

## CONSUMER PERCEPTION ON AQUACULTURE GOODS AND SERVICES IN ROMANIA

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### Abstract

*Human consumption of fish meat is very heterogeneous, differing from one part of the world to another, from one country to another, from one region to another and is influenced by many factors. In terms of the level of importance of fish consumption globally, the main factor that ranks it among the top important foods is the high amount of protein it provides. In this survey, a series of 22 questions were addressed to people aged between 18 and 76+ summing 1017 respondents. This study reflects consumer perception on aquaculture goods and services in Romania. Respondents purchase fisheries and aquaculture products mostly from supermarkets, consider fish organoleptic properties to be very important, but also, they observe the poor supply of Romanian aquaculture products on the market.*

**Key words:** fish meat, fish stocks, fisheries, market survey, questionnaire.

### INTRODUCTION

The global production of crude protein from aquaculture and fisheries in 2018 was over 13950 kilotons (Boyd et al., 2022). However, most fisheries are overexploited, and efforts to make them sustainable have made fish farming a sector of great economic growth, aquaculture production exceeding fisheries production ever since 2016 (FAO, 2020). Moreover, in recent years, the captures fisheries production has remained constant. In 2020, the production from aquaculture and fisheries amounted to a value of 424 billion USD, correspondent to 214000 kilotons (FAO, 2022). As the production aspect of aquaculture faces a number of challenges, such as climate change, resistant pathogens, depleting sources of feed ingredients, and others, the sales aspect of aquaculture also presents issues of its own.

There are many factors affecting the buying decision of consumers regarding aquaculture products. The first two attributes that consumers observe and pay attention to are freshness and colour (García-Chavarría & Lara-Flores, 2013). Other factors are also of great importance:

safety, nutritional quality, sustainability, price, availability, and also fish welfare, among others (Conte et al., 2014). In some cases, it has been proven that income and education are significant factors affecting the decision to buy fish over other meats (Morales & Higuchi, 2018). The advantages of consuming aquaculture products are evident: the meat is lean and easily digestible, it is a rich source of omega-3 fatty acids, iron, magnesium, zinc, calcium, and fish and other aquaculture products are generally recommended in the diet of pregnant women, children, and ailing people (Yılmaz et al., 2018). However, the perception of low involved consumers is that seafood is not an alternative for terrestrial meats, contrary to highly involved consumers, which rate seafood higher than terrestrial meats (Torrissen & Onozaka, 2017). There are examples of societies, especially insular states, where fish meat is preferred due to its superior nutritional quality, but also because of its high availability. For example, Japanese people have a very high life expectancy (84.79 years in 2021) (www.macrotrends.net), sometimes attributed to Japan's low obesity and heart disease rates,

which can be a consequence of a diet rich in seafood (Tacon & Metian, 2013).

Romania has a long tradition of consuming fish. Its rich water networks, ranging from mountain rivers to lakes, the Danube, and the Black Sea, allows the production of a diverse array of fish and seafood, from trout to carp, sturgeons, and mackerel. About 91% of the population consumes fish, both fresh and processed, but in small quantities, much smaller than the European average (Savin et al., 2021; Mastan et al., 2023). !!! Thus, this study aims to assess the Romanian fish consumption market, using questionnaires, and to describe the profile of fish consumers in Romania.

## MATERIALS AND METHODS

**Questionnaire elaboration.** In general, questionnaires aimed at market research or market segments have complex structures. Usually, the first section of the questionnaire is the demographic and social component (Section 1: Question 1 to Question 5). This structure is essential to be able to analyze the directions and evolution of the markets through the lens of age categories, environment, or level of education. Studies or questionnaires can have several objectives. In the present case, the second component of the questionnaire deals with general preferences and fish consumption (Section 2: Question 6 to Question 9). The third section is intended to collect information on consumers' knowledge about fish meat quality (Section 3: Question 10 to Question 14), while in the next section fish market-related information is collected (Section 4: Question 15 to Question 17). Consumer's knowledge of nutritional information related to fish meat consumption as a healthy food source was also followed (Section 5: Question 18 to Question 20). The last section of the questionnaire was designed to collect information on recreational fishing and fishing license management (Section 6: Question 21 to Question 22). Questions were coded as follows: Question 1 – Q1, Question 2 – Q2, etc.

**Survey.** The questionnaire was uploaded and configured on the Google Forms platform. Before being distributed online for completion, 3 test sessions were carried out, for the security

of receiving the answers and their centralization. The average duration of completing the questionnaire was approximately 3 minutes, an aspect specified at its initiation. The link containing the questionnaire was distributed on social media for 60 days. The answers were recorded and analyzed using Microsoft Excel.

## RESULTS AND DISCUSSIONS

The questionnaire was conducted between April and June 2023 and was structured in 6 sections (Table 1), as follows: socio-demographic information of interviewed subjects (Q1 to Q5), general preferences and fish consumption (Q6 to Q9), knowledge on fish quality (Q10-Q14), fish market-related knowledge (Q15-Q17), basic nutritional information related to fish meat (Q18-Q20) and information related to consumer habits related to sport fishing (Q21-Q22). A total number of 1017 respondents participated in the survey.

**Socio-demographic results (Q1 to Q5).** The 36-50 years old age class was the best represented (32.1%; 326 participants), followed by the 18-25 years old age class (26.5%; 270 participants). A similar percentage (22.6%; 230) was observed in the case of the 26-35 years old age class (Figure 1).

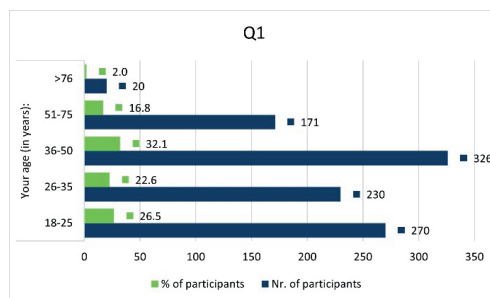


Figure 1. Age class composition for the questioned participants

The lowest percentages of responders belong to 51-75 and >76 years old age class respectively (16.8%; 171 participants and 2%; 20 participants). The sex distribution across the questioned subjects was 43% females and 57% males (Figure 2).

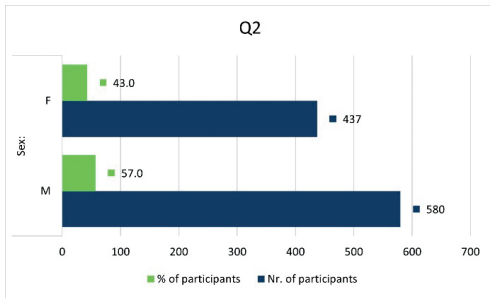


Figure 2. Sex distribution across the participants

According to the website of the National Institute of Statistics from Romania (NIS, 2024), accessed on 01.02.2024, 51.1% was represented by females and 48.9% by males. The “last completed studies” question showed that 35.8% of the subjects had their bachelor’s degree, 31.6% finished high school, had a master’s degree 20.6%, had a Ph.D. degree 6.8%, and gymnasium degree 1.2%. For the “other studies” category, 4.2% of the subjects had opted (Figure 3).

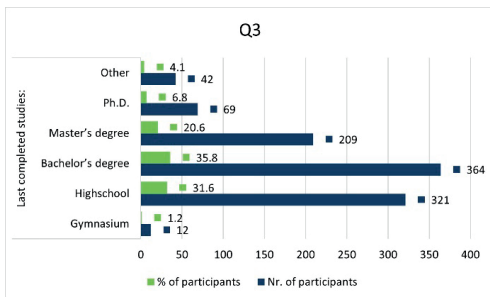


Figure 3. Completed studies of questioned participants

According to NIS, 16% of Romania’s population had superior studies in 2021. The

area of residence declared by the questioned subjects showed that 70.4% of the participants (n=716) live in urban areas while 29.6% (n=301) live in rural areas (Figure 4).

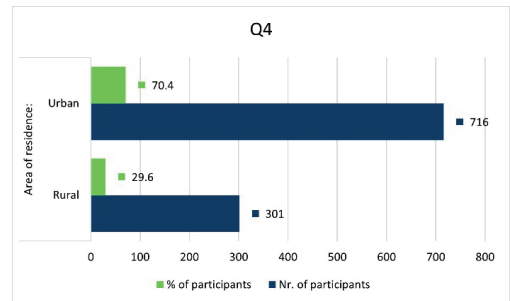


Figure 4. Area of residence distribution of the participants

The monthly net income declared by the participants varied as follows: 32.5% (n=331) had a net income between 400 to 800 €, 25.2% (n=256) had a net income between 800 and 1200 €, 21.9% (n=223) had a net income >1200 € and 20.4% (n=207) declared having a monthly income <400 € (Figure 5).

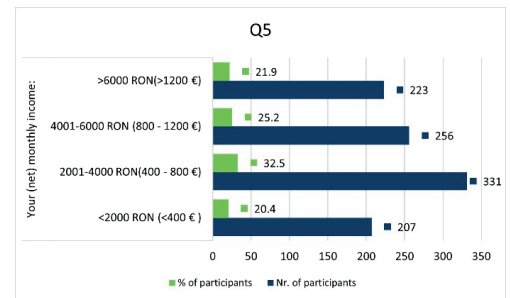


Figure 5. Declared net income of participants

Table 1. Questionnaire addressed in the study

Question No.	Addressed question	Options
Q1	Your age (in years):	18-25
		26-35
		36-50
		51-75
		>76
Q2	Sex:	M
		F
Q3	Last completed studies:	Gymnasium
		Highschool
		Bachelor's degree
		Master's degree
		Ph.D.
Q4	Area of residence:	Rural
		Urban

		<2000 RON (<400 €)
Q5	Your (net) monthly income:	2001-4000 RON (400 - 800 €)
		4001-6000 RON (800 - 1200 €)
		>6000 RON (>1200 €)
Q6	How often do you eat fish meat?	Daily
		Once a week
		3 to 4 times a week
		Once a month
Q7	Where do you prefer to consume fish?	At home
		At restaurant
		Other location
		Supermarket
Q8	Where do you usually buy/procure fish?	Fish market
		Recreational fishing (angling)
		Fish farms
		Other sources
Q9	Do you prefer:	Freshwater species
		Marine species
Q10	How important is the color of fish meat to you?	Not important
		Important
		Very important
Q11	How important is the odor of fish meat to you?	Not important
		Important
		Very important
Q12	How important is the texture of fish meat to you?	Not important
		Important
		Very important
Q13	How important is it to you to know the source of origin for the fish you buy?	Not important
		Important
		Very important
Q14	Do you consider the labeling of fishery and aquaculture products mandatory?	Yes
		No
		I don't know
Q15	How important is it to you that fish farms, supermarkets, and fish markets have qualified personnel in the field of fish farming and aquaculture?	Important
		Not important
		Very important
Q16	How well do you estimate that fishery and aquaculture products are represented in the Romanian market?	Very well represented
		Poorly represented
		Well represented
Q17	Do you find fisheries and aquaculture products of Romanian origin in most stores/supermarkets?	Yes
		No
Q18	Do you consider fish meat a healthy product?	Yes
		No
		I don't know
Q19	How would you rate your knowledge of the nutritional value of fish?	Elementary knowledge
		Advanced knowledge
		I have no knowledge on the subject
Q20	How important is the nutritional value of fish to you when you buy it?	Not important
		Important
		Very Important
Q21	Do you usually go fishing (angling)?	No
		Yes, occasionally
		Yes, very rarely
		Yes, quite often
Q22	Do you have a fishing license?	Yes
		No

**Results on general preferences and fish consumption (Q6 to Q9).** More than half of the questioned people (51%, 519 participants) consume fish once a month. The second preference for fish meat consumption according

to the participants is once a week (39.2%, 399 participants). A smaller percentage, 8.4% (85 participants) affirmed that they consume fish 3 to 4 times a week. Only a small percentage of the participants, representing 1.2% (12

participants), affirmed that they eat fish daily. Two participants (0.2%) preferred not to answer (Figure 6).

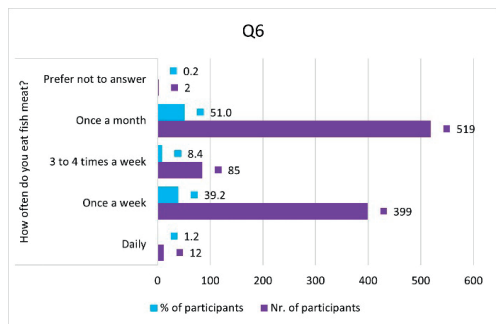


Figure 6. Consumers preferences: frequency of fish meat consumption

The participants prefer to consume fish at home in a very large percentage (82.7%, 841 participants). The second option in terms of consumer preferences is the restaurants (13.3%, 135 participants). A small percentage (3.8%, 39 participants) preferred other locations, while 0.2% (2 participants) preferred not to answer (Figure 7).

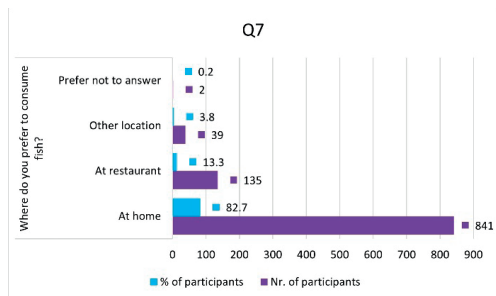


Figure 7. Consumers location preferences for fish consumption

Fish purchasing preferences, according to the data received from the participants in the present questionnaire, showed that 55.6% represented by 565 participants acquire their fish from supermarkets. The second option for fish procurement/acquisition, preferred by consumers, was recreational fishing (14.3%, 145 participants). Under Romanian legislation (OUG 23/2008), anglers can keep specific amounts of the daily capture. The third option in consumers' preferences was fish markets (13.7%, 139 participants). Direct purchase of fish from fish farms was the fourth option

among the participants (11.1%, 113 participants). A small percentage of consumers, 5.4% (n=55) procure/acquire their fish from other sources (Figure 8).

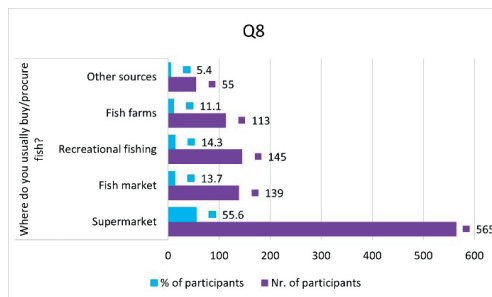


Figure 8. Consumers preferences for place of fish procurement/acquisition

Consumer preferences for freshwater or marine species revealed that 67.6% of the questioned participants (n=687) opted for freshwater species, while 32.4% (n=329) opted for marine species. One participant (0.1%) preferred not to answer (Figure 9).

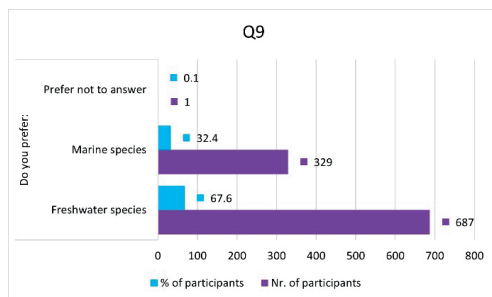


Figure 9. Consumer preferences for freshwater or marine species

**Results on consumers' knowledge on fish quality (Q10 to Q14).** One of the first qualitative attributes of food evaluation performed by customers is color appreciation (Wu & Sun, 2013; Şengör et al., 2018). When asked about the importance of fish meat color, 43.2% of the participants (n=439) considered fish meat color to be important, 34.8% (n=354) considered fish meat color very important and 22% (n=224) stated that fish meat color is not important (Figure 10).

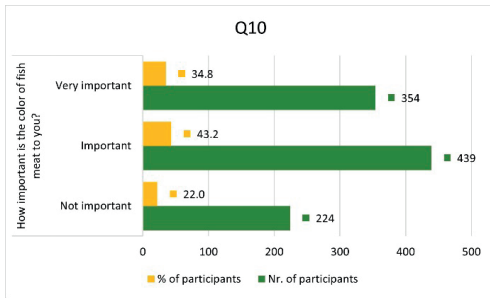


Figure 10. Fish meat color importance according to the participants

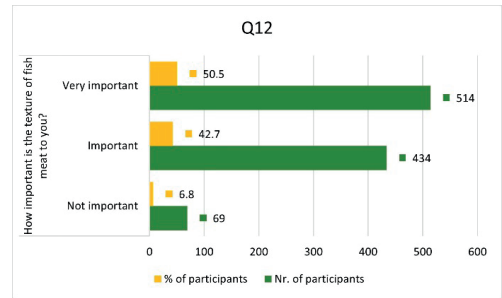


Figure 12. Importance of fish meat texture according to the participants

Meat in general and fish meat in particular is highly subjected to spoilage and contamination and the evaluation may be subjective if only sensory and microbiological methods are used (Hasan et al., 2012). The odor of fish meat was considered very important by 57.8% (n=588) of the participants, important by 34.8% (n=354), not important by 7.3% (n=74) and one person preferred not to answer (Figure 11).

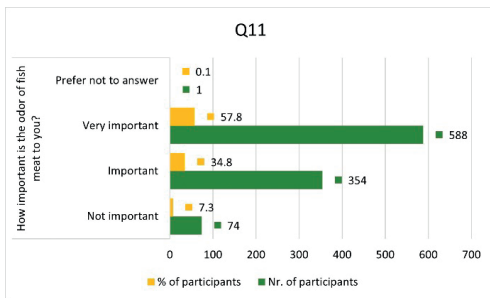


Figure 11. Fish meat odor importance according to the participants

Muscle texture (fish meat texture) is another aspect that can indicate the quality of the product, being affected by age, size, species, nutritional state, and rearing method (Dunajski, 1980). More than half of the participants (50.5%, n=514) considered fish meat texture to be very important, 42.7% (n=434) considered it important while only 6.8% (n=69) of the participants considered texture not important (Figure 12).

“From farm to fork” or “from farm to table” is a concept that embraces a fair, healthy, environmentally friendly sustainable food system (www.food.ec.europa.eu, FAO & WHO, 2024, Moretti et al., 2003). Following or tracing food is important mostly for quality control systems and risk management. Participants mentioned that it is very important to know the source of origin for fish in large percentages (50.5% respectively 41.8%). A small percentage, 7.5% (n=76) did not consider important this issue and one participant preferred not to answer (Figure 13).

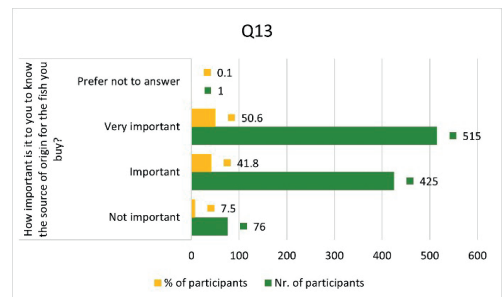


Figure 13. The importance of knowing the origin of fish found on the market

Displaying information on a product (labelling) is in general necessary for product identification, size, composition, nutritive values, expiring date, source/origin of product, possible allergens and many more reasons. In the present study, 85.5% (n=870) of the participants considered mandatory the labelling of aquaculture products while 8.8% (n=90) don't know, 5.5% (n=56) don't consider labelling mandatory. One person preferred not to answer to the question (Figure 14).

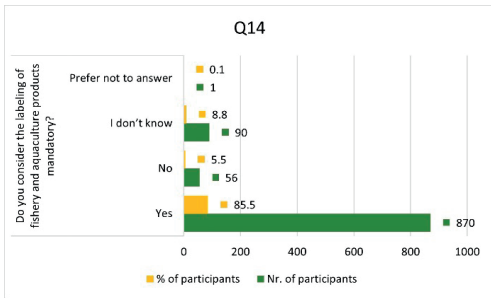


Figure 14. Labelling aquaculture products and customers' perception

**Results on consumers' knowledge on fish market-related knowledge (Q15 to Q17).** Qualified personnel working in fish farms, in consumers' point of view was very important for 35.8% of participants (n=364), important for 57.5% (n=585), and not important for 6.7% (n=68) (Figure 15).

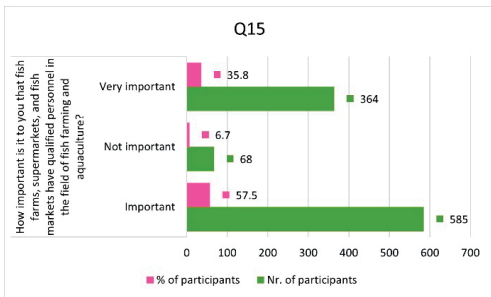


Figure 15. Consumers' view on qualified personnel (fisheries and aquaculture studies) in Romanian markets

The lack of qualified personnel in aquaculture and fish farming is considered one of the main causes of inefficiency in the field (Pillay, 1973). The presence of fishery and aquaculture products in the Romanian market was considered poorly represented by 55.2% (n=561) of the participants, while 39.5% (n=402) considered the opposite. Only 5.2% (n=53) of participants considered that fishery and aquaculture products are very well represented. And one person preferred not to answer (Figure 16).

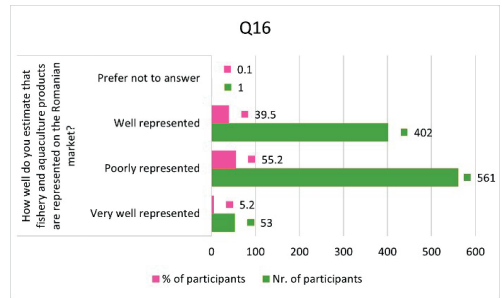


Figure 16. Consumers' view on the representation degree of fisheries and aquaculture products on Romanian markets

Products from fisheries and aquaculture of Romanian origin or production are not to be found in most of the markets and stores according to more than half (58.5%, n=595) of the participants from this study, yet 41.4% (n=421) said the opposite. One person preferred not to answer (Figure 17).

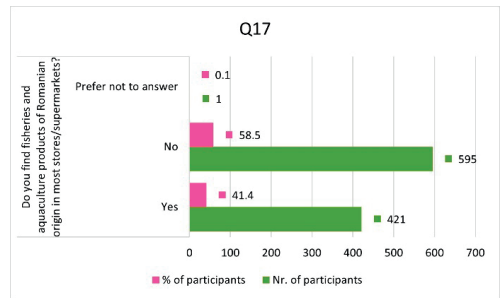


Figure 17. Consumers' view on the presence of aquaculture products of Romanian origin in markets

**Results on consumers' knowledge on basic nutritional information of fish meat (Q18 to Q20).** Fish meat is a healthy food source, rich in proteins, fatty acids, and minerals, being more available and affordable than other sources of animal protein (Mohanty et al., 2019). Most of the participants (94.4%, n=960) in our questionnaire, consider fish meat a healthy product, 4.3% (n=44) do not have knowledge of the issue, 1.2% (n=12) of the participants do not consider fish meat a healthy product and 1 person preferred not to answer (Figure 18).

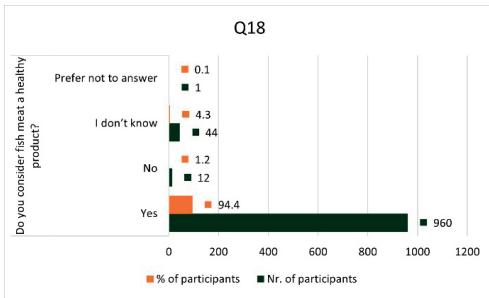


Figure 18. Consumers' view on fish meat as a healthy product

In terms of fish meat nutritional value, 67.7% (n=689) mentioned they have elementary knowledge on the subject, 23.3% (n=237) have advanced knowledge. A small proportion of the participants (8.8%, n=90) said that they do not have knowledge on subject and 1 person preferred not to answer (Figure 19).

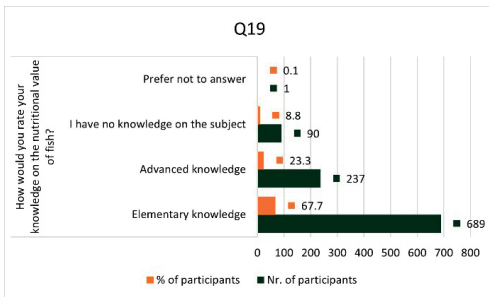


Figure 19. Consumers' self-evaluated knowledge on fish meat nutritional value

When asked about the nutritional value of fish meat at the moment of acquisition, 60.9% (n=619) responded that it is important, 29% (n=295) responded that it is very important and 10.1% (103) responded it is not important (Figure 20).

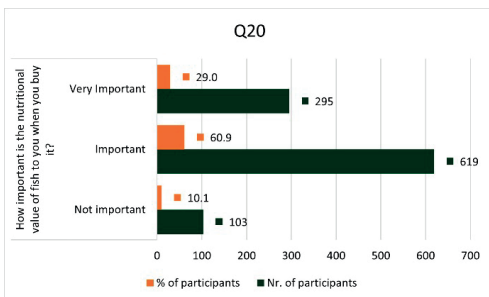


Figure 20. Consumers' view on nutritional value of fish at the moment of purchase

**Results on consumers' consumer habits related to sport, recreational fishing (angling) (Q21 to Q22).** Recreational fishing is fundamentally different from commercial fishing for different reasons, such as: gear used, size of catch, impact on diversity, economic importance, and socio-cultural. In Romania, the legislation does not distinguish properly the terms “recreational fishing” and “sport fishing”. In general, the term sport fishing is associated with competitions (O561/2023; OUG 23/2008) while recreational fishing or angling is often seen as a hobby or recreational activity without involving “competitions, competitors and prizes”. In the present study, 42.8% (n=435) participants responded that they do not go fishing, 20% (n=203) go fishing occasionally, 13.9% (n=141) go fishing rarely, and 23.4 % (n=238) go fishing often (Figure 21).

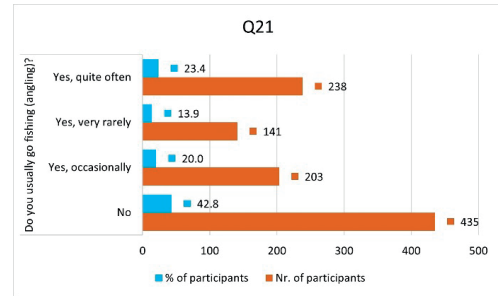


Figure 21. Consumers' preferences when it comes to recreational fishing

The participants also mentioned that 63.5% do not have a fishing license while 36.5% do have a fishing license (Figure 22).

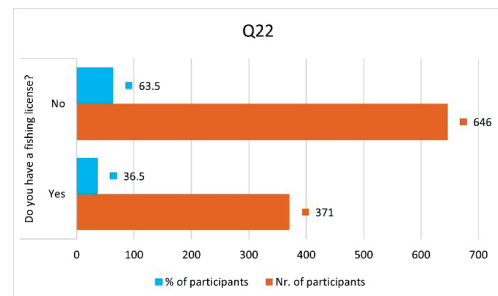


Figure 22. Consumers' option for possessing a fishing license

Analyzing the number of people going fishing in general (from Q21, all yes answers) and the number of people having a fishing license (Q22)



it can be observed that 57.3% of the participants go fishing but only 36.5% get a fishing license, meaning that 20.8% go fishing without a license. Private recreational fishing waters do not require by law to have a fishing license. There is a strong possibility that some of the 20.8% of the people going fishing without a fishing license are under this category, while some of them might be fishing on public waters without a license (illegally).

## CONCLUSIONS

The present study provides information on customers' perception of fisheries and aquaculture products, on knowledge related to fish meat as a healthy food source and provides feedback as well on the importance of trained personnel in the field in Romania. The context of the survey was based on the European Union's blue economy strategy, where aquaculture is a key element. According to FAO (2020), internal fish production covers less than 20 percent of the total fish consumption in Romania and aquaculture is still based on the semi-extensive culture (common carp and Chinese carps). As a general trend, Romanian consumers prefer to eat fish at home, somewhere between once a week to once a month and they buy fish from supermarkets, preferring mostly freshwater species. They also consider fish organoleptic properties (color, odor, texture) to be very important as well as labelling of fisheries and aquaculture products. Consumers consider qualified personnel in aquaculture to be important, fisheries and aquaculture products are poorly represented according to some and well-represented on the Romanian market according to others (probably depending on the geographical area). Fisheries and aquaculture products of Romanian origin are not found in general very often on the markets. Romanian consumers have elementary knowledge of fish nutritional value, view fish meat as a healthy food source and take into consideration fish's nutritional value at the moment of purchase. According to our data, Romanian consumers go fishing in general and have in most cases a fishing license. This information could be used in the future for strategies in the field of fisheries and aquaculture management, market-customer decisions, and recreational fishing legislation.

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