CONSUMER'S KNOWLEDGE AND PREFERENCES ABOUT FISH FARMED SPECIES

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ABSTRACT

Based on the evoked set analysis, a group of factors driving knowledge and preferences about fish farmed species are investigated with three different samples. Samples were collected in Spain, into a nationwide study about knowledge and assessments about aquaculture, funded by the General Secretary of Marine Fisheries of the Spanish Ministry of Agriculture, Fisheries and Food. An average 2,500 different consumers were interviewed each year in the period from 2005 and 2007. Respondents had to answer to two open questions indicating fish species that are being cultured and which of them they do consume. The evoked set was formed with the most repeated species reported by consumers. The factors are classified into demographic and consumption habits. Their influence on the occurrences of cultured species into an evoked set is tested using binary logistic regression models. Four equations, corresponding to the main fish-farmed species in Spain, are fitted with every sample for both known and consumed species. Results indicate that the occurrence of one species into the evoked set is related with education level, place of consumption, perceptions and consumption of other farmed species.

Keywords: farmed species, consumers' knowledge, evoked set, preferences.

INTRODUCTION

Consumer's perceptions of aquaculture, and the species provided to market, vary according to different personal and social factors. Research in the US indicated that appraisal of farmed species is influenced by frequency of seafood consumption (Gempesaw et al, 1995) and familiarity with the aquaculture industry (Quagrainie et al, 2008). A recent report from the European Commission (EC DG MARE, 2008) supports the influence of tradition and frequency of consumption on perceptions about the aquaculture industry. These worsen when changing from Central Europe to the more traditional fishing countries in the Mediterranean area. As an extension, one can expect that perceptions of aquaculture, and its influence on purchase decisions, may be less favorable in those countries with high rates of seafood consumption than in those other with low consumption. Mueller et al (2009) found that the farm raised attribute was of no significance in consumer's decision to purchase prawns in Australia, while a similar experiment done in Spain with seabream revealed a significant consumer's preference for wild breams (Fernandez-Polanco et al, 2010).

It may be expected that knowledge about aquaculture would be higher in these countries with high seafood consumption rates, even if they hold negative attitudes and perceptions. But a Spanish official report on aquaculture consumption and consumer's assessments, covering five years from 2003 to 2007 (MARM, 2009), concluded that consumer's knowledge about the species of aquaculture origin was far from what it would be considered an optimal. About a 40 to 45% of the Spanish consumers were unable to provide one name of a farmed species. This issue is related with the amount of available information by the public regarding aquaculture, and it is suggesting that this one should be improved.

The seafood market has grown in complexity, with a wide number of different species, harvest methods, origins and presentations. This complexity increases consumer's demands for information in order to accurate build their preferences toward a seafood product. As an innovative method of producing seafood, perceptions of aquaculture as a food source will depend on the available information and the consumer's

ability interpreting the potential benefits of the new technology. As more evident the benefits, more favorable will be the attitudes towards the innovation. Traditional appearance of food is identified by consumers as a sign of quality (Kupiec & Revell, 2001), while technology can be perceived as a source of potential hazards (Yeung & Morris, 2001). Consumer's perceptions of food risks arise from social interaction, and are strongly dependent upon the trust in the involved public and private institutions (Sapp, 2003). But Individuals differ in their exposure to media, cognitive skills to process information, and personal experiences with the product. Even in a well informed society knowledge about aquaculture will not be homogeneous across consumers, and the consequences of the differences will have their effect on purchase behavior. (Wessells et al, 1996), which may affect the perception of risk. Some attributes like taste may dominate de decision to consume a product, while aspects like price or safety may be more important in deciding how much to consume (Lin & Milon, 1993). Survey results from Spain (MARM, 2009) pointed that consumers are considering the price as the main advantage of farmed species, while their scores for quality and safety are lower than those for the wild species (MARM, 2009).

It is assumed that a better knowledge of aquaculture may yield to a higher consumption and a better appraisal for the farmed species. Previous research with the data from the surveys conducted for the Spanish Ministry of Fisheries have reveal that attitudes towards aquaculture as a source of foodstuffs is determined by different demographic factors, being education level the most relevant (Fernandez-Polanco et al, 2008). These attitudes have their effect improving consumer's perceptions of aquaculture when in the set of relevant consumer's beliefs about aquaculture are included favorable perceptions of safety and sustainability (Young et al., 1999; Fernandez-Polanco & Luna, 2010). As attitudes are built on cognitive bases (Fishbein & Ajzen, 1975; Fazio, 1986), it is expected a similar relation between knowledge about aquaculture species, perceptions and consumer's decision to include them into their choices for seafood.

Using a recursive model inspired on the evoked set analysis for fish and seafood species (Kinnukan et al., 1993), this paper aims to understand the factors that are affecting knowledge and consumption of farmed fish among Spanish consumers. Knowledge is assessed by measuring the number of different species they can list as farmed without committing errors. Further, this knowledge will be included in a second equation to test for main effects in consumption of particular farmed species. The second equations will also include perceptions of the species of interest, in the form of attribute scores, and consumption of other farmed species. Factors affecting knowledge of farmed species are tested in three different years, from 2005 to 2007, leading to general conclusions about the full period. Consumption is studied with the 2007 sample, which is the one with the larger number of species with scores for attribute perceptions.

METHODS AND MATERIALS

The proposed models are inspired in previous research done by Kinnukan et al (1993) introducing the evoked set analysis to research on seafood consumer's behavior. An evoked set is composed by the products that a consumer will take in consideration when face with a choice situation. A product will be included into the consumer's evoked set if it is likely to be purchased. Several different variables are then included in models reflecting the influence of individual's factors, experience, and perceptions.

It is aimed to test the factors contributing to increase consumer's knowledge about farmed species, and how this knowledge may contribute to consumption along with other variables such as perceptions. The main research questions are:

- What are the factors affecting consumer's knowledge about fish farmed species?
- How knowledge does affect consumption of fish farmed species?

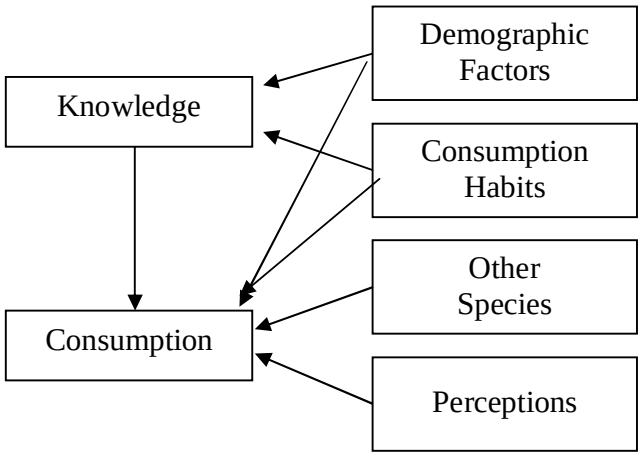
- What is the role of knowledge about aquaculture and perceptions of a species in consumer's choices?
- How do the different fish farmed species interact when making consumer's choices?

In order to solve these questions two evoked sets are going to be used, in the form of open spontaneous questions about the species known as farmed and those that are being consumed. They are going to be the dependent variables in a two equation recursive model represented by the following functions:

Knowledge = f(Demographic factors, consumption habits)
Preferences = f(Demographic factors, consumption habits, knowledge, other species, perceptions)

Relations among the variables are represented in figure 1.

Figure 1 – Model for knowledge and consumption.



Binary logistic regression has been chosen to fit the models. When samples from different years are used, a minimum of two significant values in the corresponding parameters was set as the criteria in order not to reject the null hypothesis of statistical relationship with the dependent variables.

Data used to fit the functions were taken from the surveys made from 2003 to 2007 for a report of the Spanish Ministry of Fisheries on consumer's assessments of aquaculture (MARM, 2009). The samples used for the models were those collected in 2005, 2006, 2007. After filtering the databases to eliminate respondents with uncompleted answers in the variables of interest, the sample sizes were 2,695 (E = ±1.92; CL = 95.5%), 2,345 (E = ± 2.06; CL = 95.5%) and 2,662 (E = ± 193; CL = 95.5%) respectively. The samples were collected face to face in a nationwide survey, following a random distribution proportionally assigned to region's population, gender and age. The samples were composed by different respondents each year, which offers the possibility to test the significant relations at large.

The questionnaires included two open questions regarding knowledge and consumption of farmed species. Respondents listed those species that they were aware of the farmed origin and those that they use to eat. Further, the species were recoded into dummies to allow a single observation for species. Categorical variables collected gender, age, education level, occupation and income level, but only age, education level and income, when tested alone, were found to have any effect on the aggregated knowledge and consumption of farmed species. Eating seafood out of home and being the household food

purchaser were variables used to measure some consumption habits. Finally, five point scores for price, overall quality and expected safety were used as perceptions for seabream, seabass, turbot and trout.

RESULTS

The first step in the analysis is the definition of the evoked sets that are going to be used for fitting both sets of functions. As the number of farmed species is shorter than that of the wild, the two evoked sets resulted in a maximum five workable species (Table 1). Salmon is not going to be taken into account in the case of consumption due to lack of data on consumer's perceptions. The questions made to the respondents were 'what farmed aquatic species do you know?' for knowledge, and 'what farmed aquatic species do you eat?' for consumption. The evoked set derived from the first question forms the dependent variable for the first model. The model for consumption will test the effects of the proposed factors over the species listed in the second question. This function will be only tested with the four species with available scores on perceptions using the sample from 2007, which is the one with scores for a larger number of species.

Table 1 – Evoked sets for knowledge and consumption of aquaculture

Knowledge	2005	2006	2007
Seabream	33.4%	32.5%	33.75%
Trout	28.9%	27.6%	31.70%
Seabass	20.6%	21.6%	26.40%
Turbot	9.6%	9.1%	10.10%
Salmon	12.0%	9.9%	11.50%
Consumption	2005	2006	2007
Seabream	22,4%	20,3%	21.4%
Trout	12,0%	10,4%	19.8%
Seabass	12,4%	13,1%	15.6%
Turbot	4,1%	4,0%	7.4%
N	2,685	2,345	2,662

The composition of these sets raises some information of the Spaniard's concept of aquaculture in terms of harvested species. All the listed species are fish, but Spain holds a huge production of molluscs, being the most important producer of mussels in the EU and the quantities yielded to the market are over five times those of total farmed fish. Thus, these results suggest that, when inquired about aquaculture species, the first thing that comes into the Spaniard's minds is fish-farming. Another idea that can be raised from the evoked sets is that local grown species are better known as aquaculture products that those farmed in other countries. Aquaculture origin is better known for domestic products than for imported seafood. This is the case of salmon, whose farmed origin is less well known than any other local harvested species.

The following steps consist in fitting the proposed functions for knowledge and consumption and estimate the parameters of the logistic regressions. Analysis will proceed in two steps. The first step will conclude with a general model to describe the affects of those factors affecting knowledge about the species that are being farmed. Further, all variables than which their influence on knowledge can be replicated in, at least, two years will be included in the equations for testing effects on consumption. The regression model for knowledge will be fitted in three consecutive years. For the analysis of the variables that are affecting consumption, although it can be tested in different years for some species, will be restricted here for the sample providing the larger number of species with collected attribute scores. This one is the survey made in 2007, in which scores for price, quality and safety were presented to respondents for seabream, seabass, turbot and trout.

Factors affecting awareness of farmed species

As specified in the model, demographic and consumer's habits are proposed as the variables affecting the composition of the evoked set of the species known as farmed. The demographic variables collected in the questionnaires were gender, age, education level, occupation and income. Preliminary bivariate analysis based on chi square tests of equality of distributions allowed rejecting significant influences from gender and occupation, reducing the number of variables of this group to be considered in the main models. Only three variables were available for consider consumption habits: frequency of seafood consumption, eating seafood away from home and being household food purchaser. As same as with those demographic, bivariate analysis was carried out to test for singular effects on the composition of the evoked set. Frequency of seafood consumption was found to be a very homogeneous variable across consumers. As expected from results published in official reports (FROM, 2008), more than an 80% of the Spanish households are purchasing seafood of any kind with a minimum frequency of two times a week. This derives in a strong and similar frequency of consumption across individuals that causes lack of significance when used to explain the composition of the evoked set used for knowledge about farmed species.

Table 2 – Results for awareness of farmed seabream

	2005		2006		2007	
-2 loglikelihood	2252.083		1873.252		2087.265	
Cox-Snell	0.225		0.221		0.261	
Nagelkerke	0.306		0.302		0.357	
	B	Sig	B	Sig	B	Sig
Age		0.631		0.003**		0.418
18 – 34	-0.131	0.521	-0.136	0.546	-0.167	0.439
35 – 54	0.057	0.743	0.475	0.006**	0.042	0.795
54 – 64	0.085	0.642	0.292	0.111	0.175	0.318
Education		0.000**		0.081*		0.022**
Ill Educated	-0.858	0.002**	-0.756	0.020**	-0.427	0.116
Primary	-0.572	0.000**	-0.086	0.624	-0.413	0.009**
High School	-0.040	0.753	0.039	0.806	-0.045	0.755
Income		0.000**		0.114		0.177
under 20%	-0.289	0.349	0.948	0.051*	0.096	0.806
20% - 40%	-0.231	0.440	0.645	0.175	0.387	0.310
40% - 60%	-0.741	0.017**	0.646	0.181	0.333	0.387
60% - 80%	-0.979	0.008**	0.523	0.338	0.052	0.902
Dining out	0.453	0.000**	0.325	0.007**	0.509	0.000**
Purchaser	0.237	0.030**	0.071	0.563	0.272	0.019**
Seabass	2.238	0.000**	2.216	0.000**	2.134	0.000**
Turbot	0.467	0.007**	0.397	0.043**	0.609	0.001**
Trout	0.000	1.000	0.496	0.000**	0.530	0.000**
Salmon	0.124	0.434	-0.160	0.401	0.064	0.692
Constant	-1.330	0.000**	-2.391	0.000**	-2.497	0.000**

** Significant at a 95.5% CL; * Significant at a 90.0% CL.

The equations fitted for awareness of farmed seabream (Table 2) show significant effect of the education level in all the three years observed. Parameter values indicate that the probability of listing seabream as a farmed species increases when the education level grows. Age and income only resulted in significant parameters in one of the three years. Another factor confirmed in the three years is the place of

consumption, which favors the occurrence of seabream into the evoked set when the respondent uses to eat seafood when dining out. Being the household seafood purchaser appears to be another conditioning factor and awareness of the farmed origin of seabream increases when the respondent is the one who purchase the seafood eaten at home. Seabass and turbot are associated with seabream in consumer's preferences, and the probability of include one of these species into the evoked set increases when the respondent lists seabream. Effects from trout are only significant in the last two years, but a relation between awareness of farmed origin for both species cannot be completely rejected. It is not the case of salmon, in which none parameter resulted significant.

Table 3 – Results for awareness of farmed seabass

	2005		2006		2007	
-2 loglikelihood	1704.271		1443.908		1799.461	
Cox-Snell	0.235		0.230		0.272	
Nagelkerke	0.355		0.348		0.391	
	B	Sig	B	Sig	B	Sig
Age		0.861		0.098*		0.402
18 – 34	0.004	0.986	-0.531	0.055*	-0.236	0.317
35 – 54	-0.064	0.762	-0.323	0.103	-0.264	0.135
54 – 64	0.076	0.731	-0.032	0.880	-0.082	0.662
Education		0.048*		0.275		0.001**
Ill Educated	-1.141	0.007**	-0.622	0.111	-0.767	0.020**
Primary	-0.236	0.225	-0.333	0.088*	-0.205	0.235
High School	-0.035	0.807	-0.208	0.241	0.282	0.066*
Income		0.369		0.401		0.029**
under 20%	0.152	0.663	-0.883	0.087*	-1.235	0.002**
20% - 40%	0.106	0.752	-0.676	0.180	-1.099	0.005**
40% - 60%	0.272	0.435	-0.611	0.231	-1.015	0.011**
60% - 80%	0.613	0.129	-0.723	0.216	-1.339	0.003**
Dining out	0.497	0.000**	0.499	0.000**	0.146	0.241
Purchaser	0.199	0.125	0.214	0.140	0.072	0.571
Seabream	2.236	0.000**	2.213	0.000**	2.140	0.000**
Turbot	1.272	0.000**	1.206	0.000**	1.245	0.000**
Trout	0.209	0.114	0.019	0.897	0.669	0.000**
Salmon	-0.373	0.046*	0.078	0.718	0.098	0.562
Constant	-3.538	0.000**	-1.734	0.001**	-1.372	0.004**

** Significant at a 95.5% CL; * Significant at a 90.0% CL.

Result for seabass are very similar to the previous, but less consistent in some of the significant variables (Table 3). Education level behaves in the same way as it was observed with seabream, increasing the probability of listing seabass as a farmed species for upper education levels. But only two of the three years studied has shown significance for any of the related parameters. The same happens with the place of consumption, with a significant positive parameter in the first two years of the study. Other demographic variables and the action of purchase were not significant or showed it only in one sample. The association between seabream, seabass and turbot, species promoted together in the national generic advertising campaigns, is confirmed in the equations for seabass, with significant parameters in all the years. Trout, in this case, shows only significance in the last year sample, and a consistent relation between the awareness of their farmed origin can be rejected, as it does not stand across years.

Turbot shows more differences with seabass and seabream than these two between them (Table 4). Education level is only significant in the last year's sample, while age shows significant parameters y two of the three years. This result is indicating that those who are aware of the existence of farmed turbot are older than those of seabream and seabass. Eating seafood when dinning out has also significant parameters for two years, indicating a stronger awareness from these respondents. Relation with seabream, seabass and trout cannot be rejected, being higher the probability to list turbot when seabass was also included. Seabream and trout are two well know farmed species, and have the biggest frequencies into the evoked set, while turbot is one of the less notorious. It can be due to the sample sizes that turbot appears in conjunction with seabream as a third or even a fourth option.

Table 4 – Results for awareness of farmed turbot

	2005		2006		2007	
-2 loglikelihood	1266.358		984.612		1182.014	
Cox-Snell	0.087		0.073		0.081	
Nagelkerke	0.174		0.155		0.169	
	B	Sig	B	Sig	B	Sig
Age		0.035**		0.337		0.075*
18 – 34	-0.354	0.257	0.057	0.885	-0.744	0.031**
35 – 54	0.165	0.515	0.442	0.106	-0.139	0.545
54 – 64	0.421	0.107	0.305	0.299	0.103	0.667
Education		0.825		0.894		0.094*
Ill Educated	-0.216	0.615	0.069	0.893	-1.101	0.031**
Primary	0.067	0.766	-0.114	0.648	-0.394	0.081*
High School	-0.093	0.608	0.043	0.843	-0.100	0.601
Income		0.005**		0.219		0.399
under 20%	-0.129	0.722	-1.184	0.017*	-0.397	0.361
20% - 40%	-0.806	0.022**	-0.951	0.043	-0.328	0.423
40% - 60%	-0.329	0.358	-0.951	0.048	-0.175	0.673
60% - 80%	-0.545	0.208	-0.911	0.118	0.201	0.662
Dining out	0.268	0.088*	0.451	0.015**	-0.249	0.123
Purchaser	-0.086	0.583	0.361	0.059*	-0.158	0.333
Seabream	0.524	0.002**	0.410	0.039**	0.627	0.001**
Seabass	1.279	0.000**	1.215	0.000**	1.249	0.000**
Trout	0.536	0.001**	0.367	0.043**	0.278	0.085*
Salmon	0.813	0.000**	-0.164	0.555	-0.278	0.244
Constant	-3.155	0.000**	-2.730	0.000**	-2.065	0.000**

** Significant at a 95.5% CL; * Significant at a 90.0% CL.

Trout is another well known species associated with aquaculture by consumers like there were seabream and seabass. But it shows some differences with these two species that makes it somehow particular (Table 5). While effects of education level are confirmed in the same way as they were before with the previous species, income reveals to be a determinant factor for the awareness of farmed origin in trout. In this sense, awareness increases in the 40% - 60% bound. Dinning out is not as an important factor for awareness of farmed trout as it was with the other species, being only significant at a 90% confidence level in the last year's sample. Similar results are obtained in the case of household purchasers. Bu it is in the composition of the respondent's evoked set where trout makes the grater difference with turbot, bass and bream. While the former species were not associated with salmon, this is the only one species showing significant parameters with trout in all the three years.

Table 5 – Results for awareness of farmed trout

	2005		2006		2007	
-2 loglikelihood	2422.984		1957.043		2348.087	
Cox-Snell	0.089		0.092		0.127	
Nagelkerke	0.124		0.132		0.176	
	B	Sig	B	Sig	B	Sig
Age		0.713		0.599		0.367
18 – 34	-0.065	0.739	-0.298	0.175	-0.302	0.129
35 – 54	-0.137	0.414	-0.112	0.499	-0.217	0.145
54 – 64	0.009	0.960	-0.127	0.477	-0.110	0.490
Education		0.026**		0.160		0.018**
Ill Educated	-0.751	0.005**	-0.448	0.142	-0.708	0.006**
Primary	-0.333	0.033**	-0.170	0.318	-0.334	0.022**
High School	-0.108	0.372	0.090	0.553	-0.092	0.490
Income		0.008**		0.024**		0.006**
under 20%	-0.214	0.472	-0.073	0.878	-0.831	0.017**
20% - 40%	0.044	0.877	0.340	0.466	-0.579	0.087*
40% - 60%	0.350	0.237	0.423	0.369	-0.380	0.266
60% - 80%	0.100	0.770	0.417	0.430	-0.125	0.742
Dining out	-0.137	0.187	0.029	0.808	-0.178	0.097*
Purchaser	-0.104	0.317	-0.116	0.330	0.233	0.030**
Seabream	0.001	0.995	0.500	0.000**	0.534	0.000**
Seabass	0.177	0.183	-0.002	0.987	0.662	0.000**
Turbot	0.496	0.001**	0.331	0.069*	0.252	0.119
Salmon	1.506	0.000**	1.722	0.000**	1.311	0.000**
Constant	-0.637	0.074*	-1.328	0.008**	-0.282	0.480

** Significant at a 95.5% CL; * Significant at a 90.0% CL.

Factors affecting consumption of farmed species

Once the main factors influencing knowledge about aquaculture species were stated and reduced, the second function can be fitted including also preferences, consumption of other farmed fish and the number of species known as being farmed as a measure of knowledge about aquaculture (Table 6). The function was fitted with the data from the 2007 survey, as this questionnaire included the largest number of species with scores for particular attributes. Three scores from 1 to 5 collected the overall consumer's assessments were used to measure perceptions of price, quality and safety for seabream, seabass, turbot and trout.

Education level shows significance only in seabream consumption at a 90% confidence level. In this case, consumption is higher at the less educated segments. Eating seafood out of home resulted in no significance at all with any species. The number of species known as aquaculture products is a determinant factor for consumption of any of the species considered in the analysis. As higher the size of the evoked set of known species, as bigger the probability to consume any of them. The relation among consumption of the different farmed species shows that seabass and seabream are complementary species, while trout appears to be a substitute of both. Turbot shows no significance at all with consumption of any other species. Finally, perceptions showed significance for seabream, seabass and trout. In the first two species the score for price reveals a significant positive effect. In contrast, seabream and trout present significant negative effects for the score of quality. These results seem to indicate that the main driver for consumer preferences is the low price of farmed species, which balances less positive quality scores.

Table 6 – Consumption toward consumption of farmed species

	Seabream		Seabass		Turbot		Trout	
-2 loglikelihood	877.286		700.222		331.773		431.427	
Cox-Snell	0.450		0.433		0.315		0.127	
Nagelkerke	0.604		0.592		0.438		0.263	
	B	Sig	B	Sig	B	Sig	B	Sig
Education		0.063*		0.488		0.654		0.886
Ill Educated	1.142	0.011**	-0.043	0.944	-0.913	0.409	0.093	0.870
Primary	0.036	0.876	-0.300	0.242	0.220	0.558	-0.120	0.716
High School	-0.021	0.923	0.046	0.849	0.245	0.457	-0.226	0.484
Dining out	0.062	0.732	-0.177	0.390	0.038	0.899	0.541	0.043
EV size	1.552	0.000**	1.421	0.000**	1.266	0.000**	1.149	0.000**
Seabream			1.235	0.000**	-0.395	0.279	-0.950	0.003**
Seabass	1.288	0.000**			0.040	0.911	-0.790	0.019**
Turbot	-0.239	0.253	-0.267	0.242			0.191	0.543
Trout	-0.810	0.008**	-0.762	0.027**	-0.154	0.724		
Price	0.343	0.000**	0.509	0.000**	0.132	0.315	-0.230	0.103
Quality	-0.284	0.090*	0.102	0.588	-0.362	0.232	-0.507	0.035**
Safety	0.071	0.657	-0.286	0.106	0.473	0.114	0.390	0.102
Constant	-3.345	0.000**	-3.814	0.000	-3.777	0.001	-3.565	0.000

** Significant at a 95.5% CL; * Significant at a 90.0% CL.

CONCLUSIONS

Knowledge about farmed species among Spanish consumers is related with demographic and consumer's habits variables. Higher education levels lead to a wider evoked set of farmed species, with the exception of salmon, which is the only one species in the research with no significant production in the country. Income was shown to be a significant variable in explaining the occurrence of trout and salmon into the evoked set of but the parameters obtained not always provide a consistent interpretation. Regarding consumption habits, dining out appears to be a significant factor in those respondents who listed seabream, seabass and turbot, but much less important in the cases of trout and salmon.

Education level and eating seafood out of home were included into a new function for studying consumer's preferences and consumption of farmed species. A measure for knowledge about aquaculture was also introduced in the analysis in the form of the number of farmed species listed by the respondent. This function included also consumption of other species from the evoked set and three 1 to 5 overall scores of price, quality and safety for seabream, seabass, trout and turbot. Results indicate what are the significant factors driving consumer's preferences and how do they affect consumption of particular species.

Demographic and habits have shown no direct effects on consumption of any species, and they are acting indirectly though their effect in the composition of the evoked set for farmed known species. The size of this set was found to be a determinant factor for consumption of all species, and as wider the first, as higher the probability that a respondent is a consumer of a particular farmed species. This result highlights the importance of communication for the industry. Even there are a considerable amount of consumers that are eating farmed species without being aware of its origin, as an undifferentiated product will not derive in better attitudes toward aquaculture and no marketing effort in this sense would succeed.

Results show that price is he most important product attribute that positively affects aware consumption of farmed species, while the scores for quality in some of them indicate a negative effect. Only turbot, probably due to a smaller sample size, does not show any significant parameter on this point. Results can be interpreted as that a competitive price balances the low appraisal of the quality of farmed fish which seems to be common in Spain and South Europe (MARM, 2009; EC DG MARE, 2008). Differentiation and promotion may help changing this issue and branding would help consumers to find better quality species that may obtain premiums. In order to achieve these potential benefits, improvements in consumer knowledge need to be done, not only in the numbers but also in terms of methods, economic benefits, safety and sustainability.

Competition among species can be mapped from the results of the function for preferences. Results indicate that even the species are positively associated in terms of knowledge it is not the case for consumption. Seabream and seabass are complementary species, and consumers of one of these are mostly consumers of the other. This is not the case of trout, with which all significant parameters connecting to other species are negative, indicating a relation of substitution. Unfortunately, the samples of turbot consumers are too small to provide a function with enough number of significant parameters to clarify whether this species is a substitute or a complement of any of the other.

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