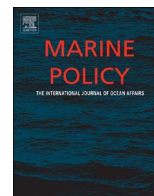




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Marine aquaculture and environment quality as perceived by Spanish consumers. The case of shellfish demand



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ABSTRACT

Commercial fishing cannot in itself satisfy the growing demand for seafood, so Spanish aquaculture has expanded considerably over the past few decades. The country's great potential for aquaculture reflects the natural conditions Spain offers for farming marine species. Consumers have learned to identify products' origins and hence to associate some regions with a certain quality. Although such association facilitates the marketing of distinctive products, it also involves some risks—including that marine pollution could result in consumers losing confidence in the quality or even the safety of seafood. This paper studies the demand of Spanish consumers for aquaculture shellfish as well as their perception of marine environment quality. The results show that consumer choices are affected by such perceptions and consumers would be willing to pay more for shellfish if doing so enabled implementation of a stronger program for guaranteeing food safety.

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1. Introduction

A worldwide rise in fish consumption, the overexploitation of fish stocks, and increasing marine pollution are gradually eroding marine resources and pushing us to consider aquaculture as a future source of fish and seafood products [1–6]. Over the past two decades, aquaculture has experienced rapid growth rates (nearly 10%) around the world. Furthermore, society's focus on the health of our environment is more acute than ever as there is more knowledge about marine ecosystems and their interrelationships, all within the context of climate change. In addition, aquaculture has been promoted as an opportunity to strengthen the economic viability of less-developed coastal regions by creating jobs for young people, generating income for women, and improving access to food [5]. Among aquaculture activities, the farming of molluscs and crustaceans is considered especially attractive as a complement to (or replacement of) wild capture fisheries in various coastal regions and as a “green” industry [3,7].

Spain has also witnessed aquaculture's rapid development, which involves various continental and marine species. The country is well positioned geographically; it has become one of the top 20 aquaculture producers in the world in recent years [5] and accounts for 25% of Europe's aquaculture production. This sector's great potential in Spain, particularly in terms of marine

aquaculture, is explained by several factors. As far as productive levels are concerned, it offers unsurpassed conditions for raising marine organisms since it boasts nearly 8,000 km of coastline featuring diverse orographic and climatological characteristics. Spain's aquatic biodiversity also favours the diversified development of this sector such that then it could become a stable industry that guarantees long-term jobs, socioeconomic development of the coastal region, and even alternatives—in terms of both the products and the jobs generated—to the fishing industry [8–10]. Moreover, Spain's domestic demand conditions are quite favourable: it has one of the world's highest per-capita rates of fish consumption (43 kg/person in 2011; [5]) and is—along with Iceland, Portugal, and Norway—a top European consumer. The sophistication of this demand is high thanks to the country's long tradition of eating fish, a staple of the Spanish diet.

At the same time, there are regions of the world where fishing and aquaculture have led consumers to identify the origin of seafood products and to associate some geographical locations with a certain level of quality [11]. In that regard, previous studies have shown that many consumers believe the origin (or region where produced) should figure prominently on food product labels [12,13]. Providing such information makes it possible for customers to distinguish among products on the market. In the case of aquaculture, that advantage could be compromised if pollution of the marine environment in which the products are farmed leads people to lose confidence in the quality and/or safety of products from a particular region. A number of studies have demonstrated that the demand for aquaculture products is negatively affected by perceived health risks [14–21].

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It is within this context that the Spanish consumer preferences for better-quality aquaculture products are studied, where such quality is understood in terms of the perception—from an environmental standpoint—of marine waters and ecosystems. More specifically, the aim is to examine consumer preferences in relation to the perceived environmental quality of shellfish species. This study is motivated by the importance of shellfish in Spanish aquaculture production overall and by the extreme sensitivity of such species to the quality of their marine environment. This paper studies whether the perception of consumers on the environmental quality of the marine ecosystem, and its potential effects on food security, has an influence on consumption decisions, and if they would also be willing to pay an additional amount to finance programs that guarantee food safety of shellfish products. Knowing these preferences could contribute to promote a green activity. The paper proceeds as follows. Section 2 describes the Spanish marine aquaculture sector. Section 3 details the methods used and the result of our field study are presented in Section 4. The paper concludes in Section 5 with a summary discussion.

2. Marine aquaculture in Spain

Spain is the European Union (EU) member with the greatest aquaculture production volume, followed by France and the United Kingdom. This sector accounts for approximately 0.20% of Spain's gross value added (GVA) between 2012 and 2014; it also accounts for about 0.11% of all jobs generated during this period. However aquaculture plays a key role in the socioeconomic development of some regions, including Andalusia, the Canary Islands, and Galicia [22–25]. The latest available data show that there are currently more than 3,000 marine aquaculture companies (Table 1).

Table 2 shows the sector's evolution by species group during the 2012–2014 period. Marine aquaculture is growing by some 4% annually, reaching 270,000 t in 2014. By species group, mollusc production (primarily mussels) accounted for around 82% during this period while fish (mainly sea bream, sea bass, turbot, and Bluefin tuna) accounted for 17%. The remaining aquaculture consists of crustacean and algae farming. In terms of how production evolved for each species group, fish experienced a sustained growth of around 5% annually throughout this period; mollusc production rose by nearly 4%. There is a notable decline in the latter during 2013 due to several “red tide” episodes that occurred that year, which forced industrial production complexes to shutter their operations. Finally, algae production—though it was not a significant part of marine aquaculture—increased by more than 15%.

Table 3 reports macroeconomic data for shellfish production

Table 2
Spanish production of marine aquaculture. 2012–2014. Source: Author compilation based on [22].

	2012	2013	2014
Fish	42,902.67	44,960.16	46,770.66
Shellfish			
Crustaceans	163.83	68.82	158.97
Molluscs	206,762.84	167,136.48	222,543.10
Seaweed	2.28	1.80	3.06
Total	249,831.62	212,167.26	269,475.79

Notes: Reported values are in tons. Data for 2014 are provisional.

Table 3
Economic performance of Spanish shellfish aquaculture (crustaceans and molluscs). 2012–2014. Source: Author compilation based on [24].

	2012	2013	2014 (P)
Income (€)	112,489.46	111,868.29	143,675.36
GVA (basic prices, €)	79,777.80	78,594.49	112,104.20
GOS/mixed income (€)	53,341.87	58,085.88	95,605.26
Employment (FTEs)	3,318	3,203	3,415
Income per FTE (€)	33.90	34.93	42.07
GVA per FTE (€)	24.04	24.54	32.83

Notes: GVA = Gross Value Added; GOS = Gross Operating Surplus; FTE = full-time employee. GVA denotes the contribution of this sector to the Gross Domestic Product (GDP) and GOS represents a first approach to the net benefit of the activity. Data for 2014 are provisional.

between 2012 and 2014. The gross value added generated by this group of species represents more than 70% of the income derived from its production. More than 75% of the GVA is earmarked for gross operating surplus (GOS)/mixed incomes, which means that the nearly 25% remaining is set aside for wages and salaries. Inspecting the evolution of this activity over the course of the entire period, both GVA and GOS experience significant growth—although the data for 2014 are still provisional because of reporting lags. Full-time employment rises in this sector, after a slight decline in 2013, all of which translated into a slight increase in the ratios for income and GVA for employment in this sector.

In fulfilling their capacity as managers of the marine environment, Spanish authorities—in collaboration with regional governments—conduct food safety inspections of aquaculture products [8]. This monitoring system consists mainly of analysing pathogens (which depend on the aquaculture species in question) in water samples collected throughout various farming regions. The frequency and location of the sampling depends on the risk level that regulators have established for each farming area; those risk levels depend in turn on the occurrence of previous marine pollution events, though no fewer than two samples are taken

Table 1
Marine Aquaculture Sector in Spain by Region. 2012. Source: Author compilation based on [8].

	Firms	Production (tons)	Number of workers	Main species
Andalusia	114	7688.12	720	Sea bass, sea bream, mussel
Valencia	40	11,843.57	401	Sea bream, sea bass, mussel
Cantabria	16	173.81	n.a.	Turbot, clams, oyster
Catalonia	190	6210.64	n.a.	Mussel, Bluefin tuna, sea bream
Galicia	2655	209,682.57	6432	Mussel, turbot, clams
Balearic Islands	19	123.27	83	Mussel
Canarias Islands	29	4967.58	130	Sea bass, sea bream, sole
Basque Country	5	43.52	n.a.	Turbot
Asturias	5	12.14	n.a.	Scallop
Murcia	7	9086.40	350	Sea bass, sea bream, Bluefin tuna
Total	3080	249,831.62	–	Mussel, Sea bream, sea bass

Note: n.a. = not available.

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