

# Implementing Supply Chain visibility to promote fisheries sustainability

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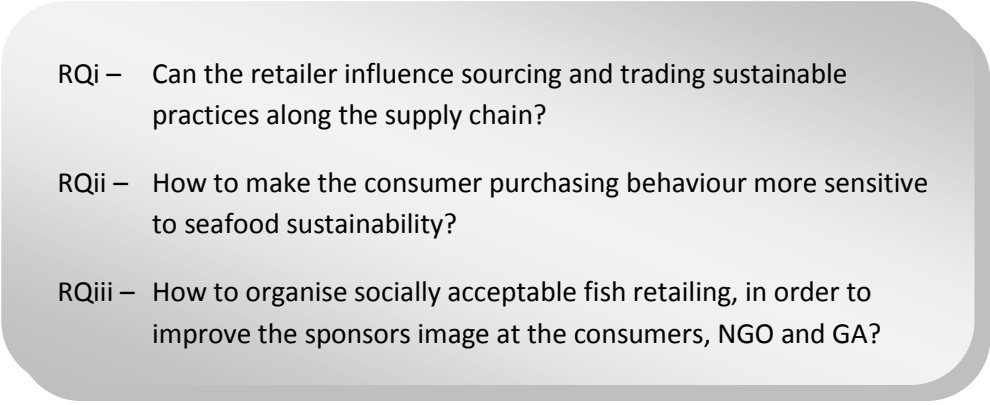
## Abstract

Operationalising good practices and better management of marine resources were pursued, in a retailer exploratory case, by following a triple bottom line approach to fine tuning corporate responsibility. Recommendations towards sustainable operations were made, as regards: developing voluntary self-certification towards eco-labelling based on third party; using IT, as a transparency promoter and so, as a leverage for traceability, collaboration and trust across the chain of custody; designing customised policies to deal with different consumer profiles and so, assuring their loyalty by adjusting consumer campaigns; educating consumers as seafood demand regulators. Improvements in Greenpeace evaluation were documented, profit increase was expected.

**Keywords:** Sustainability in seafood, Supply Chain Traceability, Social Responsibility

## 1 Introduction

This study presents an empirical research on how the implementation of good practice in fish stocks protection might also contribute to corporate sustainability performance (CSP). The followed view addresses the pursuing of these practices in a retailer, as well as in the upstream stakeholders in the supply chain. In fact, Non-governmental Organizations (NGO) have been calling for the maintenance of both an acceptable and sustainable level of fish stocks (FAO, 2010). Moreover, Governmental Agencies (GA) and Universities have also investigated excessive fishery as a major threat (Till and Markus, 2012). As a consequence, this situation demands for innovative practice towards an environmentally-friendly policy (Laxe, 2010) in the business operations of the sponsor of the current research, a large hypermarket chain. In this way, the following research questions arise (*vide* Figure 1). These questions concern the role of the retailer within the defined scope.

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- RQi – Can the retailer influence sourcing and trading sustainable practices along the supply chain?
  - RQii – How to make the consumer purchasing behaviour more sensitive to seafood sustainability?
  - RQiii – How to organise socially acceptable fish retailing, in order to improve the sponsors image at the consumers, NGO and GA?

**Figure 1.** Research questions

Nevertheless, these operations should also target the creation of competitive advantage and profitable results. To sum up, the objectives of the research are, as follows: (i) to understand and explain the purpose of corporate sustainable practices; (ii) to address the topic positioned within an integrated context by considering its economic, environmental, and social dimensions; and, (iii) to offer corporate decision makers reliable guidance towards more sustainable business operations in fish retailing.

A case study strategy is pursued in the retailer, in order to achieve the research objectives. However, establishing the research context is so important that a descriptive survey based on a short questionnaire is also applied to the consumers. This mostly quantitative questionnaire aims at collecting the perceptions of a few representative consumers as regards a few economic, environmental, and social dimensions of the context. The surveyed consumers were purposefully chosen among the customers of the store where the exploratory case study took place. This sample is constrained by the duration and the location of the study that were set by the hypermarket sponsor.

While the questionnaire sets a rich context for the situation, the case study enables an in depth understanding of the requirements for sustainable fish retailing. Therefore, socially acceptable operations suggest the design of a working tool that might enable the traceability of the supplier's activity concerning the several fish species. By using a database implemented in a spreadsheet, reports providing guidance to manager's action can be generated as a significant outcome. These reports treat, organise, consolidate and summarize data collected by observation, interviews and internal document analyses. External data sources, such as Greenpeace reports, e.g. ship owner's blacklists, are also used. A traffic-light system (TLS) (Caddy, 2002) is implemented to classify the fish capture features, based on the spreadsheet database. The TLS was also used to provide very clear information to the consumer about how critical is the sustainability status of each fish species. In this situation, the taxonomy is based on the Greenpeace red list which informs about the species at risk.

It should also be added that the reported questionnaire is supported on a thorough literature review in order to improve its construct validity. Moreover, it is validated by a pilot study. On the other hand, the reliability of the case study is improved by keeping the gathered documentation in a file, as well as by creating a case protocol (Yin, 1994: 33, 64, 95). At last, only analytic generalization might be possible due to the chosen design for the research, which mainly addresses the specific situation of the sponsor.

The developed *Database* helps the retailer to control the business procedures of its replenishment sources. In fact, fisherman and fish owners are under both economic and social pressure to accomplish the fishery policies of Governmental Agencies, i.e. avoiding overfishing, illegal fishing and unsustainable fishing methods. The sponsor and its supply chain are currently pursuing business practices also closely focused on the environmental and social dimensions, in addition to a stricter orientation towards profit. Another contribution for the practitioner is the operationalisation of real world procedures in order to be pursued a corporate performance that is more sustainable because it is strategically aligned with the other stakeholders, i.e. both final customers (consumers) and suppliers. Thus, the proposed Database System is expected to contribute to increase the loyalty of the customers by implementing a fishery policy that values the sustainability of both ecosystems and sea species, in line with the principles defended by the Blue Ocean Institute (BOI, 2013). On the other hand, the *Traffic Light* is a core system that visually reports and highlights the conclusion of the knowledge accumulated and treated in the database. The Traffic Light System (TLS) is included both in the Database and in the labels of the fish that is being sold. Another use of the TLS promotes a very easy way to make the customers aware of the impact of their purchasing options in the species at risk and, hopefully, much more responsible.

A few limitations arise from the study, as follows:

- TLS implementations that mainly address fish captured in the sea;
- just using a Greenpeace red list;
- self-certification process;
- consumer lacking information;
- weak involvement of all stakeholders and modest use information technology provide insufficient supply chain transparency and limited trust;
- no real time, on-time information across supply chain;
- sample of purposefully chosen customers;
- constrained robustness of the pilot-test;
- no partnership with scientific institutions;
- no literal and theoretical replication (Yin, 1994: 45-7).

Limited fish traceability was successfully introduced by the provision of critical information to the consumers. There is a huge need to develop a CPFAR approach and the consumers did exhibit an unacceptable behaviour pattern. This research proposes the continuing of the briefing and sensibilisation of the consumers by both eco-labelling and marking fishes accordingly to the Traffic-Light System, following the Greenpeace orientations. The pursued approach is aligned with what most of the competition does, Its usefulness is based on establishing good sourcing, working and trading practices for a chain of hypermarkets and also on diagnosing the status of the art for businesses that might be classified as “followers”. It is argued for an innovative contribution as concerns setting three types of consumer profiles, which might enable the fine tuning of future consumer campaigns and so, improving customer loyalty and business turnover.

Next sections of this paper are, as follows. In section 2, a literature review is carried out. In section 3, the results of the exploratory case study are presented and analysed. Then, discussion and final conclusions will close the report over the research questions and the objectives.

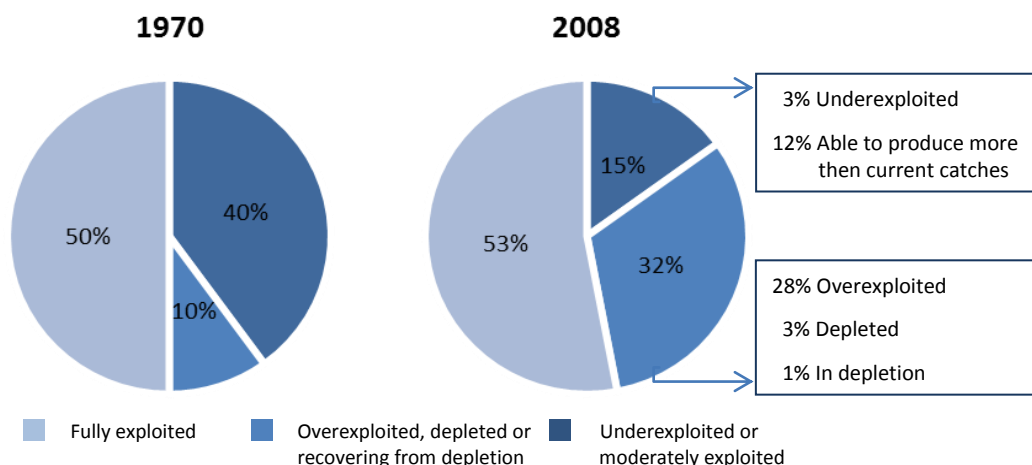
## 2 Literature review

### 2.1 Status of the art of sustainable fishing

The mismanagement of oceans resources brings serious consequences for life on Earth. Oceans are approaching the threshold of environmental recovery. Therefore, this is the right time to change the mindset and to implement its sustainable management.

An increase in scientific research concerning topics, such as acidification (Fenchel, 2011), ocean warming (Lyman et al., 2010), habitat loss (Airoldi et al., 2007), and the appearance of so called “dead-zones” has driven the shifting of attitudes (Schrope, 2006). So, indifference as regards the marine environment is no longer an option, particularly when we consider the effects of the overexploitation of fisheries (Shakouri et al., 2010).

Indeed, a growing global population over 7 billion, has led to an ever-rising demand for seafood and also to a resulting increase in fishing effort. The latest FAO figures report that 32% of marine fisheries are overexploited, depleted or recovering from depletion, having increased from 10% in 1970 (*vide* figure 1). A further 53% of fisheries are being exploited at their maximum level and, many of them, without the management measures in place to prevent over-exploitation (FAO, 2010).



**Figure 2.** The increase in fisheries exploitation since 1970. Source: FAO (2010: 8)

Still according to FAO data, the remaining 32 plus 15 percent of fisheries is not enough to overcome the excess fishing pressure and it yields less than their maximum potential production. In summary, the increasing trend in the percentage of overexploited, depleted and recovering stocks and the decreasing trend in underexploited and moderately exploited stocks provide a serious cause of concern.

### 2.2 Economic, social and ecological management of fisheries

Fisheries represent the last major international industry based on the chasing and gathering of wild animals. It is neither primitive nor innocuous, and fishing remains as an essential element of food supplies that is vital for the well-being of hundreds of millions of people (Pauly et al., 2003).

Nowadays, the higher demand levels of fishing are a major threat to the structural and functional (re)organization of marine ecosystems: direct effects regard the reduction of

both the temporal and spatial distribution of the target species, habitat damage and a sharp drop in the average size of captured fishes (Andersen et al., 2008). Indirect ones concern causing or enhancing changes in the fish community structure or differential effects on shoal functional groups (Greenstreet et al., 1999). Efforts are currently being made to understand the wider effects of fishing, to measure them (Pauly et al., 2003) and to set quotes concerning fish stocks (FAO, 2010; Shakouri et al., 2010), because the increasing evidence of the collapse of many species.

The collection of such data is often quite expensive and it requires a continuous research effort with an adequate monitoring system and, expertise that is not always available. The outcomes of this research must be robust enough to support the management of fisheries on a sustainable basis and to promote higher sustainable levels of both fish stocks and catches. Fisheries are core subjects for the balance of fish stocks in marine ecosystems, and healthy ecosystems are a key element to the continuity of the fisheries business, like an economic-ecological virtuous circle.

Fisheries also involve more socio-economic objectives, coming from fishing revenue since they provide employment for millions of people, worldwide, from fisherman to aquaculture producers and, from traders and intermediaries to wholesalers. This sector might play a fundamental role in preventing and reducing poverty, in developing countries (FAO, 2010). However, sustainably managed fish stocks have to rely on just 19% of the total fish stocks (*vide* Figure 2) to ensure the long term feasibility of all these livelihoods. In this way, the remaining stock is being recovered.

The progress made by Government Agencies (GA), Universities, Research Centres and Non-governmental organizations (NGO) is getting results in reducing exploitation rates and, restoring both overused fish stocks and marine ecosystems (Till and Markus, 2012). The adoption of the Code of Conduct for Responsible Fisheries (1995) illustrates this issue.

Control measures for illegal fishing on the high ocean, where no state has authority, do exhibit serious drawbacks as regards the law enforcement (EJF, 2012). According to Greenpeace (2013), the most problematic areas are located around West Africa where the “pirates” illegally catch tonnes of fish, destroying the economies of nearby countries. Each year, illegal fishing in the waters of sub-Saharan Africa is estimated in 1.2 billion Euros. Often, culprits are Chinese, Korean and Taiwanese vessels that have licenses to fish in one zone but, then, exploit another one (Wall Street Journal, 2007). Most illegal catches are exported to Europe through the Spanish port of Las Palmas. Fish illegally caught are transhipped at sea onto large refrigerated cargo vessels, where they are mixed with legal catches before being transported to their final destination port (EJF, 2012).

With regard to combating Illegal, Unreported and Unregulated (IUU) fishing, reinforced controls have been developed, such as: (i) the elaboration of an international legally-binding instrument (COM, 2008) on port measures to prevent and eliminate IUU fishing; this is mainly due to international cooperation, monitoring and control measures

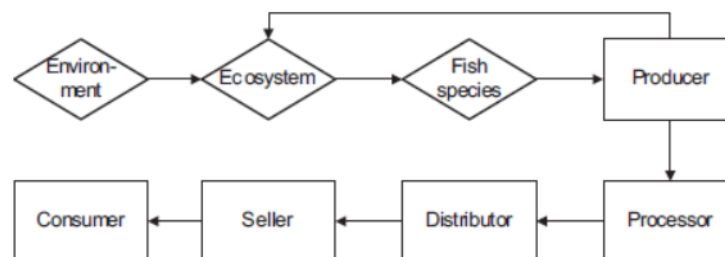
applied to the whole chain of fishing and related activities; (ii) a governmental partnership framework that develops a sustainable fisheries policy and responsible exploitation of fishery resources (FAO, 2010); and, (iii) the search for harmful fishing methods (*e.g.* like the bottom-trawl), parallel trading and lack of compliance with standards relating to minimum size of captured species (Jacquet & Pauly, 2007).

On the other hand, NGO Greenpeace, to prevent illegal fishery outcome from entering the supply chain, developed and recommends the following two initiatives: (i) the traceability of fishery products; and, (ii) the use of Greenpeace Blacklists, *i.e.* lists of boats that are not authorized to fish or that have already been punished for illegal fishing activities. All Blacklists concerning fishing vessels and fish transport vessels, including their owners or operators and companies, were compiled from the Official International Blacklists. This information is based on the official registries of IUU fishing that are publicly available and accessible in Greenpeace (2013) webpage.

Developing frameworks for achieving responsible sustainability is imperative to operationalise knowledge and to enforce good practice across the supply chain, from fishermen to retailers (FAO, 2010). These frameworks should enable a transition to sustainable fisheries management in the form of support for fisheries improvement projects, demand for certified origin of seafood and its traceability up the supply chain. Private sector should also be fully committed to these actions in order to contribute to a quick recovery of shoals from extremely low population levels.

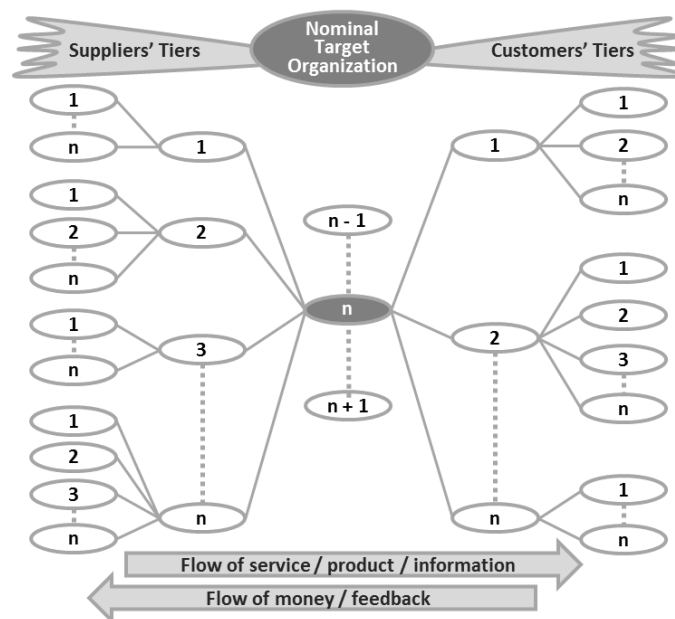
### 2.3 Retailers and Supply Chain Sustainability

In the fish supply chain the captured fish is sent to market through processors, distributors and retailers before ending up on consumers hands (Figure 3). The effort of the producer (fishing fleet) is depicted as providing feedback to the ecosystem model by impacting fish abundance and catches of both target and non-target species (*vide* also Thrane et al., 2009). Aquaculture units can also be incorporated as producers or processors as best suited in individual applications (Christensen et al., 2011). In this way, the liability to ensure the chain sustainability by an environmentally-friendly policy (Laxe, 2010) belongs to all the participating parties, in the business operations across all the supply chain (*vide* RQi).



**Figure 3.** Schematic value chain flows from sea to consumer for a single fish species. Source: Christensen et al. (2011)

Environmental pressures constitute driving forces to improve the sustainability of supply chains (Linnenluecke and Griffiths, 2010; Zhu et al., 2011). Many times, environmental damages are not acknowledged once that (i) they do not impact market price formation in early stages of unbalance; (ii) they occur too far away from the marketplace; and, (iii) product is not yet scarce. Thus, a clear link between supply chain strength and firm environmental performance becomes explicit (Vachon and Mao, 2008) and supply chains must become integrated by considering both upstream and downstream stakeholders (RQi). Connolly and Caffrey (2011) suggest the existence of additional tiers both upstream and downstream not shown in Figure 3 (e.g. Figure 4). In fact, business processes and management components of the supply chain are closely inter-related with the depicted structure (Lambert et al., 1998).



**Figure 4.** Schematic of a generalized supply network. Source: Connolly and Caffrey (2011)

In this context, due to their strategic position and market influence, retailers play a core role in driving supply chain environmental sustainability (David-Styles et al., 2012; Minten et al., 2009). Indeed, retailers are drivers to Fair Trade, offering substantial contributions for achieving sustainable development (COM, 2002), by the provision of information, user-friendly tools and spread of sustainable practices (RQi). Retailers usually avoid risk since they are very sensitive to social or environmental problems of consumers. Moreover, according to Greenpeace (2008) the high and unpredictable price of damaging the marine biodiversity has led to a growing social awareness that has been demanding the sustainability of the fish species being consumed. Thus, retailing has progressed towards stopping to offer threatened fish species, refusing illegal fishing, criticizing destructive capture methods and offering more friendly alternatives (RQi). However, the results of the Greenpeace survey on fish procuring policies adopted by major retailers, in Portugal, drew strong criticism to all the addressed Portuguese hypermarkets. In fact, still in 2008, strategies concerning fish procurement were not made available to the public, or they even were missing, despite their importance in the retail landscape (Greenpeace, 2008). Finally, according to Caniato et al. (2012) supply

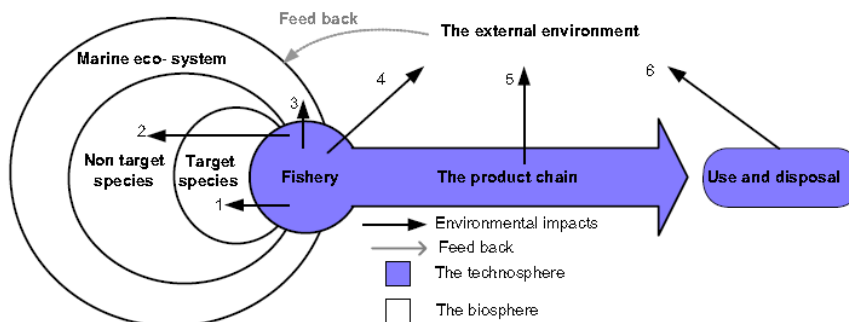
chain management (SCM) might also help companies to pursue environmental responsibility. However, few studies have analysed the relevance of SCM in contributing to environmental sustainability (RQi).

#### 2.4 Robust Management of Fisheries: monitoring, informing and enforcing

Clear standards are helpful to set milestones, agree on end-objectives and promote responsibilities definition for partners upstream the supply chain. Retailers could apply several strategies to drive environmental improvement in the fish supply chains, such as: fish traceability; product certification; environmental criteria for suppliers; dissemination of better practices across suppliers; promoting captured fish eco-labelling; local sourcing; and, optimization of logistics (Caniato et al., 2012). Secondly, the market-based approaches of retailers might push and empower customer choice in sustainable consumption. In turn, this change in the consumer attitude might influence and be transferred upstream the supply chain to the remaining stakeholders, increasing the incentive to entail strategies in the demand for sustainable seafood (Vazquez-Rowe et al., 2012) (RQiii).

#### 2.5 Product certification, eco-labelling and Traffic Light System (TLS)

Eco-labels are seals of approval given to products that are less harmful to the environment than some similar competitors (*vide* also OECD 1991 p.12). The principal objective of eco-labelling is to create a market-based incentive for sustainable management of fisheries by creating consumer demand for seafood products from well-managed stocks. It is possible to distinguish between two subcategories of multiple attribute labels; one that mainly focuses on the fishing stage, (arrows 1–3, in Figure 5) and another one that addresses the ‘environmental’ impacts in the whole life cycle of the products (*vide* arrows 1–5, in Figure 5) (Thrane et al., 2009; Christensen et al., 2011).



**Figure 5.** Environmental impacts at different life cycle stages of seafood products. Source: Thrane et al. (2009)

Type II environmental labels of the International Organization for Standardization (ISO) are based on “self-declared” or “self-certified” environmental claims by producers, importers and retailers on products and services on a voluntary basis (*vide* also IISD, 2013; EEC, 2013), based on their own product standards. The standards might be based on sustainability criteria related to specific environmental issues against which a fishery is to be evaluated.



Product certification and eco-labelling have important differences as currently applied in fisheries, while interrelated and serving the same goal. Product certification is commonly a measure mandated by governments, often mutually agreed upon by regional fisheries management organizations, in order to ensure that only legally harvested and reported fish landings can be traded and sold in the domestic or international markets. Product certification does not necessarily involve a product label at the retail level (Wessells et al., 2001).

The TLS (Caddy, 2002) was found as a useful visual tool, to operationalise effective monitoring and reporting, in a rapid and cheap manner. It supports the decision making process by: (i) describing the pressures affecting the ecosystem; (ii) allowing timely risk analyses and global assessments concerning fisheries management; (iii) updating retailers on fisheries capture and trade issues in a sustainable manner; (iv) tracking progress towards meeting management objectives; and, (v) by clearly communicating both trends in complex outcomes and management processes, to a non-specialist final consumer audience.

In summary, there is a growing awareness that retailers have a vital role to play in promoting more sustainable patterns of consumption. and, in Portugal, 70% of the fish is sold in hypermarkets (Greenpeace 2008). Moreover, the vast majority of consumers visit food retail outlets on an almost daily basis (Intel, 2008, 2010) (RQi). So, food retailers should design schemes to provide consumers with more and better information to make decisions when purchasing seafood (RQii). On the other hand, retailers are the active intermediaries between primary producers, manufacturers and consumers and so, they can be seen in a singularly and powerful position that drive sustainable consumption (RQiii).

### **3 Case study in a large retailer**

The research sponsor is a leading retailer company that owns super and hypermarkets spread all over Portugal. The company believes that taking measures to preserve the environment is a distinctive competence that might contribute to the business sustainable development and so, to Social Responsibility. Therefore, it has been developing a fish procurement policy to recover from initial competitive disadvantage by defining both responsible and sustainable trading business practices targeting to stop selling the species in risk (Greenpeace, 2008b).

Therefore, the sponsor policies have been driven by a long-term approach to risk management, in which, as many uncertainties and threats as possible might be controlled. For instance, the sponsor is taking the first steps in this direction by reducing in 10% fish caught by trawling and committing itself to eliminating illegal fishing by stop doing business with the Greenpeace blacklisted firms. Conformance with these criteria was checked every year. This strategy is expected to contribute to both business sustainability and value creation.

The described pilot-test was carried out in the fishery department of a store chosen by the sponsor as representative, regarding size, area, localization, population and product assortment. Investigated products concerned fresh (sea waters and aquaculture), frozen and dried (cod) fish.

#### **3.1 Data collection**

Data were collected from several critical sources, as follows: (i) documents, databases and the sponsor website were searched for motivations, advantages and goals of the sponsor fishery policy, in order to find out the previous sustainability strategies of the company; (ii) the ranking of the sponsor and other retailers was searched from the Greenpeace website to benchmark the sustainability levels and healthy competition; (iii) ‘Docapesca de Matosinhos’ and ‘Docapesca de Peniche’ were two of the visited suppliers to trace the sources of the supplied fish; (iv) suppliers blacklists were downloaded from the Greenpeace website; these were cross-checked with the sponsors suppliers to eliminate the blacklisted ones; (v) the Whole Foods Market was visited, in London, in order to understand and assess its decision making system; two portals<sup>1</sup> were also consulted; (vi) 153 purposefully chosen customers of the sponsor were surveyed; the applied questionnaire was about seafood purchasing behaviour, ability to identify the species in extinction risk and environmental protection policies: reactions and perceptions; the results coming from the PASW Statistics Software were sufficient to define a very first exploratory consumer profile, which enabled the sponsor to focus its policies.

#### **3.2 Results analysis**

##### **3.2.1 Survey – the consumer perceptions about seafood sustainability**

153 sponsor customers selected by convenience sampling were inquired by following a structured interview. The store, study duration and working shift were chosen by the sponsor. So, results generalization was compromised. In this exploratory survey despite

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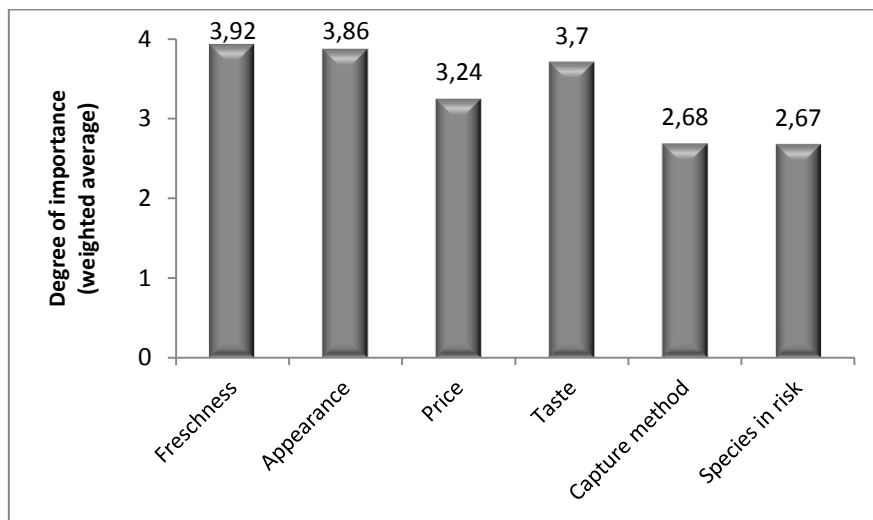
<sup>1</sup> <http://www.wholefoodsmarket.com/> and <http://www.blueocean.org/>

data being quantitative, the analysis was qualitative, because statistical significance was not addressed. Therefore, the average values registered in the graphics might only be interpreted in a qualitative way.

Understanding the consumer perception was an important driver of a future consumer campaign that was questioned in three ways, as follows: (i) relevance of capture method and risk species as purchasing criteria; (ii) general consumer behaviour towards sustainability practice, i.e. prices variations or species offer; and (iii) consumer behaviour when purchasing popular species.

### a) Purchasing criteria

The average importance allocated to each purchasing criteria by respondents in a scale ranging from 1 (not important) to 4 (very important) was depicted in Figure 6.

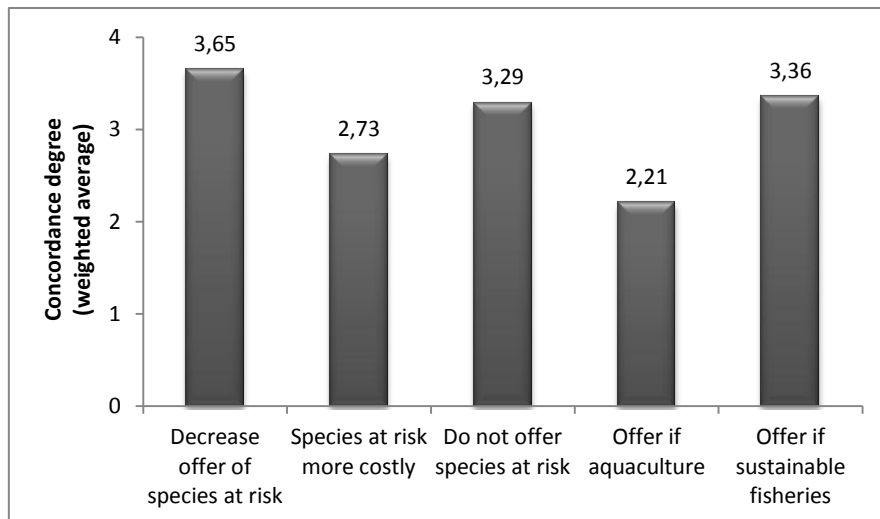


**Figure 6.** Average importance allocated to each purchasing criteria.

Sustainability criteria – capture method and risk species – showed a relevant qualitative smaller degree of importance perception when compared with others. However, respondents still showed high sensitivity, i.e. two thirds of the scale ( $\approx 2,7$  out of 4), which might mean that any potential consumer campaigns towards sustainability would have some kind of impact.

### b) Sustainability practice and general respondents behaviour

The average agreement allocated to each business practice by respondents in a scale ranging from 1 (totally disagree) to 4 (totally agree) was depicted in Figure 7.

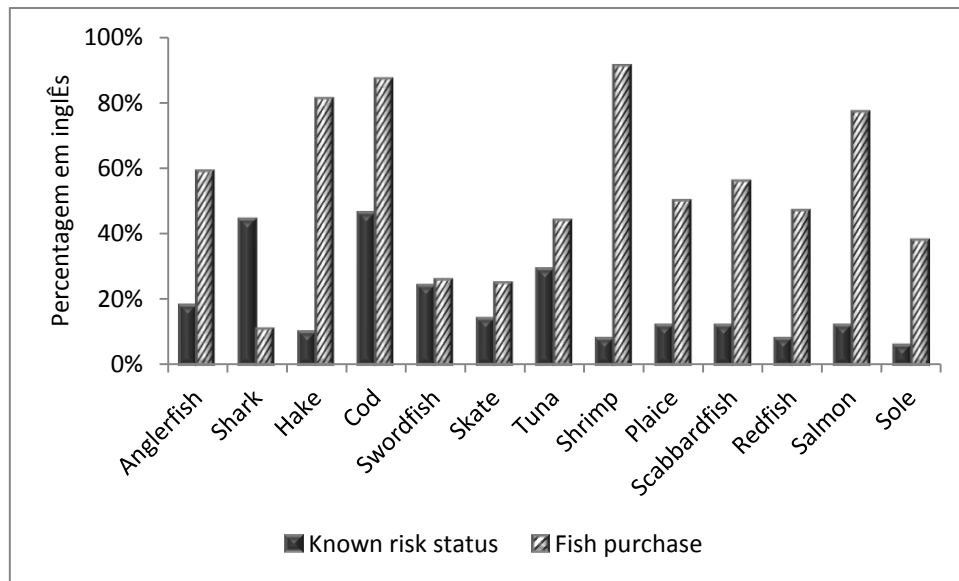


**Figure 7.** Average agreement allocated to each sustainability practice,

One might notice qualitative differences among the average scores allocated to two groups of practices. Furthermore, many respondents agreed that risk species should not be sold or, at least, its offer should decrease. However, as many respondents still thought that if the specie was being captured by sustainable fisheries, it should be made available, even if it was at risk. Perhaps, some information to the consumer was being required since the qualitative differences among the average scores were noticeable. A significant number of respondents argued for risk species becoming more costly. Only half of the respondents agreed that risk species should come from aquaculture, which showed a relevant improvement opportunity.

### c) Specific respondents behaviour when purchasing popular species

Risk species part of traditional national diet were chosen from a list built by Greenpeace (2008b) (red, in the species TLS) and the ones regularly purchased were identified (yes/no). Species risk status was only perceived by 19% of the respondents. Supplying some information could have motivated respondents to change their consuming patterns, e.g. holding the desire, abstaining to consume, replacing the risk species, choosing aquaculture.



**Figure 8.** Respondent's knowledge about seafood species at risk being offered and purchased

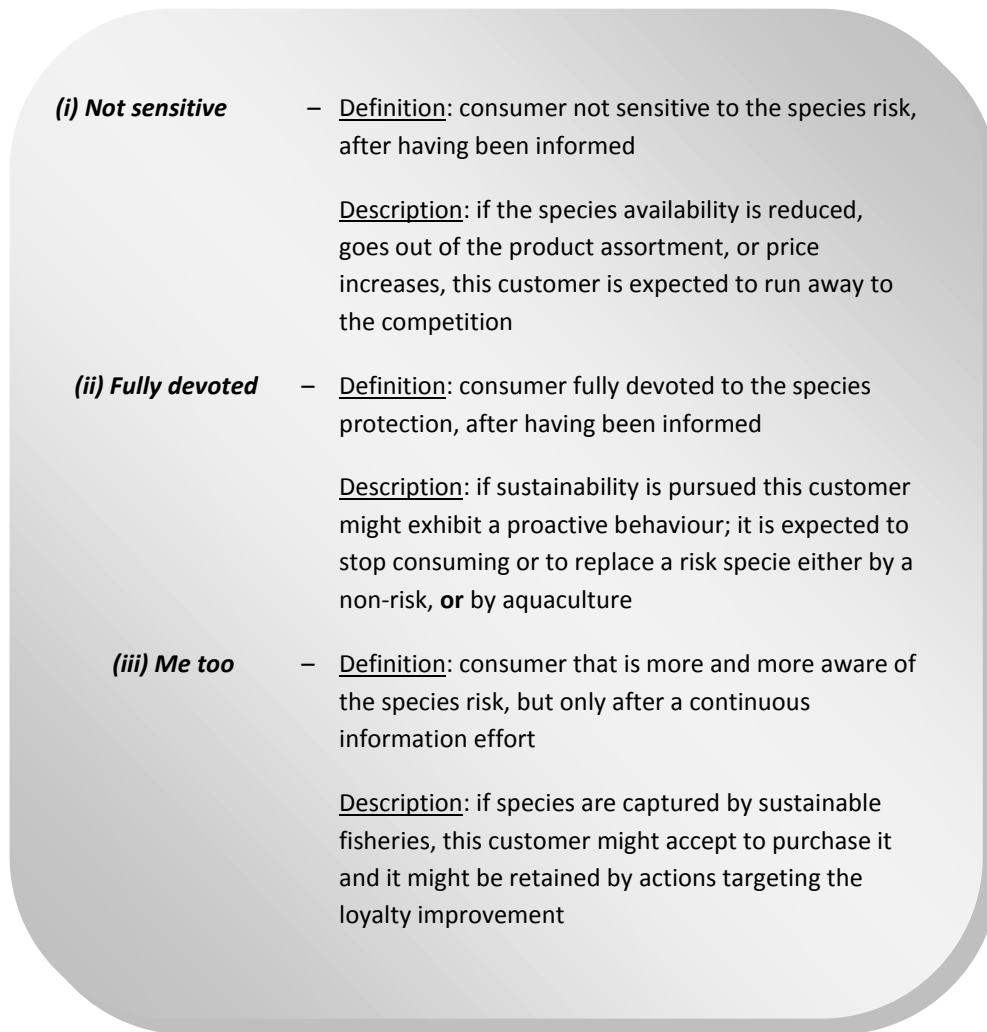
Different motivations for high consumption rates were identified since cod fish was considered a national dish, hake was very popular fish because it could be cooked in several ways, it was cheap, healthy and recommended by the nutritionists, shrimp has become popular lately because the income level rose sharply and salmon was consumed due to a price drop (aquaculture). There were two misunderstandings, as follows: the species at risk was the oceanic salmon and fresh tuna consumption was only high as a canned product. To sum up, some difficulties might be anticipated as regards the change of the consumption patterns of cod, hake, shrimp and tuna in Portugal.

#### d) Overall analysis of the survey results

Consumers<sup>2</sup> appeared to have been buying a relevant amount of seafood without being aware of the risk status of the species. Figure 9 describes three expected behaviour types, if consumers were more aware of the sustainability issues concerning the species (RQii).

Defining a retailer policy according to these three consumer profiles might result into better matching the consumer purchasing behaviour. Thus, it would be important to design a more robust survey as regards construct validity. Then, the above identified consumer profiles could be refined through an in depth socio-demographic characterisation. This should be followed by a thorough definition of the adequate variables to assure seafood sustainability, as previously exemplified in the exploratory survey. Moreover, internal validity should also be taken into consideration by setting stronger relationships among the variables.

<sup>2</sup> It is recognised that this "generalization" from respondent to consumer needs to be checked. From now on "consumer" will be used to avoid semantics complexity, since that there are expressions like "consumer campaigns" that should not be replaced.



**Figure 9.** Definition of consumer profiles

In this way, both better discrimination between the several measured categories and statistical relevance might enhance the explanatory power. Therefore, the chosen retailer policies concerning sustainable seafood consumer campaigns would be focused on the consumer profiles through a credible investigation. These campaigns might also align the producer with a sustainable integrated policy to the whole supply chain, which would be driven by the marketplace.

### **3.2.2 Design of a database to implement a traceability policy**

Consumer profiles (ii) and (iii) mentioned the requirement for sustainable fishery, i.e. capture methods adequateness and/or blacklists ship-owner compliance. Thus, species threats would decrease, risk species stocks would tend to recover and the others would be more protected.

In this way, data that were collected, treated and recorded in a database enabled higher control and an easier access to the organised information concerning the traceability of both fish capturing and some processing activities, according to Greenpeace recommendations (Greenpeace International, 2008). The developed database was made up of the attributes considered in the fields of the model expressed in Table 1.

**Table 1.** Database model to implement a traceability policy adopted by the sponsor

TLS of the Capture Method	Supplier	Product	Scientific Name	Capture Zone	Fishing Method	Boat List	Owner	Statement on the issue of quotas	Port List
...	...	...	...	...	...	...	...	...	...
	"X <sub>1</sub> "	SNAPPER	<i>Pagrus pagrus</i>	Atlantic North	Long lining	CRISTIANO	"Y <sub>1</sub> "	Catch Certificate	Rio de Janeiro
	"X <sub>2</sub> "	HORSE MACKEREL	<i>Trachurus trachurus</i>	Atlantic North	Purse seines	CARLOS APARÍCIO	"Y <sub>2</sub> "	Catch Certificate	Peniche
	"X <sub>2</sub> "	HAKE	<i>Merluccius paradoxus</i>	Atlantic North	Trawl	GALATADA	"Y <sub>3</sub> "	Catch Certificate	Canárias
...	...	...	...	...	...	...	...	...	...

Note: Suppliers, boat and company names have been disguised for confidentiality reasons.

The colour codes used in the table came from treating and categorizing the several species according to the method of fishing and further implementing a TLS methodology to accept or reject a supplier. While the red concerned trawling capture, the green included manual fishing, long lining, hooks on branch lines (snoods), Danish seines, fishing with creels and buckets. Finally, the yellow classification regarded other capture methods rather than the mentioned ones and also, multi-method of fishing put together in the same boat.

While a few suppliers have argued for confidentiality, others reported difficulties due to their positioning in the supply chain as excuses to deny the required information. Perhaps some enforcement through a contractual clause as a qualifying criterion would help to overcome these difficulties towards the green supply chain led by the retailer.

### 3.2.3 Product certification and eco-labelling for fisheries sustainability

The self-declaration/self-certification of the safety, quality and sustainability of supplied fish assured the origin from sustainable fisheries in the label, by correctly describing the species without re-labelling, by stating the capture date and the species risk, by assuring traceability within the chain of custody and so, that there was no transshipment at sea of illegally caught fish. Despite, the eco-label only focused on the fishing stage, i.e. in the target species (*vide* arrow 1, Figure 5), consumers at the POS<sup>3</sup> were directed to purchase products that had fewer ecological impacts. Thus, eco-labels operationalised a market based approach that attempted to influence consumer behaviour towards more sustainable seafood. On the other hand, the principal objective of product certification and catch documentation was accomplished, i.e. to prevent, discourage and eliminate IUU fishing (FAO, 2001) since that only legally harvested and reported fish landings could be traded.

In summary, the retailer influenced both sourcing by product self-certification and trading by eco-labelling. It might be argued that sustainable practices along the supply chain have been implemented by this assignment (RQi).

<sup>3</sup> POS – Point of Sales

### 3.2.4 Business impact – Greenpeace ranking

Our sponsor has progressed from the fourth position (2008), in the Greenpeace Supermarket Ranking, to the second one, in 2010 (Figure 10). The reported research was carried out during 2010 and so, it did also play a relevant role in the definition of a more sustainable policy for fish procurement and trading in the sponsor, as regards excluding IUU fishing, seafood traceability and eco-labelling, preservation of risk species, SC visibility improvement.

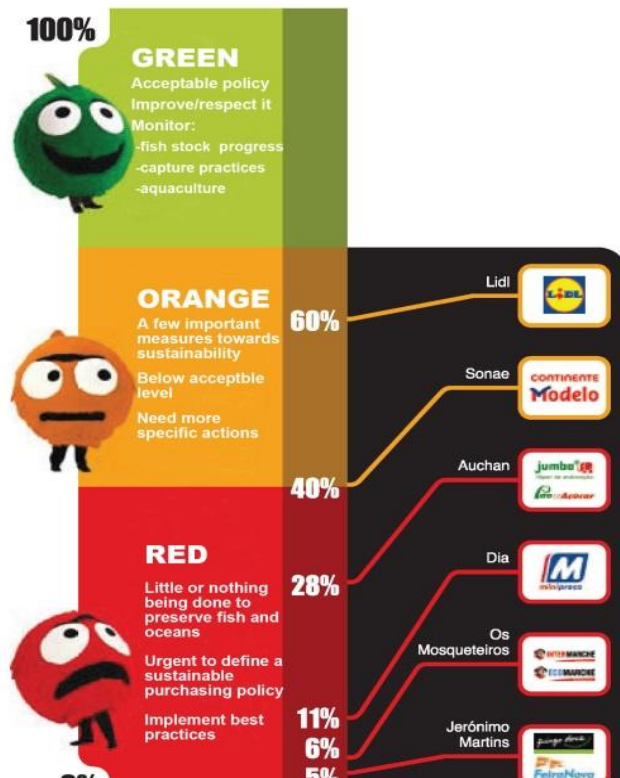


Figure 10. Results of the Third Supermarket Ranking (Greenpeace, 2010)

The position occupied by the sponsor hypermarkets had resulted from the accomplishment of criteria, established by Greenpeace, after the Code of Conduct for Responsible Fisheries (FAO, 1995) targeting the recover of the global stock level of seafood until 2015.

These results suggested that the retailer had been pursuing a socially acceptable fish retailing policy. It was both clear and confirmed that its image had improved near the consumers and also by NGOs, like the Greenpeace (RQiii).

### 3.3 Results discussion

#### 3.3.1 Sponsor’s positioning at the Greenpeace ranking for Portuguese retailers

Many institutions are working together to develop strategies targeting the consumption patterns change through the marketplace, in addition to government regulation to improve fishery production (Iles, 2007). The sponsor improved its positioning at the Greenpeace qualitative ranking for the Portuguese retailers (Figure 10) by voluntary coping with its guidance. In fact, supermarkets can be the driving force to push local fisheries towards sustainability at a faster rate than is currently being pursued by government (UNEP, 2009).

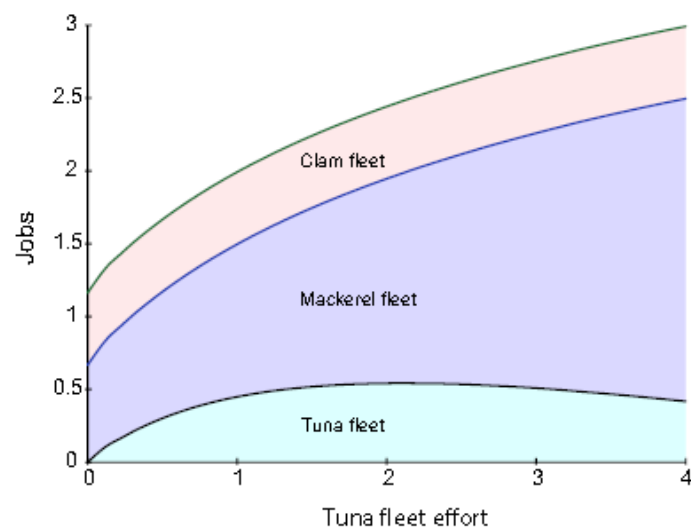
#### 3.3.2 Product certification and eco-labelling for fisheries sustainability

The used “Red List of Greenpeace” for finding out the species at risk might be questioned, in the same way that just lists of recommendations, websites and reports are used to differentiate between sustainable and unsustainable species (Iles, 2007). Moreover, Christensen et al. (2011) suggest that fishing quotas should be as dynamic, as shoals behaviour, be periodically reevaluated and include both non-target species and the



ecosystem, as a whole. The eco-labelling carried out in this research, only focused on the target species (arrow 1, Figure 5) of the “Red List” leaving an improvement margin.

Christensen et al. (2011) illustrate the required holistic approach by considering the effect of an eventual overfishing of a particular predator in a food web (e.g. Tuna), on the population of their preys (e.g. Mackerel), and even, the effect of the consequent population increase of this prey, as a predator itself, over other species (e.g. Mackerel, on Clam population). They also draw up the economic impact of the ecosystem balance on job creation (Figure 11). So, stopping overfishing and allowing the stocks to rebuild would increase their productivity and it would maximize revenues to the industry and commerce in the long run (Shao, 2009). Thus, the sponsor path could be improved by keeping track of the flow from production to trade within a broader context (social, economic and ecological).



**Figure 11.** Number of jobs as a function of the effort of the tuna fleet. Source: Christensen et al. (2011)

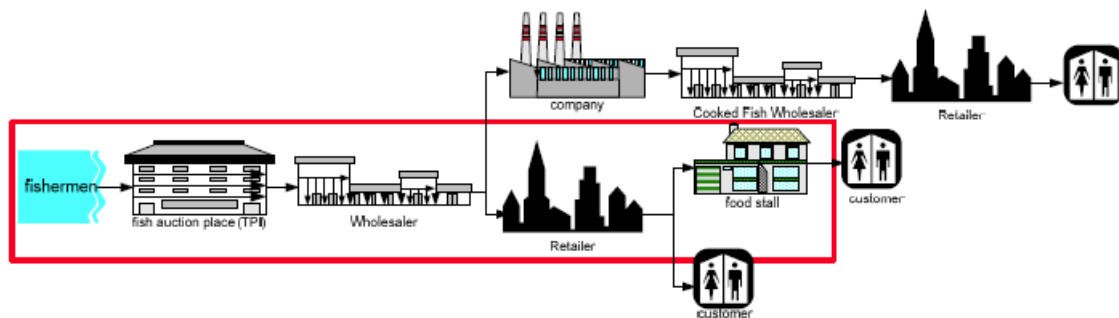
The natural progress of “self-declared”/“self-certified” environmental labelling by producers was towards “environmental labels [...] based on voluntary multi-criteria product life-cycle assessment of environmental effects with verification through a third party”<sup>4</sup> (Wessells et al., 2001). Thus, the sponsor must soon need to choose a third party certifier. According to Jacquet and Pauly (2010) the Marine Stewardship Council (MSC) has become the world’s most established fisheries certifier and is taken more seriously by scientists than many other organisations. However, they consider that objections to MSC certifications have been growing (*vide* also Martin et al., 2012). Therefore, some scientists, the Greenpeace, the Pew Environment Group, and some national branches of the World Wide Fund (WWF) have protested over various MSC procedures or certifications. MSC certification has also been questioned by retailers like Waitrose (in 2009) and Whole Foods (in 2010) by refusing to deal with certified fisheries (Jacquet et al., 2010).

<sup>4</sup> Type I environmental labels of ISO

### 3.3.3 Supply chain, visibility, traceability & IT as promoters of trust and sustainable views

Marine resources can be better managed when fishers and other resource stakeholders are more involved in management and co-management (Phillipson, 2002). Focusing on only species can hide the identity of, and variability among, producers and fisheries (Iles, 2007). Iles also argues that many internal policies and activities are not transparent to outsiders. Finally, the MSC advocates a “boat to plate” approach to certification which implies a requirement for traceability (Jacquet and Pauly, 2010).

It looks unquestionable the call for the involvement of all stakeholders in a shared holistic view focused on the customer (Figure 12). Moreover, providing visibility leveraged by information technology was found as significant steps towards trust and so, to build up a credible approach to sustainability. It was not enough just to accept the word of the suppliers about their sustainable practices, as an act of pure faith. The sponsor should make sure that there was evidence and visibility of the upstream activities supported by periodic random audits, by credible third parties and, also, by adequate realtime IS/IT solutions, since that paperwork was becoming increasingly questionable.



**Figure 12** Red square: sample of sea fishery for consumption supply chain. Source: Widyaningrum and Masruroh (2012)

In fact, nowadays, it is possible to track vessels in the ocean (e.g. Vessel Tracking Globally, EMSA webpage), even in real-time. Thus, if this is not done, reasons might be, as follows: (i) no financial resources; or, (ii) lack of political will, due to high economic interests (?); or, (iii) insufficient social/market pressure.

Despite the research sponsor having a very limited size at the international context an effort should be done to lead its supply chains towards transparency and trust, going further than designing a database to record the self-reported activity of the fisheries (*vide* Table 1). So, information dissemination, labelling and credible means of signalling are rising in importance, in order to provide feedback to customers and other stakeholders about the environmental quality, social and economic benefits of both seafood and the supply chain processes (Karl and Orwat, 1999; de Boer, 2003). Then, consumers should more easily understand the need to consume more fish from aquaculture origin and, to be ready to pay more for dearer wild-caught seafood products (Figure 7) and acting as demand regulators, i.e. accepting self-imposed limits on fish consumption, stopping purchases of certain species, or stopping to buy sustainably caught species (Iles, 2007).

## 4 Conclusions

This paper addressed the state of the art of fish retailing practices, in order to achieve better management of marine resources. The research succeeded to understand the consumer view and to introduce fish traceability to some extent, since neither CPFR approaches, nor IS/IT solutions are in place.

The research purpose was exploratory and a pilot-store was chosen by the sponsor, as representative. 153 customers were inquired and selected by convenience sampling method. Thus, a broad generalization of the results was not possible. The average values plotted in the graphics were interpreted in a qualitative way. So, statistical significance was not addressed. Further work to overcome some of the study limitations was identified, as follows: to make the pilot-test more robust, as regards, an enlarged duration, choosing the test period in order to include/exclude special seasons or events, cover other stores or improving critical store procedures. However, before that, the existing data could be quantitatively analysed by using tools from multivariate statistics, i.e. factorial analysis and cluster analysis, to make a preliminary confirmation of the main purchasing criteria and, also, of the consumer profiles that were identified.

The exploratory survey disclosed the potential consumer awareness of purchasing criteria close to sustainability. In the future, a rigorous statistical survey should be carried out, to check the absolute level of importance of these criteria for the consumers. Consumer campaigns could be reinforced and multiplied accordingly. If the criteria, which concern sustainability, do not show any relevance, then consumers might need to be educated and to become sensitive to the problem, first of all (RQii).

Moreover, the questionnaire revealed that consumers appeared to be open to some action regarding species at risk, such as reducing offer, increasing price, or practising sustainable fishery. Action should be taken to make aquaculture more popular, as it already happened with species like salmon, sea bream and bass (RQii). Perhaps, this had occurred in the same way with chicken, but, nowadays, practically everybody are happy to eat the abundant, half-priced hens coming from the poultry farming industry. The positive point was that respondents appeared to be prepared to accept a financial penalty, as regards consuming seafood species at risk, exactly the same way consumers pay double-price for free range chicken.

Finally, the survey highlighted the consumer availability to purchase species at risk that were captured by sustainable fishery, which generated what appeared to be a clear demand on information. Consumers appeared to have no information concerning the risk status of many popular species that were offered by the sponsor. Two actions were taken in order to provide more information to the consumer, as follows: (i) a 'first' Traffic Light System (TLS), concerning the sustainability of the fisheries, was supported by a purposefully constructed database based on Greenpeace blacklist; (ii) a 'second' TLS was built to classify the species at risk based on the red lists of Greenpeace. The fishing quota could have been addressed depending on the periodic dynamics of shoals and it should also have included the non-target species and the ecosystem, in addition to the target species. Despite the database supported by partner's self-evaluation being a current practice in the industry, strong criticism was arising as regards the transparency of the process in the chain of custody. In fact, the implemented schemas to operationalise the influence of the retailer on sourcing and trading

sustainable practices (RQi) were found insufficient. Thus, recommendations were made, as regards the progress towards eco-labelling based on third party certification, in which context the role of the Marine Stewardship Council (MSC) was discussed, as a popular and credible certifier entity. Finally, a supply chain approach leveraged by information technology, as a promoter of visibility and so, of trust, was also discussed as a more sustainable view.

The “boat to plate” MSC approach to certification supported by modern IT systems to track both vessels and activities across the supply chain, in real-time, was proposed. This should provide both transparency and evidence of sustainability practices, aiming at dealing with modern consumer pressure within a CPFR environment. The consumers should also be educated to acting as demand regulators, to consuming aquaculture fish rather than wild-caught seafood, to self-imposing consumption limits, to stop buying risk species and to be prepared to paying more for the wild species. It is argued that retailers did appear to have a core role as regulators of the supply chain, since they could act as perfect mergers of the upstream and downstream interests, by orchestrating both consumer and producer convergent campaigns (RQi). In this way, the retailer role should go far more beyond than just promoting the progress towards balanced marine ecosystems based on an effort to stop selling the species in risk or, merely eliminating the blacklisted fisheries (RQiii).

As regards the economic dimension, one argues that there is a relevant contribution to the practitioner, i.e. the sponsor. In fact, three types of consumer behaviour were anticipated, if the level of consumer awareness increased, as follows: not sensitive, fully devoted and me too. This consumer segmentation needs to be confirmed by designing a more robust survey, where an in depth socio-demographic characterisation would be carried out, as well as, a thorough definition of both the adequate variables to assure seafood sustainability and their relationships. In this way, the retailer might be able to design more customised policies to deal with different consumer needs, in order to assure their loyalty by adjusting the consumer campaigns (RQiii). As a consequence, a positive impact in profitability might be expected, not only directly concerning the purchasing of seafood, but also in other types of products.

At last, it is argued that the objectives of this research were fully achieved, since that the current corporate sustainable practices were understood and explained (i), the topic was addressed after a triple bottom line approach (ii) and there was a relevant contribution to practice, enabling the fine tuning of business practice (iii), during this exercise of promoting sustainability in fisheries by discussing the implementation of visibility in supply chain.

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