Investigation of Greek consumers' preferences towards certified fish products: A market segmentation analysis

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Abstract

The aim of the present study is to investigate the Greek consumers' behavior towards certified fish products. As results indicate, there are two distinct segments of consumers with different perceptions on certified fish products in which a differentiated marketing strategy should be adopted aiming to reinforce the overall demand for these products. As to the first case, the segment of "traditional" fish products consumers, it could be launched promotion campaigns whose aim is to enhance the awareness of certification systems and additionally to inform for the benefits of certified fish products. On the other hand, in the second segment, which mostly consists of "modernists" it should be possibly adopted marketing strategies which mostly focus on the creation of innovative fish products.

Keywords: certified fish products; consumer behavior; market segmentation; cluster analysis

1. Introduction

With the term fish product, we mean the products which stem from the primary sector of the economy and come from fishing and aquaculture. They are vital from human health as they are important energy sources and additionally because they are sources of vitamins, proteins, minerals and mainly omega-3 and omega 6 poly-saturated fatty acids (Domingo, 2007). Due to their vitamins, they can protect the consumer from various harmful effects on his health like coronary heart disease and stroke (Domingo, 2007). The nutritional aspects of fish and the related health effects are among the most important factors affecting consumer choices (Menozzi et al., 2020).

Fish consumption has increased along with the increased population around the world (FAO, 2020). The Mediterranean countries of European Union (Croatia, France, Greece, Italy, Slovenia, Spain, Portugal) are amongst the greatest fish products

consumers worldwide. Regarding Greece, the annual fish products consumption per capita amounts to 19.6 kilos of which 66% are imported, 22% are product of domestic aquaculture and 12% products of wild fishing (WWF, 2017). It is worth mentioning, that Greece has a share of 2.76% of the total fishing products (catches and aquaculture) of 28 countries - members of European Union (CFP, 2014). Moreover, seafood is among the most internationally traded food commodities and constitutes 15% of average animal protein intake for 4.3 thousand million people worldwide (FAO 2012a). The world population is expected to reach nine thousand million people around 2050 (Godfray et al. 2010), and the global middle class is growing rapidly. Increased incomes in developing countries and rapid urbanization are main drivers of an increased demand for animal source proteins, including fish and shellfish (Hall et al. 2011).

Concerns about the environmental impacts of catches and aquaculture and growing demand for seafood products has led to increasing interest in mitigation measures. Market-based initiatives such as certification schemes and consumer recommendation lists for aquaculture and capture fisheries have become increasingly popular tools (Washington and Ababouch 2011). Advanced countries place a significant focus on food safety and security, as well as on the sustainable fish production process (Hoque et al., 2022). Considering the increase in consumers' demand for safer, more qualitative, healthier as well as more environmentally friendly food products, the use of certification becomes even more significant in recent years. The above-mentioned certifications constitute a relatively new practice which aims to protect the fishing stocks from overfishing of sea ecosystems and the negative effect which come as a result. Furthermore, the eco-labeling of food products is a strong motive for buying them (Nguyen et al., 2015).

Certification schemes have been devised with various objectives in mind, from food safety, quality, and traceability to environmental and social impacts. Among the general aims of fishing certification is sustainability of fish stocks through the improvement of the quality of the habitat they exist and informing consumers of fish products which are produced with viable/sustainable practices (FAO, 2001). The above knowledge aims not only at promoting the product but also at changing consumers' preferences as to catches which contributes to the degrees of the footprint of the activity itself (FAO, 2010).

It has been noted that the activities which have to do with the certified fish products (such as the standardization and distribution), are increasing rapidly. Most specifically, this increase has been noticed with the latest years and in some areas, it was registered up to 10 times higher in comparison with the corresponding fish products which were not eco-labeled (Potts et al. 2016). Moreover, the certified fish products constitute exclusive trading product for many developed companies (Gutierrez et al. 2016. As a showcase in 2005 the certified fish products worldwide constituted only 0.5% of the world production, whereas in 2016 the percentage reached 14% (Potts et al. 2016). The fish products eco-labeling has been recognized as a tool for the promotion of sustainable handling of fish stocks.

According to Kafka & Alvensleben (1998), Greeks were found to be third in the list concerning awareness matters in food safety standards after Germans and Austrians. Similarly, Lumbers et al. (2003) in another comparative study also found that Greek consumers were significantly less confident about their food supply than the British. However, very few studies have been done in the Greek market regarding certified fish products. In this context, the aim of the present paper is the investigation of the

consumers' behavior towards the certified fish products. An additional goal is the examination of possible linkages between demographic and socio-economic characteristics of consumers as well as their preference or not for eco-labeled fish products. To meet the above objectives, the article is structured as follows: The second section, presents a step-by-step analysis of the adopted methodology, while the third section highlights and discusses the main findings. Lastly, the final section outlines the conclusions and suggests policy directions.

2. Methodology and data

For the scope of this study cross-sectional consumer data were collected through a survey with 266 consumers resident in the areas of Volos, Athens and Naxos between February and March 2019. Since there was a suspicion of inconsistent answers as well as because of missing observations 6 questionnaires were excluded out of the initial sample of the 266 ones. Consequently, the final sample is based on 260 consumers. Additionally, the strategy adopted when it comes to the sample has to do in a great percentage, with the persons which are responsible for buying food product for the household.

More specifically, the sample consists of 51.5% women and 48.5% men. All respondents were over the age of 18 and most of them belong to the age group of 18 – 25 years old. More analytically, the age group that follows is that of 26 - 35, with a percentage of 25.3%, the age group 36-45 with a percentage of 15%, The age group of 46-60 with a percentage of 15.5% whereas 8.9% of the respondents were 60 years old and over. As to the educational level of the respondents the vast majority have graduated from university (41.5%), with those who have graduated from Senior High School (37.3%) following. Finally, regarding the monthly disposable income, 36.2% of the sample has a monthly personal income of less than 600 Euros. What follows is the category of 601-1000 with a percentage of 32.3%, 19.2% belongs to category 1001 - 1500 and 12.3% to the category above 1500.

The questionnaire used for the aims of the study was constructed taking into account the literature on consumer behavior towards food in general and food certification in particular. More specifically, the questionnaire is divided into 5 sections. Demographic and socioeconomic data are asked in the first section which will be used to explain further consumer behavior and identify potential market segments. In the second section there are variables relating to the frequency and the place of fishing products purchase. As for the third and fourth section, there are variables which have to do with the investigation of consumers preferences when it comes to fishing products (certified or not) and finally in the fifth one of variables which show the motives which urge a consumer to choose certified fishing products. It is worth mentioning that due to a great percentage of the sample not being aware of the term "certification" and where exactly it refers, a short description of the above-mentioned term was added to the questionnaire.

The sample was chosen with the method of snowball sampling. This is a technique of creating a sample from a core of known subjects, which, in turn adding new subjects coming from the initial core. In this way, the initial core becomes bigger as a rolling snowball forming a useful sample to be investigated. Such a sampling procedure is

frequently used when there is not sampling frame available which registers all respondents (Goodman, 1961).

In order to identify possible distinct groups among consumers which will have different characteristics, the method of Cluster Analysis was applied. The latter is a multivariate data analysis technique which aims at identifying groups of consumers with similar characteristics. In other words, through this method internal homogeneity is achieved (with the greatest possible similarities among its members) whereas among groups should be the greatest possible heterogeneity (Kaufman et al. 1990). In its basic form the clustering problem is defined as the problem of finding homogeneous groups of data points in a given dataset.

More specifically, in this study the method of clustering with the use of k-means algorithm was applied. In order to perform k-means clustering, the algorithm randomly assigns k initial centers (k specified by the user), either by randomly choosing points in the "Euclidean space" defined by all n variables, or by sampling k points of all available observations to serve as initial centers. It then iteratively assigns each observation to the nearest center. Next, it calculates the new center for each cluster as the centroid mean of the clustering variables for each cluster's new set of observations (Likas et al. 2003). K-means re-iterates this process, assigning observations to the nearest center (some observations will change cluster). This process repeats until a new iteration no longer re-assigns any observations to a new cluster. At this point, the algorithm is considered to have converged, and the final cluster assignments constitute the clustering solution.

One of the simplest methods of defining the optimum number of clusters which was used in the present study is the Elbow method. [1]The rationale sequence of the elbow method is to run k-means clustering on the dataset for a range of values of k (e.g., k from 1 to 10), and for each value of k calculate the sum of squared errors (SSE). The idea is that we want a small SSE, but that the SSE tends to decrease toward 0 as we increase k (the SSE is 0 when k is equal to the number of data points in the dataset, because then each data point is its own cluster, and there is no error between it and the center of its cluster). So, our goal is to choose a small value of k that still has a low SSE, and the elbow usually represents where we start to have diminished returns by increasing k (Andrew N.G., 2012).

Finally, in order to investigate the existence of possible linkages between the demographic as well as the socio-economic characteristics of the respondents and their preference or not for certified fishing products the statistical X^2 Pearson's independence tests was applied. Furthermore, in order to examine the validity of the X^2 tests, the general rule that fewer than 20 per cent of the cells should have expected values less than 5 and/or that the minimum expected frequency should be >1 was considered. Both afore-mentioned criteria were met by the data in the present study.

3. Results

The results reveal the following: Regarding the variables which have to do with the frequency of fishing products purchases, it was found that 22.3% of consumers buys rare fishing products and that 29.6% buys these products once or twice a month. 10.4% of respondents buys fishing products more often than five to six times a month. The most common place of purchase is the fish shops (51.5 percent), followed by the supermarket (30.0 percent). The fact that supermarket is that high in consumers' preferences can be justified by the study of Arvanitoyannis et al. (2004), where such

buys in Greece have related to the consumers easy access. It is also interesting that about half of the respondents (55%) are unaware of the existence of certified fishing products. This result comes into agreement with the previous study of Botonaki et al. (2006) which concludes that the consumers' level of knowledge and information on certified products is low. This fact is attributed to the insufficient promotion and the low availability of certified products in the Greek market. It is worth mentioning that in a study of the DG Mare (2016), stressed that the market of certified fishing products can be developed, without however being feasible to recognize the motives behind the specific consumers' behavior, due to the lack of relevant literature. The 19.2% of the respondents would not opt for certified fishing products. This can be partly attributed to matters of questioning of the transparency during the various stages of certification. Although the criteria of certification are based on sustainability of fish stocks and the fishing activity as well as on consumers' information and transparency of its procedures, there have been some doubts as to certification procedures (Deere, 1999). Regarding the price, 20.4% of the sample prefers low price fishes whereas 35.3% neither agree nor disagree with it. Only 31.5% of the respondents would buy products of an unknown brand. Therefore, the preference towards a popular trademark is evident. Most of the respondents (70.3%) stated that their preferences are influenced by friends or family choices and opinions.

Tab. 1. *Consumers' preferences by age*

Age	Prefer low price fishing products		Prefer certified fishing products		Prefer fishing products of a well-known brand		My preferences are influenced by friends or family	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
18-25	21,5 %	13,8 %	31,1 %	4,2%	26,2 %	9,2%	28,1 %	7,3%
26-35	14,6 %	10,7 %	21,5 %	3,8%	17%	8,4%	20,3 %	5%
36-45	8,1%	6,9%	11,9 %	3,1%	9,6%	5,4%	10%	5%
46-60	9,6%	5,9%	12,8 %	2,7%	11,5 %	3,9%	8%	7,3%
60 +	3,9%	5%	3,5%	5,4%	4,2%	4,6%	3,9%	5,1%
Total	100%		100%		100%		100%	

Tab. 2. *Consumers' preferences by disposable monthly income*

Monthly income	Prefer low price fishing products		Prefer certified fishing products		Prefer fishing products of a well-known brand		My preferences are influenced by friends or family	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Under 600€	24,6 %	11,5 %	28,8 %	7,3%	26,2 %	10%	28,5 %	7,7%
601€-1.000€	20%	12,3 %	26,9 %	5,4%	21,5 %	10,8 %	22,7 %	9,6%
1.001 €-1.500€	10%	9,2%	15,4 %	3,9%	12,3 %	6,9%	11,9 %	7,3%
Over 1.500€	3,1%	9,3%	9,7%	2,6%	8,5%	3,8%	7,2%	5,1%
Total	100%		100%		100%		100%	

Tab. 3. *Consumers' preferences by gender*

Gender	Prefer low price fishing products		Prefer certified fishing products		Prefer fishing products of a well-known brand		My preferences are influenced by friends or family	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Male	13,4 %	35,1 %	39,0 %	9.5%	31,0 %	17,5 %	30,0 %	18,5 %
Female	7,0%	44,5 %	43,0 %	8,5%	37,5 %	14,0 %	40,3 %	11,2 %
Total	100%		100%		100%		100%	

It is perceived from the tables (Tables 1, 2 & 3) that the age, income and gender are factors which can cause differentiation in consumers' preferences. In the study of Brecard et al. (2009), which refers to the European consumers and focuses on the linkages between demographic and socio-economic characteristics on the one hand and consumers attitudes on the other hand towards certified fishing products, it is noted that the factors which greatly affect the certified products preference is the gender, the educational level as well as the extent of the respondents knowledge on this subject.

As to the results having to do with consumers' perceptions on fishing products, 47.3% claim that certified fishing products are more qualitative compared to non-certified ones. 46.5% of the respondents consider that certified fishing products are

more expensive and 35% has no knowledge of their prices. This is attributed to the lack of knowledge on certification systems.

88.1% of the respondents consider that overfishing does not only have to do with fishing quantity but also with the way of fishing, whereas 13.5% of consumers states that they are not aware of the existence of a standard fish size after which fishing is allowed. 88.8% has awareness of the fact that the fish stock is continually decreasing but women have a greater knowledge of this environmental problem. This finding comes into contrast with the study of Brécard et al. (2012), where men in China seems to be more concerned about the environment. Additionally, according to the same author, in France the latter also pay more attention to fishing conditions and practices than women.

As regards the motives which urge a consumer to choose certified fishing products, the main motive (61.9%) is the trust and safety they offer. The second important factor for buying such products is its taste; result which comes into agreement with the study of Cardello et al. (2007), where the taste and food safety play a major role in consumers' perceptions as to quality and food approval. According to Brunsø et al. (2009), the main motives for certified fish products consumption is food safety standards and taste whereas the basic barriers are price perceptions. The respondents show relatively small concern about environmental issues and at the same time packaging comes last.

Lastly, the consumer's motives, as for buying a certified fishing product are differentiated according to gender. More specifically, women compared to men do not pay that much attention to the price. This result is in accordance with the studies of Dupont (2004), Brécard et al. (2012) as well as Carlsson and Johansson-Stenman (2000), which support that, women are more indifferent (in comparison with men) to a product price, fact that renders them more willing than men for paying a higher price in order to buy a safe certified product.

The results of the cluster analysis reveal two distinct clusters of consumers based on their different perceptions regarding certified or fishing products. More specifically, the first cluster consists of 152 consumers representing 60.8% of the total sample and the second of 108 consumers representing a 39.2% respectively (Table 4).

Tab. 4. *Cluster analysis results*

	Cluster 1 n=152	Cluster 2 n=108
Consumption frequency	3-4 times/month(66%)[1]	1-2 times/month (64%)
Points of purchase	Fish shops (71%)	Super Markets (64%)
Knowledge of existence of certification systems	No (62%)	Yes (77%)
Preference in certified fishing products	No (58%)	Yes (81%)

Fish stock is decreasing continuously	Agree (52%)	Agree (84%)
Some fishing practices are destroying for the sea ecosystems	Agree (54%)	Agree (78%)
Safety as criterion	22%	36%
Price as criterion	38%	6%
Taste as criterion	26%	16%
Environmental concerns as criterion	11%	24%
Packaging as criterion	3%	18%
Influence from familiar environment	Yes (78%)	No (71%)

As far as concerned the cluster profiles: The great majority of consumers of the first cluster buys fishing products three to four times a month. They basically choose the fish shops as a marketplace. Most of these consumers are not aware of the existence of certified fishing products and they do not have any special preference for these. They appear less sensitized in matters which have to do with the protection of fish stock from overfishing of sea ecosystems and the negative effects stemming from it compared to the consumers of the second cluster. The most important factor for the specific segment of the market regarding to their motives for buying fishing products is the price of them whereas matters connecting with the safety and hygiene standards as well as their taste comes second. Based on the answers of the above-mentioned consumers, the influence of packaging as a motive for buying fishing products is negligible. Lastly, according to the results, they seem to be great influenced by their family and friend's environment to make any consumption decisions.

Regarding the second cluster, it is perceived that most of these consumers buy fishing products once or twice a month and prefer the supermarket as a marketplace. They are aware of the existence of certified fishing products and have a clear preference over them. They are also greatly sensitized in matters of sustainable fishing practices. As for the motives for buying fishing products, what is the most important is the safety and hygiene standards of the food in tandem with the protection of the environment whereas the price of the specific products is of little importance to them. Packaging is a factor which plays a major role for this segment of consumers. Finally, no special influence is observed on them by their close environment as to forming a consumer behavior.

Significant linkages were found between the cluster solutions and educational level whereas they were not found statistically significant linkages between the cluster solutions and monthly disposable income, respondents' age and gender (Table 5). A higher education level appears to be positively associated with the consumption of certified fishing products. This fact comes into agreement with the research of Jonell et

al. (2016), which concerned consumers of Sweden. The research concludes that although the level of knowledge of the above-mentioned consumers on certified fishes is low, the crucial factor which influences their preference is the educational level and their willingness to protect sea ecosystems. In the same line, O'Dierno et al. (2006) found a correlation between consumers' educational level and interest in purchasing organic seafood.

Tab. 5. *Linkages between respondents' characteristics and cluster solution*

Gender	**Men**	**Women**
1st cluster	81 (53%)	71 (47%)
2nd cluster	45 (42%)	63 (58%)

Pearson χ^2 = 6.2 not significant p>0.10

Age	**18-25**	**26-35**	**36-45**	**46-60**	**60+**
1st cluster	58	47	9	22	16
2nd cluster	33	19	30	18	8

Pearson χ^2 = 3.8 not significant p>0.10

Educational level	**Elementary**	**Secondary**	**Higher**	**Postgraduate**
1st cluster	47	61	42	-
2nd cluster	8	36	60	4

Pearson χ^2 = linear by linear association: 4.7 significant at p>0.05

Monthly income	**<600**	**601-100**	**1001-1500**	**1501+**
1st cluster	64	49	27	22
2nd cluster	30	35	23	10

Pearson χ^2 = 5.9 not significant p>0.10

4. Conclusions

The aim of the present study is to investigate the consumers' behavior towards certified fishing products and to detect possible distinct segments of consumers in the specific market. A further aim is to examine possible linkages between demographic and socio- economic consumers' characteristics as well as the extent of their preference for certified fishing products.

As results indicate, there are two distinct clusters of consumers with different perceptions on certified fishing products. Regarding the above, a differentiated marketing strategy should be adopted. As to the first case, it could be mentioned that the segment of "traditional" fishing products consumers comes up. In the specific segment it could be launched promotion campaigns whose aim is to enhance the awareness of certification systems and additionally to inform consumers of the benefits of certified fishing products. On the other hand, in the second segment, which mostly consists of "modernists" it should be possibly adopted marketing strategies which mostly focus on

the creation of innovative products. Those could potentially stimulate a consumers' market which will be aware of the benefits of certification on the one hand but does not include fishing products consumption (certified or non-certified) in their daily food plan on the other hand.

Concerning the demographic and socioeconomic characteristics of consumers behavior towards buying fishing products, it comes as a result that the higher the education level it is, the greater the consumption of certified fishing products is. Examining the defining factors among various socio-economic characteristics could allow us to comprehend even better the consumers' behavior towards certification in an effort to develop effective marketing strategies, with the aim of satisfying the different and continuously changing needs and preferences of consumers.

Consequently, those interested should develop marketing strategies by adjusting the preferences of specific consumers to increase the perceived value of their products. Marketing strategies ought to basically focus on the need to raise awareness of Greek consumers to a great extent towards fishing products certification systems. The key priority, however, must be the information on the existence and usefulness of certification as well as raising public awareness on the kind of certification on fishing products.

In this context, based on the results of the present study the suggested policy measures for the relevant stakeholders could be the following:

a) Better information of consumers on the existence of fishing products certifications through targeted advertising messages.

b) Running campaigns aiming to stress the nutritional value of fishing products and their benefits on human health.

c) Utilization of internet services to raise awareness mainly of younger consumers via social networking sites as well as some fishing products company websites which will make consumers' knowledge on this product even deeper.

d) The conduction of new research studies whose aim will be to pinpoint the continuously changing consumers' preferences of fishing products.

e) Potential collaborations of companies in the specific field with Greek laboratories and universities which will intend to provide a better control and modernization (improvement of individual characteristics) of fishing products.

Lastly, certain limitations should be acknowledged. More specifically, the limitations of the current paper are related to the size of the sample and the geographical location. This study was limited to 266 questionnaires and additionally at local level. Since these characteristics constitute important methodological limitations, further quantitative statistical analysis of larger and more diversified samples of Greek consumers should follow, to verify the conclusions of the present study. Consequently, generalizations of these findings to different market contexts should be made cautiously in view of the competitive and market differences that most likely exist between different areas of Greek region.

[1]It is worth mentioning that the number of clusters which the elbow method suggested was also verified by the application of the clustering method Two step Cluster Analysis and the use of Bayesian information criterion (BIC).

[2]The percentages in parentheses refer to percentages inside the cluster and not to the total sample. The percentages without parentheses are of the respondents who choose the first in hierarchy criterion in question concerning again the motives inside the cluster.

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