure. For instance, the striped Venus clam (*Chamelea gallina*) is targeted in the Eastern Atlantic and the Mediterranean Sea, mainly the Adriatic Sea [45,46]; its heavy exploitation in the latter area has suggested the adoption of management measures that are currently being evaluated [47]. Finally, for a small number of species globally categorized as Data Deficient by the IUCN, the official regional conservation status and stock assessment data were poor or absent. Although a small number of these species are exploited by commercial fisheries in some regions (i.e., *Panulirus regius* in the Central East Atlantic), no clear exploitation status is reported in the literature due to extreme uncertainty. For these species, purchasing should be limited or products should be offered on the market after exhaustive investigation. Therefore, further research should be conducted to gain insight into the biology of the least known species, especially to assess the extent of potential threats.

The present findings also indicate that several species marketed by Carrefour Italy, which are among the most important commercial species in Italy and Europe, are overexploited and/or close to overexploitation in terms of stock status. Clearly, these species should be suitably managed to avoid depletion. Over the past few decades, EU and national regulations have been passed to promote and enforce a sustainable use of fishery resources (see Regulations in [48–50]). However, until appropriate management plans and measures are adopted [51–54], large and small retailers should avoid selling species from unsustainable sources and fisheries, or at least help consumers make informed choices.

This study offers relevant information in view of the introduction of sustainable fishery products by a major Italian retailer. Origin, provenance, and gear type are among the requirements for MSC certification, which is currently considered as the world’s most comprehensive fishery certification scheme [6,17]. The MSC label is clear and easy to understand, and enables consumers to make informed choices. Carrefour Italy has recently announced its intention to sell fish and seafood products carrying the MSC label. The present study provides information that can guide the company in selecting products from species that come from sustainable sources and fisheries. Since in Italy the interest in sustainable fishery products is still limited [6], the adoption of eco-labelled products by Carrefour Italy and other large retailers would provide a valuable incentive, enhancing

supplier and consumer awareness and promoting more responsible consumption of fish and seafood products.

## 5. Conclusions

This study was performed to collect information in view of the introduction of sustainable fish and seafood products by a major retailer in Italy. The information on species provenance, fishing gear, and conservation and stock status thus gathered will inform the retailer's future decisions and guide it in selecting the species that can be sold in its outlets in accordance with sustainability standards. At a time when the demand for sustainable products is growing, this study also suggests that some species, which are currently overexploited in some regions, could be caught in others. Sustainability information is essential for fishery certification, which in Italy is lagging behind. This preliminary evaluation is in line with some of the requirements of the MSC certification scheme, which is considered as the most reliable eco-label now available. Further investigations are needed to establish which fish and seafood products the retailer sells most and how Italian consumers respond to eco-labels.

**Supplementary Materials:** The following are available online at [www.mdpi.com/2071-1050/9/3/438/s1](http://www.mdpi.com/2071-1050/9/3/438/s1), Table S1: Fish and seafood products sold by Carrefour Italy listed according to FAO Major Fishing Area, gear type used, and IUCN conservation status and stock status.

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**Conflicts of Interest:** All authors declare no conflict of interest.

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