Determining fish consumption behaviour among households and the most suitable type of fish in Erzurum Province

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Abstract

This study focuses on the factors influencing consumer's decision in fish consumption in Erzurum Province of Turkey. The data were obtained from 384 households who live in urban areas of Erzurum Province in 2012. The sample size of the study was determined by Unclustered Proportional Sampling Method. Analytic Hierarchy Process (AHP) was used to determine the most suitable type of fish for households. The main aim of this study was to determine the factors that influence the type of fish chosen and the most desired type of fish for consumers. The households consist of 4.5 individuals on average, with fish consumption at 6.5 kg per annum per capita. Their choice of fish was based on taste (38.4%), nutrition (23.5%), price (21.4%) and fishbone (16.7%).. Considering these criteria, the most desired type of fish for the consumers was Anchovy. 28.4% of households prefer Anchovy, 20.3% prefer Trout, 16.7% prefer Sea Bream, 12.5% prefer Horse Mackerel (Scad), 11.2% prefer Sea Bass and 10.9% prefer Atlantic Bonito. As a result, the national companies marketing fish in the research area need advertisements that inform the consumers about the utility and benefıts of all fish types.

Keywords: Fish consumption, Erzurum, AHP, Nutrition

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Introduction

Nutrition is a physiological phenomenon that has a significant role in providing the energy required for continued metabolic functioning in the body (Orak *et al*., 2006). It is a critical determinant of immune responses and malnutrition is the most common cause of failure of the immune system in the world (Chandra, 1997). Such needs as eating, housing and dressing are the most important basic needs of humanity. It is mandatory to consume the foods from plant and animal origin required by the human metabolism adequately in order to maintain a healthy and balanced life (Candemir, 2006). Individuals must eat adequately; have a balanced and healthy diet and gain appropriate eating habits in order to maintain a healthy and better life (Asik, 2006). One of the principal sources of nutrition is fish and fish products. It is a need for the continuation of human life at each stage that is from birth to the end of life.

Fish is the principal food source of animal proteins. Fish provides essential nourishment, especially quality proteins, fats, vitamins and minerals (Birgisdottir *et al*., 2008; Meena, 2015). They can also serve as a valuable source of essential fatty acids (Steffens, 1997). Fishery products are also an important source of iodine accumulated from their environment (Kearney, 2010).

The UK government stated that consumers should increase fish consumption in two portions (one portion is 140 g) a week, one of which should be oil-rich fish. However, survey data shows that this advice has not been adhered to by most members of the public (Rukton, 2011).

According to the 2011 FAO data, about 66% of the fishery products in the world are produced in the Asian continent, and China produces approximately one-third of the world's fishery products. In addition to fish consumption of about 18.9 kg per annum, per capita in the world is 25.1 kg in Oceania, 2.0 kg in Europe, 1.0 kg in Asia, 4.3 kg in America and 0.4 kg in the African continent respectively (FAO, 2015). Compared with many European countries such as Portugal and Spain, daily consumption of fishery products in the UK is as low as 22 g per capita (Kearney, 2010). Fishery products are especially important in developing countries such as Bangladesh, Cambodia and some of the poorest Asian countries which take 75% of their daily protein from fishery products (Meena, 2015).

The annual per capita consumption of fishery products ın Turkey is 6.0 kg (Turkstat, 2015). In the Maldives the annual per capita consumption of fishery products is 164 kg, and it is in the first place of consumers of fishery products. On the other hand, in various countries like Iceland, Portugal, Norway, Japan, China as well as the USA the recorded annual per capita consumption was at 89.9 kg, 57.1 kg, 53.4 kg, 51.7 kg, 33.5 kg and 21.7 kg respectively (FAO, 2015).

Despite the fact that the majority of Turkish boundaries are covered by seas including lakes, streams, rivers and other water bodies, Turkey is ranked 50th in aquaculture production and 26th in marine fisheries among 255 countries globally (Guzel *et al*., 2012). Generally, fish consumption in Turkey is very low with the exception of the Black Sea Region (Colakoglu *et al*., 2006; Gurgun, 2006; Yuksel *et al.,* 2011; Guzel *et al*., 2012). Currently, Turkey's domestic consumption is 6 kg but this would be 8 kg per capita per annum without any export and imports. (Uzundumlu, 2012). This is impossible due to the lack of enough resources for fishery production and hence the deficit in domestic supply.

Globally, the level of fish consumption depends on the area of coastaline region (York, 2004). The amount of fishery products in the coastal regions (Black Sea, Mediterranean, Aegean, and Marmara) is greater than that in landlocked regions (Eastern Anatolia, Southeastern Anatolia, and Central Anatolia) in Turkey.

Previous research shows in the seven regions that is Black Sea, Aegean, Mediterranean, Marmara, Central Anatolia, Eastern Anatolia and the Southeastern Anatolia of Turkey, per capita fish consumptions is at 15 kg, 11 kg, 10 kg, 8 kg, 5 kg, 3 kg and 1 kg respectively (Fidan and Klasra, 2005; Adiguzel *et al.,* 2009; Aydin *et al*., 2011; Yuksel *et al*., 2011; Uzundumlu, 2012; Temel, 2014).

Over the years, red and white meat demand by consumers has increased relative to the high supply of fish products. Currently, the consumption of fish products has increased significantly due to high public health awareness and education.

In Turkey, it is believed that fish produced from aquaculture contains antibiotics from the accumulation of heavy metals in the muscles of deep water fishes. This also threatens the health of the consumers, but work done by Pulatsu and Topcu (2012) showed that if the copper level in water is at 0.0001 mg L^{-1}, excess antibiotics given to fish will result in the death of Trout. These and other factors are the reason for this study. Specifically, the paper seeks to determine the fish consumption behaviors of households and the most desired type of fish in Erzurum and its environs.

Expected results assist policy makers to determine the best policies in the interest of consumers, retailers, fish production and marketing companies. Research findings will contribute significantly to the efficient functioning and operations of groups operating. Specifically, these findings will further suggest strategies for both local and national marketing strategies.



Figure 1: Province of Erzurum in the eastern Anatolia region of Turkey. (Source: Anonymous, 2015).

Material and methods

Sampling information was obtained from the municipalities and communities; this was used to determine the sample size (n) in each community using "Unclustered Proportional Sampling Method" taking into account the rate of households (Collins, 1986; Uzundumlu, 2011).

$$n = \frac{(t)^2}{(e)^2} * (p * q)$$

t= t table value corresponding to 95% significance level (1.96)

p= Probability of occurrence of the event (like fish)

q= Probability of non-occurrence of the event (don't like fish)

e= Accepted error in the sampling (0.05)

Based on the information about the desired situation (p) and unpleasant situation (q), which is when p or q is 50% to 50% according to this formula, the maximum sample size was determined as 384.

$$n = \frac{(t)^2}{(e)^2} * (p * q) \quad and \quad n = \frac{(1.96)^2}{(0.05)^2} * (0.5 * 0.5) = 384.16$$

A purposive sampling of the most preferred households were further determined for the six (6) fish species among 120 respondents. These six fish species were initially subjected to AHP analysis based on consumer preferences. These criteria included price, fishbone, nutrition and taste among species like Anchovy, Trout, Sea Bream, Scad, Sea Bass, Atlantic Bonito and other fishes annually consume by respondents.

A total of 384 respondents were interviewed in Erzurum and its environs are taking into account the population of the study area. The AHP method was further used in determining the most desired type of fish through an analysis of the research findings. The effect of demographic factors on choice of fish is shown in cross-tabulations.

AHP model

AHP allows respondents to choose the most appropriate options with pairwise comparisons of required criteria and option (Saaty, 2008). The objective is to show highest AHP in hierarchical order and also, the criteria are based on the objectives. Fig. 2. shows a simple AHP flow chart model (Tunca *et al*., 2012).

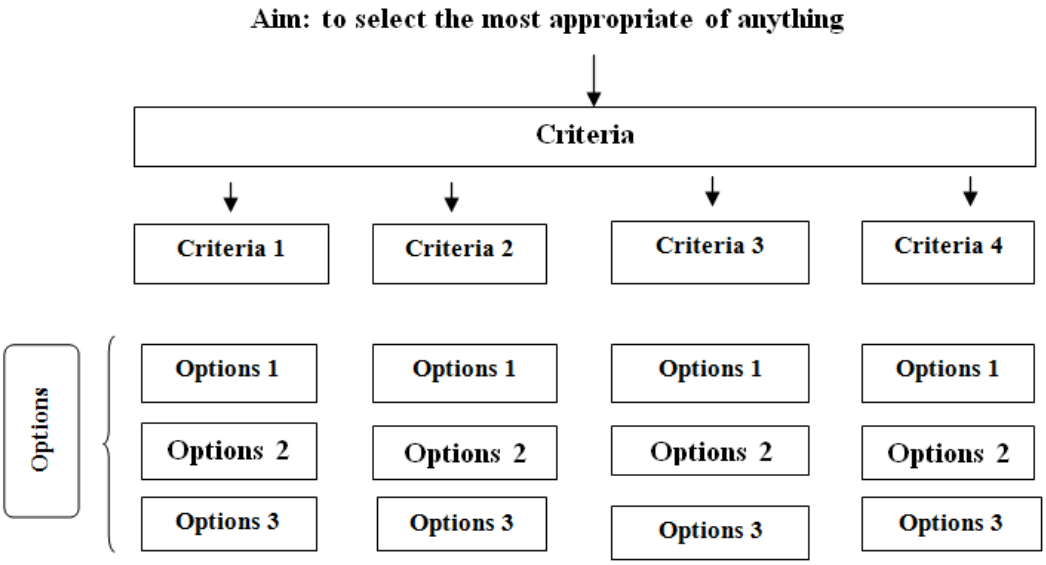


Figure 2: A simple AHP model.

AHP analysis is usually carried out in 12 steps. However, it is mainly performed in step 5 according to (Saaty, 2008).

1. Hierarchical Structure (Decision Tree) Establishment:
   At this stage, according to purpose, criteria and options are determined by a specialist.
2. A comparative matrix of factors is created:
   This matrix is nxn square matrix. A component in the matrix is a_{ij} in this form. If i equals j these values will be equal to each other.

Comparative matrix is given below:

$$A = [a_{ij}]_{nxn} = \begin{bmatrix} a_{11} & a_{12} & \cdot & \cdot & a_{1n} \\ a_{21} & a_{22} & \cdot & \cdot & a_{2n} \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ a_{n1} & \cdot & \cdot & \cdot & a_{nn} \end{bmatrix}_{nxn}$$

Comparison value is a_{ij} if a_{ij} =3 it will a_{ji}=1/3

A grade of factor is determined to five-point rating. The preferred sequence becomes as follows. Equal preference (1), low rate preference (3), high preference (5), Very strong preference (7), and particular preference (9), respectively (Gunden and Miran, 2008).

3. Determination of mass percentage criteria:

$$B_i = \begin{bmatrix} b_{11} \\ b_{21} \\ . \\ . \\ . \\ b_{n1} \end{bmatrix}$$

$$b_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}$$

$$C = \begin{bmatrix} c_{11} & c_{12} & \dots & c_{1n} \\ c_{21} & c_{22} & \dots & c_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ c_{n1} & c_{n2} & \dots & c_{nn} \end{bmatrix}$$

B_i formal shows the number of columns till n, the other formal shows the summation of b_n while C formal tells the whole summation number of C_n (Ozden, 2008).

$$w_i = \frac{\sum_{j=1}^{n} c_{ij}}{n}$$

If all lines in C_{1j} divided by n, the result will be W formal.

$$W = \begin{bmatrix} w_1 \\ w_2 \\ . \\ . \\ . \\ w_n \end{bmatrix}$$

4. Determination of mass percentage options:

$$S_i = \begin{bmatrix} s_{11} \\ s_{21} \\ . \\ . \\ . \\ s_{m1} \end{bmatrix} \qquad S_{ij} = \frac{S_{ij}}{\sum_{i=1}^{n} s_{ij}}$$

$$K = \begin{bmatrix} s_{11} & s_{12} & \dots & s_{1n} \\ s_{21} & s_{22} & \dots & s_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ s_{m1} & s_{m2} & \dots & s_{mn} \end{bmatrix}$$

S_i formal shows the number of columns till m, the other formal shows the summation of S_m while K formal tells the whole summation number of K_m (Gunden and Miran, 2008).

5.Calculation of mass percentage based on their criteria:

Comparing the results of options and criteria shows that the best one is L (Saaty and Vargas., 2012).

$$L = \begin{bmatrix} s_{11} & s_{12} & \dots & s_{1n} \\ s_{21} & s_{22} & \dots & s_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ s_{m1} & s_{m2} & \dots & s_{mn} \end{bmatrix} x \begin{bmatrix} w_1 \\ w_2 \\ . \\ . \\ . \\ w_n \end{bmatrix} = \begin{bmatrix} l_{11} \\ l_{21} \\ . \\ . \\ . \\ l_{m1} \end{bmatrix}$$

Results

Determination of the most desired type of fish with AHP

The decision tree to determine the most desired type of fish in Erzurum Province is shown in Fig. 3.

The AHP method is based on binary comparisons. The first step is to determine the criteria and their sub-criteria for an individual purpose and to form the hierarchical structure. AHP scientifically helps the decision maker to make the best choice by prioritizing the alternatives and the criteria affecting those (Scholl *et al*., 2005). The study was to determine the most desired type of fish among consumers. There were four criteria and six alternatives during

the study. After the criteria were specified, the options were listed under the criteria, and a decision tree was created as the last stage. The criteria included the price, fishbone, nutrition and taste, and alternatives among Anchovy, Trout, Sea Bream, Scad, Sea Bass and Atlantic Bonito.

Priorities of the alternatives

Table 1 shows results of a descriptive statistics explaining the alternatives of the AHP method provided. Anchovy was 28.7%, Trout was 20.1%, 16.6% for Sea Bream, 12.5% for Scad, 11.1% for Sea Bass, and Atlantic Bonito was 10.9% among households.

Priorities of the criteria

Table 2 also shows an explanatory statistics of the AHP criteria among consumers. From these standards, taste was more important at 38.4% among households. Other criteria shown were significant and an indication that about 23.5% of households consumers preferred a fish species based on nutrition, 21.4% of households based their choice on the price of fish whilst 16.7% of household consumers choice was based on fishbone.

In addition to price, consumer perceptions regarding nutrition taste, safety, and appearance, might influence consumption of any fish (Drammeh *et al*., 2002; Zhang, 2004). But the most determining factor for purchasing fish is nutrition (Adeli *et al*., 2011).

Matrix of criteria and alternatives

Comparative averages of the AHP criteria and alternatives have been given in Table 3. According to the *price* criteria, it was realized that 33.7% of the households prefer Anchovy, 19.9% preferred Trout, 14.9% prefer Sea Bream, 13.8% was for Scad, 9.1% preferred Sea Bass whilst 8.7% prefer Atlantic Bonito .

According to *nutrition* criteria, it was determined that households who preferred Anchovy were 25.7%, 21.1% preferred Trout, 18.1% preferred Sea Bream, 12% preferred Scad, 11.5% preferred Sea Bass and 11.5% desire Atlantic Bonito. With *fishbone* criteria, it was determined that 31.1% 19.3%, 15.4%,10.7%, 12.7% and 10.6% of households preferred Anchovy, Trout, Sea Bream, Scad, Sea Bass and Atlantic Bonito, respectively. For *taste criteria*, it was determined as 24.2% for Anchovy, 20.2% for Trout, 18.1% for Sea Bream, 12.1% for Scad, 10.7% for Sea Bass and 12.9% for Atlantic Bonito. Consequently, as a result of the average criteria and alternatives in the Erzurum Province, Anchovy was determined as the most desired fish at 28.7%. This was followed by Trout at 20.1%, Sea Bream at 16.6%, Scad at 12.5%, Sea Bass at 11.1% and Atlantic Bonito at 10.9%.

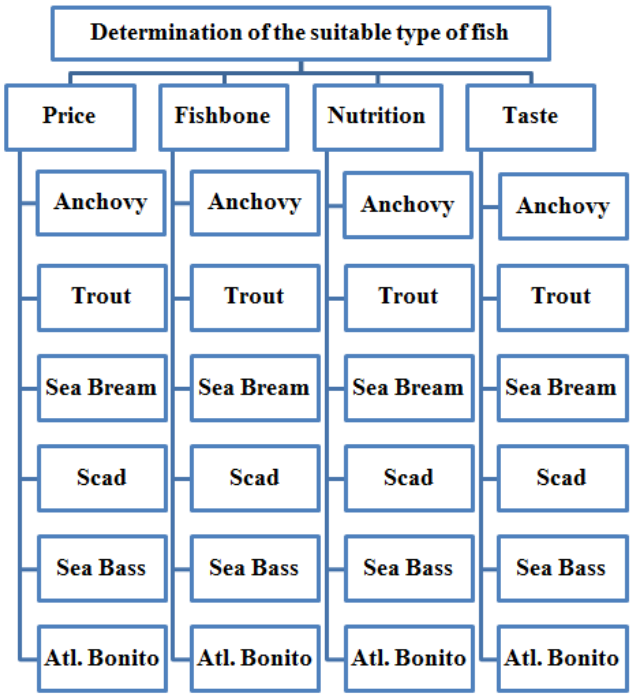


Figure 3: Decision tree in determining the most desired type of fish.

Table 1: Descriptive statistics of AHP alternatives.

Alternatives	Average	Standard error	Minimum	Maximum	Median
Anchovy	0.2868	0.1235	0.0215	0.6429	0.3063
Trout	0.2013	0.0792	0.0322	0.4104	0.2001
Sea Bream	0.1662	0.0682	0.0322	0.3922	0.1648
Scad	0.1252	0.0836	0.0199	0.4487	0.1073
Sea Bass	0.1114	0.0622	0.0273	0.3686	0.1044
Atlantic Bonito	0.1091	0.0698	0.0255	0.3423	0.0945

Table 2: Explanatory statistics of the AHP criteria.

	Average	Standard error	Minimum	Maximum	Median
Taste	0.3840	0.1802	0.0562	0.7506	0.2633
Nutrition	0.2346	0.1918	0.0365	0.5601	0.1219
Price	0.2140	0.1809	0.0358	0.5579	0.1216
Fishbone	0.1674	0.1482	0.0381	0.5603	0.1219

Table 3: Comparative averages of the AHP criteria and alternatives.

	Anchovy	Trout	Sea Bream	Scad	Sea Bass	Atlantic Bonito	Total
Price	0.33729	0.19881	0.14883	0.13752	0.09109	0.08646	1
Nutrition	0.25674	0.21146	0.18099	0.11975	0.11555	0.11551	1
Fishbone	0.31128	0.19379	0.15398	0.12695	0.10772	0.10628	1
Taste	0.24239	0.20152	0.17909	0.12139	0.12907	0.12654	1
Total	1.1477	0.80558	0.66289	0.50561	0.44343	0.43479	4
Rate (%)	28.7	20.1	16.6	12.6	11.1	10.9	100.0

Table 4: Relationship between demographic factors and consumer preference.

	Anchovy	Trout	Sea Bream	Scad	Sea Bass	Atlantic Bonito	Total/ Average
Number of individuals	4.5	4.3	4.1	4.6	5.8	4.3	4.5
Age of household head	47.1	48.0	45.7	47.3	49.6	45.7	47.1
Education of the household head	10.8	11.1	10.9	10.6	10.4	10.1	10.8
Officers (%)	37.6	35.4	34.8	50	12.5	30	36.7
Worker (%)	14.9	16.9	34.8	5	0	20	15.6
Self-employed (%)	14.5	16.9	4.3	5	12.5	10	13.4
Artisan (%)	5.8	9.3	4.3	10	50	10	7.3
Retired (%)	22.7	15.3	17.5	25	12.5	20	21.1
Other Jobs (%)	4.5	6.2	4.3	5	12.5	10	6.0
Rent (%)	26.5	29.2	17.3	25.0	37.5	30.0	26.8
Revenue (000 TRY)	2.4	2.9	3.0	2.7	3.2	2.3	2.5
Total Fish expenditure (TRY)	23.0	21.7	18.3	27.6	22.0	24.7	22.8
Fish expenditure (TRY /kg)	9.5	11.6	11.8	10.8	9.8	9.9	10.1
Per capita consumption (kg)	6.1	6.7	5.5	10.6	5.6	8.3	6.5
Working mother (%)	18.8	16.9	26.1	20.0	12.5	26.9	19.4
First choice rate (%)	63.0	16.9	6.0	5.2	2.1	6.8	100.0

Note: TRY refers to Turkish Liras. One dollar is approximately equivalent to 2.34 TRY in 2012.

Considering the occupations of household leaders in the study area who were of different professions; Officers 36.7%, retirees employees and officers 21.1%, Workers 15.6%, Self-employed 13.3%, Artisan 7.3%, and 6.0% for other occupations, household leaders, officers and retired workers consumed more Anchovy and Scad. Also, Trout and Beam was consumed by officers and other workers. On the other hand, Sea Bass was consumed more by Artisan while Atlantic Bonito was consumed by officers, workers and retirees. Comparing the preference between tenants and host families, it was found that Trout, Sea Bass and Atlantic Bonito are more likely in tenant families while Anchovies, Sea Bream, and Scad are preferred by host families.

The average monthly income of households is between 400 TRY and 10 000 TRY, and the average income of the households is 2, 527.3 TRY. Families with higher incomes prefer more Trout, Bass and Sea Bream while low-income families prefer more Anchovies, Scad, and Atlantic Bonito. Monthly total expenditure for fish consumption is 22.8 TRY while annual fish consumption per person is 6.5 kg. Families prefer Sea Bream as the first choice making less spending on fish because of this these, families consume less fish. If the wife of the household head is working, these families will try to choose Sea Bream and Atlantic Bonito.

Discussion

The research further confirmed previous research in which fish preference in some provinces in Turkey identified Anchovies as the most desired among households (Colakoglu *et al*., 2006; Adiguzel *et al*., 2009; Harlioglu, 2011; Balik *et al*., 2013; Temel, 2014). In 2010, around 57% of the total landings was Anchovy, which

is the pelagic most important regarding harvest and taste of Turkish citizens (Guzel *et al*., 2012). Among fishes, Anchovy with 58.6%, and Trout with 29.3% demand were the highest applicants in Erzurum (Oguzhan *et al*., 2009). According to Saygi *et al*. (2015), there is strong correlation and statistical significance between fishery products and the amount of Anchovy consumed.

Consumer's fish preference with the relationship between demographic factors

Research demonstrates that cultural factors, economic and ecological factors are effective in meat and fish consumption (York and Gossard, 2004). Table 4 shows the relationship between demographic factors and fish consumers' preferences.

To summarize the demographic characteristics of consumers; 31% of respondents were female while 69% were male. The average household size was 4.5 persons. According to Trondsen *et al*. (2004), fish consumption was found to be positively correlated with household size but Verbeke and Vackier (2005) found an opposite result. A large proportion of households prefers Anchovy as the first choice relative to Trout, Sea Bream, Atlantic Bonito and Scad. The average number of the households increased by Sea Bass choice whilst average household size for other fishes ranged from 4.1 to 4.6. Also, age was found to significantly associated with interest in healthy eating. Furthermore, a positive relationship existed between age and knowledge (Pieniak *et al*., 2010) and this was confirmed by findings which showed the average age of household head as 47.1 years and further revealed that the age range of household heads for all the fish ranged from 45.7 to 49.6 years.

Consumption of fishery products was also positively directly associated with education (Trondsen *et al*., 2004). Higher education levels were found leading to higher purchase but did not translate into higher fish consumption (Verbeke and Vackier, 2005). The average educational level of household head was approximately 11 years. Also, the economic, social situation, differences in the household income, occupation as well as the level of education can cause differences in consumption areas (Salehi, 2006). Western nations have a tendency to consume more meat than other nations, particularly as their economies develop (York and Gossard, 2004).

Fish constitute a little part of human diet within a large part of Turkey households. Most households consume less fish because of the smell, although they do like it. Some consumers believe fish is healthier than meat. Fish consumption varies from region to region in Turkey, where the maximum consumption regions are near lakes, rivers, and the sea. Despite the rich water bodies, fish consumption in Turkey is still at a very low level. Turkey produces about 0.6% of the total world production.

Considering Turkey's aquaculture potential, if there is no importation and exportation, per capita fish consumption would rise to 8kg, deficit supply problems of aquaculture products will continue because of consumption awareness of fishery production. As a measure in resolving this deficit further research should be carried out to increase fish consumption among consumers and also, fish farmers should increase their production level. Factors affecting consumers identified as price, nutrition, fishbone and taste influences their desired fish choices.

This paper identified the most important criteria influencing fish choice by consumers as taste (38.4%), nutrition (23.5%), price (21.4%) and fishbone (16.7%). Based on this, the most preferred fish consumed in Turkey is Anchovy because it is cheap, nutritious with few bones and has taste good.

November and March are the months fish is mostly consumed in Turkey with Anchovies as the first choice. Trout is preferred by some consumers because it is more nutritious with good taste and is cheap too. It is also easy to find within all the seasons. Sea Bream especially in the sea areas is preferred by some consumers because of its taste and nutritional level. Farmed Bream fish is easier to find all year round. The Sea Bream fishbone can also be removed comfortably. Scad is preferred by some consumers because it has a good taste and it is cheap for them. However, Scad fish bone is big. Scads are eaten more between January and April in Turkey. Sea Bass and Atlantic Bonito are preferred by some consumers because they are tastier with good nutrition and have few bones. As a result, Anchovy was determined to be the most desired type of fish in the Erzurum Province because 28.7% of the households prefer Anchovy for consumption.

However, the other respondents were educated about the various types of fishes due to their lack of knowledge about these fishes. For this reason, the fishing production and marketing companies should promote these type of fishes, and as well carry out training and advertising in order to spread information about it. Also, fish consumption per capita may be increased by giving information to consumers about the benefits of fish consumption to everyone including children and the next generation. A national day for fish such as 6th of December can be set aside as a World Fish Day.

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References

Adeli, A., Hasangholipour, T., Hossaini, A., Salehi, H. and Shabanpour, B., 2011. Status of fish consumption per capita of Tehran citizens. *Iranian Journal of Fisheries Sciences*, 10(**4**), 546-556.

Adiguzel, F., Civelek, O., Sayili, M. and Buyukbay, E.O., 2009. Fish consumption of households in almus county of Tokat Province. *Journal of Agricultural Faculty of Gaziosmanpasa University*, 26(**2**), 35-43.

Anonymous, 2015. http://www.wineandvinesearch.com/turkey.php. Access: 10.02.2015.

Asik, H., 2006. Opinions and behaviors related to the beverage consumption of Turks in Germany. Gazi University, Institute of Education Sciences, Master Thesis, Ankara.

Aydin, H., Dilek, M.K. and Aydin, K., 2011. Trends in fish and fishery products consumption in Turkey. *Turkish Journal of Fisheries and Aquatic Sciences*, 11, 499-506. DOI: 10.4194/trjfas.2011.0318.

Balik, I., Yardimci, C. and Turhan, O., 2013. Comparatively investigation of fish consumption habits of people in Fatsa and Aybasti districts of Ordu Province. *University of Ordu Journal of Science and Technology*, 3(**2**), 18-28.

Birgisdottir, B.E., Kiely, M., Martinez, J.A. and Thorsdottir, I., 2008. Validity of a food frequency questionnaire to assess intake of fishery products in adults in three European countries. *Food Control*, 19, 648-653.

Candemir, S., 2006. The factors effecting food consumption of families live in rural area of Kahramanmaras and label realities. Kahramanmaras Sutcu Imam University, Institute of Natural and Applied Sciences, Master Thesis, Kahramanmaras.

Chandra, R.K., 1997. Nutrition and the immune system: an introduction. *The American Journal of Clinical Nutrition*, 66(**2**), 460-463.

Colakoglu, A.F., Ismen, A., Ozen, O., Cakir, F., Yigin, C.C. ve Ormanci, H.B., 2006. The evaluation of fish consumption in Canakkale. *Ege University Journal of Fisheries and Aquatic Sciences*, 23(**1/3**), 387-392.

Collins, M., 1986. Sampling (Editor: Worcester, R.M. and Downhom, J.). Consumer market research hand-book. Elsevier Science Publishing Company Inc.

Drammeh, L., House, L., Sureshwaran, S., and Selassie, H., 2002. Analysis of factors influencing the frequency of catfish consumption in the United States. American Agricultural Economics Association Annual Meeting, July 28-31, Long Beach, California.

FAO, 2015. http://fao.org/FI/STAT/summary/default.htm. Access: 10.01.2015.

Fidan, H. and Klasra, M.A., 2005. Seasonality in household demand for meat and fish: Evidence from an urban area, *Turkish Journal of Veterinary and Animal Sciences*, 29, 1217-1224.

Gunden, C. and Miran, B., 2008. Analysis of farmer decisions by using fuzzy analytic hierarchy process. *Journal of Ege University*

Agricultural Faculty, 45(**3**), 195-204.

Gurgun, H., 2006. An investigation into the fish consumption in some towns on the shores of Lake Van. Ege University, Institute of Natural and Applied Sciences, *Master Thesis*, Van.

Guzel, M.M., Kameda, K., and Yamamoto, N., 2012. Comparison of fisheries sectors of Japan and Turkey in production, consumption, trade and future possibilities. *Applied Studies in Agribusiness and Commerce*, 6(**5**), 147-153.

Harlioglu, A.G., 2011. Present status of fisheries in Turkey. *Reviews in Fish Biology and Fisheries*, 21, 667-680.

Kearney, J., 2010. Food consumption trends and drivers. Philosophical transactions of the royal Society B: *Biological Sciences*, 365(**1554**), 2793-2807.

Meena, D.K., 2015. Fish and its role in human nutrition. http://aquafind.com/articles/Fish-and-its-role-in-human-nutrition.php.

Oguzhan, P., Angis, S. and Atamanalp, M., 2009. A research on the habits fish products consumption of consumers determination in Erzurum. XV. National Fisheries Symposium, 1–4 July in Rize.

Orak, S., Akgun, S. and Orhan, H., 2006. Investigation of nutritional habits of Suleyman Demirel University students. *Suleyman Demirel University Journal of Medicine*, 13(**2**), 5-11.

Ozden, U.H., 2008. Choosing primary school with analytic hierarchy process. *Journal of Marmara University Faculty of Economics and Administrative Sciences*, 24(**1**). 299-320.

Pieniak, Z., Verbeke, W., and Scholderer, J., 2010. Health-related beliefs and consumer knowledge as determinants of fish consumption. *Journal of Human Nutrition and Dietetics*, 23(**5**), 480-488.

Pulatsu, S., and Topcu, A., 2012. Water quality in fish production. Ankara University, Faculty of Agriculture, Publication No:1591, Textbook: 543, p.90.

Rukton, C.H.S., Reed, S.C., Simpson, M.J.A. and Millington, K.J., 2011. The health benefits of omega-3 polyunsaturated fatty acids: a review of the evidence. *Journal of Human Nutrition and Dietetics*, 17, 449-459.

Saaty, T.L. and Vargas, L.G., 2012. Models, methods, concepts and applications of the analytic hierarchy process (Vol. 175). Springer Science & Business Media.

Saaty, T.L., 2008. Decision making with the Analytic Hierarchy Process. Internatunal. Journal. Services Sciences, 1(**1**), 83-98.

Salehi, H., 2006. An analysis of the consumer market for carp and carp products in Iran. *Iranian Journal of Fisheries Sciences*, 5(**2**), 83-110.

Saygi, H., Bayhan, B., and Hekimoglu, M.A., 2015. Fishery

products consumption in the cities of Ankara and Izmir in Turkey. *Turkish Journal of Agriculture-Food Science and Technology*, 3(**5**), 248-254.

Scholl, A., Manthey, L., Helm, R. and Steiner, M., 2005. Solving multi-attribute design problems with analytic hierarchy process and conjoint analysis: an empirical comparison. *European Journal of Operational Research*, 164(**3**), 760-777.

Steffens, W., 1997. Aquaculture. Fish nutrition and feeding proceedings of the Sixth International Symposium on Feeding and Nutrition in Fish. 151, 97-119, 15 May, Hobart, Australia.

Temel, T., 2014. To determine the factors that affects the fish consumption of families in Rize. Ataturk University, Institute of Natural and Applied Sciences, Master Thesis, Erzurum.

Trondsen, T., Braaten, T., Lund, E. and Eggen, A.E., 2004. Health and fishery products consumption patterns among women aged 45-69 years. A Norwegian fishery products consumption study. *Food Quality and Preference*, 15(**2**), 117-128.

Tunca, S., Miran, B. and Unal, V., 2012. Decisions of stakeholders for the proposed artificial reef deployment: Analytic hierarchy process approach. *Ege Journal Fish Aquaculture Science*, 29(**1**), 21-29.

Turkstat, 2015. Turkey in Statistics 2014. Publication number: 4380. http://www. turkstat.gov.tr. Access: 19.02.2015.

Uzundumlu, A.S., 2011. A study on the behaviours of the consumers on the consumption of raw and processed milk in Erzurum Province. Ataturk University Graduate School of Natural and Applied Sciences, Ph.D. Thesis, Erzurum.

Uzundumlu, A.S., 2012. Determination of the most desired fish consumption preferences for consumers in Erzurum Province. Atatürk University Research Fund, Project No: BAP-2012/264, Erzurum.

Verbeke, W. and Vackier, I., 2005. Individual determinants of fish consumption: application of the theory of planned behavior. *Appetite*, 44(**1**), 67-82.

York, R., and Gossard, M.H., 2004. Cross-national meat and fish consumption: exploring the effects of modernization and ecological context. *Ecological Economics*, 48(**3**), 293-302.

Yuksel, F., Kuzgun, N.K. and Ozer, E.I., 2011. Determination of the fish consumption habits of Tunceli Province. *The Black Sea Journal of Science*, 2(**5**), 28-36.

Zhang, X., 2004. An Evaluation of Factors Influencing Away-from-home Consumption of Crawfish in the Gulf Region. Doctoral Dissertation, University of Florida.