Understanding consumers' preferences for finfish in the Mediterranean region: a multiperspective approach.

Ph.D. thesis

Candidate: Ahmed Saidi

Supervisor: Prof. Gianni Cicia

Dedication

Success is no accident, it is hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing

I would like to dedicate this work to my parents who encouraged me through my studies

To my sister, you will always be my number one love and I will always be by your side like you always are and will be for me.

To my professor and my amazing friend Dr. Faten Khamassi, you are the best role model that anyone can dream off, an amazing person with a great heart; you changed my life by believing in me and for that I will forever by grateful.

To my friends, thank you for your support and for the amazing years that we spent together. Many still to come.

To everyone one who loves me, I wish all the success and happiness in the world.

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Lastly, always remember that: IF YOURE ALWAYS TRYING TO BE NORMAL, YOU WILL NEVER KNOW HOW AMAZING YOU CAN BE, MAYA ANGELOU.

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1. Introduction

Since the 20st century, globalization has been considered the main factor contributing to the homogenization of consumption habits (Leng et al., 2017; Upadhyay, 2014). This phenomenon was linked to the convergence of lifestyles of different ages and social groups (particularly younger and middle-aged people), as well as the declining significance of local customs in consumer behaviour (Cicia et al., 2012; Hanus, 2018). Specifically, cultural globalization has revolutionized diets around the world and increased their intake of ethnic foods (Lehel et al., 2021). Additionally, the forces of advertising, consumer capitalism, and broad global institutionalization that shaped the postmodern age significantly revolutionized how consumers perceived food and made their decision (Verneau et al., 2012; Yazdani et al., 2011). Global supply chains have also influenced consumer behaviour as more people have integrated a panoply of foodstuff from across the world, for example; the popularity of pangasius for its health benefits and ethnic meals as sushi in Europe (Altintzoglou et al., 2016; Hanus, 2018; Little et al., 2012).

As a result, fish consumption has gained prominence as a major source of human nutrition (Rimm, 2006; Ruxton, 2011). According to the Food and Agriculture Organization (FAO), globally, fish represents about 16.6% of animal protein supply and 6.5% of all protein for human consumption. Fish is usually low in saturated fats, carbohydrates, and cholesterol and provides high-value protein as well as a wide range of essential micronutrients, including vitamins, minerals, and polyunsaturated omega-3 fatty acids (Carlucci et al., 2015). The annual per capita fish consumption is projected to increase from 17.2 kilograms in 2010 to 18.2 kilograms in 2030 (FAO, 2020a). Mediterranean Sea is particularly rich in fish species: it is considered as a marine biodiversity hotspot, exhibiting a unique mixture of endemics, species from the Atlantic, and others of tropical origins (Coll & Libralato, 2012). Fish is one of the most traded food items in the world today: it was estimated at a first sale value of $129.2 billion for capture fisheries and $160.2 billion for aquaculture production globally(FAO, 2020b) . In 2016, about 35% of global fish production entered international trade in various forms for human consumption or nonedible purposes (FAO, 2019). Thus, fishery provides an important income and trade opportunities in many Mediterranean countries (FAO, 2020a; Karataş & Karataş, 2017). However, there are still several issues associated with fish identification and traceability as this valuable commodity is fraudulently sold (Fiorino et al., 2018; Pappalardo et al., 2021; Visciano & Schirone, 2021). Several scholars have reported fish mislabelling cases worldwide (Jacquet & Pauly, 2008; Maralit et al., 2013; Meloni et al., 2015).

International law requires providing to consumers information about fish geographical origin, production technique, and nutritional labelling. Besides, Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 regulates the official controls and other official

activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products. Frauds mainly affect imported/local processed products since they cannot be clearly verified (Borit & Olsen, 2016). For instance, when filleted, the flesh of many fish species becomes similar in texture; and thus, it is difficult to differentiate fish species. Certain processing procedures such as glazing may also induce an increase in the apparent weight in the case of over-glazing, and consequently, a rise of the apparent value of the delivered product, and substitution of inexpensive species for others with higher commercial values (i.e. ringed squid substituted with cuttlefish) (Cawthorn et al., 2012; Kappel & Schröder, 2016). As a result, methods to avoid all types of fraud for fish and other food products will become increasingly important in the near future as the risk-based control of food authenticity is increasing. (ADD REF)

Traceability and identification of the sea goods is crucial, now more than ever, to bring safety and reliability to the transport service, as long as a permanent control is maintained. Most labelling and certifications schemes showed improving conformance with FAO guidelines for fisheries and aquaculture certification. However, significant variation in fish assessment exists, calling into question the accuracy, precision of information and provided advice (Parkes et al., 2010). Certifications and labelling systems have evolved to a point of sophistication that can overwhelm consumers and trigger confusion; scholars noted a lack in consumer understanding of several labels, despite a good grasp of sustainability issues in fisheries (McClenachan et al., 2016; Zander et al., 2018). Therefore, understanding the main drivers incentivising consumer's fish preferences is crucial to implement a successful traceability system, that can meet both producers and consumer's needs.

1.1. Consumer behaviour and preferences

Consumer behaviour is the study of the process involved in selecting, purchasing, using or disposing of products, services, ideas or experiences by individuals, groups and organizations to meet their needs and desires (Solomon et al., 2016).

The importance of understanding consumer buying behaviour is essential for manufacturers, service providers and policy makers (N. Sheth & S. Sisodia, 2006). The ways in which individuals choose their products and services can be extremely important as it impacts the sustainable use of natural resources, specifically for fisheries (Friese et al., 2006). Therefore, it is important to increase the understanding of consumer behaviour towards fish products as there is a continuous growth in the request of fish products due to the increase of health awareness, and the incorporation of new foods in human diet.

Multiple characteristics affect consumer's preferences and purchase of fish. Many scholars investigated the impact of fish attributes on consumer's choice, mainly, sensory features, nutritional values, health-related aspects, price and value for money, convenience, availability and seasonality, geographical

origin, production mode (wild or farmed), and product form (fresh, frozen ,transformed and other) (Claret et al., 2014; English et al., 2004; Gaviglio et al., 2014; Gaviglio & Demartini, 2009; Grunert, 2005)

Moreover, fish products acquired further differentiation with the advent of certifications and labels, traceability, respect of environmental regulations and the management of the fisheries' value chain (globally and locally) (Saidi et al., 2023). These elements have a much stronger impact on consumer's choice and preferences (Leal et al., 2015; Maralit et al., 2013; Nhu et al., 2016; Roheim & Zhang, 2018; Tlusty, 2012). Therefore, the topic of consumer's preferences with respect to all features of fish products appears extremely fragmented and complex to understand (Zuzanna Pieniak et al., 2007).

Additionally, consumer's characteristics can influence how product attributes are perceived and affect the market performance of such products (Brécard et al., 2009; Reczkova et al., 2013; Tempesta et al., 2016; Wenaty et al., 2018). For example, there are some perceived risk linked to fish consumption, that has been triggered by scandals that occurred in the food industry during last decades, and are currently reinforced by the Covid-19 pandemic events (Pennings et al., 2002; Yamoah & Yewson, 2014; Yeung & Morris, 2006). Also the personal concern for healthy eating can influence fish consumption, in the light of the reduced consumption of meat (Faber et al., 2021), or in a healthy lifestyle aimed at health risks prevention (Chrysohoou et al., 2007; De Smet, 2012; English et al., 2004; Rimm, 2006).

1.2. Consumer decision making process

Consumers constantly make decisions regarding the choice, purchase, and use of products and services (Franchi, 2012; Solomon et al., 2016). These decisions are crucial not only for the consumers themselves, but also for marketers and policymakers (dos Santos et al., 2022; Karen et al., 2002) . Decision making is often difficult as consumers usually are faced with many alternatives which re constantly changing due to new technologies, the emergence of new trends and competitive pressures (N. Sheth & S. Sisodia, 2006). The difficulty of consumer decision is influenced not only by product features , but also by also how information is provided (Lihra & Graf, 2007). There is often of great deal of information available from many sources (e.g., advertisements, packages, brochures, salespeople, and friends) (Freisling et al., 2010; McCracken, 1987). Therefore, the organisation of information affects the difficulty of consumer's choice (Graham & Abrahamse, 2017; Wim Verbeke & Liu, 2014). The difficulty of consumer's choice depends also on alternatives, attributes of value and uncertainties (Bault & Rusconi, 2020; Walters & Hershfield, 2020). For example, choice difficulty generally will increase as the number of alternatives and attributes increases, or if some specific attribute values are difficult to process and whether there is a great deal of uncertainty about the values of many product features (Kuhnlein, 1989; Wein et al., 1996). Alongside heuristic quick decisions that generally occur for cheap and low involvement products (Gigerenzer & Gaissmaier, 2011), Consumers' decision

making process generally follows a five step model as already explained by N. Sheth & S. Sisodia, (2006) as follow:

- **Problem recognition:** The first step identifies the difference between the consumer's recognition of needs and wants. It occurs when the consumer senses a significant difference between his or her current state of affairs versus a desired and ideal state.
- **Information search:** Information search is the process when a consumer examines his or her environment in order to find suitable data to make a reasonable decision.
- **Evaluation of alternatives:** Evaluation of alternatives starts with identifying alternatives. A consumer involved in extended problem-solving will carefully evaluate several products, while someone who makes a regular decision may not consider alternatives to their normal brand. Consumer evaluates a product with the careful categorization of all the options based on his/her knowledge and beliefs about the product and afterwards selects a product among the alternatives.
- **Purchase decision:** The consumer forms preferences among the products in the choice set during the evaluation stage and further creates an intention to buy the most preferred brand. During the purchase decision process, the consumer still has to make five following sub-decisions: brand, dealer, quantity, timing, and payment method. In addition, in order to increase consumer's sustainable performance in consumption, a consumer might reconsider the manner of buying behaviour. In the stage of a purchase decision, it might be evaluated through the purchasing of the product with an emphasis on environmental benefit against other attributes of product features such as price, performance, and design.
- **Post purchase evaluation:** Consumers may feel uncertain about a purchase after noticing disquieting product features or hearing good recommendations about other brands. According to Kotler & Keller (2015) marketing communications should supply support and beliefs for consumers that reinforce and continually support positive feelings about a purchase. In addition, marketers should monitor consumer behaviour from post-purchase satisfaction, post-purchase actions and post-purchase product use and disposal.

1.3. The framework

The current Ph.D. thesis is conducted under the framework of the SUREFISH project, part of the PRIMA Programme supported by the European Union under the Grant Agreement number 1933. SUREFISH's essential mission is to valorise traditional Mediterranean fish by fostering supply-chain innovation and increasing confidence for Mediterranean fish by deploying new technologies to establish unequivocal traceability and proving their authenticity, thereby deterring frauds. Specifically, SUREFISH will:

- Deploy innovative solutions to achieve traceability of traditional Mediterranean Fish.
- Revise, validate and make a harmonisation of protocols to ensure fish authenticity.
- Increase consumer confidence of Mediterranean fish.
- Share data on Mediterranean Fish products.

In the current thesis, our main goal is to study consumers' fish preferences to help producers, and policy makers in implementing new strategies that deter frauds, educate and increase consumer confidence regarding their food choice.

The current research is holistic, and each and every component helps to provide a more comprehensive understanding on the subject. The work is structured in 4 papers:

- Consumer preferences for finfish: A systematic literature review. This is the first step to have a complete view about the most recent state of the art identified by the literature. The complete view is achieved by summarizing the existent data in the literature using the Mojet model.
- Drivers of fish choice: an exploratory analysis in Mediterranean countries. Due to the lack of research regarding consumer preferences within the Mediterranean area. The second step aims to get an exploratory overview of consumer preferences, and the major attributes guiding their decision-making process within four Mediterranean countries (Italy, Spain, Tunisia, and Lebanon).
- Consumer's segmentation based on fish attributes. A case study in Italy and Spain. This empirical study aims to identify the importance of fish attributes on a representative sample of Spanish and Italian consumers, and the consumer typologies within every population. The analysis is deeper compared to the previous work, thanks to the bigger size of data that allows to generalize the findings on a broader sample. In addition, the confrontation of various traceability related attributes, intrinsic and extrinsic cues will provide insights on the most important attributes and their weight in consumer's decision making process.
- Healthiness, appearance, or fashion? The drivers behind sushi consumption: Evidence from a national sample survey in Italy. This study investigates the main drivers behind sushi consumption frequency in Italy, using structural equation models. In addition, this work investigates the importance of fish traceability in consumer decision making process. This study aims to understand the main motivations behind the acceptance of raw fish consumption in Italy, particularly sushi, and how to include healthier eating habits among Italians.

2. Consumer preferences for finfish: A systematic literature review

Saidi A. [1], Cavallo C.[1], Del Giudice T. [1], Vecchio R. [1]and Cicia G. [1]*

[1] University of Naples Federico II, Naples (Italy)

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2.1. Abstract

During the last decades, several changes have significantly affected fish consumption as population growth, globalization, and evolution of global value chains. This review analyses consumer's fish preferences. Applying the PRISMA framework, 56 articles published between 2015 and 2022 have been selected and the Mojet model has been employed to systemize the core findings. Results show that different fish cues have an impact on consumer's choice. Previous work focused on price, sensory attributes, freshness, origin, method of production, trust of certification and labels, neglecting the impact of other relevant socio-demographic, socio-cultural, psychological, and biological factors that interplay in defining consumer's preferences. Additionally, current review reveals the need to investigate further factors beyond intrinsic and extrinsic product characteristics and the necessity to investigate consumption drivers of developing countries.

Keywords: consumption; fish; intrinsic and extrinsic attributes; categorisation.

2.2. Introduction

Seafood has always been considered an important source of nutrition for humans. Its proteins contribute to the development of a healthy diet and their low content in fat, mostly unsaturated fat, helps in preventing non-communicable diseases in all ages (FAO, 2020a; Rimm, 2006; Ruxton, 2011). This category of food has also a substantial importance on an economical level as it is a major source of employment, especially in developing and low-income, food-deficit countries (FAO, 2020a).

With the term seafood two main groups are identified: finfish and shellfish (Dineshbabu et al., 2013; Venugopal & Gopakumar, 2017). Finfish are cold-blooded aquatic craniate vertebrate with fins and gills (Bharti, 2017); while, shellfish consists broadly of crustaceans and mollusks (Venugopal & Gopakumar, 2017). Finfish represents the most important group in terms of overall production with a total of 126.2 million tons, largely exceeding the production of crustaceans and mollusks with 15.4 and 23.4 million tons, respectively(FAO, 2020b). The current study will focus only on finfish, both for its substantial contribution to the supply of local and global markets with seafood products and for its essential role in human nutrition.

Multiple characteristics affect consumers' preferences and purchase of fish. Many researchers have already highlighted the impact of finfish attributes on consumers' choice, linked either to intrinsic or extrinsic characteristics (Claret et al., 2014; English et al., 2004; Gaviglio et al., 2014; Gaviglio & Demartini, 2009; Grunert, 2005). Nevertheless, the topic of consumers' preferences appears extremely fragmented and complex to understand (Cantillo et al., 2020a; Carlucci et al., 2015; Maesano et al., 2020). This knowledge would be crucial, as consumers can influence how product attributes perform on the market (Brécard et al., 2009; Reczkova et al., 2013; Tempesta et al., 2016; Wenaty et al., 2018). For example, perceived risk linked to fish consumption, triggered by food scandals, have been further reinforced by the COVID-19 pandemic (Pennings et al., 2002; Yamoah & Yewson, 2014; Yeung & Morris, 2006). Personal concern for healthy eating can also influence fish consumption, as the rising trend of reducing meat consumption (Chrysohoou et al., 2007; De Smet, 2012; English et al., 2004; Faber et al., 2021; Rimm, 2006). Moreover, global supply chains have impacted consumers' everyday shopping habits as people have increasingly embedded in their diet foreigner products, as shown by the popularity in Europe of pangasius or ethnic meals as Japanese sushi (Altintzoglou et al., 2016; Hanus, 2018; Little et al., 2012), reinforced by the seek of new food experiences (Manohar et al., 2021; Van Trijp & Steenkamp, 1992).

In addition , situational factors can play a major role in consumers' decisions (Bond & Bond, 2020; Loebnitz et al., 2015). Food decisions are taken very quickly and different goals and needs are salient in the individual's mind according to how and where the decision is taken (D. A. Cohen & Babey, 2012; Wan & Agrawal, 2011).

Recent reviews by Maesano et al. (2020), Vitale et al. (2017) Carlucci et al. (2015) and Cantillo et al. (2020) focused on studying the impact of seafood attributes on consumer preferences and decision-making process. In Maesano et al. (2020), 39 studies were included to analyse the effect of sustainability attributes on consumer choices of fish products. Results show that the most important attribute driving consumers' choice is the country-of-origin label, having the highest price premium; notably, local products were also preferred by consumers. In addition, consumers favoured wild fish based on greater safety, quality and taste perception compared to the farmed alternative. Furthermore, this study revealed that though the organic attribute was highly regarded by consumers, it is unlikely to be a key factor in consumer's choice, relative to attributes as country of origin. While this review succeeded to identify the effect of credence features on consumer's choice, it did not highlight the effect of experience and search attributes. Afterwards, 49 studies, that were published after 2000s, were reviewed by Carlucci et al. (2015) to identify consumer purchasing behaviour towards a variety of fish and seafood products. While this review underlined the importance of the various fish and seafood traits and their contribution to consumer's decision making, it did not include insights after 2015. Then, Vitale et al. (2017) reviewed

21 studies to systematize the available information about the willingness-to-pay (WTP) for eco-labelled wild seafood. The results were organised into 3 categories: crustaceans (15 %), teleosts (76 %), and seafood (9 % - species not defined). The WTP varied between the groups, among the species, as well as by countries and in function of the brand. Consumers' awareness with environmental concerns was influenced by the socio-demographic structure of investigated population. However, the outcomes of this review focus only on ecolabelling, and thus a more comprehensive review is needed to identify all the factors that influence consumer choice. Similarly, Cantillo et al. (2020) reviewed 39 articles to identify the most important characteristics that guide consumer choice for finfish, focusing only on studies using discrete choice experiments. reviewed 39 articles to identify the most important characteristics that guide consumer choice for finfish, focusing only on studies using discrete choice experiments. The results of this review featured consumer's WTP for intrinsic and extrinsic finfish traits, however, it does not provide insights regarding the importance of consumer-related characteristics and situational factors, and is limitted to the review of studies using discrete choice experiments.

Considering the lack of a global overview on the plethora cues that might impact consumer preferences, the present review will provide a contribution to collect and systematize the existing literature on the key factors that drive consumers' preferences for finfish considering the last six years using the model proposed by Mojet (Köster, 2009).

The current study aims to answer the following research questions:

1) What finfish's intrinsic and extrinsic cues impact consumers' preferences, and decision choice?
2) What additional drivers affect consumers' preferences, and decision choice?

The review starts with a description of the applied systematic data collection techniques, then descriptive and qualitative data analysis is presented, and, at the end, a theory-oriented synthesis provides insights for further research on the topic (Crossan & Apaydin, 2010; Tranfield et al., 2003).

2.3. Methodology

2.3.1. Review strategy

The search for articles has been performed using two online databases: Web of Science and Scopus (Bramer et al., 2017; Green et al., 2001). They both feature high-quality, peer-reviewed journal publications as well as contributions to scientific conferences. The review focused only on peer-reviewed articles. The possibility of extending the review to publications from other sources has also been explored; yet it was deemed that these publications would not meet the scientific requirements of this review due to a lack of an independent revision process.

The following algorithm has been applied: (fisheries OR fish*) AND (consumer*) AND (attribute* OR intention* OR preference* OR perception* OR wtp OR price* OR certification* OR label* OR "value chain" OR choice* OR retail). An asterisk (*) has been attached to most word stems to find all articles which include terms starting with that word stem. The search was limited to the title, abstract and keywords, and constrained to publications from 2015 to 2022. The entire search and analysis process was undertaken following the PRISMA Statement for Reporting Systematic Reviews and meta-Analyses (Cronin, 2011; Liberati et al., 2009); and thus the 27-items checklist structure (Moher et al., 2009).

All evidence from studies dealing with consumer's behaviour, and response to different attributes for finfish have been collected. Specific inclusion and exclusion criteria have been set following the research questions, to strictly define the eligibility of the articles to be included in the database. In detail, inclusion criteria were:

- Papers published in the last 7 years (from 2015 to 2022). The literature search was concluded on the 12th of June 2022.
- Papers written in English.
- Papers published on peer-reviewed scientific journals.
- Papers that focus only on finfish, excluding studies on crustaceans, shellfish, and other marine-based products.
- Papers that provide information to our research questions.
- Papers that dealt with biology issues or farming technology were instead excluded.

A total of 3618 paper were identified at the first step: 2416 from Web of Science and 1202 from Scopus. Subsequently, duplicates (489) were deleted from the dataset. Then, studies that were not relevant to the specific research areas, timeline period, language, literature type and location were excluded (1701). Specifically, the time frame from 2015 to 2022 has been chosen in order to investigate and offer an overview of the latest studies, it also covered most of the relevant literature. Afterwards, a two-step screening procedure was applied: articles were initially screened by reading the title and abstract, and the core topic of the study; 1364 papers were excluded due their non relevancy to the research questions. In the second phase, a total of 64 publications needed full-text reviewing. From these, 19 were excluded due to non-relevancy to the research questions, and additional 11 research were identified from cross referencing, resulting in a final selection of 56 articles (Figure 1).

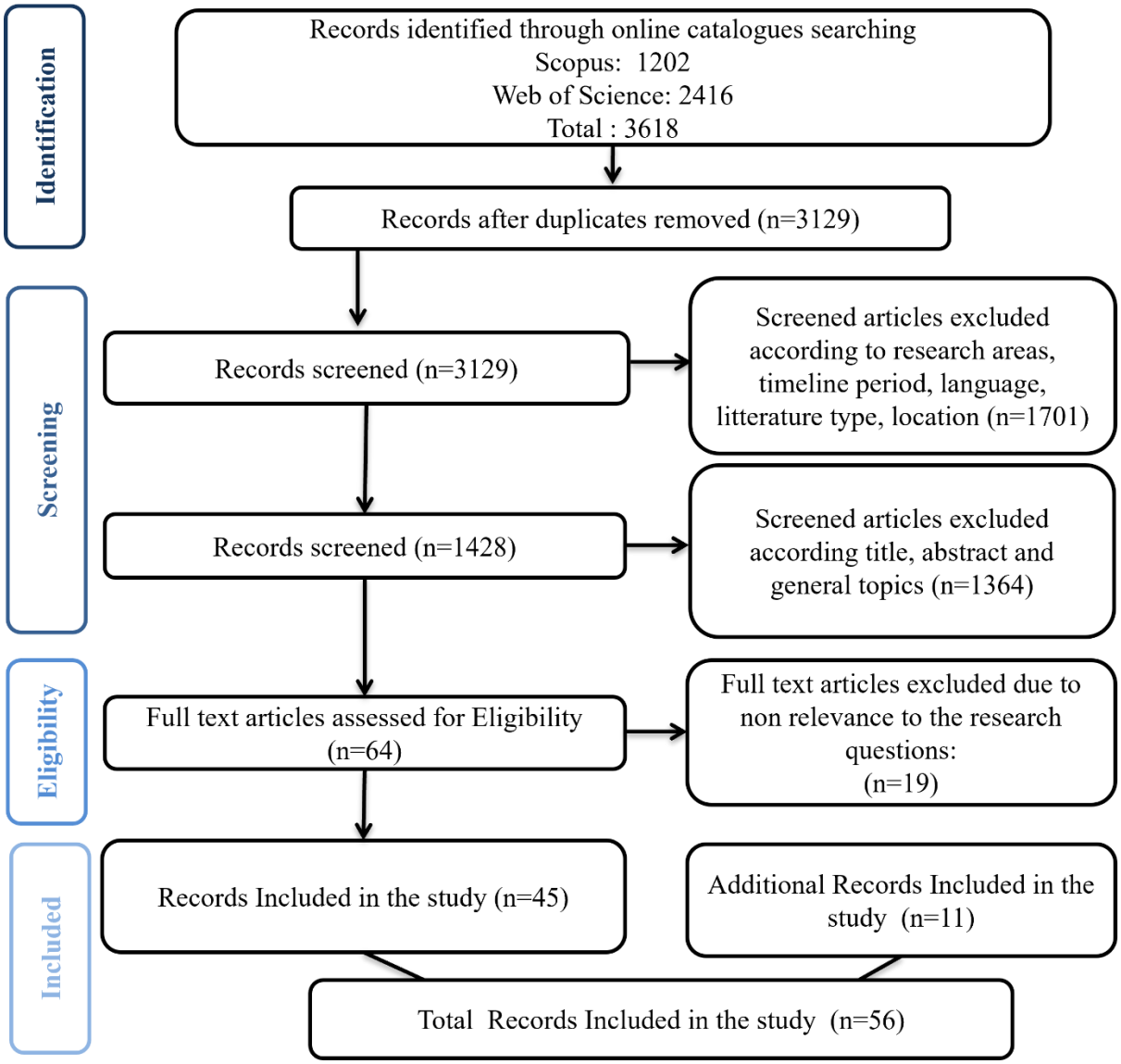

Figure 1. Article selection process

2.3.2. Data extraction and tabulation

The final papers that were included in this review were summarized, and the essential data including article information (title, authors, year of publication), study characteristics (study design, sample size, country of interest), and major findings were gathered. The full list of articles is presented in the Appendix Table A 1.

Then, in this review we categorized the insights according to the Mojet model, aiming to highlight the factors and sub-factors that determine consumer's preferences for a specific product, thereby providing a better basis for the prediction of consumer food choice, using a multidisciplinary approach (Köster, 2009). The Mojet model provides a synthetic overview of consumer behaviour taking into consideration all factors impacting consumer preferences (Köster, 2009), and it is based on three pillars: the

characteristics of products, the consumer-related characteristics, then, the situational factors as different contexts. The intrinsic properties are the ones that cannot be changed without changing the product itself (Oude Ophuis & Van Trijp, 1995), and they can be evaluated either before or after consumption (Aqueveque, 2006). While the extrinsic characteristics are information that are not embedded in the product. Next, biological and physiological factors are related to how humans perceive the products based on genetics, age, sex, physical conditions etc. (Vabø & Hansen, 2014). Later, psychological factors are related to motivation, attitudes and beliefs which can further influence how the perception takes place (Vabø & Hansen, 2014). Additionally, the socio-cultural factors can also alter thoughts, feelings, and behaviour of consumers. Lastly, situational factors are the circumstances and the social environment that establish the probability of consumer response, and direct consumers' attention (Bond, 2013). The Mojet model has been extensively used in reviews analysing consumer's preferences (*e.g.*: Asioli et al., 2017; Betancur et al., 2020; Rondoni et al., 2020).

2.3.3. Characterization of the selected articles

The relevant insights were collected from multidisciplinary studies, as the issue of preferences towards finfish can be dealt from different perspectives. In fact, from the totality of studies, 57% of the selected articles were part of the fisheries research area, followed by food science and technology with 20%, while 9% derived from environmental science and, lastly, 7% in both business and economics, behavioural sciences and nutrition and dietetics.

Despite the differences across the years, the publishing trend seems to be quite stable over time except in 2020 where an increase in the number of publications can be noticed (Figure 2). Considering the geographical location of the articles (Figure 3), 32 out of 56 studies were conducted in Europe, 5 in both North America and Asia, 8 in multiple areas, 4 in Africa, and finally 2 were undertaken in Australia. The huge interest in fish studies in Europe may be due to the existing high appreciation from consumers, testified by the high share of importation (34 %) and to the concern deriving from the decrease in fish production (FAO, 2020b). While a clear lack of research is noticed in North America, particularly in the USA. The aversion of consuming fish is mainly cultural (Burger et al., 1993; Gilbertson et al., 2004; Story & Harris, 1989; Wein et al., 1996), with the globalization and widespread of global food chains all over the country (Cheek, 2006; Scholte, 2008), many facets of cultural identity, particularly food consumption change relatively quickly when new immigrants come in the United States (or elsewhere)(Allen et al., 1996; Ballew et al., 2006). Additionally, the response of state and federal agencies to the potential health risks from fish consumption by issuing consumption advisories, or, in rare cases, making it illegal to fish in certain waters in the last two decades might be behind Americans' neophobic behaviour towards fish (Burger, 2005). Specifically, the strong emphasis on mercury toxicity lowered Americans' fish consumption (Ser & Watanabe, 2012). While instead

European public health advisories encourage fish consumption. in European countries rather than others.

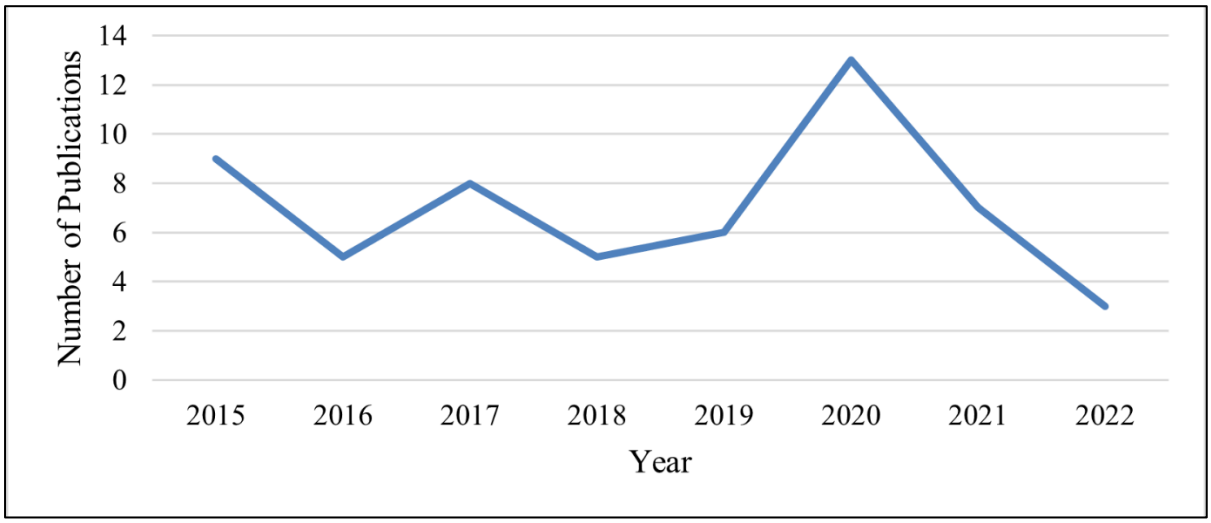

Figure 2. Evolution of the selected publications

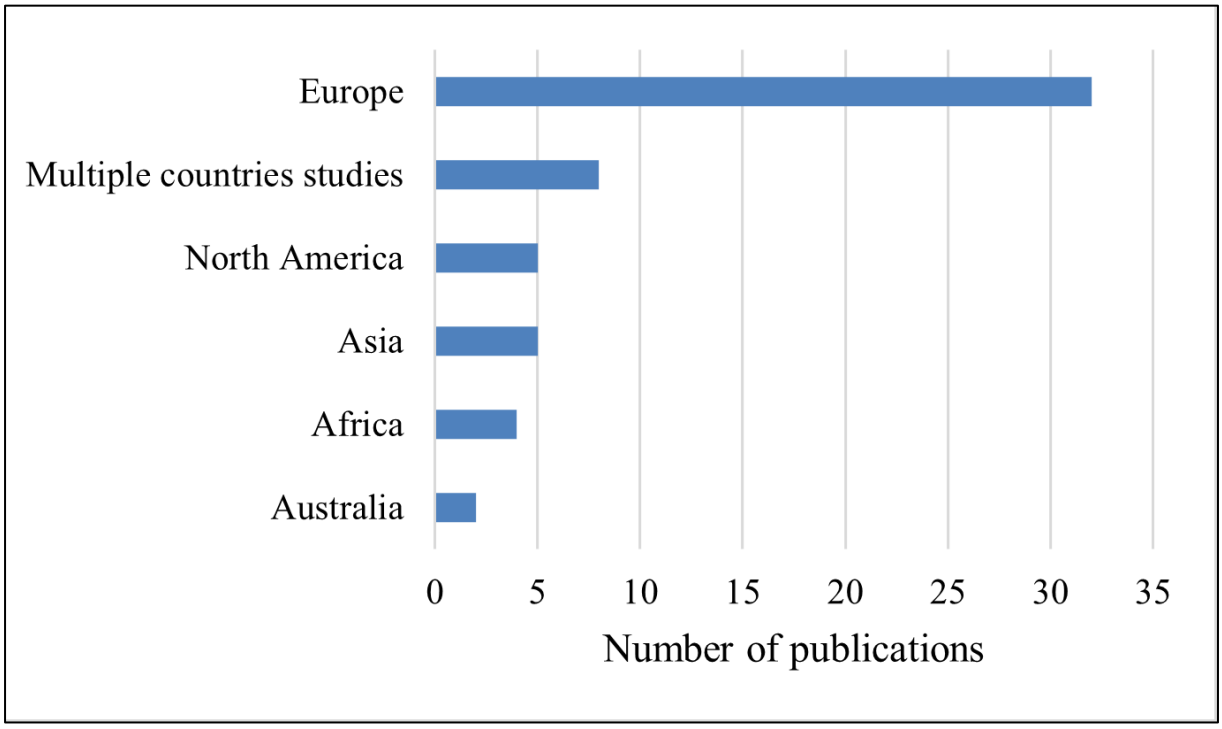

Figure 3. Geographical distribution of the selected publications

2.4. Results

Following the Mojet model (Köster, 2009), the factors influencing finfish consumption have been categorized into six groups (Figure 5).

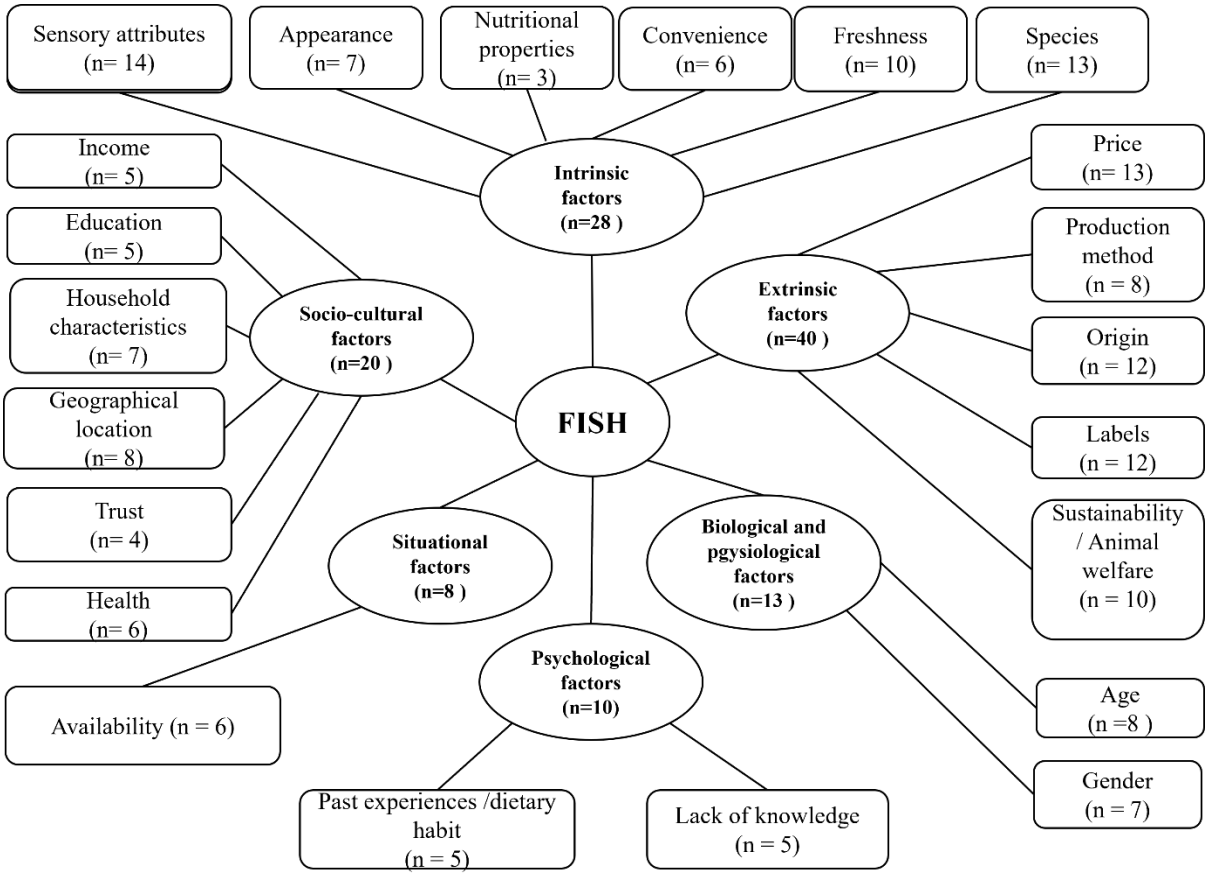

Figure 4. Essential factors and sub-factors that drive consumer preferences for finfish, adapted from Mojet's model. (E. P. Köster, 2009)[1]

2.4.1. Intrinsic factors

The properties of finfish that have been considered relevant are either sensory, physical, convenience, nutritional or freshness (Carlucci et al., 2015; Pulcini et al., 2020; Rickertsen et al., 2017a).

Taste, flavour, texture (mouth feel) and smell have been extensively investigated as traditionally being the most valuable reasons for choosing or avoiding fish; there are several evidences in which consumers state they consume only according to the best tasting available option (Cantillo et al., 2021; Carlucci et al., 2015; Hossain et al., 2022; López-Mas et al., 2021; Maesano et al., 2020; Murray et al., 2017; Paredes et al., 2020; Pihlajamäki et al., 2019a; Pulcini et al., 2020; Jose Ruiz-Chico et al., 2020). However, taste and flavor preferences were found to vary according to dietary habits, cultural background of consumers and attitudes towards seafood (Alam & Alfnes, 2020; Sacchettini et al., 2021; Smith et al., 2017). demonstrated how religion and culture are important factors when eating or abstaining from fish and other proteins. In addition, Alam and Alfnes (2020) identified a higher WTP

[1] n refers to the number of studies that feature the factors and subfactors.

for some species of fish – as Singi and catfish -not only for the good taste but also for their popularity in South Asia. Furthermore, in López-Mas et al., (2021), consumers in France, Germany, Italy, Spain, and the United Kingdom all agreed on wild caught fish being of a better taste compared to the farmed option. While, a study on Italian consumers found a division between individuals from Northern regions who preferred mostly a fresher taste, compared to those from Southern regions who leaned towards fish with a stronger taste (Pulcini et al., 2020). Smell and texture also influenced the selection of consumers when purchasing finfish, since all studies addressing these attributes agreed on both being key elements in consumers' perception (Carlucci et al., 2015; Lawley et al., 2020; Murray et al., 2017). Particularly, some minority groups in Lawley et al. (2020) choose smell and texture as major attributes to assess barramundi fish.

The appearance of fish has been demonstrated to be a key factor in consumer's decision choice (Alam & Alfnes, 2020; Antão-Geraldes et al., 2020; Murray et al., 2017; Thapa et al., 2015). In Antão-Geraldes et al. (2020), consumers placed a high importance on appearance for choosing wild versus farmed brown trout. In addition, most US consumers seem to prefer a good appearance as a primary driver for choice. Specifically, consumers look for fish without visible defects (Murray et al., 2017; Thapa et al., 2015). Some attributes such as colour, brightness of the skin, eyes, and fish size are critical to infer the quality at the time of purchase, together with other physical attributes such as spines and bones and the firmness of the meat (Lawley et al., 2020; López-Mas et al., 2021; Thapa et al., 2015). Moreover, a preference for a larger fish size is sometimes present (Darko et al., 2016).

Convenience is also an important feature as many consumers avoid fish consumption due to its time and effort-taking preparation. This issue presents a barrier especially for fresh products versus frozen or pre-packed ones, regardless of all other characteristics (Ankamah-Yeboah et al., 2019; Cantillo et al., 2021; Carlucci et al., 2015; Pulcini et al., 2020). A study on Norwegian consumers stated that individuals attach convenience more to "skin and boneless" fish more than to quick-to-prepare options and that this segment of consumers appears to be less price sensitive than the others (Heide & Olsen, 2017). Moreover, the demand for fast and easy to prepare meals, especially among urban younger generations, is partly responsible for motivating the retail sector to prioritize processed products over fresh ones, favouring supermarkets to the detriment of fishmongers (Cusa et al., 2021).

Consumers also prefer the consumption of fish for its nutritional properties. Among these, Omega-3 and fatty acids content were highlighted as key characteristics (Carlucci et al., 2015). Furthermore, the content of proteins is considered crucial, this can be important especially for consumers that are trying to avoid meat-based proteins and for those who care about their health (Menozzi et al., 2020; Rickertsen et al., 2017).

Freshness is one of the main concerns for fish consumers (Cantillo et al., 2020a; Giosuè et al., 2018; Lawley et al., 2020; Paredes et al., 2020; Pulcini et al., 2020; Zander et al., 2018). Pérez-Ramirez et al. (2015) Consumers also prefer the consumption of fish for its nutritional properties. Among these, Omega-3 and fatty acids content were highlighted as key characteristics (Pulcini et al., 2020). Some consumers also use extrinsic attributes as cues to determine freshness of fish, as higher price (Wenaty et al., 2018) or the colour of packaging (Zander et al., 2018). In Masi et al. (2022), respondents valued freshness through sensory evaluation, the date of capture, taste, health benefits, and most importantly the quality/price ratio. This attribute is important also in packaged fish, where the shelf life is used as a cue to determine freshness and accounts for a large part of choice motivation among Norwegian consumers (Heide & Olsen, 2017).

Concerning species, the collected insights do not allow to obtain specific consumer's preferences as 64% of the reviewed articles investigated finfish in general or considered a particular fish species during their studies, however, 36% of the studies indicated specific species targeted in the research, highlighting a pattern in consumer' consumption across countries and continents. In Europe, Cusa et al. (2021) emphasized the failure of European respondents to identify the fish by appearance, with the British being the least accurate and the Spanish the most accurate in identifying fish species. The commoditization of seafood, a phenomenon likely affecting consumers ability to discriminate between species, might be the reason behind growing tolerance in the substitution of species within key groups such as white fish, tuna and salmon (Cusa et al., 2021). The studies and the reviews also indicated that in Northern Europe most of the investigated species are: trout (especially in Germany), salmon, and cod (Heide & Olsen, 2017; Hynes et al., 2019; Risius et al., 2017; Vitale et al., 2017). While research from southern Europe has been more focused on other species such as anchovies and seabream (Claret et al., 2016; Vitale et al., 2020). Pangasius appeared of interest both in studies from Asia and Europe (Alam & Alfnes, 2020; X. Chen et al., 2015). The same for tilapia, as it has been investigated both in Europe and Africa (Darko et al., 2016; Hinkes & Schulze-Ehlers, 2018). While evidence from Japan report the interest for more local, typical species as Japanese amberjack, or global species as salmon and tuna (Kitano & Yamamoto, 2020; Vitale et al., 2017). Only one study from Oceania dealt with barramundi fish (Lawley et al., 2020). Research from the United States investigated mostly species as cod, mackerel, salmon and tuna (Vitale et al., 2017; Witkin et al., 2015).

2.4.2. Extrinsic factors

Price is an important attribute for all types of purchases, as consumers come up with a value judgment, that is behind every purchase decision when comparing price and quality (Steenkamp & van Trijp, 1996). Several studies highlighted how price can be a major driver of choice; in Germany (Bronnmann & Hoffmann, 2018; Hinkes & Schulze-Ehlers, 2018; Risius et al., 2017a), Italy (Giosuè et al., 2018),

France (Rickertsen et al., 2017a), Tanzania (Wenaty et al., 2018), Turkey (Abdikoglu & Unakitan, 2019), Canada (Murray et al., 2017) and China (Liu et al., 2015). According to neoclassical economic theory, cheaper prices are always favoured leading to an increase in fish consumption and a shift towards more valuable species and larger portions (Carlucci et al., 2015). For example, Darko et al. (2016) demonstrated that, although Tanzanian consumers tend to prefer fresh and medium to large size tilapia, they, instead buy the smaller and farmed alternative as it is less pricey. Similarly, silver sardines were purchased as more affordable and available in Tanzania (Wenaty et al., 2018). Moreover, price can be used as a cue for a higher quality, as consumers who prefer higher price also expect more expensive options to be fresher, wildly and locally caught and not processed (Bronnmann & Hoffmann, 2018; Cantillo et al., 2021; Hinkes & Schulze-Ehlers, 2018; Onyeneke et al., 2020). In Hossain et al. (2022), consumers revealed to be willing to pay 7% less if the pangasius smelled bad (Hossain et al., 2022).

Academic literature has extensively dealt with the key role of the country of origin and catch area in consumer's choice of fish. They are the most important fish attributes in several studies (Cantillo et al., 2020a; Giosuè et al., 2018; Maesano et al., 2020; Masi et al., 2022; Murray et al., 2017; Paredes et al., 2020; Risius et al., 2017a; Witkin et al., 2015). In Italy, USA and United Kingdom; consumers have shown a preference for local versus imported fish and product with less food miles (Maesano et al., 2020; Murray et al., 2017; Zander et al., 2018). Similarly, in Ankamah-Yeboah et al. (2019), a local German trout is the most valued fish by respondents. The same has been shown for US consumers in Witkin et al. (2015). Risius et al. (2017) found that fish choice was more dependent on origin over sustainability labels. Similarly, Paredes et al. (2020) demonstrated that origin can be more important than price. Moreover, Cantillo et al. (2021) found an increase in WTP for a particular origin of fish and seafood, in Boncinelli et al. (2018) it was quantified in an average premium price of 4.75% over the baseline price. While, Masi et al. (2022) found that origin seems to be taken into less consideration than freshness, taste and health aspects. Alam and Alfnes (2020) found no impact of origin on consumers' WTP.

Production method has been shown to be a crucial factor in defining consumers' perception, quality and decision choice in several studies (Abdikoglu & Unakitan, 2019; Claret et al., 2016; Güney, 2019; Menozzi, Nguyen, Sogari, Taskov, et al., 2020). Specifically, wild fresh fish is often preferred over farmed, or more processed alternatives (Abdikoglu & Unakitan, 2019; Darko et al., 2016). This preference is often ascribed to concerns over safety of farmed fish raised by food scandals (Kitano & Yamamoto, 2020; Murray et al., 2017). In other cases, the product origin is deemed still more important than its farming method (Lawley et al., 2020). The same holds for Turkey where Can et al. (2015) demonstrated that most respondents preferred fresh over processed fish. While, in Polymeros et al. (2015) wild and farmed fish were preferred to frozen and processed fish. Actually, the information

provided to consumers about the production has an impact on consumers' evaluations, as in Claret et al. (2016) consumers preferred farmed fish in a blind condition. Nevertheless, consumers can have an attitude-behaviour gap and choose the most convenient option over the fresh one (Ankamah-Yeboah et al., 2019; Pulcini et al., 2020).

The certification systems can also influence consumers, being procedures by which a third party gives written assurance that a product, process, or service is in conformity with certain standards (Del Giudice, Stranieri, et al., 2018; Nagy et al., 2022; Ponte, 2012). Additionally, food labels both as a part of the food package, or the label on-shelf, must contain necessary, accessible and understandable information and be located in a visible and clear way to consumer (Caswell, 2006; Caswell & Padberg, 1992). Although labelling and certifications have evolved to a point of sophistication that can overwhelm the consumers and trigger confusion; it was also noted a lack in consumer's understanding of labels, despite a good knowledge of sustainability issues in fisheries sector (McClenachan et al., 2016; Zander et al., 2018). Sometimes, labels are not able to answer consumers' concerns over the products (Risius et al., 2019a). In fact, Masi et al. (2022) demonstrated that providing information to consumers is not necessarily easy, as respondents were generally confident in their ability to recognize the quality and freshness of products on their own, and mostly favoured official sources of information, such as government agencies or doctors. Moreover, it has been found that some organic or eco-labels represent a minimum requirement for fish to be bought by some consumers (Maesano et al., 2020). In Germany, where organic labels are highly popular, in the case of fish, consumers preferred organic over other specific labels, like the Aquaculture Stewardship Council label (ASC), and they were willing to pay higher prices for local organic trout fillets (Ankamah-Yeboah et al., 2019). In Nigeria, consumers were willing to pay a premium between 3.1% and 18.8% for high-value, larger-sized and certified fish compared to smaller-sized and uncertified fish (Tran et al., 2022). Certifications can increase consumers' WTP also when the consumer does not fully understand their meaning (Bronnmann & Hoffmann, 2018). The certifications preferred by consumers were: the ASC, the Marine Stewardship Council (MSC), and organic label Lastly, Giosuè et al. (2018) revealed that consumers were more interested in fish quality certifications than in those related to marine resource management.

Even the bare colour of packaging can be important, as consumers preferred a blue packaging in one experiment (Zander et al., 2018) or, in another case, they preferred a black packaging compared to a silver alternative (Heide & Olsen, 2017). However, among the elements of packaging, informational cues – as expiring date and information about taste and preparation- are preferred over visual elements -pictorial cues and colours (Heide & Olsen, 2017). Heavy fish consumers appear to prefer fish without packaging at all, the opposite is for price-sensitive consumers(Heide & Olsen, 2017).

Sustainability issues related to fishery products are increasing their importance in the scientific debate; however, consumers are not guided in their purchases by them, as they are still perceived as ambiguous (Hynes et al., 2019; Zander et al., 2018). However, a negative environmental information can reduce consumer's WTP regardless of eco-labelling(X. Chen et al., 2015). Some studies highlighted that, indeed, the majority of consumers is actually concerned about the environmental impact of fishing and farming (Alam & Alfnes, 2020; Risius et al., 2019a). Alam & Alfnes, (2019) reported that respectively: 61%, 56% and 52% of the respondents were concerned about the environmental impact of farming, overfishing and the welfare of both sea and fresh water caught fish. Also, (Risius et al., 2019) demonstrated that sustainability claims had a higher importance for consumers than labels. Therefore, an attitude behaviour gap can exist in this domain.

The same contradictory findings were found regarding animal welfare. In Veldhuizen et al. (2017), consumers place animal benefits over personal, worker, and community benefits. In addition, the perception of a higher animal welfare can lead to better evaluations for wild fish over farmed one (Rickertsen et al., 2017b). In addition, Castro et al. (2021) demonstrated how respondents from the Philippines preferred the presence of information on the extent of good aquatic and animal welfare for target and non-target species during the catch and production process. However, consumers tend to attach the responsibility for animal welfare to institutions and government over personal purchases (Maesano et al., 2020). In fact, in Ellingsen et al. (2015) Norwegian consumers showed a 50% increase in their WTP for salmon but, at the same time, they ascribed this responsibility to the government.

2.4.3. Biological and physiological factors

Among the biological characteristics of consumers, gender and age appear to be determinant in finfish consumption. Gender has been proven to be a key factor in fish consumption, for example, in Tanzania, male consume more product than female (Wenaty et al., 2018). This is true also in Europe, where Jacobs et al. (2015) found a different (higher) benefit perception in women compared to men, and found that households with a pregnant women in Belgium, Ireland, Italy, Portugal and Spain are divided between heavy and low fish consumers, due to the controversial information about the nutritional value and the safety of the product. While women in Italy were the ones willing to pay the highest premium price for eco-labelled anchovies(Sergio Vitale et al., 2020). Regarding the sensitivity to finfish characteristics, women in China and Spain were noticed to have a higher interest in environmental issues and health risks as they tended to feel more responsibility toward their families to provide safe food (Liu et al., 2015; Jose Ruiz-Chico et al., 2020). Still, they had a positive opinion about farmed fish compared to men (Rickertsen et al., 2017b). This is particularly important in the light of the fact that in several countries, women are the most frequent responsible for food purchases in the household. Similarly, the

preparation type appeared to be dependent upon consumer's sex at birth in Turkey, as males preferred baked or grilled fish compared to females who leaned more towards fried fish (Can et al., 2015)

Considering the role of age, older consumers may be more prone to eat farmed fish (Jacobs et al., 2015; López-Mas et al., 2021). additionally, older consumers can be persuaded more easily to eat fish due to their higher health concern compared to other age cohorts (Pulcini et al., 2020). Older consumers also tended to perceive fish as a more natural food (Onyeneke et al., 2020). These consumers are also the ones more concerned about sustainability and environmental issues and they showed a preference for fresh alternatives (Cantillo et al., 2021; Cardoso et al., 2016; Rickertsen et al., 2017b). In turn, young consumers, who naturally tend to be more open to new foods, appeared to be more prone to consume farmed fish (Güney, 2019).

2.4.4. Psychological factors

Some other individual traits and beliefs about finfish can influence how consumers build their perceptions and preferences about the product. Specifically, two core elements linked to either the lack of knowledge or to past experiences with fish products are highlighted in the academic literature.

Regarding the lack of knowledge, consumers seem to feel a limited knowledge about traceability (Jonell et al., 2016). In addition, the lack of knowledge about production methods in aquaculture makes consumers unable to differentiate between wild and farmed fish (Zander et al., 2018). Moreover, the unfamiliarity with particular species can contrast with the desire for local or sustainable products (Witkin et al., 2015). Furthermore, the lack of knowledge about aquaculture can be a barrier for its social acceptability (Reig et al., 2019). The effectiveness of eco-labels also may be linked to knowledge: actually, consumers with a low fish intake and knowledge possess negative perceptions (Pérez-Ramirez et al., 2015).

Past experiences and dietary habits can influence attitudes towards finfish. The effect played by the proximity of the living area with seaside influences populations' food traditions. Besides, there is an effect played by the exposure, especially during childhood, that increases the likelihood of the consumer to eat fish during the rest of his life (Murray et al., 2017; Temesi et al., 2020). A study on North Europe countries highlighted that Baltic herring consumption was higher for groups of consumers who had this product as a traditional food in their culture (Pihlajamäki et al., 2019a). In turn, bad experiences linked to fish consumption can generate aversion in people that experience them, such as intoxications or digestion problems (Temesi et al., 2020). Some food habits can also be linked to religious reasons, even though a study in Canada highlighted this to be the least important factor (Murray et al., 2017). Consumption frequency was higher in individuals with a higher involvement with the product, this is due to a higher amount of information that involved consumers tend to process about the target product (Jacobs et al., 2015; Kitano & Yamamoto, 2020).

2.4.5. Situational factors

Situational factors may refer to broad dimensions of situation characteristics that can be used to describe and compare any situation(Funder & Ozer, 1983). Situation research in general has seen a resurgence in interest and publication volumes in the last decade (Rauthmann, 2016; Reis, 2008). However, recent studies have focused on situation characteristics which capture the psychological meaning and interpretation of a situation rather than single cues or abstract situations in their studies (Rauthmann, 2020). Therefore, it is difficult to identify in this review the various situational cues that might impact finfish consumption.

The situational factors of availability can affect consumer's preferences and consumption of finfish. Due to the tendency of consumers to try saving his/her time and efforts in food purchases, availability becomes a key factor in defining intake and purchases (Carlucci et al., 2015; Wenaty et al., 2018). In fact, when the preferred fish of choice is not available, the alternative might be perceived as a poor substitute and thus consumers might decide to avoid buying fish altogether (Carlucci et al., 2015). For example, in a choice experiment on pangasius and tilapia, there was a high opt-out rate as consumer that did not like any of the options preferred nothing over the least preferred alternative (Hinkes & Schulze-Ehlers, 2018). This is the case of Japan where the consumption is very high also due to the high availability of the product (Kitano & Yamamoto, 2020). To this point, farmed fish increased consumers' intake due to the year-round availability that farming is able to assure (Lawley et al., 2020; Thapa et al., 2015).

2.4.6. Socio-cultural factors

Besides the characteristics of the products, the specific features of consumers are important in driving finfish preferences. Especially in quick decision making, the consumer bases her/his judgment upon heuristics and rules-of-thumb which can entail a priority among the different features and characteristics of the products (Wansink & Sobal, 2007). Consumers can be easily classified according to their socio-demographic characteristics, such as: income, education, household size and living area. Additional influences can be exerted by trust towards the whole category of supply chain actors.

Income was found to be determinant in the frequency of finfish consumption in the individual's diet and, also, higher income has been correlated with more wildly caught fish consumption compared to farmed (Cantillo et al., 2021; Onyeneke et al., 2020; Jose Ruiz-Chico et al., 2020; Smith et al., 2017). Additionally, they showed more interest in fish quality and nutrition (Vitale et al., 2020).

The same holds for education, the more consumers are educated, the more are aware about the pivotal role that the fish can have in a healthy diet and lifestyle, also, they prefer more wild over farmed fish, and are more informed about preparation methods (Can et al., 2015; Cardoso et al., 2016; Carlucci et al., 2015; Güney, 2019; Onyeneke et al., 2020).

Analogously, when there are more persons in the household, there is a lowering in fish consumption, mainly due to its affordability (Bronnmann & Hoffmann, 2018; Onyeneke et al., 2020). However, the presence of children can be, on average, a factor for increasing fish consumption and for increasing the attention towards its quality and safety, even if this finding has not been confirmed by the totality of researches (Cantillo et al., 2021; Kitano & Yamamoto, 2020; Liu et al., 2015; López-Mas et al., 2021; Smith et al., 2017).

Living area can be a further element able to shape consumer's perceptions and behaviours towards finfish. People who live in urban areas are more likely to consume fish due to its higher availability and to higher restaurants patronage (Castro et al., 2021; Smith et al., 2017). The availability influences also the habits of consumers from both North and South of Italy (Pulcini et al., 2020). Considering a broader territory as the European Union, substantial differences have been registered in terms of fish consumption across countries being Spain the country with the highest fish consumption and Hungary the lowest. This may be due to the absence/presence of shoreline that can influence the food habits of consumers (Cantillo et al., 2021). However, other reasons can concur, as consumers from Portugal and Spain appeared to have higher fish consumption frequency compared to consumers from Belgium and Ireland (Jacobs et al., 2015; Pihlajamäki et al., 2019a). While another study found that Danish consumers are more motivated by health reasons compared to consumers from Estonia, which appeared to be more price sensitive (Pihlajamäki et al., 2019a). A study that investigated the preferences of Canadian consumers from an island in British Columbia highlighted that it is important for fish products to be local (Murray et al., 2017). Similarly Hossain et al. (2022) found that those living far from the production zones of pangasius in Bangladesh considered more attributes during their decision-making process compared to those living near the production zones.`

When investigating consumers' trust in control organization, heterogeneous results have been obtained across European countries, where consumers from Ireland, Italy and Portugal have a low confidence, instead Belgium and Spain appear to have a higher confidence (Jacobs et al., 2015). The presence of trust may influence consumers' risk perception: this is confirmed in Pihlajamäki et al. (2019), where consumers that do not consume Baltic herring are the ones that perceive a chemical content concern this belief is based on substantial evidences, due to Finland public authorities communications which discouraged this consumption due to dioxin issues. However, in Murray et al. (2017) health risks linked to fish consumption have been considered not a priority by interviewed Canadian consumers. While, a study on Japanese consumers found that the traceability system succeeded in reassuring consumers about the safety of farmed fish (Kitano & Yamamoto, 2020).

Regarding the health concern, healthiness perception of fish products are linked to nutritional benefits (Carlucci et al., 2015). A higher food safety also motivates European consumers to pay more for fish,

additionally, the minimal use of hormones and drugs in aquaculture reassures consumers about the health effects of the fish they are buying (Zander et al., 2018). Consumers who have a higher health concern for food include more fish in their diet compared to other types of meats (Liu et al., 2015; Smith et al., 2017; Wenaty et al., 2018).A study on German consumers demonstrated that individuals who choose Pangasius and Tilapia place their health over social and environmental issues due to the location of the production of these species in far-away countries (Hinkes & Schulze-Ehlers, 2018). While in Sacchettini et al. (2021), despite respondents recognized seafood as a healthy dietary choice, those who were less conscious of healthful eating were less keen on seafood features such as quality or sustainability labels.

2.5. Conclusion

The ongoing fast changes in consumer's behaviour makes it difficult to track the process of individuals choice decision. This systematic review aims to collect the latest insights regarding the impact of finfish cues, consumer-related cues and situational cues on consumer's preferences. In spite of popularity of fish as a food, most of the available consumer's research focused on crustaceans and molluscs, more particularly on shrimp as the highest traded product in the world (Venugopal & Gopakumar, 2017). Additionally, most studies were conducted in developed countries, therefore a consistent lack of research in developing countries, specifically in Africa, has been detected in this review, allowing only a partial view of the fish consumer's behaviour. We noticed a greater dwelling of information on individuals living in the Mediterranean basin, which represents an interesting case due the unsustainable levels of fishing and the impacts of climate-driven changes on fish stocks (FAO, 2020a).

Intrinsic and extrinsic characteristics of finfish, socio-cultural, situational, psychological, biological and physiological factors have been identified (Köster, 2009). Regarding intrinsic cues, consumers choose finfish based mainly on sensory attributes as: taste, flavour, texture and smell; followed by physical attributes as appearance, colour, brightness of the skin, fish size, presence or absence of spines and bones. In particular, bigger fish, with no bones, overall pleasant appearance (bright colour, shiny skin, bloody gills), and fresh products are preferred above others as frozen, smoked, dried or fried. The convenience was also a major driver in consumer's preferences; favouring frozen and already cleaned and pre-packaged products; this could be due to the change in lifestyles and the increasing lack of time in developed countries (Wethington & Johnson-Askew, 2009). Additionally, nutritional intake and freshness were identified as drivers for including more finfish in a healthy and balanced diet.

Concerning extrinsic cues: price, origin, catch area and production method were found very important in shaping consumer's behaviour. Mainly, an increase in finfish price and availability of farmed, pre-packed, and imported fish caused a decrease in fish intake. Local products are preferred over imported products, and wild fish is preferred over farmed fish. Moreover, certifications and labels are quite

important to consumers since most studies showed the importance of these two factors on consumers' choice especially for farmed fish. Labelled/certified products are preferred especially if labels highlight health and nutritional benefits, as a high content of omega-3 or improvement of the heart function. Within labels, the most important ones appear to be ASC, MSC and Naturland. Nevertheless, they are not yet able to totally fulfil consumers' expectations of information, and therefore gaining consumer's trust is still far from being achieved. Sustainability issues and animal welfare did not contribute much into shaping consumer's decision choice, as studies found that consumers did not feel any responsibility toward protecting the environment from the overexploitation of marine resources. This may due to a lack of environmental concern or to the ascription of the problem to public authorities. This can be addressed by focusing on increasing awareness particularly on marine conservation.

Additional consumer-related factors including past experiences, dietary habits, lack of knowledge, age, income, and health concerns turned out to be decisive in defining individuals' perception and choice making. As consumers became older, experienced, more knowledgeable, with higher income and concerned about their health, the more critical they became of their food, and thus the more stringent their standards for the product they would be eating. Sex also influences consumer's sensitivity to some safety and quality factors, as it is common that women determine family food choices. Furthermore, the availability of the product has an impact on consumer choice and the market offer which favours farmed fish. But consumers are still hesitant to eat farmed fish because they are unaware of the production process and the health hazards associated with the use of hormones and chemicals. As a result, the development of organic aquaculture might be a valuable pattern to reassure the public about aquaculture. The geographical location also seems to define consumer's behaviour: those living in coastal areas, near the seaside have more knowledge and experience about fish, making them more critical about what they eat. Instead, those living in internal areas are less confident about their choices. Therefore, more information and communication efforts are required to raise consumer's awareness of what they eat and to increase consumer familiarity with fish.

Several implications for finfish producers and policy makers can be derived from the outcomes of this review. First, fish producers should expect that a diversity of factors impact fish purchasing and therefore they need to be prepared to accomodate these drivers while developing new products and entering new markets. Specifically, intrinsic, and extrinsic cues as well as socio-cultural factors influence consumer's preferences, while less can be concluded for the remaining factors. The previous studies included in this review did not succeed to identify a clear pattern for how consumer-related features impact finfish consumption. Studies on the sources of fish attributes information and their effects on consumers' expectations and intentions have not been sufficiently addressed (Krešić et al., 2022). This could maybe be due to the unidisplinary nature of most studies that tend to investigate the impact of biological and physiological factors, situational, and psychological factors separately or study

homogeneous samples of population. Thus, marketers and policy makers need to take into consideration a systemic approach, based on a credible scientific support, to seafood that includes informative campaigns in specific interventions in different sectoral policies (fisheries, health, fiscal, rural areas). A better information design should also include fish mandatory labelling. The labels linked to the FAO fishing area do not satisfy consumers knowledge needs. To reconsider the labelling of fishery products could be an efficient strategy to ensure unbiased information for the general public on nutritional value, fishing zone and fishing management (Krešić et al., 2022).

Second, in developed countries, convenience is a crucial attribute that drives consumers purchases of finfish, partly because individuals worry about preparation time. Modern lifestyles are increasingly detaching consumers from the source of their food (Cusa et al., 2021). The growing demand for seafood and the dynamic nature of the fisheries industry are responsible for the grouping of fish species into broad categories, masking seasonal and yearly variations in species harvest, production, and trade, and offering a constant and steady commodity to the consumer, that does not need to deepen the technical knowledge of the product. Thus, it is essential to inform consumers about the value of eating fish in accordance with seasonality in order to revive forgotten fish species. Furthermore, it is very important that producers communicate to consumers more information about the origin, catch area and production method through labelling to gain market trust. In the current scenario, public policies should improve the nutrition sensitivity of fish system, similarly to what already happened in the agricultural sector (Bennett et al., 2021). Fisheries policies could design a development path in which origin, traceability, fishing management, species specific health values (targeted for specific micronutrient deficiencies) could represent main pillars (Bogard et al., 2017) .

Concerning fish labels, the results of this review show that consumers are confused and do not understand all of the supplied information. Thus, it is strategic to implement communication tools, different from mandatory labelling to educate consumers about locally available fish species, the benefits from consuming locally sourced fish and how behavioural change can contribute to environmental sustainability and to the maintenance of ecosystems. Similarly, policy makers should work with producers to better inform consumers about the health and environmental benefits from including more fish in their diet. In Scarborough et al., (2014), fish-eaters (who consumed no other meat) had nearly the same greenhouse gas emissions profile of strict vegetarians vs those who were meat eaters had the highest greenhouse gas emissions. Thus, encouraging consumers to include more fish in their diet would not only increase their longevity but will also address climate change issues and preserve cultural values among numerous fishing communities (Ignatius et al., 2019).

In addition, industries and government institutions need to communicate to final consumers the benefits of higher animal welfare standards through labelling and the effect on healthfulness, food safety, and

sensory properties, if any, for marketing and transparency purposes. Moreover, support is needed to broaden the access to fish with a broad price range, to ensure equal access for lower and higher income households. This objective could be achieved through a policy mix of public interventions based on at least four guidelines: structural modernisation of small and medium-sized fisheries in order to enhance their profitability (Arthur et al., 2022), supply chain integration to reduce the distance between fishing and the final market and to achieve a better distribution of added value for fisheries (Tsolakis et al., 2021), expansion of the assortment of healthiness for wild and farmed species to cover a wider price range, information campaigns and sensory education starting in collective catering in primary schools. Lastly, a more thorough traceability system could increase consumer's confidence in fish products, and thus balance fish consumption between developed and developing countries, and between coastal and inland regions. Producers also need to consider consumer's living area when making supply and marketing decisions to satisfy consumers diverse requisitions in terms of sensory and physical requirements of the available fish in local markets.

This review has also highlighted several research avenues in need of further investigation. First, more studies should embrace a holistic view of finfish consumer behaviour, as most of the studies included in this review focused on one particular feature compared to another, and thus causing a bias in the articles' findings. Also, additional studies should explore how product and consumer-related characteristics interact one with another. Secondly, we found some cultural patterns in finfish preferences and consumption: thus, comparative research could potentially broaden current knowledge by capturing the effect of different cultural backgrounds. Then, future research is required to further investigate the role of behavioural factors. Specifically, future research should examine the combined effect and strength of the factors identified in this review to further understand to what extent they contribute to consumer choice decisions. Likewise, it would be interesting to include various psychological, biological, and situational factors in consumers' decision-making models to get a clearer view of the complete decision-making process. Lastly, investigations between multiple countries are needed to explore how different consumers value sensory and non-sensory aspects of finfish.

Regarding the limitations of this review, only two scientific databases were consulted to answer our research questions, and, although we used a broad search string, some studies may be missing. In addition, only studies and reviews between 2015 and 2022 were included. Furthermore, as commonly in systematic reviews, shortcomings stem from possible publication bias in favour of positive/expected results, and from the different data collection and statistical tools biasing possible comparisons among studies. In addition, many of the papers failed to provide adequate summaries of the included studies, and the sample size was quite heterogeneous, ranging from 30 to 27,732.

3. Understanding the links between fish cues and consumers' choice:

Results of a focus group study in four countries of the Mediterranean Basin

Short title: Perceptions on fish in Mediterranean area

*Saidi A. [1], Sacchi G. [2,] Cavallo C.[1 *], Cicia G. [1], Di Monaco R. [1]and Del Giudice T. [1]*

[1] University of Naples Federico II, Naples (Italy)

[2] Free University of Bozen-Bolzano (Italy)

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3.1. Abstract

Fish is an important source of healthy proteins and also an important economic sector in Mediterranean countries. Despite the wealth of knowledge acquired in Western countries, a gap has been found in studies in developing countries. Therefore, we aimed to investigate consumers' perceptions on finfish attributes, with qualitative tools as focus groups, given the exploratory nature of the research. The focus groups have been held in Italy, Spain, Tunisia and Lebanon; in each country one was held in seaside areas and one in inland areas, in order to control for the availability of fish that shapes consumers' evaluations and expectations. The focus groups have been analyzed through content and sematic analyses. Results of the study yielded main themes recurring in focus groups discussion categorized along such dimensions: 1) Definition of fish products; 2) Context; 3) Search attributes; 4) Experience Attributes; and 5) Credence attributes. Among attributes, the ones mostly guiding consumers' choices seem to be freshness and fish species, which are used as proxies for quality and sensory attributes. Most of respondents preferred delicate white fish, while some exceptions were found in Tunisian respondents preferring blue fish and they also were the only ones who were not looking for convenient and already cleaned products. Trust also represented a critical element in guiding decisions of consumers: with a lack of trust, consumers deviate from preferring local products, as noticeable especially in Lebanese respondents' opinions. Credence attributes such as animal welfare and sustainability received a minor attention from all the respondents.

Keywords: focus group, fish, consumers, preferences, Mediterranean area, cues.

3.2. Introduction

Fish has always been of great importance not only for the economic implications in both developed and developing countries, but also a vital source of nutrition for humans (Rimm, 2006; Ruxton, 2011). In

particular, fish has numerous virtues that make it a desirable component of a balanced diet (Thilsted et al., 2016).

The popularization of extant eating trends such as veganism, vegetarianism and pescetarianism, along with the ongoing series of food scandals and the increase of health and nutrition concerns among people, have fuelled the reshape of human diet towards substituting meat with fish (Pennings et al., 2002; Rosenfeld & Tomiyama, 2019; Tilman & Clark, 2014; Yamoah & Yewson, 2014; Yeung & Morris, 2006). Furthermore, the globalization of both food markets and supply chains has been of major importance in changing people's habits, causing a shift in consumer demand from domestic to global goods. Global population growth and the resulting increase in food demand, as well as overfishing of several key marine stocks, have affected both the supply of and demand for food and fish (FAO, 2020b; Hanus, 2018).

In general terms, consumers acquire a particular food or service to meet their perceived needs (Agyekum et al., 2015). However, the choice of a product capable to meet specific requirements depends also on consumer's perception of quality (Emilien et al., 2017), which may be perceived differently from one consumer to another (Agyekum et al., 2015). Indeed, consumers deal with food decisions (Emilien et al., 2017): in this mechanism both intrinsic and extrinsic cues shape consumers' choices. The most known are: sensory characteristics, nutritional values, health aspects, price and value for money, convenience, availability and seasonality, geographical origin, production method (wild vs farmed) and product form (fresh, frozen, processed and other) (Claret et al., 2014; Gaviglio et al., 2014; Gaviglio & Demartini, 2009; Grunert, 2005).

Most of research are based on developed countries, with a particular focus on European Countries (Cantillo et al., 2020b), while a consistent shortage of investigations in developing countries has been detected, thereby contributing to a partial view of consumer behaviour (Prato & Biandolino, 2015a).

Fish is important in the diets and livelihoods of people in developing countries (Guillen et al., 2019). The share of developing countries in total fishery exports has been about 54% by value and 61% by quantity (live weight equivalent) in 2019 (FAO, 2021). Although fish consumption per capita was higher in developed countries, fish still contributes to fight against malnutrition, and is a main part of Mediterranean food (Prato & Biandolino, 2015b).

On these premises, the overall objective of the present study is to shed light on how fish characteristics may influence preferences and decision making.

The focus is on Mediterranean basin, including less developed countries, adding some new insights to the current scientific debate.

A qualitative analysis involving Focus Group (FG) method has been applied in four Countries of the Mediterranean area, namely Italy, Lebanon, Spain, and Tunisia.

This work aims to answer to the following research questions:

RQ1. How attributes of the product influence consumer's preferences in selected countries?

RQ2. How availability influences the perceptions between inland and seaside residents within each country?

The remainder of the paper is organized as follows: section 2 provides an overview of the theoretical framework at the basis of the research; it then will go into presenting the methodology and the data analysis in section 3. In section 4 the results arisen from the content analysis of the Focus Groups (FGs) are reported, while section 5 provides a discussion of the results obtained by the content analysis of the FGs conducted and, in section 6, the main conclusions are drawn.

3.3. Theoretical framework

Food quality is a central issue in today's food economics (Grunert, 2005). As posited by Lancaster (1966), or Molnar (1995), food quality is the assemblage of the effect of attributes which determine the product's performance, are in dynamic interrelation, and influence the consumer in accepting the product.

Over the years, attributes have been categorized as: 1) search, 2) experience, or 3) credence characteristics, according to when the consumer can ascertain their presence (Darby & Karni, 1973; Nelson, 1970). Therefore, this categorization will be used to illustrate the opinion of consumers as disclosed in the focus groups.

Dietary habits of population in different regions of the world have been determined mainly by the availability and local practices (Shashikanth H & Somashekar, 2020). In general, the choice set always influences how choices take place, and this is particularly true in fish choice (Thong & Olsen, 2012). The main pattern characterizing fish availability is linked to proximity with seaside, where people living nearby the sea generally having a higher fish consumption compared to inland residents (Bose & Brown, 2008; Wim Verbeke & Vackier, 2005). Therefore, in this study, we will explore consumers' opinions splitting the sample into two tiers, according to either coastal or inland residence in different countries: Italy, Lebanon, Spain, and Tunisia.

for better representativeness of fish consumption (S. O. Olsen, 2001; Samaniego-Vaesken et al., 2018). Therefore, our analysis is structured as follows:

1. ***Definition of fish products.*** Some debate originated on which products were eligible for discussion when talking about fish products.
2. ***Context.*** Some contextual factors need to be specified, being availability the reason to split in two our focus groups and trust a factor that hampers/enhances the effect of each attribute.
3. ***Search attributes.*** The attributes that are available to the consumer at the time of purchase.
4. ***Experience attributes.*** The attributes that can be discovered only after the trial of the product.

5. ***Credence attributes.*** The attributes that the consumer believes the products have but can never verify by himself.

3.4. Methodology

3.4.1. Procedure

Focus Groups (FG) interviews were chosen as they are more useful for exploratory research (Cyr, 2016; Morgan, 1998; Smithson, 2000; Wilkinson, 1999). In fact, without adequate and structured knowledge is not possible to set a quantitative research analysis, in which specific research questions guide the investigation. In this case, we first acknowledged the lack of research in the Mediterranean area for fish consumer behavior.

In FG interviews, the social dimension in terms of the participants' interactions is added compared to individual interview (Wong, 2008). Participants are encouraged to exchange thoughts and opinions on each other's points of view (Kitzinger, 2006). Therefore, a thorough insight of what moves and inspires the target group can be collected.

The first step has been the gathering of semi-structured open questions in a manual. Following the theoretical framework, questions were grouped into four themes: 1) search; 3) experience attributes; 4) credence attributes. **Error! Reference source not found.Error! Reference source not found.** gives an overview of the questions administered during the FGs.

Definition of fish products	Context	Search attributes	Experience attributes	Credence attributes
• How do you define fish?	• What are your problems or concerns when consuming fish? • What trends do you see happening in the fish market?	• What are the types of fish that you prefer to consume the most? • What are the characteristics that you like in the type of fish that you like to consume?	• What makes you lean towards one fish specie rather than another? • Did your previous fish purchases impact your current behaviour?	• Why do you think that fish consumption is important? • What are other product, social or environment related factors you believe impact your fish consumption preferences?

Figure 5. Thematic categorization of focus groups

The FG protocol was then tested during a pilot discussion in Tunisia in August 2020 and thereafter validated. Following, two FGs per country (Italy, Spain, Tunisia and Lebanon) for a total of eight sessions were held from September 2020 until March 2021. The countries were chosen with the aim of

representing the whole Mediterranean area, of much importance for its diet (Prato & Biandolino, 2015a). In each country, one session was held with consumers living near the seaside and the second one with residents of in internal areas. Hereinafter, participants who live near the seaside are referred to as "*seaside residents"* while those living in internal areas are referred to as *"internal residents"*. Table 1 shows the research procedure used for this study.

Table 1. Procedure adopted for the research

Study propositions	To improve knowledge of the current preferences on fish consumption in the Mediterranean basin To understand fish characteristics and their influence on consumer decision-making
Research questions	RQ1. How attributes of the product influence consumer's preferences? RQ2. How availability influences the perceptions between inland and seaside residents in the countries investigated?
Units of analysis	Four countries of the Mediterranean area: Italy Lebanon Spain Tunisia
Linking data to propositions	1. Definition of fish products 2. How the context influences preferences for fish products 3. Analysis of *search* attributes 4. Analysis of *experience* attributes 5. Analysis of *credence* attributes
Method of analysis	Focus groups: two per areas (seaside/inland) per each country, tot.: 8 focus groups
Criteria for interpreting the study's findings	Content analysis: Word-count analysis Text coding Aggregation of similar and related topics Semantic analysis: Analysis of co-occurrences Score assignment to different cues
Timing	September 2020–March 2021

3.4.2. Selection of participants

Participants must comply with these requirements: over 18 years old, partially, or totally responsible for the household grocery, balanced between living either from seaside or in inland.

The sample consisted of 77 participants: 27% were from Italy, 17% from Lebanon, 23% from Spain and 32% from Tunisia. The northern Mediterranean countries were represented by Italy and Spain, while the southern Mediterranean countries were represented by Tunisia and Lebanon. 47% were male and 53% female; 45% were from internal areas while the 55% lived nearby the seaside. Respondents between 18 and 29 were the largest share of the total sample (26%), the 32% did not specify the age (Table 2). The absence of age specification has been accepted for privacy purposes.

Table 2. Description of the sample

Variables	No. of participants	Percentage
Country		
Italy	21	27
Lebanon	13	17
Spain	18	23
Tunisia	25	32
Geographical area		
Inland	35	45
Seaside	42	55
Gender		
Female	41	53
Male	36	47
Age		
18–29	20	26
30–40	12	16
41–50	13	17
51–60	5	6
Over 60	2	3
Unspecified	25	32

3.4.3. Data analysis

All FGs discussions were audio-taped, video registered, and word-by-word transcribed. Discussions were conducted by native speakers of Arabic, Italian, and Spanish, and afterwards, all transcriptions were translated into English and used as input for the content and semantic analysis purpose.

The content analysis is a systematic and descriptive method used to analyse words or phrases within a wider range of spoken or written communication. It uses units of analysis extrapolated from the messages that coincide with the significant elements of the text. Content analysis can have different extensions and semantic complexity ranging from single words to full texts.

We have also followed the grounded theory principles (i.e. the collection of theories suggested by patterns found in data) and deductive methods (i.e. the process of reasoning from certain laws, principles, or the analysis of facts) with an emphasis on emergent themes (Charmaz, 2011).

As a first step, we performed with the software NVivo 12 the word-count analysis of each transcription. The word-count was conducted separately by the authors to identify the most recurrent words and phrases and then the most recurrent themes were coded based on topic similarities. For consistency reason, we have also applied a coding following the "classic approach" otherwise known as the "scissor-and-sort" technique. In more detail, the printed transcripts were cut up grouping similar quotes and then assigning the codes to the quotes (Braun & Clarke, 2006; Billups, 2003). Once the codes were established, they were put together into memos and the memos were subsumed into themes. The

consistency, coherence, and distinctiveness of the themes were confronted with those emerged by the NVivo analysis and double-checked by the researchers involved in the study who operated separately and compared their evaluations only at the end of the process.

As a second step, based on the recurrent words/concepts, we performed a semantic analysis of the topics identified. Indeed, this method allows to explore the relationships between identified themes, in this case what it is seeks is the meaning derived from the relationships between concepts in the text. A list of cues was consequently agreed upon on among researchers and scales were built based on the relevance of the words and topics to the attributes that determine consumer's choice for finfish. When assigning scores, the neutral perception of the cues was also considered (i.e., when a certain attribute was mentioned several times but in phrases that stated its low importance) without influencing the assignment of the scores.

3.5. Results

The analysis of focus groups yielded to the definition of a set of attributes that respondents highlighted as important for their fish choices. In Figure 2 main insights are summarized, according to the starting thematic scheme. In the following paragraphs more detail will be given about how most recurrent themes occurred during the discussion and how each attribute has been intended by the discussant and whether there have been differences between seaside-inland residents or per country of origin.

Following, according to the results of content and semantic analysis, the scores assigned to the elements determining fish choices have been plotted in graphs and differences between groups of the same countries are discussed.

Definition of fish products	Context	Search attributes	Experience attributes	Credence attributes
• Distinction between seafood .	• Availability • Trust towards the supply chain	• Fish species. • Origin. • Physical cues • Price • Labels and packaging.	• Freshness. • Convenience. • Sensory attributes.	• Healthiness. • Animal welfare.

Figure 6. Factors influencing fish consumption and consumer's choice

3.5.1. Definition of fish products

The first insights we gained from the study is a not clear idea among consumers, about the targets of this study: finfish products. Actually, most respondents were unable to distinguish between finfish and shellfish: "*For me, everything that lives underneath water is fish. Then if the experts want to classify it into different categories, that is their choice*" (Tunisian participant).

Consumers from South Mediterranean countries were aware of the distinctions between different fish categories according to the appearance: "*I am aware of the difference between sea food and fish. For example, octopus and shrimps are very different in appearance compared to fish, but when I speak, I tend to say fish since it is easier for me to talk*" (Tunisian participant). Some respondents from Northern Mediterranean countries also differentiated between finfish and shellfish using physical cues: "*Fish is everything that has to do with animals that comes out of the sea, I would not consider seafood as fish as the body structure is quite different*" (Spanish participant). The overall tendency highlighted was to consider all marine commodities as fish.

3.5.2. Context

3.5.2.1. Availability

Availability represents a key element in fish consumer behaviour. Even with global supply chains, seaside and inland residents have a different choice set when buying fish (MISIR et al., 2015). Therefore, this motivated to conduct separate focus groups for seaside and inland residents.

This was confirmed by a first analysis of our focus groups discussions: all participants agreed on fish availability being pivotal for their choices: "*The fact that I live far from the coast and the lack of ports significantly reduces the frequency of fish consumption*" (Tunisian participant). Most participants' decision was actually based upon "*What is available and the advice of the fishmonger*" (Italian respondent).

Some inland residents pointed out to reduce their fish consumption due to a scarcity in fish species sold at their available sale channels: "*The lack of taste characteristics of fish similar to swordfish and salmon, reduced fish consumption*" (Tunisian participant). This was also valid for Italian, Lebanese and Spanish inland residents, participants had problems finding fish that met their requisitions in terms of freshness, quality, safety, and price: *"I first look at the available options and then check whether they are affordable or not"* (Spanish participant). In contrast, seaside residents did not refer to availability as a driving factor in their decision-making process.

The availability of fish also has an impact at the time of buying. All respondents agreed on making their choice within the shop/market. Most respondents stated that "*they never buy what they decide to get prior to going to the fishmonger"* (Italian participant), and that their choice is dependent on what is available: "*I generally go out of the house to buy grouper, but that changes the moment that I arrive to the local market where the offer doesn't correspond to my needs*" (Lebanese participant). Others combined availability with intrinsic and extrinsic product features as appearance and price to make their choice: "*When buying fish, I first look at the available options and check whether they are affordable or not. I usually choose what I like the most, what is most appetising, and what looks the best from the available options at the local market*" (Spanish participant).

Lastly, the availability can impact the familiarity with the product, and hence the habit to include it in the diet and the ability to cook. In fact, in Tunisia, internal respondents felt that their knowledge of fish to be restricted since they live far from the sea, as opposed to those who live in coastal areas, where fish is a staple of the diet since childhood: "*People who live in internal areas like Tebourba, Sidi Bouzid and El kef do not have a considerable knowledge of fisheries and we cannot consider them fish consumers because of the nature of their habitats*" (Tunisian participant).

3.5.2.2. Trust towards the supply chain

The effect that each attribute can play in the consumer's mind is believed to be mediated by trust (Giampietri et al., 2018). Furthermore, fish is a food category that is particularly susceptible of food safety issues and food scandals (Visciano & Schirone, 2021). Therefore, we collected the trust opinions and concern expressed by the participants to the focus groups.

Respondents from Tunisia and Lebanon did not have any trust in fishmongers and industries on product's information. The perceived lack of transparency regarding fish supply chain makes consumers losing their control over origin and production method of sea goods: "*I would love to know from where that fish came exactly. However, this kind of information is never present and even if it is, you can never be sure if it is true or not*" (Tunisian participant). Therefore, buying frozen fish from foreign brands, is seen as a solution, their traceability information is considered more trustful. In turn, there are some participants who expressed the opposite opinion, relying on local companies when they feel lack of trust: "*Companies keep involving and renovating their production system by putting in place international certification systems such bio certification*" (Tunisian participant).

Italian and Spanish participants preferred to buy local and, overall, showed more trust in fishmongers. Specifically, Spanish respondents felt reassured by the fish markets regulating organisations: "*I think that there are organisations that do their job very well in protecting consumers. So, we really must lower our guard*" (Spanish participant).

3.5.3. Search Attributes

3.5.3.1 Fish species

Tunisian respondents displayed various preferences for fish species depending on their geographical location. There was consensus among internal residents regarding preferred fish species: Sardines, Mackerel, Tuna, and Sea Bass being the main choice. Furthermore, participants claimed to consume also other species such as Sea bream, bluefish, Red Pandora, Red Mullet, and Dentex whenever possible. Others also eat salmon, swordfish, and grouper occasionally, as they are considered among the premium species in the Tunisian market. While most seaside residents prefer to eat Saupe and

Dolphinfish[2] even if these species are difficult to be found in local markets, followed by Red Mullet, sea bream and sea bass. White fish species are preferred by most respondents. Finally, a small minority showed a preference for blue fish, specifically sardines and bogue fish.

In Lebanon all participants prefer to eat Salmon, Sea Bream, Tuna, Common Pandora, grouper, and Swordfish. Generally, all white fish species tend to be preferred.

In Italy differences have been found between seaside and internal residents. While inland residents preferred blue fish species such as anchovies, salmon, and cod followed by Sea Bream, Swordfish, Red Mullet, salted cod and Plaice; seaside residents preferred mainly sea bass and cod followed by salmon, and swordfish. Italian participants from internal areas showed a huge interest in the consumption of salted cod, especially due to its availability all year round, shelf life, and also do the fact that it is an ingredient present in many easy-to-cook recipes.

Spanish participants' preferences for fish species were relatively homogenous and they were mainly directed towards Salmon (smoked or fresh), tuna (fresh or canned), cod (fresh or frozen), sea bass (fresh or frozen), sole, Sea Bream (fresh) and Swordfish (fresh).

3.5.3.2 Origin

The origin of fish is a crucial aspect linked to consumer's choice. Participants from Tunisia, Italy and Spain prefer to eat local while Lebanese and inland Tunisian respondents leaned towards imported fish because of more stringent regulations they rely upon. A particular emphasis on origin is found for prepacked sea goods that carry this information clearly on the label.

The origin can also be intended in terms of caught or farmed fish. It is not a determining factor amongst Northern Mediterranean interviewees as most of them "*Do not pay attention to whether fish is wildly caught or farmed*" (Spanish participant). On the other hand, Southern Mediterranean respondents showed some preferences for caught fish: "*Would like to consume more locally caught fish to support fishmongers and local economy*" (Lebanese participant). Furthermore, wild caught fish was considered tastier and less smelly compared to the farmed alternative as "*It has a very salty pleasant taste compared to the farmed one which tends to be very neutral, and sometimes even tasteless*" (Lebanese participant). Lebanese consumers are concerned about the seawater pollution as "*Fishmongers do not care if the product that they are catching is polluted or not*" (Lebanese participant). Few participants favoured farmed fish as it is better controlled and helps reducing the overexploitation of marine resources. Finally, other participants stopped purchasing farmed fish for its high fat content as "*It releases much more fat than the wild caught one during cooking*" (Tunisian participant).

[2] The dolphinfish, Coryphaena hippurus (Linnaeus, 1758), a migratory pelagic fish with a world distribution and a relatively fast growth (Scherbachev, 1973). Also widely called dorado (not to be confused with Salminus brasiliensis, a freshwater fish) and dolphin.

3.5.3.3. Physical cues

Respondents from the four selected countries choose fish based on specific physical characteristics, especially those that are traditionally used to infer fish freshness.

Tunisian respondents mainly claimed to choose fish based on size, with a preference for medium to large fish. Small fish species were associated to an unpleasant eating experience due to the lack of meat and the presence of little spines and fishbones. Consumers also considered the general appearance, brightness of the skin and eyes, bloody gills, evidence of bleeding, and firmness of the flesh. A Tunisian participant stated: "*The brighter the eyes, skin and the redder the gills are, the fresher the fish is*".

In Lebanon, people also leaned towards large fish and relied on the general appearance such as the absence of spines and fishbones, brightness of the eyes and firmness of the meat to select one fish species over another.

Italian respondents also used the general appearance, the vividness of the eyes, absence of spines and fishbones and the firmness of the meat to make their decision choice. No differences according to age and living area were noted regarding the impact of physical features on consumer's choice. Nonetheless, Italian male participants were more likely to base their decisions on physical traits.

In Spain, most respondents had limited knowledge for fish regardless of the living area. Nonetheless, "*The overall appearance and the size*" were the main features that helped consumers when making their purchase. The smoothness, brightness of the eyes and skin and the absence of the spines were used by few Spanish respondents when buying sea goods.

3.5.3.4. Price

Price is the main attribute that guides consumers' choices. In the case of fish, it is seen as a constraint as "*Fish is usually more expensive than other types of meat*" (Tunisian participant).

Fish is perceived as luxury good by respondents from Tunisia, who reported to include fish at least once a week for health reasons, even if expensive.

Similarly in Lebanon, while the ongoing Covid-19 pandemic and the country's financial crisis have helped to lower the price discrepancies between fish and other types of meat, Lebanese participants still perceive fish as an expensive food.

In Italy, price was more relevant for seaside residents compared to inland ones. Inland residents were more concerned with other factors such as freshness, availability, and seasonality, meaning that they were less price sensitive when the product meets their requirements.

In Spain, only inland residents reported it as a barrier: "*When I go buying fish, I try to balance my purchase, mixing expensive and cheap options*" (Spanish participant).

Price is also used as a signal of quality. Few participants linked a cheaper fish price with a lower quality: "*I really care about the freshness and the price-quality ratio*" (Tunisian participant), "*The price and quality ratio are the biggest determining factor when it comes to buying fish*" (Spanish participant).

3.5.3.5. Labels and packaging

In Tunisia, most of respondents reported their preference for wild caught fish, unpacked and unlabelled. Some exceptions were for canned tuna by famous brands as El Manar or Sidi Daoud. Seaside residents showed a strong preference for local brands, stating that they "*Will never buy fish that has been imported from another country*" (Tunisian participant). While inland residents preferred imported brands as they perceived more transparency and better quality.

While Italians stated to have no preferences in terms of brands and that, in the case of packed fish, they are "*Mainly guided by promotions*" (Italian participant). they did not show any interest or preference regarding the packaging of sea goods, as the respondents from Tunisia.

While respondents from Lebanon and Spain showed a preference for a particular type of packaging: simple, transparent, and soft colours that remind the colour of the sea. Also pressurized and individually packaged slices were valued as they reassure on the product quality. The presence of water mist on the packaging represented a barrier to some participants from buying sea goods as it evoked poor quality and enabled them to clearly see the product inside. Spanish respondents also reported the importance of labels to infer good quality and a more flavourful fish.

The preference for foreign fish in Lebanon is reinforced by the analogous preference for foreign brands of fish, as perceived more compliant with food regulations.

3.5.4. Experience Attributes

3.5.4.1. Freshness

Freshness has been recorded as the most important aspect for consumer's choice. Freshness is so vital that some participants opt to buy frozen sea goods instead of fresh fish when local markets cannot meet their expectations.

In many cases the value of freshness is seen as an indicator of the overall quality of the product- For example, some respondent linked freshness to nutritional value as fresh fish was considered "*More nutritious than the frozen or pre-packaged alternatives*" (Lebanese participant).

Freshness cannot be ascertained at the moment of purchase in many cases, therefore, some cues like smell, or visual peculiarities are used as signs of freshness.

While for other respondents it is an experience attribute that is discovered at the time of eating with texture: "*When fish is not fresh, I get an itchy sensation in my mouth, which is not the case of fresh fish that usually has a smooth texture and is very moist*" (Tunisian participant).

Also, seasonality is used as a cue for freshness, and it is linked with tendentially cheaper prices: "*I know the appropriate periods of consumption for particular fish species*" (Italian participant); "*I tend to buy species according to the fishing season for several reasons, most importantly to have a fresh product*" (Tunisian participant). It can also be used as a cue for good *taste: "Any fish that is caught in its season*

is delicious" (Tunisian participant). Lebanese and Spanish respondents did not consider fish seasonality in their discussions.

3.5.4.2. Convenience

Convenience is an important feature for the totality of the sample, as few participants avoided the consumption of small fish species like sardines due to their effort-taking preparation.

Italian and Spanish participants considered fish preparation very time consuming and not well adaptable to many recipes. For this reason, some participant stated to prefer eating frozen fish, as it must be cooked without any additional cleaning or preparation.

Cleaning fish is tendentially avoided by all respondents, but an exception was found in seaside Tunisian residents, they enjoyed cleaning fish as it evoked memories of their childhood: "*I used to watch my mom clean fish, so I grew up watching her do it and I always wanted to imitate her when I get married*" (Tunisian participant). Some inland Tunisian respondents considered a barrier to fish consumption the lack of culinary skills for fish-based dishes: "*It all rolls back to the culinary habits linked mainly to the geography, I as a well as a lot of people her in Tebourba prefer to buy lamb and chicken meat because it gives us a larger option of plates to prepare and women do not know how to prepare a lot of fish based dishes*" (Tunisian participant).

Some Italian respondents stated to avoid convenience problems by purchasing fish that was already cleaned by their local fishmonger: "*The cleaning process is the thing that I hate the most. So, my local fishmonger cleans it and bring it to my house so it is a very nice service that I will not be able to get it somewhere else*" (Italian participant). But this service does not appear to be popular in most of the sales channels of other countries, therefore respondents do not rely on this.

3.5.4.3 Sensory attributes

Sensory attributes are considered important cues for fish consumption, especially taste and smell.

A Tunisian participant stated "*I do prefer to consume blue fish because I like to have a meat of fish with a very strong taste*" but all others (seaside residents, Lebanese, Italian and Spanish respondents) prefer neutral taste and a non-slimy texture. Few respondents preferred the salty flavour, that they associated with wild-caught fish.

Furthermore, smell is a valued attribute at both the time of purchase and at the time of consumption as a strong unpleasant smell can be a significant barrier for all respondents. Tunisian respondents reported to be a major barrier to eating blue fish species and used this cue to infer lower freshness. Similarly, some inland Italian residents stated to avoid anchovies for their strong smell.

Lebanese respondents considered fish to be naturally a smelly food but, instead, they reported to pay attention to the smell of the environment: "*I know that fish has a smell naturally, but the marketplace*

doesn't have to smell horrible" (Lebanese participant). While some Spanish respondents resented the fish smell getting on their hands, and they even avoided patronizing fish because of it.

Finally, the general appearance of the product in the market or within the shops is also claimed to be an important aspect guiding consumer's choice. The organization of fish stalls and the overall cleanliness of the selling place made Lebanese participants at ease when buying fish: "*The overall appearance of the environment is what really draws my attention (the cleanliness of the shop, the lighting of the shop and even the fishmonger)*" (Lebanese participant). Whereas respondents from Italy, Spain and Tunisia focused their attention mainly on the actual products rather than the setting in which they were traded.

3.5.5. Credence Attributes

3.5.5.1 Healthiness

The nutritional value is one of the main drivers of fish consumption among all participants, as fish is believed to contribute strongly to a healthy diet. Indeed, most of them agreed on fish being an important source of protein, omega 3 content and oligo-elements.

This can be more important in the light of meat restrictions increasingly popular among Western consumers. In fact, for some respondents, especially from Spain and Lebanon, it represented the sole alternative to eating high biological value proteins: "*I don't eat red meat, so one of my main sources of protein is fish*" (Spanish participant). While, Italian and Tunisian respondents appeared to be less restrictive about food sources.

Even participants loving red meat (beef and lamb), perceived a higher nutritional value in fish: "*I still prefer red meat rather than fish even though fish has a higher nutritional value which makes me include it in my diet*" (Lebanese participant). The awareness of health content of fish was higher in seaside residents, while inland residents across all countries neglected more the nutritional value of fish.

For some consumers, the choice of fish is motivated by food safety issues: "*With all the scandals happening consecutively for the other types of meat like chicken and beef, I started to become more aware of what I put in my body and leaned more towards fish*" (Tunisian participant). Some beliefs are valid only for some species as blue fish is perceived as more beneficial to health while large fish were considered to contain more heavy metals and to be sources of contamination compared to medium or small fish species: "*I prefer to eat sardines over Red Pandora because from what I know, sardines have a higher omega 3 intake*" (Tunisian participant).

Lebanese respondents considered the lack of environmental regulations in the country a main driver of fish pollution as most industries discharge wastewater, full of chemical residues, into the sea, endangering the health of people. This outcome was found to be a major barrier in consuming local fish. Lebanese participants also reported some concern for the healthiness of fish due to the content in

pollutants: "*Pollution is one the main concerns that comes to my mind when consuming fish since the Lebanese costs are very polluted*" (Lebanese participant)

3.5.5.2 Animal welfare

Most participants did not mention animal welfare or environmental sustainability in their fish choice since they perceive a very low impact on the environment from their consumption behaviour: "*I do not think that I can have that much impact on the environment. So, when I buy fish or any other product, I do not think of the repercussions of my behaviour on the environment*" (Italian participant).
Lebanese respondents were the most concerned about sustainability believing that the available marine resources are not able to meet the population's needs and therefore they expressed the need for more regulations for protecting the environment: "*Using very small fillets to catch as much fish as they can contributes significantly to the reduction of the natural available stocks of fish*" (Lebanese participant).

Some respondents, mainly seaside residents, did show concern about the overexploitation of marine resources, the pollution of the environment and the consumption of endangered species. Some Italian, Lebanese, and Tunisian respondents emphasised the need of "*more laws about the modalities and methods of fishing to be able to ensure a sustainable fishing supply system to consumers*" (Italian participant).

Tunisian respondents reported aquaculture as a viable way to protect some fish species, but showed also concern for its sustainability, due to the use of chemicals: "*Even though I know that the ponds are treated with chemicals. Still, it is a controlled environment where the risk on human's health is much lower than the case of wildly caught fish*" (Tunisian participant).

3.5.6. Comparison between Inland and Seaside respondents

According to the content analysis, we collected some scores for each element that we included in the model to explain respondents' behaviour for fish products across countries on the Mediterranean basin. The scores have been split for the groups in which we divided the focus groups: the seaside and the inland residents. Following we report the main issues emerged during the discussions.
In Tunisia, as reported in Figure 3, the respondents based their fish purchases mainly on price, freshness, and origin. Seaside residents placed more importance on origin, wild caught fish, but also valued seasonality, instead inland residents placed more importance on blue fish species and convenience. Tendentially, context and credence attributes were slightly influential in consumers' choices.

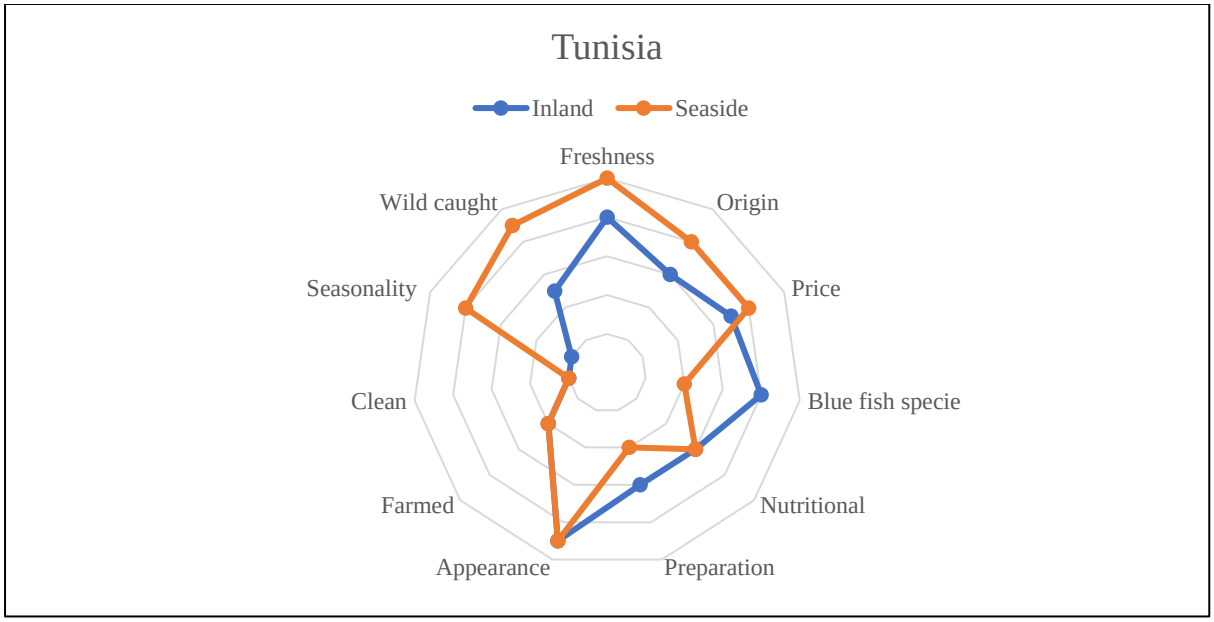

Figure 7. Importance of fish attributes in defining consumers' preferences, Tunisia

In Lebanon, as shown in Figure 4, no major differences were noticed between inland and seaside residents. Only the perception of farmed fish was higher for inland residents and the importance of freshness was higher for seaside residents. In general, Lebanese respondents considered fish to be healthy, and preferred white fish species without spines or bones. A serious issue regarding the trust towards the supply chain has been delineated, it emerged also during the previous analysis, and this substantially impacted the differences in perceptions between Lebanese respondents and respondents from all the other countries.

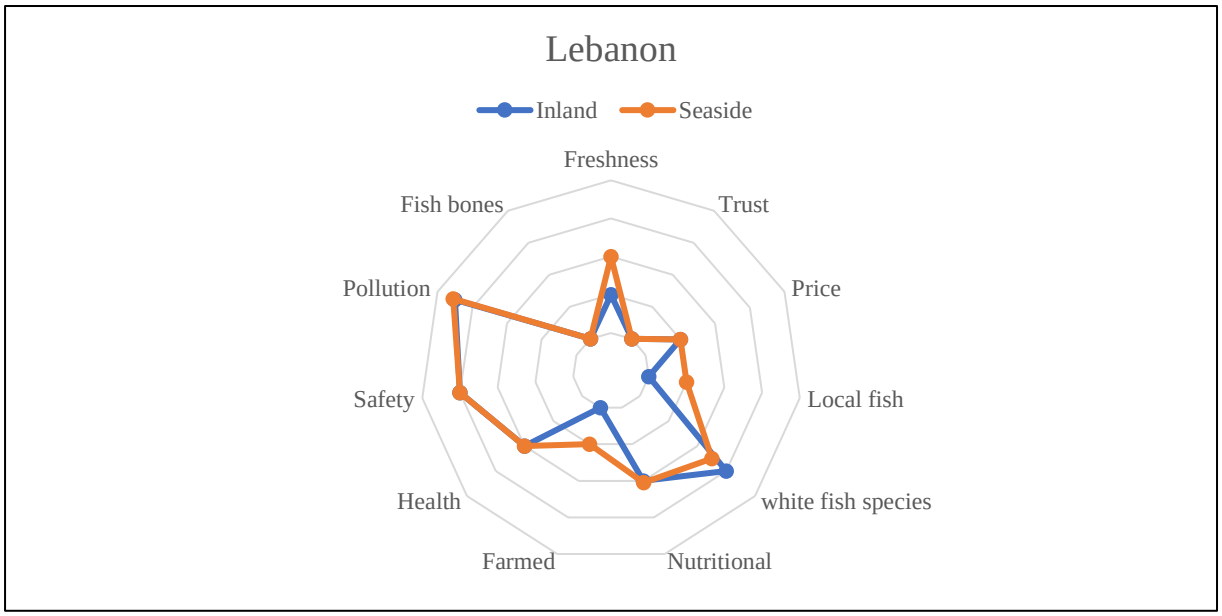

Figure 8. Importance of fish attributes in defining consumer's preferences, Lebanon

In Italy, as shown in Figure 5, all respondents agreed on the importance of white fish species and considered freshness to be way more important than other aspect, a minor importance attached to price was constant for all respondents. The two groups had some major differences: seaside residents displayed more trust in fish supply chain compared to others. While inland resident, lacking trust, relied more on other aspects as origin of the product, quality, and intrinsic aspects as smell. Inland residents also stated to rely more on frozen fish over fresh one for availability constraints. The content analysis also yields that credence attributes were neglected in the discussion compared to others.

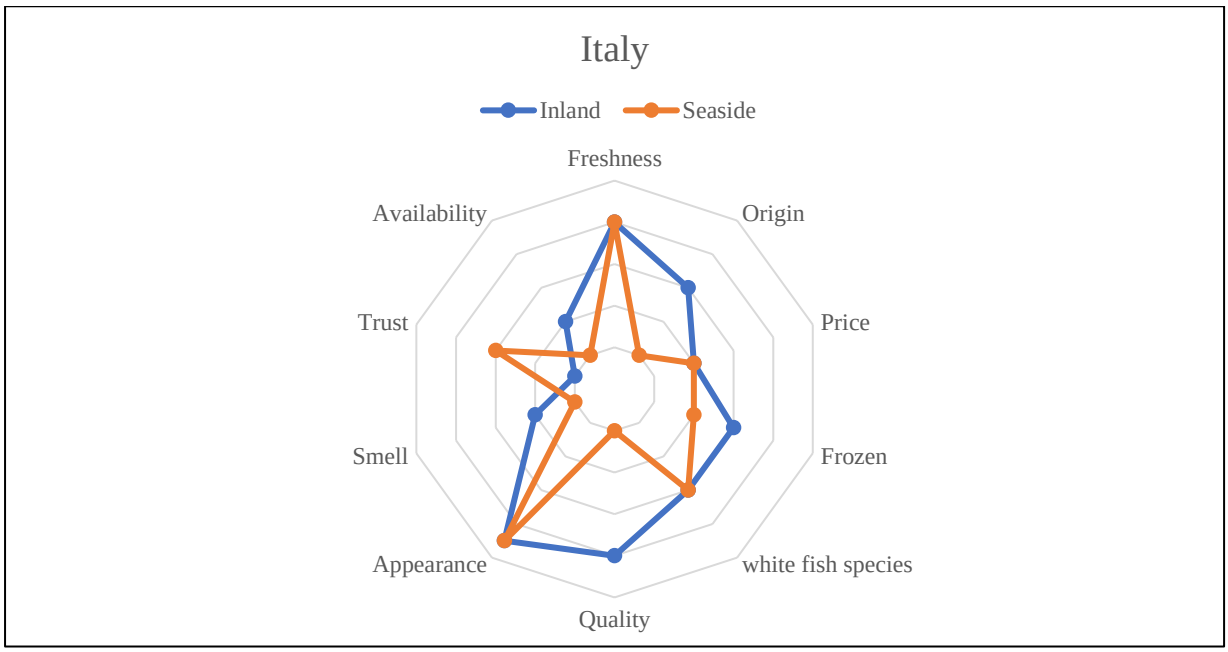

Figure 9. Importance of fish attributes in defining consumer's preferences, Italy

Lastly, as shown in Figure 6, Spanish respondents agreed on liking fish mostly with a good appearance. Also, freshness and seasonality were deemed as important elements of choice, while origin was slightly important for all respondents. The two groups showed some differences: seaside residents highly valued the packaging of fish and the frozen form. While the inland respondents were more interested with the types of preparation that the product requires and more interested with price compared to others. The importance of credence attributes appears to be minor compared to other aspects of the product.

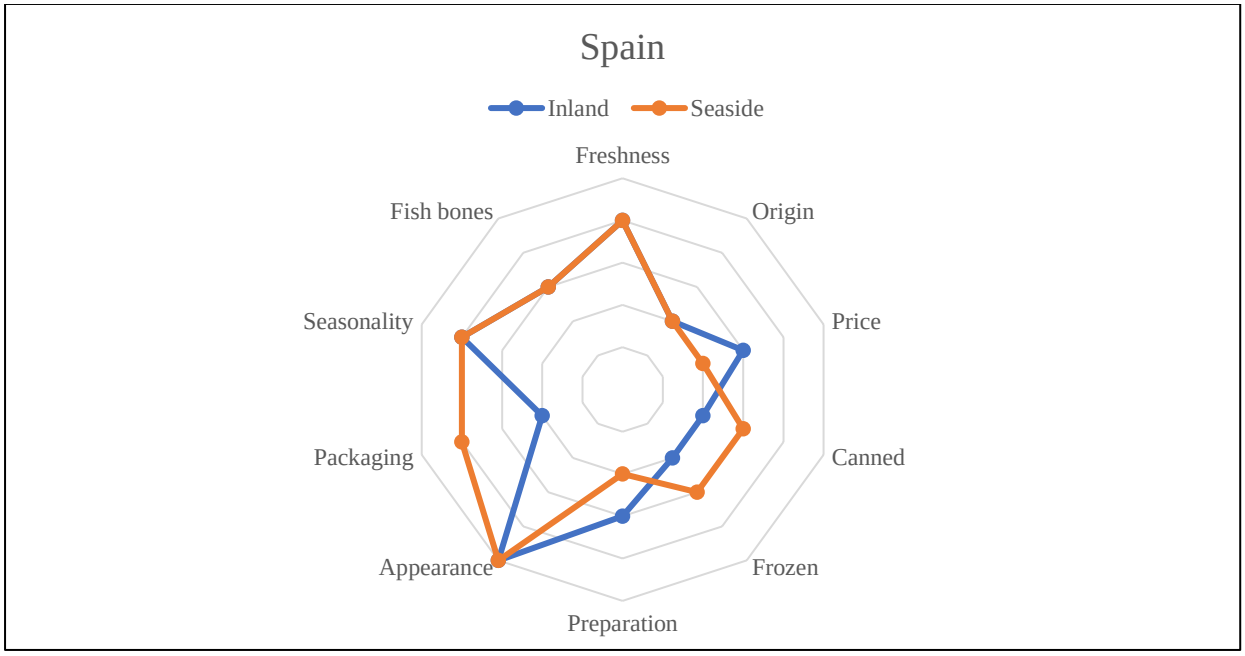

Figure 10. Importance of fish attributes in defining consumer's preferences, Spain

3.6. Discussion

The results of the focus groups showed homogeneous results across discussions occurred in different Mediterranean countries. Unlike other foods as meat, wine or cereals that can define a clear consumption pattern for food products among people from different countries, finfish is still unable to do so even thought a progressive departure from the traditional Mediterranean diet is being observed mainly in younger generations (Tur et al., 2004).

The analysis of focus groups firstly indicated that decision making of the respondents tends to occur directly within the shop/market and not before, and that availability is a substantial constraint in purchases, especially for inland residents. In this sense, we can suppose that fish purchases take place tendentially quickly with a more impulsive vs. rational decision-making style (Cacioppo et al., 1986). The importance of availability led us to split each focus group in two: seaside and inland residents, in order to control the effect of this variable in our results. This has been already highlighted for a reason for not purchasing fish by other Authors (Hinkes & Schulze-Ehlers 2018) who found a high opt-out rate among consumers who did not like any of the options presented (Vanhonacker et al., 2010).

Trust also appeared as critical with high levels of trust corresponding to lower attention devoted to the other aspects of the product. When trust issues were identified, respondents tended to prefer imported foods from trusted countries and they devoted attention to foreign quality certifications (Wu et al., 2021). Respondents from Lebanon declared to be concerned for pollution, and this impacted the perception of attributes as freshness and local origin. It is generally assumed that the local origin of fish has been proven to raise consumers' expectations in terms of tastiness and food safety (Maesano et al., 2020, Murray et al., 2017; Zander et al., 2018), but this case represents an exception.

Considering search attributes, the most important appeared to be fish species, origin, and price. Specifically, respondents tendentially preferred white fish, but Tunisian respondents showed preference for blue fish, instead. This is because respondents learnt the sensory traits and the nutritional benefits belonging to each species (Lawley et al., 2012; Pohar, 2011; Verbeke et al., 2007). A lower price is preferred by most of respondents, in line with the economic theory, however there are some cases in which a higher price is seen as a proxy for higher quality, lacking other cues (Cicia et al., 2002).

The appearance of the product is also important for respondents, especially in the Spanish part of the sample. In general, visual cues are used to infer the freshness, one of the strongest drivers of consumption. Therefore, who uses to inspect the product does not like the presence of packaging. The respondents reported to use several sensory cues as: the brightness of the eyes and skin, red gills, texture, and light smell (López-Mas et al., 2021; Lawley et al.,2020; Thapa et al., 2015). Generally, wild caught fish appears to be preferred over farmed one, except for Lebanese inland residents.

Considering experience attributes, respondents appeared to be mostly concerned by freshness: it is used as an indicator of the overall quality of the product, and it is inferred by other available cues in the environment. We already mentioned the role of sensory cues, but also extrinsic attributes can be used, for example, origin, seasonality or texture and mouthfeel. Convenience plays a particular role in the decision of consuming fresh fish, to the point of being a barrier in some cases (Ankamah-Yeboah et al., 2019; Cantillo et al., 2021; Carlucci et al., 2015; Pulcini et al., 2020). Italian respondents stated to purchase fresh fish only if a cleaning service is provided by the fishmonger. While an exception was represented by Tunisian respondents: they showed pleasure in the preparation and cleaning process of fish. This can be understood in terms of coproduction value, which states that convenience has origins in shifting consumer values, and that individualism and self-fulfilment may conflict with traditions such as frequent family meals and a lot of time in the kitchen (Heide & Olsen, 2011; Scholderer & Grunert, 2005).

Lastly, we must consider the effect that credence attributes play in consumers' decisions, they are generally more important where more wealth is available to consumers (Yang & Renwick, 2019).

The healthiness of fish is an important driver for its consumption, since health concerns tend to reduce the expenditure on beef and chicken, instead Pihlajamäki et al. (2019) and Morales & Higuchi (2020).

Previous studies were devoted to issues as animal welfare and sustainability, but in our focus groups these elements did not appear as salient in the mind of consumers (Zander et al. 2018; Hynes et al., 2019; Jacobs et al., 2015). This can be motivated by the peculiarities of the product investigated, as already Pieniak et al. (2009) indicated that credence attributes are ranked substantially lower than search attributes in the case of fish. Another reason can be found in the saliency of short terms goals over long-term ones when the consumer is facing a purchasing occasion, that leads to attitude-behaviour gap, particularly for animal welfare (W. Verbeke, 2009). Some Authors also suggest that credence features

are becoming so complex that the consumer finds hard to process a big amount of information in short time (Del Giudice, Cavallo, et al., 2018; Nuttavuthisit & Thøgersen, 2017).

3.7. Conclusions

Fish is an important product in the Mediterranean area, for both national economies and for consumers' diets, therefore it represents an interesting target market to be investigated in order to understand, in a deeper way, the opinion of consumers. Despite a wide array of research conducted in Western countries, structured knowledge still lacks for developing countries, such as the ones of the southern Mediterranean shore.

Therefore, this study leveraged qualitative analysis to undertake an exploratory analysis of the consumers' point of views on fin fish in four countries: Italy, Lebanon, Spain, and Tunisia. This seemed the most fitting method for investigating topics with no abundant previous knowledge. To this purpose, focus groups have been conducted in the selected countries, in each country, in order to control for the different availability of finfish products, two groups of consumers have been analysed: seaside and inland residents.

The focus groups have been analysed with a qualitative two-steps research that yielded some interesting results. Going back to initial research questions, we can then provide some answer.

The first issue that has been investigated has been: "*How attributes of the product influence consumers' preferences in selected countries*?". Tunisian respondents appeared to be the only ones valuing blue fish, while all others preferred the characteristics of white fish. Wild caught fish is preferred by most of respondents with some exceptions found in some respondents from Southern Mediterranean. Lebanese respondents stated to be slightly price sensitive and preferring foreign frozen products and foreign certifications as concerned by local water pollution and, therefore, feared local fish products. Spanish respondents are the ones most preferring canned, frozen, and pre-packed fish and especially concerned for its convenience. While Italian respondents stated to be mostly concerned by freshness of the product embedding all other quality attributes and are the respondents who showed the highest level of trust towards the capacity of the supply chain in providing fresh and healthy fish.

The second issue to be investigated has been: "*How availability influences the perceptions between inland and seaside residents within each country*?". Therefore, comparing the inland vs. seaside focus groups we compared groups with different finfish availability levels. We have found that respondents from continental areas are concerned about accessibility of finfish, and this lowers their price sensitiveness (with low availability). Inland respondents are more prone to buy pre-packed and frozen fish to overcome the availability problem, sometimes they rely on peculiar forms that extend fish shelf-life, as salted cod. Seaside respondents also appear to be more knowledgeable about seasonality and preparation of fish and sometimes, they are less bothered by the cleaning of fish, stating even to enjoy this activity.

In the end, respondents showed a need of reassurance on freshness, quality, and healthiness of fish. Hence, information asymmetry reduction activities would be desirable, both in term of augmented traceability, and consumer's education. We must also acknowledge that respondents had conflicting purchasing motivations. For example, their desire to eat better tasting fish may compete with convenience, or healthiness. In fact, fresh fish is perceived tastier but requires a longer preparation time, whereas frozen food has a more detailed label and is boneless, but it is considered less tasty and less nutritious.

Our study provided some exploratory insights on finfish consumers' point of view on several countries, some of them neglected by previous literature as Tunisia and Lebanon, in which fish has a prominent role in consumers' diets and national economy. However, some limitations must be recognized: our sample has been based on a territorial categorization, but some deeper investigations on groups of consumers with specific socio-demographics variables would be desirable. Our study concerned the broad category of finfish, that is understood differently in those countries, with usually eaten species being very different from one another, therefore, narrowing the set of finfish species would add more actionable knowledge for the stakeholders. In the end, some limitations are embedded in the qualitative analysis that suits exploratory analysis but must rely on a limited number of participants which lack a representativeness and do not allow for generalization of results.

4. Consumer's segmentation based on fish attributes. A case study in Italy and Spain.

Saidi A. [1], Cavallo C.[1], Del Giudice T. [1]and Cicia G. [1]*

[1] University of Naples Federico II, Naples (Italy)

Under review

4.1. Abstract

Consumers are becoming more involved in the development of new products and services, and their food choice motives are gradually better understood. Consumer's involvement in the development of new goods and services is growing, and thus understanding food motives is crucial for fisheries stakeholders to manage fish value chain. In addition, traceability is becoming more prominent in guiding consumer's behaviour. Yet, the latter can be considered a source of confusion as the multiplication of certifications and labelling systems can be overwhelming. A national web-based survey was conducted on a representative sample of Italian and Spanish consumers. A set of 13 attributes was chosen to identify the most important factors guiding consumers choice and various groups in each population were identified using hierarchical cluster analysis. Results show various affinities to fish cues between Italy and Spain and shows how low is the percentage of consumers interested in traceability in general. Our findings could be useful for fish value chain stakeholders to better manage fisheries supply chain, educate consumers about fish species, and make choice making more sustainably conscious.

Key words: segmentation, consumer, behaviour, traceability, preferences, fish.

4.2. Introduction

Consumers make food decisions every day, and healthy eating habits have gained increasing attention in recent decades (Emilien et al., 2017; Paiva et al., 2012; Torpy et al., 2006; Turyk et al., 2012). Fish is widely accepted as an essential component of a balanced and healthy diet, especially for its long-chain polyunsaturated fatty acids (LCPUFAs), including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which offer several health benefits such as reducing the risk of cardiovascular diseases.(FAO, 2020b; Rimm, 2006; Ruxton, 2011).

Recent studies have focused on understanding the impact of seafood attributes on consumer preferences and decision-making processes (Januszewska et al., 2011; Macht, 2008). However, the interplay of different product and consumer-related characteristics needs further exploration to understand to what extent they contribute to consumer choice decisions (Cantillo et al., 2020; Maesano et al., 2020; Saidi et al., 2023; Vitale et al., 2017). Evaluating these determinants can be either positive or negative, representing drivers or barriers to fish consumption behaviour. Several determinants influence consumer's attitudes towards fish, such as sensory characteristics, fish species, quality labels, sustainability concerns, price, catch area, and production method (Heide & Olsen, 2017; Liem et al., 2018; Masi et al., 2022; Paredes et al., 2020). For example, positive drivers for fish consumption include

factors such as good taste, freshness, ease of preparation, fish species, quality labels, and catch area and production method (Cantillo et al., 2021; Heide & Olsen, 2017; Maesano et al., 2020; Zander & Feucht, 2018). Conversely, major barriers to fish consumption can be related to unpleasant sensory qualities such as distasteful smell, unpleasant taste or texture, and the presence of bones. Price is also a significant barrier to seafood consumption, and seasonality and sustainability issues can also affect consumer attitudes towards fish (Carlucci et al., 2015; Lawley et al., 2020; Murray et al., 2017; Pulcini et al., 2020).

In the last 20 years old, fish producers and processors have mostly undertaken a product differentiated strategy to raise their competitiveness. Yet, the COVID-19 pandemic has had a significant impact on the fisheries market, with disruptions in supply chains and changes in consumer behaviour (FAO, 2021). With the numerous health scares, consumers became more aware of the potential health risks associated with consuming seafood that is not properly traced, as well as the negative environmental impacts that can result from unsustainable fishing practices (Saidi et al., 2022). In response, governments, industry organizations, and retailers are implementing traceability systems to ensure that seafood products are safe, sustainable, and accurately labelled (Boström et al., 2005; Hobbs et al., 2005). These systems typically involve tracking the product from the point of catch or harvest all the way through to the final point of sale, using various technologies and data management tools (Jaffry et al., 2004; McClenachan et al., 2016; Ahmed Saidi et al., 2023). By providing more information about the origin, quality, and sustainability of seafood products, traceability systems can help to build consumer trust and promote more responsible practices in the seafood industry (Rodriguez-Salvador & Dopico, 2020).

In recent years, both Italy and Spain have seen a shift in consumer preferences for fish (Galati et al., 2022), with a growing demand for sustainable and locally sourced products. This trend is driven by a number of factors, including concerns over overfishing and the environmental impact of fishing practices, as well as a desire for high-quality, fresh seafood (Guidetti et al., 2010; Natali et al., 2022). In Italy, there has been a growing interest in traditional, regional fish dishes, particularly those made with lesser-known or underutilized species (Menozzi et al., 2015). Consumers are also increasingly looking for fish that is certified sustainable and traceable, with a preference for products that are caught or farmed locally (Iue et al., 2022). In Spain, there has been a similar trend towards sustainable and locally sourced fish (Saidi et al., 2022), with an emphasis on high-quality products that are both fresh and affordable.

Given the many options available to producers and processors to differentiate fish, we extend the current literature in two ways. First, we will assess to the importance of traceability related features when confronted with intrinsic and extrinsic cues. Then, we will provide insights regarding consumers segmentation in Italy and Spain to provide updated insights to policy makers, marketers, and fish producers about consumer typologies.

The primary objective of this research is to explore the impact of traceability-related features on consumer preferences and purchasing behaviour. Specifically, we aim to investigate the relative importance of traceability-related features when compared to other intrinsic and extrinsic cues, such as price, quality, and origin.

Moreover, this study seeks to identify different consumer segments in Italy and Spain, based on their attitudes and behaviours towards fish. By doing so, we aim to provide a more nuanced understanding of the various factors that drive consumer preferences and decision-making processes, which can inform targeted marketing strategies and policy interventions in the fish industry.

In this present study, the BW method will be employed to evaluate key attributes defining consumer preferences for fish features (E. Cohen, 2009). This method provides a structured and systematic approach to measuring consumer preferences and can be used to identify distinct consumer segments based on their ranking of products.

The reminder of the paper is organized as follows: section 2 provides an overview on the data collection and data analysis. In section 3 the results and discussions arising from the data analysis are reported, while in section 4, the main conclusions are drawn.

4.3. Materials and methods

4.3.1. Data collection and description

The data was collected in 2021-2022 by online surveys administered by professional marketing agencies for a representative sample of Italian (N =1000), and Spanish (N =1003) respondents responsible for food shopping stratified by age, gender, population density and area of residence. The data collection method complied with national ethical requirements as all subjects gave their informed consent to participate in the study, and all data was collected anonymously. The data was recorded and managed according to the "Italian Personal Data Protection Code"(Legislative Decree no. 196 of 30 June 2003, 2016) and to the general data protection regulation of the European union (Regulation (EU) 2016/679) ('GDPR')(General Data Protection Regulation, 2014).

The questionnaire consisted of two parts. The first part concerned respondents' choice associated with the BW experiment described in the next paragraph, aimed at identifying consumer preferences for 13 finfish attributes selected from the literature and reported in Table 3. The list of the attributes in the present study emerged from a recent systematic literature review (Saidi et al., 2022), and an exploratory research conducted in 4 Mediterranean countries (Saidi et al., 2022)

Table 3. Fish attributes used in the survey

Attribute categories	Fish attribute	Description	References
Traceability	**Quality label (MSC, BAP, FOS, ASC)**	The quality labels (MSC, BAP, FOS, ASC) are for products grown and processed according to special product-specific conditions.	(Ankamah-Yeboah et al., 2019; Cantillo et al., 2020a; X. Chen et al., 2015; Saidi et al., 2022)
	Fish species	Fish species are the various fish available in the market	(Pulcini et al., 2020; Rickertsen et al., 2017b; Risius et al., 2017b; Saidi et al., 2022)

Attribute categories	**Fish attribute**	**Description**	**References**
	Catch area	The place of origin where fish is caught (e.g. sea, river)	(Cantillo et al., 2020a; Maesano et al., 2020; Masi et al., 2022; Paredes et al., 2020; Saidi et al., 2022)
	Seasonality	Seasonal fish is caught only in the period that is dedicated for it.	(Saidi et al.; 2022, von Stackelberg et al., 2017)
	Wild caught fish	Fish caught in the sea.	(Güney, 2019; Saidi et al., 2022)
	Farmed fish	Fish that originates from aquaculture.	(Saidi et al. ; 2022, Claret et al., 2016; Güney, 2019)
Intrinsic cues	**Freshness**	Fish freshness is related to product intrinsic and extrinsic cues (e.g. freshly caught, good appearance, taste and quality)	(Alam & Alfnes, 2019; Lawley et al., 2012b; Nicolae et al., 2016; Wang et al., 2009; Saidi et al., 2022)
	Smell, appearance	The smell of fish (e.g. not smelly, very smelly)	(Grunert, 2005; Zuzanna Pieniak et al., 2008; Pohar, 2011; Saidi et al., 2022)
	Cleaned/ filleted	Fish that is cleaned and filleted	(Abdikoglu & Unakitan, 2019; Menozzi, Nguyen, Sogari, Taskov, et al., 2020, Saidi et al., 2022)
	Taste, consistency	The sensory features of fish (e.g. neutral, strong) and the consistency of fish meat (e.g. juiciness, tenderness)	(Lawley et al., 2012b; Pohar, 2011; Wim Verbeke, Sioen, & Brunsø, 2007)
Extrinsic cues	**Price**	The paid price for purchased fish	(Bronnmann & Hoffmann, 2018; Hinkes & Schulze-Ehlers, 2018; Rickertsen et al., 2017b; Risius et al., 2017b)

Attribute categories	**Fish attribute**	**Description**	**References**
	Physical state	Physical state of fish (e.g. fresh, frozen, defrosted)	(Polymeros et al., 2015; Saidi et al., 2022)
	Sustainable fishing	Sustainable fishing respects the laws and regulations aiming to protect fisheries from overexploitation.	(X. Chen et al., 2015; Hynes et al., 2019; Zander et al., 2018; Saidi et al., 2022)

The second part of the questionnaire collected socio-demographic data of respondents (e.g. gender, age, education, number of individuals within the household, children under 12 years in the household self-declared income and diet,) and fish consumption habits (the overall linking and the consumption frequency of fish in general. A nine-points Likert scale was used to assess consumers overall liking of fish ranging from 1 = not at all to 9 = a lot. Fish consumption frequency was assessed also using a single choice question with the following options: "Never"; "Once a year"; "Less than once a month"; "Once a month"; "2-3 times a month"; "Once a week"; "2 times a week"; and "More than 2 times a week".

4.3.2. Best-Worst method and clustering analysis

The Best-Worst Scaling (BWS) approach was used to classify consumer's preferences for 13 fish traits. The BWS—also known as maximum difference scaling was applied for the first time by Finn and Louviere (Finn & Louviere, 1992) in a study on food safety. It consists in iteratively asking interviewees to choose the most preferred ("best") and the least preferred ("worst") items of a choice set (Louviere et al., 2015).Therefore, forcing respondents to make trade-offs between items, BW scaling overcomes the issue of many attributes having similar importance weights and it provides more information about the ranking of the choice options in each set (Louviere et al., 2013). The number of items in a single choice set and the number of choice sets depend on the total number of items and the experimental design. Due to its advantage (i.e., it is free of bias), BWS was used in several studies on consumers' behavior (Auger et al., 2007; Burke et al., 2014), food preferences(Lusk, 1917),wine marketing(E. Cohen, 2009; Pomarici et al., 2017; Stanco et al., 2020) and consumers ethical beliefs(Auger et al., 2007) . Indeed, compared to other rating scales, BWS does not undergo cultural bias due to respondent background (E. Cohen, 2009) . Accordingly, it results in a valid and precise method for drawing up a ranking of consumers' preferences.

The current BW scaling experiment had a balanced incomplete block design (13,4,4,1)[3], i.e., 13 items divided into 13 choice sets with four items each, and every attribute appearing 4 times in the choice sets. Balanced indicates that every item appears the same number of times. The 13 items fish preferences related attributes are detailed in Table 3. Respondents were asked to choose between fish attributes according to which they considered the most (and the least) important in their choice of fish (Table 4).

Table 4. Example of choice set

	Most important	***Least important***
Fish species		
Price		
Physical state (fresh, frozen, defrosted)		
Sustainable fishing		

The ranking of fish traits was computed for every respondent individually and ultimately for the full sample by allocating a + 1 to each attribute that was described as the best and a -1 to each attribute that was mentioned as the worst. Adding the + 1s and -1s yielded a score (BW score) for each fish attribute, which was used to determine the final ranking. The experimental design was conducted in a way that each subject received a score ranging from -4 to + 4 for each attribute. While the BW score shows the prominence of an attribute, negative values imply below-average preference rather than dislike (Peano et al., 2019).

Moreover, a correlation matrix of the average BW scores depicts fish attribute preferences structure in Italy and Spain (Appendix, Table A 2 and Table A 3). A significant high correlation, for instance, indicates that two attributes vary in tandem. This makes it possible to identify the most essential features that lead consumers to choose fish and then identify different consumer's categories, each of which includes individuals with similar tastes.

In addition, a hierarchical Clustering analysis, was used to further analyse the heterogeneity underlying attribute importance among respondents and unveil patterns that may be used for market analysis (Sara R. Jaeger et al., 2008; Mueller & Rungie, 2009). As a consequence, clusters have been created with attribute BW scores as dependent variables. Hierarchical Clustering assumes that data is created by a probability distribution that defines a set number of latent clusters. The sub-samples generated by the hierarchical clustering were also characterized according to the demographic characteristics, preference, and consumption of fish. All analyses were performed using Stata14.0 software.

[3] 13 are the choice set, 4 is the repetition per level, 4 is the number of items in each choice set, 1 is the pair frequency.

4.4. Results and discussion

4.4.1. Sample description

In Italy, the survey has been filled by 50.4% females and 49.6% males. 29.7% of the respondents were between 55 and 77 years old, followed by 28.4% between 30 and 40 years old, 24% between 45 and 54 and lastly 17.8% between 18 and 29 years old. 53% of respondents are holders of high school diploma, 29.7% had bachelor degrees, 10.6% were secondary school diploma holders and consecutively, 3.2% and 3.5% were masters and PhD holders. 39.9% of the sample was made off employees, 19.7% were unemployed, 11.3% were freelancers, 7.6% were students, while 9.9% had different professions from the ones mentioned above. Regarding the living area, 51.4% of the respondents lived in internal areas, 21.4% and 21.1% lived, respectively, in seaside cities or near the seaside while only the 6% lived in mounting areas. 78.2% of the respondents did not have kids. 82.9% were omnivores. While 6.2% were pescatarians, 5.5% were flexitarians, 2.1% were vegetarians, 0.7% were vegans, while 2,7% had a particular diet related to personal food allergies and personal preferences (Appendix, Table A 4).

In Spain, the survey was completed by 50.3 % of males and 49.7% of females. 35% were between the ages of 55 and 77, 26.1 % were between 30 and 40 years old, 15% were between 45 and 54 years old, and 23.9% were between the ages of 18 and 29. 39.4% of respondents had a high school diploma, 37.8% had bachelor's degree, 11% had a secondary school diploma, and only 11.8% had a master's or PhD. 39.5% of respondents were employees, 20.7% were unemployed, 8.4 % were freelancers, 9.7% were students, and 10.8% worked in a field other than those listed above. In terms of living area, 40.7% of respondents reside in internal areas, 32.2 percent lived in seaside cities, and 22.7 percent lived near the sea. In terms of living area, 40.7% of respondents lived in interior areas, 32.2% and 22.7% lived in seaside cities or near the seaside, respectively, and just 4.4% live in mounting areas. 33% of respondents did not have children, and 54.2% were omnivores (Appendix, Table A 4).

4.4.2. Average Best-Worst score analysis

The number of times each attribute was indicated as best (B), most important, and worst (W), least important, were used to calculate the BW score by subtracting the number of times the attribute was selected as worst from the number of times it was selected as best. The BW score was divided over the total number of respondents (n) in the sample to compute the average BW score (B–W)/n.

Table 5 and Table 6 provide a summary of the best to worst scores for Italian and Spanish consumers. Italian consumers selected freshness, smell/appearance and taste/consistency as the most important attributes when making their decision choice. Italians rely on intrinsic product properties when making their choice. The findings suggested the importance of sensory cues in selecting fish as previously documented by Saidi et al., (2023) Carlucci et al., (2015), Murray et al., (2017) and Saidi et al., (2022). Generally, freshness is a key determinant in influencing fish consumption, in the current study this

attribute was considered to be main driver for Italian consumers to purchase fish (Giosuè et al., 2018; Lawley et al., 2020). The positive importance of freshness is mainly linked to the nature of the product. Consumers associate fresh fish with less health risks and minimal use of hormones and drugs during the production process (Zander & Feucht, 2018).

Moreover, previous studies showed the importance of fresh fish, and its association with several other intrinsic and extrinsic cues (health, taste, quality, origin, firmness of fish meat, colour, overall appearance) in shaping consumers' preferences for some particular fish species more than others (Giosuè et al., 2018; Lawley et al., 2020; Paredes et al., 2020; Pulcini et al., 2020; Zander et al., 2018). In the current study, our findings show how Italian consumers rely on their own judgement rather than trust information provided by sellers (origin, production method, seasonality , price, fish species)The quality label attribute ranked immediately after inherent product traits. The use of labels to highlight specific product traits and content of products has a relatively long history (Potts & Haward, 2007). Bronnmann and Hoffmann, (2018) demonstrated that the presence of a label increased consumers' wtp for the fish. In the current study, labels and quality certifications also contribute to Italian choice making. Then, the attribute sustainable fishing scored immediately after quality label attribute, consumers valued the environmental sustainability of fish once they had more information about the product (Alam & Alfnes, 2019; Lawley et al., 2020; Menozzi, Nguyen, Sogari, & Taskov, 2020), suggesting that the latter is of secondary interest for the average Italian fish eater.

Table 5. Sample-level BW scores and average BW scores, Italy

Fish attributes	Best scores	Worst scores	BW scores	Average BW scores	Sqrt |B/W|	Standardized ratio scale (%)	Standardized importance weights scale (%)
Freshness	2527	-166	2360	2.35	3.90	100	22
Smell/appearance	1708	-279	1428	1.42	2.47	64	14
Taste/consistency	1354	-278	1075	1.07	2.21	57	12
Quality label	892	-206	686	0.68	2.08	53	12
wildly caught fish	1080	-596	485	0.48	1.35	35	8
Sustainable fishing	1016	-737	280	0.27	1.17	30	7
Physical state	1350	-1024	326	0.32	1.15	29	6
Seasonality	783	-1208	-424	-0.42	0.81	21	5
Price	668	-1328	-659	-0.65	0.71	18	4
Cleaned/filleted	565	-1749	-1185	-1.18	0.57	15	3

Catch area	481	-1724	-1243	-1.23	0.53	14	3
Fish species	341	-1465	-1124	-1.12	0.48	12	3
Farmed fish	202	-1437	-1236	-1.23	0.37	10	2
Total					17.80		100

While Spanish consumers selected fish species, followed by farmed fish and cleaned/filleted traits as the most important attributes when choosing fish. Spain has the highest per capita fish consumption in Europe, with 42.4 kg/capita (European Environment Agency, 2016). The exposure of Spanish consumers to fish might be the reason behind their huge interest in fish, its production method and commodity of use. Numerous empirical evidence have demonstrated that the perceived difficulty in preparing fresh fish has a negative influence on purchasing behaviour (Altintzoglou et al., 2010; Carlucci et al., 2015). As a result, Spanish respondents placed a high value on fish is ready to be cooked, in line with previous studies by Heide & Olsen, (2017), Cusa et al., (2021) and Cantillo et al., (2020). In addition, farmed fish is usually more available compared to wild caught alternatives as it is accessible all year round and doesn't depend on seasonality (Claret et al., 2014), and thus, consumers can have an attitude-behaviour gap and choose the most convenient option over the fresh one (Ankamah-Yeboah et al., 2019; Pulcini et al., 2020). Furthermore, price ranked fourth after the Cleaned/filleted attribute. Although Price is an important attribute for all types of purchases, as consumers usually come up with a value judgment, that is behind every purchase decision when comparing price and quality (Steenkamp & van Trijp, 1996), this seems to not be valid for Spanish consumers. In the current study, fish cues, related to consumers level of knowledge, commodity and availability overpowered price, and consequently Spanish consumers appear to be shifting their purchasing habits toward foods that are more suited to their modern lifestyle.

Table 6. Sample-level BW scores and average BW scores, Spain

Fish attributes	**Best scores**	**Worst scores**	**BW scores**	**Average BW scores**	**Sqrt B/W**	**Standardized ratio scale**	**Standardized importance weights scale**
Fish species	1541	-207	1334	13.34	2.73	100	19
Farmed fish	1067	-172	895	8.95	2.49	91	17
Cleaned/filleted	1456	-707	749	7.49	1.44	53	10

Fish attributes	**Best scores**	**Worst scores**	**BW scores**	**Average BW scores**	**Sqrt B/W**	**Standardized ratio scale**	**Standardized importance weights scale**
Price	1276	-863	413	4.13	1.22	45	8
wildly caught fish	915	-763	152	1.52	1.10	40	7
Seasonality	907	-815	92	0.92	1.05	39	7
Catch area	423	-431	-8	-0.08	0.99	36	7
Physical state	893	-999	-106	-1.06	0.95	35	6
Quality label	816	-1037	-221	-2.21	0.89	32	6
Sustainable fishing	115	-232	-117	-1.17	0.70	26	5
Smell/appearance	332	-1523	-1191	-11.91	0.47	17	3
Taste/consistency	291	-1436	-1145	-11.45	0.45	16	3
Freshness	157	-2281	-2124	-21.24	0.26	10	2
Total					14.73	539	100

Italian and Spanish consumers had diametrically opposed preferences. While Italians ranked top in terms of sensory product qualities and freshness, Spanish consumers ranked lowest. Likewise, Spanish people scored higher for fish species, farmed fish, and cleaned cleaned/filleted features compared to Italians. The Global demographic and socio-economic trends such as a growing and increasingly affluent population and rising urbanisation, are shifting consumption and production patterns (European Environment Agency, 2016; Senker, 2011). Since the 1960s, fish and seafood supply in Spain was higher compared to Italy, reaching 122 grams/ person/day, showing a faster transition towards western diet among Spanish consumers (Garcia-Closas et al., 2006). As a result of their exposure to fish, Spanish customers may place less emphasis on intrinsic fish features, instead they choose to focus on convenience, fish species, and whether the fish is farmed or not.

4.4.3. Cluster analysis

In the current study, we utilized BW scores and hierarchical cluster analysis to find homogenous groups of customers with similar preferences for fish qualities. The higher the BW score for an attribute, the more significant the attribute is for the respondent group. Hierarchical cluster analysis presupposes that individuals belong to one of k clusters, the size and number of which are unknown a priori. Furthermore, hierarchical clustering implies that there are distinct clusters of consumers with similar preferences within segments but considerably different preferences across clusters (S. C. Johnson, 1967; Nielsen, 2016)

We identified homogeneous consumer groups in Italy and Spain using the Duda-Hart Je(2)/Je index to select the optimal number of segments (Halpin, 2016). ANOVA tests were undertaken to assess whether segments differed significantly in the importance of each attribute, using the BW score as an indicator of attribute-related importance. Specifically, ANOVA F statistics tests BW scores across clusters against the null hypothesis that they are statistically equal across clusters. Subsequently, post-hoc Tukey tests investigated the pairwise statistical significant differences ($p < 0.05$) among the cluster means.

The information reported in the last column of Table 7,Table 8,Table 9, and Table 10 show that consumer's preferences differ from one group to another, and great variance exist, also among clusters' mean scores assigned to fish attributes.

In Italy, four groups of consumers were defined as: "*Price insensitive consumers", "Traceability enthusiasts", "Sensory sensitive consumers", and "Traditionalists"*.

The first group of Italian consumers were dubbed *"price insensitive consumers"* (29% of the sample). Consumers in this segment valued freshness (2.92), Smell/appearance (1.83), and Taste/consistency (1.24) the most. While they showed less interest in price (-1.97), catch area (-1,39) and cleaned/filleted (-2.25) attributes. These findings are in line with previous research showing how fish choice rely mainly on intrinsic factors (Saidi et al., 2022; Saidi et al., 2023). Price insensitive consumers considered price non crucial when buying fish, the high income of individuals in this group made them less sensitive to the expensive nature of fish. Previous studies proven the importance of price when buying fish for low-income consumers (Carlucci et al., 2015), and thus stressing how consumers in this group showed more interest on quality related attributes rather than price. In addition, price insensitive consumers did not compromise on their expectations when it came to freshness regardless of how large their families were, in line with previous outcomes by Tomić et al., (2016). In addition, the presence of children in households may also be a major reason behind attribute importance, as adults often feel responsible to ensure healthy and safe food for their children (Kelly et al., 2006).

The second Italian consumers group, "Traceability enthusiasts" (13% of the sample), valued quality label (1.93), freshness (2.07), and sustainable fishing (2.26) the most, while they were less interested

whether fish was cleaned filleted (-2.21), whether fish is farmed (-1.01), and price (-2.11). In addition, consumers in this group had the highest average for fish preference (8.3) and fish frequency (5.4) consumption compared to all other segments. Traceability enthusiasts regrouped people who were old (2.8), with large families (3.0) and living near the seaside (2.5). A clear connection between price and ecolabelling does exist, in line previous studies by Brécard et al., (2009) and McClenachan et al., (2016) where consumers were willing to pay more for an eco-labelled or socially responsible product. Spanish consumers disregarded price when making their choice to be sure of fish quality that is supported by a label or a specific certification organization, and thus demonstrating how price and quality labels were on the opposite end of the Spectrum for this group. In addition, this group's interest in sustainable fishing can be attributed to a demand for a quality label that generally guarantees ethical exploitation of marine resources and sustainable fishing practices (Gambelli et al., 2019). Furthermore, in line with previous studies by Grimsrud et al., (2013), Wenaty et al., (2018) and Saidi et al., (2022), consumer's interest in fish attributes is strongly driven by biological and socio-demographic factors, with older individuals being most likely interested in fish labels and product safety due to higher health concerns.

The third group of Italian consumers, *"Sensory sensitive consumers"* (35% of the sample) was the largest. *"Sensory sensitive consumers"* valued Smell/appearance (1.91), freshness (2.78), and taste/consistency (1.55) the most. While they were less interested with catch area (-1.96), fish species (-1.40), cleaned/filleted (-0.79) and farmed fish (-1.67) attributes. In addition, this cluster of consumers mainly lived in internal or mountainous areas (2.5) and had the lowest education level (2.3) out of all clusters. Previous findings by Pulcini et al., (2020), Antão-Geraldes et al., (2020), and Rickertsen et al., (2017) demonstrated the importance of sensory and physical characteristics in defining consumers' choice. Sensory, and physical features could be therefore used as a proxy to address consumer's concerns about fish quality and health risks, and highlight other features as origin, production method, sustainability, and animal welfare to engage consumers in the protection of marine resources. Moreover, the low educational level in this group may be contributing to the lack of interest for fish species. Previous studies by Can et al., (2015), Uddin et al., (2019), and Myrland et al., (2000) found out that consumers holding bachelor's degrees are more open to varying species in their intake. Thus, educating consumers by promoting underutilised fish species throughout mass and social media could help to revive the consumption of forgotten or cheaper fish species currently neglected due to health claims around popular fish species as salmon or tuna. On top of that, living area is proven to define fish overall preference and consumption. The main pattern characterizing fish consumption is linked to proximity with seaside as people living nearby the sea generally have a higher fish consumption compared to inland residents (Bose & Brown, 2008; Saidi et al., 2022; Verbeke & Vackier, 2005).

Lastly, the fourth group of Italian consumers, *"Traditionalists"* (23% of the sample), valued freshness (1.15) the most while all the other attributes didn't contribute to defining their choice. Additionally,

they had the lowest preference (6.4) and consumption frequency (4.5) of fish among all clusters, leading to their lower seafood product requisitions. *Traditionalists* were the youngest and had the lowest income level compared to the other groups. Many scholars demonstrated a generational gap in consumer's food preferences, as younger people were found to be more open in their fish consumption habits (Kaimakoudi et al., 2013; Pulcini et al., 2020; Supartini et al., 2018). Furthermore, higher income levels were proven to be generally associated with higher dietary fish intake (Rahman & Islam, 2020). Accordingly, the level of income and age of Italian *"Traditionalists"* determine whether to eat more fish or not.

Table 7. Heterogeneity of preferences for product attributes according to BW scores, Italy

Clusters	Price insensitive group (n =287)	Traceability enthusiasts (n =136)	Sensory sensitive consumers (n =351)	Traditionalists (n =229)	F stats
Quality label	0.62 (a)	1.93 (b)	0.28 (c)	0.64 (a)	62.90*
Fish species	-1.23 (a)	-1.13 (a)	-1.40 (a)	-0.55 (b)	15.44*
Catch area	-1.39 (a)	-0.76 (b)	-1.96 (c)	-0.24 (d)	59.09*
Freshness	2.92 (a)	2.07 (b)	2.78 (c)	1.15 (d)	100.47
Price	-1.97 (a)	-2.11 (a)	0.88 (b)	-0.51 (c)	187.30*
Physical state	1.24 (a)	-0.80 (b)	0.49 (c)	-0.41 (d)	55.46*
Sustainable fishing	0.48 (a)	2.26 (b)	-0.54 (c)	0.11 (d)	94.32*
wildly caught fish	1.20 (a)	0.84 (b)	-0.12 (c)	0.31 (d)	38.85*
Seasonality	-0.94 (a)	0.70 (b)	-0.36 (c)	-0.55 (c)	28.89*
Farmed fish	-1.01 (a)	-1.40 (b)	-1.67 (c)	-0.75 (d)	32.88*
Cleaned/filleted	-2.25 (a)	-2.21 (a)	-0.79 (b)	0.16 (c)	99.37*
Taste/consistency	1.24 (a)	0.51 (b)	1.55 (c)	0.46 (b)	43.46*
Smell/appearance	1.83 (a)	0.28 (b)	1.91 (a)	0.85 (c)	59.06*

Note: The asterisk (*) in the last column indicates an F test p-value < 0.05, rejecting the null hypothesis of equality of mean values across groups. BW scores bearing the same letter on the same row were not significantly different according to pairwise Tukey test ($p < 0.05$).

Table 8. Cluster differences in terms of respondent socio-demographics and fish consumption habits, Italy

Clusters	**Price insensitive group (n =287)**	**Traceability enthusiasts (n =136)**	**Sensory sensitive consumers (n =351)**	**Traditionalists (n =229)**	**F stats**
Fish preference	8.3 (a)	8.1 (a)	7.7 (b)	6.4 (c)	63.25*
Fish frequency consumption	5.4 (a)	5.4 (a)	5.0 (b)	4.5 (c)	25.79*
Sex	1.5 (a)	1.4 (a)	1.5(b)	1.6 (a)	1.80
Age range	2.8 (a)	2.8 (a)	2.6 (b)	2.4 (c)	9.52*
Living area	2.3 (a)	2.5 (b)	2.5 (b,c)	2.4 (b)	4.30*
Education	2.3 (a)	2.5 (a)	2.3 (a)	2.4 (a)	1.99
Job	3.3 (a)	2.9 (b,c)	3.1 (b)	2.6 (c)	10.44*
Income	2.8 (a)	2.4 (b)	2.5 (b)	2.4 (b)	4.05*
Family	3.2 (a)	3.0 (a)	2.9 (b)	3.1 (a)	4.22*
Kids	1.8 (a)	1.8 (a)	1.8 (a)	1.7 (a)	4.95*
Diet	3.3 (a)	3.2 (a)	3.2 (b)	3.2 (a)	2.01

Note: The asterisk (*) in the last column indicates an F test p-value < 0.05, rejecting the null hypothesis of equality of mean values across groups. BW scores bearing the same letter on the same row were not significantly different according to pairwise Tukey test ($p < 0.05$).

In Spain, four groups of consumers were defined as: *"Price conscious consumers", "Sensory insensitive consumers", "Traditionalists" and "Traceability enthusiasts".*

The first group of Spanish consumers were *"Price conscious consumers"* (27% of the sample). Respondents in this segment valued price (1.86) and cleaned/filleted (1.80) attributes, as the most important in their choice making. While they were less interested with quality label (-1.54), freshness (-2.29), and taste/consistency (-0.69) attributes. In addition, "*Price conscious consumers"* were the oldest (2.91), and with the second lowest income (2.14) compared to other groups. Several scholars highlighted how fish products with quality labelling and certification systems are more expensive compared to non-certified fish products (Ankamah-Yeboah et al., 2019; Maesano et al., 2020). consumer's fish expenditure is also affected by income and price (Cantillo et al., 2021; Onyeneke et al., 2020). Price is often regarded as an indication of freshness by consumers, who believe that higher priced fish is more likely to be fresh compared to the cheaper alternatives (Wenaty et al., 2018), and thus explaining why "*Price conscious consumers"* prioritized price and valued less factors indicating product quality when making their choice.

The second group of Spanish consumers were "*Sensory insensitive consumers"* (24 % of the sample). Consumers in this segment valued fish species (1.60), and price (1.17) as the most important features in their decision choice. While they were less interested with Smell/appearance (-1.95), taste/consistency (-1.78), and freshness (-2.74). "*Sensory insensitive consumers"* preferred (8.00) and consumed (5.97) fish the second best out of the 4 clusters. In addition, this group had the highest income (2.83), and education level (2.73) compared to the other groups. In line with previous studies highlighting the importance of income and education level for consumers fish choice (Can et al., 2015; Rahman & Islam, 2020; Uddin et al., 2019), the effect of price on consumer's choice seems to overlap with the level of income, as high-income Spanish respondents considered price crucial but not limiting their intake.

The third group of Spanish consumers were "*Traditionalists"* (23 % of the sample). Consumers in this segment preferred (6.15) and consumed (4.65) fish the least out of all 4 clusters. Except for price and fish species, none of the selected attributes were considered more important than the others by this group. Traditionalists were the youngest (1.85) and those with lowest education level (2.39). "*Traditionalists"* are not fish eaters and thus their low appreciation of fish attributes. Similar to Italian consumers, the young age of respondents may contribute to their level of knowledge, product cues are less important to younger people in general.

The fourth and last group of Spanish consumers were dubbed "*Traceability enthusiasts"* (26 % of the sample). Consumers in this segment valued fish species (1.73) followed by farmed fish (0.88) and quality label (0.74) the most. While they were less interested with freshness (-2.32), price (-2.27), taste/consistency (-1.39) and smell/appearance (-1.31). In addition, this group had the lowest income level and the second lowest fish consumption frequency compared to "*Sensory insensitive consumers"*, "*Traceability enthusiasts".* Fish consumption is usually dictated by income, still traceability enthusiasts didn't scale down their fish intake, instead they leaned towards fish species that are not expensive. Furthermore, the popularity of farmed fish may be a direct result of this segment's general low income. Several scholars highlighted the price gap between wild caught and farmed fish, and how farmed fish is an essential alternative for people with low income to include this food more often in their diet (Bronnmann & Hoffmann, 2018; Cantillo et al., 2021; Carlucci et al., 2015; Hinkes & Schulze-Ehlers, 2018; Onyeneke et al., 2020).

Table 9. Heterogeneity of preferences for product attributes according to BW scores, Spain

Clusters	**Price conscious consumers (n =268)**	**Sensory insensitive consumers (n =240)**	**Traditionalists (n =234)**	**Traceability enthusiasts (n =258)**	**F stats**
Quality label	-1.54 (a)	0.63 (b)	-0.65 (c)	0.74 (b)	100.06*
Fish species	1.00 (a)	1.60 (b)	1.00 (a)	1.73 (b)	18.21*
Catch area	-0.18 (a)	0.11 (b)	-0.13 (c)	0.17 (b)	8.46*
Freshness	-2.29 (a)	-2.74 (b)	-1.09 (c)	-2.32 (a)	68.14*
Price	1.86 (a)	1.17 (b)	0.94 (b)	-2.27 (c)	300.31*
Physical state	0.50 (a)	-0.72 (b)	-0.57 (b)	0.25 (c)	35.84*
Sustainable fishing	-0.43 (a)	-0.09 (b)	0.00 (b)	0.08 (c)	45.37*
wildly caught fish	-0.71 (a)	0.48 (b)	0.66 (b)	0.27 (b)	40.83*
Seasonality	0.01 (a)	-0.39 (b)	0.38 (c)	0.36 (c)	14.89*
Farmed fish	0.97 (a)	1.10 (a)	0.62 (b)	0.88 (b)	8.30*
Cleaned/filleted	1.80 (a)	1.05 (b)	-0.43 (c)	0.45 (d)	69.21*
Taste/consistency	-0.60 (a)	-1.78 (b)	-0.84 (c)	-1.39 (d)	39.68*
Smell/appearance	-0.56 (a)	-1.95 (b)	-1.00 (c)	-1.31 (d)	35.18*

Note: The asterisk (*) in the last column indicates an F test p-value < 0.05, rejecting the null hypothesis of equality of mean values across groups. BW scores bearing the same letter on the same row were not significantly different according to pairwise Tukey test ($p < 0.05$).

Table 10. Cluster differences in terms of respondent socio-demographics and fish consumption habits, Spain

Clusters	**Price conscious consumers (n =268)**	**Sensory insensitive consumers (n =240)**	**Traditionalists (n =234)**	**Fish species enthusiasts (n =258)**	**F stats**
Fish preference	8.02 (a)	8.00 (a)	6.15 (b)	7.01 (c)	68.57*
Fish frequency consumption	6.01 (a)	5.97 (a)	4.65 (b)	5.00 (c)	82.11*
Sex	1.50 (a)	1.51 (a)	1.51 (a)	1.48 (a)	0.18
Age range	2.91 (a)	2.78 (a,c)	1.85 (b)	2.84 (c)	47.42*
Living area	2.09 (a)	2.14 (a)	2.32 (b)	2.16 (a)	2.75*
Education	2.47 (a)	2.73 (b)	2.39 (a)	2.43 (a)	8.41*

Clusters	Price conscious consumers (n =268)	Sensory insensitive consumers (n =240)	Traditionalists (n =234)	Fish species enthusiasts (n =258)	F stats
Job	3.05 (a)	2.93 (a)	3.03 (a)	3.61 (b)	10.85*
Income	2.14 (a)	2.83 (b)	2.10 (a)	2.03 (c)	18.70*
Family	2.97 (a)	3.05 (a)	3.43(b)	2.86 (d)	10.04*
Kids	1.63 (a)	1.70 (b)	1.55 (c)	1.78 (d)	11.19*
Diet	3.97 (a)	3.96 (a)	3.85 (a)	3.97 (a)	0.40

Note: The asterisk (*) in the last column indicates an F test p-value < 0.05, rejecting the null hypothesis of equality of mean values across groups. BW scores bearing the same letter on the same row were not significantly different according to pairwise Tukey test ($p < 0.05$).

In Italy, three out of four clusters considered freshness a fundamental element in their purchasing decisions. This outcome could be a due to an overlap between sensory attributes, physical features, and freshness as previous scholars found out the importance of fresh fish and its association with several intrinsic and extrinsic traits like health aspects, taste, quality, and origin in shaping consumers' preferences (Alam & Alfnes, 2019; Birch & Lawley, 2012; Saidi et al., 2023; Verbeke, Sioen, Brunsø, et al., 2007). "Traditionalists", on the other hand, were less interested in the freshness of the fish. This could be due to the typology of consumers in this segment, who are younger and considered healthier and therefore less concerned about what they eat. While Spanish consumers did not attach much importance to the freshness and sensory characteristics of fish, their decision-making depended more on the type of fish, the production method and convenience. The choice of Spanish consumers could be related to the availability of seafood in Spain, as Spain is one of the most important European fishing countries in terms of production, employment, fleet, consumption and aquaculture (José Ruiz-Chico et al., 2020). Furthermore, the overall higher preference, consumption, and exposure to seafood in Spain could be the reason why people are less neophobic towards fish.

Generally, when consumers' health is impaired, they often cannot immediately or definitively attribute the disease to a certain food. Moreover, consumers cannot observe the production process, thus leading to information asymmetry in food safety information attributes (Hobbs, 2004). Food traceability systems are used to monitor food production and distribution by generating a reliable continuous flow of safety information in the supply chain, to identify the source of the problem, and recall related products through traceability (van Rijswijk et al., 2008). These systems are, therefore, considered a major tool for the effective elimination of information asymmetry and the fundamental prevention of food safety risks (Ahmed Saidi et al., 2023). Still, they are still unable to address consumers concerns regarding sea goods Therefore, the latter should be utilized to educate, disseminate and inform

consumers about fish. Particularly, producers and marketers should focus mainly on educating consumers on the sensory and physical attributes of fish species, then inform them about product origin production process, and the impact of their behaviour on the sustainability and animal welfare of fisheries sector, enabling to make consumers more conscious about the role of their choice in ensuring a sustainable exploitation of marine resources.

4.5. Conclusion

In this study, we employed Best-Worst Scaling (BWS) analysis to confront the characteristics of traceability related to fish with other cues among a representative sample of Italian and Spanish consumers. Our objective was to evaluate the relationship between traceability features, intrinsic and extrinsic cues, and sociodemographic factors, as well as the influence of consumer typologies on purchasing behavior in these two countries.

Comparing the results in Italy and Spain, the cross-country comparison revealed notable differences in consumer preferences for fish between Italy and Spain. The Italian sample placed greater importance on intrinsic qualities of fish, including freshness, sensory and physical characteristics, and quality labels, while Spanish respondents prioritized factors such as preparation method, price, and farmed vs. wild fish. These findings have implications for the development of sustainable food systems and mitigation of food safety risks and foodborne illnesses. In Italy, stakeholders across the production, processing, distribution, wholesale, and retail sectors may need to adopt new practices to ensure the availability of safe and traceable fish that meets consumer expectations for sensory attributes such as freshness, aroma, texture, and taste. Meanwhile, in Spain, fish producers and industries may need to consider the specific needs and preferences of Spanish consumers, including their preferred fish species and convenience requirements, to effectively cater to their demand.

Furthermore, the results of the cluster analysis show that consumer's preferences in both countries are very fragmented, and this fragmentation depends mainly on the socio-demographic characteristics of the identified clusters. Age, income, education level, place of residence and household size determine both consumer's response to the different fish attributes and consumption levels. The findings suggest that targeted marketing strategies and tailored product offerings based on demographic factors may be more effective in promoting seafood consumption among Italian and Spanish consumers. Retailers and producers can use this information to better understand and meet the needs and preferences of different consumer groups, potentially increasing sales and improving consumer satisfaction. Additionally, the results highlight the importance of traceability and the role it plays in shaping consumer behavior, indicating a need for continued investment in traceability technology and infrastructure to meet consumer demand for transparent and sustainable seafood sourcing practices.

Thus, governments should encourage manufacturers to produce traceable fish with food quality inspection via customization through subsidies and other policies to meet consumer demand for safe food and to reduce the spread of foodborne diseases. In addition, as supply chain traceability is a basic requirement of consumers, ex post traceability should cover all the risk processes of the entire food supply chain. Furthermore, governments should support manufacturers in producing multi-level safe food to meet diverse consumer demand and gradually promote the construction of a traceable food market system, and manufacturers should dynamically adjust their production and marketing strategies for different types of safe food based on consumer preferences. This could be achieved throughout the implementation of a traceability platform combining blockchain, QR code, and RFID tags to minimize human intervention, deter frauds, and ensure a reliable and accurate access to information for all users. Still, fish producers may not see a significant return on investment for implementing traceability measures, as consumers are not willing to pay a premium for these products. This could lead to a situation where only a small proportion of fish products are traceable, and where traceable products are only available at a premium price point.

Our findings, however, are not free from limitations. One of these shortcomings is related to the way the attributes used for the BW experiment were described and how they were interpreted by individual consumers. In addition, the BW method uses an unrealistic map experiment, which could reduce the external validity of the results. Furthermore, the order in which items are presented in a BWS survey can influence the responses. Consumers may be more likely to choose the "best" item if it is presented first, or the "worst" item if it is presented last. Moreover, consumers' choices in a BWS survey may be influenced by the context in which the survey is conducted, such as the time of day or the consumer's mood. Lastly, BWS results may not be generalizable to other contexts or populations, as preferences and priorities can vary across different groups of consumers.

In an attempt to overcome one of the main limitations of the current study, it would be worthwhile to analyse consumer's attitudes and preferences for selected fish attributes defined in more detail. A more realistic research design for higher external validity of the results is needed. This could be achieved, for example, the use of experimental markets or grocery stores to replicate the features of a real-world marketplace, such as the physical layout, product assortment, and pricing structures. (Huang & Oppewal, 2006). Combining BWS with other research methods, such as focus groups or in-store experiments, in future studies to gain a more comprehensive understanding of consumer preferences or exploring alternative methods for measuring consumer preferences, such as conjoint analysis or adaptive choice-based conjoint analysis, might offer greater scale sensitivity and reduce order bias. Finally, the outcomes of the present study may not be transferable to other geographical contexts. Thus,

conducting BWS surveys in multiple contexts or with diverse populations will contribute to assess the generalizability of the results, particularly within the Mediterranean region.

5. Healthiness, appearance, or fashion? The drivers behind sushi consumption: evidence from a national sample survey in Italy.

*Cavallo C[1]., Carfora V.[2], Cicia G.[1], Di Monaco R.[1], Puleo S[1]., Saidi A.[*1] and Del Giudice T.*

[1] *University of Naples Federico II, Naples (Italy)*

[2] *Catholic University of the Sacred Heart (Italy)*

Under review

5.1. Abstract

Cultural globalization morphed people's diets around the world and accelerated the expenditure of sushi. Plus, the ongoing food scandals related to food security made traceability crucial in consumer's choice, particularly for raw fish consumption. This paper aims to identify the main drivers behind sushi eating in Italy and how does traceability impacts consumers decision making process. A national web-based survey was conducted on a representative sample of 993 Italian consumers. Data analysis included calculation of Cronbach's alpha, ANOVA tests, confirmatory factor analysis and two models using structural equation modelling. The results show that social pressure, and attitude towards sushi were main drivers behind sushi consumption frequency. While sensory appeal and neophobia reduced sushi intake among Italians. Neophobia was also found to be correlated to consumers general food choice motives. Most importantly, consumers who considered traceability crucial for their food choice had a lower sushi intake. The findings of this study may be relevant to different stakeholders such as local regulatory bodies, policy makers, and food industry that aim to implement traceability systems and increase their compactivity in the food market.

Key words: Sushi, consumer, preferences, ethnic, fish. traceability

5.2. Introduction

Since the 20th century, globalization substantially contributed to the homogenization of consumption habits (Leng et al., 2017; Upadhyay, 2014). This phenomenon has been related to the convergence of lifestyles of different groups of people from all over the world, as well as the decreasing significance of local customs (Cicia et al., 2012; Hanus, 2018). This affected worldwide diets and the rise of ethnic foods (Lehel et al., 2021). As a result, Japanese sushi[1] cuisine become among the most popular foods in the US, with the number of sushi restaurants quadrupling between 1988 and 1998 (Hsin-I Feng, 2012). This process replicated in Europe and East Asia, making sushi renowned worldwide (Hsin-I Feng, 2012). sushi benefits also from a health halo (Daschner, 2016; Hsin-I Feng, 2012). Similar to fish, sushi is low in fat, calories, cholesterol and unusual enough to appeal to increasingly adventurous eaters (Mouritsen, 2009a).

In Italy, sushi has been available for about 40 years. Its arrival in the 1970s was helped by restaurants such as Poporoya in Rome. In 1989, Poporoya founded in Milan one of the first high-quality and low-price sushi restaurants, in opposition to other sushi-bars, considered fashionable and expensive

(Cwiertka, 2001). According to the last study conducted by Nielsen for the Norwegian Seafood Council (2019), Italian grocery sales of ready-to-eat sushi increased by 43%. As reported by the "Survey on Japanese Restaurants and Japanese Food Ingredient Distribution in Italy" issued by JETRO (Japan External Trade Organization) in August 2019, about 1,000 Japanese restaurants in Italy have been listed on Trip advisor website (Fanelli & Di Nocera, 2018). The success of sushi in Italy is partly due to the freshness and reduced number of ingredients (Fanelli & Di Nocera, 2018). In addition, Japanese cuisine benefits from a naturalness halo (Cwiertka, 2005; Jang et al., 2009; Wahlqvist & Lee, 2007). However, sushi remains far from traditional Italian cuisine, both for aspect and taste, therefore the reasons for the great interest cannot be ascribable familiarity (Keys et al., 1986). Also, it is not know why it reached far more success than any other ethnic food and obtained glamour and luxury perception (Sakamoto & Allen, 2011).

When considering the willingness to consume sushi, there are numerous factors to take into account. These can include the sensory appeal of the food, natural content, health benefits, price, convenience, and individual traits of consumers, such as food neophobia and stress/mood conditions (Carfora, Cicia, et al., 2021; Mascarello et al., 2020; Onwezen & Bartels, 2013; White & Argo, 2009). Social aspects, such as social norms based on the perception of behaviour and the opinions of others (e.g. family or friends), as well as contextual effects (e.g. cultural, economic, and legal factors), are also influential in shaping consumer behaviour towards sushi and other new or ethnic foods (Heffler et al., 2011; Lehel et al., 2021; Mouritsen, 2009). The prevalence of health risks associated with raw or undercooked fish consumption, as found in sushi, is a particular concern for Italian consumers, given their high awareness of such risks in regions where raw fish consumption is popular (Morales & Higuchi, 2020; Sirot et al., 2011).

Food safety is a crucial issue for the food industry, with particular concern for seafood due to issues such as mislabelling and the potential risk of parasitic zoonoses associated with the consumption of raw or undercooked fish or shellfish, as commonly found in sushi (Baptista-Fernandes et al., 2017; Cawthorn et al., 2015; Di Pinto et al., 2015; Warner et al., 2013). Italian consumers, in particular, are highly aware of the health risks posed by raw fish consumption, especially in regions where it is popular. Studies have shown a high prevalence of Anisakis hypersensitivity among Italians, especially in coastal areas where marinated anchovies are commonly consumed (Pampiglione et al., 2002; Pozio et al., 2013) (Fumarola et al., 2009; Maggi et al., 2000; Mattiucci et al., 2013; Ugenti et al., 2007). Therefore, ensuring the safety and traceability of seafood products is of paramount importance for both the food industry and consumers in Italy and beyond, and measures should be taken to address these concerns and ensure safe and healthy seafood consumption practices (Heffler et al., 2011).

The prevention of health risks is on the agenda of EU which normed the provision of information regarding the supply chain and the punishment for illegal fishing (AlTal, 2012; EUMOFA, 2020). Still, the ongoing series of food scandals caused some aversion towards raw fish, and sushi as well, among consumers (Pennings et al., 2002; Rosenfeld & Tomiyama, 2019; Tilman & Clark, 2014). Sushi venues (including restaurants and grocery stores) have the highest level of mislabelling (Khaksar et al., 2015; Lowenstein et al., 2010; Pappalardo et al., 2021; Pramod et al., 2014) and misdescription that ranges from 31.8% in Northern Italy to 40% in Southern and Central Italy (Pappalardo et al., 2021). These aspects made traceability crucial in defining sushi consumption.

From previous studies, there is clear evidence indicating the importance of traceability on sushi benefits expectations (Rodriguez-Salvador & Dopico, 2020; van Rijswijk et al., 2008). However, a literature gap exists regarding the impact of fish traceability on consumer behaviour particularly for raw fish consumption.

To the best of our knowledge, few scholars have explained the individual motives behind fish consumption (Gempesaw et al., 1995; Hall & Amberg, 2013; Myrland et al., 2000; Thong & Solgaard, 2017) and no study has been conducted to investigate the psychological determinants of raw fish consumption and the importance of traceability on consumers' decision-making process in Italy. Given that sushi is becoming the most common raw fish dish and its diffusion might cause a change in fish consumption, the main objective of this study aimed to answer the following research questions:

1. What are the main drivers for sushi consumption in Italy?
2. How does traceability play a role in defining their decision-making process?

The reminder of the paper is organized as follows: section 2 provides an overview of the theoretical framework; section 3 presents the adopted methodology. In section 4 the results arisen from the data analysis are reported, section 5 provides a discussion of the results obtained and lasty, in section 6 the main conclusions are drawn.

5.3. Theoretical framework

5.3.1. Consumers' food motives

The role of consumers' food motives in food choice has been studied intensively, and there is a broad consensus in measuring them with the Food Choice Questionnaire (FCQ; Steptoe et al., 1995), which has been updated and confirmed invariant across countries and cultures (e.g., Januszewska et al., 2011, Milošević et al., 2012). It is made up of 36 questions aggregated into nine factors: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern (Januszewska et al., 2011). Several studies used part of these FCQ dimensions to study causal effects between food motives and consumption (e.g., Konttinen et al., 2013, Lee & Yun, 2015), as in the case of consumers' selection of fishery products. For example, Thong & Solgaard (2016) and Myrland et al. (2000) confirmed the predictiveness of food motives (i.e., sensory appeal, convenience, health, availability, safety, price, ethical concerns, natural content) in explaining consumption frequencies of three typical seafood products (i.e., fish, shrimp, and mussels). However, we have no evidence on how these food motives can influence the Italians' perception of sushi, and in turn their sushi consumption.

Seafood is generally perceived as healthy food and recommended for regular intake, and higher fish consumption is related to consumer beliefs and practices regarding the importance of food for health (Olsen, 2003; Supartini et al., 2018; Trondsen et al., 2004). However, even if consumers consider sushi healthy, it can also be considered a route of exposure to different contaminants such as potentially toxic trace elements (Hsin-I Feng, 2012). For this reason, the present study aimed to investigate whether *health motive* increases or decreases sushi consumption frequency. Thus, we answered to the following research question:

RQ1: Does consumers' health motive influence consumers' sushi consumption?

Moreover, health is not the only factor behind sushi consumption. Given the importance of other product attributes (Olsen, 2003, Thong & Olsen, 2012, Torbjørn Trondsen et al., 2003), we can expect that further motives might determine consumer's perception of sushi. Among them, we find its perceived price. Related to *price motive*, namely to what extent consumers prefer to buy cheap and good value food, we can expect

that the more consumers value the cost of food, the more they perceive sushi as unaffordable. Supporting this is the evidence that the recent increase in fish consumption is positively associated with its cheaper price (Supartini et al., 2018), and consumers tend to perceive sushi as an expensive food (Sakamoto & Allen, 2011). Thus, we hypothesised that:

H1: Consumers' price motive influences sushi consumption frequency.

Another important food motive is the *sensory appeal*, which is associated with giving a high relevance to smell, appearance, consistency, and taste of the selected food. Previous studies already highlighted the importance of sensory cues in determining consumers' preferences for seafood (Antão-Geraldes et al., 2020; Hinkes & Schulze-Ehlers, 2018; Murray et al., 2017; Pihlajamäki et al., 2019b). Importantly, a previous study confirmed that people who put more emphasis on sensory appeal motive more regularly consume fish and shrimps (Thong & Solgaard, 2017). In this study, we thus expected that the influence of the sensory aspects is equally relevant when considering the consumption of sushi. Specifically, we hypothesised that the more consumers gave importance to this motive during their decision-making, the more they consumed sushi.

H2: Consumers' sensory appeal motive increases sushi consumption.

In addition, sushi perception can be guided by consumers' *mood motive,* which is centred on emotional well-being and highlights individuals' interest to eat food thats reduce stress and relax, or to cheer up and feel good (Naughton et al., 2015). On one hand, mood can provide an internal stimulus or state that elicits a beneficial food choice. Many scholars highlighted the effect of meal pleasantness on individual moods (Komatsu, 2008; Small et al., 2003), and the role of people's emotions on their food intake (Desmet & Schifferstein, 2008). Regarding the role of emotions in the selection of fishery products, previous studies showed that consumers are not guided by a mood motive when selecting fish, shrimp and mussels (Thong & Solgaard, 2017) . However, in the present study, we cannot exclude this consumption driver, given the recognized enjoyment and pleasure associated with the experience of eating sushi (Hsin-I Feng, 2012). For this reason, we have proposed a research question on the possible impact of mood motive on sushi consumption.

RQ2: Does consumers' mood motive impact sushi consumption?

In addition, fishery products are consumed because they are perceived as beneficial protein sources to health, characterized by the presence of polyunsaturated fatty acids (Connor, 2000, Kris-Etherton et al., 2002, Sidhu, 2003). The natural perception is also a significant driver when eating fish or mussel (Thong et al., 2016). This evidence can be attributed to the fact that the word "natural" evokes mostly positive associations for consumers, and they often see natural food as inherently better and healthier (Migliore et al., 2018; Rozin et al., 2012). Considering the above evidence, we hypothesised that:

H3: Natural content positively influences sushi consumption.

Then, food choice usually entails moral decision-making within the framework of cultures, customs, and societal norms that affect personal diet (Fanzo, 2015). Ethical consumerism has flourished both in scope and scale in the last decades (Carrington et al., 2010). The focus on environmental/'green' behaviour has grown to cover issues of animal welfare, human rights, country of origin, fair trade, and health (Auger & Devinney, 2007; Carrington et al., 2010). However, previous studies have found mixed results. Some scholars found sustainability and ethical concerns to determine fish consumption (McClenachan et al., 2016; Menozzi, Nguyen, Sogari, & Taskov, 2020; Risius et al., 2019a). For example, ethical concern seems to influence consumer's decision to refuse to eat wild fish (Wim Verbeke, Vanhonacker, et al., 2007). Other scholars have instead reported that ethical concern is not a significant determinant of seafood consumption

(Thong & Solgaard, 2017). Considering this contrast of results and the absence of studies on the relationship between sushi consumption and ethical concern, we have proposed the following research question:

RQ3: Does ethical concern influence consumers' sushi consumption frequency?

Next, familiarity with food plays an important role in the acceptability and preferences of consumers because it provides a better match between expectations and experience (Borgogno et al., 2015; Delizia & Macfie, 1996). In general, consumers are unwilling to try novel and unfamiliar foods because a risk/benefit assessment is needed and most consumers follow the basic human tendency of saving attention and mental efforts in their choices (Arvola et al., 1999; Cavallo et al., 2020). Vice versa, consumers who perceive sushi as a familiar dish should be more willing to eat it. Thus, we except:

H4: Familiarity positively impacts sushi consumption frequency.

In addition, convenience is an important feature as many consumers avoid fish consumption due to its time and effort-taking preparation (Pulcini et al., 2020). This is a barrier for fresh versus frozen or pre-packed products (Bae et al., 2010; Carlucci et al., 2015). While preparing sushi requires time and good cooking skills, compared to traditional fish dishes. In Italy, it is mostly consumed already prepared or out of home, therefore is extremely convenient and fast. So, conflicting perceptions of convenience can occur, and the lack of literature does not allow to advance a definite hypothesis on the causal relationship between convenience motive and sushi consumption. As a result, we have proposed the following research question:

RQ4: Does convenience have an impact on sushi consumption frequency?

Furthermore, diet and health concerns are related to nutrition and diseases prevention, mostly considered in a healthy lifestyle framework (Meiselman, 1996). For example, Sun, (2008) demonstrated that individuals expressing more concerned for food calories reported choosing foods according to the goal of weight control (Mela, 2001). Since sushi is generally perceived as low in fat, calories, and cholesterol (Hsin-I Feng, 2012) and weight control is one of the most important motives driving the seafood consumption (Thong et al., 2016), we except that:

H5: Weight control motive positively predicts sushi intake.

Lastly, we considered the impact of consumers' attitudes on their fish consumption. Attitude towards a behaviour refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour. Precisely, consumers' attitudes regarding the potential consequences associated with eating specific foods are a fundamental determinant of general food choice (e.g. Verbeke & Vackier, (2005), valid also in the case of fish selection (Khan et al., 2018; Thong & Olsen, 2012; Wim Verbeke & Vackier, 2005). Consistently, we expected that consumers' positive attitude toward sushi increase its consumption.

H6: Attitude towards sushi has an impact on sushi consumption frequency.

5.3.2. Social influences

As for the role of social influence on food choice, shared standards of acceptable behaviour by groups (i.e., *social norms*) strongly influence our own decisions and actions. Social norms are thought to influence behaviour because they signal the correct way to act in a certain situation and thereby serve people's goal of accuracy: "If a lot of people are doing and approving it, it must be right." It is because social norms provide social proof that they often function as shortcuts (i.e., heuristic cues) in the decision-making process and thus influence our behaviour, especially at low levels of effortful cognitive activity (Jacobson et al., 2011). Given the relevance of the social influence, people tend to modify their

eating choices to impress their companions (i.e. impression management; Vartanian, 2015). Thus, we can expect that perceiving that others approve sushi consumption enhances consumers' desire of consuming:

H7a: Social norms increased consumers' sushi consumption frequency as a mean to manage their social impression.

H7b: Social norms enhanced consumers' attitudes toward sushi.

5.3.3. Individual characteristics

Regarding the individual traits, individuals by nature tend to avoid unfamiliar, novel foods (Barrena & Sánchez, 2013; Pliner & Hobden, 1992a). The variety-seeking attitude and the increased availability on the market may be considered as most important factors affecting acceptance of ethnic foods (Tuorila & Hartmann, 2020). However, consumer's cultural background plays a role in conservative behaviour for non-traditional foods, as sushi (Dordevic & Buchtova, 2017). Food neophobia is defined as the reluctance, unwillingness or refusal to consume novel foods, and unfamiliar foods and appears to affect all food choices (Pliner & Hobden, 1992a). It captures the extent to which people are averse to new foods, particularly those from other cultures (Pliner & Pelchat, 1991). Previous studies demonstrated the role of neophobia in food choice (Sara R. Jaeger et al., 2021; Kral, 2018), specifically for ethnic food (Asperin et al., 2011; Losada-Lopez et al., 2021; Ting et al., 2016). The fear to consume unusual foods can result in a decrease in the choice and the quality of food in a diet (Jaeger et al., 2017). Jaeger et al. (2021) found positive correlations between neophobia and familiarity, convenience and price, and negative correlations among health, natural content, ethical concerns, and sensory cues for various food options. Thus, in the present paper, we hypothesized that:

H8: There is a negative correlation between neophobia and health (**H8a**), mood (**H8b**), convenience (**H8c**), sensory appeal (**H8d**), natural content (**H8e**), price (**H8f**), weight control (**H8g**), and ethical concerns (**H8h**) and a positive correlation between neophobia and familiarity (**H8i**).

H9: Neophobia has a negative impact on consumers' attitudes towards sushi.

H10: Neophobia has a negative impact on sushi consumption frequency.

5.3.4. Perception of product properties

Finally, in the present research, we also verify the predictive role of product properties in explaining consumer's frequency of sushi consumption. Food traceability has gained recognition in the assessment of consumer's perceptions and attitudes toward traceable food (M. F. Chen & Huang, 2013; Chrysochou et al., 2009; van Rijswijk et al., 2008). Traceability is expected to boost consumer's trust in food systems by boosting food chain transparency, especially when combined with other quality assurance schemes (Hobbs et al., 2005; Wim Verbeke & Ward, 2006). As sushi is fish based, the role of traceability is fundamental in ensuring consumers regarding the safety and the quality of the products (Fung et al., 2018; Rodriguez-Salvador & Dopico, 2020). Traceability plays a relevant role in the decision-making process, given that most of food production and processing is unknown to most of consumers and, in any case, they cannot verify it (Nuttavuthisit & Thøgersen, 2017) For this reason, we hypothesized that:

H11: Traceability has a negative impact on sushi consumption.

H12: The importance of seafood traceability is determined by ethical concern (**H12a**) natural content motive**(H12b**), price motive (**H12c**), health motive (**H12d**) and seafood traceability (**H12e**).

5.4. Methodology

5.4.1. Questionnaire and data collection

The current study is cross-sectional and involves a representative sample of 993 consumers from Italy collected based on age distribution, gender, geographical distribution of the population, and population density within the country. The survey was pretested and administered by Demetra, a market research company. To measure sushi preferences, a single choice question was constructed with the following options: "I do not know it"; "I know it, but I do not consume it";

"I have tasted it but do not consume it"; "I consume it occasionally"; and "I consume it regularly". Sushi consumption frequency was assessed also using a single choice question with the following options: "Never"; "Once a year"; "Less than once a month"; "Once a month"; "2-3 times a month"; "Once a week"; "2 times a week"; and "More than 2 times a week". Then, data regarding Italian's food choice motives was collected using the general food choice items questionnaire (Steptoe et al., 1995) (Table 11). Particularly, respondents had to indicate their agreement on a 7-point Likert scale, ranging from "Strongly disagree" to "Strongly agree". Furthermore, using Pliner & Hobden, (1992) scale, Italian's neophobia towards food was evaluated to assess the impact of this trait on sushi consumption frequency, each variable has been rated with a 7-point scale likert response format (strongly disagree–strongly agree)(Table 11).

As few studies investigated attitudes towards sushi, our scale for measuring Italian's attitudes towards sushi was based on previous scale development studies (Churchill, 1979; Hensley, 1999). Specifically, several steps were applied. First, items and construct domains were identified through a review of studies of attitudes towards the consumption of ethnic foods. Second, a pool of items was generated from the literature review, and a Likert-type scale was chosen as the measurement format (Table 11). Moreover, social norms were assesed using a previous scale validated by Giampietri et al., (2018) and Wolstenholme et al., (2021), with a 7-point likert scale. Regarding traceability, the following defintion was provided: "Traceability is the ability to trace and follow a food, feed or animal intended for human consumption through all stages of production, processing, and distribution (Reg. 178/2002)", then respondents were asked to express "How important is it for you to consume traceable fish?" on a 7-point Likert scale (Not important at all- Extremely important). Lastly, the survey included a variety of sociodemographic variables such as age, income, urban/suburban/rural residence, education, work status, presence of children within the household and type of diet.

Table 11. Items description, Mean score, factor loading, Cronbach's alpha(α), composite reliability (CR), and average variance extracted (AVE) of the food choice questionnaire, social norms, traceability, and sushi consumption frequency.

Construct /code /Item description	**Mean Score**	**Factor Loading**	***p value***	**Bibliographic reference(s)**
Food choice questionnaire				
Dimension 1: Health, Mean Score: 4.45 ± 0.96, Cronbach's alpha: 0.84, CR: 0.84, AVE: 0.46				(Steptoe et al., 1995)
Health_1, Contains a lot of vitamins and minerals.	5.58 ± 1.23	0.76	***	

Construct /code /Item description	**Mean Score**	**Factor Loading**	***p value***	**Bibliographic reference(s)**
Health_2, Keeps me healthy.	4.94 ± 1.16	0.68	***	
Health_3, Is nutritious.	5.82 ± 0.99	0.69	***	
Health_4, Is high in protein.	5.06 ± 1.29	0.62	***	
Health_5, Is good for my skin/teeth/hair/ nails etc.	5.22 ± 1.45	0.64	***	
Health_6, Is high in fibre and roughage.	5.04 ± 1.40	0.67	***	
Dimension 2: Mood, Mean Score: 5.25 ± 1.1, Cronbach's alpha: 0.87, CR: 0.87, AVE: 0.53				
Mood_1, Helps me cope with stress.	5.04 ± 1.47	0.78	***	
Mood_2, Helps me to cope with life.	5.11 ± 1.44	0.78	***	
Mood_3, Helps me relax.	5.04 ± 1.47	0.76	***	
Mood_4, Keeps me awake/alert.	5.14 ± 1.43	0.69	***	
Mood_5, Cheers me up.	5.22 ± 1.40	0.77	***	
Mood_6, Makes me feel good.	5.93 ± 1.19	0.56	***	
Dimension 3: Sensory appeal (Senso), Mean Score: 5.98 ± 0.93, Cronbach's alpha: 0.83, CR: 0.82, AVE: 0.53				
Sens_1, Smells nice.	6.08 ± 1.09	0.75	***	
Sens_2, Looks nice.	5.69 ± 1.25	0.68	***	
Sens_3, Has a pleasant texture.	5.90 ± 1.14	0.73	***	
Sens_4, Tastes good.	6.25 ± 1.08	0.74	***	
Dimension 4: Natural content (Natur), Mean Score: 5.73 ± 1.16, Cronbach's alpha: 0.82, CR: 0.79, AVE: 0.56				
Natur_1, Contains no additives.	5.72 ± 1.39	0.75	***	
Natur_2, Contains natural ingredients.	5.81 ± 1.24	0.69	***	
Natur_3, Contains no artificial ingredients.	5.65 ± 1.4	0.81	***	
Dimension 5: Price (Pric), Mean Score: 5.23 ± 1.18, Cronbach's alpha: 0.77, CR: 0.75, AVE: 0.5				
Price_1, Is not expensive.	5.05 ± 1.47	0.8	***	
Price_2, Is cheap.	4.78 ± 1.53	0.73	***	

Construct /code /Item description	**Mean Score**	**Factor Loading**	***p value***	**Bibliographic reference(s)**
Price_3, Is good value for money.	5.84 ± 1.24	0.56	***	
Dimension 6: Ethical concern (Ethic), Mean Score: 5.12 ± 1.15, Cronbach's alpha: 0.64, CR: 0.6, AVE: 0.33				
Ethic_1, Comes from countries I approve of politically.	4.44 ± 1.75	0.523	***	
Ethic_2, Has the country of origin clearly marked?	5.6 ± 1.35	0.593	***	
Ethic_3, Is packaged in an environmentally friendly way.	5.29 ± 1.38	0.609	***	
Dimension 7: Convenience (Convi), Mean Score: 5.31 ± 1.10, Cronbach's alpha: 0.83, CR: 0.91, AVE: 0.62				
Conv_1, Is easy to prepare.	5.28 ± 1.48	0.82	***	
Conv_2, Can be cooked simply.	5.41 ± 1.39	0.8	***	
Conv_3, Takes no time.	4.99 ± 1.54	0.74	***	
Conv_4, Can be bought in shops that are close.	5.33 ± 1.43	0.55	***	
Conv_5, Is easily available.	5.56 ± 1.32	0.58	***	
Dimension 8: Weight, Mean Score: 5.31 ± 1.10, Cronbach's alpha: 0.85, CR: 0.82, AVE: 0.61				
Weight _1, Is low in calories.	4.87± 1.52	0.78	***	
Weight _2, Controls my weight.	5.21± 1.52	0.78	***	
Weight _3, Is low in fat.	5.26± 1.44	0.78	***	
Dimension 9: Familiarity (Familia), Mean Score: 3.80 ± 0.76, Cronbach's alpha: 0.69, CR: 0.65, AVE: 0.38				
Familia _1, Is what I usually eat.	5.11 ± 1.43	0.63	***	
Familia _2, Is familiar.	4.91 ± 1.45	0.67	***	
Familia _3, Is like the food I ate when I was a child.	4.45 ± 1.61	0.55	***	
Social norms (Norms), Mean Score: 4.51 ± 1.34, Cronbach's alpha: 0.85, CR: 0.84, AVE: 0.57				(Giampietri et al., 2018; Wolstenholme et al., 2021)
Norms_1, Most of the people I know (family, friends...) would approve if I eat sushi.	4.92 ± 1.55	0.73	***	

Construct /code /Item description	**Mean Score**	**Factor Loading**	***p value***	**Bibliographic reference(s)**
Norms_2, Most of the people I know (family, friends...) would like me to eat sushi.	4.09 ± 1.67	0.76	***	
Norms_3, Most of the people I know (family, friends...) eat sushi.	4.61 ± 1.69	0.73	***	
Norms_4, Most of the people I know (family, friends...) think it's OK to eat sushi.	4.42 ± 1.50	0.8	***	
Attitude towards sushi (Atti_ Sushi), Mean Score: 4.46 ± 1.06, Cronbach's alpha: 0.8, CR: 0.88, AVE: 0.47				
Sushi affordability (Sushi_afford), The price of sushi is affordable.	3.85 ± 1.45	0.32	***	(Bihan et al., 2010; A. Lee et al., 2013)
Sushi perceived quality (Sushi_qual), The quality of the sushi is good.	4.67 ± 1.28	0.8	***	(Oude Ophuis & Van Trijp, 1995b)
Sushi mood (Sushi_mood), Eating sushi makes me feel good.	4.38 ± 1.52	0.81	***	(Babicz-zielinska, 2006)
Sushi novelty (Sushi_nov), Eating sushi makes me experience new things.	4.46 ± 1.45	0.73	***	(Jacobs et al., 2015; Kitano & Yamamoto, 2020)
Sushi appearance (Sushi_appe), Sushi looks good.	4.98 ± 1.39	0.71	***	(Alam & Alfnes, 2020; Antão-Geraldes et al., 2020; Murray et al., 2017)
Neophobia (Neo), Mean Score: 3.27± 1.02, Cronbach's alpha: 0.88, CR: 0.96, AVE: 0.43				
Neo_1, I am constantly trying new and different foods.	3.41± 1.65	0.65	***	(Pliner & Hobden, 1992)
Neo_2, When choosing food, I don't trust novelties.	3.22± 1.77	0.63	***	
Neo_3, If I don't know a food, I don't try it.	3.15± 1.89	0.69	***	
Neo_4, I like food from different countries.	2.89± 1.64	0.77	***	

Construct /code /Item description	**Mean Score**	**Factor Loading**	***p value***	**Bibliographic reference(s)**
Neo_5, Ethnic food seems too strange for me to eat.	3.16± 1.85	0.71	***	
Neo_6, At dinners with friends, I like to try new foods.	2.75± 1.61	0.73	***	
Neo_7, I am afraid to eat food that I have never tasted before.	3.26± 1.86	0.72	***	
Neo_8, I am picky about the food I eat.	3.53± 2.00	0.57	***	
Neo_9, I generally eat almost everything.	2.66± 1.66	0.55	***	
Neo_10, I like to try new ethnic restaurants.	4.70± 1.77	0.39	***	
Traceability, How important is it for you to consume traceable fish?,Mean Score: 5.89 ± 1.20				(Loureiro & Umberger, 2007; Menozzi et al., 2015; Nicolae et al., 2016)

5.4.2. Data analysis

Since our focus was on sushi eaters, an initial screening of respondents has been performed to select only those who already knew sushi. All versions of the survey have been approved by the University of Naples Federico II Subjects Committee, and all participants provided informed consent.

Statistical analyses included frequencies and descriptive statistics to describe sushi consumers and their purchasing habits. The Cronbach's alpha value for each variable was computed to assess the reliability of the items included in the questionnaire. Plus, one-way ANOVA tests were performed to check differences in sushi consumption among groups. The CFA was carried out to estimate factor loading, composite reliability (CR), and average variance extracted (AVE), for all constructs. The composite reliability of the constructs of the questionnaire was determined to examine the reliability of scale items. The factor loading and average variance extracted were determined to assess the convergent validity of the constructs of the measurement model. Then, two structural models were constructed: model 1 for understanding the main drivers behind sushi consumption (n = 993) and model 2 to identify the impact of fish traceability on consumers' decision-making (n = 993). Models fit were analysed using a comparative fit index (CFI), Tucker-Lewis index (TLI), standard root mean squared residual (SRMR), root mean square error of approximation (RMSEA) and the direct and indirect effects for each of the stipulated models (p-value for testing the null hypothesis that RMSEA is no >0.05). All analyses were conducted using STATA software.

5.5. Results

5.5.1. Descriptive statistics

Table 12 presents the socio-demographic characteristics of participants. The sample consisted of 50.76% females and 49.24% males. Respondents between 55 and 77 years old were the largest share of the total sample (29.41%), while those between 18 and 29 years old represented the lowest share (17.93%). Most of the respondents obtained a high school diploma (53%), while few obtained a post-degree master (3.22%) or a PhD (3.42%). 39.88% of the respondents were employees, while students were only 7.65%. In terms of living area, 51.56% of the respondents lived in internal areas, 21.35% and 21.15% live, respectively, in seaside cities or near the seaside while less than 6% lived in mountain areas. Most respondents did have kids (78.15%) and were omnivores (82.88%).

Table 12. Sample description, Italy

Variable	Number of individuals	Percentage
Gender		
Female	504	50.76%
Male	489	49.24%
Age class		
18-29	178	17.93%
30-44	282	28.40%
45-54	241	24.27%
55-70	292	29.41%
Educational level		
Secondary school diploma	103	10.37%
High school diploma	528	53.17%
Bachelor's degree	296	29.81%
Master	32	3.22%
PhD	34	3.42%
Profession		
Freelancer	111	11.18%
Employee	396	39.88%
Worker	116	11.68%
None	195	19.64%
Student	76	7.65%

Variable	**Number of individuals**	**Percentage**
Others	99	9.97%
Revenue level		
<20.000€	267	26.89%
20.000-40.000 €	405	40.79%
40.000-60.000 €	125	12.59%
60.000-100.000 €	41	4.13%
>100.000 €	11	1.11%
Prefer to not respond	144	14.50%
Area of living		
Seaside city	212	21.35%
Near the seaside	210	21.15%
Internal area	512	51.56%
Mounting area	59	5.94%
Kids		
No	217	21.85%
Yes	776	78.15%
Food orientation		
Vegetarian	21	2.11%
Vegan	7	0.70%
Omnivore	823	82.88%
Flexitarian	54	5.44%
Pescatarian	61	6.14%
Others	27	2.72%
Total	**993**	**100.00%**

Summary statistics in Table 11 shows how sensory appeal (5.98), natural content (5.73) and convenience (5.31) scored the highest among all general food choice variables. While Mood motives (5.25), price (5.23) and Ethical concern (5.12) took the second place. Then, traceability appeared substantially important, scoring the second highest average of 5.89 with a standard deviation of 1.19. While neophobia (3.27), familiarity (3.8), and health (4.45) scored the least.

5.5.2. Effects of sociodemographic cues on sushi consumption frequency

Sushi consumption is mostly determined by age (p=0.000, p≤0.001), as respondents between 18 to 29 years old were the most frequent sushi eaters. Likewise, sushi intake was also substantially influenced by education (p=0.000, p≤0.001), as respondents with post-degree education had a higher intake. Furthermore, students and employees were the categories who consumed sushi the most. Similarly, respondents' annual income (p=0.000, p≤0.001) was significant in determining sushi consumption frequency; those with a yearly income above 100.000 € had sushi more frequently than others. Moreover, people with no kids (p=0.002, p≤0.01) or living near the seaside (p=0.028, p≤0.05) included more sushi in their diet. While sex (p=0.782, p≥0.05), and diet (p=0.146, p≥0.05) did not have any influence on sushi intake frequency.

ADD MORE DETAILS FOR THIS PART

5.5.3. Structural equation model

5.5.3.1. Measurement model

Bartlett's test for sphericity and the Kaiser-Meyer-Olkin (KMO) was initially performed to measure the sampling adequacy. The results show that a rejection of the null hypothesis for the Bartlett's test of sphericity (p=0.000, p≤0.001) and overall high KMO (0.833) indicates that the factor analysis of the variables is suitable.

The factor loadings in Table 1 of all ethical concern, familiarity, price, natural content, convenience, sensory appeal, health, weight, mood motive, neophobia, social norms and attitude towards sushi items were significant ($p \leq 0.01$). The factor loadings for different items for all constructs ranged from 0.52 to 0.81, which were higher than the threshold value of 0.50 (Contini et al., 2018; M. C. Johnson & Guilford, 1956; Konuk, 2019), hence all items were included for the interpretation of results. Cronbach's alpha for ethical concern, familiarity, price, natural content, convenience, sensory appeal, health, weight, mood motive, neophobia, social norms ranged between 0.64 and 0.88, revealing good internal consistency and reliability of the questionnaire items (Agbo, 2010; Fornell & Larcker, 1981). Composite reliability for health, mood motive, sensory appeal, natural content, price, weight, convenience, attitude towards sushi, neophobia and social norms ranged from 0.75 to 0.96 exceeded the recommended minimum cut-off value of 0.70 (Bacon et al., 1995). Only ethical concern and familiarity scored lower than the recommended minimum cut-off. Cronbach's alpha and composite reliability values obtained for different constructs revealed good internal consistency and reliability of scale items of the questionnaire. The average variance extracted (AVE) for mood motive, sensory appeal, natural content, price, social norms, weight, and convenience ranged from 0.50 to 0.62, which were higher than the minimum acceptable cut-off value of 0.50. While the AVE of health, ethical concern, familiarity, neophobia and attitude towards sushi was lower than 0.5, but the composite reliability was higher than 0.6 which validates the internal consistency and reliability of the scale items (Fornell, 1979). Overall, the factor loadings and average variance extracted values obtained for different constructs and items for each construct demonstrated the convergent validity of the constructs of the model.

4.1.1 Sushi consumption drivers

The first structural model was developed to demonstrate the extent of the relationship between the general food choice motives, sushi consumption drivers and sushi consumption frequency (Figure 3). All insignificant impacts were eliminated to have a clear representation of the model. Results showed that the model had a good fit. The RMSEA value was 0.035 (p=0.000, p≤0.05), The SRMR value was

0.017. The CFI was 0.981 and TLI was 0.952, which is within the acceptable range. The results of the structural model presented in Figure 11 shows that:

Health had no impact on sushi consumption because standardized estimate (ß) of the path of the structural model was non-significant (**RQ1**: β= -0.05, S.E.= 0.08, p≥0.05). Also, no significant effect between price motives and sushi consumption frequency was found, rejecting the hypothesis (**H1**: β= 0.0003, S.E.= 0.04, p≥0.05) on price motives influencing affordability. Consumers' preference for food with a nice smell, taste, and beautiful appearance (**H2**: β= -0.26, S.E.= 0.06, p≤0.001) decreased respondents' consumption frequency. While mood motives (**RQ2**: β= 0.03, S.E.= 0.05, p≥0.05) had no significant impact. In addition, ethical concern (**RQ3**: β= -0.06, S.E.= 0.05, p≥0.05) and natural content (**H3**: β= -0.06, S.E.= 0.05, p≥0.05) had no significant impact. Furthermore, familiarity (**H4**: β= -0.025, S.E.= 0.07, p≥0.05), convenience (**RQ4**: β= -0.05, S.E.= 0.05, p≥0.05) and weight control (**H5**: β= 0.06, S.E.= 0.04, p≥0.05) also did not have an influence.

Consumers' attitude towards sushi (**H6**: β= 0.71, S.E.= 0.04, p≤0.001) had a significant positive impact on consumption frequency. Social norms (β=0.18, S.E.= 0.03, p≤0.001), had a direct significant positive impact on sushi intake, therefore **H7a** is accepted. Furthermore, social norms enhanced consumers' attitude toward sushi (**H7b**: β=0.25, S.E.= 0.02, p≤0.001).

The correlations analysis between food neophobia and FCQ factors showed no significance between neophobia and convenience (β=-0.003, S.E.= 0.03, p≥0.05), price (β=0.01, S.E.= 0.03, p≥0.05), weight control (β=0.06, S.E.= 0.04, p≥0.05) and ethical concern (β= 0.01, S.E.= 0.03, p≥0.05). While health (β=-0.09, S.E.= 0.02, p≤0.01), mood (β=-0.11, S.E.= 0.03, p≤0.001), sensory appeal (β= -0.20, S.E.= 0.03, p≤0.001), natural content (β= -0.12, S.E.= 0.03, p≤0.001) and familiarity (β=0.14, S.E.= 0.02, p≤0.001) were found to be significant. A negative correlation between neophobia and health, mood, sensory appeal, and natural content was proven valid. While there is a positive correlation between neophobia and familiarity. Then, neophobia was found to negatively impact consumers' attitude toward sushi (**H9**: β= -0.18, S.E.= 0.03, p≤0.001) and sushi consumption frequency (**H10**: β= -0.24, S.E.= 0.04, p≤0.001) as those who were neophobic had a lower appreciation of sushi and consumed it less than others.

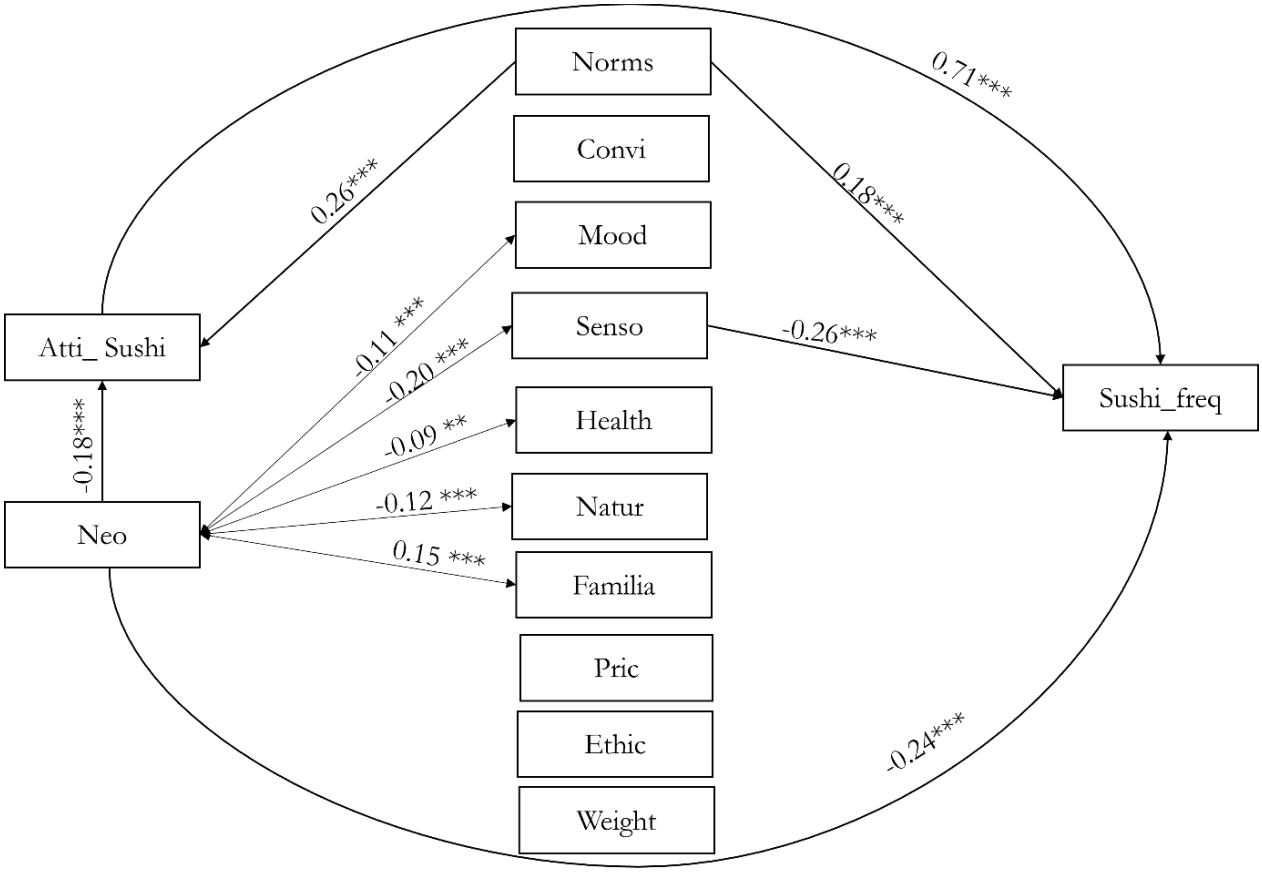

Figure 11. Model 1, results of SEM for the sushi consumption drivers.

5.5.3.3. The role of traceability in defining consumers' decision-making process

The second structural model, in Figure 12, was developed to determine the role of seafood traceability in defining consumers choice and its interaction with the main consumption drivers. All insignificant impacts have been eliminated to have a clearer representation of the model.

The goodness of the model performed well. The RMSEA value was 0.042 (p=0.000, p≤0.001), The SRMR value was 0.019. The CFI was 0.967 and the TLI was 0.93, which is within the acceptable range. Model 2 showed a good fit, proving the importance of traceability in explaining consumers' behaviour. The results of the structural model 2 are presented in Figure 12.

All hypotheses assessed in Model 1 were validated. Ethical concern (β=0.27, S.E.= 0.03, p≤0.001) natural concern (β=0.19, S.E.= 0.04, p≤0.001), price (β= -0.14, S.E.= 0.03, p≤0.001), and health motives (β=0.18, S.E.= 0.03, p≤0.001) were found significant. On one hand, respondents considered natural food, with a clear origin indication and with a eco-friendly packaging to have better traceability. Plus, they found healthy food to be more traceable. On the other hand, price motive had negative impact on traceability, meaning people perceived cheaper food as non-traceable. Most importantly, **H11** (β=-0.16, S.E.= 0.03, p≤0.001) stipulating the impact of seafood traceability on sushi consumption frequency was found to be significant.

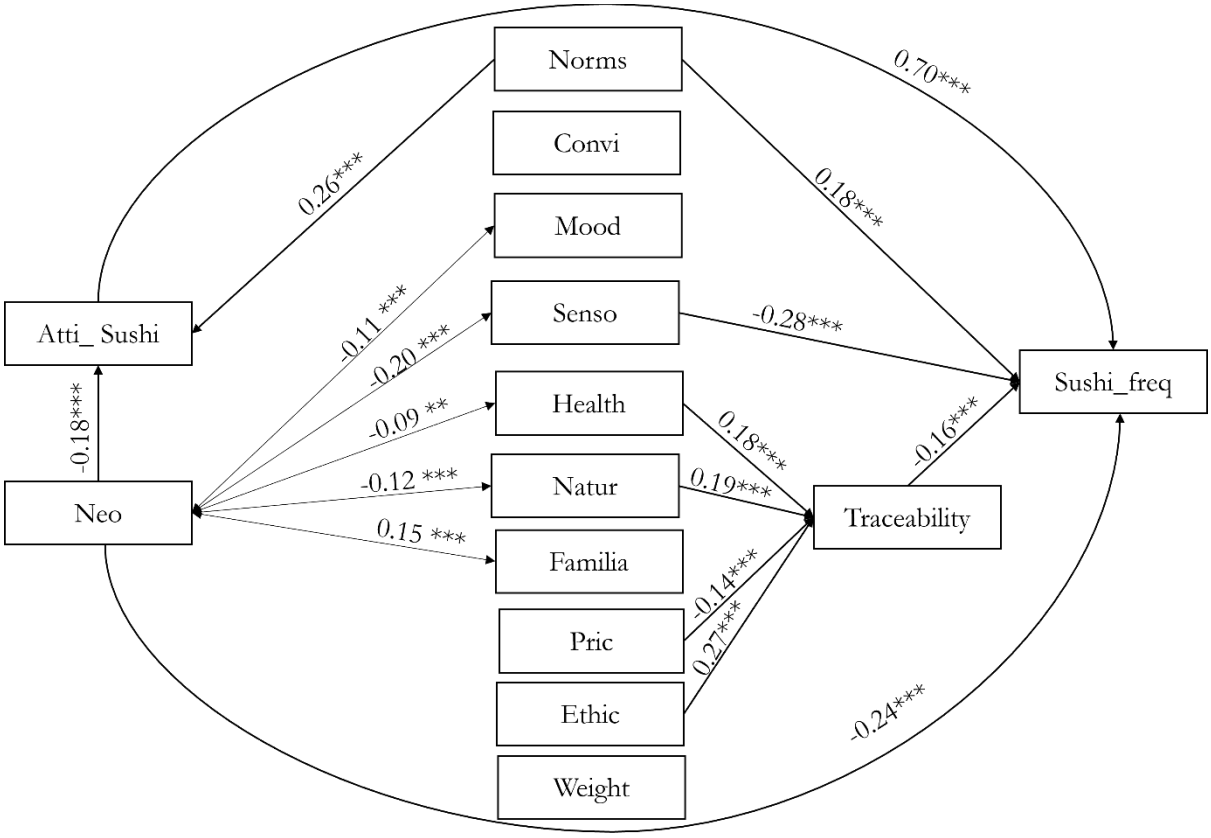

Figure 12. Model 2, results of SEM for the sushi consumption drivers and role of traceability in defining consumers sushi consumption.

5.6. Discussion

In the present study, we attempt to understand the main drivers behind sushi consumption and the role of traceability in defining consumers dietary habits among Italian consumers. Table 13 summarizes the list of hypotheses, research questions and results of the current study.

Table 13. Summary of hypothesis, and research questions results

Code	Hypothesis, research question	Results
RQ1	Does consumers' health motive influence consumers' sushi consumption?	NO
H1	Does consumers' health motive influence consumers' sushi consumption?	NO
H2	Consumers' sensory appeal motive increases sushi consumption.	NO
RQ2	Does consumers' mood motive impact sushi consumption?	NO
H3	Natural content positively influences sushi consumption.	NO
RQ3	Does ethical concern influence consumers' sushi consumption frequency?	NO
H4	Familiarity positively impacts sushi consumption frequency.	NO
RQ4	Does convenience have an impact on sushi consumption frequency?	NO
H5	Weight control motive positively predicts sushi consumption frequency.	NO
H6	Attitude towards sushi has an impact on sushi consumption frequency.	YES
H7a	Social norms increased consumers' sushi consumption frequency as a mean to manage their social impression.	YES
H7b	Social norms enhanced consumers' attitude toward sushi.	YES

H8	There is a negative correlation between neophobia and health (**H8a**), mood (**H8b**), convenience (**H8c**), sensory appeal (**H8d**), and natural content (**H8e**) and a positive correlation with familiarity(**H8i**).	YES
H8	There is a negative correlation between neophobia and price (**H8f**), weight control (**H8g**), and ethical concerns (**H8h**)	NO
H9	Neophobia has a negative impact on consumers' attitudes towards sushi.	YES
H10	Neophobia has a negative impact on sushi consumption frequency.	YES
H11	Traceability has a negative impact on sushi consumption.	YES
H12	**H12:** The importance of seafood traceability is determined by ethical concern (**H12a**) natural content motive **(H12b)**, price motive (**H12c**), health motive (**H12d**) and seafood traceability (**H12e**).	YES

The consumption of ethnic products such as sushi is widespread and still growing (Mascarello et al., 2017; 2020). However, rejection of ethnic food is still common. Only the 18.2% of respondents stated to consume sushi regularly and the 28.6% never consumed it.

The current study shows that many product and consumer related factors condition sushi consumption in Italy. Sushi consumption appears to be correlated to the sociodemographic cues, as younger, more educated, and wealthier respondents stated to consume more sushi. These results are consistent with previous studies on new and exotic foods (Fernández-Ruiz et al., 2013; Giordano et al., 2018; Meiselman et al., 2010). Then, we also found confirmation of previous evidence that dietary habits and availability influence fish food choices (Bose & Brown, 2008; Shashikanth & Somashekar, 2020; Thong & Olsen, 2012). In addition, the absence of kids within the household was found to increase sushi intake, probably due to the health risks related to raw fish consumption risks (Kelly et al., 2006) and food scandals (Audicana et al., 2002; Mattiucci et al., 2013).

One of the main findings of the present study is that consumer's attitudes predict their behaviour. This link is fostered by a wide availability and differentiation of both products and use situations. The combination of perceived quality, appearance, novelty, affordability, and mood motives increased sushi consumption frequency. However, this is not common for all food commodities (Antão-Geraldes et al., 2020; Babicz-zielinska, 2006; A. Lee et al., 2013), due to individual, social and situational factors that may hinder decision making.

Additionally, eating often occurs in a social context and the food choices of others, and the amounts that those around us eat have a powerful effect on our own consumption decisions (Herman et al., 2003; Melnyk et al., 2022). Dietary behaviours have been reported to be related to perceptions of normative behaviour within peer groups (Ball et al., 2010; Lally et al., 2011; Louis et al., 2007) and food intake can be predicted by the eating behaviour of socially connected peers(de la Haye et al., 2010; Pachucki et al., 2011). In the present study, Italians' attitude towards sushi and consumption frequency was found to be mainly dependent on people's approval and appreciation of sushi as a food. Therefore. the general food choice motives are not the only factors impacting consumers eating habits, the social context in this finding highlights its role in defining individuals' food patterns, thus the importance of further studying how contextual elements can help to implement a healthier diet, reduce food waste, and promote sustainable exploitation of marine resources. Therefore, despite sushi being a "healthy food" we found no health motives leading to the frequency of consumption. So, the potential for sushi eating to be a chic or trendy food choice is likely to be true as consumers still have doubts regarding the health risks related to raw fish.

Regarding traceability, food traceability has gained considerable momentum in assessing consumer perceptions and incentives for traceable food. By increasing the transparency of the food chain (M. F. Chen & Huang, 2013; Chrysochou et al., 2009; van Rijswijk & Frewer, 2008), traceability is believed to improve consumer trust and confidence in food systems, particularly in conjunction with other quality assurance schemes (Wim Verbeke & Ward, 2006). Its main strengths are food safety, health, naturalness, quality, trust, guaranteed control and environmental protection (Giraud & Amblard, 2003; Lichtenberg et al., 2008; Mai et al., 2010; Wim Verbeke & Ward, 2006). In the present study, a higher interest in health, natural content, and ethical concern for food generally increased consumers' need for traceability. Particularly, ethical concern can be linked to interest in traceability, in line with previous studies on other foods as wheat (Barling et al., 2009) and fish (Hoque et al., 2022). The importance of seafood traceability is determined by natural content motive. Still, naturalness is a not well-defined concept as it is not strictly linked to any certification or issuing body. Carfora, et al., (2021) highlighted that consumers feel trustful towards the supply chain that delivers what they perceive being natural food. Since consumers are often reassured by certification, traceability may indeed be valued higher by health-conscious consumers. In the case of organic food, organic food certification specify the way food has to be grown and produced without causing environmental harm, however, customers perceive far more qualities than those that are actually present (Apaolaza et al., 2018; Botonaki et al., 2006). While cheaper food was found to be less traceable, this might be due to higher certification costs that causes an increase in the average price of traceable food (Cavallo et al., 2018). Lastly, traceability perception is a product-specific matter, essentially due to the different perceived risks of different products, where traceability is expected to carry more weight for fresh produce (Dickinson & Bailey, 2002; van Rijswijk & Frewer, 2008). Our results show that traceability reduced sushi consumption frequency among Italians emphasizing the role that traceability plays in ensuring consumers about their food choices. sushi consumption is becoming an unsustainable practice given its intensive demand for large fish (salmon and tuna, especially)(Metian et al., 2014; Torrissen et al., 2011). Talking about traceability would therefore pave the way towards a more sustainable consumption of this product, reducing the memory to practices (e.g., all you can eat) that have a low cost on consumers but a high cost on the sustainability of the environment.

Then, neophobia was found to be very heavily correlated to the consumers general food choice motives. Specifically, neophobia is a barrier for trying new foods and this can impact nutritional health that is fostered by food variety (Sylvester et al., 2018). In the present study, neophobia is negatively correlated with the mood motive, this is quite new for literature in which the link between the two variables has been found to be weak or non-significant (Jaeger et al., 2021). In addition, neophobia is not correlated with convenience, although a previous study by highlighted a strong correlation of this trait with the convenience motive (. Jaeger et al., 2021). Neophobia is also negatively correlated with sensory appeal. This could be due to several motives: (1) physiological motive, as the sensory sensitivity for children seems to be higher compared to adults (Dovey et al., 2012); and the (2) contribution of sensory education in lowering neophobia levels (Rabadán & Bernabéu, 2021). Moreover, neophobic individuals are not influenced by price, this could be due to a larger importance assigned to other products cues, such as the ones that can add bring novelty to the routinely purchased products. Jaeger et al. (2021) highlighted a link between neophobia and price, but this is supposedly mediated by consumers' income. Regarding weight control and ethical concern, in line with previous findings these two factors are independent form neophobia (Jaeger et al., 2021). Most importantly, positive correlation between neophobia and familiarity were significant. These two are very close concepts, therefore the association between these two variables represents a proof of validity of the proposed model (Aldridge et al., 2009; Raudenbush & Frank, 1999). Furthermore, neophobia lowers the attitudes of consumers towards sushi,

this finding has been retrieved also in research investigating more in general the attitudes towards ethnic food and consumption behaviour (Mascarello et al., 2020; Ting et al., 2016). Lastly, neophobia is critical in sushi consumption as neophobic respondents were the lower sushi consumers. This can be due to the ethnic nature of food, in line with extant studies by Losada-Lopez et al. (2021) and Asperin et al. (2011).

When making purchase and consumption decisions, consumers frequently have to prioritize FCQ aspects (Jaeger et al., 2017). Even if one of the main motives driving food choice is health (Rana & Paul, 2020; Sun, 2008), our results show that health had no impact on sushi consumption frequency. This result can be interpreted in the light of at least two reasons. On the one hand, even though fish-based products may be tendentially healthy for their high content in protein together with low fats (Svein Ottar Olsen, 2003), the ample concern about safety of raw fish could have harm the health perception of our participants (Hsin-I Feng, 2012). On the second hand, consumers usually face contradictory advice regarding fish (Kris-Etherton et al., 2002; Slavin, 2012), which can potentially make the decision-making process more complicated. Accordingly, previous scholars found that the available information regarding the healthiness of fish can be a source of confusion (Oken et al., 2012).

Similarly, the natural content didn't influence sushi consumption. Although fish is commonly perceived to be natural, sushi is not perceived as such. This could be due to its ethnic feature, that makes consumers scarcely familiar with its processing and preparation (Nygård & Storstad, 1998). Moreover, Italian consumers appear to consume sushi for motives that are not linked either to a luxury or affordable price perception. Although previous studies demonstrated the impact of price on consumers choice for fish and fish-based products (Carlucci et al., 2015; Steenkamp & van Trijp, 1996). Italian consumers did not choose sushi according to its affordability perception, even if in other countries, it appeared to be paired with an expensive perception that lead to special occasions consumption (Altintzoglou et al., 2014).

In addition, respondents who favoured good-looking, nice-smelling, good-textured, and tasty food ended up eating less sushi compared to those who did not consider food sensory appeal when making their choice. Previous studies demonstrated how the sensory experience of eating is multifaceted and has a functional role to play in energy intake regulation, beyond simply guiding food choice and hedonic value (Januszewska et al., 2011; Jáuregui-Lobera & Bolaños Ríos, 2011). Specifically, each component of consumers' sensory experience drives the behavioural responses to food in a number of distinct but certainly overlapping ways (Mccrickerd & Forde, 2016). As a result, Italians who look for meals that provides them with a positive sensory experience do not expect it in sushi, therefore other elements (mostly extrinsic) seem to play a major role in sushi consumption.

Furthermore, sushi consumption was not perceived as a mood-raising activity by Italian consumers. In general, emotion and food are interrelated in a plethora of ways as mood have an impact on food intake and choice, and vice versa (Mccrickerd & Forde, 2016). A study by Kandiah et al. (2006) demonstrated that when under stress, people commonly eat burgers, sandwiches, pizza, tacos, ethnic food and fast food. In Italy, mood exerted its role on sushi consumption. Additionally, ethical concerns were found to not influence consumers sushi intake. These findings are in line with previous studies where consumers tend to attach the responsibility for animal welfare to institutions and government (Ellingsen et al., 2015; Maesano et al., 2020).

Regarding familiarity, the latter was found to have no impact on sushi intake frequency. Previous scholars proven that once individuals have developed familiarity with a product, they are more inclined to process information from previous beliefs and experiences (Fischer & Frewer, 2009; Hughes & Harding, 2014). So probably, the unfamiliarity of sushi could be explained by the ethnic nature of this

food. Similarly, the ethnic nature of sushi could be behind convenience found insignificant in determining sushi consumption frequency. Sushi preparation usually requires a special set of tools and skills for consumers to prepare in their own homes (Nagel, 2009), thus Italian consumers might prefer to eat sushi in specialised restaurants rather than prepare it by themselves to avoid any possible health hazards.

Lastly, respondents' concerns with weight didn't condition sushi consumption frequency. Indeed, sushi is a differentiated category of food that can have heterogeneous nutritional properties and can actually have nutritional values conflicting with weight control objectives (Hsin-I Feng, 2012). Furthermore, the spread of "all you can eat" restaurant (Mela, 2001), makes this category of food particularly linked with excessive intake. Hence, sushi cannot be generalised as a diet friendly food.

5.7. Conclusion

Japanese cuisine in Italy can be understood as an "ethnic cuisine," defined as a cuisine which is ethnically marked and commonly understood to be of non-local derivation. The successful establishment of ethnic food is the result of the dynamic relationship between both supply-side and demand-side factors. In the present study, positive attitude towards sushi, social norms and neophobia are found to be the major drivers of consuming this food. Sushi consumption is considered to be a fashionable, trendy, and stylish food for Italian consumers. Unlike seafood where health benefits play a crucial role in consumers' decision-making process, Italians eat sushi to feel acceptance among their friends and family. Still, the unfamiliarity with sushi among a large portion of the Italian population makes it still perceived as a strange food. Consumers' request is also focused more and more on high-quality, safe and environmentally friendly products, as well as having transparent traceability. seafood traceability reduced consumers' consumption frequency, and therefore there is a need to better inform consumers about fisheries origin and value chain to reduce their fear of eating raw fish like sushi. Thus, producers, marketers, and policy makers need to be coherent and clear regarding fish origin, production method and traceability to not cause further confusion among consumers. This can be achieved by adopting new technologies as blockchain that brings diverse stakeholders together to ensure food safety by providing a transparent and immutable history of transactions (Galvez et al., 2018; Mcentire & Kennedy, 2019).

Our findings are not free of limitations. SEM can be sensitive to model misspecification, where the underlying assumptions of the model do not match the data. In addition, identifying the parameters of the SEM may be difficult when there is a lack of variation in the observed variables or when the model is too complex. SEM can only infer causality but cannot prove it. It is important to keep in mind that correlation does not always imply causation. Furthermore, SEM require careful consideration of model selection, and often involve a trade-off between model fit and parsimony. Thus, it can be difficult to determine which model is the best fit for the data. Most importantly, SEMs can be difficult to interpret, particularly when the results are not consistent with prior theory or research. The interpretation of SEM results requires a high level of expertise in statistics and research methodology. Our results only concern Italian consumers and may not be transferable to other geographical contexts, as cultural differences and dietary habits may play a role in shaping consumer decision choice for sushi. Future research needs to be undertaken in several directions.

In an attempt to address one of the core limitations of the current study, it would be worth analysing the main drives for sushi and the role traceability plays in consumer's decision-making choice in other

countries. In addition, Alternative modelling techniques such as multiple group SEM or latent curve analysis can be used to address identification issues(Bayard & Jolly, 2007; Meredith & Tisak, 1990). Furthermore, one future direction could be to extend the SEM to a longitudinal design, where data is collected at multiple time points. This could help in analysing the changes in the relationships among the variables over time (Oud, 2001). Future research could also explore Bayesian SEM, which is a relatively new approach that allows for flexible model specification and uncertainty quantification. Lastly, Multi-method SEM involving the use of multiple data sources or methods to test the same hypothesis, could help in improving the validity of the SEM results (Schuberth & Cantaluppi, 2017).

6. Conclusions

The current PhD thesis analysed consumers' preferences for fish in different dimensions. We can draw a list of main findings from the 4 papers structuring this work.

From the literature, it is clear that the major importance of intrinsic fish factors is the main driver behind consumers' choices. In addition, factors such as past experiences, dietary habits, and sociodemographic characteristics condition fish consumption across the world. Furthermore, certification systems and labels are another important product-related feature. National and international labels and certifications, thanks to their reputation, manage to provide consumers with a guarantee not only of organoleptic quality and food safety but also of environmental sustainability (protecting fish species from extinction and ensuring animal welfare) and social sustainability (Corporate Social Responsibility (CSR)). Still, the latter are unable to ensure consumers about fish consumption, as the

provided information does not meet consumer needs. Lastly, a concentration of research among Mediterranean countries, particularly southern ones, requires more research to have an overall view of consumers' preferences.

Going deeply into the analysis of consumer behavior for four Mediterranean countries (Italy, Spain, Tunisia, and Lebanon), and unlike other foods such as meat, wine, or cereals that can define a clear consumption pattern for food products among people from different countries, finfish is still unable to do so, even though a progressive departure from the traditional Mediterranean diet is being observed mainly in younger generations. In addition, apart from intrinsic features, trust appeared critical in consumers' choices along with a set of attributes related to food traceability in general. Consumers showed their need for reassurance regarding fish quality due to the numerous health hazards linked with fish. Hence, information asymmetry reduction activities would be desirable, both in terms of augmented traceability and consumer education. We must also acknowledge that respondents had conflicting purchasing motivations. For example, their desire to eat better-tasting fish may compete with convenience or healthiness. Our study concerned the broad category of finfish, which is understood differently in those countries, with usually eaten species being very different from one another. Consumers' preferences appear to be extremely fragmented in each country, and thus identifying the important attributes for various consumer typologies will help marketers and fish suppliers satisfy people's needs without overexploiting marine resources. Therefore, narrowing the set of finfish species would add more actionable knowledge for the stakeholders.

The best to worst analysis, using a set of 13 attributes (confronting traceability related features with The best-to-worst analysis, using a set of 13 attributes (confronting traceability-related features with intrinsic and extrinsic cues), identified to be important in consumers' choice, was performed. It enabled

us to demonstrate how traceability became of secondary concern when confronted with intrinsic and extrinsic cues. Therefore, certifications and labels need to promote fish species' sensory characteristics to promote less popular fish species and shift consumers' behavior towards a more conscious choice. This could be achieved by educating people about fish species and their uniqueness (sensory sheets for fish species available through QR codes, implementation of a blockchain-based platform ensuring access to reliable information), which will help promote sustainable consumption, adhere to a healthier and conscious food choice, protect the environment, and provide fisheries stakeholders with real-time data about consumers' behavior. Furthermore, only a small percentage of consumers cared about traceability issues, which can actually hinder fish companies in reinforcing their traceability as end-users are still not well informed about the risks of fraud for seafood on their health. Thus, private and public bodies should encourage manufacturers to produce traceable fish with food quality inspection via customization through subsidies and other policies to reduce the spread of foodborne diseases and adhere to people's needs. In addition, as supply chain traceability is a basic and mandatory requirement from public bodies, governments should support manufacturers in producing multi-level safe food to meet diverse consumer demand and gradually promote the construction of a traceable food market system. Manufacturers should dynamically adjust their production and marketing strategies for different types of safe food based on consumers' preferences

Lastly, the popularity of ethnic food trends as sushi is mainly linked to social pressure. Positive attitude towards sushi, social norms and neophobia are found to be the major drivers of consuming this food. Sushi consumption is considered to be a fashionable, trendy, and stylish food for Italian consumers. Unlike seafood where health benefits play a crucial role in consumers' decision-making process, Italians eat sushi to feel acceptance among their friends and family. Still, the unfamiliarity with sushi among a large portion of the Italian population makes it still perceived as a strange food. Consumers' request is also focused more and more on high-quality, safe and environmentally friendly products, as well as having transparent traceability. seafood traceability reduced consumers' consumption frequency, and therefore there is a need to better inform consumers about fisheries origin and value chain to reduce their fear of eating raw fish like sushi. Thus, producers, marketers, and policy makers need to be coherent and clear regarding fish origin, production method and traceability to not cause further confusion among consumers.

From the present PHD. Thesis, we can draw a series of conclusions and implications from the 4 papers constituting the entire work.

Initially, Business owners and decision-makers need to adopt a comprehensive strategy that is based on reliable scientific evidence for seafood and incorporates educational campaigns in targeted interventions in several sectoral policies (fisheries, health, fiscal, rural areas). Mandatory labelling of

fish should also be a part of enhanced information layout. The accrual labels associated with the FAO fishing area, ethical concerns and sustainability issues do not meet the expectations of consumers for information. As a result, rethinking the labelling of fisheries goods could be a successful tactic to guarantee that the general public receives balanced information on nutritional value, fishing zone, and fishing management. To apprise consumers about fish species that are readily available locally, the advantages of eating locally sourced fish, and how behavioural change can contribute to environmental sustainability and the maintenance of ecosystems, it is critically important to implement instant messaging other than mandatory labelling. For instance, providing information about fish could encourage consumers to eat less popular fish species and advertise the importance of conscious fish intake that would not only increase their longevity but will also address climate change issues and preserve cultural values among numerous fishing communities. If a company is aiming to implement a good certification and traceability system, the latter must demonstrate those practices and communicate them through the impact of such interventions on product quality, freshness, Taste and health guarantees.

Consuming fish in accordance with seasonality is not only an important aspect of sustainable consumption, but it also helps to revive forgotten fish species. Educating consumers about the nutritional benefits and culinary versatility of these species can aid in shifting their consumption patterns towards more sustainable options. This could be achieved through targeted marketing and promotions, as well as through the integration of seasonal fish species into restaurant menus and culinary education programs. At policy level, there is a need to improve the nutrition sensitivity of the fish system, similar to what has already been done in the agricultural sector (Bennett et al., 2021). This could include measures such as promoting sustainable fishing practices, supporting small-scale and artisanal fishing communities, and investing in research and development of sustainable aquaculture practices. It is also important to ensure that public policies are aligned with consumer preferences and demand, and that they are designed to promote sustainable and responsible consumption practices. This could be achieved through a combination of market-based incentives, regulations, and public education and outreach campaigns. Ultimately, a holistic and collaborative approach involving all stakeholders in the fish supply chain, including producers, distributors, retailers, and consumers, is necessary to achieve a more sustainable and equitable fish system. Fisheries policies could design a development path in which origin, traceability, fishing management, species specific health values (targeted for specific micronutrient deficiencies) could represent main pillars (Bogard et al., 2017).

Lastly, the findings indicate a significant demand for sustainable seafood options among consumers, highlighting the need for action by various stakeholders. It is recommended that restaurants and seafood suppliers prioritize sourcing sustainable seafood and effectively communicate this information to their customers. Such efforts would not only cater to the demands of the consumers but also benefit the

environment in the long run. Moreover, policymakers should take note of this trend and consider implementing regulations that promote sustainable fishing practices and traceability in seafood supply chains. These policy interventions can lead to positive outcomes for both the environment and the economy, including the preservation of marine ecosystems and the livelihoods of fishermen. Overall, the study's implications and policy recommendations serve as a call to action for all stakeholders to promote sustainable seafood practices and work towards a more environmentally friendly and socially responsible seafood industry.

Appendix

Table A 1. Summary of reviewed articles

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(López-Mas et al., 2021)	France, Germany, Italy, Spain, and UK	Quantitative approach (questionnaire)	2511	• The EU respondents' attributions of 'quality' favoured wild fish. • Consumers believed that wild fish were more affected by marine pollution, heavy metals, and parasites. Farmed fish were safer, more controlled, offered more guarantees, were easier to find. • The presence of children within the household made consumers lean more towards wild versus farmed fish.
(Maesano et al., 2020)	***	Qualitative approach (review of articles)	***	• The country-of-origin attribute was found to be the most important attribute in relation to consumer choice. Consumers prefer wild-caught fish for its perceived quality, better safety and health aspects, and taste perception than the farmed options. • Consumers are willing to pay premium prices for organic labels and animal welfare certification despite their non-relevance during the decision choice.
(Temesi et al., 2020)	Hungary	Quantitative approach (questionnaire)	1042	• No effect of either physical or social risk on fish consumption were noted. • The direct and negative effects of unpleasant experiences as psychological risk on consumption frequency were verified. • Past experiences of consumers have a negative impact on fish consumption.
(Pulcini et al., 2020)	Italy	Quantitative approach (questionnaire)	8657	• Fresh fish consumption is mainly driven by organoleptic characteristics: taste and flavour as well as freshness and health. • Consumers leaned toward frozen fish for its convenience and easy preparation. • Fish species consumption varied among the north and the centre of Italy. • Younger respondents consumed more freshwater than marine fish due to the cheaper price cue and cared less about traceability and natural taste. • Absence of antibiotics was more important for ≥70.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Reig et al., 2019)	Spain	Qualitative approach (Nominal group technique)	30	• Consumers have a different perception of fish. characteristics than experts, wholesalers, and fishmongers. • The lack of information and knowledge about aquaculture practices stands out as the main negative issue that could become a barrier for its social acceptability.
(Ankamah-Yeboah et al., 2019)	Germany	Quantitative approach (questionnaire)	1236	• Consumers prefer convenient fish products, such as fillets, without bones and skin. • Country of origin significantly affects consumers' preferences, with local German trout being the most valued by consumers. • Organic labels are more preferred than the ASC one. Information about the environment did not change respondents' choice compared to the organic label.
(Hinkes & Schulze-Ehlers, 2018)	Germany	Quantitative approach (questionnaire)	325	• German consumers are price sensitive and prefer fish produced in Germany over fish farmed in either Bangladesh or Vietnam. • Respondents were not familiar with certification systems of fish products. • Country image plays a major role in consumers' decision choice as German respondents showed low interest in buying fish from Vietnam or Bangladesh.
(Bronnmann & Hoffmann, 2018)	Germany	Quantitative approach (questionnaire)	485	• Price and catch area had an impact on consumers' preferences (cheap and wild fish was preferred). • The presence of a label increased consumers wtp for the product (in both cases where consumers were informed about the meaning of the label or not). • The choice of turbot decreased as family members increased due to the expensive price of turbot. • The wtp was also affected by the purchase location of fish. • Other socio demographic features such as income, education, age, or gender did not have an impact on consumer's choice and wtp.
(Giosuè et al., 2018)	Italy	Quantitative approach (questionnaire)	560	• Consumers paid more attention to factors related to the quality of the product than to those affecting the exploitation of the marine resources.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				• Existence of a connection between the desire for Eco-labelling and seafood features; especially fish quality and freshness, geo-origin of fish and wild versus farmed origin were observed. • Price is a major factor in guiding consumer's decision choice.
(Risius et al., 2017a)	Germany	Qualitative approach (taps and in-depth interviews) + quantitative approach (cross-sectional consumer survey)	18 for the qualitative approach and 459 for quantitative approach	• The attributes geographical origin, price, and claim were more important to consumers than sustainability labels. • Geographical origin was the most influential attribute for consumers.
(Veldhuizen et al., 2017)	Netherlands	Quantitative approach (questionnaire)	457	• Product quality and animal welfare concerns are two factors that guide consumers in their decision choice. • Consumers place animal benefits over personal benefits, worker benefits and community benefits. • Consumers' preference for environmentally sustainable over the socially sustainable is due to the lack of information about the second one.
(Rickertsen et al., 2017a)	France	Quantitative approach (questionnaire)	276	• Wild and locally caught fish is healthier and safer than farmed fish. • Fish species defined consumers' preferences (price and nutritional value were the main factors that defined consumers appreciation of the product). • Information about the product had an impact on consumers' choice. • Older participants were more concerned about environment and animal well fare than younger ones. • Gender plays a role in consumers' attitudes as old French women had a positive view of farmed fish compared to old French man.
(Jonell et al., 2016)	Sweden	Quantitative approach (questionnaire)	371	• Recognition of eco-labels for seafood (together with concern for negative environmental impacts) constitutes the variable that most strongly influences

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				respondents stated purchasing of eco-labelled seafood. • Consumers' concerns about environment are positively correlated to purchasing eco-labelled products. • Consumers have a limited knowledge level about the traceability and information about seafood products.
(McClenachan et al., 2016)	USA	Quantitative approach (questionnaire)	235	• Consumers are confused about the meaning of different terms related to fish sustainability. • Engaging consumers about social issues associated with global fisheries has an impact on their decision making, as consumers are willing to pay more for seafood labelled or certified and socially responsible.
(Claret et al., 2016)	Spain	Quantitative approach (questionnaire)	300	• Information provided to consumers about method of production and fish species had an impact on their perception of the product. • Consumers preferring wild fish were those who perceived wild fish as being healthier, having a healthier diet, better taste and being of better quality. • Consumers preferring farmed fish considered that fish from this method of production were less affected by marine pollution and provided more guarantees than wild fish.
(Can et al., 2015)	Turkey	Quantitative approach (questionnaire)	127	• Health concerns play an important role in the selection of fish consumption. • Fish consumption is heavily correlated to the socio-demographic characteristics of the consumers as well as their habits and traditions.
(Carlucci et al., 2015)	***	Qualitative approach (review of articles)	***	• The most important barriers to fish consumption are the sensory disliking of fish, health risk concerns, high price perception, lack of convenience, lack of availability of the preferred fish products, and lack of knowledge in selecting and preparing fish. • Sensory characteristics of fish (taste, smell, and texture) are key determinants of fish consumption. • Consumer fish choice is strongly affected by habits which emerge and are reinforced from the accumulated satisfactory/unsatisfactory

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				past experiences associated with the same behaviour. • The presence of children in the households (less than 18 years old) increased the fish consumption. • Older and well-educated consumers' intake of fish was higher than younger and less educated categories.
(S. Vitale et al., 2017)	***	Qualitative approach (review of articles)	***	• WTP varied among the species, as well as by countries and in function of the brand. • Consumers' awareness about environmental concerns is influenced by social and demographics' structure of investigated population, but also by cultural heritage and economic conditions and all intrinsic factors able to affect the consumers' WTP.
(Witkin et al., 2015)	UK	Quantitative approach (questionnaire)	302	• Consumers value both location of catch and eco-labelled seafood. Consumers' higher wtp was related to the origin of the fish. • Unfamiliarity with a species often overrode the desire for local or sustainable products. • Respondents were more willing to try new species in restaurants.
(Hynes et al., 2019)	Ireland and Norway	Quantitative approach (questionnaire)	1960	• Respondents who believe that environmentally friendly fish farming practices are a relevant consideration when buying a fillet of farmed salmon are more likely to be willing to pay a price premium for the proposed produce. • Environmentally friendly practices were not translated in a higher wtp for farmed salmon in Ireland compared to Norway where consumers were willing to pay higher for friendly practices.
(Cantillo et al., 2021)	***	Quantitative approach (questionnaire)	27732	• Wildly caught fish was more preferred compared to the farmed alternative. • Older and high-income people prefer to consume wild fish versus the farmed alternatives. • Fish consumption is linked to taste, price, easy to digest, easy to prepare and cook and low-fat content (healthiness).

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				• Female with high-income and living with children consumers tend to consume sea food more frequently.
(Paredes et al., 2020)	Australia	Quantitative approach (questionnaire)	1011	• The catch area of the fish is an important determinant of fish consumption (high preference for wildly caught vs farmed fish). • Locally caught fish is preferred compared to the farmed one regardless of the residence area of the consumers. • Taste, followed by diet diversity defined consumers' intention to eat fish. • Freshness is linked to the origin.
(Jose Ruiz-Chico et al., 2020)	Spain	Quantitative approach (questionnaire)	558	• Quality, taste, environmentally friendly and healthy are the main intrinsic cues explaining consumers' choice for farmed fish. • Price and more employments are the extrinsic cues that defined consumers' perception of farmed fisheries. • Consumers didn't have enough information about the origin of the product that they are eating. • Women cared more about environmental issues. • People with high income showed less acceptance of farmed fish compared to medium and low-income individuals.
(Menozzi, Nguyen, Sogari, Taskov, et al., 2020)	France, Germany, Italy, Spain, and the UK	Quantitative approach (questionnaire)	2509	• A higher preference for wild fish was translated with a higher wtp for the production method. • The sustainability label was appreciated in all countries. • The nutrition and health claim estimates indicated a positive effect on consumers 'utility.
(Rodriguez-Salvador & Dopico, 2020)	Spain	Quantitative approach (questionnaire)	216	• Consumers do not have a good knowledge of traceability. • Consumers related traceability to origin and to the entire life history of the product. • Participants' main expectations regarding traceability functions are the origin of the fish, quality control and the information that appears on the label.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Alam & Alfnes, 2020)	Bangladesh	Quantitative approach (questionnaire)	410	• Consumers were willing to pay more for indigenous than for foreign fish species. • Appearance, taste, texture, and global appreciation were found significant in defining consumers preferences for brown trout and rainbow trout whether wild or farmed.
(Zander et al., 2018)	Germany	Quantitative approach (questionnaire) + Qualitative approach (focus groups and TAPS)	quantitative approach: 459 qualitative approaches: 18 for TAPS and 56 for focus groups	• Consumers' awareness of production methods in modern aquaculture was low. • Lack of knowledge about differences between wild and farmed fish was noticed. • Freshness, appearance, intended use, and price were mostly the determinants cues for consumer's choice. • Sustainable production didn't seem to be relevant. Consumers are unaware of the difference between labels.
(Darko et al., 2016)	Tanzania	Quantitative approach (questionnaire)	479	• The "farmed" attribute has a negative and statistically significant coefficient, resulting in a negative willingness to pay estimate. • Consumers prefer cheaper tilapia prices. Farmed tilapia is less preferred compared to wild tilapia. • Consumers like medium and large size tilapia compared to small size fish.
(X. Chen et al., 2015)	France	Quantitative approach (questionnaire)	78	• Negative environmental information reduces the wtp regardless of fish eco-labelling. • Consumers were willing to pay premium prices for eco-labelled wild and farmed cod and eco-labelled farmed salmon. • Participants were found prone to pay 4% more for eco-labelled products.
(Thapa et al., 2015)	USA	Quantitative approach (questionnaire)	506	• Flesh colour, fish size, whether fish was bony or not, fat content, appearance, and origin of fish. Year-round availability of live fish and frequency of visiting fish market had an impact on consumers' choice. • Religion, ethnicity, educational status, employment status, annual income, family size, and weekly expenditures on seafood had an impact on consumers' choice.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Sergio Vitale et al., 2020)	Italy	Quantitative approach (questionnaire)	560	• Consumers that were aware and willing to pay a price premium for anchovy eco-labels were female, living alone, informed about environmental issues by means of mass communication, and had a strong intrinsic motivation to protect habitats. • Income and interest in other eco-label products seemed to influence the consumers' responsiveness to anchovies caught in certified 'blue' fishing grounds, while high-income consumers showed an interest in fish quality and its effects on human health.
(Boncinelli et al., 2018)	Italy	Quantitative approach (questionnaire)	250	• Consumers are willing to pay an average premium price of 4.75% for knowing the catch zone of fish used as ingredients of fish-based processed food. • Gender and education have an impact on consumers' wtp.
(Pérez-Ramirez et al., 2015)	Mexico	Quantitative approach (questionnaire)	364	• Freshness was the most important factor when buying fish, followed by protein intake, taste and price. • Income level, consumers' occupation and frequency of fish consumption are factors considered in the buying decision. • The acceptance of eco-labelled fish is correlated to the consumption levels and knowledge (low fish intake and no knowledge was translated by a negative perception for eco-labelled fish).
(Polymeros et al., 2015)	Greece	Quantitative approach (questionnaire)	149	• The high-potential aquaculture consumers declared a higher income, were younger and represented a higher educational level than the low-potential aquaculture consumers. • Wild and farmed fish is preferred compared to frozen and processed fish-based products. • Lack of information about farmed fish is the main barrier to increasing farmed fish acceptability among consumers.
(Risius et al., 2019b)	Germany	Quantitative approach (questionnaire)	447	• Sustainability was demonstrated to be the major concern in defining consumer's decision choice. • Label was not very important. Domestic origin was preferred compared to imported fish.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				• The sustainable labels were demonstrated to be ineffective in ensuring consumers and gaining their trust.
(Heide & Olsen, 2017)	Norway	Quantitative approach (questionnaire)	503	• Cognitive freshness was identified as the most important attribute when choosing cod fillets, followed by convenience, colour, freshness statements, packaging shape and taste. • Black packaging was the preferred colour among the consumers compared to silver or vacuumed packaging.
(Ellingsen et al., 2015)	Norway	Quantitative approach (questionnaire)	2147	• These results indicate that in a hypothetical choice experiment Norwegian consumers are willing to pay about 50 per cent extra for a salmon filet from a salmon with improved fish welfare. • Norwegian public think that the main responsibility for fish welfare lies on producers and the Government.
(Güney, 2019)	Turkey	Quantitative approach (questionnaire)	526	• Lack of information on the production method (wild or farmed) causes doubts, and consumers tend to purchase farmed fish instead of the more expensive wild fish. • The easy access to farmed fish caused more trust issues between consumers and sales points. • Age and education level influenced consumers' willingness to eat farmed fish, younger and more educated people were more willing to do it than older and less educated ones.
(Kitano & Yamamoto, 2020)	Japan	Quantitative approach (questionnaire)	532	• The availability of fish in local markets plays a major role in consumer's choice decision. • Wildly caught fish was preferred compared to the farmed alternatives in terms of quality. • Information and quality guarantees given about the product by aquaculture industrial cooperatives made consumers less anxious about risk related to fish consumption. • The presence of children in the household had no significant effect on consumers' purchase habits. • A correlation between frequency of consumption and eating habits, knowledge and experience was found.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Smith et al., 2017)	USA	Quantitative approach (questionnaire)	202	• Fish consumers found taste to be the most influential factor. • Eating habits and cultural reasons influenced consumers' intake and view of healthiness and sustainability of fish. • Gender and geographic location had an impact on consumers preferences toward fish (male and those living in urban areas were more likely to consume fish). • Income, area of living, presence of children and purchase habits were found to increase fish consumption whether in restaurants or at home consumption.
(Abdikoglu & Unakitan, 2019)	Turkey	Quantitative approach (questionnaire)	248	• The most important factors in fish consumption are price, form, production method and supply channel (supermarket >fishmonger>restaurants). • Income plays a key factor in defining the important factors that guide consumer's choice, low-income consumers think more about price, high-income consumers think more about the form of the product. Fish price and form are the most important factors that define different typologies of people.
(Murray et al., 2017)	Canada	Quantitative approach (questionnaire)	315	• Sensory attributes of the product (taste, smell, and appearance) were the most important factors for most consumers. • Origin, catch area and price are the three main factors that defined consumers' decision choice for seafood products. • People who eat more fish when they are young, eat it more often when they are adults.
(Lawley et al., 2020)	Australia	Quantitative approach (questionnaire)	2061	• Freshness (time since harvest) along with color, smell and eyes were identified as key indicators for fish quality perception. • Size and origin of fish were important for barramundi fish quality perception as consumers preferred locally vs imported fish and preferred locally farmed fish more than wildly caught in terms of availability. • Eyes, as a sign of freshness, were more used by older people than younger ones due to better experiences.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Pereira et al., 2020)	Portugal	Quantitative approach (questionnaire)	640	• Respondents are not willing to pay premium price for fish with low allergenic potential compared to conventional fish. • The presence of fish allergies inside the household increased consumers' wtp for fish with low allergenic potential since consumers wants to acquire the health benefits of fish meat without compromising their health status.
(Antão-Geraldes et al., 2020)	Spain	Quantitative approach (questionnaire)	74	• Appearance and global appreciation defined consumers' choice between farmed and wild brown trout and rainbow trout. • The acceptance of farmed fish varied according to the specie.
(Onyeneke et al., 2020)	Nigeria	Quantitative approach (questionnaire)	54	• Income, education, household size and the price of fresh fish had positive effects on the demand for dried fish. • Fresh fish is the highest priced form of fish in the consumer market, whereas smoked fish is the lowest priced. • Age of the consumer was a negative and significant predictor of demand for dried fish.
(Cardoso et al., 2016)	Portugal	Quantitative approach (questionnaire)	1083	• The consumption choices within the seafood category were affected by the education factor. • Older consumers were much fonder of wild fish and much more unwilling to consume farmed fish. • Age was a major determinant affecting seafood choices and interfered in the relationship between these and health status.
(Liu et al., 2015)	China	Quantitative approach (questionnaire)	192	• The price of freshwater fish impacts consumers risk perception. • Consumers' perception of a healthy diet, purchasing experience, concern extent of food safety and the situation of food safety affect consumers' perception of freshwater fish. • Risk perception was higher for women than men due to a more important responsibility to provide safe food for the family. • Families with children under 18 cares more about food safety.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Wenaty et al., 2018)	Tanzania	Quantitative approach (questionnaire)	122	• The main factors affecting fish consumption were reported to be price, convenience, accessibility, availability, and healthy concerns.
(Cantillo et al., 2020a)	***	Qualitative approach (review of articles)	***	• The general pattern shows that the local products are the preferred options. Consumers usually prefer wild fish over farmed fish. the preference for wild species was more related to issues like availability and taste. • Many studies showed that products that have some specific certified labels are preferred by consumers. • A general preference for fresh products above other presentations like frozen, smoked, dried or fried is observed. place of purchase impacts consumers' wtp (higher in specialized stores).
(Masi et al., 2022)	France, Spain, Greece, Italy	Quantitative approach(questionnaire)	6117	• The most significant consumption of sea bass and sea bream is found in Italy, where it occurs at least once a week for 54.4% for the respondents. • The preferred form of purchase of sea bream and sea bass in three out of four of the analysed countries is the fresh product, either whole or gutted. • consumers personal experiences influenced the most their fish species consumption. • consumer pays most attention is freshness, detected through a sensory evaluation or the date of capture (if present), taste, health benefits, but also the quality/price ratio.
(Castro et al., 2021)	Philippines	Quantitative approach(questionnaire) and qualitative approach (focus groups)	Quantitative approach (300) and qualitative approach (10)	• Information about food safety plays the most important role in consumer likelihood to buy fish and fishery products. consumers preferred the presence of information on the extent of good aquatic and animal welfare for target and non-target species during catch/production. • urban barangay settlers were more likely than rural barangay settlers to prefer both environmental sustainability and food safety policies to a combination of food safety and traceability policies. • Respondents associate a safe product with freshness.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
(Sacchettini et al., 2021)	Italy	Quantitative approach (questionnaire)	404	• consumers who are less concerned about healthy eating and less involved in their own health are also less interested in characteristics of seafood products such as quality or sustainability labels. • Most consumers viewed seafood consumption as a healthy eating choice. They also showed an extremely positive attitude towards the consumption of seafood considering it as being tasty and satisfying for the palate. those seeking more information regarding seafood are more demanding in terms of clear information about the product quality and origin.
(Cusa et al., 2021a)	UK, Ireland, Belgium, Spain, Italy, Greece	Quantitative approach(questionnaire)	720	• European consumers have a poor understanding of the appearance of the fish they consume (overall ~ 30% correct identification). • British consumers performed the poorest and Spanish ones doing best in terms of identifying fish species. Spanish consumers had the highest fish consumption among all the selected countries. • the appetite for fast and easy to prepare meals, especially among urban dwelling younger generations, is partly responsible for motivating the retail sector to prioritize processed products over fresh ones, favouring supermarkets to the detriment of fishmongers.
(Hossain et al., 2022)	Bangladesh	Quantitative approach(questionnaire)	292	• Odour is the most influential attribute as consumers are found to pay 7% less if the pangasius smells bad. • The quality attributes such as fish size, form, color, appearance, and abdomen are important for pangasius purchase decision. older consumers preferred pangasius less than the other age groups. • Consumers in the consumption zone considered more factors in their purchase of pangasius than consumers in the production zone.
(Tran et al., 2022)	Nigeria	Qualitative approach(choice experiment)	200	• Consumers were willing to pay between 3.1% and 18.8% more for fish certified as safe compared to uncertified fish.

Author(s)	Country of investigation	Methodology	Sample size	Key findings
				• there was an asymmetry in food safety certification valuation, with consumers paying significant premiums for high-value larger-sized certified live and smoked catfish, but not smaller-sized certified live and smoked catfish. • Lower-value fish products typically consumed by lower-income consumers show less potential for certification instead consumers showed higher demand for high value certified fish species.

Table A 2. Correlation between average BW attribute scores Coefficients, Italy

	Quality label												
Quality label	1.00	Fish species											
Fish species	0.01	1.00	Catch area										
Catch area	0.06	0.03	1.00	Freshness									
Freshness	-0.40	-0.23	-0.30	1.00	Price								
Price	-0.15	-0.18	-0.14	0.02	1.00	Physical state							
Physical state	-0.10	-0.10	-0.18	0.16	-0.23	1.00	Sustainable fishing						
Sustainable fishing	0.04	-0.08	0.17	-0.09	-0.24	-0.30	1.00	wildl caught fish					
wild caught fish	-0.07	-0.06	0.08	0.02	-0.16	-0.15	0.15	1.00	Seasonality				
Seasonality	-0.15	-0.05	0.04	0.00	-0.04	-0.16	-0.01	0.06	1.00	Farmed fish			
Farmed fish	-0.01	-0.08	0.13	-0.19	-0.09	0.00	0.05	0.06	-0.10	1.00	Cleaned/filleted		
Cleaned/filleted	-0.08	0.00	-0.14	-0.05	0.26	-0.13	-0.16	-0.23	-0.18	-0.04	1.00	Taste/consistency	
Taste/consistency	-0.13	-0.10	-0.31	0.19	0.11	-0.03	-0.17	-0.16	-0.16	-0.15	-0.03	1.00	Smell/appearance
Smell/appearance	-0.07	-0.21	-0.23	0.22	0.11	0.07	-0.16	-0.42	-0.13	-0.19	0.04	0.25	1.00

Table A 3. Correlation between average BW attribute scores Coefficients, Spain

	Quality label												
Quality label	1.00	Fish species											
Fish species	0.10	1.00	Catch area										
Catch area	0.08	0.11	1.00	Freshness									
Freshness	-0.45	-0.28	-0.40	1.00	Price								
Price	-0.21	-0.22	-0.15	0.12	1.00	Physical state							
Physical state	-0.12	-0.19	-0.25	0.11	-0.25	1.00	Sustainable fishing						
Sustainable fishing	0.15	-0.02	0.21	-0.07	-0.35	-0.35	1.00	wild caught fish					
wild caught fish	-0.13	0.04	0.16	-0.04	-0.14	-0.20	0.13	1.00	Seasonality				
Seasonality	-0.16	0.02	0.02	0.07	-0.08	-0.19	0.03	-0.01	1.00	Farmed fish			
Farmed fish	-0.13	-0.07	0.04	-0.08	0.07	-0.06	0.04	0.03	-0.21	1.00	Cleaned/filleted		
Cleaned/filleted	-0.16	-0.14	-0.19	0.06	0.20	0.11	-0.20	-0.23	-0.12	0.03	1.00	Taste/consistency	
Taste/consistency	-0.13	-0.15	-0.27	0.24	0.12	-0.06	-0.09	-0.22	-0.02	-0.09	0.02	1.00	Smell/appearance
Smell/appearance	-0.01	-0.23	-0.21	0.18	0.12	0.10	-0.12	-0.31	-0.06	-0.18	0.06	0.27	1.00

Table A 4. Summary statistics (N = 2003)

Variable	Country	Code	Number of individuals	Percentage
Gender				
Female	Italy	1	506	50.4
	Spain		497	49.7

Male	Italy	2	497	49.6
	Spain		503	50.3
Age class				
18-29	Italy	1	179	17.8
	Spain		239	23.9
30-44	Italy	2	285	28.4
	Spain		261	26.1
45-54	Italy	3	241	24
	Spain		150	15
55-70	Italy	4	298	29.7
	Spain		350	35
Educational level				
Secondary school diploma	Italy	1	106	10.6
	Spain		110	11
High school diploma	Italy	2	532	53
	Spain		394	39.4
Bachelor's degree	Italy	3	298	29.7
	Spain		378	37.8
Master	Italy	4	32	3.2
PhD	Italy	5	35	3.5
Master or PhD	Spain	4	118	11.8
Profession				
Freelancer	Italy		113	11.3
	Spain	1	84	8.4
Employee	Italy		400	39.9
	Spain	2	395	39.5
Worker	Italy		117	11.7
	Spain	3	107	10.7
Unemployed	Italy		198	19.7
	Spain	4	209	20.9

Student	Italy		76	7.6
	Spain	5	97	9.7
Others	Italy		99	9.9
	Spain	6	108	10.8
Revenue level				
<20.000€	Italy		271	27
	Spain	1	311	31.1
20.000-40.000 €	Italy		408	40.7
	Spain	2	413	41.3
40.000-60.000 €	Italy		126	12.6
	Spain	3	135	13.5
60.000-100.000 €	Italy		41	4.1
	Spain	4	52	5.2
>100.000 €	Italy		12	1.2
	Spain	5	16	1.6
Prefer to not respond	Italy		145	14.5
	Spain	6	73	7.3
Area of living				
Seaside city	Italy		215	21.4
	Spain	1	322	32.2
Near the seaside	Italy		212	21.1
	Spain	2	227	22.7
Internal area	Italy		516	51.4
	Spain	3	407	40.7
Mounting area	Italy		60	6
	Spain	4	44	4.4
Kids				
No	Italy		784	78.2
	Spain	1	330	33
Yes	Italy		219	21.8
	Spain	2	670	67

Number of household members				
1	Italy		83	8.3
	Spain		81	8.1
2	Italy		266	26.5
	Spain		269	26.9
3	Italy		288	28.7
	Spain		290	29
4	Italy		305	30.4
	Spain		269	26.9
5	Italy		53	5.3
	Spain		61	6.1
6	Italy		6	0.6
	Spain		19	1.9
7	Italy		1	0.1
	Spain		6	0.6
8	Italy		1	0.1
	Spain		2	0.2
9	Italy		0	0
	Spain		3	0.3
Food orientation				
Vegetarian	Italy	1	21	2.1
	Spain		28	2.8
Vegan	Italy	2	7	0.7
	Spain		10	1
Omnivore	Italy	3	831	82.9
	Spain		542	54.2
Flexitarian	Italy	4	55	5.5
	Spain		110	11
Pescatarian	Italy	5	62	6.2
	Spain		36	3.6
Others	Italy	6	27	2.7

	Spain		274	27.4
Total	Italy		1003	100
Total	Spain		1000	100

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