A cross-sectional study in Mediterranean European countries to support stakeholders in addressing future market demands: Consumption of farmed fish products

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ABSTRACT

Aquaculture is now a viable alternative to help depleted wild fish stocks and encourage the production of alternative animal protein sources. However, studies have shown that farmed fish has a less positive image in consumers than wild fish. The present study investigates the aspects that most influence the consumption choices of some of the most farmed species in the Mediterranean, sea bass and sea bream. The objective is to analyse the habits and preferences of consumers of these products in Mediterranean countries to identify homogeneous and transversal behaviours in the four countries under analysis in order to recognise common marketing actions and levers. To achieve it, a direct survey was conducted on a representative sample of 6117 consumers from France, Spain, Greece and Italy. The cluster analysis carried out for the four countries revealed 11 well-defined consumer profiles. They showed that different socio-economic characteristics, purchasing habits and product attributes explain a significant part of consumption choices and offer key information for exploring food consumer attitudes. In addition, the role of labelling in consumer behaviour is important to understand which aspects consumers pay more attention to when making their choices, representing a discriminating factor in segmenting respondents' profiles. Understanding these preferences, and the importance of certain information, can be useful to intercept and respond to market demands and to improve consumer confidence in farmed fish products.

1. Introduction

The world population growth, the increase in purchasing power in developing countries and the changes in food patterns have led to an increase in the demand for foods of protein origin, with a consequent increase in meat consumption and even more marked stress on fish stocks (FAO, 2014; FAO, 2020). Although some recent studies (Vollset et al., 2020; Bricker, 2021), indicate that between now and 2100 the total fertility rate is destined to decrease all over the world and consequently there will be a decrease in the world population, this will happen indicatively starting from 2064. Until then, the population will continue to increase, reaching approximately 9.7 billion people. This slowdown in population growth is destined to have a major impact on society, and from an environmental point of view it could help mitigate the effects that humanity has on the environment and its degradation.

Nevertheless, given the current world situation, it is not possible to wait for 40 years of nature's course. It is necessary to act in order to safeguard natural resources and in particular the fish stocks most under pressure (FAO, 2018), for which a possible alternative could come from farmed products (Cahu et al., 2004; Duarte et al., 2007; Kole et al., 2009; Atalah and Sánchez-Jerez, 2020).

In Europe low consumption of farmed fish is associated with strong preference for wild fish over farmed fish partly due to a negative image of products from aquaculture (Reig et al., 2019; Pulcini et al., 2020; López-Mas et al., 2021). Often it is preconceptions or beliefs that guide the consumer's choices (Frewer et al., 2001). Beliefs can be self-generated or can arise from direct observations (i.e. tasting) or external sources (Fishbein and Ajzen, 2011). Claret et al. (2016) found out that consumers prefer farmed fish to wild one in a blind tasting, however, they prefer the latter when they know the production method.

Wild products are generally perceived as tastier and healthier by the consumer, rather the choice to buy farmed products is mainly linked to a convenience factor. Moreover, fish from aquaculture is often associated with the use of antibiotics and high farming densities (Pulcini et al., 2020). It is in the study conducted on Italian consumers that Pulcini et al. (2020) raise this issue pointing out how consumers' knowledge about these products is often scarce and frequently misconceived.

López-Mas et al. (2021) conducted a study on over 2500 consumers in 5 European countries to understand what beliefs there are about fish farming and thus, be able to indicate to producers and policymakers the messages to convey in order to improve the perception of this production. The results of their work indicate a path to be taken to improve the perception of aquaculture products; however, the time needed to change consumers' purchasing habits could be quite long. Still, a positive or negative perception is not always associated with coherent purchasing choices for these products. For this reason, it is important to find out what the dynamics and determinants of purchase already in place are in order to find the marketing levers useful to convey aquaculture products. Therefore, there is a need to further investigate not only preferences, but also the drivers that influence these consumption choices.

Analyses of food behaviour in recent years have focused on consumer behaviour towards fish products (Carlucci et al., 2015). Several researchers have been involved in the analysis of consumer behaviour towards fish products and numerous determinants of choice emerged.

Many studies have focused on the role of demographic variables (Tomić et al., 2016), highlighting in particular the relevance of age and household dimension (Birch and Lawley, 2012). A generational gap in consumers' food preferences has been identified by scholars, who mostly found that younger people report higher fish consumption likely due to more variable consumption habits and diet (Kaimakoudi et al., 2013; Supartini et al., 2018). Factors such as education and income levels exert important influences on consumption choices of these products; therefore, regarding gender and type of occupation studies remain controversial. In particular, education (Can et al., 2015; Uddin et al., 2019) is positively correlated with fish consumption; furthermore Myrland et al. (2000) found out that consumers holding bachelor's degrees are more open to varying species in their intake. Higher income levels are generally associated with higher dietary fish intake (Rahman and Islam, 2020). Nevertheless, it is relevant to note that high income levels are also associated with the possibility to consider alternative products in the diet (Hansen and Grung, 2016).

Beyond these, other factors that have been recognised as highly influential are sensory aspects such as freshness, smell and taste (Uddin et al., 2019). Among these, freshness is a key determinant in influencing fish consumption. It is relevant to note that while there is a general propensity for most consumers to purchase fresh produce (Neale et al., 2012), numerous empirical evidences have also observed that the perceived difficulty in preparing fresh fish has a negative influence on purchasing behaviour (Altintzoglou et al., 2010).

Among the most relevant aspects in the empirical investigations, non-sensory factors (motivational, socio-cultural, organisational, agroecological factors) were also explored. The perception of health, quality and safety benefits is considered as one of the motivational factors that could explain fish consumption patterns (Neale et al., 2012; Obiero et al., 2014); however, the issue of perceived convenience or discomfort of fish has often emerged as influential in consumer choice too (Cosmina et al., 2012; Supartini et al., 2018). Price is still little explored in the study of fish consumption behaviour, since the quantity of different species and the wide range of their prices make it difficult to perform any evaluation (Neale et al., 2012). Otherwise, price is a vital determinant of fish consumption both in developed and developing countries (Supartini et al., 2018). Empirical evidence has shown that fish is widely perceived as more expensive than other sources of protein and particularly meat (McManus et al., 2012), although there is little certainty about how this perception influences purchasing behaviour towards fish and fish products (Khan et al., 2018). A minority of studies (e.g.,

Chowdhury et al., 2016) show the opposite, justifying that fish consumption habits are strongly influenced by agroecological and socio-cultural context (i.e. social norms, ethnicity). Fish consumption preferences can vary according to the context in which fish products are consumed, and beyond the socio-cultural heritage, it is the environmental conditions (climate, inland or coastal areas, etc.) that also determine common or different consumption trends (Pilgrim, 1957; Rahman and Islam, 2020; Islam et al., 2020). Origin and production methods are considered among the most important attributes to stimulate food consumption choices, also in the case of fish products (Mauracher et al., 2013). Available studies show that consumers living in areas that are traditionally suited to fish consumption prefer to eat unprocessed fish products (Tomić et al., 2016). The role played by the main factors contributing to consumer awareness complete the general framework (Adinolfi et al., 2011). These factors include trust in information sources (Pieniak et al., 2007), self-efficacy in quality assessment (Sveinsdóttir et al., 2009) and the ability of quality signals to provide accurate information (Adinolfi et al., 2011).

In order to analyse the influence of different factors, the role of product information in consumer choices is important to understand which aspects consumers pay most attention to during their choices.

For this reason, to realise the present work, with the intention of surveying the dynamics of fish consumption, of two of the most consumed fish species in four European Mediterranean countries (Italy, France, Greece and Spain), it has been administered a survey that investigates the determinants of preferences and how these are decoded through labels. The survey was conducted as part of the Horizon PerformFISH project, which gathered relevant information on consumer decision making in order to explore the behaviour of Mediterranean consumers towards sea bass and sea bream (SBSB) products. Through the analysis of literature, the main factors influencing the consumption of fish products were identified. The empirical review was aimed to determine how these factors impact on the consumption of SBSB. Subsequently, the application of the MCA-CA (multiple correspondence analysis-cluster analysis) algorithm allowed to define typological groups based on previously selected dimensions corresponding to the survey section. Cluster analysis techniques have been commonly used by economists to investigate the characteristics and motivations of food consumers and it's one of the most widely used methods in marketing research. The segmentation of consumers into different homogeneous groups permits to summarise consumers' behaviour in a limited number of distinct consumption profiles attentive to precise characteristics of the product. Subsequently, efforts were made to identify transversal consumption dynamics in the various countries in order to understand if stakeholders can use these features as marketing levers highlighting them in the labels.

As far as our knowledge is concerned, some studies are conducted in depth on individual European countries (Tomić et al., 2016; Reig et al., 2019; Pulcini et al., 2020 among others) or comparing multiple countries but with a limited number of cases (Altintzoglou et al., 2010, 2021 among others). This work contributes to bridging an information gap since it aims to find homogeneous transnational cluster among consumers of four Mediterranean European countries through a survey involving more than 6000 consumers.

2. Materials and method

The survey we carried out is part of the Horizon 2020 PerformFish[1] project, which among other objectives aims to analyse consumer profiles and preferences for SBSB products. The aim is to understand the motivations behind consumer choices and to capture the main factors influencing consumer attitudes towards SBSB and/or their derivatives, with particular attention to the role played by origin and labelling. The

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[1] http://performfish.eu/project-overview/

literature suggests that younger and highly educated respondents may be more inclined to participate in CAWI surveys, representing the best solutions to stratify large samples (Christensen, 2013). To overcome this limitation, the survey was commissioned to an external agency in possession of a panel of consumers including all age groups. Obviously, this implies the relative limit to having been able to interview people who are able to use the internet.

Data are collected through surveys conducted with CAWI (Computer Assisted Web Interview) methodology. The first draft of the questionnaire was developed in July 2017 and finalised by November 2017, through modifications advanced and agreed with all project partners.

The final version of the questionnaire was obtained at the end of November 2017 and it was checked with a pilot survey to ensure that everything was correct. Further quality control was carried out directly in the field through a soft launch (179 completed interviews). The approved questionnaire was used for all subsequent surveys, after a new soft launch used as an additional quality control to verify the correctness of the translated version of the questionnaire.

In this article, we extracted and re-elaborated data from the first four surveys of the project that were conducted in the Mediterranean countries: Italy, Spain, Greece and France. Each survey was conducted on at least 1500 consumers who declared to consume SBSB at least twice a year (selected by a filter question) and who were at least 18 years old. The questionnaire (annex 1) has been structured in 27 questions belonging to the 4 domains that are the follow:

1. Socio-demographic variables;
2. Frequency of consumption and reasons of purchase variables;
3. Consumer approach to SBSB products variables;
4. Information and label variables.

In this paper we will proceed with a descriptive analysis of the samples; then, an in-depth comparison of the results of the cluster analyses carried out was made.

The descriptive analysis was performed by comparing the data that emerged from the four surveys using Microsoft Excel. While, the data collected for each country were analysed. In order to identify groups of consumers. To this end the algorithm "Multiple Correspondence Analysis-Cluster Analysis (MCA-CA)" was applied. The MCA-CA algorithm was used to reduce the number of variables (MCA) in order to obtain a more compact set of information in the second analysis (CA). The output of the process is the creation of groups of respondents with common characteristics.

Multivariate analysis techniques simultaneously represent variables and/or cases in an array to better synthesise information. The result is obtained through the representation of variables and conditions in a small number of new dimensions. The cases are aggregated in groups according to the number of discriminating variables. The analysis of multiple correspondences belongs to the family of "descriptive" analysis. This type of analysis is not based on inferential criteria but it is extremely valuable because it allows the use of categorical variables, and to explore non-linear relationships between the most fundamental details related to a particular object of analysis. Specifically, in the analysis of multiple correspondences, all variables are synthesised through the extraction of a series of factors that are combinations of procedures falling within the range of used data. These combinations are calculated through the preliminary transformation of the "case by variable'' matrix into two new matrices: the complete disjunctive matrix and the Burt matrix. These operations improve the information of variables-modalities with low frequencies, such as dichotomic, and to reduce the impact of those with high frequencies, since they use the chi-square metric (Lebart et al., 2006).

The cluster analysis is a multivariate analysis of the data that finds wide application in many areas and that responds to the necessity of gathering the statistical units in homogeneous groups, simplifying the original information but safeguarding the substantial components.

The data were processed through statistical tools to describe the diversified set of attitudes and socio-demographic parameters.

Through the analysis of multiple correspondences, the set of variables is reduced to the only factors explaining the total variability of the data. From the previous analysis, a clustering procedure has been carried out to make values of the same group more similar to each other than those of the other groups (Greenacre, 2010). The data were processed through the SPAD software, version 3.21, with the agglomeration hierarchy procedure, one of the most common clustering criteria (Murtagh and Contreras, 2016), which allows to consider each data value as a single cluster.

An iteration procedure is provided to analyse similarities and differences between the points and through clustering from the closest ones. According to Ward's aggregation criterion, 10 iterations with mobile centers have been completed.

At the end of the analysis, 5–9 clusters emerged in the various surveys. The choice of clusters was based on the dendrogram, the main graphical tool for observing a hierarchical cluster solution (Maimon and Rokach, 2010). An overall reading of these consumption profiles makes it possible to highlight similar consumer profiles in the four countries and at the same time some types of consumers with country-specific purchasing dynamics.

For this reason, the main results of the cluster analysis will be presented through a synthesis of the clusters that have similar preference, purchase and consumption dynamics in the four countries analysed in addition to the country-specific clusters.

3. Results

3.1. Descriptive analysis

Through the filter question used to select consumers of fish and seafood products, it was possible to investigate the main reasons that determine non-consumption. In particular, results of the descriptive analysis conducted in the four countries show us which might be the most relevant factors for not consuming or not purchasing SBSB:

- Sensory attributes or "**not liking the smell or taste of fish**". It was the most important factor for 29.9% of Italian non-consumers; 28.2% of Spanish non-consumers, and 28.8% for French non-consumers of SBSB among the reasons for not consuming those species.
- Economic factor or **"too expensive"** price was the most important factor for Spanish non-consumers (30.6%) and French non-consumers (41%), while 25.1% of non-consumers in Italy considered this factor.
- The next essential reasons for not consuming SBSB products were **"difficulty in preparation"** and **"too many bones"**. Those factors were equally significant in Italy (26.3%), while they were indicated by respectively 25.8% and 20.5% of Spanish non-consumers, and respectively 18.7% and 17.3% of French non-consumers.

Other obstacles included a vegetarian lifestyle (by 9.6% in Italy and Spain, and 3.4% in France) and fish allergies (by almost 5% in Italy and Spain, and 3.4% in France). Smaller shares of non-consumers stated environmental, food safety, and fish welfare concerns.

Excluding non-consumers, the sample of fish and seafood consumers

Table 1
Consumers in different countries.

Country	Frequency	Percent
France	1530	25.0
Grecia	1519	24.8
Italia	1516	24.8
Spain	1552	25.4
Total	6117	100.0

is composed of 6117 interviewees (Table 1), distributed equally among the four countries investigated: Italy, Spain, Greece and France. Samples were collected through a representative stratification of the population on the variables sex, age and geographical distribution on a regional basis.

The social and demographic characteristics of the sample interviewed are summarised in the Table 2 presented below:

The male and female genders are equally distributed in the sample. More than half of the respondents (51.8%) are in the age range between 26 and 45 years old and the majority live in urban areas (82%) to the detriment of rural areas (18%). A good percentage of respondents have a high level of education, such as a university degree (44.1%), but also a secondary education (37.1%). The composition of households seems to be fairly homogeneous, with a slight prevalence of families composed of four members (30.3%). Families with children, have mainly teens (25.4%). A high percentage of respondents are employed (71.3%), mostly in the private sector (35.8%) with a salary similar to the average of their country (55%).

At the moment of the data analysis of the single nation, differences emerge within the Mediterranean countries for factors such as: average age of the respondents, area of residence (rural or urban), level of education, number of individuals in the household, age of children, employment and finally the level of income compared to the average in the same country. Analysing these factors, it emerges that France has the highest percentage of people who live in a rural area (34.9%), while in Greece this value is the lowest (9.4%). In terms of the qualifications possessed by respondents, Greece has the highest percentage of individuals with a University degree (49.2%) compared to other Mediterranean countries, while Spain has the highest percentage of individuals with Postgraduate studies (32.1%), a value four times higher than that of France (8%). The composition of households varies between countries, where in Italy, Spain and Greece the 5% of households are

composed of a single individual, while in France this value is much higher, reaching 15.4%. France is also the nation with the lowest percentage of households composed of four people (22%), while the highest value is reached by Italy (35.8%). The age of the children within the household varies among countries, for example the lowest percentage of children of school age or younger can be found in Greece, which is 30%, while in the other nations this value always exceeds 40%, reaching its maximum in Italy with 53.1%. Regarding the employment of respondents from Mediterranean countries, Spain has the lowest percentage of unemployed (7.7%) while France has the highest percentage of retired (9%). The most common type of employment is in the private sector for all the countries, with values ranging from 37.5% in Italy to 45.2% in Spain. One third of respondents in Greece (33.4%) claim to have an income lower than the national average, while Spain has the highest value (68.6%) of people who declare having an income close to the national average.

In line with the Mediterranean diet, the Mediterranean countries show a high consumption of fish and fish products, as shown in Table 3. More than 74% of respondents consume seafood products at least once a week at home. Within the products chosen, Mediterranean consumers also include SBSB at least once a month with percentage ranging from 67% to 92%. The most significant consumption of these two species is found in Italy, where this occurs at least once a week for more than half of the respondents (54.4%). For consumption outside of home, the values found change considerably. When considering fish and fish products, the highest percentage of respondents for consumption that occurs at least once a week is 36.3% and corresponds to Italy. However,

Table 2
Social and demographic characteristics of the Mediterranean respondents.

Variable	Modality	Frequency	Percent
Gender	Man	3036	49.6
	Woman	3081	50.4
Age	18–25	973	15.9
	26–35	1592	26.0
	36–45	1577	25.8
	46–55	1144	18.7
	56–65	759	12.4
	65 +	72	1.2
Area	Urban	5017	82.0
	Rural	1100	18.0
Level of Education	Primary	129	2.1
	Secondary	2268	37.1
	Degree	2698	44.1
	Post-Degree	1022	16.7
Household family	1	493	8.0
	2	1363	22.3
	3	1668	27.3
	4	1852	30.3
	5 +	741	12.1
Families with children	Young children	1402	22.9
	Scholar children	1224	20.0
	Teens	1554	25.4
	No	2436	39.8
Occupation	Worker	4361	71.3
	Unemployed	785	12.8
	Student	599	9.8
	Retired	372	6.1
Job	High skilled profession	980	16.0
	Public sector	908	14.8
	Private sector	2191	35.8
	Farmer	44	0.7
	Others	238	3.9
Income	Below the average	1449	23.7
	Average	3363	55.0
	Above the average	1305	21.3

Table 3
Frequency of consumption fish and seafood of the Mediterranean respondents.

		Italian Percentage	Spanish Percentage	Greek Percentage	France Percentage
HOME: fish and seafood	Once a week or more	81.3	86.4	74.3	75.4
	Once a month or more	16.5	11.8	22.2	20.8
	Several times a year or never	2.2	1.9	2.9	3.2
HOME: sea bass and sea bream	Once a week or more	54.4	47.9	32.3	23.6
	Once a month or more	38.2	44.8	53.6	43.4
	Several times a year or never	7.3	7.2	13.1	29.7
OUT OF HOME: fish and seafood	Once a week or more	36.3	25.7	12.9	28.4
	Once a month or more	38.2	44.4	38	34.4
	Several times a year or never	19.9	23.6	36	29.7
OUT OF HOME: sea bass and sea bream	Once a week or more	25.2	15.8	6	15.9
	Once a month or more	34.1	34.8	28	28.2
	Several times a year or never	26.1	33.2	37.8	37.1

the choice of consuming SBSB dishes at least once a month outside home varies from 34% to 59.3%.

The preferred form of purchase of SBSB in three out of four of the analysed countries is the fresh product, either whole or gutted (Fig. 1). France differs based on consumers' preferences, where the preferred form of purchase is fresh fillet (53%). At the same time, ready-to-cook and ready-to-eat products are not widely appreciated.

Among the factors that influence the choice of SBSB, quality stands out, being the only factor indicated by at least half of the respondents from each country (Fig. 2). To be noted is the importance given by Greek consumers to freshness and date of capture or harvesting (62%), quality (60%) and value for money (59%). Greek consumers also show a marked interest in the nutritional value of SBSB (51%) where other countries have lower percentages with a difference of almost 20% points.

As far as the choice of the preferred place to buy SBSB is concerned, the "fishmonger and specialised store" option stands out, where Italy (69%), Spain (60%) and France (57%) reached the highest values (Fig. 3). Similarly, these three countries achieve the highest values for the "supermarket" option (58%, 56%, and 49%, respectively), while Greece reports the lowest value (49%). Greece confirms its preference for more traditional purchasing methods than large-scale distribution thanks to its highest value for the "directly from fish farm" option, where it reports a value almost double that of Italy.

In addition to SBSB, the fish species indicated are mainly the same in the different nations that participated in these Surveys. The choice of the other countries is concentrated in species such as salmon, tuna and cod (Fig. 4). This can lead to some reflections on the sustainability of fishing, not considering fishing techniques that are not the subject of this study (and on which other studies have expressed opinions) but considering the homologation of consumption that emerges from the graph and that pushes for greater pressure on certain fish stocks than others. At the same time, Greece shows particularly high values for pilchard and anchovy, where the other countries report lower values, and Spain reports a very high value for hake, which is practically not indicated by the other countries.

The preferred method of production of SBSB is fishing, by all countries (Fig. 5). In fact, this option shows higher percentages than the other two options, from 43% in Italy to 62% in Greece. Italy's lower propensity compared to other countries towards the caught product is in agreement with the percentage of its respondents who prefer the farmed product (29%), a value not reached by other countries.

Regarding the preferred sources of information about the benefits deriving from fish consumption, it is interesting to see how consumers in the four countries prefer unofficial over institutional sources, given by doctors and institutions (Fig. 6). Among the options provided, the preferred source for obtaining information about the benefits and consumption of fish and fish products is "own experience and habits", where Greece reached the highest value overall (50%) followed by Spain (47%), France (44%), and Italy (38%). In addition to this option, high values are reported for "store or fishmonger employee", where all countries get the answer from at least a third of respondents. High percentages are also reported for "Internet" and "Family and friends".

Regarding the information observed on packaged seafood products, there are four types of information that most consumers pay attention to (Fig. 7). Two related to the freshness of the product, expiration date and
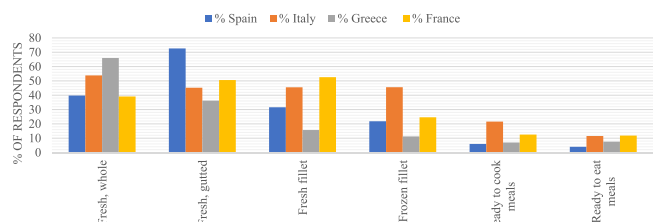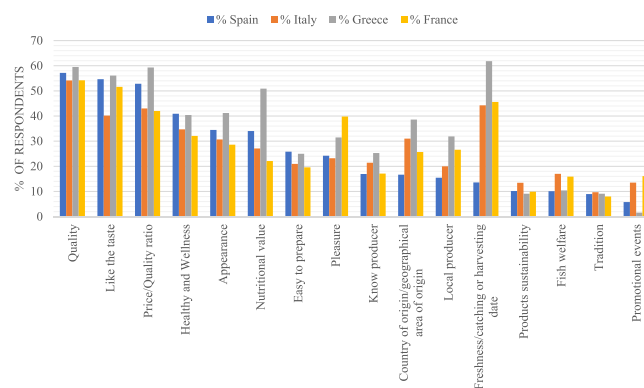

Fig. 2. Factors affecting the purchase of sea bass and sea bream.
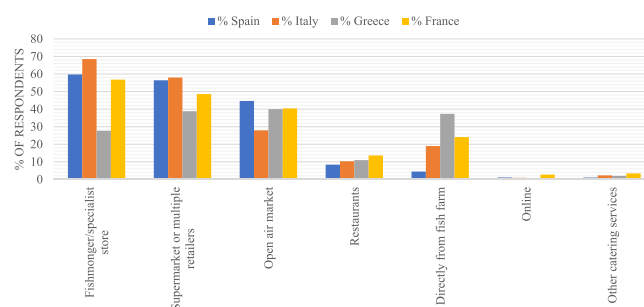

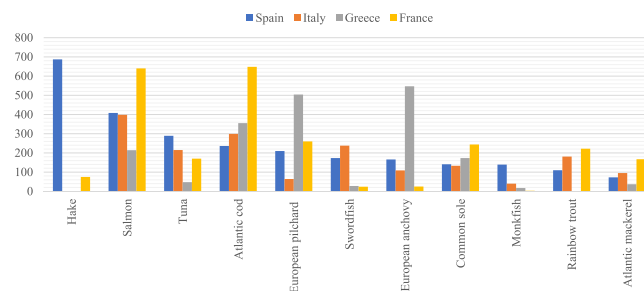**Fig. 3.** Preferred places to purchase sea bass and sea bream.

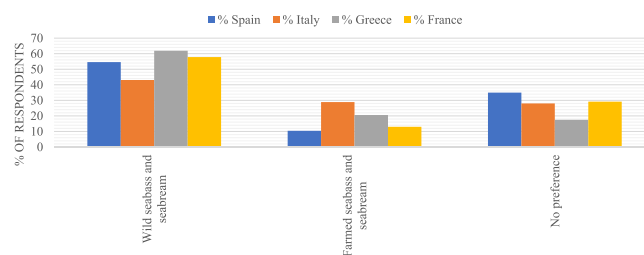**Fig. 4.** Preferred species to purchase, except sea bass and sea bream.

Fig. 5. Preference regarding production method of sea bass and sea bream.

date of catch or harvest. Furthermore, the origin and method of production "wild or farmed" is of great importance. The values of Greece stand out, reaching the maximum in the options of "best before date/use by date" (76%), "wild or farmed" (72%), and "date of catch or harvest" (71%). The other most observed information on all four countries reached values over 40%. As far as product name and species name are concerned, the values of France (61%) and Greece (54%) stand out.

In line with what was previously observed for fish and fish products, also for SBSB, the information considered the most important are those
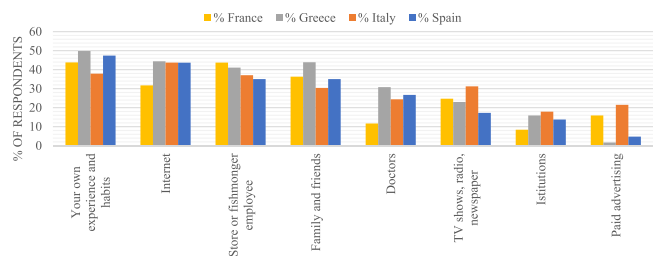

Fig. 1. Typical product forms of sea bass and sea bream products for purchases.

Fig. 6. Most preferred sources for obtaining information about the benefits and consumption of fish and seafood.
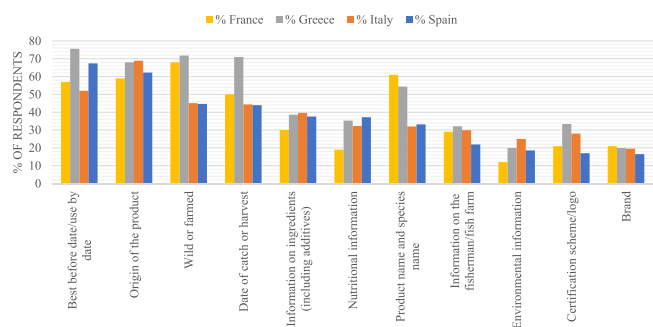

Fig. 7. Information observed on packed fish and seafood products.

relating to the freshness of the product, the origin and the production method (Fig. 8). Those information gained the maximum with the values expressed by Greece for "origin of sea bass and sea bream" (86%), "expiration date" (79%), "date of catch or harvest" (75%), if the product is "wild or farmed" (67%) and "certification schemes" (58%). The origin of seab ass and sea bream is in any case the factor preferred by all countries, with percentages above 60%, followed by the values of "expiration date" and "date of catch or harvest".

3.2. Cluster analysis

The analyses carried out in the four different countries have revealed well-defined consumption profiles, some of which are common to all and others which are characteristic of specific countries.

In particular, 11 relevant profiles of consumers can be recognised (Fig. 9):

3.3. Premium consumers

The profile of premium consumers recurs in all four countries. The consumers of this cluster give particular attention to freshness and quality of the products. It is mainly made up of small families (e.g. couples, single workers) who show a marked tendency for national or local products, also for sea bass and sea bream. They prefer wild fish to farmed fish and fresh product (both whole and fillet), for which they
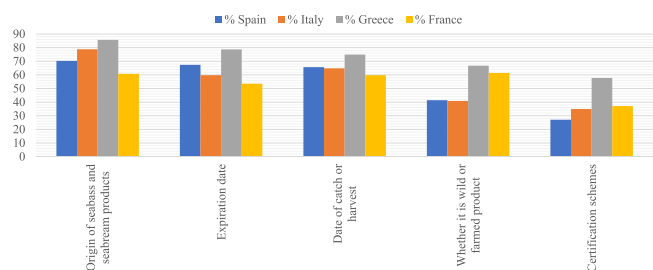

Fig. 8. Importance of finding the following information on the product label accompanying sea bass and sea bream products.

look for information related to the date of capture/harvest or the expiration date. They do not like frozen or even ready to eat or cook products. In any case, they usually don't buy packed fish. Many of the members of these groups have an income above the national average.

3.4. Traditional consumers

Consumers in this group are mainly represented by families who enjoy traditional cooking or experimenting at home. This profile reflects very well the consumer of the "Mediterranean diet". It represents an important category in all countries, except France. They regularly consume fish at home (2–3 times a month), paying close attention to information such as the origin, the date the fish was caught and the expiry date when making purchasing decisions. They buy mainly in specialist stores and open-air markets.

3.5. Ethical consumers

The characteristic of this group is a focus on sustainable methods of production, affecting both the environmental aspects and those related to fish welfare. The need for clarity in the signals transferring knowledge about these topics on the label is perceived by most of the members of the group. Most of the group read the labels always or frequently and believe that the information is only partially comprehensible. This group does not have a precise demographic physiognomy, mainly comprehending people from 18 to 45 years old. This profile was found in Spain, Italy and Greece.

3.6. Conscious consumers

The attention to the label information is the prominent feature of the group, which is characterised by almost all individuals who read the label frequently, and feel comfortable with its use. In the same way, almost all of the group does not believe in the information provided by the seller. Attention to the issue of origin results in the preference for consumption of products of national (and in any case European) and local origin. The propensity to read the labels of these consumers probably helps to make them aware of the diversified supply of fish products. The focus on information is also justified because the group is characterised from a socio-demographic point of view by the presence of many families with children, so probably, special attention is paid to the choice of products. This profile was found in Spain, Italy and Greece.

3.7. Purchasing responsible consumers, who pay little attention to labels

This group is formed exclusively by self-assured consumers. The absence of information in unpacked products is treated as an unimportant gap that manifests itself when buying products to all members of the group (mainly from 26 to 45 years). They read the label only sometimes or occasionally. While they strongly trust the information provided by the seller and numerous make their purchases driven by taste. An interesting detail of this group is the widespread and differentiated attention to information regarding fish products. This profile was found in Spain and Greece.

3.8. Occasional consumers

Consumers of this group only occasionally consume fish, including sea bass and sea bream. The cluster is characterised by minor importance attributed to the system of information accompanying the product. This is manifested both in the maximum use of reading label information and the non-detection of an informational gap for purchases without packaging. This is a consumer group disinclined to seek and use information about consumed products. Demographic characterisation of this cluster is the presence of many young couples and singles. This group characterises Spain and Italy consumption of fish products.
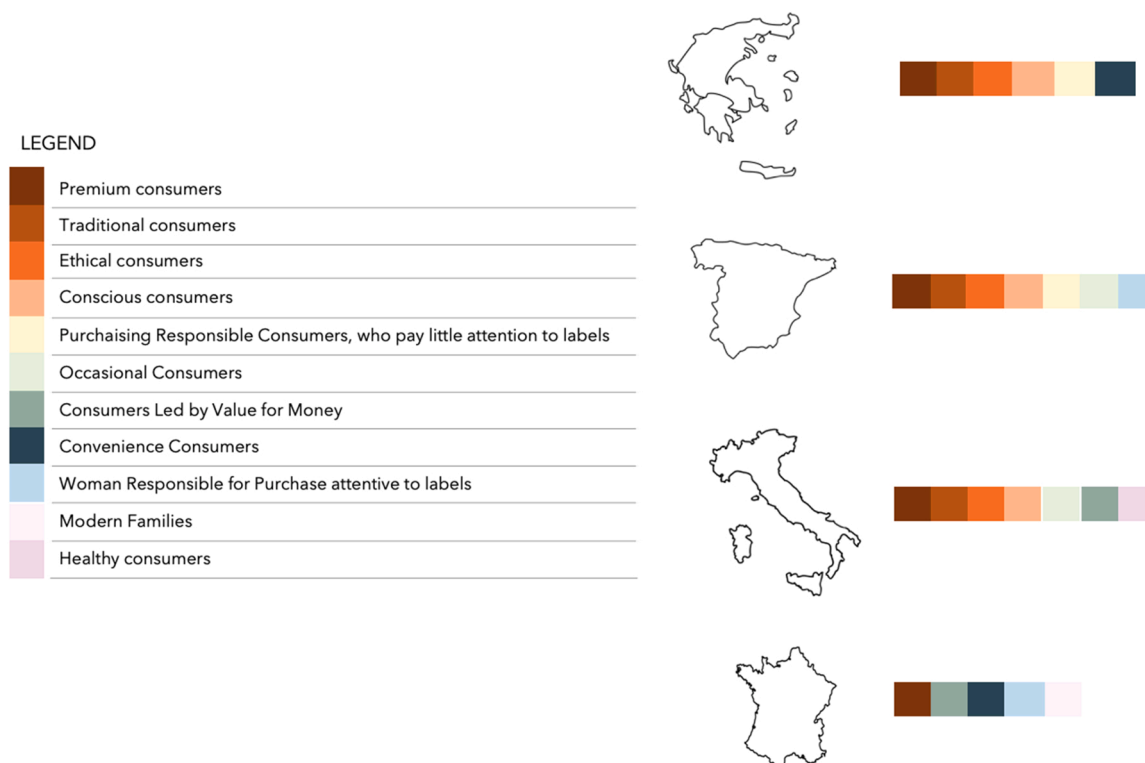
Fig. 9. Main profiles of consumers identified in the study for Greece, Spain, Italy and France.

3.9. Consumers led by value for money

The individuals of this Group consider the aspect of price ratio as important in influencing aspects when they purchase sea bass and sea bream products. The majority of this cluster is characterised by a low frequency of consumption of seafood and sea bass and sea bream products probably due to the perception of a high price of the product in relation to other foods. This group characterises France and Italy consumption of fish products.

3.10. Convenience consumers

In choosing to buy fish products, this group positively evaluates the practicality, both for the product and for the place to buy it. In fact, consumers buy fillets (mainly frozen), ready meals both to cook and to eat and, among places, most prefer to buy fish products in the supermarket. The group is made up exclusively of people of working age, and it is probably the weekly commitment that leads them to choose the convenience of consumption. This group characterises Greece and France consumption of fish products.

3.11. Woman responsible for purchase attentive to labels

This cluster of consumers is mostly made up of people who are very attentive to information for their purchase. They are those who are very interested in knowing the characteristics of the product. For this reason, they always read the labels to search for all of this information and when they buy products without packaging, they would like to know the same indications. Demographic characterisation of this cluster is the predominantly presence of women and most of the members of the group have children. This group has been identified only for France and Spain.

3.12. Modern families

This group is represented by families, often with young children

(under the age of 7), who have a high consumption of fish, more than 2–3 times a week. They prefer consuming fish and seafood products away from home, whereas consuming sea bass and sea bream products at home. These consumers are influenced by social media, advertising and by the support of famous people. They give little or medium importance to the word "origin" and they pay attention to nutritional values and health values when they purchase sea bass and sea bream products. This group has been identified only for France.

3.13. Healthy consumers

This group describes consumers who pay a lot of attention to health and nutrition in their purchasing decisions. They are young consumers, with a high degree of education and capable of understanding information on nutritional values, for which they are willing to pay more. This profile stands out for the country Italy, denoting that the relationship between consumption and health is a very important issue for consumers in the country.

4. Discussion

In line with the principles of the Mediterranean diet, the populations of the four countries surveyed demonstrate a high consumption of seafood products and they are familiar with and consume both SBSB. These data are in line with what emerges from market sources, which indicate that 80% of the volume of seafood products in Europe is consumed in three of the four countries investigated, namely Spain, France and Italy. These countries are respectively the 2nd, 4th and 6th countries in the European ranking by per capita fish consumption (Eumofa, 2020). The preference of consumers, regarding SBSB falls on fresh fish either whole or gutted, there is a slight preference for processed fish, such as fillets, and a low appreciation for ready-made products. Again, the data agree both with the literature, which shows a marked preference for the fresh product (Neale et al., 2012), unprocessed product (Tomić et al., 2016), as well as with the market data, where in the ranking of the five most

consumed fresh species, both SBSB appear in Italy and Spain, while in France only sea bream is reported (Eumofa, 2020). During the surveys, it emerged how the attributes to which the 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. Also, in this case the dynamics of preference and consumption mentioned in the literature are confirmed (Neale et al., 2012).

Regarding origin, which is one of the most debated factors in consumer preferences (Mauracher et al., 2013), in the case of seafood, it seems to be taken into less consideration than freshness, taste and health aspects.

However, from the descriptive analysis of Italian consumers, specification of the country of origin of SBSB shows the ultimate importance in all the steps of preference, demand, and purchase of those species. Analysis of preferences of Italian consumers in connection with the country or region of product origin shows that national/local SBSB products are preferred by over half of Italian respondents.

In addition, in this study the preference for domestic products and especially for wild versus farmed fish must be emphasised. The preference for wild fish, as pointed out by Lopez-Mas et al. (2021), may result from a negative conception of aquaculture in which consumers believe it implies a high use of antibiotics and that the fish is less fresh. This is the reason for which it is essential to act on the information aspect to find the right channels to convey the messages in favour of aquaculture. This is also due to the need to safeguard fish stocks, exploiting the full potential of the aquaculture sector (Cahu et al., 2004; Duarte et al., 2007; Kole et al., 2009; Atalah and Sánchez-Jerez, 2020).

Conveying information to consumers may not be easy, since, in general, they appear convinced of their ability to recognise quality products, freshness, and above all, they prefer official sources of information, such as from government agencies or doctors. When it comes to the label, consumers pay attention to information about attributes that determine their purchasing choices. Therefore, the date of capture, or expiration date, origin, and production methodology are all relevant. Dividing the population into homogeneous groups could make it easier to identify the marketing levers needed to develop the sector, choosing the right message and channel for each of them. Product quality is one of the main determinants of purchase, premium consumers look for fresh, unprocessed products and shop in specialised distribution channels. Consumers who shop ethically and pay attention to the production method might appreciate respect for fish stocks and a production method that takes animal welfare into account. Pointing out similarities and differences between farmed and caught fish from a nutritional perspective could bring consumers closer to health attributes. Differently, the competitive advantage on the price factor of farmed fish could bring closer consumers who pay attention to price and consider fish an expensive product and the non-consumers who consider as "too expensive". In general, some of the determinants of non-purchase and non-consumption found in the literature (Birch and Lawley, 2012), such as socio-demographic determinants, particularly related to age, or the presence of children in the household, are not confirmed in this study not even from the analysis of non-consumers. Within the clusters, high proportions of households with children are found to be consuming fish products. In the case of more dynamic consumers, e.g. young working adults, who therefore have little time to devote to food preparation, the discomforts associated with fish consumption are bypassed by the use of convenience products or increased consumption away from home.

5. Conclusion

In the current situation, it is clear that fish stocks are under pressure and European consumers focus their attention on very few fish species among those available on the market. At the same time, the aquaculture sector, which could present itself as a solution to the problems highlighted in this study, is not expressing its full potential, also due to the presence of several false notions that distort its image, in particular the

better quality of the wild fish and a lower freshness of the farmed fish. Stakeholders and policy makers must work to improve the image of the sector by conveying correct information regarding the freshness, quality and healthiness of the farmed product, but at the same time marketing levers can be identified that are useful for establishing a direct dialogue with the various consumers divided into clusters. Fortunately, SBSB are species known and appreciated by consumers in the countries analysed and constitute a good starting point for future strategies at a European and also global level. It is clear from the present study that the Mediterranean consumers are well disposed to consume farmed SBSB. There are preferences and consumption dynamics that are transversal to all European Mediterranean countries that allow stakeholders to look at this area as a single market subcategorised into clusters of consumers each with specific preferences, such as fresh product, national or European products, consumers attentive to ethics characteristics and that who are attentive to labels' information, and there are specific country dynamics, i.e. consumers attentive to health or families influenced by social media, advertising and by the support of famous people requiring different marketing strategies for each country. Knowing the clusters that make up the market and the preferences, the importance of conveying certain information on labels or choosing the way and the media through which inform consumers can be useful to intercept and respond to market demands. This can help the development of the sector and decrease the impact of capture on wild fish stocks.

Declaration of Competing Interest

Acknowledgements

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.aqrep.2022.101133.

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