

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

SCUOLA DI SCIENZE
Corso di laurea magistrale in Biologia Marina

SUSTAINABILITY AND VALORIZATION OF SMALL PELAGICS:
IMPLEMENTATION OF A SHARK-FREE ECO-LABEL FOR PELAGIC TRAWLING
FISHERIES IN THE ADRIATIC SEA

Tesi di laurea in Economia e Politica della Pesca

Relatore

Dr. Luca Mulazzani

Presentata da

Laura Piredda

Correlatore

Dr. Sara Segati

Dr. Simone D'Acunto

Sessione Anno Accademico 2018/2019

INDEX

1. Introduction: General characteristics of the Adriatic Sea	4
1.1 Negative aspects of fishing in the northern Adriatic Sea	5
1.2 The PRIZEFISH Project	5
2. Purpose of the study	6
3. By-catch and shark meat consumption in Italy	7
3.1 General ecological and biological characteristics of sharks	8
4. Ecosystem services	10
4.1 Classification of the Millennium Ecosystem Assessment	10
4.2 Anthropocentrism and Biocentrism	10
4.3 Sharks and ecotourism	11
4.4 Negative perception regarding sharks	12
4.5 Multifunctionality in fisheries	12
5. Eco-labels	14
5.1 Knowledge of eco-labels	14
5.2 The eco-labels considered for the survey	15
6. Contingent Valuation Method	17
6.1 Contingent Valuation Method surveys typologies	18
6.2 Negative aspects of the Contingent Valuation Method	18
7. Materials and methods	20
7.1 Consumer questionnaire design	20
7.2 Fishmonger and supermarket questionnaire design	22
7.3 Wholesaler questionnaire design	23
7.4 Consumers survey elaboration	23
7.5 Qualitative analyses	26
7.6 Sharks by-catch data collection	27
7.7 Economic advantage per vessel	28
8. Results and discussions	30
8.1 Qualitative analyses results: Frequency purchase of fresh fish products	30
8.2 Socio-demographic variables	30
8.3 Main fish aspects	31
8.4 The awareness of labels significance	32

8.5 EMBC scale results	33
8.6 Estimation of the willingness to pay.....	33
8.7 Sales managers questionnaires results	35
8.7.1 Supermarket of Pavullo nel Frignano	35
8.7.2 Supermarket of Ravenna.....	35
8.7.3 Fishmonger of Pavullo nel Frignano.....	36
8.7.4 Fishmonger of Ravenna.	36
8.8 Wholesaler questionnaire results	37
8.9 Linear regression results	37
8.10 By-catch value results for the pair of vessels	39
8.11 Economic advantage per vessel results	40
9. Conclusions	41
10. Acknowledgements.....	43
11. References	44

1. Introduction: General characteristics of the Adriatic Sea

The Adriatic Sea is a fraction of the Mediterranean Sea, situated between the Italian and Balkan Peninsulas. It borders six countries: Italy, Slovenia, Croatia, Bosnia-Herzegovina, Montenegro and Albania. Geo-morphological characteristics, along with political and economic aspects, have led to the implementation of two Geographical Sub-Areas that divide the Adriatic Sea: GSA 17 and GSA 18. The GSA 17 covers the Northern and Central Adriatic Sea up to the Gargano-Kotor junction, where the water is shallow and depth constantly increases from north to south, but generally does not exceed 100 meters. The Pomo pit, in the middle of the Adriatic basin, is the only area where depth can reach 200-260 meters. Muddy and sandy sediments of different granulometry and composition cover the Italian seabed, while the Po river has an important control on salinity, temperature and primary production (Barausse *et al.*, 2014).

On the other hand, the Croatian coast is characterized by rocky articulations that include islands, bays and canals. The GSA 18 is connected to the Northern Ionian Sea through the Otranto Channel and the bathymetry of the Southern Adriatic Sea reaches almost 1233 meters (Bombace *et al.*, 2011; Barausse *et al.*, 2014; MIPAAF, 2019).

The Mediterranean Sea is characterized by multi-specific stock and the Adriatic Sea constitutes one of the most important fishing grounds where almost every target species can be considered shared among countries. Therefore, the institution of partnerships is thus necessary in order to improve a better fishery management (Bonanomi *et al.*, 2018). One of the main target resource in the Adriatic Sea is small pelagic fish, which include mainly anchovies, *Engraulis encrasicolus* (Linnaeus, 1758) and sardines, *Sardina philcardus* (Walbaum, 1792).

According to CNR-ISMAR, small pelagics represent 41 % of total Adriatic catches. Pelagic pair trawling has been introduced for the first time by the northern Adriatic fishers as the main fishing gear for small pelagic fish. According to the (EC) No 1967/2006, “trawl nets means nets which are actively towed by the main vessel engine and consisting of a cone- or pyramid-shaped body (as trawl body) closed at the back by a cod-end and which can extend at the opening by the wings or can be mounted on a rigid frame. Horizontal opening is either obtained by otter boards or provided by a beam or frame of variable shape and size. Such nets can be towed either on the bottom (bottom trawl net) or in midwater (pelagic trawl net)”.

1.1 Negative aspects of fishing in the northern Adriatic Sea

The Northern-Central Adriatic is one of the most overfished basins of the Mediterranean Sea, because of its important productivity and the high marine resources demand. Unfortunately, pelagic trawling does not only catch target species, but also different elasmobranch, like sharks and rays, which end up caught in the nets. Those species represent the so-called by-catch; therefore, it is important to understand the impact of fisheries on elasmobranch populations for a better management.

Humans rely on biodiversity in many different ways and anthropogenic activity is rapidly impoverishing natural resources. As human population is growing and the demand for marine resources supplies, too, sustainable fishing is needed in order to ensure marine resources recovery in a long-term period, in this way future generations will be able to benefit from it, too (Bonanomi *et al.*, 2018). Environmental concern is not a new topic and since the late 1960s, people's awareness regarding environment has raised considerably. Once the myriad impacts on the environment were identified, different steps towards eco-friendly approaches have been introduced. Among these, eco-labels and certifications took an important role in fish trade, as they give an added value to a more sustainable product (Galarragua, 2002).

1.2 The PRIZEFISH Project

This study is included in the framework of the project “PRIZEFISH - Piloting of eco-innovative fishery supply-chains to market added-value Adriatic fish products” funded by the Call 2014 - 2020 Interreg V-A Italy - Croatia CBC Programme. The PRIZEFISH project has the purpose of ameliorating Adriatic fishery resources management among the Italian and Croatian region through eco-innovative fishery supply-chains. The fulfilment of a medium-term sustainability strategy based on solid scientific and socio-economic research and innovative actions to meet small-scale fisheries amelioration is needed.

The main challenge is to collaborate with several parties, such as fishers, in order to improve territorial socio-economic status and to deal with overexploitation of Adriatic Sea resources for a long-term benefit. The PRIZEFISH project aims to connect scientists, researchers and experts in marine fishery and economic sciences who work together in order to achieve environmental and sustainability certification, conferring an added value through eco-labels to Adriatic fish products.

2. Purpose of the study

Small pelagic fish is one of the most consumed products in the Adriatic Sea and has great economic and culinary value. This study investigates the results of a contingent valuation method, conducted in two fishmongers and two supermarkets, carried out in order to determine consumers' willingness to pay for a "shark-free" certified product compared to the ordinary small pelagic fish product. In particular, the information collected for this survey concerns consumers' choice for the purchase of sustainable commodities, their personal interest and level of knowledge of eco-labels. It is important to understand the power that these eco-labels have on consumers' selection of products. Extra surveys addressed to sales manager of the respective stores have been accomplished.

This study aims to appraise a certain price that consumers would pay for a certified small pelagic fish product. The improvement of consumers' interest for eco-certified products is a goal in order to raise awareness for the conservation of the Adriatic Sea and its fish resources. It is essential to meet consumers and fishers needs and at the same time preserve marine ecosystems and species.

The following paragraphs are developed along these lines. Paragraph 3 considers the state of art of by-catch and the role of Italy regarding shark meat consumption. Paragraph 4 defines the concept of ecosystem services and multifunctionality in fisheries, introducing the anthropocentric concept, focusing on the role and presence of species, like sharks, as a benefit for humans, from an economic point of view. Paragraph 5 introduces the world of eco-labels and their power to improve sustainability in marine ecosystems and fish resources. Paragraph 6 describes the positive and negative aspects of the Contingent Valuation Method. Paragraph 7 contains the materials and methods of this study to define the willingness of consumers to pay for a shark-free eco-labelled product, the sales managers concern and the economic estimation of the annual amount of money that the fishers would not gain out of the by-catch. Paragraph 8 justifies the results and discussion of the survey, analyzing the positive and negative aspects. Paragraph 9 concludes the study, advancing the possible solutions.

3. By-catch and shark meat consumption in Italy

There is a plethora of studies concerning shark populations degradation caused by commercial fishing activity. This unsustainable situation is no longer tolerable, because is now well-known the role of sharks as key species in marine ecosystems and the critical effects their reduction would cause directly to the trophic chain, but also to human kind (Ferretti *et al.*, 2008; Clua *et al.*, 2011). The Mediterranean Sea is a laboratory of life and overfishing, in addition to climate change and pollution, is one of the main threats and anthropogenic activity has a heavy influence on marine habitats and populations. Many shark species are extremely affected by overfishing that causes the decrement of large shark populations. Sharks are exploited all over the world, both as target species (for their fins, liver, cartilage and meat) and as an accidental catch of fisheries interested in other valuable species.

Since there is a plethora of definitions for “discards” and “by-catch”, for this study the following terms have been considered:

- By-catch: catch of species, which is not the targeted species;
- Discards: catch, both targeted species and by-catch, thrown back into the sea (EUMOFA, 2020).

The accidental capture of non-target species during fishing activity, or by-catch, is a source of mortality that inhibits the survival of several shark species all around the world. While by-catch may be sold, it may also be useless, and ultimately thrown back into the sea, most of the times dead, for a variety of regulatory and economic reasons (Davies *et al.*, 2009). Italy is one of the world’s top consumers of shark meat and it positioned itself as third largest importer in the world by volume and second largest importer of sharks by value. The imports are represented mainly by larger shark species from European suppliers. Italy is not a great exporter of shark meat and since 1990s, domestic production of shark species declined significantly.

According to the State of the global market for shark products by FAO (2015): “from 2000 to 2011, Italy imported an average of 11526 tons of shark meat per year, equivalent to 11 percent of the world total volume. These imports were worth USD 34.8 million annually on average or 14 percent of the world total”. Why do people eat shark meat? Consumers’ demand for shark meat is growing and this is related to the fact that shark meat is a source of protein and, from an economic point of view, is a suitable product for several families.

3.1 General ecological and biological characteristics of sharks

Sharks are the so-called K-selected species, which means that they reach sexual maturity very late, have low reproductive rates, long gestation and produce few offspring. Their sensitive biological characteristics, combined with by-catch activity, limit the ability of these species to recover from heavy fishing pressure (Gallagher, 2011; Bargione *et al.*, 2019) and make them one of the most threatened marine animals on Earth (Bonanomi *et al.*, 2018). In the northern Adriatic Sea, most of the times, landings include *Mustelus spp* and *Squalus spp* and according to the International Union for the Conservation of Nature Red List (IUCN), at the fish market in Chioggia, 25 % of male and 50-75 % of female sharks are landed before reaching sexual maturity.

The spiny dogfish, *Squalus acanthias* (Linnaeus, 1758), is one of the most valuable commercial species consumed by humans and is globally listed as Vulnerable by the IUCN classification and as Endangered in the Mediterranean Sea (Bargione *et al.*, 2019). The common smooth-hound, *Mustelus mustelus* (Linnaeus, 1758), is globally classified as Vulnerable and as Endangered in the Mediterranean Sea. It has been estimated that 70 % of male individuals and 90% of female individuals are sexually immature. Numerous studies show sharks decline in Adriatic Sea. The Northern Adriatic has faced a great decrease of shark populations and unfortunately, there is still a lack of information about by-catch data regarding sharks (Bonanomi *et al.*, 2018). As stated by Ferretti *et al.*, (2013), is not easy to explain, evaluating the effects of fishing, how fish communities change in marine ecosystems.

Several experiments at large scale are needed, such as the study of gradual variation of natural and anthropogenic events. A study by Barausse *et al.*, (2014) analyses landings records of the years 1997-2012 in the Adriatic Sea, in order to estimate spatial and temporal changes in elasmobranchs community. Fishery data from fish market of Chioggia were collected to examine the impact of fishing pressure and other factors on elasmobranchs in the northern Adriatic Sea. The results represented in Figure 1 confirm elasmobranchs decrement, caused by high fishing effort. Landings of elasmobranchs conducted during the years are mostly represented by *Mustelus spp*. (colored in dark blue), which presence goes from 61.4 % to 68.8 % of the total landings. Shark conservation is neither easy nor cheap and better enforcement, assessment and conservations policy in fishery management is necessary.

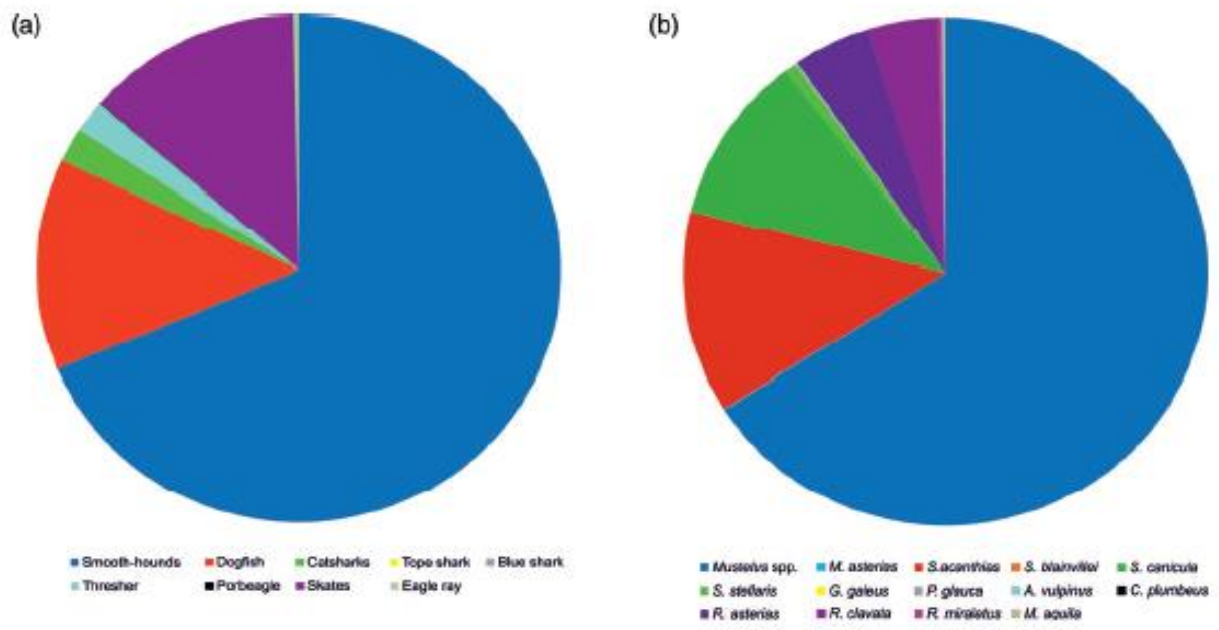


Figure 1. (a) Official fish market statistics, biomass data regarding the composition of elasmobranchs landings (1997-2012), (b) survey including the number of individuals at the fish market (Barausse *et al.*, 2014).

4. Ecosystem services

Ecosystems can provide different benefits, both consumptive and non-consumptive, that human kind can enjoy. The concept of ecosystem services (ESs), described for the first time by the Millennium Ecosystem Assessment (2005), has gone through different definitions. They constitute direct and indirect welfare to human kind, improving the quality of life. Ecosystems function as a result of amazing and complex relationships among species that are a very important ingredient concerning ecosystem valuation. Ecosystem services can be classified into four categories.

4.1 Classification of the Millennium Ecosystem Assessment

- **Supporting**, such as primary production, soil formation and nutrient cycling;
- **Provisioning**, including all the products deriving from nature, such as food, fresh water, fiber and genetic resources;
- **Regulating**, including ecosystemic functions as climate regulation, water regulation, disease regulation and pollination;
- **Culture**, which includes all the non-materials goods, such as ecotourism, recreation, spiritual activities.

4.2 Anthropocentrism and Biocentrism

The disappearance of multiple species leads to a domino collapse of all the benefits humans can gain from them. One of the main difficulties that governments, scientists, researchers and non-profit organizations are facing is to raise awareness regarding ecosystem services and long-term conservation to society. Giving monetary value to ecosystem services allows species to have an economic value, too. It is not easy to confer to species an economic value, because they play distinct roles in different ecosystems. Hence, species are treated with different degrees of value, based on their purpose. Those differences may create multiple concerns. One is that species, for the fact that they exist, have an intrinsic, priceless value and contribute to the flourishing of biodiversity. Nature and ecosystems are considered a treasure to preserve simply because they exist (Schröter *et al.*, 2014; Gascon *et al.*, 2015).

Anthropocentrism, associated to environmental ethics, assumes that everything is related only to human kind and that all other living beings are means to satisfy human needs (Kopnina *et al.*, 2018). There are different perspectives for what concerns conservation and ecosystem services. On one hand, several critiques have been associated to ecosystem services; in fact, they have been highly discussed for their anthropocentric connotation that is opposed to the concept of the intrinsic value of nature. On the other hand, ecosystem services are not meant to undermine the biocentric concept of nature, but rather to help protect and preserve nature and biodiversity adding an economic value. There is this belief that nature has other properties, aside provision, to make people feel good, mentally and physically. This concept is considered anthropocentric, even if it contains this shade of pure and intrinsic value of nature.

4.3 Sharks and ecotourism

Fish are both important and valuable as food supply and for tourism. Sharks are mainly consumed for their fins and meat, but many people travel the world to go cage diving with great white sharks, *Carcharodon carcharias* (Linnaeus, 1758) in South Africa or snorkeling with the whale shark, *Rhincodon typus* (Smith, 1828) in Egypt. The industry of ecotourism improved the growth of economic value and the collaboration among stakeholders (Mazzoldi *et al.*, 2019). Ecotourism activity gives people the opportunity, paying an amount of money, to be in contact with nature (Gallagher *et al.*, 2011). Fishing for sport also has a relevant dimension that brings 33.1 million dollars in the U.S. and 25 million in Europe. Fishing activity employs 40 million people globally and fish represent one of the main sources of protein (Gascon *et al.*, 2015).

As stated by Clua *et al.*, (2011): “When a live shark is involved in ecotourism, it has a higher value than a shark that is caught”. The results of their study show that the economic revenue generated by the shark-feeding ecotourism activity in Moorea Island (French Polynesia) brings US\$ 5.4 million per year. They also state that giving an economic value to each shark individual is more convincing than conferring only an ecological value. While fisheries focus on the economic value on the direct consumption of sharks, the production of ecotourism activities regarding sharks is included in the principles of non-consumer direct use (Clua, 2011). Ecotourism brought to a change in marine ecosystems through conservation of species, such as “flag species”. This change from a destructive to non-destructive use of marine resources helps the growth of local economy and animal preservation. Still, non-destructive use needs management, considering that there may be negative consequences on marine wildlife.

4.4 Negative perception regarding sharks

Do people believe sharks are worth being protected? Unfortunately, many people around the world know of the existence of sharks because of their “bad reputation”. The movie *Jaws*, directed by Steven Spielberg in 1975, developed among people a great fear of sharks. After that, a myriad of movies (*Sharknado*, *The Shallows*, *The Meg*, etc.) and documentaries without any scientific base have been released, classifying sharks as “fearless men-eaters”. Therefore, mass media allowed the dissemination of information regarding shark attacks, thus influencing this animal's public perspective (Mazzoldi *et al.*, 2019). Sharks have been on Earth for 400 million of years. There are approximately 500 different species of sharks living in our seas and oceans, from the smallest shark in the Mediterranean Sea, *Etmopterus spinax* (Linnaeus, 1758), 11 cm of length at birth, to the whale shark, *R. typus*, the length of which can reach up to 20 meters (De Maddalena *et al.*, 2008). Nevertheless, sharks should be valued as an ecosystem service that can be included under the cultural category of the Millennium Ecosystem Assessment. It is a real battle to raise people’s awareness about sharks, explaining that they are not all dangerous species, but rather misunderstood creatures.

4.5 Multifunctionality in fisheries

As established by the World Trade Organization (WTO), the term “multifunctionality” is mostly used in agriculture and relates generally to two types of goods: “material” goods, such as food and edible products and “non-material” goods, as the level of employment around the agricultural sector or the importance of landscapes as environment. In agriculture, there is a higher chance to conserve lands, for example, old patches of natural habitats deriving from agriculture activity can create non-material goods, preserving biodiversity. Fish products are typically considered as a resource of common property. The assignment of property rights over fish stocks and Non-Commodity Outputs (NCOs) is mostly linked to individual quotas for commercial stocks. NCOs are typical non-material and non-commercial goods. For fisheries, healthy ecosystems, biodiversity externalities, cultural heritage, safety of food, coastal employment are examples of NCOs. Payment for ecosystem services and creation of marine protected areas are necessary to improve social-economic welfare. The healthy use of seas appears to be an essential obligation to reduce poverty, improve food security, healthy livelihoods and decent work development. Management measures must be taken in order to control by-catch and harmful activities must be eliminated.

Even though overfishing should not be underestimated or encouraged, fishery incentives, that mostly cause overexploitation of the seas, are legitimized when they allow a positive improvement of social benefits (Mulazzani *et al.*, 2019). As suggested by Mazzoldi *et al.*, (2019) fishers and other stakeholders should benefit from ecotourism activities and incentives have to be provided.

Figure 2 shows a core representation of the framework that considers aggregation of commodity outputs and NCOs that could generate social welfare, deriving from the relation between natural capital and fishing activity. Based on the economic use of natural capital, different outputs are generated to improve social welfare.

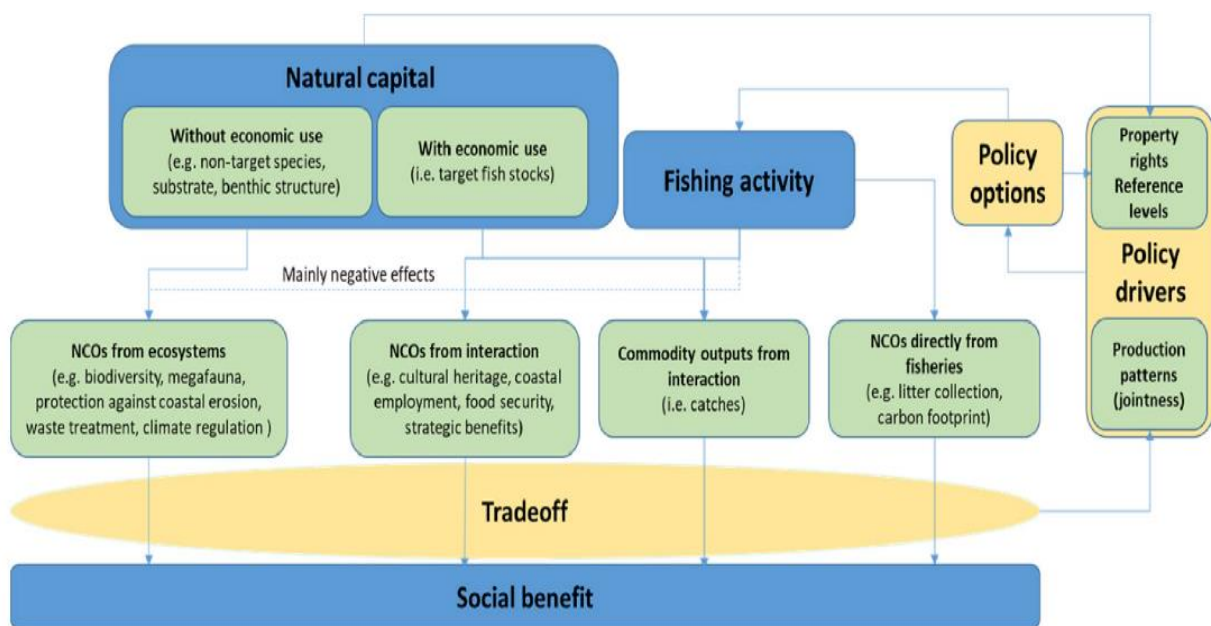


Figure 2. Commodity outputs and NCOs framework (Mulazzani *et al.*, 2019).

5. Eco-labels

In 1992, the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, established, for the first time, eco-labelling. The principal aim of this label was to inform consumers about environmental and ecological issues, giving them the chance to evaluate their purchase choice (Gardiner *et al.*, 2004). As stated by Galarraga (2002) eco-labels are used for plenty of merchandises. They have the aim to educate consumers to choose sustainable, eco-friendly products, providing them with information regarding production methods, from sea to fork. Consumers should be informed about environmental impacts due to their consumption, in order to spring an interest towards eco-friendly purchase.

Srinivasa Gopal *et al.*, (2013) divide three categories of eco-labels according to the OECD (2001):

- **Type I** is related to the quality of the product, from an environmental point of view. They are voluntary, non-discriminatory and the goal is to inspire the consumer to purchase responsibly. This kind of eco-label belongs to a group of certifications supported by third parties, generally governments. The purpose of this eco-label is to certify not only the product, but also the processes behind production (e.g. EU eco-labels).
- **Type II** is set by the organization (importers or manufacturers) itself and is related to some characteristic of the product (e.g. “plastic-free” or “BPA-free”).
- **Type III** follows a pre-set scheme that shows valuated information calculated independently by the organization. Eco-labels differ from ordinary products because they confer less negative impacts on environment.

5.1 Knowledge of eco-labels

As described by Song *et al.*, (2018) nowadays there are a myriad of eco-certifications available for many products. As there are wide numbers of different eco-labels, to educate consumers to choose eco-friendly products is challenging. Those who use eco-labels may not really know their purpose and the actual success of eco-labels in advising consumers is still unclear (statement supported also by Thøgersen, 2009).

The existence of so many eco-labels could misinform and confuse consumers during their purchase activity, making them discouraged and less interested. It is important to understand the power of eco-labels in the purchase decision of consumers. The study conducted by Song *et al.*, (2018) evaluated the efficacy of eco-labels through the collection of data gathered from the purchase activity of 156 consumers using eye-tracking glasses test. Their results showed that consumers did not consider eco-labelled products enough and most of the products were purchased by habit. Therefore, actual data regarding how those eco-labels are used during the purchase are needed. Another important aspect is to hang a lantern on the several information regarding the product, such as price or calories table to shed light on eco-labels.

Fish markets are adopting eco-certifications, too. Many fisheries have improved their fishing methods, becoming more sustainable. MSC, Dolphin safe and Friends of the Sea are some of the most known third party eco-label (Gopal *et al.*, 2013). The main objective of an eco-labeling system is to implement a market-based incentive in order to develop a better management of fisheries by growing consumer demand for seafood products from well-managed stocks (FAO, 2001). Informing consumers, sales managers and fishers about the existence and importance of eco-labels in order to confer to eco-labeled commodities a greater value compared to ordinary products is crucial. One of the main eco-label used in fisheries is the Marine Stewardship Council (MSC).

5.2 The eco-labels considered for the survey

Protected Designation of Origin (DOP)

Italy is the European country with the highest number of agri-food products with a designation of origin and a geographical indication recognized by the European Union. The system of the Geographical Indications of the EU favors the productive system, the economy of the territory, protects the environment and supports the social cohesion of the whole community. At the same time, consumers are given greater guarantees with a higher level of traceability and food safety than other products. The Protected Designation of Origin is a name that identifies a product originating from a place, a region or a specific country, whose quality or characteristics are essentially or exclusively due to a particular geographical environment and its intrinsic natural and human factors and whose production phases take place in the defined geographical area (MIPAAF, n.d.).

Biological product (BIO)

Organic farming is an agricultural method aimed at producing food with natural substances and processes. This means that it tends to have limited environmental impacts. It encourages using energy and natural resources responsibly, maintain biodiversity, preserve regional ecological balances, improve soil fertility and maintain water quality. In addition, organic farming rules encourage animal welfare and require farmers to meet the specific behavioral needs of animals. The European Union (EU) regulations on organic farming are designed to provide a clear framework for the production of organic products across the EU. The intent is to meet consumer demand for reliable organic products while creating a fair market for producers, distributors and retailers. The BIO logo provides a visual identity consistent with organic products sold in the EU. It helps EU consumers to identify organic products more easily and farmers to market them in all EU countries. The logo can only be used on products that have been certified as organic by an authorized inspection body or agency (European Union, n.d.).

Marine Stewardship Council (MSC)

The international non-profit organization, established in 1997 (independent body in 1999), aims to preserve oceans and marine resources. Giving oceanic fish resources the chance to grow, respecting ecosystems and biodiversity, makes sure that present and future generations will be able to consume fish. Eco-labels are used in order to help safeguard oceans, by improving sustainable fishing activities and guiding consumers to purchase respectfully. Independent, third-party certifiers carry out certifications by the MSC standard; this means that MSC does not directly confer certifications to fisheries. Fishery science and management experts redact the fishery assessments and are independent from MSC and fisheries. Conformity Assessment Bodies (CABs) are an independent organization, which supervises the certification process of eco-labels. MSC and stakeholders follow multiple Standards to ensure sustainable fisheries and improve the supply chains (MSC, n.d.). The following labels in Figure 3 are those showed during the consumers' survey.



Figure 3. Three eco-labels shown to consumers during the survey.

6. Contingent Valuation Method

The main purpose of the Contingent Valuation Method is to determine the economic approximation regarding non-market goods (health, environment, culture, etc.) through direct surveys addressed to people in order to estimate their opinions, thoughts and preferences. The Contingent Valuation Method focuses on the extra price that the consumer would pay for a certain product, which is not yet on the market (Owusu *et al.*, 2013). Several studies used this approach for different products such as safety of food or products from organic origin (Dìaz *et al.*, 2012).

The scenario consists of a simulation of a hypothetical (or contingent) market the purpose of which is to estimate the “willingness to pay” (WTP) or the “willingness to accept” (WTA) of the consumers with an eye to improve the well-being. Since the 1960, a vast number of economists referred to this methodology, including environmental field, to measure the non-use value estimation, in particular the value of option and value of existence (Notaro, 2011).

The willingness to pay is the amount of money that represents how much consumers are prone to pay. As stated by Bezzi 2010, this technique is used in cost-benefit analysis, for the evaluation of alternative options. Questionnaires are commonly used for this type of survey. The questions for this survey are developed in order to appraise the “willingness to pay” (WTP).

As described by Bezzi (2010) the WTP may be distinguished in:

- WTP with indirect knowledge of the good: The knowledge derives from the description given during the interview;
- WTP with direct knowledge of the good: The interviewed have been able to inspect the good;
- Hypothetic WTP: The interviewed expresses an intention of behavior with no payments involved;
- Real WTP: The interviewed is interested in paying for the good.

6.1 Contingent Valuation Method surveys typologies

- **Open-ended** questions require the maximum willingness to pay for a good (or minimum willingness to accept a compensation for its absence) without any hint or advice. This type of questions present difficulties for the interviewed to estimate, therefore poorly used;
- **Close-ended** questions as dichotomous choice to avoid bestowing upon the interviewed the burden of knowledge of the economic nuances of the good through pre-selected answers;
- **Guided open-ended** questions where the interviewed choice is limited by payment card with decreasing groups of monetary imports;
- **Payment ladder**, with increasing monthly and annual imports where the interviewed signs the values, from the lower ones, that would be willing to pay, and with an X, from above, the ones not willing to pay;
- **Bidding**, after defining an initial price suggested by the interviewer, the price itself is modified based on the acceptance or refusal of the interviewer, up to establishing the maximum price that the latter is willing to pay to win the good (Notaro, 2011).

6.2 Negative aspects of the Contingent Valuation Method

Several concerns regarding this model exist and are mainly related to two key aspects: *validity* or precision and *reliability* or coherence of the results of the estimation. The application of this method leads to multiple bias (Notaro, 2011).

They are analysed one by one as follows:

- **Embedding effect** is the first source of error. Indeed, some studies have validated that the estimation of the value of a good may vary according to whether it is assessed individually or as part of a complex set of goods;

- **Question order bias** is another source of error. This effect takes place when the value of the good depends on the order in which the questions are arranged in the questionnaire. The validity of the estimate results depends mainly on the actual nature of the information provided by the description of the hypothetical scenarios to the participants. The way the information is provided can have a positive and negative effect on the results;

- **Strategic error:** when the respondents conclude that they can receive personal benefits based on their responses. This could induce them to respond in a "strategic" way, in order to obtain the highest result. This problem usually arises when the questionnaire presents high imports choices compared to the average. There are two types of strategic errors:
 - **Free riding:** an individual declares a low WTP for a public good because he expects others to pay for it too.

 - **Over-pledging:** when a person believes that the proclaimed value will affect the price, quality and quantity of the good, therefore tends to overestimate or underestimate the good.

- **Hypothetical error:** the scenario may be not very close to reality. The interviewed considers the scenario unrealistic, which consequently leads to declare untrue WTP or WTA values (Notaro, 2011).

7. Materials and methods

The data collected for this study derives from a contingent valuation survey conducted among consumers. It consists in the administration of a personal, anonymous questionnaire to the consumer, who needs to answer questions containing hypothetical decisions in a hypothetical fishmonger and supermarket situation. This method is often used to understand the preferences of the consumers, their willingness to pay or accept an extra price for a certified product and the personal knowledge regarding eco-labels (Song *et al.*, 2018). Two hundred questionnaires have been administered, randomly, face-to-face, to fishery products consumers in two towns, Ravenna and Pavullo nel Frignano (Emilia Romagna, IT), in a fish market and a supermarket each. Owusu (2013) and Nandi (2017) indicate that this direct “interviewer-interviewed” approach is more valid for the contingent valuation method. Specifically, this survey asks how much money consumers would spend to buy a shark-free eco-labelled product. The interview took about from 3 to 5 minutes per interviewed. The investigation has been carried out from September to November 2019. Besides the consumer surveys, in November, there has been administered a questionnaire to a wholesaler and in January, there have been administered questionnaires to the sales manager of the two fishmongers and two supermarkets per town.

7.1 Consumer questionnaire design

The questions presented in the survey for this study are both an open-ended (max price) and a closed-ended binary (accept or not accept the price proposed). The survey can be divided into two versions of the same survey, each divided in 6 parts and accounting for 100 interviews. The difference between those surveys lies in the order of the question number 9:” *Did you know that different species of sharks in the Adriatic Sea, such as the common smooth-hound shark and the blue shark, have experienced a drastic decline because of fishing activity? a. Yes, b. No*”. This division was made in order to see if knowing this information, would have conditioned or not the acceptance of the price proposed and the maximum price.

The six parts are described as follows:

- **Part 1** contains questions about the frequency purchase of fresh fish products. The interviewed has to choose among 5 possible answers:” (0) never, (1) rarely, (2) 1-2 times per month, (3) once a week and (4) several times a week”. Afterwards, the interviewed declares, always using the 5 possible answers above, the frequency of purchase of specific fish products that have been classified in

“crustaceans, pelagic fish, sharks, other fish, shellfish and cephalopods”. The interviewed chooses 3 main shopping places among supermarket, fishmonger, market, fisher and ambulant.

- **Part 2** contains questions that aims to understand the personal awareness and knowledge of eco-labelled products. The focus is to understand whether the consumer is aware of the eco-labels meaning, besides having seen them on a product. Three main eco-labels (Figure 2) were shown to consumers: DOP (Designation of Protected Origin), BIO (Biological Product) and MSC (Marine Stewardship Council).
- **Part 3** aims to comprehend 3 main aspects the consumer considers for what concern fish products. The options are:” (a) origin of the catch (Italian or from abroad), (b) origin of the Adriatic Sea, (c) method of production (fished or farmed), (d) freshness (external appearance), (e) nutritional properties (calories), (f) ease of preparation, (g) habit of buying products that one knows and likes, (h) price and (i) eco-sustainable certifications.
- **Part 4** aims to see whether the consumer is aware that fishing activity is causing sharks decline in the Adriatic Sea and if, consequently, people would be interested in shark-free eco-labelled products of small pelagics. Five different prices have been chosen for this survey:”6.30 €, 6.60 €, 6.90 €, 7.20 € and 7.50 €”. Each price was proposed 20 times per each of the two versions, meaning 10 per version per town, meaning 5 per version, per town per shop. Eventually, consumers indicate the maximum price they would pay for a shark-free product, compared to the average market price (for this survey the average market price established is 6 €/Kg).
- **Part 5** where consumers were asked to assign a value from 1 to 5 to the 4 options, where 1 = false; 2 = rarely true; 3 = sometimes true, 4 = most of the times true and 5 = always true. The possible choices chosen for this phase serve to establish the propension of the buyer in purchasing responsibly on behalf of the environment, using the Ethically Minded Consumer Behavior (EMBC) scale. The

scale has gone through multiple rearrangements and modifications over the years (Sudbury-Riley *et al.*, 2016). Table 1 shows the EMBC scale answer choices. For this study answers 1, 4, 5 and 9 have been used for the questionnaires.

- **Part 6** concludes the survey and contains questions in order to obtain some socio-economic information, such as age, sex, school qualification, number of family members and net monthly family income.

Table 1. EMBC scale (Sudbury-Riley *et al.*, 2016).

1. When there is a choice, I always choose the product that contributes to the least amount of environmental damage.
2. I have switched products for environmental reasons.
3. If I understand the potential damage to the environment that some products can cause, I do not purchase those products.
4. I do not buy household products that harm the environment.
5. Whenever possible, I buy products packaged in reusable or recyclable containers.
6. I make every effort to buy paper products (toilet paper, tissues, etc.) made from recycled paper.
7. I will not buy a product if I know that the company that sells it is socially irresponsible.
8. I do not buy products from companies that I know use sweatshop labor, child labor, or other poor working conditions.
9. I have paid more for environmentally friendly products when there is a cheaper alternative.
10. I have paid more for socially responsible products when there is a cheaper alternative.

7.2 Fishmonger and supermarket questionnaire design

The questions presented for this survey are divided into two parts as follows:

- **Part 1** contains information regarding commercial channels, in which the sales managers are asked to indicate how many kilograms of anchovies and sardines they sell in one year and from whom do they buy pelagic fish and in which proportion. If the sales managers supply pelagic fish from vessels or wholesalers, it is important to indicate the number. The provenance of pelagic fish represents another important slice of the survey and the managers have to indicate, in proportion, from which vessels do they supply (Italian, Croatian or other vessels). The managers have to point out how the selling price is decided (if a specific agreement with the wholesalers has been stipulated) and if it depends on the

quality of the pelagic fish. In this case, the managers have to indicate the minimum and maximum price based on the physical appearance (size, compactness and integrity) of the fish.

- **Part 2** contains information about commercial strategies. The sales managers are asked to give personal opinions regarding MSC eco-labels knowledge, specifying if eco-labels could improve market conditions. It is relevant to understand if eco-labelled pelagic fish products would valorize the product itself and improving the market. If the answer is positive, then, on a scale of 1 to 5, the manager has to indicate from 1 = no efficacy to 5 = great efficacy, different labels: (a.) geographical origin labels, (b) private labels, (c) supermarkets labels, (d) specific fishing tool labels and (e) sustainable labels effectiveness. The managers are asked to choose two negative and two positive aspects, using a scale from 1 to 5 (1= total disagreement, 5=total agreement), whether pelagic fish would have a specific eco-label, in this case, a shark-free eco-label.

7.3 Wholesaler questionnaire design

The wholesaler was asked to describe the principal activity, answering where the commercial chain is distributed, in which geographical scale occurs the activity and what kind of buyers and wholesalers interacts with. The wholesaler was asked to indicate the number of vessels that supply, in which port those vessels land and, in proportion, how many anchovies and sardines are bought. Important was to know whether the price of the small pelagics remains constant during the year and or not, and what kind of factors influence the possible variation. The wholesaler was asked whether there are specific deals with the fishers.

The last part of the questionnaire contains questions regarding the shark-free eco-labelling, and the wholesaler is asked whether the buyers would be interested or not in a more sustainable product of small pelagic and how much would be the difference in price to sell this product.

7.4 Consumers survey elaboration

The open-ended questions from the 200 questionnaires have been analysed through cross section linear regressions with ordinary least squares (OLS), using software Gretl (Gretl, 2019d). In these regressions the focus has been on the Difference in Price (DiffPrice) as the dependent variable, deriving from the difference between the Maximum Price (MaxPrice)

proposed by the consumers and the market price for the pelagic fish (anchovy) chosen for the survey (6 €/kg). The aim of this analysis was to study how the DiffPrice is influenced by the independent variables.

A boxplot has been created in order to see how DiffPrice values is distributed. A boxplot is a graphical representation used to describe the distribution of a sample through simple dispersion (standard error, standard deviation and deviance) and position (mode, mean and median) indices. This type of graphical representation is used to see whether outlier values are present or not. Four outlier values have been omitted to be able to work with a more consistent dataset. Several attempts have been made to explain the relations among the DiffPrice and the independent variables hypothesized.

The independent variables can be summarized in:

- Frequency purchase of fresh fish products (Frequency);
- Frequency purchase of pelagic fish (FreqPelagic);
- Frequency purchase of sharks (FreqShark);
- Shop preferences (Shop);
- Town of administration of questionnaires (Town);
- Position of question number 9 (Information);
- Knowledge of eco-labels (KnowDOP, KnowBIO, KnowMSC);
- Main aspects considered for what concern fish products (Origin, Adriatic, Method, Freshness, Calories, EasyPrep, Habit, Price_aaa, Certified);
- Awareness regarding sharks decline due to fishing activity (SharkDecline);
- Interest in a shark-free eco-label (Sharkfree);
- Responsible purchase (LessImpact, HouseProducts, Recycle, EnvGood);
- Socio-economic features (Sex, Age, SchoolTitle, Family and Economic).

The following 2 models constitute the background steps in a broader reasoning process that led to the formulation of a final model:

- *Model 1*: OLS, observations 1-200, dependent variable: DiffPrice.

In this model, a shotgun cross section analysis on 200 questionnaires on the independent variables has been made, followed by the tests of White and Breusch-Pagan for heteroskedasticity. A sample of random variables is defined heteroskedastic if there are sub-populations within it that have different variances.

These test aims to establish whether the variance of the errors in a regression model is constant or not (White, 1980). A test to calculate the normality of residuals, to see how the error is distributed, has been made.

- *Model 2*: OLS, observations 1-200, dependent variable: DiffPrice. Robust standard errors compared to the Heteroskedasticity, variant HC1.

In this model, the same shotgun cross section analysis on 200 questionnaires on the same independent variables has been made. The heteroskedasticity tests and the normality of residuals have not been effectuated, while the residuals of regression of the DiffPrice have been calculated.

The following 10 models, executed on the 196 observations, the ones without outliers, constitute steps in a broader reasoning process that led to the formulation of a final model:

- *Model 1*: OLS, observations 1-196, dependent variable: DiffPrice.
For this model, the same analysis made on the first 1-200 observation has been made, as in Model 1.
- *Model 2*: OLS, observations 1-196, dependent variable: DiffPrice. Robust standard errors compared to the Heteroskedasticity, variant HC1.
For this model, the same analysis made on the first 1-196 observation has been made, as in the previous Model 2.
- *Model 3*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of Town, Shop and Information. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 4*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of Frequency, FreqPelagic and FreqShark. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 5*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of KnowDOP, KnowBIO and KnowMSC. Robust standard errors compared to the Heteroskedasticity, variant HC1.

- *Model 6*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of Origin, Adriatic, Method, Freshness, Calories, EasyPrep, Habit, Price_aaa and Certified. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 7*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of SharkDecline and Sharkfree. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 8*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of LessImpact, HouseProducts, Recycle and EnvGood. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 9*: OLS, observations 1-196, dependent variable: DiffPrice, independent variable: group of Sex, Age, SchoolTitle, Family and Economic. Robust standard errors compared to the Heteroskedasticity, variant HC1.
- *Model 10*: OLS, observations 1-196, dependent variable: DiffPrice, independent variables: Town, Shop, Information, Frequency, FreqPelagic, KnowBIO, SharkDecline, Sharkfree, EnvGood, Age, Economic. Robust standard errors compared to the Heteroskedasticity, variant HC1. A test for the omitted variables (Town, Shop and Information) has been made.
- *Model 11*: OLS, observations 1-196, dependent variable: DiffPrice, independent variables: Frequency, FreqPelagic, KnowBIO, SharkDecline, Sharkfree, EnvGood, Age, Economic. Robust standard errors compared to the Heteroskedasticity, variant HC1. This model represents the final analysis for which results have been discussed.

7.5 Qualitative analyses

A qualitative analyses on the close-ended questions of the 200 questionnaires have been done using Excel 15.0, 2013 (Microsoft, 2013). For each question, graphs and histograms have been made in order to get a general overview of the information given by the consumers. Since several inconsistencies for questions where consumers were asked if they would be willing to

pay for a shark-free eco-labelled product have been found, ulterior adjustments and analysis have been made. There have been created two variables: “Accept” and “Accept Bis”. Accept indicates which consumer accepted the proposed price, while Accept Bis is corrected taking into account consistency with “maximum price” answer. For all consumers who accepted the proposed price, but later indicated a maximum price, lower than the price accepted before, the Accept Bis was considered null. In other words, the question was evaluated as if the consumers did not accepted the proposed price.

Farther, qualitative comments semi-structured interviews to introduce and evaluate the opinion regarding shark eco-labelling stated by the sales managers of the fishmongers and supermarkets and the wholesaler have been made.

7.6 Sharks by-catch data collection

The Experimental Centre for Habitat Conservation (CESTHA), headquartered in Marina di Ravenna, provided pelagic trawlers by-catch data for the years 2018-2019, already aggregated by port of landing. Qualified observers worked on board of pelagic trawlers in the northern and central Adriatic Sea and monitored fishing operations. By-catch data of species of conservation concern (e.g., elasmobranchs) were collected. For the year 2018, the port of Chioggia cooperated with 2 pairs of vessels, that means 4 vessels in total, while Pila and San Benedetto del Tronto with 1 pair of vessels, which means 2 vessels total, each. For the year 2019, the port of Cesenatico cooperated with 2 pairs of vessels, that means 4 vessels in total, while Chioggia, Pila, San Benedetto del Tronto and Porto Garibaldi with 1 pair of vessels, that means 2 vessels total, each. The aggregated data contain the date, the quantity, the weight (kg), the port of landing of the shark species and the total boarding per port, which refers to the presence on board of the observers.

For the study it has been estimated the amount of money that the pair of vessels gains per year with the by-catch of sharks. In order to create a shark-free eco-label, it is essential to make an economic assessment of the amount of money that the pair of vessels would lose if they would decide to adopt the label, meaning, throwing the sharks back in the sea.

The positive attitude of fishers towards a better management of fisheries is indispensable and the greatest challenge is to encourage them to release sharks in the sea, rather than sell them. The price applied to calculate the annual profit/kg for the years 2018-2019 by-catch of sharks was retrieved from the ISMEA markets 2017 dataset (the only one available during the drafting of this study).

The annual average price per kg of Chioggia 2017 has been calculated summing the maximum price/kg to the minimum price/kg, divided per 2. Afterwards, the resulting price has been applied for both ports of Emilia-Romagna and Veneto (that is to say Pila, Chioggia, Cesenatico and Porto Garibaldi provided by CESTHA). The average annual price per kg of San Benedetto del Tronto 2017 has been applied for the Marche region (that is to say San Benedetto del Tronto provided by CESTHA). It was subsequently calculated the economic value of the by-catch of sharks per pair of vessels.

More specifically, part of this study aims to assess the economic importance of the landed by-catch of sharks to the pelagic trawling fisheries in the Northern and Central Adriatic Sea. This is in terms of the annual value of by-catch for pair of vessels. Afterwards, analyses accounting for each species of sharks have been made. For the species for which ISEMA did not provide a price, the price of 4.97 has been used.

By-catch shark species from CESTHA dataset are:

- *M. mustelus*;
- *Mustelus punctulatus* (Risso, 1827);
- *Mustelus spp*;
- *Alopias supercillosus* (Lowe, 1840);
- *Alopias vulpinus* (Bonnaterre, 1788);
- *Scyliorhinus stellaris* (Linnaeus, 1758);
- *Scyliorhinus canicula* (Linnaeus, 1758);
- *S. acanthias*;
- *Prionace glauca* (Linnaeus, 1758);
- *Carcharhinus plumbeus* (Nardo, 1827)
- *ND Squaliformes*.

7.7 Economic advantage per vessel

Theoretical advantages of a shark-free eco-label for the vessels have been thus calculated as follows:

1. Estimation of the mean DiffPrice;
2. Calculation of the percentage of mean DiffPrice (mean DiffPrice/average market price)*100;

3. Application of the percentage to the mean revenues of a, for instance, Veneto pelagic trawl vessel using NISEA 2017 dataset;
4. The theoretical revenue for a pelagic trawl in the event that it would have sold the small pelagics in the reference year at the higher price guaranteed by the label;
5. The lack of revenues of a vessel of Chioggia given by the value of the by-catch is assumed as the amount of money for the application of the label;
6. The lack of revenues given by the unsold sharks have been compared to the increased revenues from the higher price of small pelagics, assuming that the label is given freely.

Since NISEA data were aggregated for the entire Veneto fleet (36 vessels) and, for the present work, were divided by 36 to obtain an average per vessel, the total values for the years 2018-2019 of Chioggia reported in Tables 8 and 10 have been calculated per vessel, too.

8. Results and discussions

8.1 Qualitative analyses results: Frequency purchase of fresh fish products

On 200 consumers, 37 % buy fresh fish products once a week and 39 % several times a week. The 8 % of consumers purchase fresh fish rarely and 16 % 1 or 2 times per month. One of the main purposes was to find out how many consumers purchase small pelagics and how frequently. The results showed in Table 2 reveal that 27.5 % of the interviewed purchase sardines and anchovies once a week and that consumers have major interest in purchasing “cephalopods”, “shellfish”, “crustaceans” and “other fish”. The qualitative results indicate also that 70.5 % of consumers never buy shark meat. During the survey, some examples of shark species have been given as examples, since several consumers thought that sharks included the swordfish or even tuna, which are bony fish. Therefore, the high number of consumers that do not consume shark meat could contain bias due to the likely misidentification of sharks as other species.

Table 2. Percentage of consumers and frequency purchase of fresh fish products.

	Crustaceans	Small pelagics	Sharks	Other fish	Shell fish	Cephalopods
Never	21 %	12 %	70.5 %	7.5 %	16.5 %	13.5 %
Rarely	27 %	21 %	12 %	14.5 %	21 %	17 %
1-2 per month	31.5 %	21%	12.5 %	35 %	35 %	28 %
Once a week	15.5 %	27.5 %	4 %	29.5 %	16.5 %	21 %
Several times a week	5 %	18.5 %	1 %	13.5 %	11 %	10.5 %
Total	100 %					

8.2 Socio-demographic variables

The results of the descriptive analyses of consumers socio-demographic variables indicated in Table 3 revealed that on 200 consumers, 65.5 % were female and 34.5 % were male. This result was predictable since females are usually in charge of the family’s expenses regarding groceries (Nandi *et al.*, 2017). Respondents with the age between 50-65 (37.5 %) and 35-49 (32 %), as well as highly educated consumers (42.5 % went to high school and 30.5 % went to university) are overrepresented in this study. On 200 consumers, 39.5 % claimed that the monthly family net income ranged from 1501 to 3000 €. On the other hand, 23.5 % of consumers preferred not to answer the question, as considered too personal.

Table 3. Socio-demographic information of the participants.

	N. of participants	%
Family Members		
1	18	9 %
2	64	32 %
3	61	30.5 %
4	40	20 %
5	13	6.5 %
6	3	1.5 %
7	1	0.5 %
Sex		
Female	131	65.5 %
Male	69	34.5 %
Age		
<35	17	8.5 %
35-49	64	32 %
50-65	75	37.5 %
>65	44	22 %
No answer	0	0 %
School Title		
Middle School	44	22 %
High School	85	42.5 %
University	61	30.5 %
Other	10	5 %
Economic status		
Up to € 1.500	24	12 %
€ 1.501 - 3.000	79	39.5 %
€ 3.001 - 4.500	38	19 %
> € 4.500	12	6 %
No answer	47	23.5 %
<hr/>		
Total per group	200	100 %

8.3 Main fish aspects

Table 4 provides the main characteristic considered by consumers. Freshness (78.5 %), origin (72 %) and method of production (43.5 %) are the main aspects considered mostly. Contrary to what was expected, few consumers are interested in the origin from the Adriatic Sea (23 %). Surprisingly, the price was not one of the three main aspects chosen by the consumers. Indeed, only the 19 % of shoppers considered the price as an important factor.

This result could mean that consumers would be willing to pay an extra price for a more sustainable fish product but, according to the results, 95 % of consumers did not consider the sustainable eco-certification as one of the three aspects while purchasing fresh fish.

Table 4. Table indicating the main aspects chosen by the consumers regarding fish products.

Variables	Yes	%	No	%
Origin	144	72 %	65	32.5 %
Adriatic	46	23 %	154	77 %
Method	87	43.5 %	113	56.5 %
Freshness	157	78.5 %	43	21.5 %
Calories	28	14 %	172	86 %
EasyPrep	53	26.5 %	147	73.5 %
Habit	35	17.5 %	165	82.5 %
Price	38	19 %	162	81 %
Certified	10	5 %	190	95 %

Note: the answers under column Yes and No indicate the number of consumers on 200 total and the relative percentage.

8.4 The awareness of labels significance

Although eco-labels are increasingly being used for various products, their usefulness in educating customers to purchase environmentally-friendly goods is still uncertain (Song *et al.*, 2018). Most consumers are poorly aware of the existence of MSC, BIO and DOP labels. As it was important to understand whether the consumers know the label besides having seen it. Table 5 shows the number of consumers that have seen the labels and how much they know about them. When consumer were asked to explain what the meaning of the labels was, very few of them could describe in short words what they represented or on which product were present. Despite the lack of knowledge of labels, 70.5 % of consumers would pay for a shark-free product, even though only 5 % of consumers indicated the certification of the product as one of the 3 priorities when purchasing fresh fish products. This result could confirm that not all good intentions and interest into eco-labelled products can translate into a practical reality.

Table 5. The awareness of consumers regarding the 3 labels selected for the survey.

Variables	Knowledge of DOP	Knowledge of BIO	Knowledge of MSC
Have not seen and do not know	61.5 %	48.5 %	64 %
Have not seen and know in part	0 %	1 %	1 %
Saw and do not know	21.5 %	35 %	18.5 %
Saw and know in part	12 %	13.5 %	10 %
Saw and know well	5 %	2 %	6.5 %
Total:	100 %	100 %	100 %

8.5 EMBC scale results

Table 6 contains the number of consumers who answered the questions of the survey according to the EMBC scale. With the assumption of having the possibility to choose, 35 % of consumers, most of the time, decide to purchase products that have the least impact on the environment and 37.5 % of consumers, whenever possible, choose products with recyclable packaging or that can be reused. Indeed, when consumers can choose, most of the time, they are attentive to the environment, with 45.5 % stating that they would spend an extra price on more sustainable products than the cheaper ones.

Table 6. EMBC scale results to measure the buyer's propensity to make environmentally responsible purchases.

	Less Impact	House Products	Recycle	Env Good
False	4 %	12 %	8 %	6.5 %
Rarely	9 %	18 %	10.5 %	7.5 %
Sometimes	19.5 %	22 %	18.5 %	24.5 %
Most of the times	35 %	28 %	37.5 %	45.5 %
Always	32.5 %	20 %	25.5 %	16 %
Total	100 %			

8.6 Estimation of the willingness to pay



Figure 4. Rate of acceptance of proposed prices.

Figure 4 portrays the results in percentage of 181 consumers' willingness to pay for a shark-free product. This analysis has been made in order to visualize the rate of acceptance of the proposed prices. The results that include the raw data (without Accept Bis) show that the price acceptance is constant for each price proposed. The raw data have been subsequently adjusted, as several cases of inconsistencies were identified during the analysis.

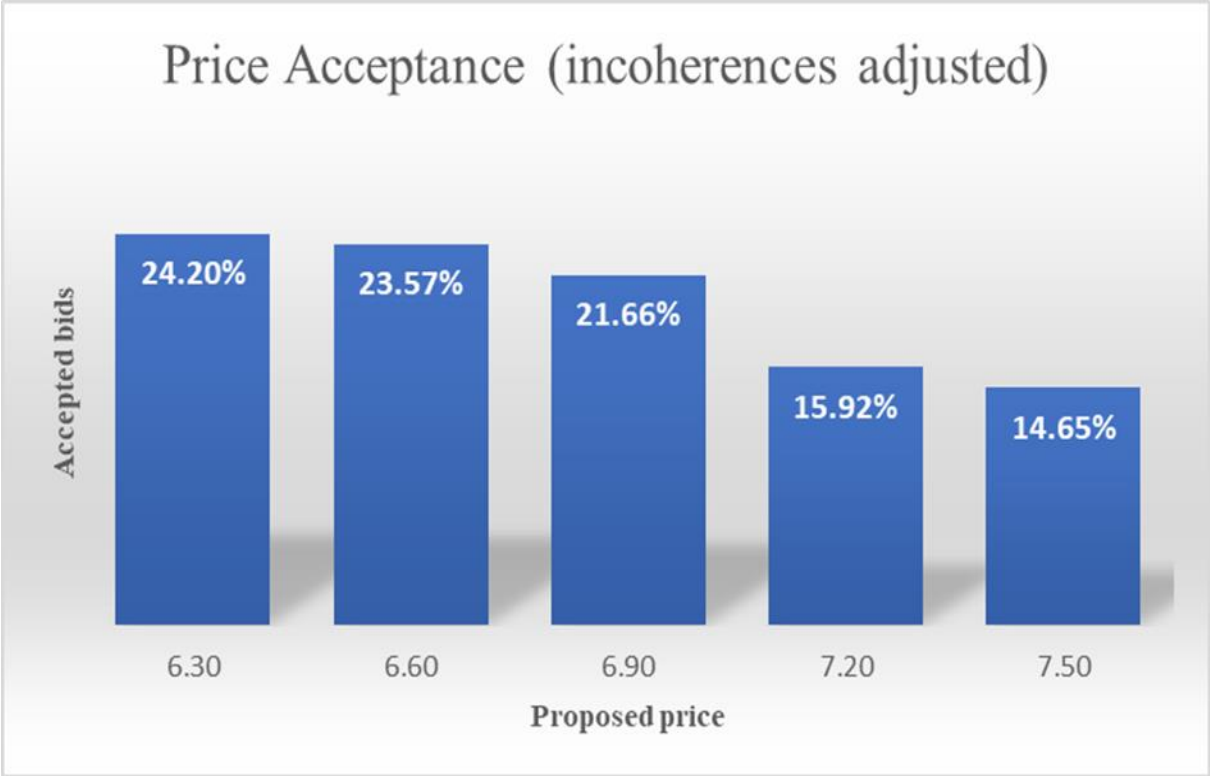


Figure 5. Rate of acceptance including the incoherent answers.

Twenty-four consumers out of 200 have been individuated and classified under the “Incoherent” category and 3 under the “X cases” category. The “Incoherent” category include those consumers who during the survey indicated a maximum price that they were willing to pay which was though inferior to the offered price that they had already accepted (e.g. price proposed during the survey that has been accepted: 7.50 € and maximum price proposed by the consumer: 6.00 €). Vice versa, the “X cases” are those consumers who did not accept the proposed price, but offered a higher maximum price (e.g. price proposed during the survey that has not been accepted: 6.30 € and maximum price proposed by the consumer: 8.00 €). Figure 5 considers the category “Accept Bis” and show how the presence of the “Incoherent” and “X cases” adjustment influences the results. As the price proposed grow, the acceptance by the consumers decline.

8.7 Sales managers questionnaires results

8.7.1 Supermarket of Pavullo nel Frignano

An external cooperative society decides commercial channels and strategies for the supermarket in Pavullo nel Frignano, including all decisions about fish products, species preferences, prices and even suppliers. The supermarket sells annually about 1500 kg of anchovies and up to 1800/2000 kg of the less expensive sardines. A pricelist is provided by the cooperative society to the supermarket and can be negotiated based on the market trend, the fish catches rate, and partially on the demand of the consumer. This cooperative society provides mainly 2 wholesalers from which the supermarket supplies itself 100 % of the fish products.

As well as for other food products, sustainable labels on fresh pelagic fish products could improve market conditions and increase the value of anchovies and sardines. The sales manager is aware of the existence of MSC label and believes that labels of geographical origin (Mediterranean and Adriatic Sea) are deemed as very successful, considering that consumers prefer products caught by the Italian fleet. In addition, labels that carry the supermarket logo, labels indicating the use of specific fishing tools or techniques and sustainable labels could valorize the product. The least efficacy was attributed to private labels.

If the fishers adopted the shark-free eco-label, the supermarket would also be prone to do the same, always according to the decisions of the cooperative society. The consumer would be willing to pay an extra price, after being informed regarding the certification and sustainability topic. Considering that Pavullo nel Frignano is an inland town, fish is not the main product consumed and consumers mostly seek for fresh products in discount, which include sharks, such as the common smooth-hound or mako shark.

8.7.2 Supermarket of Ravenna

The purchase of fish products, species preferences, prices and wholesalers for the supermarket in Ravenna is managed by a fish market that has not been indicated in the survey. The supermarket sells annually about 1500 kg of anchovies and 1700 kg of sardines, which supplies itself 100 % from the fish market. While 85 % of the pelagic fish comes from the Adriatic Sea (Italian fleets), 15 % comes from other seas. Prices are negotiated based on the market trend, catches rate and consumers' demand. The price can change according to the physical characteristics of the fish (size, freshness, etc.). No minimum or maximum price has been indicated.

Sustainable labels on fresh pelagic fish products could improve market conditions, the value of the fish and the reputation of the supermarket, creating competitive advantage compared to other supermarkets and fishmongers. Labels of geographical origin (Mediterranean and Adriatic Sea) could have a quite high efficacy, as well as private labels, fishing sustainability labels and labels that would include the logo of the supermarket. An almost null efficacy was attributed to labels based on specific fishing tools.

The interviewed is not aware of the existence of the MSC and claims that there could be difficulties in keeping separate the certified products from the uncertified ones, with higher costs. The sales manager is not sure that a shark-free eco-label could improve market condition of anchovies and sardines, but claims that consumers could be interested in a shark-free eco-labels product after being informed about the topic.

8.7.3 Fishmonger of Pavullo nel Frignano

The fishmonger of Pavullo nel Frignano sells annually about 1000 kg of anchovies per year and 700 kg sardines per year and supplies itself 100 % by 2 wholesalers that restock from the market of Chioggia. In proportion, 90 % of the pelagic fish comes from Italian fleets operating in the Adriatic Sea, 5 % from Croatian fleets operating in the Adriatic Sea and 5 % from other seas. The price is decided by the wholesalers based on the trends of the market of Chioggia and can depend on the physical characteristics of the fish, such as size and freshness. No minimum nor maximum price has been indicated. The selling price of the day is updated based on the price negotiated with the wholesaler.

The sales manager is not aware of the MSC label and believes that consumers would probably not be willing to pay an extra price for the pelagic fish, but at the same time, could be interested in paying for a shark-free product, after being informed about the topic.

8.7.4 Fishmonger of Ravenna

The fishmonger in Ravenna sells annually about 4500 kg of anchovies per year and 4500 kg sardines per year. This can be explained as the fishmonger run a second fishmonger in Lido Adriano. They are supplied of 30 % of the products by the market of Rimini and 70 % by 3 wholesalers. In proportion, 80 % of the anchovies come from Italian fleets operating in the Adriatic Sea, 10 % from Croatian fleets operating in the Adriatic Sea and 10 % from other seas. The price is decided by the wholesalers and is negotiated at each market trade. It depends on the catches rate and the consumers' demand. The price may depend on the physical condition

of the fish as well as on the size (minimum price: 2.00 € and maximum price 4.50 €). The selling price of the day is updated based on the price with the wholesalers. The sale manager states that consumers seek for freshness and affordable prices that and it could be difficult to sell the products for a higher price. The sales manager is not aware of the existence of MSC label and claims that eco-labels, including the shark-free, would not be a competitive advantage compared to other shops and the reputation of the fishmonger would only slightly be enhanced over time. Creation of vertical privileged and direct relationships with fishers would not be possible. Furthermore, there would be many administrative efforts and continuous monitoring would be necessary.

8.8 Wholesaler questionnaire results

The wholesaler trades fish products in Italy and in general Europe. Fishers, fish markets and other traders are the main suppliers, while wholesalers, fisheries, supermarkets, HORECA, processing and GDOs (“Grande Distribuzione Organizzata”) are the primary buyers. The wholesaler supplies itself from 3 vessels that land in Porto Garibaldi, Cesenatico and Cattolica. In proportion, the purchase of anchovies and sardines ranges respectively from 300-400 g per day and 300-500 g per day. The price and the quantity of fish are negotiated each time with the fishers or through auction.

The price varies during the year and it depends on:

- The quantity of fish caught in the entire Adriatic Sea and in Italy;
- The demand of pelagic fish from abroad;
- The demand of pelagic fish from other buyers;
- The quality of the fish.

The wholesaler believes that none of the main buyers would be interested in a shark-free eco-label and concludes indicating that there would be no difference of price between a traditional product and the certified one.

8.9 Linear regression results

In order to get to the final result, the variables, that individually taken were significant, have been grouped. The result of the linear regression is shown in Table 7. The constant explains whether the consumers are willing to pay an extra price. With a coefficient of 1.15079 and a p-value of 0.0141, it is assumable that consumers are prone to pay an extra price.

Awareness of consumers concerning BIO products has positive significance with the variable DiffPrice (p-value of 0.0069). Sorting for decreasing order of significance, variables are as follows: Sharkfree (p-value di 0.0105 **), Economic (p-value di 0.0224 **) and Age (p-value di 0.0620 *). An arbitrary limit, commonly 0.01, 0.05 and 0.1, to the p-value indicates statistical significance. The lower the p-value, the more unlikely the sample is distributed in such a way randomly. When the calculated p-value is lower than the set limit, it is attributed that level of significance.

The extent of the additional price that the consumer is willing to pay is strongly related to the degree of information on a sensitive topic such as the BIO eco-label. The degree of information does not seem to be reflected in the school qualification; therefore, it seems to be more of a personal propensity towards the topic. The second most important variable is the Sharkfree, which can be translated into the interest of the consumers for a product that could meet their awareness about sharks. The more consumers know the shark-free eco-label, the more likely they are to pay for it, as with similar ideals as BIO. As was expected, the regression results indicate significant positive relationships between DiffPrice and the economic situation, which is a strong discriminator in the willingness to pay. The more a person has a high economic income, the more likely would pay a higher price for a sustainable product. The variable Age, which presents significance at a p-value of 0.1, may suggest that younger people, having a different sensitivity regarding environmental issues, may be more prone to pay a higher price compared to elderly ones.

Table 7. Model 11 results obtained through OLS model. Robust standard errors compared to the Heteroskedasticity, variant HC1.

	Coefficient	Error Std.	t-distribution	p-value
Const	1.15079	0.464546	2.477	0.0141 **
Frequency	-0.141541	0,0953140	-1,485	0,1392
FreqPelagic	0,0963639	0,0671901	1.434	0,1532
KnowBIO	0,449259	0,164596	2.729	0,0069 ***
SharkDecline	-0,257608	0,162528	-1.585	0.1147
Sharkfree	0,431692	0,166945	2.586	0.0105 **
EnvGood	0.123438	0,0805962	1.532	0.1273
Age	-0,165481	0,0881317	-1.878	0.0620 *
Economic	0.155726	0.0676502	2.302	0.0224 **

Observations 196

*** = significant at 1%

** = significant at 5%

* = significant at 10%

8.10 By-catch value results for the pair of vessels

Tables 8 and 10 indicate the results of the economic assessment per pair of vessels for the several ports considered in this study. The amount of money given by shark by-catch for the pair of vessels per year is not excessive and. The capture of different species varies from port to port for the 2 years, as shown in Table 9 and 11. As previously stated, the port of Chioggia confirms the majority of shark landings and is the port in which the total income per pair of vessels is the highest compared to the other ports. For the year 2018, *M. mustelus* and *M. punctulatus* are the main representative species. San Benedetto del Tronto, for the year 2018, only caught 11 individuals of *S. acanthias*, for 506.06 € as income total. In the same year, the port of Pila caught more various species, for a lower income, 333.83 €.

Table 8. Results of economic calculation in €, per each species, per year and per pair of vessels, 2018.

Shark species	Chioggia	Pila	San Benedetto del Tronto
<i>M. mustelus</i>	309.80 €	146.87 €	
<i>M. punctulatus</i>	689.25 €	6 €	
<i>S. acanthias</i>	19.48 €	119.32 €	506.06 €
<i>A. supercilliosus</i>	37.28 €		
<i>S. stellaris</i>	10.19 €	12.43 €	
<i>S. canicula</i>	2 €	21.87 €	
<i>P. glauca</i>	10.94 €	27.34 €	
Total	1078.94 €	333.83 €	506.06 €

Table 9. Number of shark individuals per port for the year 2018.

Shark Species	Individuals Chioggia	Individuals Pila	Individuals San Benedetto del Tronto
<i>M. mustelus</i>	52	12	
<i>M. punctulatus</i>	114	1	
<i>S. acanthias</i>	5	18	11
<i>A. supercilliosus</i>	1		
<i>S. stellaris</i>	2	1	
<i>S. canicula</i>	1	3	
<i>P. glauca</i>	1	3	
Total	176	38	11

For the year 2019, both *S. acanthias* and *A. vulpinus* contribute to the annual income of Chioggia. Different species with different criteria according to the IUCN Italian red list are thus present. Since those species have distinct characteristics, either ecological or commercial, enhancing shark by-catch data collection in commercial fisheries is relevant in order to determine means to preserve endangered species, and to better estimate the economic income from by-catch. It is advised to gather species size and weight, collaborating with fishers.

Table 10. Results of economic calculation in €, per each species, per year and per pair of vessels, 2019.

Shark species	Cesenatico	Chioggia	Pila	Porto Garibaldi	San Benedetto del Tronto
<i>M. mustelus</i>		187.82 €			12.97 €
<i>M. punctulatus</i>		77.36 €			
<i>Mustelus spp</i>		36.4 €		59.15 €	
<i>S. acanthias</i>	7.71 €	116.51 €	44.99 €		76.73 €
<i>A. vulpinus</i>	86.98 €	944.3 €		124.25 €	
<i>Squaliformes</i>		6.46 €			
<i>P. glauca</i>		27.36 €			
<i>C. plumbeus</i>	4.57 €				
Total	99.26 €	1396.21 €	44.99 €	183.4 €	89.7 €

Table 11. Number of shark individuals per port for the year 2019.

Shark Species	Individuals Cesenatico	Individuals Chioggia	Individuals Pila	Individuals Porto Garibaldi	Individuals San Benedetto del Tronto
<i>M. mustelus</i>		14			1
<i>M. punctulatus</i>		7			
<i>Mustelus spp</i>		1		2	
<i>S. acanthias</i>	2	17	6		2
<i>A. Vulpinus</i>	1	2		1	
<i>Squaliformes</i>		1			
<i>P. glauca</i>		1			
<i>C. plumbeus</i>	1				
Total	4	43	6	3	3

8.11 Economic advantage per vessel results

The mean DiffPrice of 1.58 € and its percentage of 26.33 % have been calculated to see how much higher the price would be compared to the average market price of 6 €. The mean revenue per vessel for the year 2017 for the fleet of Veneto, calculated using NISEA dataset, is equal to 574900 €. This amount has been increased by the 26.33 % to see how much the vessel's revenue for that year would have improved. The results indicate that each vessel would have increased its revenues by 151371 €, with a total revenue of 726271€, applying the shark-free eco-label with a DiffPrice of 1.58 €. The lack of revenue due to the unsold shark by-catch per vessel of Chioggia has been considered as the value of application of the shark-free eco-label.

Finally, the lost revenues due to the lack of sale of sharks and the increase in revenues due to the higher selling price of small pelagics were compared, assuming that the shark-free eco-label is granted freely. The value of 539.47 € for the year 2018 and the value of 698.11 € for the year 2019, due to the unsold sharks, are lower compared to the added revenue of 151371 €.

No actual drawbacks have emerged from this work.

9. Conclusions

This kind of survey can involve several errors, such as the “Social Desirability Bias”. This bias is a systematic error which refers to the tendency of subjects, in this case consumers, to behave in order to be seen as citizens who give good impression to society, or to the interviewer, without appearing embarrassed or unprepared, rather than express opinions that reflects their believes (Fisher, 1993; Grimm, 2010; Brenner *et al.*, 2016). In general, many factors could affect the behavior of consumers during the purchase. For example, some consumers from both supermarkets claimed to be late or in a hurry, because some had to go to work, while others had to go pick up children from school, especially when the survey was conducted in the afternoon. Considering a general view, during the administration of the questionnaires, including those addressed to the sales managers and the wholesaler, there may have been a lack of attention and, to a lesser extent, disinterest, in the interviewed behavior.

In conclusion, the general public knowledge of eco-labels is low. Therefore, raising awareness regarding sustainable eco-labels already in the market is advised. Since KnowBIO seems to be the main drive for the willingness to pay, the public should be better informed about the labelling industry and its mechanisms, before the shark-free eco-label is implemented. It is challenging to introduce eco-friendly products to those consumers who do not purchase them. As suggested by Song *et al.*, (2018) the clarity of eco-labels on the packaging needs to ameliorate. For the future implementation of the shark-free eco-label, the increase in price does not seem to be the major concern for consumers, until freshness, origin and method of production is insured. The ideal eco-label that for the consumers may be the best is the one that assures that small pelagics are caught by the Italian fleet and, more precisely, in the Mediterranean Sea. In addition, considering the small sample size of this study and the geographical area in which the study has been conducted, the sample cannot be deemed representative of the Italian population.

All vendors currently have no interest in promoting eco-labels, as joining the certification is considered a cost, as well as keeping the certified lines separate from the non-certified ones without mixing the products. None will assume the risk of joining the certification first, preferring to let others pave the way.

This is not a problem for successful labels like MSC, which are already in place for pre-packaged products since little effort is requested to the vendors to sort the products from non-certified ones. If an interest from vendors will emerge, it will likely only be as a consequence

of an already strong and well established demand from the consumers. It is advised to improve communication among all the actors of the fish sector, from fishers to consumers, which would enhance the effectiveness of eco-labels.

Since information about by-catch data regarding sharks are still lacking, the economic calculations achieved in this study only represents a first assessment that aimed to approximate the amount of money that the vessels would renounce in order to join the shark-free eco-label. Theoretically, the economic loss due to the release of sharks is lower compared to how much the vessels could gain by joining the shark-free eco-label. For fishers, even a small increase in price could be positive, as the by-catch of sharks are quite limited and could not have negative impacts on fishers' job. Incentives would thou encourage fishers to comply with the good practice of releasing the by-catch (Pascoe *et al.*, 2010).

Further surveys addressed to fishers to determine their revenues, opinions and interest in joining the shark-free eco-label are thus needed.

10 Acknowledgements

Vorrei dedicare questo spazio della mia tesi a tutti coloro che mi sono stati vicini durante questo mio percorso universitario.

Un ringraziamento sentito va al mio relatore, Luca Mulazzani. Le sono davvero grata per avermi seguita con tanta pazienza sin dalla scelta dell'argomento, guidandomi durante la stesura dell'elaborato.

Grazie mamma, che hai sempre creduto in me, supportandomi e incoraggiandomi, quando ansie e insicurezze prendevano il sopravvento. Grazie per aver sostenuto ogni mia scelta, ascoltato ogni mio pensiero e per aver realizzato il mio sogno di vedere gli squali bianchi in Sud Africa. Grazie papà e nonno che dall'alto state festeggiando con noi anche questo traguardo.

Grazie di cuore, Remo, che mi hai sempre tranquillizzata quando ero triste per gli esami andati male e per il tuo sostegno in questi anni. Ricorderò sempre il tuo consiglio: "Mai pora, Lauretta, mai pora". Grazie nonna Gajca, zia Nina e Saška, che mi siete sempre state accanto, dando la vostra disponibilità per aiutarmi, soprattutto nei momenti stressanti.

Grazie amiche mie, Mary, Elena, Tazzio, Ge per essere sempre state al mio fianco, condividendo con me questi anni. Grazie per i consigli, le risate, i pianti e il vino rosso il sabato sera. Senza di voi, questi anni sarebbero stati insostenibili.

Grazie Pico per essere entrato nella mia vita e per essermi sempre stato accanto. Grazie per aver creduto in me, per avermi spronata a migliorare e a superare le mie più grandi paure. Grazie per avermi salvata nei momenti in cui mi lasciavo andare. Ti amo.

11. References

1. Barausse A, Correale V, Curkovic A, Finotto L, Riginella E, Visentin E, Mazzoldi C, 2014. The role of fisheries and the environment in driving the decline of elasmobranchs in the northern Adriatic Sea. *ICES Journal of Marine Science*: 71 (7): 1593-1603.
2. Bargione G, Donato F, La Mesa M, Mazzoldi C, Riginella E, Vasapollo C, Virgili M, Lucchetti A, 2019. Life-history traits of the spiny dogfish *Squalus acanthias* in the Adriatic Sea. *Scientific reports*, 9 (1): 1-10.
3. Bezzi C, 2010. <https://bezzicante.files.wordpress.com/2014/05/valutazione-contingente.pdf> [Last visited 04/02/2020].
4. Bombace G, Lucchetti A, 2011. *Elementi di biologia della pesca*. Milano: 1° Edizione. Il Sole 24 ore Edagricole.
5. Bonanomi S, Pulcinella J, Fortuna C M, Moro F, Sala A, 2018. Elasmobranch bycatch in the Italian Adriatic pelagic trawl fishery. *PloS one*: 13 (1): e0191647.
6. Brenner P S, DeLamater J, 2016. Lies, damned lies, and survey self-reports? Identity as a cause of measurement bias. *Social psychology quarterly*: 79 (4): 333-354.
7. Breusch T S, Pagan A R, 1979. A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the Econometric Society*, 1287-1294.
8. Clua E, Buray N, Legendre P, Mourier J, Planes S, 2011. Business partner or simple catch? The economic value of the sicklefin lemon shark in French Polynesia. *Marine and Freshwater Research*: 62 (6): 764-770.
9. COUNCIL REGULATION (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea. *Official Journal of the European Union*.

10. Davies RWD, Cripps SJ, Nickson A, Porter G, 2009. Defining and estimating global marine fisheries bycatch. *Marine Policy*: 33 (4): 661±672.
11. De Maddalena A, Bansch H, 2008. *Squali del Mare Mediterraneo*. Milani: Class Editori.
12. Díaz F J M, Pleite F M C, Paz J M M, García P G, 2012. Consumer knowledge, consumption, and willingness to pay for organic tomatoes. *British Food Journal*.
13. European Market Observatory for Fisheries and Aquaculture Products (EUMOFA). *MARKET OUTLETS FOR UNWANTED CATCHES*, Executive Summary. European Union, 2020.
14. Food and Agriculture Organization of the United Nations (FAO), 2015. State of the global market for shark products. *FAO Fisheries and Aquaculture technical paper*: (590), I.
15. Ferretti F, Myers R A, Serena, F, Lotze H K, 2008. Loss of large predatory sharks from the Mediterranean Sea. *Conservation Biology*: 22 (4): 952-964.
16. Ferretti F, Osio G C, Jenkins C J, Rosenberg A A, Lotze H K, 2013. Long-term change in a meso-predator community in response to prolonged and heterogeneous human impact. *Scientific reports*: 3, 1057.
17. Fisher R J, 1993. Social desirability bias and the validity of indirect questioning. *Journal of consumer research*: 20 (2): 303-315.
18. Galarraga Gallastegui I, 2002. The use of eco-labels: a review of the literature. *European Environment*: 12 (6): 316-331.
19. Gallagher A J, Hammerschlag N, 2011. Global shark currency: the distribution, frequency, and economic value of shark ecotourism. *Current Issues in Tourism*: 14 (8): 797-812.

20. Gardiner P R, Viswanathan K K, 2004. Ecolabelling and fisheries management (Vol. 1714). WorldFish.
21. Gascon C, Brooks T M, Contreras-MacBeath T, Heard N, Konstant W, Lamoreux J, Launay F, Maunder M, Mittermeier R A, Molur S, Al Mubarak R K, Parr M J, Rhodin A G J, Rylands A B, Soorae P, Sanderson J G, Vie´ J C, 2015. The importance and benefits of species. *Current Biology*: 25 (10): R431-R438.
22. Gretl, 2019. Copyright: Allin Cottrell, Riccardo Lucchetti. <http://gretl.sourceforge.net/>
23. Grimm P, 2010. Social desirability bias. *Wiley international encyclopedia of marketing*.
24. International Union for Conservation of Nature, IUCN, 2019. The IUCN Red List of Threatened Species. Version 2019-3. <http://www.iucnredlist.org> [Last visited 3/01/2020].
25. Istituto di Servizi per il Mercato Agricolo Alimentare, ISMEA. <http://www.ismea.it/flex/FixedPages/IT/WizardPescaMercati.php/L/IT> [Last visited 12/02/2020].
26. Kopnina H, Washington H, Taylor B, Piccolo J J, 2018. Anthropocentrism: More than just a misunderstood problem. *Journal of Agricultural and Environmental Ethics*: 31 (1): 109-127.
27. Marine Stewardship Council. MSC. <https://www.msc.org/it> [Last visited 27/02/2020].
28. Microsoft. Microsoft Excel. Microsoft, 2013.
29. Millenium ecosystem assessment MEA, 2005.
30. Ministero delle politiche agricole alimentari e forestali. MIPAAF. (2019). Piano di Gestione Nazionale relativo alle flotte di pesca per la cattura delle risorse demersali

nell'ambito delle GSA 17 (Mar Adriatico Centro-settentrionale) e GSA 18 (Mar Adriatico Meridionale).

31. Ministero delle politiche agricole alimentari e forestali. MIPAAF. <https://dopigp.politicheagricole.it/web/guest/le-denominazioni> [Last visited 27/02/2020].
32. Ministero delle politiche agricole alimentari e forestali. MIPAAF, NISEA, 2017. Programma Nazionale raccolta dati alieutici.
33. Mulazzani L, Camanzi L, Malorgio G, 2019. Multifunctionality in fisheries and the provision of public goods. *Ocean & coastal management*: 168, 51-62.
34. Nandi R, Bokelmann W, Gowdru N V, Dias G, 2017. Factors influencing consumers' willingness to pay for organic fruits and vegetables: Empirical evidence from a consumer survey in India. *Journal of Food Products Marketing*: 23 (4): 430-451.
35. Notaro C, 2011. <http://www.bankpedia.org/index.php/it/115-italian/m/21097-metodo-della-valutazione-contingente-enciclopedia> [Last visited 04/02/2020].
36. Owusu V, Owusu A M, 2013. Consumer willingness to pay a premium for organic fruit and vegetable in Ghana. *International Food and Agribusiness Management Review*: 16 (1030-2016-82931): 67-86.
37. Pascoe S, Innes J, Holland D, Fina M, Thébaud O, Townsend R, Sanchirico J, Arnason R, Wilcox C, Hutton T, 2010. Use of incentive-based management systems to limit bycatch and discarding. *International Review of Environmental and Resource Economics*, 4 (2): 123-161.
38. Prizefish. <https://www.italy-croatia.eu/web/prizefish> [Last visited 29/02/2020].
39. Prodotto Biologico. https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/organics-glance_it [Last visited 27/02/2020].

40. Schröter M, Van der Zanden E H, Van Oudenhoven A P, Remme R P, Serna-Chavez H M, De Groot R S, Opdam P, 2014. Ecosystem services as a contested concept: a synthesis of critique and counter-arguments. *Conservation Letters*: 7 (6): 514-523.
41. Song L, Lim Y, Chang P, Guo Y, Zhang M, Wang X, Yu X, Lehto M R, Cai H, 2019. Ecolabel's role in informing sustainable consumption: A naturalistic decision making study using eye tracking glasses. *Journal of cleaner production*: 218: 685-695.
42. Srinivasa Gopal T K, Boopendranath M R, 2013. Seafood ecolabelling. *Fishery Technology* 50: 1-10.
43. Sudbury-Riley L, Kohlbacher F, 2016. Ethically minded consumer behavior: Scale review, development, and validation. *Journal of Business Research*: 69 (8): 2697-2710.
44. Thøgersen J, Haugaard P, Olesen A, 2010. Consumer responses to ecolabels. *European Journal of Marketing*: 44 (11/12): 1787-1810.
45. White H, 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: journal of the Econometric Society*: 817-838.