Analysis of seabream and seabass consumption in the Mediterranean countries of the European Union

L. Luna Sotorrío[1], J.M. Fernández-Polanco[2] and J.L.Fernández Sánchez[3]
Research Group "Economic Management for the Sustainable Development of the Primary Sector"
Universidad de Cantabria, Av. Los Castros, s.n., S-39005 Santander, Spain
e-mail: [1]lunal@unican.es; [2]polancoj@unican.es; [3]fernandezjl@unican.es

SUMMARY – The overall objective of this study is to analyse the situation of the seabream and seabass market, in order to provide relevant information for designing sustainable development strategies. It is divided into two parts: the first is an aggregated study about the factors affecting consumption in the Mediterranean countries of the European Union, which concentrated 79.5% of the consumption of these species in 2005. The second part is more specific and studies the influence that awareness and attitude towards aquaculture has on consumption patterns and valuation of the species, factors that are to be taken into account when designing specific strategies for each market. This latter part is confined to the Spanish market, and therefore results cannot be extrapolated to others, but they may serve as reference given that Spain accounts for 18.6% of total seabream and seabass consumption in the European Union.

Keywords: Seabream and seabass market, aquaculture consumption, market strategy.

RESUME – *"Analyse de la consommation de bar et de daurade dans les pays méditerranéens de l'Union Européenne". L'objectif global de cette étude est d'analyser la situation du marché du bar et de la daurade, afin de fournir une information utile pour la mise au point de stratégies de développement durable. Elle est divisée en deux parties : la première est constituée par une étude agrégée sur les facteurs qui influencent la consommation dans les pays méditerranéens de l'Union Européenne, qui ont concentré 79,5% de la consommation de ces espèces en 2005. La seconde partie est plus spécifique et examine l'influence que la sensibilisation et l'attitude vis-à-vis de l'aquaculture présentent sur les tendances de consommation et d'appréciation de ces espèces, facteurs qui entrent en ligne de compte pour la conception de stratégies spécifiques à chaque marché. Cette dernière partie se limite au marché espagnol, et par conséquent les résultats ne peuvent pas être extrapolés à d'autres marchés, mais ils peuvent toutefois servir de référence étant donné que l'Espagne représente 18,6% de la consommation totale de bar et de daurade au sein de l'Union Européenne.*

Mots-clés : *Marché du bar et de la daurade, consommation de produits aquacoles, stratégie de marché.*

Introduction

The seabream and seabass markets in the European Union are characterised by a steep rise in both supply and consumption. Seabream consumption rose from 28,960 t in 1995 to 102,789 t in 2005, meaning an increase of 254.9% over the decade and an annual mean increase of 13.50%. Seabass consumption followed a similar trend, rising from 25,529 t in 1995 to 78,939 t in 2005, what is an increase of 209.2% over the period analysed, with a mean annual increase of 11.97%. The following five Mediterranean countries of the European Union: Italy, Spain, Greece, France and Cyprus, as well as Portugal concentrated approximately 80% of the production and consumption of the two species in 2005 (Table 1).

This spectacular increase in supply and demand is a result of the standardisation of the production and marketing processes, providing high quality products, with clear traceability and a stable and sustainable supply, all of which are factors that indicate a favourable situation for development of the sector. However, the positive market trend of this sector, contrary to expectations, is not accompanied by a proportional increase in the creation of value for the firms, whose market strategy, motivated by the market situation, drives them to compete on prices, leading to erratic results, profit margin reductions and subsequent business crises.

Table 1. Seabass and seabream production, catches and consumption in EU Meditarranean countries (2005)

	Seabass (t)			Seabream (t)		
	Production	Catches	Consumption	Production	Catches	Consumption
Cyprus	583		363	1,465	3	1,026
Spain	5,713	480	13,872	15,433	744	20,006
France	3,913	5,450	9,555	1,778	567	5,818
Greece	30,959	828	21,035	43,829	357	18,651
Italy	6,262	194	24,146	6,914	265	22,568
Portugal	1,526	177	2,907	1,514	137	4,690

Source: FAO Fishstat plus.

Traditionally, aquaculture product marketing has had to face the problem of highly volatile prices following a downward trend, becoming stable at medium to low prices, leading to narrower business margins. This circumstance is systematically repeated when the production process of a given aquaculture species is standardised, permitting the exponential growth of supply. The consequences are well known in the sector: reduction of profits and increase in economic risk for firms.

There is general consensus when identifying the origin of the problem in price trends. However, when explaining this price evolution, the consensus is lost giving way to different explanations: supply and demand not matching because of rapid growth or seasonality of supply, firms lacking the appropriate dimensions with subsequent repercussions on trade management and financial structure, hindering negotiation with actors in the marketing channel, and consumers' low appreciation of aquaculture products. Market saturation is often mentioned, even when experience in other species such as trout and salmon has shown that these problems arose when the volume of consumption was a third of that which was reached ten years later; or, as in the most extreme case, with the premature turbot crisis in the 80s, when the annual production was below 2000 t.

Firms' strategies and responses to this problem vary among species, countries and market development stage (European Commission, 2002), thus:

(i) In order to match supply and demand, production scheduling is proposed, through management, scale and production siting techniques in order to avoid or take advantage of seasonality and improve efficiency so as to withstand price fluctuations, taking into account the clear increase in demand.

(ii) If the problem is the inappropriate scale of the firm, the solution seems to lie in the concentrating supply, either through concentrating the firms themselves or through trade alliances. This process helps to improve efficiency through economies of scale, and therefore situations in which supply and demand do not match can be overcome and at the same time favours the creation of a commercial and financial structure for the businesses to be competitive. This solution is becoming one of the most highly valued, which is why this trend is being observed in the sector.

(iii) To increase the value of products supplied through differentiation by quality marks, new forms of presentation, product processing and diversification of supply with new species. This proposal of a solution also requires a greater production scale which thus enhances the firm concentration process.

(iv) Finally, some experts hold that the explanation lies in the inappropriate valuation that consumers make of aquaculture products, either due to ignorance or to prejudice. If this were so, it would complicate the problem significantly since the price would not be low at a given moment, but would remain low in the long term, decreasing the expectations of creating value in the sector or an attraction to investment. In this case, communication would be an appropriate strategy in an effort to revalorise the product, and in which case institutional support would be required. Or, if this support were to come from firms, an increase in dimension would be necessary in order to address it.

Seafarming development in Spain, as in other Meditarranean countries, faces two challenges: to reach the scale of production and to increase knowledge of the market, especially of the factors that condition consumers' attitude towards aquaculture and their appreciation of the products, with the aim of contributing to the sustainable development of the sector.

The consequences of undertaking such strategies without having overcome the restrictions mentioned, are well known in the sector: on one hand, large investments with moderate success that cannnot be exploited (giving the impression of opening the way for other businesses) and, on the other hand, a response from consumers that does not correspond to the commercial effort made. The lack of results of these strategies generates a reduction in the dynamics that may lead to the stagnation of this activity.

It is essential and urgent, therefore, to overcome these restrictions, for which a possible line of action, where this study lies, would consist of improving market and consumer knowledge of aquaculture products.

Objective

The general objective of this study is to analyse the demand for seabream and seabass in order to obtain relevant information for orienting strategic actions to be taken by both regulating institutions and firms, thus enhancing the sustainable development of the sector. This general objective is subdivided into three specific sub-objectives:

(i) Analysis of the aggregate demand in the Mediterranean countries of the European Union in order to detect the variables that influence demand and their effect. Through this analysis a framework can be drawn up for the development of the sector's activity and the evaluation of its expectations.

(ii) A specific analysis of one of the countries, Spain, with the purpose of capturing the special characteristics of the Spanish market when analysing the evolution of the seabass and seabream consumption. This part of the work is necessary, given that aggregate factors cannot be extrapolated without considering the specific situation of each market.

(iii) Finally, in the light of the aggregate and specific analyses, a series of strategic actions will be proposed with the intention of enhancing the sustainable development of the cultured seabass and seabream sector.

Methodology

The data sources and analysis techniques used can be differentiated, following the work structure, into two parts, according to whether the objective is to carry out the aggregate analysis of consumption for the Mediterranean countries of the European Union or to analyse the specific factors of the Spanish market. This heterogeneity is due to the restrictions imposed by the type of information available and the statistical nature of the sources of data used for each type of analysis, which makes it impossible to address the objectives using a common technique. The study of consumption of the EU countries is conducted using a dynamic model, using time series. The Spanish case will be studied through the statistical analysis of survey data.

Aggregate analysis of the Mediterranean countries of the European Union

The data referring to the evolution of supply and demand of seabass[1], seabream and white fish

[1] The names for the species seabass and seabream correspond to the English designation "European seabass" and "gilthead seabream", respectively. In the database on seafood production and trade the names "seabass", "fresh or chilled" and "seabream", "fresh or chilled" have been used since these are the data which come closer to those obtained by aggregating figures corresponding to tariff nomenclatures CNC 03.02.69.61, "doradas de mar", and CNC 03.02.69.95, "pargo dorado".

come from the FAO database FishSTAT, just as those that are used for the evolution of the meat market come from TradeSTAT. The series for income, life expectancy, urban population and employment in agriculture have been obtained from the World Development Indicators 2006 of the World Bank, whereas the data used for exchange rates came from EuroSTAT, the Central European Bank and the Bank of Spain[2].

The self-correlation that existed between some variables made it advisable in the following cases to group them into principal components, using factorial reduction techniques:

(i) Social factor aggregating income, life expectancy, percentage of urban population and employment in agriculture.

(ii) Complementary meat factor aggregating poultry and pork consumption, series that are positively correlated with seabream and seabass consumption.

(iii) Substitute meat factor aggregating beef and lamb consumption, series that have a negative correlation with the consumption of seabass and seabream.

The linear regression model explaining the evolution of aggregate consumption of seabream and seabass is given in the following expression:

$$C_t = A + \beta_1 \cdot C_{t-1} + \beta_2 \cdot Pd_t + \beta_3 \cdot CPB_t + \beta_4 \cdot FS_t + \beta_5 \cdot FCC_t + \beta_6 \cdot FCS_t$$

where: C_t = Consumption of the species (production+captures+imports-exports); C_{t-1} = Consumption pattern (consumption previous period); Pd_t = Price; CPB_t = Consumption of white fish; FS_t = Social factor; FCC_t = Complementary meat factor; and FCS_t = Substitute meat factor.

Specific analysis of Spain

The data used to conduct the study of seabass and seabream consumption in Spain comes from a survey on consumption patterns of aquaculture species with a representative market sample of 3200 consumers (sampling error of ± 1.7 % for a significance of 95.5%) conducted in November 2006 and included in the context of the framework agreement between the Research Group "Gestión Económica para el Desarrollo Sostenible del Sector Primario" ("Economic Management for the Sustainable Development of the Primary Sector") of the University of Cantabria and the General Secretariat of Maritime Fisheries of the Spanish Ministry of Agriculture, Fisheries and Food.

The technique used to study the relationship between the ability to distinguish the product and the price paid was the Kruskal – Wallis rank statistic test. In the remaining cases, the Pearson *Chi-squared* likeness of distributions test, when the variables used were all nominal, and the H of Kruskal and Wallis, when some of the variables were numeric.

The close associations recorded between some observations justified their aggregation through factorial reduction techniques, giving rise to two dimensions already used for the explanation of consumer behaviour in markets of products from aquaculture and from capture fisheries:

(i) *Attitude factor towards aquaculture* (Kinnucan and Wessells, 1997), carried out on a series of 5 point scales, in terms of agreement and disagreement, through five statements that gather opinions on aquaculture in general and the consequences on the consumption of farmed species (aquaculture is an activity that produces healthy foods, aquaculture contributes to the conservation of marine resources, consuming farmed fish contributes to the support of fishery resources and the consumption of aquaculture species is a recommendable dietary practice).

[2] Databases consulted: FAO-FishSTAT (http://www.fao.org/fi); FAO-TradeSTAT (http://faostat.fao.org); World Bank-World Development Indicators 2006 (http://devdata.worldbank.org/dataonline/); EuroSTAT (http://epp.eurostat.ec.europa.eu); Central European Bank (http://www.ecb.int); and the Bank of Spain (http://www.bde.es).

(ii) *Willingness factor to pay a price premium for food products that comply with food safety* (Wessells and Anderson, 1995) *and sustainability conditions* (Jaffry *et al.,* 2003), has been measured with another two 5-point scales (willingness to pay a price premium for foods that guarantee safety conditions and willingness to pay a price premium for foods obtained with environmentally friendly methods).

Consumers have been classified into segments using classical segmentation techniques *a posteriori*, applying a cluster analysis on the scores of each individual within a Euclidean distance defined by two representative factors of the attitude towards aquaculture, willingness to pay a higher price for products that guarantee food safety and the protection of nature.

Once the interviews have been assigned to four previously specified segments, it will be verified if they are capable of explaining the consumption and appreciation of seabream and seabass, going on to identify the demographic characteristics of each segment so as to propose strategies for the sustainable development of their market in Spain.

Analysis of the aggregate consumption of seabream and seabass in the Mediterranean countries of the European Union

The analysis of seabream and seabass consumption in the Mediterranean countries of the European Union, including Portugal, is carried out as a function of the following variables: consumption pattern of the referred species, price, white fish consumption, social aspects (income, life expectancy, employment in agriculture and urban population as aggregates in a single social factor) and meat consumption (pork, chicken, beef and lamb, both individually and as aggregates in two factors according to the relationship of complementary or substitute product that they have with the consumption of seabream and seabass). This analysis is carried out using two statistical techniques: the correlation and multiple regression analysis, whether it be to analyse the relationship of the variables with the consumption of the species either individually or jointly, respectively.

In order to obtain information on the stability of results and their evolution during the period 1985-2005, the mentioned techniques were applied for the periods: 1985-2002, 1985-2003, 1985-2004 and 1985-2005.

Specific relationship of the variables with seabream and seabass consumption

In the analysis of the evolution of seabream and seabass in the Mediterranean countries of the EU (see Table 1), a large parallelism is observed among market behaviours for both species, since they present practically identical correlation coefficients and significances in all periods.

The variables that have a *direct relationship* with consumption are:

(i) The *consumption pattern* of the species is the variable with the greatest influence on consumption, confirming a generally contrasted hypothesis in the consumption of any type of product in which the consumption pattern is the variable that best predicts consumer behaviour (Bentler and Seckart, 1981; Bagozzi and Warshaw, 1990), a progressive process wherein great changes are not frequent. This relationship presents the greatest level of correlation and significance for both species.

(ii) The *evolution of society* towards urban life, with the abandonment of the rural environment, the rise in income and the improvement of living conditions, measured by the increase in life expectancy, favour the consumption of these species. This relationship is obtained for the variables both individually and for the social factor that aggregates them.

It is important to highlight that the relationship between income and seabream and seabass consumption, in spite of being positive and significant, has a negative trend, going from values over 0.75 during the period 1985-2002 to under 0.6 in the period 1985-2005, in a process of decreasing importance of income in consumption. This evolution, that could be similar in other aquaculture species, can be interpreted as the process by which the species considered luxury foods because of

their price, when they came only from capture fisheries, became normal consumption goods as aquaculture made them more affordable, risking becoming inferior goods (inverse relationship of consumption with regard to income) if they fall in the appreciation of consumers (Dong *et al*., 1998; Thiele and Weiss, 2003).

(iii) The *complementary products* that enhance the consumption of these species are chicken and pork, both independently and aggregated in the factor and, contrary to expectations, seabream and seabass are complementary to each other. These relations are persistent and with trend towards growing importance.

Table 1. Evolution of correlation coefficients of the variables in the seabream and seabass consumption in the last four years of the period 1985-2005

Variable	Correlation coefficient (consumption - variable)							
	Seabream consumption				Seabass consumption			
	Period				Period			
	1985-2002	1985-2003	1985-2004	1985-2005	1985-2002	1985-2003	1985-2004	1985-2005
Consumption pattern	0.983**	0.981**	0.988**	0.983**	0.989**	0.988**	0.990**	0.989**
Price seabream	-0.735**	-0.764**	-0.799**	-0.812*	-0.466*	-0.523*	-0.622**	-0.649**
Price seabass	-0.500*	-0.541*	-0.643*	-0.686**	-0.729**	-0.776*	-0.812**	-0.817**
White fish consumption	-0.569**	-0.558*	-0.572*	-0.525*	-0.552*	-0.545*	-0.557*	-0.508*
Social factor	0.854**	0.832**	0.807**	0.789**	0.866**	0.839**	0.815**	0.793**
Income	0.774**	0.740**	0.692**	0.587*	0.789**	0.736**	0.687**	0.595*
Life expectancy	0.552*	0.517*	0.593**	0.586*	0.561*	0.525*	0.602**	0.589*
Employment in agriculture	-0.784**	-0.759**	-0.725**	-0.771**	-0.796**	-0.773**	-0.741**	-0.775**
Urban population	0.971**	0.968**	0.962**	0.957**	0.977**	0.972**	0.968**	0.961**
Complementary meat factor	0.851**	0.873**	0.878**	0.885**	0.842**	0.882**	0.888**	0.887**
Pork	0.860**	0.881**	0.886**	0.886**	0.855**	0.895**	0.901**	0.896**
Chicken	0.797**	0.875**	0.891**	0.910**	0.774**	0.882**	0.899**	0.908**
Substitution meat factor	-0.411	-0.326	-0.226	-0.133	-0.415	-0.313	-0.211	-0.124
Veal	-0.717**	-0.689**	-0.670**	-0.656**	-0.720**	-0.692**	-0.673**	-0.653**
Lamb	-0.432	-0.362	-0.261	-0.159	-0.432	-0.349	-0.246	-0.150

** Significant at 99%; * Significant at 95%.

The variables that have an *inverse relationship* with consumption are:

(i) *Price*. In accordance with economic theory, the amount of seabream and seabass consumed is inversely related to price, with a significant persistent influence and a trend towards growing importance, indicating that the consumption of these species is increasingly more sensitive to price (Duval and Biere, 2002).

(ii) *Substitute products* are white fish from capture fisheries, beef, and, non-significantly, lamb. The results of complementary and substitute products may be interpreted by relating the consumption of these species to the evolution of food consumption patterns, observing a direct relationship between those who consume aquaculture products (the relationship of complementary product between the consumption of seabream and seabass is noteworthy), chicken and pork, in comparison to the consumption of white fish and beef.

Joint relationship of the variables with seabream and seabass consumption

The multiple linear regression analysis of the variables with the consumption of seabream and seabass (see Table 2) shows how they help to explain the evolution of the consumption.

Table 2. Evolution of regression coefficients of the variables with the consumption of seabream, seabass and joint consumption in the last four years of the period 1985-2005

β Coefficients of the consumption regression function (C_t)										
Variable		Function	$C_t = A + \beta_1 \cdot C_{t-1} + \beta_2 \cdot Pd_t + \beta_3 \cdot CPB_t + \beta_4 \cdot FS_t + \beta_5 \cdot FCC_t + \beta_6 \cdot FCS_t$ With purchase habit				$C_t = A + \beta_1 \cdot Pd_t + \beta_2 \cdot CPB_t + \beta_3 \cdot FS_t + \beta_4 \cdot FCC_t + \beta_5 \cdot FCS_t$ Without purchase habit			
		R^2	97.9%	98.3%	98.3%	98.5%	96.1%	96.3%	96.8%	96.6%
		Period	1985-2002	1985-2003	1985-2004	1985-2005	1985-2002	1985-2003	1985-2004	1985-2005
Seabream	Consumption pattern	C_{t-1}	0.589*	0.655**	0.572**	0.567**	-	-	-	-
	Price seabream	Pd_t	-0.138	-0.076	-0.156†	-0.148*	-0.409**	-0.307*	-0.274**	-0.269**
	White fish consumption	CPB_t	-0.128	-0.084	-0.197	-0.188 †	-0.472*	-0.434*	-0.389**	-0.398**
	Social factor	FS_t	0.171	0.211*	0.060	0.080	0.267	0.432	0.470*	0.355*
	Complementary meat factor	FCC_t	0.075	0.026	0.112	0.097	0.136	0.020	-0.002	0.074
	Substitute meat factor	FCS_t	-0.144	-0.151	-0.137	-0.147	-0.369*	-0.459**	-0.468**	-0.434**
Variable		R^2	97.9%	98.7%	98.5%	98.6%	94.9%	95.4%	96.0%	96.7%
Seabass	Consumption pattern	Ct-1	0.878**	0.795**	0.757**	0.662**	-	-	-	-
	Price seabass	Pdt	0.029	-0.025	-0.067	-0.073	-0.305*	-0.220*	-0.216**	-0.196**
	Consumption white fish	CPBt	0.006	0.047	0.012	0.032	0.142	0.049	0.034	0.025
	Social factor	FSt	0.306	0.288	0.127	0.286†	0.738*	0.828*	0.743**	0.707**
	Complementary meat factor	FCCt	-0.132	-0.046	0.104	0.034	0.222	0.088	0.134	0.142
	Substitute meat factor	FCSt	-0.106	-0.076	-0.031	-0.094	-0.327*	-0.430**	-0.397**	-0.379**
Variable		R^2	98.7%	99.0%	98.9%	99.0%	97.4%	97.0%	97.4%	97.7%
Seabream+seabass	Consumption pattern	Ct-1	0.646**	0.716**	0.620**	0.569**	-	-	-	-
	Mean price	Pdt	-0.116	-0.066	-0.138*	-0.135*	-0.440**	-0.317**	-0.281**	-0.265**
	White fish consumption	CPBt	-0.015	-0.006	-0.073	-0.067	-0.168	-0.202	-0.176	-0.179
	Social factor	FSt	0.252	0.246	0.140	0.226†	0.389	0.575*	0.622**	0.557**
	Complementary meat factor	FCCt	0.028	-0.003	0.092	0.050	0.183	0.036	0.004	0.049
	Substitute meat factor	FCSt	-0.104	-0.102	-0.087	-0.125	-0.236†	-0.388**	-0.404**	-0.380**

** Significant at 99%; * Significant at 95%; †Significant at 90%.

As with the analysis of the specific relationship of each variable, a parallelism is observed between the behaviour of seabream and seabass consumption whereby practically the same results can be obtained when the aggregate consumption of both species is analysed.

The second aspect worthy of mention is that the relationships described in the individual analysis of the variables are maintained, as it is the consumption pattern (measured through consumption of the previous year) that has the greatest power of explanation, both through the value of the regression coefficient of the total consumption and through its significance. However, the introduction of this variable incorporates part of the influence of the other variables, which explains why its importance and significance are reduced. In order to analyse the joint influence without losing information, the values of the coefficients with and without the variable consumption pattern, so that the explanatory value of the other variables can be appreciated.

In order to avoid repetitions, given the similarity of the relationships between the variables, the results obtained for seabream, seabass and the aggregate of both species will be discussed together, indicating any differences between them when they arise:

(i) Consumption habit: this is the variable with most direct contribution to consumption, presenting a slight downward trend in seabass.

(ii) Price: this variable has a significant inverse relationship, with a slight tendency to reduce its capacity to influence consumption.

(iii) White fish consumption: this variable has an inverse relationship that is only significant in the case of seabream.

(iv) Evolution of society: the rise in income, the improvement of life expectancy and the increasing trend towards urban life, measured through the social factor, is, after consumption pattern, the variable with the greatest and most significant direct relationship with the consumption of these species.

(v) Meat consumption patterns: the complementary consumption, chicken and pork, maintains their positive symbol but with a low and non significant coefficient; however, the substitution of beef and lamb (inverse relationship with consumption) is high and significant.

It is important to point out the persistence of these relationships that maintain their sign and significance during the periods analysed, a circumstance which shows the stability and slow rate of change in the consumption of these species.

The synthesis of the results obtained in the aggregate analysis of the consumption of seabream and seabass in the Mediterranean countries of the European Union shows that consumption increases are enhanced by: the incorporation of these species into the diet, the reduction in price which makes them more affordable and the evolution of society towards a higher standard of living due to the rise in income, of life expectancy and the increase in urban population, that has a diet in which white fish, lamb and beef are substituted by aquaculture products, chicken and pork.

Local factors that condition the development of seabream and seabass production: The case of Spain

The evolution of demand and the trend of the variables upon which it depends, appears to indicate a great potential for the increase in the consumption of these species which should be specified for each market according to the knowledge and valuation of the consumers of farmed seabream and seabass. Market information may be used to segment it, in order to develop marketing strategies that will enhance the sustainable development of the businesses in the sector.

Capacity to differentiate the origin and valuation of farmed seabream and seabass

The seabream and seabass supply of the Spanish market comes from two sources, capture fisheries and aquaculture. The most traditional known source, as it has supplied the market for a long time, is the fish from capture fisheries. Competition on the market of the same species from different sources poses a problem of asymmetrical information between the supplier and the consumer which may lead to uncertainty and distort the marketing process for these species.

The problem becomes more complicated when the price differs according to the source of the product and when consumers are not capable of distinguishing the source, or in doing so many doubts arise, as occurs in these species, thus favouring opportunist behaviour among suppliers as they have no incentive of conveying this information and may even distort information about the source.

The purpose of the labelling standards is to reduce this uncertainty, despite problems of efficiency in their use which leads to various questions: How many consumers of seabream and seabass from aquaculture are really aware of where the fish they are eating comes from? What effect does consumers' knowing where the fish comes from have on their valuation?

In order to study this problem, an analysis is made of the price difference[3] that consumers are willing to pay for seabream and seabass according to whether they can distinguish the source[4] (1,308 sample size, in reply to both data). The main results of the survey are presented in Table 3.

Table 3. Reference price difference according to the subjective ability of the consumer to distinguish the aquaculture origin of seabream and seabass

Species	Ability to distinguish (CD)	Groups per price	N	P_M (€/Kg)	P_R (€/Kg)	Significance
Seabream	No	$P_R < P_M$	271		5.40	579.20**
		$P_R > P_M$	248		8.75	
	Yes	$P_R < P_M$	144	6.98	5.32	
		$P_R > P_M$	95		9.35	
Seabass	No	$P_R < P_M$	249		6.46	397.94**
		$P_R > P_M$	137		10.97	
	Yes	$P_R < P_M$	88	8.24	6.59	
		$P_R > P_M$	76		11.03	

CD = Subjective ability to distinguish aquaculture products; N = Number of group members; P_M = Mean reference price for each species; P_R = Mean reference price for each group; Significance = Contrast in mean differences between groups of H Kruskal-Wallis; ** Significance at 99%.

Subjective ability to differentiate the source of the species

The percentage of seabream and seabass consumers that believe they are able to distinguish their source is 31.5% and 29.8%, respectively. This indicates that more than 68% of the consumers of these species do not feel they are able to distinguish the origin, a situation that supposes a source of uncertainty for the consumer, at the same time at which it casts shadows over the efficiency of the labelling system of the supply.

Difference between reference prices for aquaculture products and fish from capture fisheries

The main difficulty that arises is the quantification of the difference in valuation according to source comes from the subjectivity of the ability of the consumer to determine such source. As an indicator, the difference in prices of the group that claims to possess such ability since more than 95% of those that pay an over-average price in this group say that they consume only the species that comes from capture fisheries, giving rise to the following results:

(i) Seabass. The mean reference price is 8.24 €/kg, rising by 33.8% up to 11.03 €/kg when it supposedly comes from capture fisheries and drops by 20% down to 6.59 €/kg for aquaculture, meaning a difference of 67.3% between both sources.

(ii) Seabream. The mean reference price is 6.98 €/kg rising by 33.9% up to 9.35 €/kg when it supposedly comes from capture fisheries and drops by 23.7% down to 5.32 €/kg for aquaculture, meaning a difference of 75.73% between both sources.

[3] The question in the survey referring to the price of each specie was asked explaining that the price asked for wasn't the market price (variable), but the price that subjectively each consumer had as reference in order to make their purchase decision, in such a way that, if the market price that day was higher than that price, they considered it expensive and deciding not to buy the species at that moment, whereas if it were lower, then they would consider buying it. This reference price is not, in any case, the maximum price that the consumer is willing to pay for the species, which will depend on other factors, both referring to the organoleptic characteristics of the product at each time and to the subjective conditions of the consumer and situation of the market.

[4] The subjective capability of the consumer to differentiate the source does not mean that they really do so. This fact is reflected in the percentage of consumers who believe they are consuming these species from capture fisheries. This number is much greater than the percentage of fish actually supplied from capture fisheries in comparison to the total supply of each species.

The data obtained leads to a higher appreciation of the species when the consumers are convinced that they are purchasing captured fish rather than farmed fish, data which becomes more relevant if we take into account that the percentage of consumers of the group that believe they are consuming only caught fish is around 13% when the supply of produce from this source does not reach 5%. This result appears to indicate a subjective depreciation of the aquaculture species (given that, in many cases, the consumers who believe they are consuming only from capture fisheries are unaware that they are also consuming fish from aquaculture).

Marketing strategy for the development of seabream and seabass consumption in Spain

The good prospects for growth in seabream and seabass consumption are distorted by the difficulty that consumers have in differentiating aquaculture products and their undervaluation. In this context it is necessary to increase knowledge about consumers in order to obtain relevant information so as to design the business marketing strategy and enhance sustainable development.

Segmentation is carried out by cluster according to consumer attitude towards aquaculture and their willingness to pay a higher price for sustainable and healthy products. For each cluster demographic characteristics are analysed as well as the differences regarding consumption and valuation of price, quality and health guarantee of the two species. Each group is designated according to the orientation of the most appropriate marketing strategy in each case (see Table 4).

Table 4. Differences in the consumption and valuation of seabream and seabass for the different segments of consumers

Results				Cluster			
Segmentation variables				1	2	3	4
Attitude towards aquaculture				-1.237	-1.039	0.634	0.414
Willingness to pay more for healthy products				-1.409	0.658	0.545	-1.041
Sample percentage				9.17	24.38	41.65	24.80
Variable	Chi Square	df	Sig	%			
Consumption	167.46	3	0.00	20.0	24.9	52.2	43.7
Valuation	Species	H	Sig	Mean rank			
Price	Seabream	5.17	0.15	95.00	129.27	133.87	118.61
	Seabass	6.44	0.09	64.50	107.52	104.75	102.07
Quality	Seabream	30.14	0.00	103.93	79.74	147.44	132.59
	Seabass	21.25	0.00	71.69	75.09	120.41	99.96
Guarantee	Seabream	18.35	0.00	116.82	89.72	143.17	135.02
	Seabass	16.96	0.00	81.31	74.17	117.67	104.45

Differentiation cluster (3)

The members of this group value aquaculture products. They consume a higher percentage of them and they are willing to pay more for healthy products, which, together with being the most numerous group (41.65% of the sample), makes it the target group for the marketing strategy in the development of a favourable image of aquaculture and the engine to drive its consumption and higher appreciation. It is integrated by consumers of both sexes, of ages between 30 and 50, with intermediate and higher levels of education and with medium to high levels of income.

The marketing strategy, in this case, would be differentiation through guarantee and quality marks, with the possibility of matching the product to the needs or demands of consumers through new presentations and processing of the product to higher prices capable of making the differentiation costs profitable.

This differentiation strategy should take into account the awareness of consumers of the opportunist behaviour of the firms, specially developed towards food products, which requires exhaustive quality control.

Cluster of cost leadership (4)

In this group, consumers value aquaculture products and consume them, but they are not willing to pay more. They are mainly consumers under 30 and older than 65, with medium to low levels of education, are housewives, pensioners and students with medium to low levels of income.

The marketing strategy in this case would be that of cost leadership in order to compete on prices through the optimisation of the production process, since the attitude of the consumer towards aquaculture is use-oriented, wishing to obtain a quality and safe food at a good price. In this case the investment in differentiation would not be profitable as the consumer is not willing to pay a higher price.

The importance of the size of this group, 24.8% of the sample and the consumption, points out the great limitation of the differentiation strategies, given that a significant part of the consumers would not be willing to maintain their consumption if the price is increased, which means that there would still be a large market for the non-differentiated product (fresh, whole, without quality or guarantee marks and 300-400 g/unit) purchased mainly in hypermarkets and supermarkets.

Cluster of communication (2)

The members of this group are willing to pay more for a sustainable product, but have a negative attitude towards aquaculture, that they are unfamiliar with, they consume few aquaculture products and when they do so it is because of the price (this is the group that most values price).

This group, which makes up 24.38% of the sample, is composed of individuals of both sexes, over 30 years old, without relevant differences in income and education levels, makes up a large part of the market, and considers that aquaculture products are "cheap but not very good". In spite of generally being prepared to pay more for sustainable products, they would possibly not do so for aquaculture products.

The market strategy in this case should be to convey to those customers the quality, healthiness and sustainability of aquaculture in order to increase consumption, which at present is associated with low prices, and, fundamentally, to improve attitude towards aquaculture, in order for it to cease to be underappreciated. The lack of definition of the demographic characteristics of the group (it appears that this opinion is similar indepedently of age, sex, education and income) makes the communication campaign difficult and expensive and also hinders the efficacy of the strategy.

Adverse cluster (1)

For this group, due to its marginal size, only 9.17% of the sample, its negative attitude towards aquaculture and not being prepared to pay the extra price, would not be advisable to develop a specific strategy due to the fact that the necessary investments would not be cost-effective. Members of the group are consumers over 65 with low levels of education and income, who combine their low appreciation of aquaculture with greater levels of ignorance about this activity. They may consume aquaculture products despite being unaware of their origin, even though they state they consume only products from capture fisheries (coherent with the low valuation of the price and high valuation of the quality). Most of them state they are not sure whether they can distinguish between sources.

Conclusions

The results of this study are summarised following the same structure as that established in the objectives:

(i) The consumption of seabream and seabass in the Mediterranean countries of the European Union, as reflected in the historical data, presents a growing trend. If to this information we add the result of the analysis conducted in this study, we can state that the consumption of these species forms part of an eating pattern driven by: the trend in quality of life with higher levels of income, longer

life expectancy and migration towards urban life, the drop in price that makes the product more affordable and makes it easier to substitute fish from capture fisheries, chicken and pork. These effects are stable in the values and have persisted over the last 5 years.

(ii) This general trend is conditioned in the Spanish market by the fact that the seabream and seabass consumers, in spite of mainly being unable to distinguish the source of the species, tend to depreciate the price when they suppose that it comes from aquaculture. This underestimation, that exceeds 70% compared to supposedly capture fisheries, constitutes one of the main problems that the market strategy of the aquaculture firms have to overcome if they wish to successfully implement differentiation strategies and stabilise results. The verification of this problem shows the complexity involved in the development of a market strategy that allows the prices of the aquaculture products to be increased without suffering the effects of the undervaluation of the source (difficulty which in some cases leads to the limitation of information offered to the consumer, as occurs in restoration or, in the worst case, opportunist behaviour by the supplier).

(iii) Consumer response is not homogeneous, as segments can be detected in the market that, according to the values associated to aquaculture, significantly differentiate the consumption and appreciation of the species. The analysis of these segments should be taken into account when designing the market strategy of the firms that can be summarised into two options:

- *Product differentiation*. The existence of a large group of consumers, 41.65% (cluster 3), with a favourable attitude towards aquaculture and willing to pay an extra price for differentiated healthy and sustainable products whose expectations of success rise when associated with employment, training and income, which show a favourable trend in Spain.

- Maintenance of *price competition*. However, the other groups, 58.35% of the sample (clusters 4, 2 and 1), are not willing to pay higher prices for aquaculture products, even when they have a positive attitude towards them, which indicates the need to maintain in the mid term a price competition, if demand is not to fall off once the mechanisms to improve knowledge and appreciation of aquaculture products.

In conclusion, in spite of the growing consumption trend, overcoming price volatility of seabream and seabass together with the business problems involved, is not an easy task. In order to achieve sustainable development, the strategy requires efficiency in the production process, in order to compete on a market where most consumers decide because of the price. At the same time, the sector also needs to develop a differentiation strategy to improve the image of aquaculture products thanks to their healthy and sustainable properties (European Commission, 2002), and offering highly differentiated products for the segment of the market that demands them.

This double market requirement or demand only appears to be satisfied by firms of a greater size that can cope with the differentiation strategy maintaining the necessary efficiency to offer the products at the price levels demanded by consumers.

Acknowledgements

The information used for this study was obtained from the project "Valuation of aquaculture in Spain for the period 2006-2007" (*La valoración de la acuicultura en España en el periodo 2006-2007*) financed by the General Secretariat for Maritime Fisheries of the Spanish Ministry of Agriculture, Fisheries and Food.

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