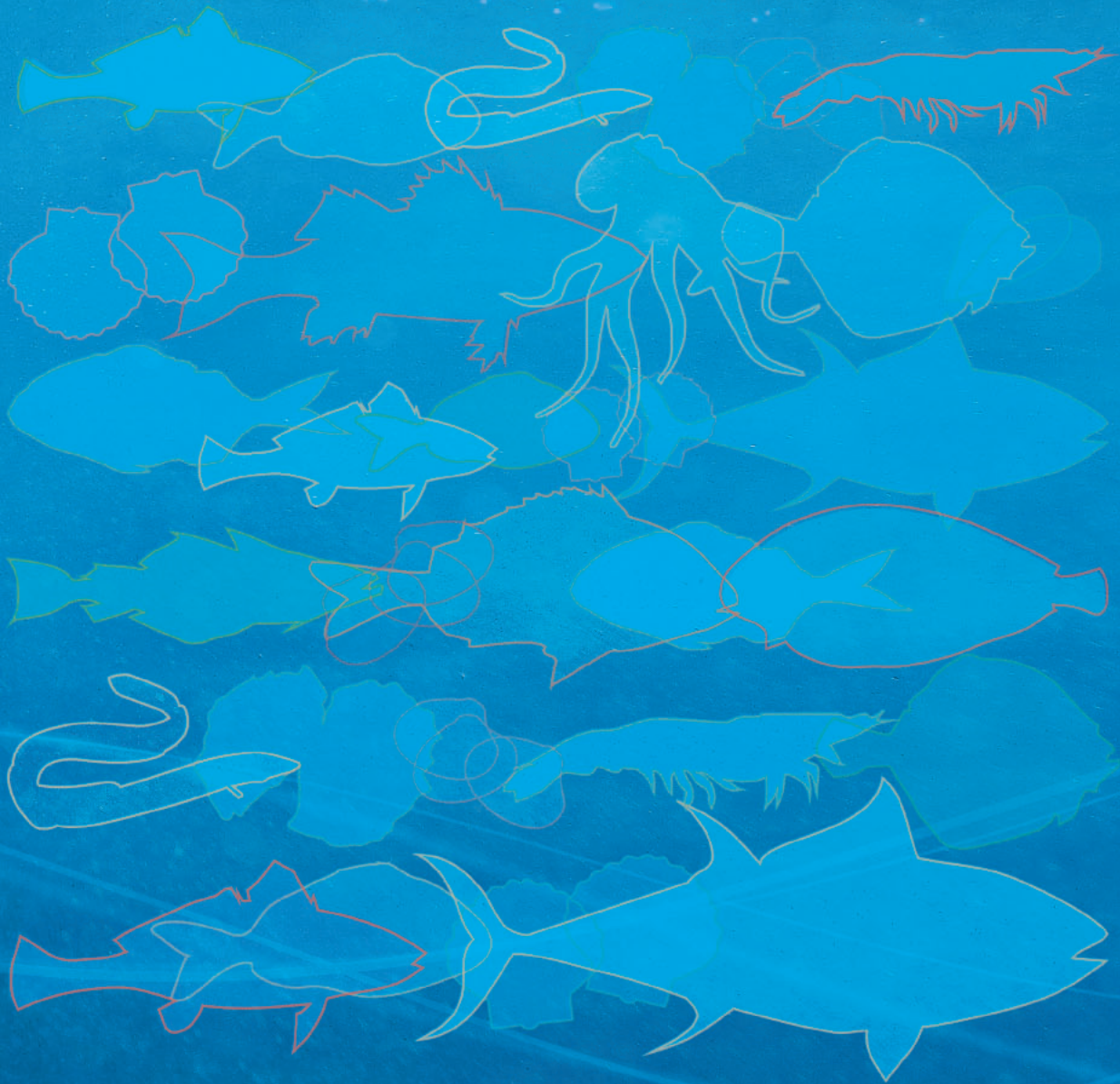
# Aquaculture in Spain

# 2019



APROMAR

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# 1. Executive abstract

## 1.3. Aquaculture production in Spain

» The aquaculture production in Spain in 2018 has been 348,395 tonnes. This production reached a value in its first sale of 472.3 million Euros. The main species produced has been mussels (273,600 t), followed by sea bass (22,460 t), rainbow trout (18,856 t) and sea bream (14,930 t).

» The aquaculture facilities in Spain have decreased since 2007, which accounted for a total of 5,313. In 2017, a total of 5,100 aquaculture facilities were in operation and with production. Of these, 4,793 were molluscs, 187 farms of freshwater aquaculture, 79 facilities on the coast, beaches, intertidal areas and estuaries and 41 in pens.

» The employment rate in aquaculture in Spain in 2017 was 6,301 annual working units, although this quantity was distributed among 16,151 people. The estimation of indirect employment associated with 16,151 people working in aquaculture was 40,378 jobs.

» In 2018, 140,050 tonnes of aquaculture feed were used in Spain. This amount is 8.4% higher than in 2017. To marine fish species was supplied the 85.1% of it and the remaining 14.9% to freshwater species.

» The aquaculture sea bream harvest in Spain in 2018 was 14,930 tonnes, 9.4% more than the previous year. The Valencian Community has led the production (7,806 t, 52%), followed by Murcia (3,184 t, 21%), Canary Islands (2,380 t, 16%) and Andalusia (1,560 t, 10%).

» Sea bream juvenile production in Spain in 2018 was 37.5 million units, 2.3% more than in 2017. Production is led by the Valencian Community (59%), Cantabria (22%), Balearic Islands (23%) and Andalusia (9%).

» The harvest of seabass in Spain in 2018 was 22,460 tonnes, 5.6% more than in 2017. The Region of Murcia has led the production (7,525 t, 34%), followed by the Canary Islands (5,793 t, 26%), Valencian Community (4,633 t, 21%), Andalusia (4,479 t, 20%) and Catalonia (30 t, 0.1%).

» The production of sea bass juveniles in Spain in 2018 was 66 million units, which represents an increase of 35.1% over the 2017 production. The sea bass juveniles harvest in Spain takes place in the Balearic Islands (65 %), Valencian Community (20%), Cantabria (10%) and Andalusia (5%). For 2019, it is estimated that the production of sea bass juveniles in Spain will decrease -11.2% to almost 59 million units.

» Rainbow trout production in Spain in 2018 is estimated at 18,856 tonnes, 5.1% more than in the previous year.

» Total turbot harvested in Spain in 2018 was 7,450 tonnes. Galicia is the main Community producing turbot in Spain (99%), the rest is being produced in Cantabria.

» The production of turbot juveniles in Spain in 2018 was 6,823,150 units.

» The production of meagre in Spain in 2017 was 2,500 tonnes. The bulk of the Spanish meagre production comes from the Valencian Community.

» In 2018, Spain produced a total of 774 tonnes of sole, -6.7% less than in 2017. This production occurs in Galicia and Andalusia.

## 1.4. Aquaculture in the European Union and in the world

» Global aquaculture production reached 111.9 million tonnes in 2017, 3.5% more than the previous year. It exceeded capture fisheries production by 18.3 million tonnes and reached a value of 199,6 billion Euros in first sale.

» EU aquaculture production in 2017 was 1,353,201 tonnes with a value of 4,147 million Euros. The main species produced in the EU are mussels, of which two species are produced with a total of 493,844 tonnes in 2017, followed by Atlantic salmon with 209,180 tonnes and rainbow trout with 185,316 tonnes.

» Spain is the Member State of the European Union with the highest aquaculture harvest with 311,032 tonnes in 2017 (23.0% of the total). However, when considering the value of production, it occupies the fourth position with 466.4 million (12.2%).

» In 2017, the EU harvested 731,591 tonnes of finfish species, 6.2% more than in 2016. This production accounted for 54.1% in weight of the total aquaculture production and reached a value of 3,249.3 million Euros on first sale (78.4% of the total value).

» Spain is the third largest finfish producer country in the EU, with 66,591 tonnes (9.1%) behind the United Kingdom and Greece.

» The growth rate of the total UE aquaculture production (essentially finfish and molluscs) has decreased since 2000 by an average of -0.5% per year while in the world aquaculture it has grown on average an 11.2%.

» Total aquaculture production of sea bream in Europe and the rest of the Mediterranean in 2018 is estimated at 246,839 t, 10.7% higher than in 2017. The total value at first sale is estimated at 1,111 million Euros.

» The total production of sea bream juveniles in 2018 in Europe (including Turkey) is estimated to be 734.299 million units, 1.4% more than in 2017.

» The sum of sea bass aquaculture production in Europe and the rest of the Mediterranean arch in 2018 was 196,573 tonnes, -2.1% lower than the previous year. The total value at first sale was 982.9 million Euros.

» The production of sea bass juveniles in 2018 in Europe (including Turkey) amounted to 627 million units, 3.3% more than in 2017.

» The total production of aquaculture turbot in the world in 2017 was 57,072 tonnes, -4.3% lower than the previous year.

» Global aquaculture production of rainbow trout in 2017 was 811,590 tonnes which represents a decrease of -0.6% compared to the previous year.

» The global employment in the aquaculture sector represents 19.3 million people and it is estimated that only 14% of them are women.

## 1.5. Commercialization of the aquaculture products

» The EU is the first and most relevant world market for aquatic products. In 2018, the European Union consumed 13 million tonnes of aquatic products almost the same as the previous year for which it imported 9.5 million tonnes, 3.0% more than in 2017. The self-sufficiency of aquatic products in the EU is only the 27.4%.

» Spanish households dedicated a 13.29% of food and beverage expenses to the purchase of aquatic products, which means 196.71 Euros per capita and a consumption of 23.73 kg per person per year.

» The average first sale price of aquaculture sea bream produced in Spain in 2018 was 4.41 Euros/kg, that represents a 15.7% lower than the average price of 2017. The total value of the 14,930 tonnes of the Spanish sea bream marketed has been 65.8 million Euros.

» The average price for the first sale of aquaculture sea bass produced in Spain in 2018 was 4.68 Euros/kg, which is a -0.1% lower than the average price of the previous year. The total value of the 22,460 tonnes of Spanish sea bass marketed has been 104.2 million Euros.

» The average first sale price of aquaculture turbot produced in Spain in 2018 was 8.89 Euros/kg that is it very similar to the previous year (0.7%) and represented a total amount of 72.9 million Euros.

# 2. Introduction

In this moment, humanity has serious concerns about the future of its next generations and in general about life on the planet. The essential initiative that is focusing the efforts for a better future is the United Nations 2030 Agenda for Sustainable Development and has the slogan "Transform our world". The 2030 Agenda for Sustainable Development was signed in the United Nations Summit of 2015. This Agenda includes 17 Sustainable Development Goals (SDGs) and 169 targets that cover a very diverse set of topics such as technical, institutional, social and legal changes to achieve full sustainable development.

The 2030 Agenda concerns all states in the world, integrates the three pillars of sustainable development (social, environmental and economic) and should serve as a guide for countries, the United Nations, intergovernmental organizations, organizations of society civilians and other institutions. This commitment addresses future opportunities, challenges and needs related to sustainable development for all sectors and activities. The 2030 Agenda is an action plan in favour of people, the planet and prosperity in the general sense. It also has an object to strengthen world peace within the broader concept of freedom. Its sustainable development goals cover issues such as security and nutrition, poverty reduction in rural areas, social justice and the management and use of natural resources.

The Food and Agriculture Organization of the United Nations (FAO) has promoted aquaculture for a long time. Its Code of Conduct for Responsible Fisheries of 1995 has already given aquaculture a key role. This is a statement on aquaculture that has now been reinforced in the Sustainable Development Goals of the 2030 Agenda that will serve to reform the policies, planning and management of sustainable aquaculture development.

In particular, SDG 1 (ending poverty), SDG 2 (ending hunger), SDG 5 (gender equality), SDG 8 (growth, employment), SDG 12 (production are relevant for aquaculture and consumption), SDG 13 (climate change), SDG 14 (marine resources and ecosystems) and SDG 15 (biodiversity).


In the European Union, a world leader in social and environmental policies, numerous actions have already been developed that are going in the right direction to achieve the SDGs. Specifically, and referring to the aquatic environment, Europe has the Water Framework Directive (freshwater and coastal marine waters) and the Framework Directive on the Marine Strategy (marine waters) to ensure the environmental quality of the waters in addition to an Integrated Maritime Policy for smart, sustainable and inclusive growth. Thus, the European concept of Blue Growth was born as a long-term strategy to support the sustainable growth of the marine and maritime sectors so that the importance of the seas and oceans as engines of the European economy is recognized for their great potential for Innovation and growth. The blue economy represents 5.4 million jobs in the European Union and a gross added value of almost 500,000 million Euros a year.

From Spain, where the marine and maritime sector have a special social and economic relevance, the Spanish Aquaculture Producers Association (APROMAR) has the commitment to contribute to achieving, in its immediate environment and within the extent of its possibilities, the Sustainable Development Goals. For this, it strives to improve the competitiveness of the Spanish aquaculture sector and to ensure the sustainability of the sector within the framework of the Blue Economy. This circumstance is a new opportunity for aquaculture. However, to achieve this it is necessary to align the actions of governments, society, scientists and the industry by promoting bold and transformative measures.

## Aquaculture is an essential pillar of the Blue Growth that propels the European Union and Spain to achieve the objectives of a smart, sustainable and integrative growth.

APROMAR signed with the Spanish General Secretariat for Fisheries (Ministry of Agriculture, Fisheries and Food of Spain) on May 8th of 2018 a Memorandum of Understanding for the promotion of Blue Growth through aquaculture in the Spanish waters. This document has been preceded and followed by numerous innovation initiatives launched by the association and now framed under its Blue Growth strategy.

It should be reminded that aquaculture is the production of animals and plants in the water through techniques aimed at making a more efficient use of the natural resources. It is an activity equivalent to what on the mainland are livestock and agriculture. It covers varied practices and a very wide range of species and production systems. One of its differential characteristics on capture fisheries is that, throughout all, or at least a part, of its life cycle the specimens produced are the property of some person. Aquaculture has a history of 4,000 years, but it has been 50 years ago when it has become a relevant socio-economic activity, employing more than 13 million people around the world.

Aquaculture is not a complement to capture fisheries, but its natural evolution, as livestock production once replaced hunting. Aquaculture has a huge projection for the future because the resources needed to produce a kilogram of food suitable for consumption are lower in the water than in the mainland. It also has in its favour that 70% of the planet's surface is water, that its requirement for fresh water is minimal, that the reproduction rates of aquatic animals are several orders of magnitude higher than those of terrestrial vertebrates and that aquatic animals are more efficient converters of their food because they float in water and do not consume energy to keep their body temperature.

To solve satisfactorily the great technical challenges aquaculture faces research and innovation initiatives must be directed towards optimizing efficiency and productivity, both in small and large-scale systems. These investigations should lead to improving knowledge about the maintenance of the good health of the animals raised, the optimization of feed and its raw materials, improvements in the management of farms, as well as for the domestication of new species. However, the real challenge for the development of aquaculture in Spain is to make the administrative framework in which it must operate more efficient, as will be seen later in this report.

## Aquaculture is the production in the water of animals and plants through techniques aimed at making more efficient use of natural resources.

Never in the past has humanity consumed such an amount of aquatic products as in the present. On the other hand, globalization and interconnection between markets make changes in food supply affect all countries of the world without exception, even if their population in a particular place neither increases in size or changes their wealth level. This situation will probably be aggravated by climate change, which is already making significant changes in the traditional production models and trade flows.

Aquatic products are an extraordinarily nutritious food, a vital source of protein, fatty acids and essential nutrients. In addition, the consumption of aquatic products and their introduction into the diets of pregnant and lactating women, as well as for young children, represents an important way to improve food security and nutrition. In the first place, because the lipid composition of fish is exceptional because it comprises long-chain polyunsaturated fatty acids (Omega-3 DHA and EPA) that offer multiple positive effects in adults health and in child development. In the second place, aquatic products' protein has a greater bioavailability, approximately 5% to 15%, than those derived from plant sources and in addition to containing essential amino acids for human health. And in the third place, they are an important source of vitamins (D, A and B) and mineral micronutrients (calcium, phosphorus, iodine, zinc, iron and selenium).

## Scope of the report

The elaboration of this annual report about the evolution of the aquaculture sector is important to know the status of the activity and to promote its sustainable development. Its target audience are private companies and professionals of the sector, but also public administrations, legislators, politicians, researchers, media, freelances, syndicates, students and society in general.

Although this report focuses on aquaculture as a supplier of food for people, there are other important purposes for the outputs of this activity, such as the development of pharmaceutical products, the release of specimens for sport fishing, the repopulation of the natural environment, aquarium hobby or scientific research.

This document is an exercise of industry transparency that respects the right to free competition. In its writing, the publication of confidential information regarding the strategies of the farming companies from which anticompetitive practices could be derived has been avoided. It objective is only to provide aggregate basic information that may be of interest to anyone interested in aquaculture, both producers and researchers, non-governmental organizations, suppliers, public administrations, syndicates, educators and students.

The collection and processing of the data contained in this report has been carried out by APROMAR. In addition to the information collected by the association itself among its members it makes use of information from the European Commission, the Spanish Ministry of Agriculture, Fisheries and Food (MAPA), the Federation European of Aquaculture Producers (FEAP) and the Organization of the United Nations for Food and Agriculture (FAO). The National Aquaculture Advisory Board (JACUMAR-JACUCON) has also been a relevant source of data.

### INFORMATIVE NOTES

- This study refers only to quantities produced and placed on the market by aquaculture farming companies. All references to the term "production" refer to quantities produced, harvested and marketed. Product volumes in production process (biomass increase), but not yet harvested, are not considered.
- The weight of the species produced refers to live weight. All references to production volumes refer to weight previously eviscerated or processed, if it is carried out.
- The value of global aquaculture productions offered by FAO is given in US dollars. In this report the US dollars have been converted into Euros at the change of 1.0 dollars = 0.80 Euros.
- In the time series of prices, no adjustment has been made based on changes in the price of money (CPI). All prices indicated are in nominal values.
- The annual publication of FAO and FEAP production statistics sometimes includes the review of data from past years. This circumstance may mean changes on the figures published for the same years in previous editions of this same report.
- "First sale" means the sale made by the primary producer (aquaculture farmer) to the first commercial link in the value chain.

### NOTES ON STATISTICS

- The data that have been used for the preparation of this 2019 report refers to last year, and even 2 previous years, depending on the source consulted. Thus, the most recently published FAO and MAPA data refer to 2017. While the data resulting from the surveys carried out by APROMAR and FEAP refer to 2018. When possible, a forecast for 2018 is offered.
- In the statistical compilation of aquaculture productions in Europe for this report, the data of the European Union are presented separately, in order to disaggregate them from those of Norway and Turkey.

*The purpose of this report is to disseminate the information contained therein. To this end, APROMAR authorizes the use by third parties of the text, graphics and tables shown with the sole condition of citing APROMAR as its source.*

# 3. Aquaculture in the world

## 3.1. Global availability of aquatic products

The growing global demand for healthy and nutritious aquatic products is a challenge that has only been possible to face by adding aquaculture production to capture fisheries, two activities that will continue hand in hand at least in the coming decades.

The year 2017 is the most recent year of the extensive series of statistical information on global aquatic production (aquaculture and capture fisheries) offered by the United Nations Food and Agriculture Organization (FAO). In that year, global aquatic production was 205.6 million tonnes, a 3.5% more than in 2016. This production has grown continuously during the last three decades at an average rate of a 2.45% annually, exceeding the growth rate of the world population which has been an 1.6%. World consumption per capita of aquatic products has increased from 9.0 kg in 1961 to 20.5 kg in 2017, according to the FAO Sofia 2018 report. This has been possible thanks to the incessant increase in production, the improvements in the conservation techniques of the produced fish, the reduction of food waste, the more efficient distribution channels and the disposable income increases.

Aquatic products are one of the most important sources of animal protein in the world. According to FAO, aquatic products account for 17.0% of the world's animal protein intake and a 6.7% of all the protein consumed. In addition to offering high quality protein, aquatic food is easily digestible and contains all the essential amino acids, the essential Omega-3 fatty acids (EPA and DHA), vitamins (D, A and B) and minerals (calcium, iodine, zinc, iron and selenium). With these nutritional values fish and other aquatic species play an important role in correcting unbalanced diets.

**Global aquatic production (aquaculture + fisheries) in 2017 was 205.5 million tonnes, 3.5% more than the previous year.**

Employment in all activities related to the obtention of aquatic products has grown at a faster rate than the world population. It represents 59.6 million people divided in 19.3 million in aquaculture and 40.3 million in extractive fishing. However, it is estimated that only 14% of these workers are women. The proportion of

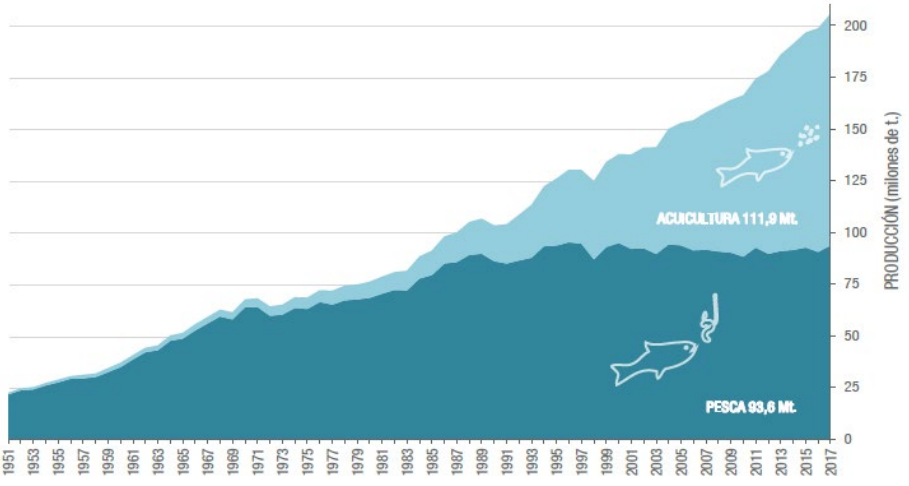



Figure 3-1. Evolution of world aquatic production (aquaculture plus capture fisheries) in the period 1950-2017 (FAO).

employment in aquaculture with respect to all fishing activities has grown from 17% in 1990 to 32% in 2016.

The proportion of the total of aquatic products going to direct human consumption has increased from a 67% in 1960 to more than an 88% in 2016. The other part is mainly used as raw material for animal feed, including aquaculture.

Aquatic products remain one of the most internationally traded staple foods in the world, specifically 35% of the global production of aquatic products was traded internationally, that is about 60 million tonnes according to FAO. In 2017, due to economic growth, the demand for aquatic products increased as well as their prices growing the value of global exports by 7%. More than 200 countries reported exports of aquatic products. In 2017 China remained the largest exporter followed by Norway, Vietnam and Thailand.

Global catches of extractive fisheries have stabilized in the last 20 years at around 90 million tonnes per year without exceeding at any time the 95 million that were predicted as a definitive ceiling for capture fishing activity. In 2017 the total catches were 93.6 million tonnes, a 3.4% more than in 2016 and it represented the largest volume of catches since 2005.

The greater efficiency in the exploitation of fishing grounds and the new technologies applied to fishing fleets have led to maximum levels of sustainable exploitation of wild fishery resources. However, the stabilization of fisheries together with the increased demand for aquatic products have encouraged the promotion of aquaculture for the global supply of these foods. And it has been precisely from such moment, when the capture fishing activity stagnated, when the definitive take off of aquaculture occurred putting a 111.9 million tonnes on the market in 2017, a 3.5% more than the previous year and surpassing capture fishing production by 18.3 million tonnes.

**The global aquaculture harvest in 2017 was 111.9 million tonnes, 3.5% more than the previous year, and exceeding capture fishing production by 18.3 million tonnes.**

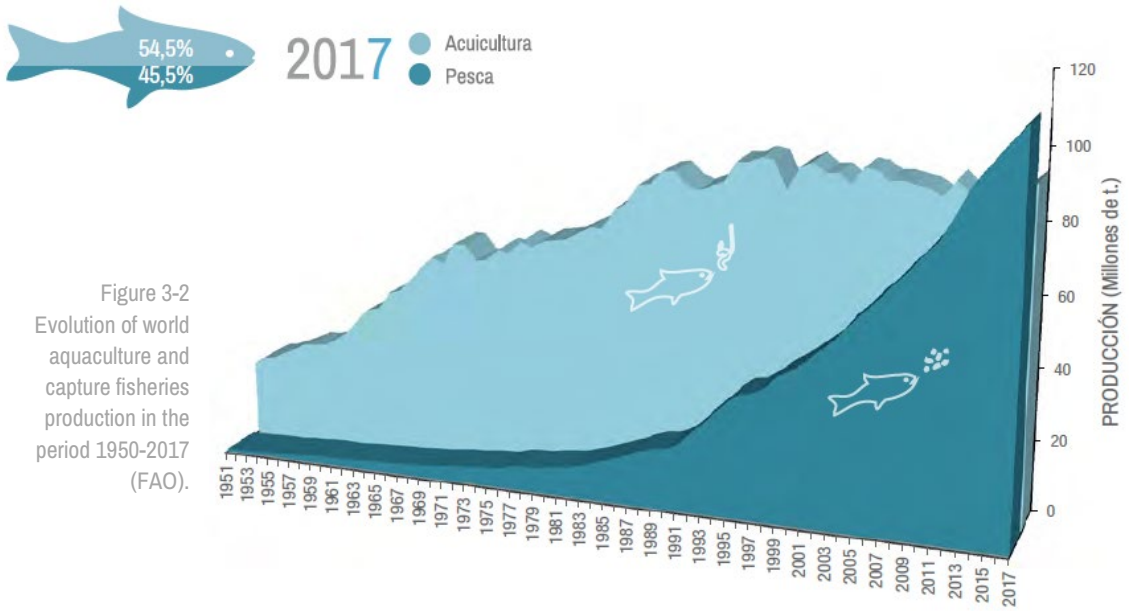



Figure 3-2
Evolution of world aquaculture and capture fisheries production in the period 1950-2017 (FAO).

## 3.2. Situation of aquaculture in the world

Global aquaculture production comes from farms where fish, crustaceans, algae, molluscs and other invertebrates are harvest. These establishments are playing a crucial role in many developing countries in their efforts to eradicate hunger and malnutrition providing food rich in protein, essential oils, vitamins and minerals to a wide section of the population. The contribution of the Omega-3 polyunsaturated long-chain fatty acids (EPA and DHA) contained in aquatic foods to the health and quality of life of people is especially remarkable.

The progress of aquaculture in the last four decades has revealed not only the vitality of this activity as a production technique but also the capacity for innovation, entrepreneurship and sustainable use of available resources. FAO believes that aquaculture contributes to the effective use of natural resources, food security and economic development with a limited and controllable impact on the environment. That is why the development of this activity continues its progress and its consolidation in the world, both in developed and developing countries. In addition, aquaculture is an engine for economic development that is contributing in an important way and in many countries to reduce poverty by increasing the economic income of families, promoting local and international trade, providing foreign monetary exchange, improving returns on use of resources and offering employment opportunities.

To the direct jobs in the farms we must add the jobs that are generated by the large number of ancillary activities that support aquaculture such as processing and packaging, marketing and distribution, manufacturing of equipment, networks and technologies, the production and supply of ice, construction and maintenance of vessels and aquaculture facilities, consulting services, all the scientific activity and that of the administrations involved in the governance, monitoring and development of aquaculture.

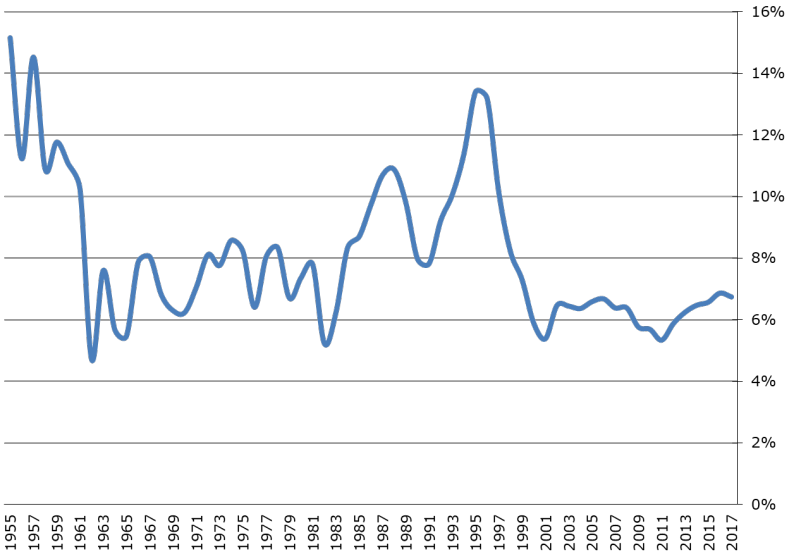



Figure 3-3. Evolution of the annual growth of world aquaculture production in the period 1955-2017, calculated on arithmetic averages by moving sections of 5 years to attenuate short-cycle oscillations (from FAO).

## 3.3. Aquaculture productions in the world

Since the sixties of the twentieth century world aquaculture production has grown steadily and spectacularly. Although a slight decline in its powerful growth rate has been noticeable in recent years the sector continues to maintain a vigorous average rate of growth between a 6 and 8% per year even though in 2017 it grew a 3.5%. From a production of less than 0.8 million tonnes in 1951 it has reached the aforementioned 111.9 million tonnes in 2017 with a global first sale value of more than 199.6 billion Euros.

The great majority of world aquaculture is carried out in Asia, practically 92% as it is the biggest continent in fishing (52%). The rest of aquaculture production is distributed throughout America (3.2%), Europe (2.7%), Africa (2.0%) and Oceania (0.2%).

The analysis of FAO's global aquaculture production statistics shows that although aquaculture is carried out in practically all the countries of the world it is a specialized activity in which only countries that strategically bet on it achieve real progress maintained over time. This circumstance is evident in the fact that the top 10 aquaculture producing countries worldwide have increased their production volume in 2017 with an average total growth rate of a 3.6% compared to the rest of the countries that showed an average total growth rate of a 2,9% which increases the gap between both groups. Furthermore, in 2017 the top 10 aquaculture producing countries in the world produced 101.1 million tonnes, 90.3% of the total amount produced.

**The value of the global aquaculture harvest in 2017 reached 199.6 billion Euros.**

The development of this activity is occurring mainly in developing countries and less in developed countries even though the first have less access to technologies. The main aquaculture producing countries are in Asia. They are developing countries that suffer a certain degree of food deficiencies. Although sometimes these Asian countries have intensive aquaculture industries with high-value products, such as shrimp, to

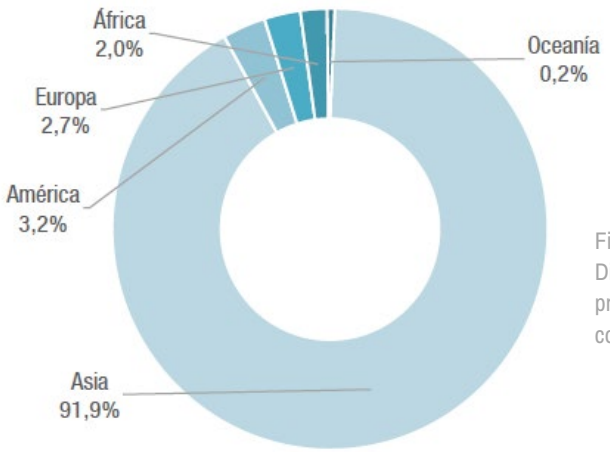



Figure 3-4.
Distribution of aquaculture production across the five continents (from FAO).

export to other markets, the largest proportion of their aquaculture is traditional, extensive and for local consumption with species such as carp and other cyprinids, in addition to seaweed.

**China stands out as the first aquaculture producing country in the world, with 64.4 million tonnes harvested in 2017, representing 57.5% of world production.**

China remains the undisputed leader in world aquaculture production with a 64.4 million tonnes of harvest in 2017, 3.3% higher than in 2016 and with a great difference over the second country in production, Indonesia, which harvested 15,9 million tonnes. Despite China's large size (9.3 million km2), it represents only 6.26% of the world's land area and its coastal coastline has 14,500 km, that represents only 4% of the entire coastline of the world. This leadership with such an advantage over the rest of the countries is due, on one hand, to the enormous population of that country (1,386 million inhabitants in 2017) associated with an outstanding culture of consumption of aquatic products, and on the other hand, thousands of years of practice in subsistence aquaculture. The first recognized form of aquaculture in the world was carp farming and its references date back to 3,500 BC, precisely in ancient China. The three main species produced in aquaculture today in China are the Japanese laminaria, Chinese carp and Japanese oyster. Indonesia remains the second producing country, although its growth rate has fallen by -0.7% in 2017. In Indonesia, the largest productions are Japanese eucheuma and laminaria algae, along with Nile tilapia. India follows with a production of 6.2 million tonnes and an annual increase of an 8.4% and Vietnam with 3.8 million tonnes and a growth of a 7% in 2016. Among the rest of the 10 main aquaculture producing countries in 2017, the strong growth in the Republic of Korea stands out (+24%), occupying the sixth place in the ranking behind Bangladesh whose production was about 0.03 million tonnes higher. It also highlights the sharp growth of Chile that entered to the tenth position in the ranking of the top 10 world producers increasing its production by 0.17 million tonnes in 2017 which meant an annual increase of 16.2% compared to 2016. In contrast, Japan drops from tenth to twelfth in the ranking with a production of 1.05 million tonnes in 2017.

Spain rose a position in the ranking and went on to occupy the 20th position with 311,032 tonnes and an increase of a 9.6%.

Table 3-1.
Main aquaculture producing countries by annual tonnes produced in 2017 and interannual variation rate (FAO).

| País | Cantidad (t) | % Var. anual |
|---|---|---|
| China | 64.358.481 | 3,3% |
| Indonesia | 15.896.100 | -0,7% |
| India | 6.182.000 | 8,4% |
| Viet Nam | 3.831.241 | 7,0% |
| Bangladesh | 2.333.352 | 5,9% |
| República de Corea | 2.306.280 | 24,0% |
| Filipinas | 2.237.787 | 1,7% |
| Egipto | 1.451.841 | 5,9% |
| Noruega | 1.308.634 | -1,3% |
| Chile | 1.219.747 | 16,2% |
| TOTAL 10 PRALES. PRODUCTORES | 101.125.463 | 3,6% |
| RESTO DE PAISES | 10.821.160 | 2,9% |
| TOTAL MUNDIAL | 111.946.623 | 3,5% |
| España | 311.032 | 9,6% |

Table 3-2.
Main aquaculture producing countries by value of annual production (millions of Euros) in 2017 (FAO) and interannual variation rate.

| País | Valor (M€) | % Var. anual |
|---|---|---|
| China | 119.170 | 3,8% |
| Indonesia | 10.325 | 17,1% |
| India | 9.835 | 16,8% |
| Chile | 8.330 | 31,8% |
| Viet Nam | 7.772 | 6,3% |
| Noruega | 6.286 | 3,1% |
| Bangladesh | 4.724 | 5,1% |
| Japón | 3.748 | -3,5% |
| República de Corea | 2.745 | 49,0% |
| Tailandia | 2.163 | 9,9% |
| TOTAL 10 PRALES. PRODUCTORES | 175.099 | 6,8% |
| RESTO DE PAISES | 24.564 | 5,3% |
| TOTAL MUNDIAL | 199.663 | 6,6% |
| España | 466 | 3,8% |

If the European Union were considered as a unit, its aquaculture harvest would be 1.35 million tonnes in 9th place between Norway and Egypt.

If the European Union is considered as a unit, its aquaculture harvest would be 1.35 million tonnes, in 9th place between Norway and Egypt.

In relation to the value of their first sale harvest the top 10 aquaculture producing countries worldwide increased their 2017 figures compared to the previous year by a 6.8% compared to the other countries that did so at a 5.3 %, increasing the gap between both groups also from this perspective. With this, the top 10 aquaculture producing countries in the world produced 175.1 million Euros in 2017, an 87.7% of the total world harvest value.

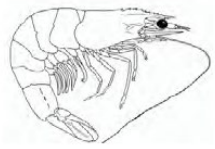
From the point of view of the value, China's aquaculture production is significantly higher than that of the other countries reaching 119,170 million Euros while India and Indonesia produced 10,325 (+17.1%) and 9,835 (+16.8%) million Euros respectively. Due to the high unit value of aquaculture productions in Chile and the increase in its production, in 2017, the value of its production was 8.3 million Euros, a 31.8% more than the previous year and also rose a position in the ranking being in 4th place, above Vietnam. In Chile, the productions of Atlantic salmon, mussels and Coho salmon stands out while in Norway they mainly grow Atlantic salmon and rainbow trout. Norway grew in value 3.1% in 2017 with a total value in aquaculture of 6.3 million Euros. As in production volume it is the Republic of Korea that experiences the highest growth in value a 49% with a total of 2.7 million Euros and moving from the 11th to 9th place in the world ranking in just a year being included in the top 10 producing countries in value.

Spain dropped one place in the ranking in 2017 occupying the 31st position with a production value of about 466 million Euros, 3.8% more than in 2016.

The two main species produced by aquaculture in the world in 2017 have been the Japanese laminaria algae or kombu (*Saccharina japonica*) with 11.2 million tonnes and the algae eucheuma (genera Eucheuma and Kappaphycus) with 8.6 million tonnes. The third species is Japanese oyster (*Crassostrea gigas*) with 5.5 million tonnes and in fourth place the Chinese carp (*Ctenopharyngodon idella*) with 5.5 million tonnes. The first 10 species accounted for the 50.8% of the total production and increased their production compared to the previous year by a 3.5%, while the rest of the species increased by a 7%.

Of the species produced in Spain, the production of rainbow trout, the 33rd species produced, stands out in the world context with 811,590 t in total, the European mussels occupy the 53rd position with 268,061 t, the sea bream the 62nd position, with 218.099 t, the sea bass the 63rd with 215,636 t and turbot the 104th with 57.072 t.

In relation to the value of production, white shrimp (*Litopenaeus vannamei*) is the main global species with a value in first sale in 2017 of 21,395 million Euros followed by the Atlantic salmon (*Salmo salar*) with a value of 13,358 million Euros and for the Chinese carp (*Ctenopharyngodon idella*) for 10,119 million Euros. The first 10 species accounted for 46.6% of the 199.663 million Euros worth of the total crop of world aquaculture.



*Litopenaeus vannamei*

### **WHITELEG SHRIMP** (Litopenaeus vannamei)

Subphylum: Crustacea - Order: Decapoda - Family: Penaeidae

Meaningful characters and morphology: The white shrimp, also called equatorial shrimp, is a species characterized by having whitish legs, and has a raw greenish gray colour (red when cooked). It can reach a maximum size of 230 mm.

Cultivation: Its production is carried out on the coast, in ponds located in intertidal areas and with different levels of intensification.

Presentation of the product: It is presented in the fresh, frozen, whole or decapitated market.

*Saccharina japonica*

### **SACCHARINA JAPONICA** (*Saccharina japonica*)

Class: Phaeophyceae - Order: Laminariales - Family: Laminariaceae

Meaningful characters and morphology: Brown seaweed formed by a sheet and a brown-gold stipe. The edges of the central nerve expand in a pinatifid manner along with the lamina.

Cultivation: It is one of the species with the highest world production due to its high growth rate, facilitating its large-scale cultivation. It can occur both on exposed and calm coasts.

Marketing and consumption: Cultivated for human consumption, it takes advantage of almost everything including the stem. About 10.6 kilos can be obtained for each meter of rope.

*Hypophthalmichthys molitrix*

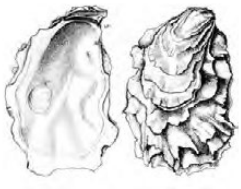
### **SILVER CARP** (*Hypophthalmichthys molitrix*)

Class: Osteictios - Order: Cypriniformes - Family: Cyprinidae

Meaningful characters and morphology: Robust fish with a slight elevation in its dorsal part. The body is laterally compressed fusiform and the ventral part forms an acute keel, which goes from the chest to the belly.

Cultivation: It is widely used in polyculture for the best use of the systems, when they do not contain fish that use the trophic level of phytoplankton. It is used in waters affected by eutrophication from anthropic action. Its reproduction is obtained inductively in the laboratory, not spawning spontaneously in naturalized or closed environments.

Products and consumption: Species suitable for consumption, but with lots of thorns that hinder its commercialization.



*Crassostrea gigas*

### **PACIFIC OYSTER** (*Crassostrea gigas*)

Class: Bivalvia Order: Ostreida - Family: Ostreidae

Meaningful characters and morphology: Bivalve mollusc, filter, dirty white or gray. The leaflets are slightly elongated on the anteroposterior axis with one end (where the hinge is) terminated at the tip. The right or upper leaflet is relatively flat and the left or lower leaflet is concave and with it adheres to the substrate. The average size is 9 to 10 cm and reaches a maximum size of 20 cm.

Cultivation: The breeding method used depends on the environment, in addition to tradition. In "high lift" culture, the oysters are placed in plastic meshes attached to easels on the ground. In the "bottom" crop they are placed directly on the shore or in shallow water. The "rope" culture is done with the oysters on ropes. And in the “deep water” culture, oysters are placed in parks located at depths of up to ten meters.

Commercialization: It is sold in fresh, frozen (meat and half shell) and canned.

| Especie | Nombre científico | Toneladas | % Var. anual |
|---|---|---|---|
| Laminaria japonesa | *(Saccharina japonica)* | 11.174.505 | 4,8% |
| Alga Eucheuma | *(Eucheuma y Kappaphycus)* | 8.637.534 | -11,6% |
| Ostión japones | *(Crassostrea gigas)* | 5.544.245 | 1,2% |
| Carpa china | *(Ctenopharyngodon idella)* | 5.519.487 | 1,4% |
| Carpa plateada | *(Hypophthalmichthys molitrix)* | 4.704.675 | -0,5% |
| Langostino blanco | *(Litopenaeus vannamei)* | 4.456.605 | 7,8% |
| Alga Gracilaria | *(Gracilaria sp.)* | 4.311.040 | 1,5% |
| Almeja japonesa | *(Ruditapes philippinarum)* | 4.228.206 | 1,3% |
| Tilapia del Nilo | *(Oreochromis niloticus)* | 4.130.281 | 5,4% |
| Carpa común | *(Cyprinus carpio)* | 4.129.100 | 1,8% |
| TOTAL 10 PRALES. ESPECIES | | 56.835.674 | 0,4% |
| RESTO DE ESPECIES | | 55.110.949 | 7,0% |
| TOTAL ACUICULTURA MUNDIAL | | 111.946.623 | 3,5% |
| Trucha arco iris | *(Oncorhynchus mykiss)* | 811.590 | -0,6% |
| Mejillones europeos | *(Mytilus galloprovincialis y edulis)* | 268.061 | -1,9% |
| Dorada | *(Sparus aurata)* | 218.099 | 15,3% |
| Lubina | *(Dicentrarchus labrax)* | 215.636 | 12,4% |
| Rodaballo | *(Psetta maxima)* | 57.072 | -4,3% |

Table 3-3. Main species produced by aquaculture in the world (in tonnes) in 2017 (FAO) and interannual variation rate.

| Especie | Nombre científico | Valor (M€) | % Var. anual |
|---|---|---|---|
| Langostino blanco | *(Litopenaeus vannamei)* | 21.395 | 8,8% |
| Salmón atlántico | *(Salmo salar)* | 13.358 | 16,1% |
| Carpa china | *(Ctenopharyngodon idella)* | 10.119 | 1,4% |
| Carpa plateada | *(Hypophthalmichthys molitrix)* | 8.215 | -0,5% |
| Cangrejo de las marismas | *(Procambarus clarkii)* | 8.003 | 35,5% |
| Cangrejo de canal chino | *(Eriocheir sinensis)* | 7.632 | 0,3% |
| Carpa común | *(Cyprinus carpio)* | 6.909 | 1,3% |
| Tilapia del Nilo | *(Oreochromis niloticus)* | 6.090 | 3,5% |
| Carpa cabezona | *(Hypophthalmichthys nobilis)* | 5.855 | -0,5% |
| Almeja japonesa | *(Venerupis philippinarum)* | 5.566 | 1,2% |
| TOTAL 10 PRALES. ESPECIES | | 93.141 | 7,0% |
| RESTO DE ESPECIES | | 106.522 | 6,2% |
| TOTAL ACUICULTURA MUNDIAL | | 199.663 | 6,6% |
| Trucha arco iris | *(Oncorhynchus mykiss)* | 2.884 | 5,3% |
| Lubina | *(Dicentrarchus labrax)* | 907 | 3,7% |
| Dorada | *(Sparus aurata)* | 838 | 5,2% |
| Rodaballo | *(Psetta maxima)* | 310 | -4,7% |
| Mejillones europeos | *(Mytilus galloprovincialis y edulis)* | 289 | -2,8% |

Table 3-4. Main species worth (millions of Euros) produced through aquaculture in the world in 2017 (FAO) and interannual variation.

## 3.4. Aquaculture productions by groups and environments

Almost half of the entire global aquaculture harvested in 2017 consisted of finfish a 47.7% and about 53.4 million tonnes but the increase in production has taken place in all species groups. The harvest of vegetables (algae) represented 28.4% of the tonnes (31.8 million tonnes) that of molluscs a 15.5% (17.4 million tonnes), crustaceans a 7.5% (8,4 million t) while the production of amphibians and reptiles and other invertebrates has been anecdotal with a 0.4% in both cases.

The aquaculture finfish harvest in 2017 represented a value in first sale of more than 111,795 million Euros, equivalent to 56.0% of the value of the total aquaculture production. The crustacean production accounted for 48,852 million Euros (24.5%), the molluscs 24,300 million Euros (12.2%) and algae 9,475 million Euros (4.7% of the total).

The 56.8% of world aquaculture production takes place in marine waters and the 43.2% in freshwater. Contrary to land farming systems in which most of the production is obtained from a small number of very domesticated species of animals and plants, in 2017 about 424 different aquatic species were being raised in the world including fish, molluscs, crustaceans, algae and others. Of these, about 302 are in significant quantities (more than 100 tonnes per year).

**The diversity of species produced in aquaculture is due to the rich biodiversity of the aquatic environment, the adaptability of the species to the controlled production systems and the ingenuity of the people.**

This diversity is due to the richness in species of the aquatic environment, the adaptability of these organisms to the systems of controlled production and the ingenuity of the people.

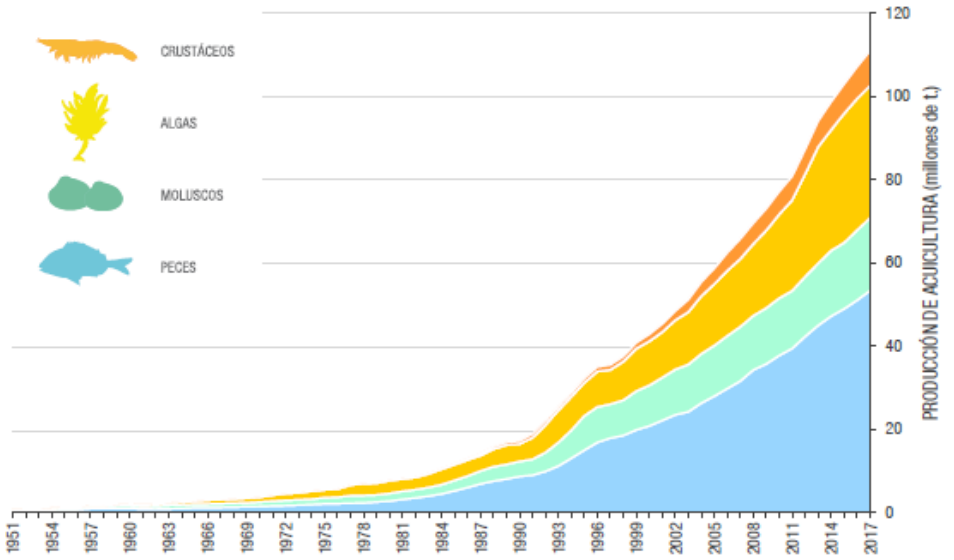



Figure 3-5. Evolution of world aquaculture production (millions of tonnes), by groups, for the period 1950-2017 (FAO).

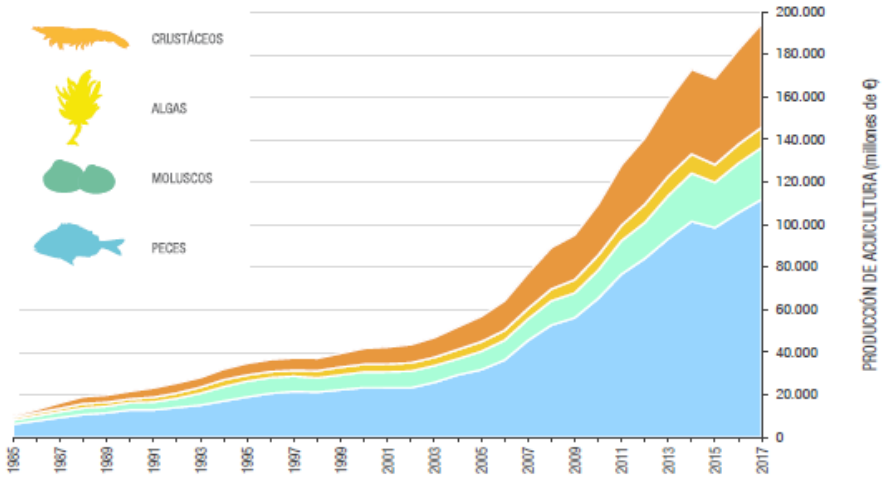



Figure 3-6. Evolution of the value of world aquaculture production, by groups, for the period 1984-2017, in millions of Euros (FAO).

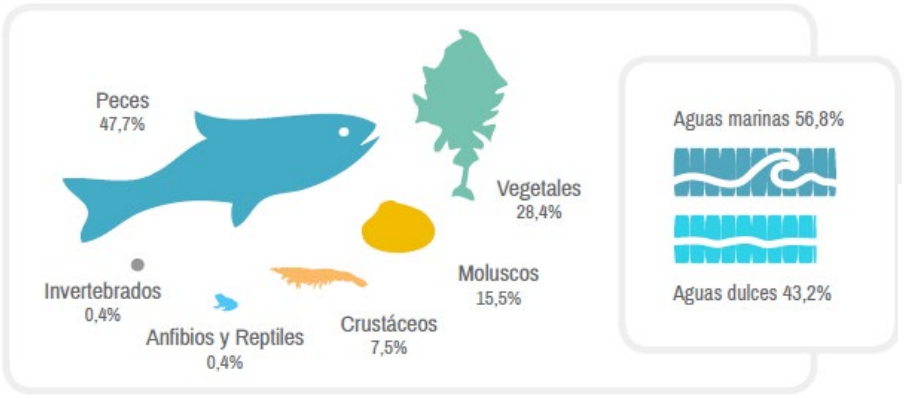



Figure 3-7/3-8. Percentage distribution of world aquaculture production (t) in 2017 by groups (FAO).

## 3.5. Potential of aquaculture and sustainable development

During the last four decades, aquaculture has developed, diversified and registered notable technological and scientific advances. The success of modern aquaculture is based on the proper management of the biology of cultivated species, the introduction of technological innovations, the development of specific foods and entrepreneurship. The potential of these advances for economic growth, both in developed and developing countries, for improving living standards and for increasing food security, was already recognized by FAO in its Bangkok Declaration and Strategy of 2000, which stressed that aquaculture should continue its development until it offers all its potential to humanity and so on at it has been observed over the years.

At the second International Conference on Nutrition (ICN2) of FAO, which took place in Rome in November 2014, world leaders renewed their commitment to the establishment and implementation of policies aimed to the eradication of malnutrition and the transformation of health systems to make nutritious diets affordable for all people. This conference confirmed the importance of aquatic foods as a source of nutrition and health for numerous coastal and river communities especially for their proteins and trace elements, particularly for women of childbearing age and children.

To offer guidelines for better governance of the sector FAO is advocating its Blue Growth program as a framework for the sustainable management of aquatic resources for the balance in its use and for its conservation in a way that is economically, socially and environmentally responsible. This program is based on the FAO Responsible Fisheries Code of Conduct of 1995 and addresses fisheries, aquaculture, ecosystem services, trade and social protection. It seeks the balance between growth and conservation, between industrial and artisanal activity to ensure fair benefits between societies. Blue Growth is integrated on the United Nations 2030 Agenda for Sustainable

Development referenced in the introduction of this report.

In October 2015, seventy FAO member states plus the private sector non-governmental organizations and civil society celebrated in Vigo the twentieth anniversary of the adoption of the FAO Code of Responsible Fisheries Conduct. At that meeting, the achievements of the code and the obstacles encountered in its implementation were highlighted but above all its essential role in the sustainable management of living aquatic resources. Especially with regard to aquaculture, which in the year of adoption of the code accounted for only the 25% of global aquatic production and currently exceeds the 50%.

The Scientific Advisory Mechanism of the European Commission (SAM) published its report "Food from the oceans" in 2016. (Available at http://bit.ly/2oWMzGP). It indicates that although the oceans represent about the 50% of the new animal and plant biomass that is created annually on the planet, food from the oceans only reaches a 2% of the daily consumption of calories per person and a 15 % of protein consumption worldwide. Foods from the oceans can and should constitute a much higher percentage of the total amount of food consumed. They are foods that, in addition to being very healthy in general, are essential for the fight against hunger and malnutrition in some parts of the world. In addition, the necessary resources (energy, nutrients, space, water) to produce a kilogram of food suitable for consumption are lower in the oceans than on land. Therefore, if the proportion of food from the oceans is increased, it will be contributing to reducing the pressure of agriculture on terrestrial natural resources.

**The success of modern aquaculture is based on the proper management of the biology of cultivated species, the introduction of technological innovations, the development of specific foods and entrepreneurship.**

In June 2018, the Plenary Session of the European Parliament approved its own initiative report "Towards a sustainable and competitive European aquaculture sector: current situation and future challenges". Its rapporteur was Mr. Carlos Iturgáiz (European People's Group). This document defends the need to harness the potential of aquaculture in the European Union and proposes concrete actions (Available at http://bit.ly/2yfkj6P).

# 4. Aquaculture in the European Union

## 4.1. Situation of aquaculture in the European Union

Aquaculture is an important source of aquatic products in the European Union. In 2017, 1,353,201 tonnes of aquaculture products were harvested in the European Union. This data represents an increase of 4.8% compared to what was placed on the market in 2016, although it is still below the maximum production of European aquaculture that took place in 1999 when they exceeded 1,435,350 tonnes. On the other hand, aquaculture represents 19.2% of the volume of total aquatic production (aquaculture and capture fisheries) of the European Union. The remaining 80.8% of production came from capture fisheries, that is 5,680,902 tonnes.

**The aquaculture production of the European Union in 2017 was 1,353,201 tonnes, with a value of 4,147 million Euros.**

Aquaculture production in the European Union had a value in first sale in 2017 of 4,147 million Euros which meant an annual increase of 11.3%. However, the importance of aquaculture is not the same in all countries of the Union. In some, its economic and social relevance already exceeds that of fishing, as also occurs in Spain in some autonomous communities. Aquaculture plays a very significant role in the social and economic development of certain coastal and river areas, as well as in the preservation of the maritime-river and fishing culture of those same areas.

**Aquaculture plays a very significant role in the socioeconomic development of European coastal and river areas, as well as in the preservation of maritime-river and fishing culture.**

The total production of aquatic products (aquaculture plus fishing) in the European Union in 2017 was 7,034,104 tonnes, an increase of 7.3%. The maximum production was reached in 1988 with a production of 10,612,520 tonnes and from that year until 2017, it has decreased by 33.7%. In spite of its promising expectations, aquaculture production in the EU has not been able, in any case, to compensate for the sharp reduction suffered by European capture fishing in the last two decades.

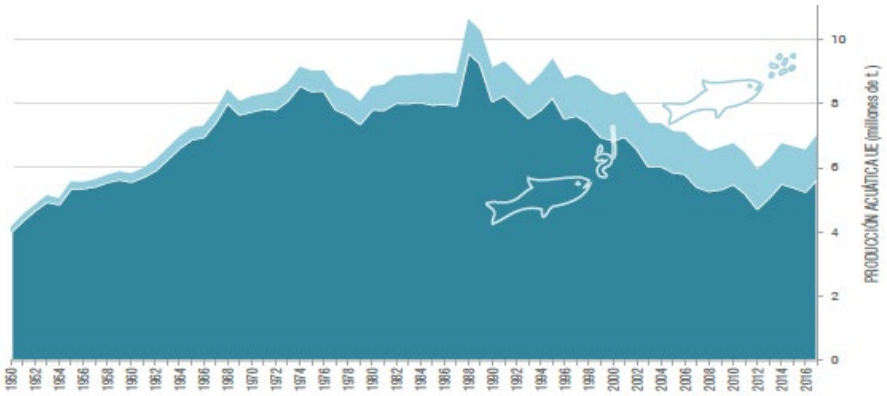



Figure 4-1. Evolution of total aquaculture and capture fisheries production of the 28 member states of the European Union between 1950 and 2017, in millions of tonnes (FAO).

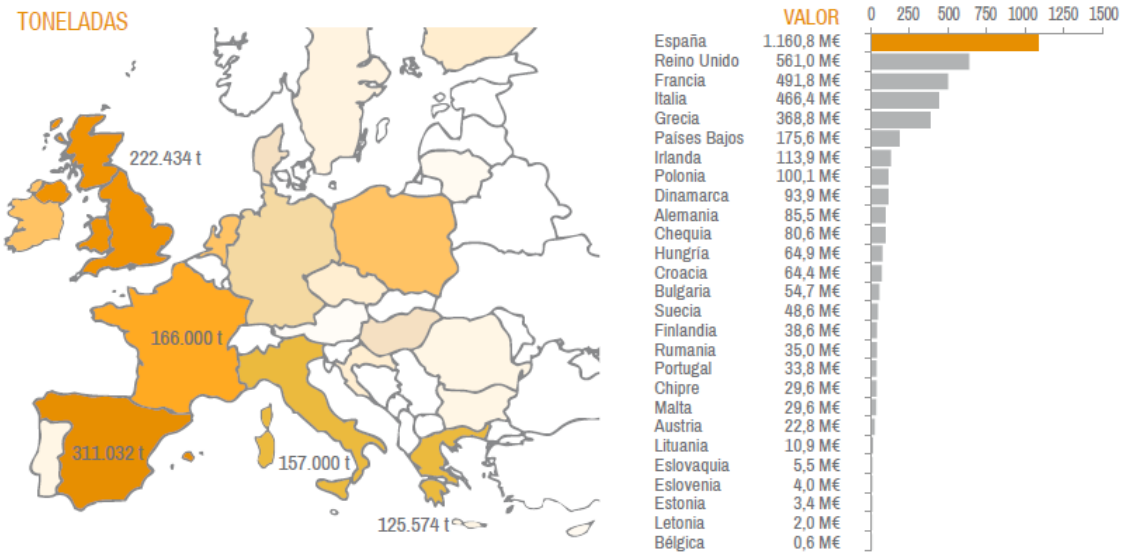



Figure 4-2 Distribution of aquaculture production in the Member States of the European Union by their quantity (tonnes) and value (millions of Euros) in 2017 (FAO).

Spain is the Member State of the European Union with the highest aquaculture harvest, with 311,032 tonnes in 2017 (23.0% of the total for the Union), followed by the United Kingdom with 222,434 tonnes (16.4%) and France with 166,000 tonnes (12.3%). However, when considering the value of production, the United Kingdom is the main producing Member State with 1,160.8 million Euros (28% of the total value), followed by France with 561 million Euros (13.5%) and Greece with 491.8 million Euros (11.9%). Spain occupies the fourth position, with 466.4 million (12.2%), followed by Italy.

In the European Union the main products of aquaculture are finfish and molluscs. The aquaculture of crustaceans, algae or other invertebrates is very small. The finfish harvest in 2017 meant 731,591 tonnes, which accounted for 54.1% by weight of the total aquaculture and reached a value of 3,249.3 million Euros (78.4% of the total value of aquaculture production). Harvested molluscs totalled 621,004 tonnes, 45.9% of the total weight, reaching a value of 891.8 million Euros (27% of the total).

The main species produced in the EU are mussels, with 493,844 tonnes in 2017, of which two species are produced, the common and the Mediterranean, not always adequately differentiated in the statistics. It is followed by the Atlantic salmon with 209,180 tonnes that has taken over the second position where rainbow trout was situated, of which in 2017 185,316 tonnes were produced. Considering its value at first sale, Atlantic salmon is the first species (1,207.4 million Euros) with a strong annual increase of 30.2%, followed by rainbow trout (574.1 million Euros) with a 5.4% increase and sea bass (442.1 million Euros).

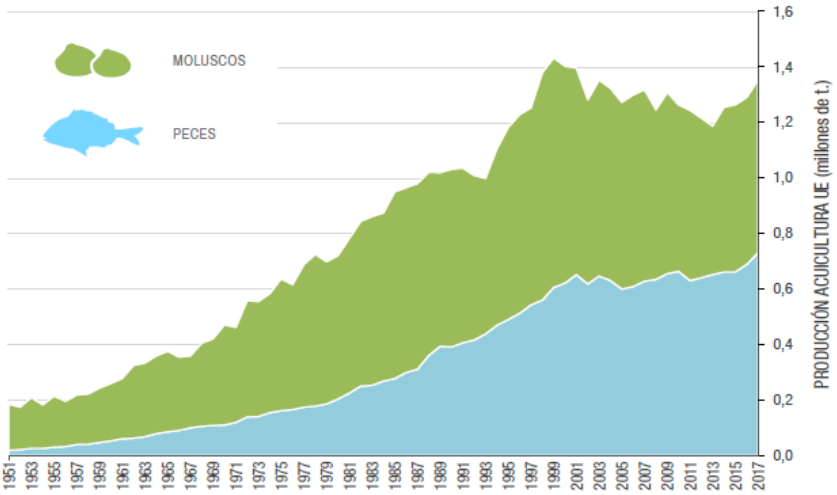



Figure 4-3. Evolution of aquaculture production (millions of t.) in the European Union by groups for the period 1950-2017 (FAO).

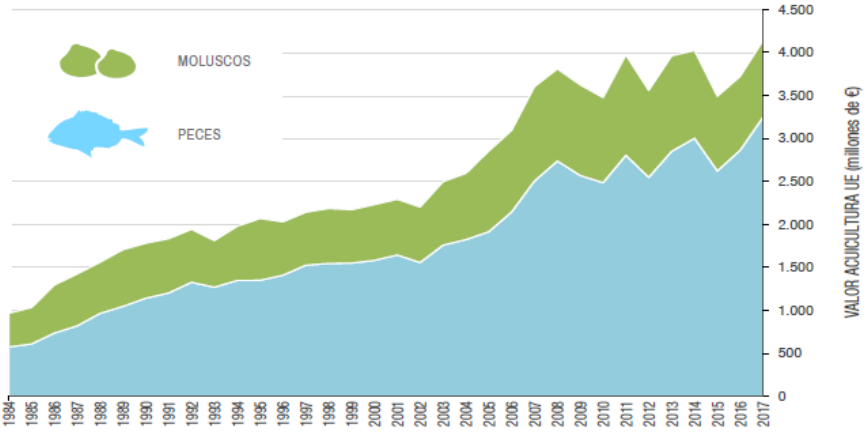



Figure 4-4. Evolution of the value of aquaculture production in the European Union in millions of Euros, by groups for the period 1945-2017 (FAO).

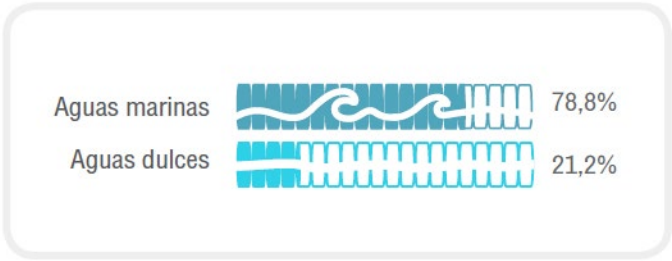



Figure 4-5. Percentage distribution of aquaculture production (tonnes) in the European Union in 2017 by production environments (FAO).

Table 4-1. Main species produced by aquaculture in the European Union, by tonnes, in 2017 (FAO).

| Especie | Nombre científico | Toneladas | % Var. anual |
|---|---|---|---|
| Mejillones | *(Mytilus spp)* | 493.844 | 3,9% |
| Salmón del Atlántico | *(Onchorynchus mykiss)* | 209.180 | 15,6% |
| Trucha arco iris | *(Salmo salar)* | 185.316 | 0,0% |
| Dorada | *(Sparus aurata)* | 95.390 | 14,2% |
| Lubina | *(Dicentrarchus labrax)* | 79.350 | -3,0% |
| Ostión japonés | *(Crassostrea gigas)* | 77.947 | 3,3% |
| Carpa común | *(Cyprinus carpio)* | 73.911 | 1,5% |
| Almeja japonesa | *(Ruditapes philippinarum)* | 35.114 | -0,9% |
| Rodaballo | *(Psetta maxima)* | 11.571 | 14,4% |
| Pez-gato | *(Clarias gariepinus)* | 8.821 | 7,6% |
| TOTAL 10 PRALES. ESPECIES | | 1.270.444 | 6,8% |
| RESTO DE ESPECIES | | 82.758 | -19,1% |
| TOTAL ACUICULTURA UE | | 1.353.201 | 4,8% |

Table 4-2. Main species produced by aquaculture in the European Union, by value, in 2017 (FAO).

| Especie | Nombre científico | Valor (M€) | % Var. anual |
|---|---|---|---|
| Salmón del Atlántico | *(Salmo salar)* | 1.207,4 | 30,2% |
| Trucha arco iris | *(Onchorynchus mykiss)* | 574,1 | 5,4% |
| Lubina | *(Dicentrarchus labrax)* | 442,1 | -0,5% |
| Dorada | *(Sparus aurata)* | 435,1 | 9,9% |
| Ostión japonés | *(Crassostrea gigas)* | 345,2 | 5,1% |
| Mejillones | *(Mytilus spp)* | 390,0 | 5,3% |
| Carpa común | *(Cyprinus carpio)* | 151,3 | 7,8% |
| Almeja japonesa | *(Ruditapes philippinarum)* | 96,4 | -0,5% |
| Atún rojo del Atlántico | *(Thunnus thynnus)* | 79,5 | 10,5% |
| Rodaballo | *(Psetta maxima)* | 73,2 | 8,1% |
| TOTAL 10 PRALES. ESPECIES | | 3.794,3 | 12,0% |
| RESTO DE ESPECIES | | 352,8 | 4,0% |
| TOTAL ACUICULTURA UE | | 4.147,0 | 11,3% |

species

SALMON

**ATLANTIC SALMON** (*Salmo salar*)

Class: Actinopterygii - Order: Salmoniformes - Family: Salmonidae

*Salmo salar*

**Significant characters and morphology:** Blue-gray fish in the dorsal part with some points, lighter on the flanks and with a silver belly. Elongated body covered with small scales. Big mouth with strong teeth. Second fat dorsal fin. Narrow caudal peduncle.

**Farming:** The farming of Atlantic salmon has an initial stage in fresh water that is carried out in facilities on land. When they are between 1 year and 18 months, and reach a weight of 50-90 g, they are transferred to nurseries at sea. There they are raised for 12 to 18 months, until they reach a harvest weight of 4 to 5 kg.

**Product presentation:** The main final product is fresh fillet, although it is also sold whole (or eviscerated) in fresh. Frozen fillets and other products are also sold

Finfish production through modern aquaculture systems has been a success in Europe in the development of a new and innovative economic activity. Despite its limited current growth, aquaculture in the European Union is a model of sustainable progress led by companies of all sizes with strong scientific and technological support. It should be pointed out that in parallel more traditional aquaculture systems persist perfectly adapted also to ecosystems and social uses.

## 4.2. Situation of finfish aquaculture in the European Union

In 2017, 731.59 tonnes of aquaculture finfish were harvested in the European Union, up 6.2% from 2016. The total harvest volumes of the first 10 finfish species produced was 682,768 tonnes, 6.9% higher than in 2016. In contrast, the harvest of the rest of finfish species decreased by -2.3%, after a few years with a trend of increased diversification of the species produced.

The total first-sale value of aquaculture finfish produced in the EU in 2017 was approximately 3,249.3 million Euros, an increase of 13.5% compared to 2016. The average value of the kilo of aquaculture finfish in first sale was 5.5 Euros/kg.

The main species of finfish produced in the European Union is Atlantic salmon, of which in 2017 209,180 tonnes were produced, 15.6% more than the previous year. It surpassed rainbow trout that was the first place in 2016 and of which in 2017 185,316 tonnes were

Table 4-3. Main finfish species produced by aquaculture in the European Union, in tonnes, in 2017 (FAO).

| Especie | Nombre científico | Toneladas | % Var. anual |
|---|---|---|---|
| Salmón del Atlántico | *(Salmo salar)* | 209.180 | 15,5% |
| Trucha arco iris | *(Onchorynchus mykiss)* | 185.316 | 0,0% |
| Dorada | *(Sparus aurata)* | 95.390 | 14,2% |
| Lubina | *(Dicentrarchus labrax)* | 79.350 | -3,0% |
| Carpa común | *(Cyprinus carpio)* | 73.911 | 1,5% |
| Rodaballo | *(Psetta maxima)* | 11.571 | 14,4% |
| Pez-gato | *(Clarias gariepinus)* | 8.821 | 7,6% |
| Atún rojo del Atlántico | *(Thunnus thynnus)* | 6.616 | 8,7% |
| Carpa cabezona | *(Anguilla anguilla)* | 6.432 | 27,3% |
| Corvina | *(Argyrosomus regius)* | 6.181 | 28,7% |
| TOTAL 10 PRALES. ESPECIES | | 682.768 | 6,9% |
| RESTO DE ESPECIES | | 48.822 | -2,3% |
| TOTAL ACUICULTURA PECES UE | | 731.590 | 6,2% |

Table 4-4. Main finfish species produced by aquaculture in the European Union, by value, in 2017 (FAO).

| Especie | Nombre científico | Valor M€ | % Var. anual |
|---|---|---|---|
| Salmón del Atlántico | *(Salmo salar)* | 1.207,4 | 30,2% |
| Trucha arco iris | *(Onchorynchus mykiss)* | 574,1 | 5,4% |
| Lubina | *(Dicentrarchus labrax)* | 442,1 | -0,5% |
| Dorada | *(Sparus aurata)* | 435,1 | 9,9% |
| Carpa común | *(Cyprinus carpio)* | 151,3 | 7,8% |
| Atún rojo del Atlántico | *(Thunnus thynnus)* | 79,5 | 10,5% |
| Rodaballo | *(Psetta maxima)* | 73,2 | 8,1% |
| Anguila europea | *(Anguilla anguilla)* | 54,8 | -0,1% |
| Corvina | *(Argyrosomus regius)* | 30,4 | 22,3% |
| Esturiones | (Varias) | 19,7 | 5,3% |
| TOTAL 10 PRALES. ESPECIES | | 3.067,6 | 14,0% |
| RESTO DE ESPECIES | | 181,7 | 5,5% |
| TOTAL ACUICULTURA PECES UE | | 3.249,3 | 13,5% |

produced. And the third species was Gilthead seabream with 95,390 tonnes, which has increased by 14.2%. From an economic point of view, the main specie produced in 2017 was Atlantic salmon, which accounted for 1,207.4 million Euros, an increase of 30.2% over the previous year, followed by rainbow trout with 574.1 (up 5.4%).

The United Kingdom is the EU Member State with the highest production of aquaculture finfish in 2017, both by weight, 203,922 tonnes (27.9% of the total), and by value, 1,132.5 million Euros (34.9% of total value and 28.6% growth). It should be noted that UK production has increased significantly in 2017 after two years of decline, reaching its highest historical value since 1950. Greece is the second largest producer, with 106,165 tonnes (27.9% of the total and growth of 5.9%) and 483.1 million Euros (14.9% of the total and growth of 5.4%), mostly sea bass and gilthead seabream. Spain is the third largest producer, with 66,591 tonnes (9.1% of the total and growth of 3.9%) and 331.7 million Euros (10.2% of the total value of finfish farming in the European Union and growth of 2.8%).

The pace of growth in finfish aquaculture in the European Union since 2000 has been very low. Its average increase over the last three years has been only 2% per year, compared to 10.2% seen in the rest of the world. This difference is even more marked when other forms of aquaculture are also considered. Thus, the total aquaculture of the EU (essentially finfish and molluscs) has decreased since 2000 an average of -0.5% per year, while in the world aquaculture has grown in that time an average of 11.2%. It should be clarified that these production figures of the Member States of the European Union do not include data from other European countries such as Norway or, where appropriate, Turkey. The average annual growth in the last decade of aquaculture across Europe was 4.5% covering all aquaculture and 7.3% for finfish farming (including Turkey, but particularly taking into account Norway).

These data clearly flag that severe limitations on the development of aquaculture exist in the European Union and are not occurring in other countries or happen to a lesser extent.

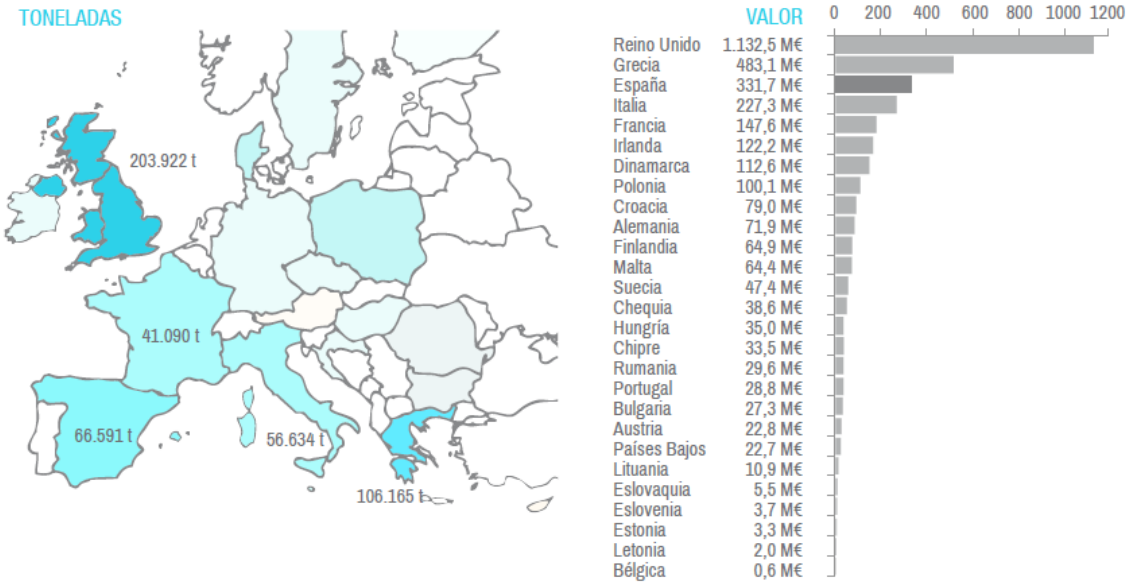



Figure 4-6. Distribution of aquaculture finfish production in the Member States of the European Union by its volume (tonnes) and value (millions of Euros) in 2017 (FAO).

Figure 4-7. Relative evolution of increases in total aquaculture production in the areas of the European Union, Europe (including Turkey) and global *between 2000 and 2017. Cumulative percentage increases are shown, based on the year 2000 (on FAO data).*

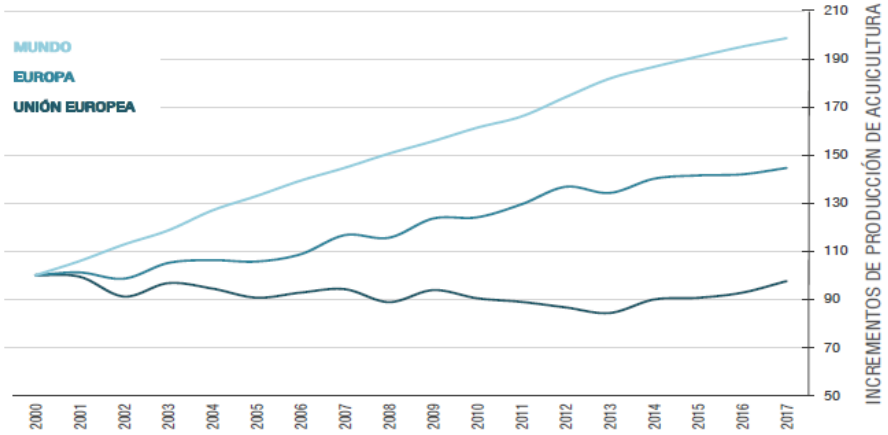



Figure 4-8. Relative evolution of increases in aquaculture fish production in the areas of the European Union, Europe (including Turkey) and global between 2000 and 2017. Cumulative percentage increases are shown, based on the year 2000 (Year 2000=100) (on FAO data).

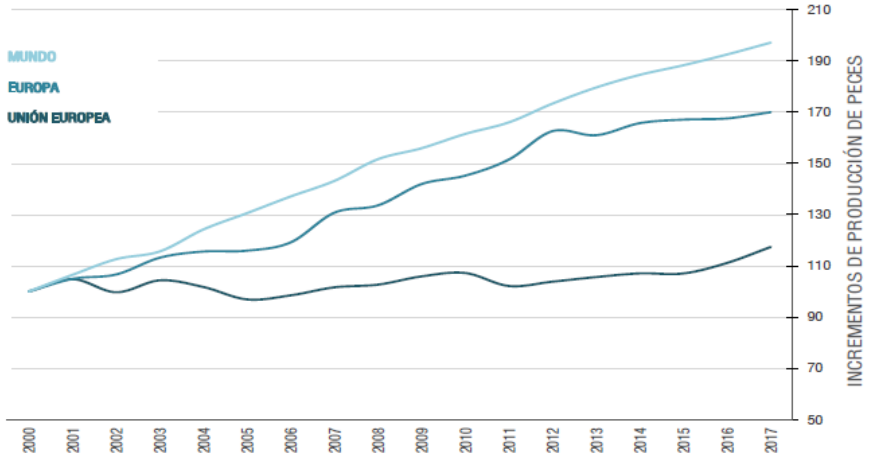
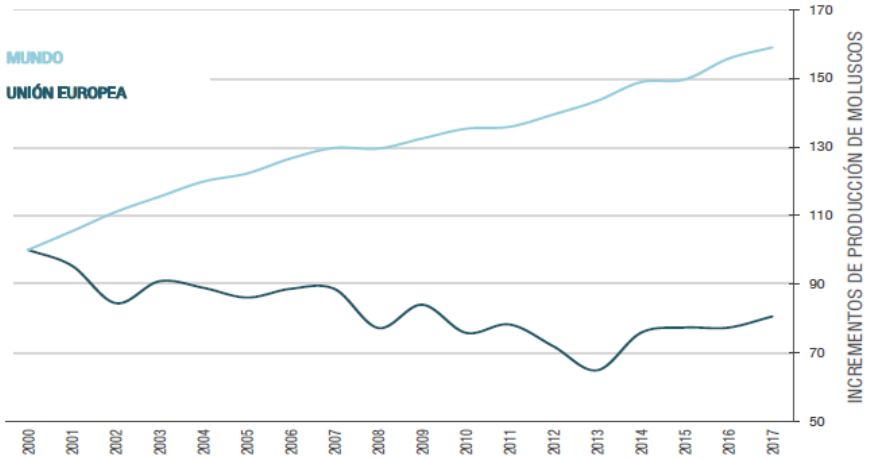



Figure 4-9. Relative evolution of increases in aquaculture mollusc production in the European union and global levels between 2000 and 2017. Cumulative percentage increases are shown, based on the year 2000 (Year 2000=100) (on FAO data).



## 4.3. Situation of shellfish aquaculture in the European Union

In 2017 17,396,477 tonnes of aquaculture molluscs were harvested worldwide. The European Union contributed 621,004 tonnes to this production, or 3.6%, and with a value in first sale of 892 million Euros.

The main producing country is Spain, based on the cultivation of mussels, followed by France (oysters) and Italy (clams). In 2017, these three countries accounted for 75.6% of the total European aquaculture mollusc harvest.

**In 2017, 17.4 million tonnes of aquaculture molluscs were harvested worldwide. The European Union contributed 0.62 million to this production and with a value in first sale of 892 million Euros.**

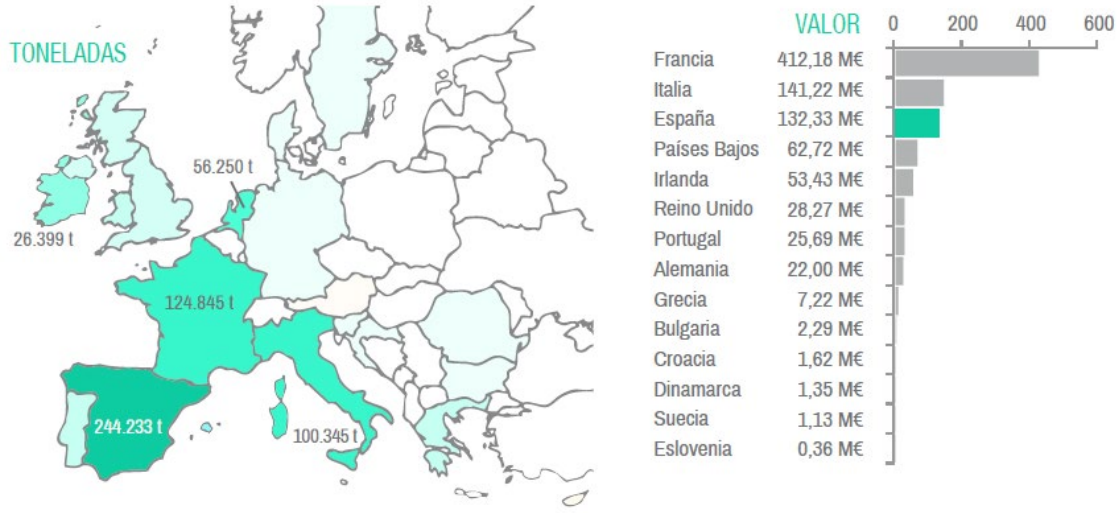



Figure 4-10. Production of aquaculture molluscs in EU Member States by volume (tonnes) and value (millions of Euros) in 2017 (on FAO data).

European production of aquaculture molluscs has in recent years seen a decrease in the amount of its harvest, reducing an average of 0,8 % per year in the last decade, from a maximum of 826,140 tonnes in 1999 to 621,004 tonnes in 2017. Its economic value is also in decline, in the order of 1.6% per year in the last 10 years.

Mussel aquaculture in the European Union put 493,844 tonnes on the market in 2017, representing 79.8% of the total mollusc harvest. It is followed in production by Pacific cupped oyster, with 82.302 tonnes (13.3%) Japanese carpet shell, with 35,113 (5.7%). Another species with significant productions is the Grooved carpet shell (5,363 tonnes).

The total value of mussels produced in the EU in 2017 was 351.3 million Euros, at an average of 0.79 Euros/kg in first sale. The Pacific cupped oyster 351.3 million Euros, at 4.27 Euros/kg. And the Japanese carpet shell 96.4 million Euros, at an average of 2.75 Euros/kg.

Table 4-5. Main species of molluscs produced by aquaculture in the European Union, by tonnes, in 2017 (FAO).

| Especie | Nombre científico | Toneladas | % Var. anual |
|---|---|---|---|
| Mejillones | *(Mytilus spp)* | 493.844 | 79,8% |
| Ostión japonés | *(Crassostrea gigas)* | 82.302 | 13,3% |
| Almeja japonesa | *(Ruditapes philippinarum)* | 35.113 | 5,7% |
| Almeja fina | *(Ruditapes decussatus)* | 5.363 | 0,9% |
| Ostra europea | *(Ostrea edulis)* | 1.669 | 0,3% |
| Almeja babosa | *(Venerupis pullastra)* | 183 | 0,0% |
| TOTAL 6 PRALES. ESPECIES | | 618.474 | 99,9% |
| RESTO DE ESPECIES | | 574 | 0,1% |
| TOTAL ACUICULTURA MOLUSCOS UE | | 619.048 | 3,4% |

Table 4-6. Main species of molluscs produced by aquaculture in the European Union, by value, in 2017 (FAO).

| Especie | Nombre científico | Valor M€ | % Var. anual |
|---|---|---|---|
| Ostión japonés | *(Crassostrea gigas)* | 351,3 | 39,4% |
| Mejillones | *(Mytilus spp)* | 390,0 | 43,7% |
| Almeja japonesa | *(Ruditapes philippinarum)* | 96,4 | 10,8% |
| Almeja fina | *(Ruditapes decussatus)* | 32,9 | 3,7% |
| Ostra europea | *(Ostrea edulis)* | 9,7 | 1,1% |
| Almeja babosa | *(Venerupis pullastra)* | 2,0 | 0,2% |
| TOTAL 6 PRALES. ESPECIES | | 882,3 | 98,9% |
| RESTO DE ESPECIES | | 9,5 | 1,1% |
| TOTAL ACUICULTURA MOLUSCOS UE | | 891,8 | 5,2% |

## 4.4. Potential for European aquaculture

Europe has 55,000 km of coastline, the second-longest coastline in the world after Canada, and offers environmental, physical and oceanographic conditions conducive to aquaculture. On the other hand, the industry of European aquaculture has proven to have the knowledge, experience and technical means to be an environmentally sustainable, economically profitable activity, offering food safe, healthy and quality, and socially acceptable with stable and quality jobs.

In addition, the European Union enjoys other advantages. The Member States of the Union are leaders in technology and research, have well-trained human resources, and as mentioned, environmental conditions are appropriate for the farming of many of the species that are most in demand today by the consumers. But, on the other hand, the stringent regulatory rules entrusted by the European Union to ensure that aquaculture products are as safe as any food, that the natural environment of its production areas is respected scrupulously, that workers have safe and motivating working conditions, and that the welfare of the animals bred has been met, offer an added value that society and consumers must be aware of.

The European Commission's Scientific Advisory Mechanism (SAM) recommends making aquaculture an explicit priority of the EU and global policies through the integration of its policies into a global policy framework for food production that takes in view of the needs of producers and consumers.

However, aquaculture in the European Union, both finfish and molluscs, has been virtually stagnant for the past fifteen years for various reasons and is not exploiting its potential source of wealth and

employment, as has been strongly recommended the FAO. This situation, coupled with lower catches of extractive fisheries, has consolidated a situation of great dependence of the EU on aquatic product imports to meet the growing demand. Presently, the European Union's fish import and processing industries are more relevant, in terms of turnover and employment, than capture fisheries and aquaculture producers combined.

Having a demanding and tight legal regulatory framework is a competitive edge that no one disputes. But when these rules are taken to unnecessary higher levels without sufficient justification, or without that increased demand providing added value to society, then they become an economic burden for the industry. This circumstance of sublimation of regulations occurs, for example, in environmental matters. However, the opposite is the case in consumer information, where the requirements are clearly lower than those demanded by consumers (e.g. by indicating at final sale points the date of capture or harvest of fresh unpackaged fish).

Sublimation at national or regional level, also called gold platting of European regulations. It results in the procedures to obtain an authorisation to carry aquaculture (license to produce), or to achieve the granting of a concession of a space in the public domain, lasting up to 8 years and unnecessarily raising business costs. Thus, the possibility of growing and taking advantage of economies of scale, or simply to start producing, entails anomalously high costs when operating within the European Union. And with these higher costs it is complex to compete with imported fish from developing third countries. On the other hand, the growing demand for the use of space in coastal and river areas by other activities leads to increased competition that confronts aquaculture with these other industries, including those relating to the construction of residential housing, tourism or capture or even recreational fishing. The management of these spaces in search of synergies is a social and political necessity.

Finally, even today there are occasional problems related to the image of aquaculture, mostly unsupported by real facts, which continue to prevent this activity from taking advantage of all the benefits of the stringent legal standards to which it must conform, both environmental issues, such as public health or animal health.

While at the level of the European Commission and the European Parliament the regulatory framework for aquaculture has improved markedly in recent years, at national, and above all regional (subnational) levels, there is considerable work to be done in relation to the implementation of EU legislation and to establishing a framework conductive to the development of this activity that ensures a level playing field for entrepreneurs in front of similar product imports, and providing a strong level of confidence for both consumers and neighbours of aquaculture farms.

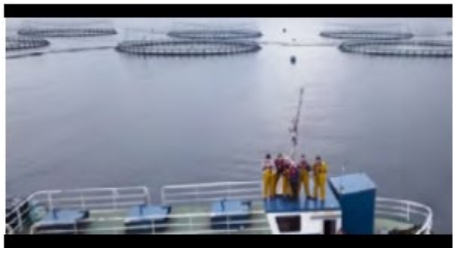
## 4.5. Videos of interest


World ORGANIZATION FOR ANIMAL HEALTH Video (OIE)

**Benefits of aquatic animals are infinite. Keep them healthy!**

Importance of fish health for the future of humanity's diet

https://youtu.be/ek9iUXWX29I



Video de GLOBAL SUSTAINABLE SEAFOOD INITIATIVE (GSSI)

**Delivering More Sustainable Seafood for Everyone.**

How to offer more healthy and sustainable aquatic products

https://vimeo.com/333938732


SPANISH FOOD AND DRINK INDUSTRY FEDERATION Video (FIAB)

**With your confidence we Feed the Future.**

Innovation to achieve the highest quality standards and ensure maximum food safety

https://www.youtube.com/watch?time_continue=6&v=jexaBiyKYnA


SEBRAE Video. MATO GROSSO

**I prefer farmed fish.**

Why prefer aquaculture fish (in Portuguese)

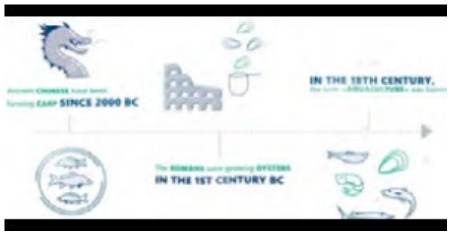
https://www.youtube.com/watch?v=H3dlH_RBmAg


Radio wedge of the AGENCY OF AGRARIAN MANAGEMENT AND PESQUERA DE ANDALUCIA (AGAPA) of the Junta de Andalucía

**In Confidence, Breeding Fish!**

About what aquaculture is

https://youtu.be/DTwUxGSwESc




Video of THE FEDERATION OF EUROPEAN AQUACULTURE PRODUCERS (FEAP)

**The Evolution of Aquaculture.**

Information on how aquaculture development has been in Europe

https://www.youtube.com/watch?time_continue=14&v=p_hmIzfO9uU

ITALY'S ASSOCIATION OF AQUACULTURE PRODUCERS (API)


### What do aquaculture fish eat?

Explanation of the composition of the feed, its traceability and control.
https://www.youtube.com/watch?v=gkXcV21iGJk&feature=youtu.be


### Aquaculture and the environment

Contribution of aquaculture to habitat conservation, biodiversity and water quality.
https://www.youtube.com/watch?v=gVBypvaJ_2w&feature=youtu.be


### Aquaculture and food security

Aquaculture products are of high quality and subject to strict health controls.
https://www.youtube.com/watch?v=IJs9yQ4i8i8


### Aquaculture and fish welfare

The importance of fish welfare and health in aquaculture.
https://www.youtube.com/watch?v=6uMh7EzU7lY

# 5. Aquaculture production in Spain and Europe

## 5.1. Aquatic food production in Spain

At the end of the 1960s Spain was in a prominent position on the world stage on the production of aquatic food. This situation was based on capture fishing, mainly done in the waters of third countries. From the 1970s on, the volume of capture fisheries activities began to decline gradually due to reduced fishing opportunities.
Aquaculture, which began in Spain in the same 1960s, despite the progressive increase in its specific weight and the expectations generated, has not been able to compensate for the decline in the capture fishing activity neither to counteract the decrease in catches.

Primary production of aquatic products in Spain in 2017, i.e. from the aquatic environment through aquaculture and capture fisheries, increased by 6% compared to 2016, up to 1,268,244 tonnes according to FAO. After two years of decline production has increased in both aquaculture (9.6%) and capture fishing (4.8%).

The mussel (*Mytilus spp.*), of which 241,785 tonnes were harvested in 2017, was the main living aquatic resource in Spain in terms of weight. On the part of capture fishing, the main species caught by the Spanish fleet was skipjack tuna (*Katsuwonus pelamis*) from which 161,790 tonnes were caught that same year.

For 2017 the aquaculture harvest figures in Spain are for a total of 313,538 tons and first sale value of 451,5 million euros. Broken down into mussels (241,785 t), European sea bass (21,269 t), rainbow trout (17,948 t) and Gilthead seabream (13,643 t) as main species.

**The aquaculture harvest in Spain in 2018 is estimated at 348,395 tonnes and a value in first sale of 472.3 million Euros.**

Based on the latest statistics collected by APROMAR, the aquaculture harvest in Spain in 2018 totalled 348,395 tonnes. This production reached a value in its first sale of 472,3millions of Euros. The main species produced have been the aforementioned mussel (273,600 t), followed by European seabass (22.460 t), rainbow trout (18,856 t) and Gilthead seabream (14,930 t).

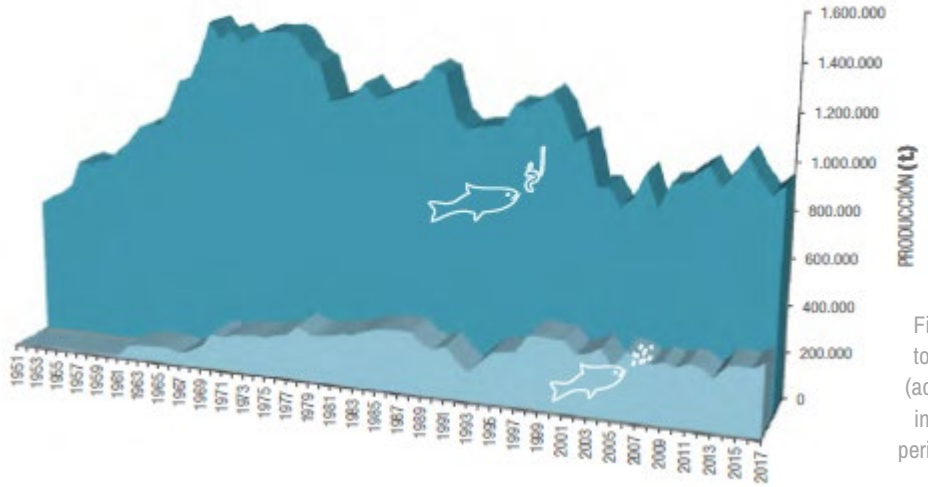



Figure 5-1. Evolution of total aquatic production (aquaculture + fisheries) in Spain (tonnes) in the period 1950-2017 (FAO).

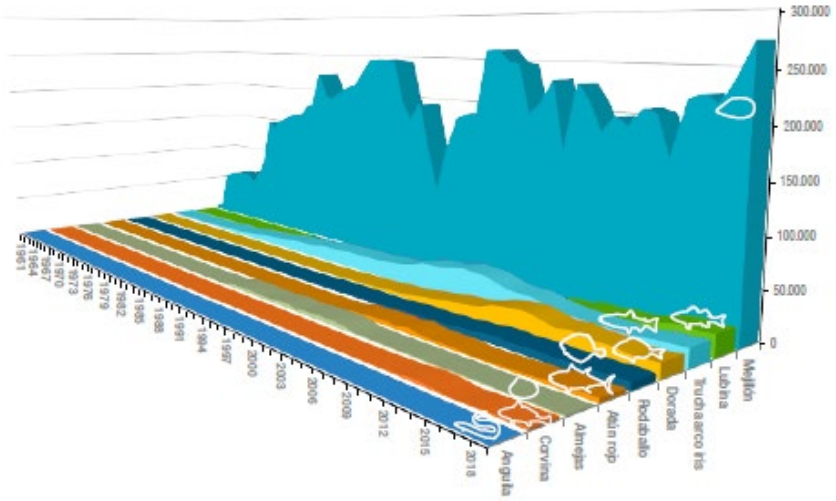



Figure 5-2. Evolution of the aquaculture harvest in Spain, in tonnes and by species, in the period 1960-2018 (MAPA and APROMAR).

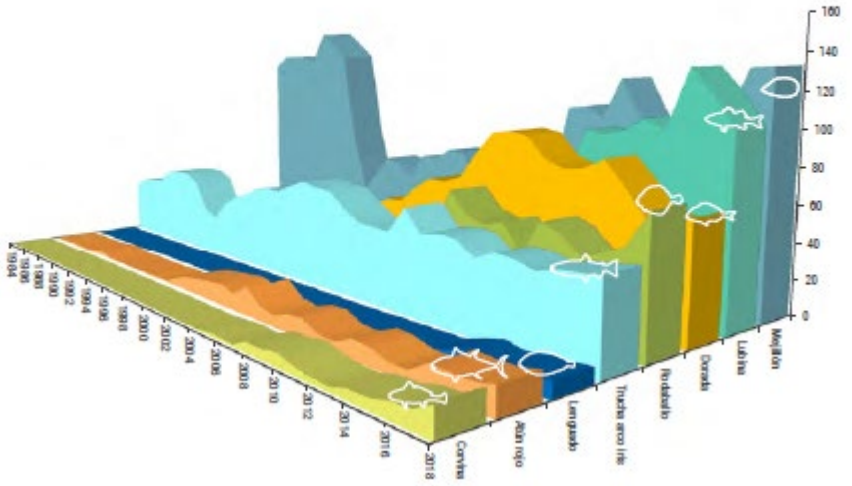



Figure 5-3. Evolution of the value of the aquaculture harvest in Spain, in millions of Euros and by species, in the period 1984-2018 (MAPA and APROMAR data).

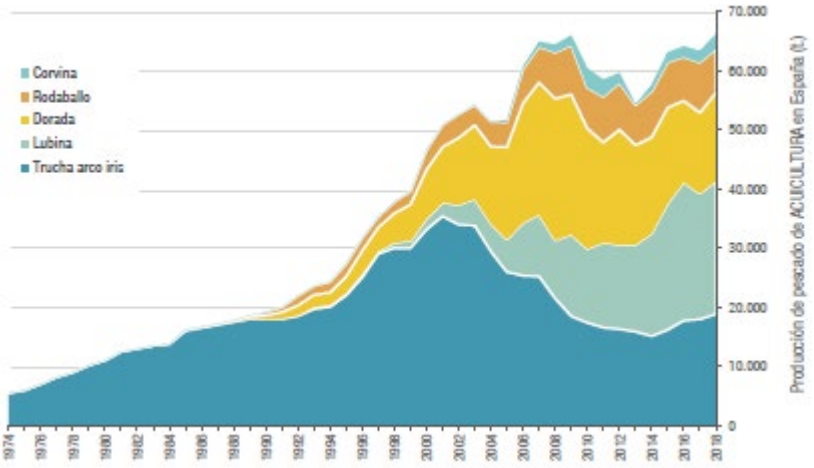



Figure 5-4. Evolution of the harvest of aquaculture finfish in Spain, in tonnes and for the main species, in the period 1975-2018 (MAPA and APROMAR).

## 5.2. Types of aquaculture facilities in Spain

Spain has a wide range of water resources on which aquaculture is feasible, both in marine and inland (freshwater) areas. Thus, to the almost 8,000 km of coastline are added nine large rivers, numerous minor river courses, lakes and dammed water capacity of more than 55,000 hm3, in addition to an orography and diversity of climates that provide environmental and physiochemical characteristics suitable for the development of aquaculture.

Aquaculture facilities are designed and built to meet the needs of the species produced and adapted to the conditions of the physical environment. In this way, the following categorization of aquaculture facilities in Spain can be made:

### AQUACULTURE FACILITIES IN SPAIN

- **At sea in pens.**
  These facilities consist of rigid plastic rings that support and float net bags inside which finfish such as Gilthead seabream, European seabass or meagre are stocked and raised.

- **At sea in platforms and long-lines.**
  These are floating structures for the cultivation of bivalve molluscs, mainly mussels. The platforms consist of a structure from which the culture ropes hang, and the *long-lines* are non-rigid structures consisting of a mother line, arranged between buoys linearly on the sea surface, from which hang in turn the ropes of culture. The platforms operate better in sheltered waters, as in the case of Galician estuaries, while *long-lines* offer better results in open water, as is the case of mussel cultivation in Andalusia.

- **On the coast line (salt water).**
  These are facilities built on land on the coast and obtaining their water by pumping from the sea or wells. It is the type of farm on which the production of turbot is carried out, for example, or sole.

- **On the beach, intertidal areas and estuaries (salt water).**
  They are aquaculture facilities where the farming is carried out with minimal physical intervention on the environment. This is the case with the production of clams and oysters. It is done in beach or intertidal areas where animals are deposited directly on the substrate or inside meshes on tables. It is also the type of farms located in ponds dug into the land in ancient salt areas or marshes, being an example of this the estuaries for the production of finfish such as Gilthead seabream, European sea bass or meagre.

- **In land (fresh water).**
  They consist of facilities built on the banks of rivers, or their sources, that take advantage of the circulation by gravity of the water. It is the type of farm in which the production of rainbow trout or sturgeon take place.

## 5.3. Number of aquaculture facilities in Spain

In 2017 a total of 5,100 aquaculture establishments were in operation and with production in Spain. Of these, 4,793 were of molluscs in marine aquaculture, consisting of platforms and "long-lines" in which vertical farming of mussels and other molluscs are done. Freshwater aquaculture had 187 active farms, essentially for finfish such as rainbow trout and sturgeon. The number of facilities on the coast, beaches, intertidal areas and estuaries was 79. And operating in pens at sea there were 41, for finfish farming.

Statistics show a persistent reduction over the years in the number of aquaculture facilities in Spain, from a peak in 2007 with 5,313 to the current 5,100.

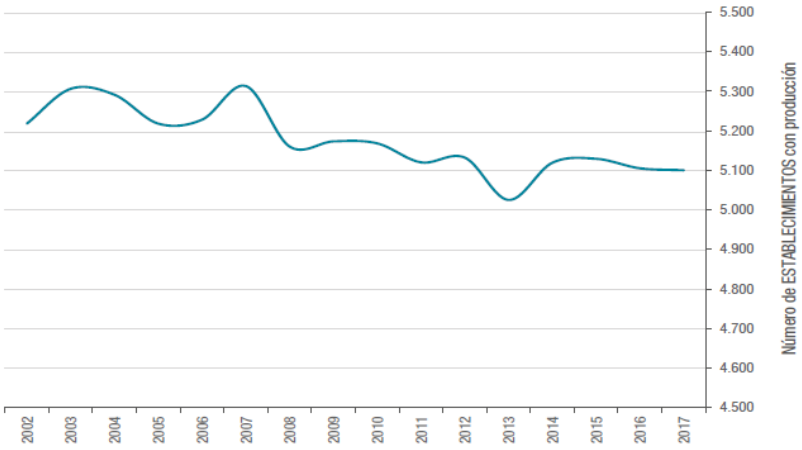



Figure 5-5. Evolution of the total number of aquaculture facilities in Spain with production between 2002 and 2017 (Source MAPA/APROMAR).

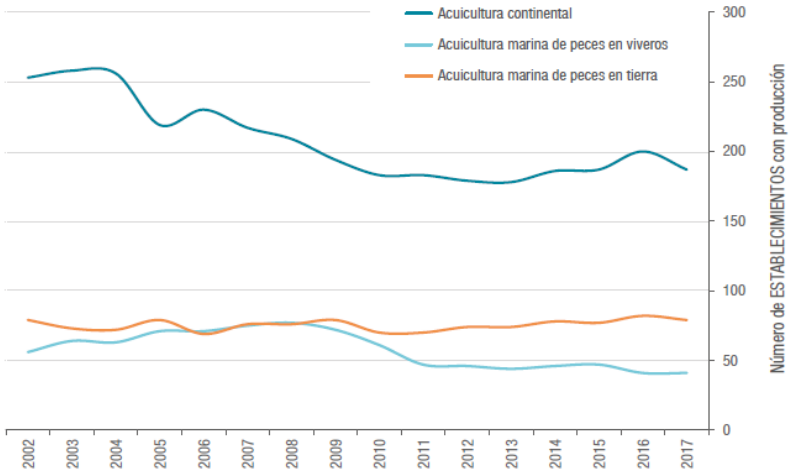



Figure 5-6. Evolution of the number of aquaculture facilities in Spain with production, dedicated to freshwater aquaculture, to marine fish in pens and in marine onshore fish farms between 2002 and 2017 (source MAPA/APROMAR).

## 5.4. Employment in aquaculture in Spain

Statistics produced annually by the Spanish Ministry of Agriculture, Fisheries and Food (MAPA) indicate that the number of annual units of work (UTAs) in aquaculture in Spain in 2017 was 6,301, although this figure was distributed among 16,151 persons. Most of these, 9,324, were non-employees (self-employed), mainly from the mussel subsector. It was followed by 3,559 specialized operators, 2,228 non-specialized operators, 701 qualified or medium-qualified technicians, 278 office staff and 61 people with other professional categories.

It is noteworthy that since 2007 there has been an agreement between trade unions and employers to regulate minimum working conditions and salaries in marine aquaculture in Spain. On June 5th of 2019, the Fifth National Collective Labour Agreement for Marine Aquaculture was published in the Official Journal that applies to 2018-2020.

The evolution of aquaculture employment in Spain shows over the years a declining trend in the number of people employed. However, the statistics measured in Annual Units of Work show a situation of relative stability.

The estimated indirect employment associated with the 17,811 people working in aquaculture was 40,378 jobs.

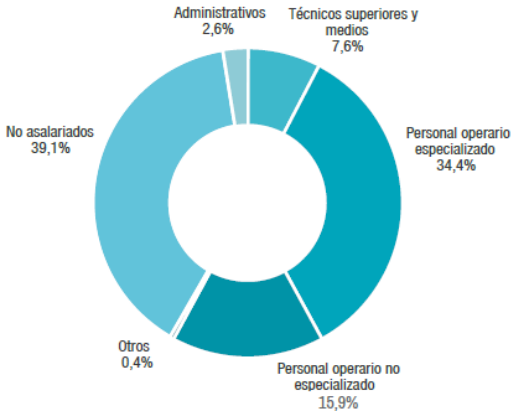



Figure 5-7.
Distribution of employment in aquaculture in Spain, by professional category, in 2017 calculated on Annual Working Units (MAPA).

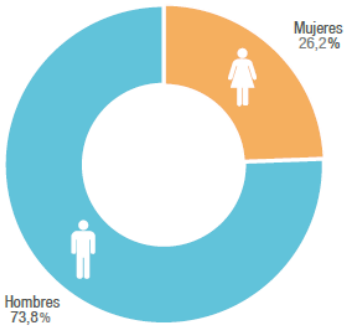



Figure 5-8.
Distribution of employment by sex calculated on the number of people in aquaculture in Spain in 2017 (MAPA).

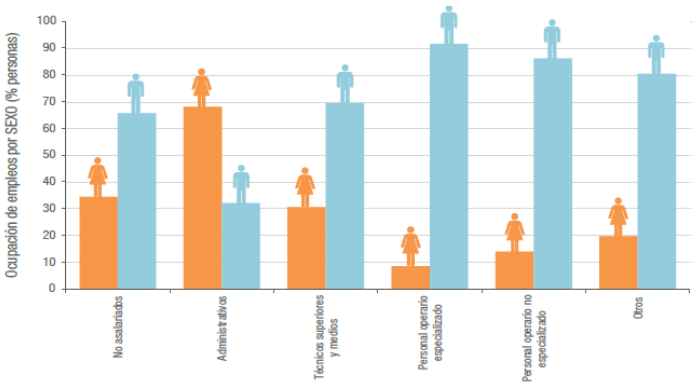



Figure 5-9.
Occupation of jobs by sex calculated on the number of people in aquaculture in Spain in 2017 (MAPA).

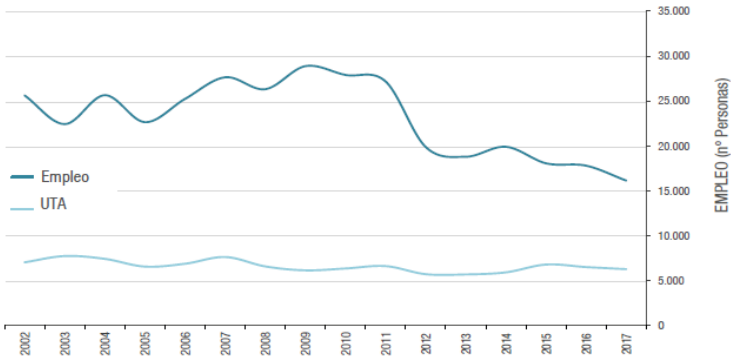



Figure 5-10. Evolution of employment in aquaculture in Spain during the period 2002-2017, showing the figures of people and Annual Working Units (MAPA).

## 5.5. Consumption of aquaculture feed in Spain

The feeding of aquaculture animals, in particular fish, is a key element of the viability of aquaculture. The optimization of the use of raw materials, knowledge about nutrients, their digestibility and the correct management of feed at the farms are essential for the responsible development of this activity. In 2018, 140,050 tonnes of aquaculture feed were used in Spain. This amount is 8.4% higher than in 2017. 85.1% of it was administered to marine fish: European seabass, meagre, turbot, Gilthead seabream, eel and sole, mainly. And the remaining 14.9% to freshwater species such as trout and sturgeon. The amount of aquaculture feed used in Spain only accounts for 1% of the total livestock feed consumed in this country.

The feed used by Spanish aquaculture farms is almost entirely extruded type and has been mainly produced in the country itself, being supplemented by imports from other EU Member States, mainly France and Portugal. The location in Spain of feed mills facilitates the realization of an important research and innovation activity in the field of nutrition and fish feeding. This innovation is promoted from the feed-making companies themselves and by aquaculture farming companies, but public research centres and universities also play a crucial role.

There is no feed consumption in the cultivation of molluscs as they are filter animals. Their diet is based on the use of the natural productivity of the waters, whose nutrients favour the presence of plankton that is filtered and consumed by molluscs. Galicia, which is the main mollusc-producing region in Spain and Europe, stands out for the high natural productivity of its five main estuaries.

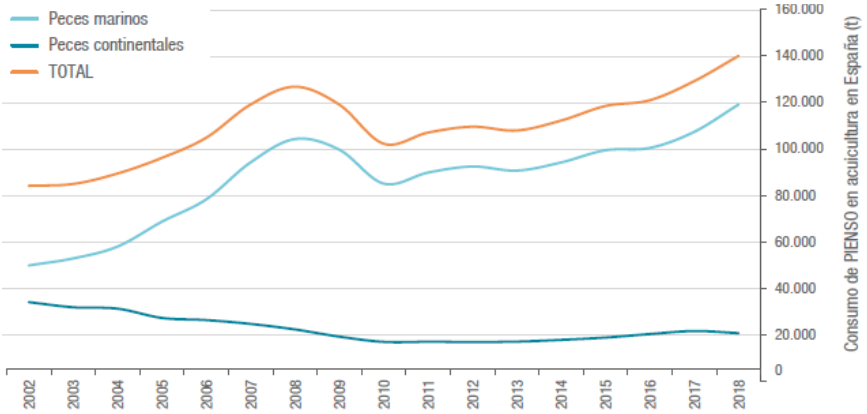



Figure 5-11. Evolution of feed consumption (tonnes) for aquaculture in Spain broken down between marine and freshwater finfish during the period 2002-2018 (Skretting and Biomar sources).

## 5.6. Marine aquaculture in Spain and Europe

The species produced by aquaculture in Spanish marine waters, and contemplated in greater detail in this report, are Gilthead seabream, European seabass, turbot, meagre, sole, bluefin tuna, mussels, clams, oysters and abalones. They are also analysed, but with less detail, other species of interest such as European eel, Blackspot seabream, Greater amberjack, shrimps, microalgae and macroalgae.

# Marine finfish farming

The farming of marine finfish in Spain maintained a vigorous growth path from its beginnings in the 1980s until 2009, when it reached 48,441 tonnes harvested. However, in the years since then it has suffered a stagnation that only in 2015 began to be overcome, which in 2018 marked 48,562 tonnes and that by 2019 is expected to exceed 52,000 tonnes.

The Valencian Community is the largest marine fish farming region in Spain in 2018 with 15,219 tonnes, followed by the Murcia region with 10,709 tonnes, the Canary Islands with 8,173 tonnes, Andalusia with 6,576 tonnes and Galicia with 7,750 tonnes. Production in Catalonia has been declining over the years and is now anecdotal (30 tonnes).

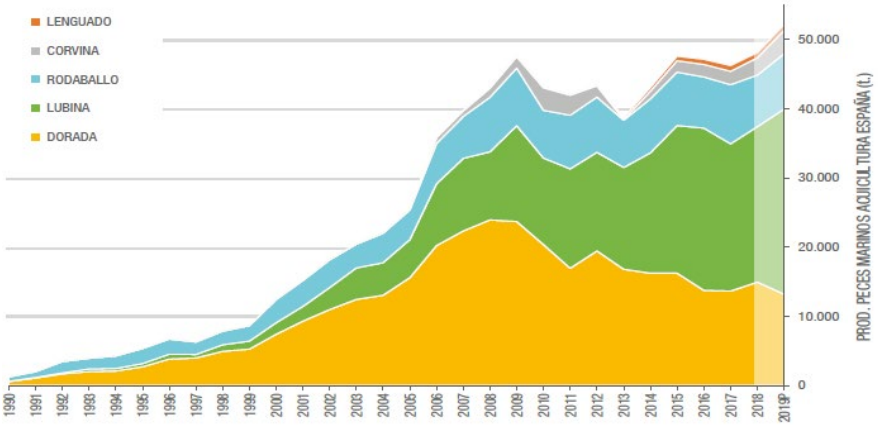



Figure 5-12. Evolution of the harvest (tonnes) of marine aquaculture finfish in Spain in the period 1990-2019.

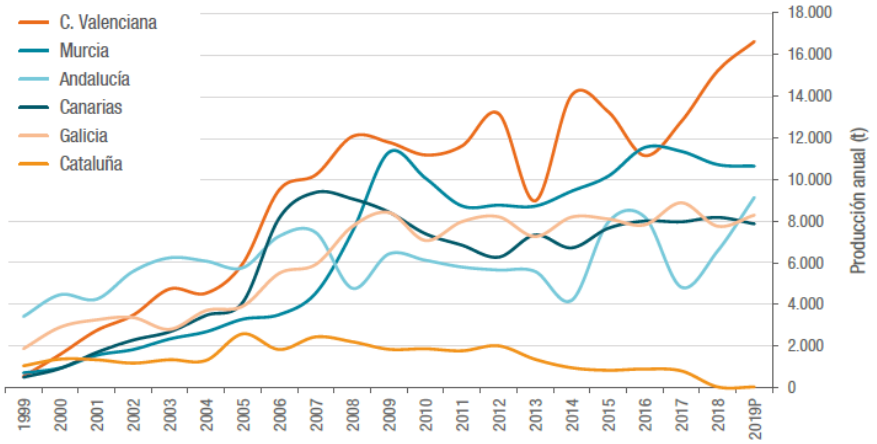
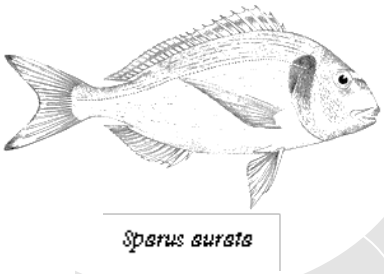



Figure 5-13. Evolution of the harvest (tonnes) of aquaculture marine fish in the different Autonomous regions in Spain for the period 1999-2019.

Species

SEABREAM




**GILTHEAD SEABREAM** (*Sparus aurata*)
Class: Osteidacty - Order: Perciformes - Family: Sparidae

**Significant characters:** High oval body and laterally flattened. Large head with arched profile. Silver-grey coloration with a dark spot at the beginning of the sideline and a small scarlet band on the upper edge of the operculum. Shows a characteristic golden band between the eyes. Forked caudal fin. It reaches a size of up to 57 cm in length. It is a proteranical hermaphrodite animal, first mature as a male and from the second or third year becomes female. It can live more than 10 years.

**Habitat and biology:** Coastal species found in brackish and marine waters. It is distributed in wildlife along the eastern shores of the Atlantic Ocean, from Great Britain to Cape Green, and all over the Mediterranean Sea. Protruding Hermaphrodite first matures as male and from the second or third year becomes female. You can live more than 10 years.

**Farming:** It takes place in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under tightly controlled conditions. Each female gets to lay 2 million eggs of 1 mm in diameter per kilo of weight. During their first month of life, the larvae feed on living organisms: rotifers and artemia. They later on fed a diet with feed made from natural raw materials. The ongrowing facilities are varied: floating pens at sea, concrete tanks or ponds on land. Each Gilthead seabream takes between 18 and 24 months to reach 400g since hatching. The commercial size ranges from 250 g to more than 2.000 g.

## SEABREAM farming

Total aquaculture production of gilthead seabream (*Sparus aurata*) in Europe and the rest of the Mediterranean in 2018 is estimated at 246.839 t according to statistics from APROMAR, FEAP and FAO. This figure is 10.7% higher than in 2017. For 2019, it is estimated a growth of 2,4% to reach almost 253.000 tonnes.

The total first-sale value of Mediterranean aquaculture of seabream in 2018 is estimated at 1.111 million Euros.

Aquaculture of Gilthead seabream exists in 20 countries, with the main producers being Turkey with 83,000 tonnes (representing 33.6% of total production), Greece with 61,000 tonnes (24.7%), Egypt with 36,000 t (14.6%) Spain with 14,930 t (6.0%). But it is also farmed in Tunisia, Italy, Cyprus, Croatia, Malta, Israel, France and Portugal, and there are minor productions in Albania, Algeria, United Arab Emirates and Bosnia, among others.

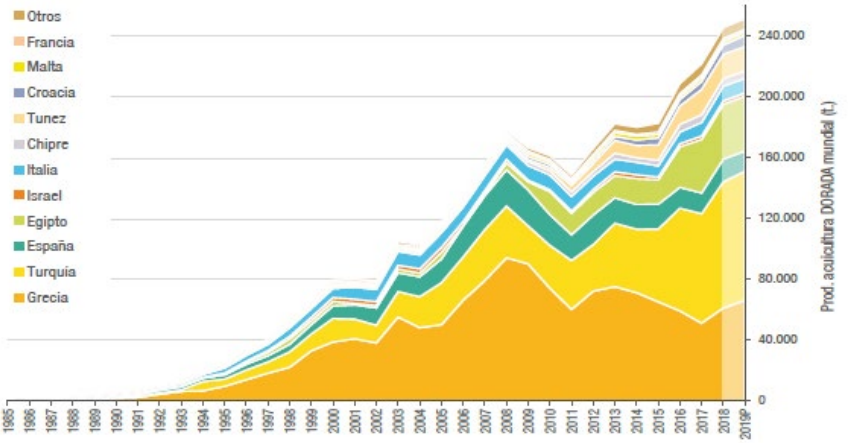



Figure 5-14. Evolution of aquaculture production of Gilthead seabream (tonnes) in the Mediterranean area and the rest of the world for the period 1985-2019 (On FAO, FEAP and APROMAR data).

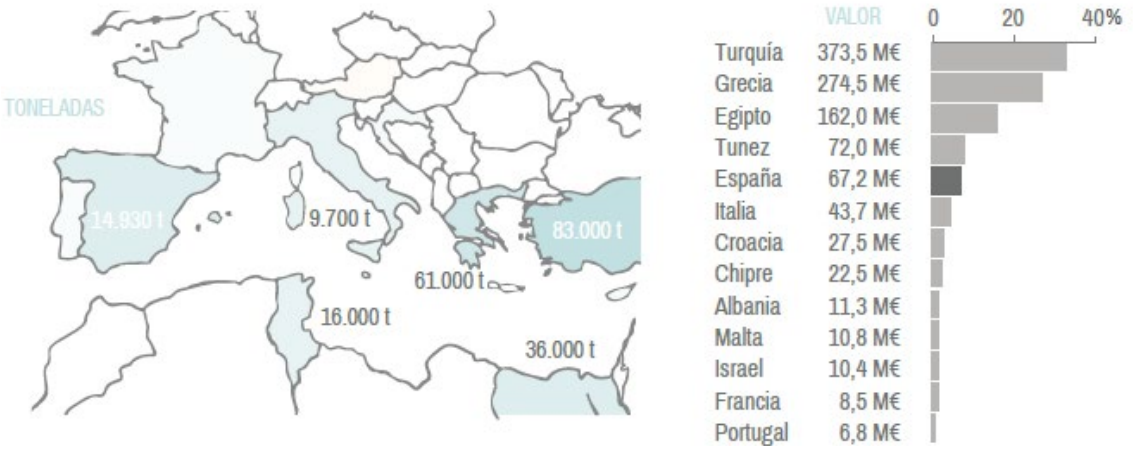



Figure 5-15. Distribution of aquaculture production of Gilthead seabream in the Mediterranean area in 2018 by volume (tonnes) and value (millions of euros), on FAO, FEAP and APROMAR data.

Total production of gilthead seabream juveniles in 2018 in Europe (including Turkey) is estimated to be 734,299 million units, up 1.4% from 2017. The main producing country is Turkey (260 million) followed by Greece (250 million). Further down are Italy (80 million), France (65.6 million) and Spain (37.5 million juveniles). In any case, the difficulty of contrasting these figures is relevant, especially in Greece and Turkey. It is estimated that the production of juvenile of this fish will decrease by -2.3% in 2019, to 717 million units.

The capture from fishing ports in the Mediterranean Sea and Atlantic Ocean of gilthead seabream from fishing vessels totalled 9,258 tonnes in 2018, up 11.8% than the previous year. However, this amount remains relatively constant in recent years, fluctuating between 6,000 and 9,500 tonnes per year, while farmed seabream accounts for 96.4% of the total supply of this species.

The harvest of aquaculture bream in Spain in 2018 was 14,930 tonnes, 9.4% more than the previous year. By 2019, a decrease of -11.6% is estimated to 13,200 tonnes. The maximum harvest in Spain of farmed Gilthead seabream took place in 2008, with 23,930 t. In 2018, the Valencian region has led the production of aquaculture of this species in Spain with 7,806 t (52% of the total), followed by Murcia (3,184 t, 21%), the Canary Islands (2,380 t, 16 %) and Andalusia (1,560 t, 10%).

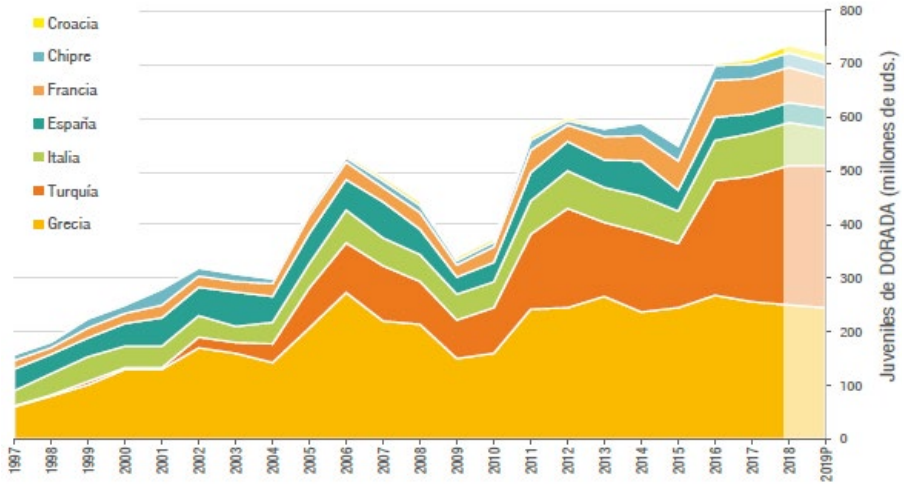



Figure 5-16. Evolution of the total production of juveniles of gilthead seabream (millions of units) in the Mediterranean area for the period 1997-2019 (on FEAP and APROMAR).

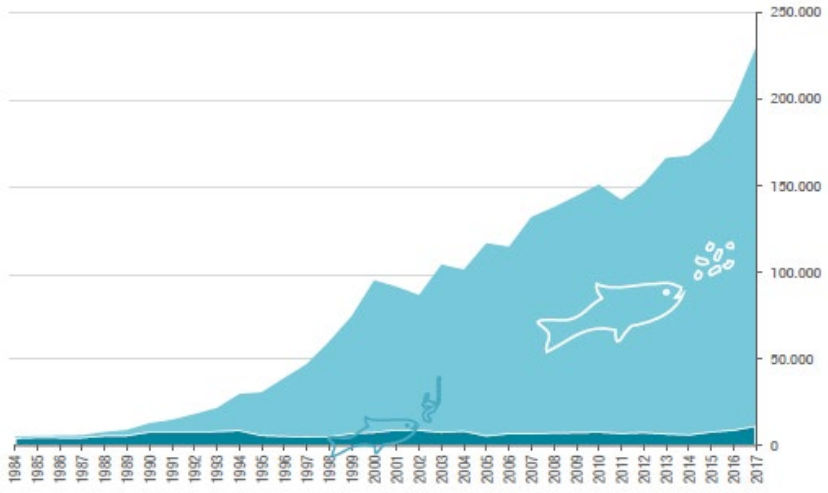



Figure 5-17. Evolution of world production (tonnes) of gilthead seabream (*Sparus aurata*), through aquaculture and fisheries, for the period 1984-2017 (FAO).

Although a small amount of wild seabream caught by fishing vessels continues to arrive in Spanish fishing ports today (1,227 tonnes in 2017), its volume remains relatively constant around that number, while farmed Gilthead seabream means 93.3% of the total seabream placed on the market.

The production of juveniles of gilthead seabream in Spain in 2018 was 37.5 million units, an increase of 2.3% over the previous year's number. It is estimated that production in 2019 will grow slightly, 3.8%. The production of juveniles of gilthead seabreams is concentrated in the Valencian Community (59%), Cantabria (22%), Balearic Islands (23%) Andalusia (9%).

The average purchase price of juveniles of Gilthead seabream in Spain, at equivalent weight of 2 g per unit, is estimated at 0.22 euros/unit.

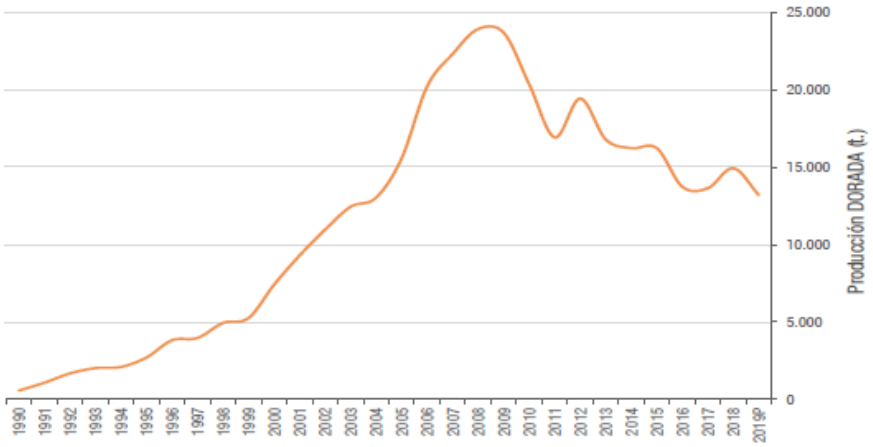



Figure 5-18. Evolution of aquaculture production of gilthead seabream (*Sparus aurata*) in tonnes (1990-2019).

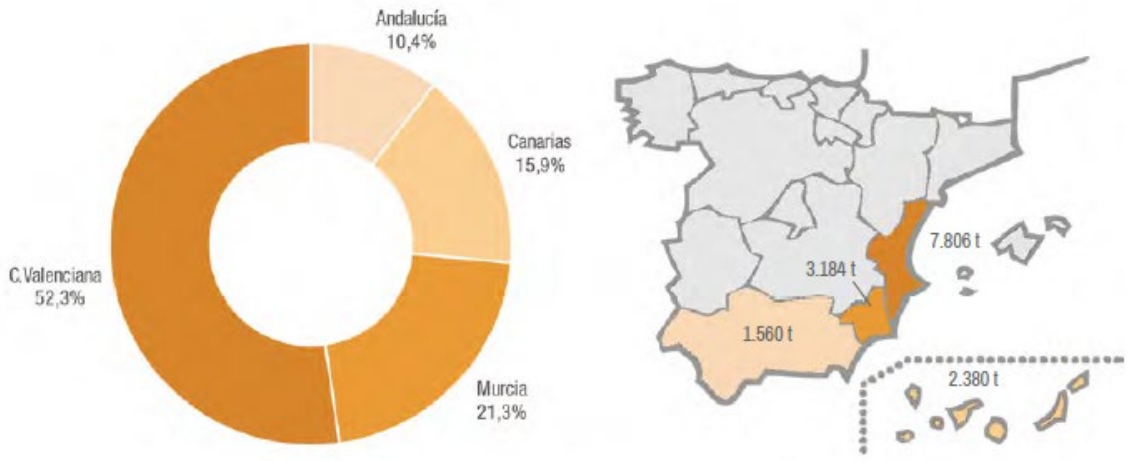



Figure 5-19. Distribution percentage productions (tonnes) of Gilthead seabream in Spain by Autonomous region for 2018.

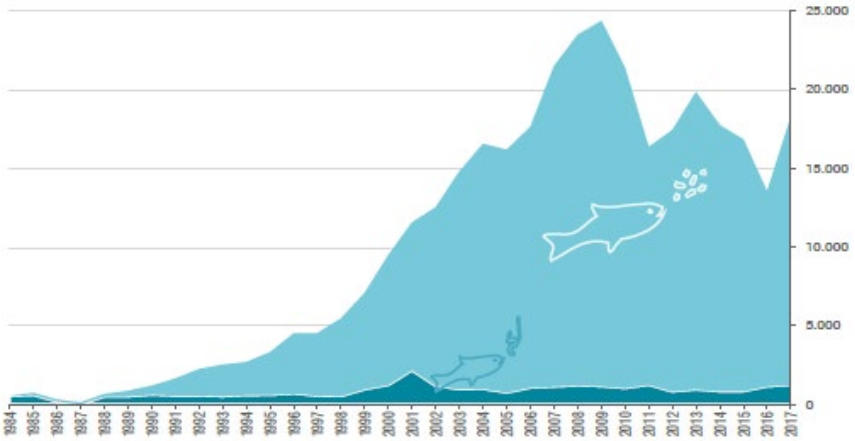



Figure 5-20. Evolution of the sources of Gilthead seabream (Sparus aurata) in Spain in tonnes: aquaculture and fisheries, in the period 1984-2017 (MAPA-FAO).

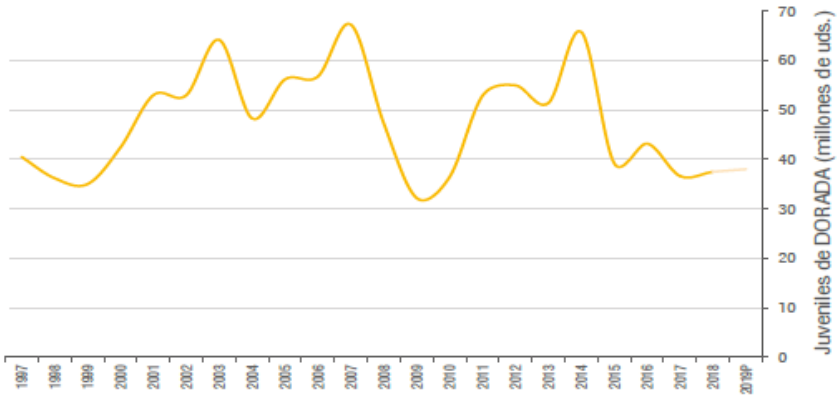


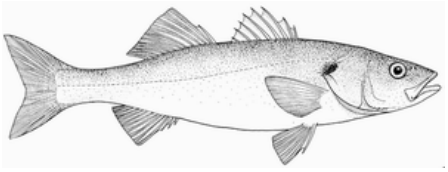

Figure 5-21. Evolution of the production of juveniles of gilthead seabreams in millions of units (1997-2019).

# SEABASS farming

Total aquaculture production of European seabass (*Dicentrarchus labrax*) in Europe and the rest of the Mediterranean arc in 2018 was 196,573 tonnes, according to consolidated statistics from FAO, FEAP and APROMAR. This figure is -2.1% lower than the previous year. This is the first year that they decrease, although slightly, after increases since 2012. By 2019, a recovery is estimated with growth of 7% to almost 210,000 tonnes.



## SEABASS



*Dicentrarchus labrax*

**EUROPEAN SEABASS** (*Dicentrarchus labrax*)

Class: Osteidacty - Order: Perciformes - Family: Moronidae

**Significant characters:** Fusiform and vigorous body with large scales. Pointed head with small nasal openings, small eyes and large mouth. The lower jaw is prominent. Pale grey coloration, darker on the dorsal and silvery sides. On the operculum has a black spot. Slightly forked caudal fin. It reaches a size of up to 70 cm in length. It tolerates wide variations in temperature and salinity of water. The first sexual maturation usually occurs at 2-4 years. Its longevity is estimated at about 30 years.

**Habitat and biology:** Pelagic littoral species that is distributed naturally along the coasts Eastern Atlantic Ocean, English Channel and Baltic Sea, from Norway to Morocco, and all over the Mediterranean Sea. It frequents estuaries and coastal lagoons. Can live in a wide variation of temperature and salinity of the water. The first sexual maturation occurs Usually at 2-4 years. Its longevity is estimated at about 30 years.

**Farming:** European seabass is a fish that is farmed in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under tightly controlled conditions. Each female gets to lay 250,000 eggs of 1 mm in diameter per kilo of weight. During their first month of life, the larvae feed on living organisms: rotifers and artemia. They then start to eat based on feeds made from natural raw materials. The breeding facilities are varied: floating pens at sea, concrete tanks or ponds on land. Each seabass takes between 20 and 24 months to reach 400g since hatching the egg. The commercial size ranges from 250 g to more than 2,500 g.

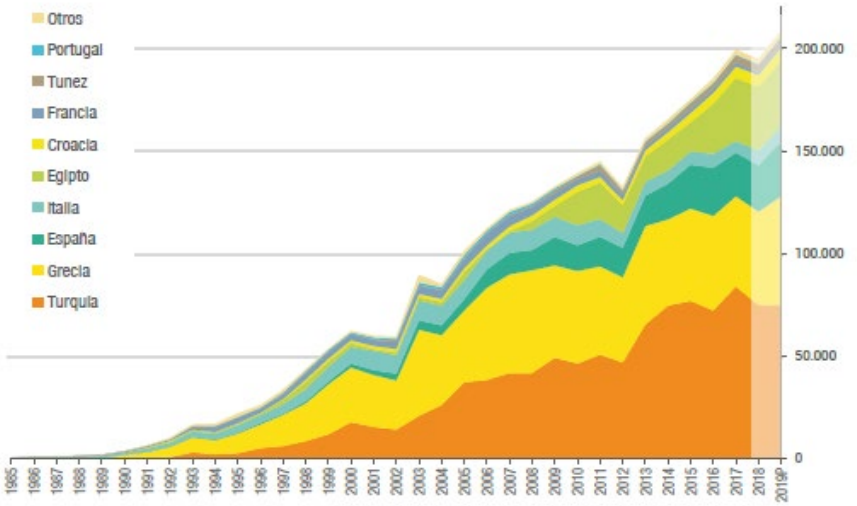



Figure 5-22. Evolution of total production (tonnes) of aquaculture seabass in the Mediterranean area and the rest of the world in the period 1985-2019 (On FAO, FEAP and APROMAR data).

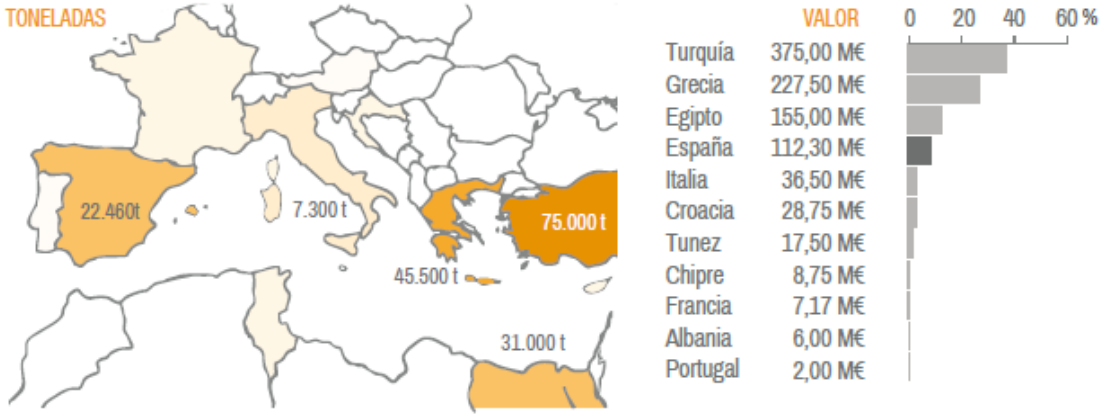



*Figure 5-23. Distribution of sea bass* aquaculture production in the Mediterranean area in *2018 by volume (tonnes) and value (millions of Euros), on* FAO, *FEAP and APROMAR data.*

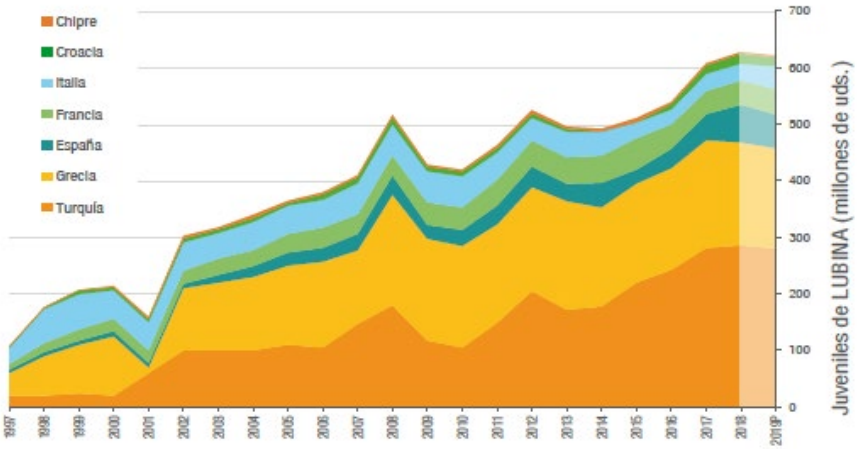



Figure 5-24. Evolution of the total production of juvenile European seabass in the Mediterranean area in the period 1997-2019, in millions of units (on FEAP and APROMAR).

The total first-sale value of aquaculture European seabass in 2018 was approximately 982.9 million Euros.

The main European seabass producing countries are Turkey, with 75,000 tonnes (representing 38.2% of total seabass), Greece with 45,500 tonnes (23.1%), The production of juvenile seabass in 2018 in Europe (including Turkey) reached 627 million units, up 3.3% from 2017. The main producing country is Turkey with 286 million, followed by Greece with 182 million. While with smaller productions are Spain (66.5 million), France (42.7 million) and Italy (30.0 million juveniles). By 2019, an estimated 622 million juveniles of sea bass are estimated, meaning -1% less.

Egypt with 31,000 tonnes (15.8%) and Spain with 22,460 t (11.4%). But seabass is farmed in a total of 19 countries, including, in addition to the previous ones, Italy, Egypt, Croatia, France, Tunisia, Portugal, Cyprus, Israel, United Kingdom, Bosnia, Algeria, Montenegro, Malta, Slovenia and Morocco.

Although seabass from capture fisheries continues to be unloaded in the fishing ports of various countries in the Mediterranean Sea and the Atlantic Ocean, 5,463 tonnes in 2017 (5% less than the previous year), this amount decreases slightly since 2013, while farmed seabass account for 97.5% of the total.

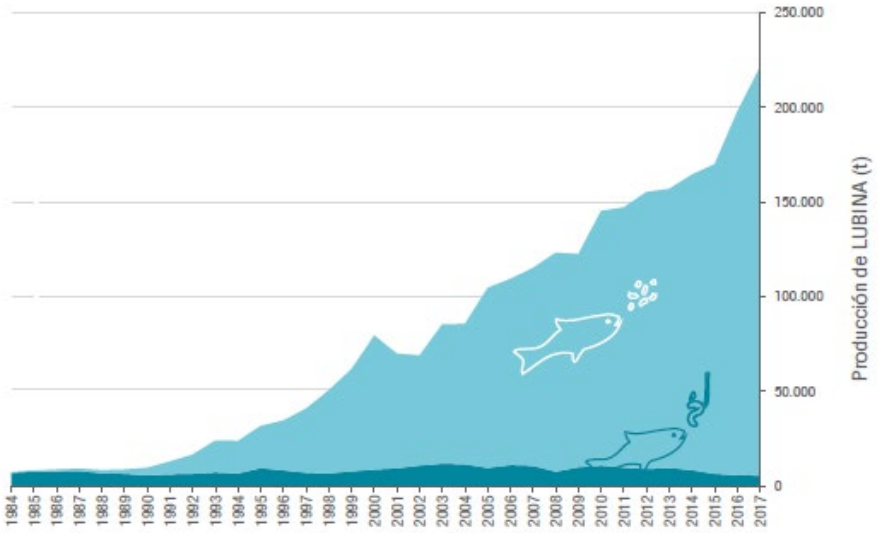



Figure 5-25. Evolution of total global production (tonnes) of European seabass (*Dicentrarchus labrax*), through aquaculture and fisheries, in the period 1984-2017 (FAO).

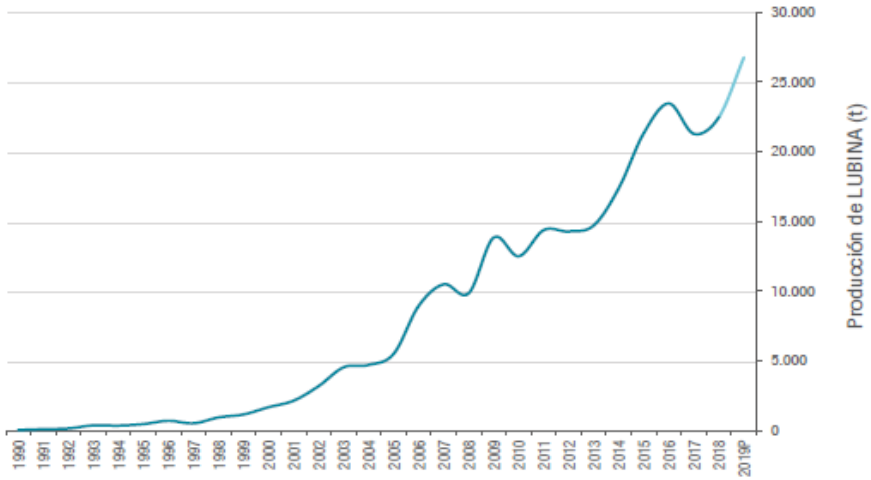



Figure 5-26. Evolution of aquaculture production of seabass (*Dicentrarchus labrax*) in tonnes (1990-2019).

The harvest of aquaculture seabass in Spain in 2018 was 22,460 tonnes, 5.6% more than in 2017. The Region of Murcia has led the production,7,525 tonnes (34% of the total), followed by the Canary Islands (5,793 t, 26%), Valencia's region (4,633 tonnes, 21%), Andalusia (4,479 t, 20%) and Catalonia (30 t, 0.1%).

For 2019, European seabass harvest is expected in Spain to reach 26,740 t, or a growth of 19.1%.

Although a small amount of wild seabass is caught by fishing boats and arrive to Spanish fishing ports today (602 tonnes in 2017), its volume remains relatively constant close to that amount, while farmed sea bass is 96.7% of the total.

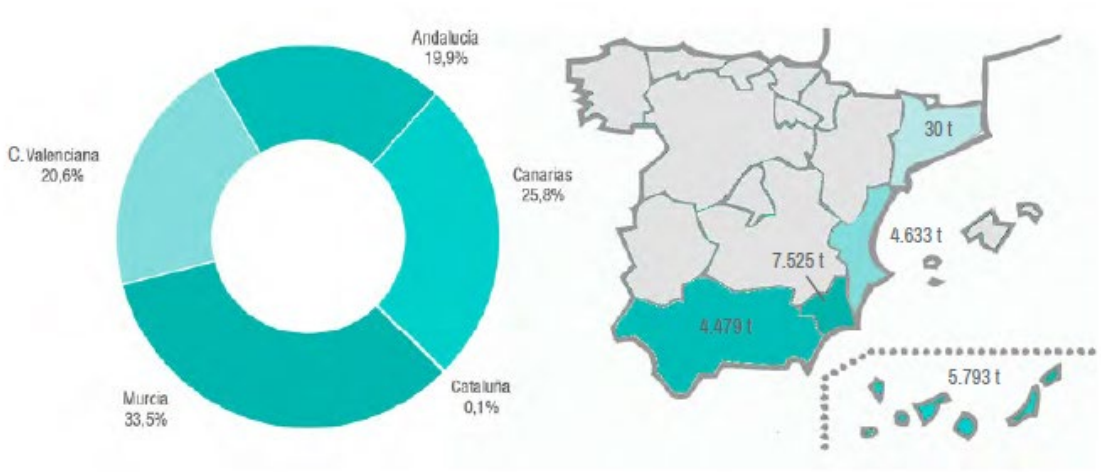



Figure 5-27. Percentage distribution of seabass production (tonnes) in Spain by Autonomous regions in 2018.

The production of juvenile seabass in Spain in 2018 has been of 66 million units, an increase of 35,1% over the figure of 2017. The production of juvenile seabass in Spain is carried out in the Balearic Islands (65%), Valencian region (20%), Cantabria (10 %) Andalusia (5%). By 2019 it is estimated that the production of juvenile seabass in Spain will decrease by -11.2% to fall to almost 59 million units.

The average purchase and sale price of juvenile bass in Spain, at equivalent weight of 2 g per unit, is estimated at 0.22 euros/unit.

Spanish production of commercial-sized seabass requires the importation of juveniles in addition to those of domestic production. The origin of these fish is, by order of importance, France, Italy and Greece. Although juveniles from Spain are also exported to other countries.

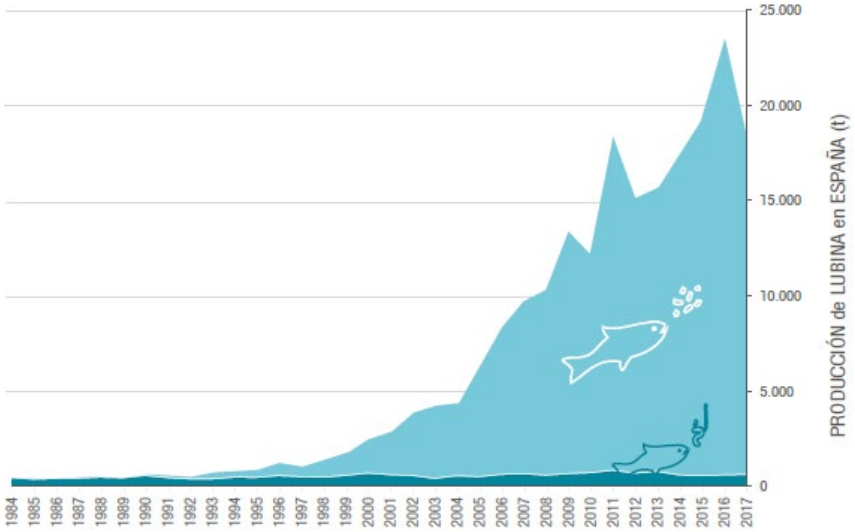



Figure 5-28. Evolution of seabass sources (*Dicentrarchus labrax*) in Spain: aquaculture and fishing in tonnes, for the period 1984-2017 (MAPA-FAO).

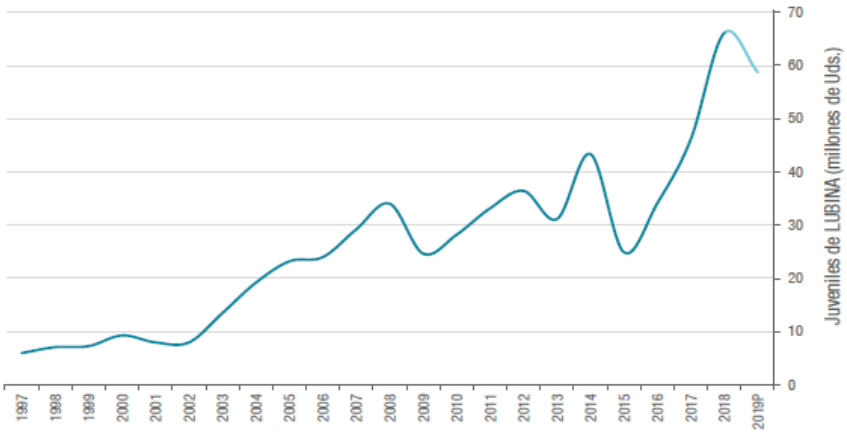



Figure 5-29. Evolution of the production of juvenile of seabass in Spain in millions of units (1997-2019).

## Joint figures on the farming of SEABREAM and SEABASS

Given the very similar environmental and biological requirements of seabream and seabass, their ways of production are very similar. As a result, they are often grown on the same farms and both are replaceable. Even at the market level, the situation of gilthead seabream affects that of seabass, and vice versa. It is therefore interesting to show the joint analysis of the production of both species.

Total aquaculture production of seabream and seabass in Europe and the rest of the world in 2018 is estimated at 443,412 tonnes, according to consolidated statistics from FEAP, APROMAR and FAO. This figure is 4.7% higher than the previous year. Growth of 4.5% to over 460,000 tonnes is expected to occur by 2019.

The combined production of juveniles of seabream and seabass in the Mediterranean area in 2018 (not including Egypt, nor Tunisia) has been 1.362 million units, an increase of 3.6% over the previous year's data. The main producer countries in order of importance are Turkey (546 million), Greece (432 million), Italy (110 million), France (108 million) and Spain (104 million). Production is expected to be virtually stable compared to the previous year (a decrease of -1.7 %) meaning an approximate production of 1.339 million juveniles.

Total aquaculture production of seabream and seabass in Spain in 2018 was 37,390 tonnes, up 7.1% from the previous year. The largest production took place in the Valencian region (33% of the total), followed by Murcia (29%), the Canary Islands (22%), Andalusia (16 %) and Catalonia (0.1%).

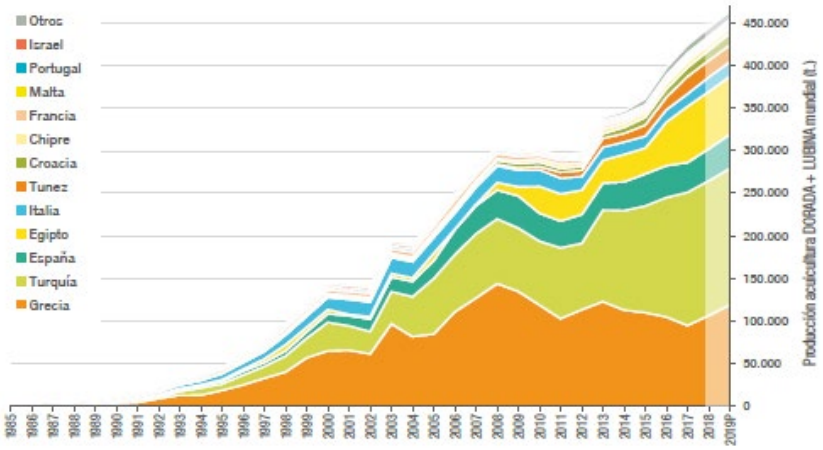



Figure 5-30. Evolution of joint production of aquaculture seabream and seabass (tonnes) in the Mediterranean area and the rest of the world for the period 1985-2019 (On FAO, FEAP and APROMAR data).

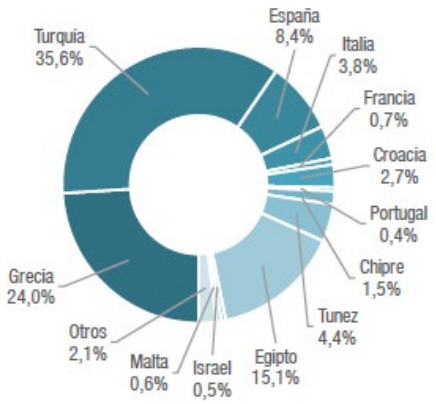



Figure 5-31. Distribution of aquaculture production of seabream plus seabass in the Mediterranean area in 2018 by volume (tonnes) and value (millions of euros), on FAO, FEAP and APROMAR data.

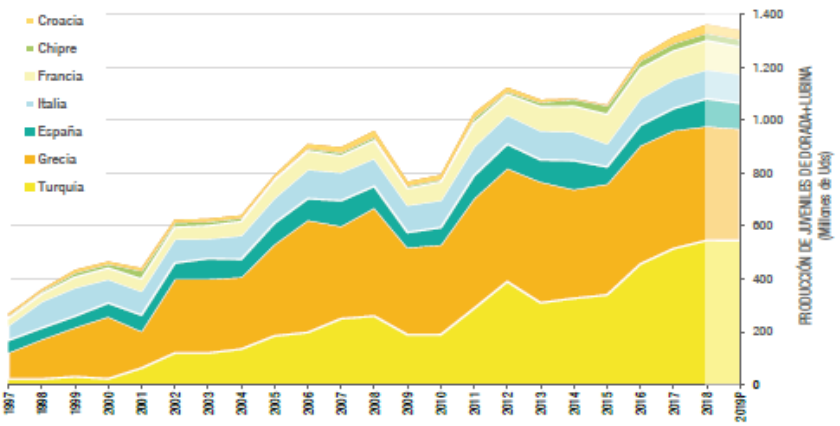



Figure 5-32. Evolution of the joint production of juveniles of gilthead seabream and European seabass in the Mediterranean area in the period 1997-2019, in millions of units (on FEAP and APROMAR).

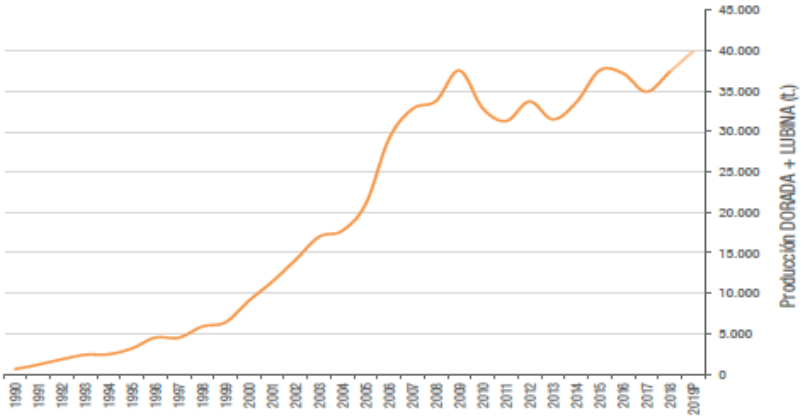



Figure 5-33. Evolution of aquaculture production of seabream plus seabass in Spain in tonnes (1990-2019).

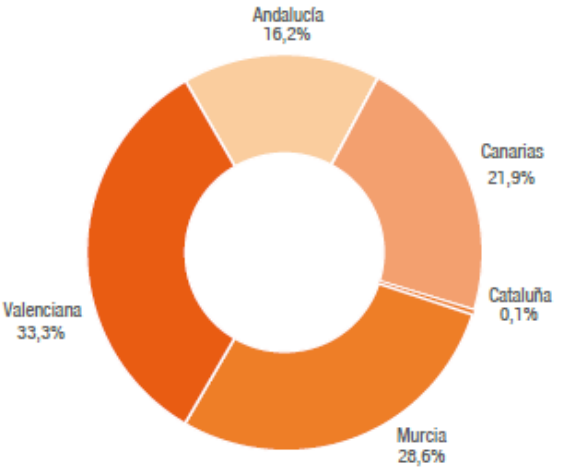
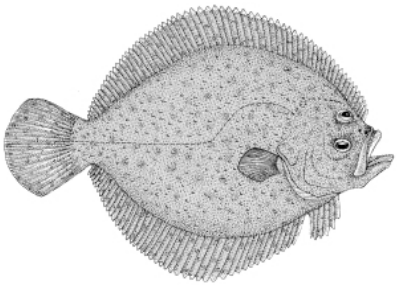



Figure 5-34. Percentage distribution of the production (tonnes) of seabream plus seabass in Spain by Autonomous regions in 2018.

Species

TURBOT



*Psetta maxima*

**TURBOT** (*Psetta maxima*)

Class: Osteopathies - Orden: Pleuronectiformes - Family: Scophthalmidae

**Significant characters:** The body of the adult specimens has no bilateral symmetry, being rounded and flattened. Eyes bulging, located on the left side. Large mouth with prominent jaw. Top brownish more or less dark, which varies depending on the environment, presenting numerous spots that also cover the fins. The lower flank is depigmented. It can reach up to 100 cm in length. It reaches sexual maturity during the 4th or 5th year of life.

**Habitat and biology:** It is a benthic species that is distributed naturally by the Baltic Sea, North Sea, English Channel, Northeast Atlantic to Morocco, Mediterranean Sea and Sea Black. They reach sexual maturity during the 4th or 5th year of life.

**Farming:** In aquaculture the reproduction is carried out in hatcheries under very controlled conditions. The spawns are about 500,000 to 1,000,000 eggs per kilo of female's weight. After an incubation period of 5 to 7 days the larvae hatch. During their first month of life they feed on living organisms: rotifers and artemia. They then start a feed made with natural ingredients. Farming facilities are usually circular concrete tanks in facilities on the coast.

## Farming of TURBOT

The total production of turbot (Scophthalmus maximus - Psetta maxima) of aquaculture in 2017 was 57,072 tonnes, a -4.3% lower than the previous year. In China there is a very significant production of aquaculture turbot of about 106,000 tonnes in 2017, although both the figures and the exact species are uncertain. In Europe the main producing country is Spain, which harvested 7,450 tonnes (74.4% of the total). Portugal, with 2,350 tonnes, is the second largest producer (23.5%). There are harvests, albeit substantially lower, in France and the Netherlands. By 2019, the European turbot harvest is expected to increase slightly to 10,500 tonnes.

Unlike seabream and seabass, in the case of turbot there is still a significant part of the supply of this species for the markets that comes from capture fishing (6,803 tonnes in 2017).

The farmed turbot harvest in Spain in 2018 was 7,450 tonnes, -12.8% less than the previous year. Galicia is by far the main autonomous region producing turbot in Spain (99%), with the remaining 1% produced in Cantabria.

As in the case of seabream and seabass, the amount of wild turbot that is caught by the Spanish fleet is increasingly scarce and testimonial to markets (59 t in 2017). Farmed turbot production accounts for more than 99.3% of the production of this species in Spain. Imports of captured turbot arriving from Europe, mainly from the Netherlands, are relevant.

The production of juvenile turbot in Spain in 2018 was 6,823,150 units. Galicia is where all the juveniles of this species are produced. The average purchase and sale price of juvenile turbot in Spain is estimated at 1.30 euros/unit.

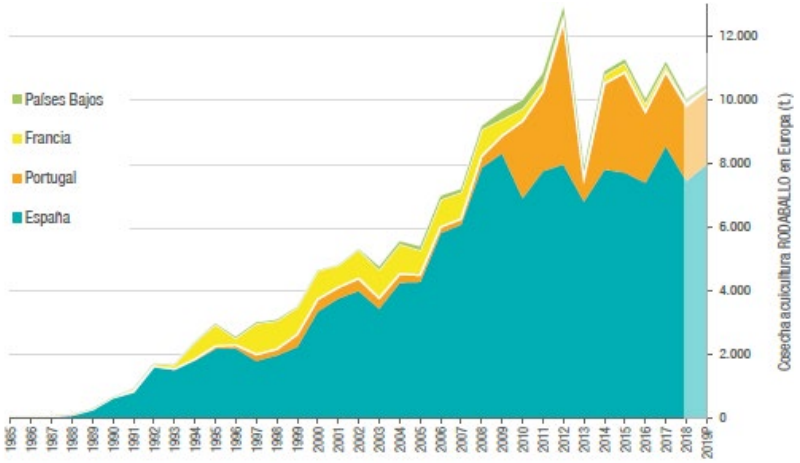



Figure 5-35. Evolution of the turbot aquaculture (production) in Europe (tonnes) for the period 1985-2019 (On FAO, FEAP and APROMAR data).

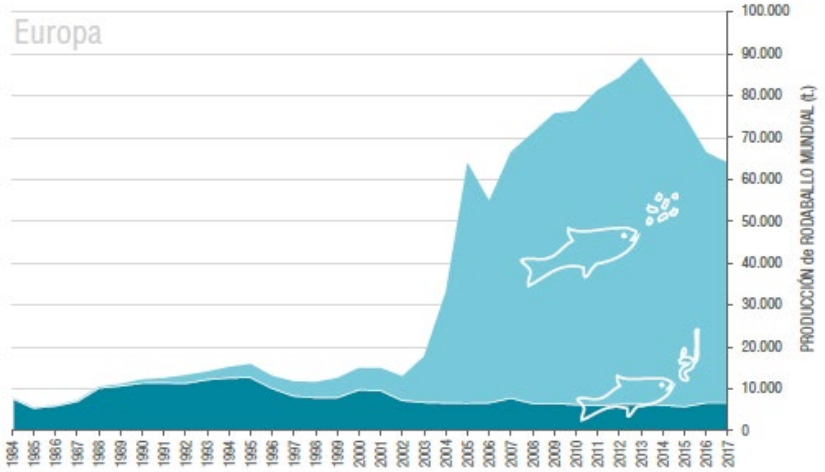



Figure 5-36. Evolution of global production (tonnes) of turbot (*Psetta maxima*), through aquaculture and capture fisheries, for the period 1985-2017 (FAO).

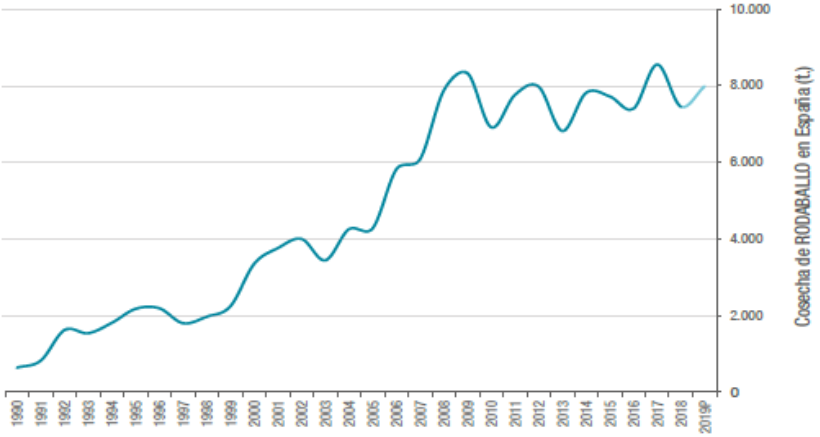



Figure 5-37. Harvest evolution (production) of farmed turbot (*Psetta maximum*) in Spain in tonnes (2006-2019).

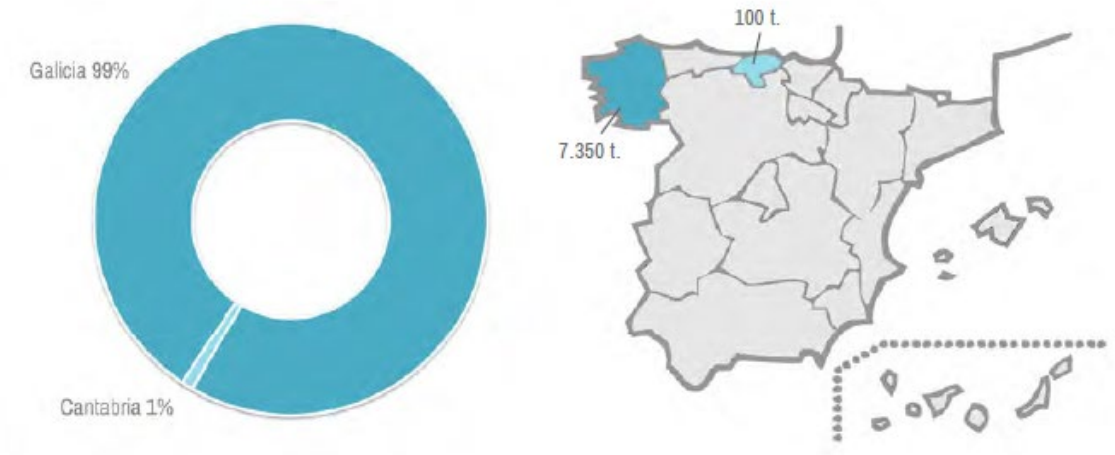



Figure 5-38. Distribution map of turbot production in Spain.

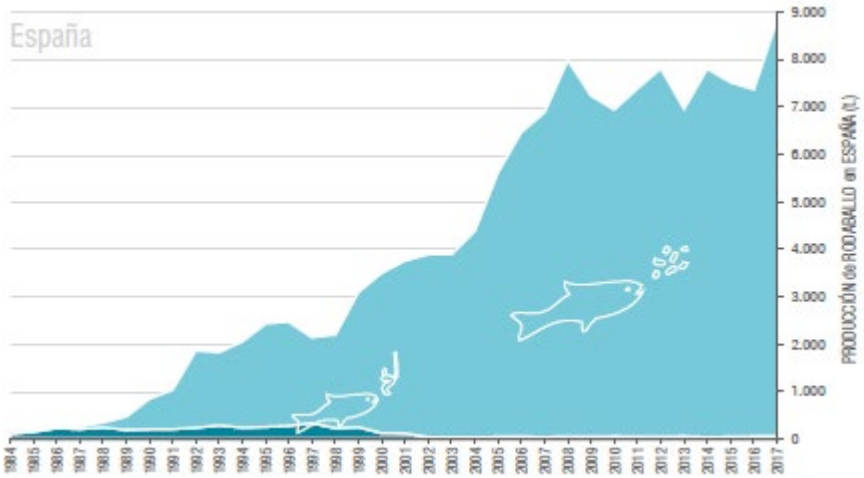
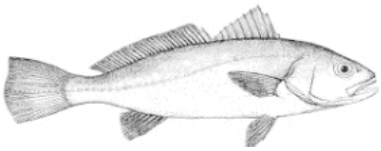



Figure 5-39. Evolution of the sources of turbot (Psetta máxima) in Spain: aquaculture and capture fisheries, for the period 1984-2017, in tonnes (MAPA-FAO).

Species

MEAGRE



*Argyrosomus regius*

**MEAGRE** (*Argyrosomus regius*)

Class: Osteidacty - Order: Perciformes - Family: Scienidae

**Significant characters:** Relatively large head and elongated body with a mixture of dark tones. The head is coloured yellow with a rounded snout. Mouth in terminal position without chines, with conical and robust teeth. Small eyes. It reaches lengths of between 50 cm and up to 2m, and a weight of up to 40 kg.

**Habitat and biology:** The natural distribution covers the eastern Atlantic, from Senegal to the north of France, including the Canary Islands and the Mediterranean Sea.

**Farming:** The farming of meagre is carried out in various Mediterranean countries. Breeding centres produce eggs from breeding individuals under tightly controlled conditions. A female 1 m long produces more than 1 million eggs per year, which have a diameter of less than 1 mm. During their first month of growing life, the larvae feed on living organisms: rotifers and artemia. They then feed on feed made from natural raw materials. Breeding techniques are similar to those used for seabass and gilthead seabream, both in floating pens at sea and in earthen ponds. Meagres grow substantially faster than seabream or seabass and can reach 1 kg in 12 months. Commercial size is between 1 and 4 kg.

## Farming of MEAGRE

The production of meagre (*Argyrosomus regius*) of aquaculture in the Mediterranean area in 2018 is estimated at 37,377 tonnes, an increase of 6.6% compared to the previous year. The main producing countries are Egypt (30,000 tonnes), Spain (2,500 t), Turkey (2,400 t) and Greece (1,600 t). For 2019, an additional growth of 9.1% is estimated, to exceed 40,700 tonnes.

Meagre is a highly valued fish in those regions where it has traditionally been consumed. Recent increases in aquaculture production have begun to make it recognized in many new markets.

The production of meagre through aquaculture in Spain in 2018 was 2,500 tonnes, 29.4% more than in 2017. This figure refers to fish completed and placed on the market, and not to increases in live biomass. This nuance is important in a fish, such as meagre, which is grown up to several kilograms of individual weight. The bulk of Spanish meagre harvest comes from the Valencian region. By 2019, an estimated 36% increase in Spain's total is estimated to take it over to 3,400 tonnes.

The capture of meagre by the world's fishing fleets in 2017 was 8,954 tonnes. Of these, 6,250 t were fished in Mauritania and 735 t in Egypt. At European level, France stands out (936 t), followed by Spain (352 t) and Portugal (344 t).

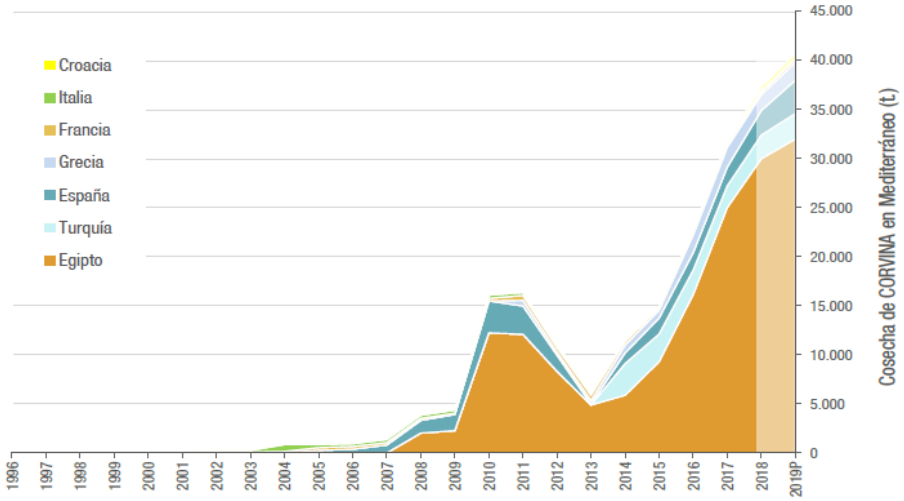



Figure 5-40. Evolution of the harvest (production) of meagre aquaculture (in tonnes) in the Mediterranean for the period 1996-2019(On FAO, FEAP and APROMAR data).

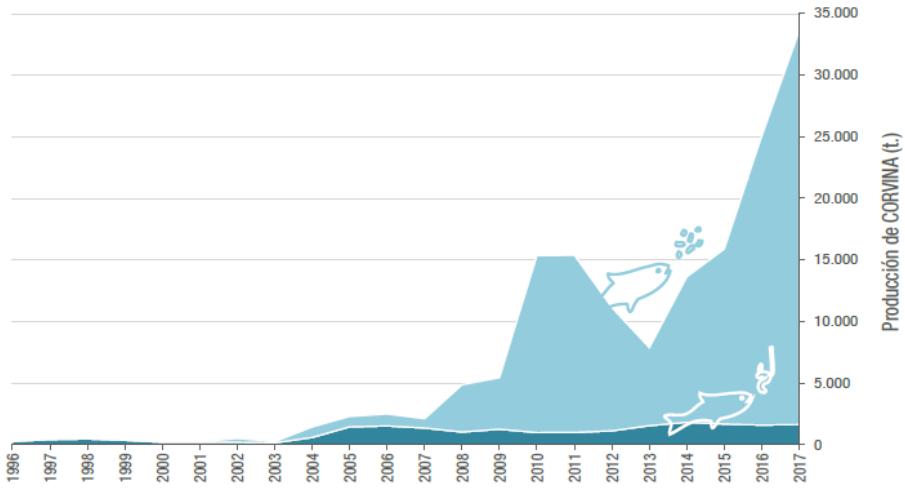



Figure 5-41. Evolution of Mediterranean production of meagre (*Argyrosomus regius*), in tonnes, by aquaculture and fisheries, in the period 1996-2017 (FAO).

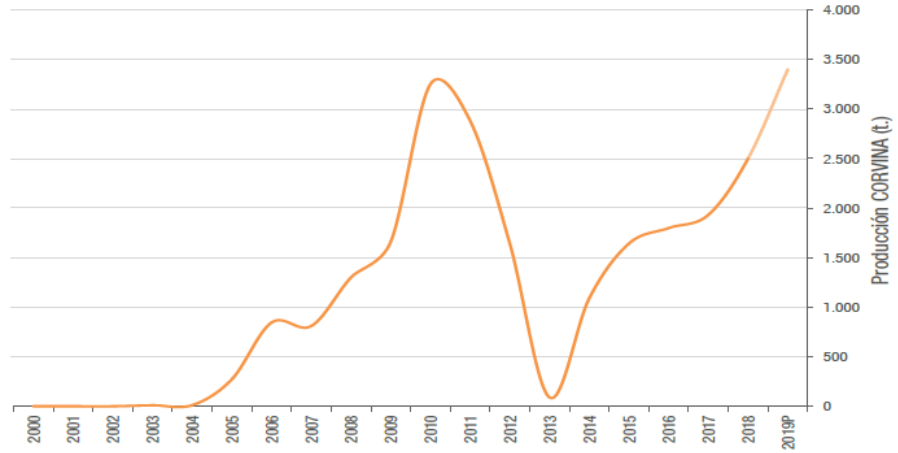
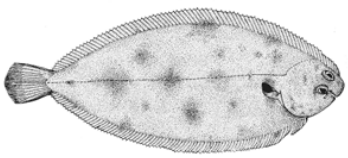



Figure 5-42. Evolution of meagre harvest (*Argyrosomus regius*) in Spain in tonnes (2000-2019).

## Farming of SOLE



*Solea senegalensis*

In 2018 the world harvest of Senegalese sole (*Solea senegalensis*) of aquaculture origin was 1,616 tonnes, -3.9% less than the previous year. A slight increase of 5.5% is expected by 2019, to reach 1,700 tonnes. Senegalese sole capture fishing adds 45 tonnes globally in 2017, mainly from France.

In 2018, 774 tonnes of aquaculture Senegalese sole were produced in Spain, a -6.7% less than in 2017. This production is located in Galicia and Andalusia. The 2019 harvest is estimated to increase by 9.2% to 845 tonnes.

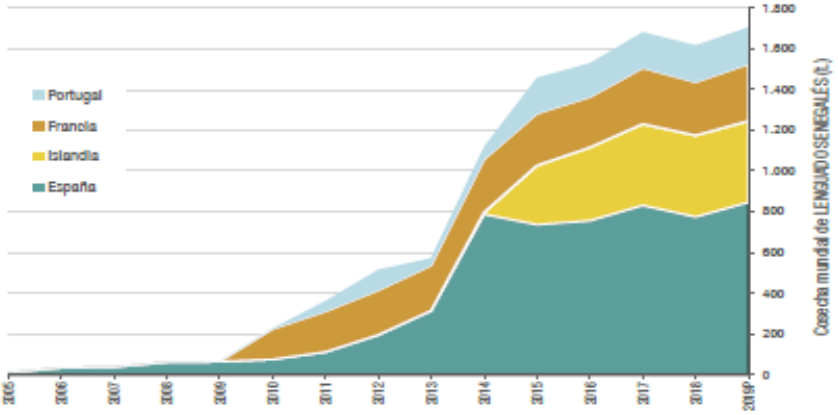



Figure 5-43. Evolution of the harvest (aquaculture production) of Senegalese sole (*Solea senegalensis*) in the world for the period 2005-2019 (on FAO, FEAP and APROMAR data).

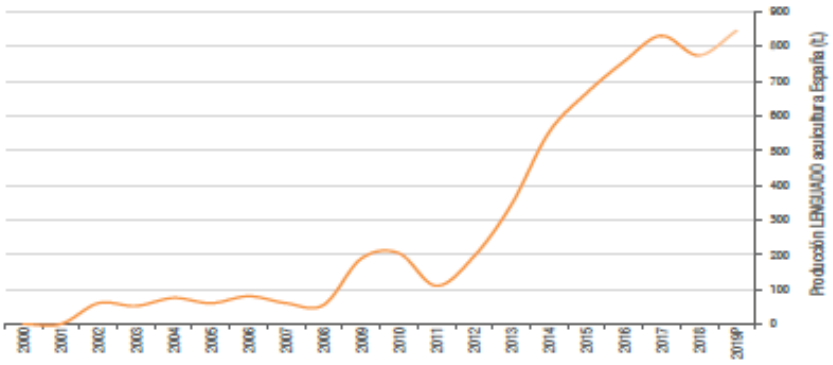
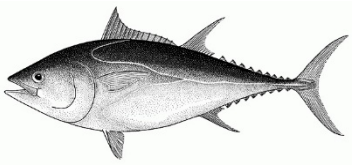



Figure 5-44. Evolution of the harvest (aquaculture production) of Senegalese sole (*Solea senegalensis*) in Spain in tonnes (2005-2019).

## Farming of BLUEFIN TUNA

Almost all of the bluefin tuna (*Thunnus thynnus*) that is available in consumer markets comes originally from wild stocks. Part of them are placed on the market immediately after their capture and are considered the product of fishing activities. But another relevant part of the bluefin tuna, increasing and now the most important, is caught from the wild alive by purse seine gear or almadrabas and kept for months in aquaculture farms. In these farms, consisting of pens in the sea, bluefin tuna are fed to recover their optimal body condition after the breeding migration they will have made from the Atlantic Ocean to the interior of the Mediterranean Sea, and to regulate the market. But in addition to this partial aquaculture activity there is a remarkable scientific effort to close the production cycle and to raise bluefin tuna from egg to commercial size in captivity. Spain is a world leader in the research of the integral cultivation of bluefin tuna, especially through the Spanish Institute of Oceanography (IEO), and very satisfactory results have been achieved both in its reproduction and in ongrowing to commercial size.



*Thunnus thynnus*

Global production of aquaculture bluefin tuna (Pacific, Atlantic and South) in 2017 was 37,115 tonnes, a production of -2.3% compared to the previous year. The main producing countries are Japan (42.8%), Australia (21.8%), Mexico (15.4%) and Malta (12.1%). The production of bluefin tuna is limited by internationally established catch quotas. Production in Spain of bluefin tuna was 1,030 tonnes in 2017.

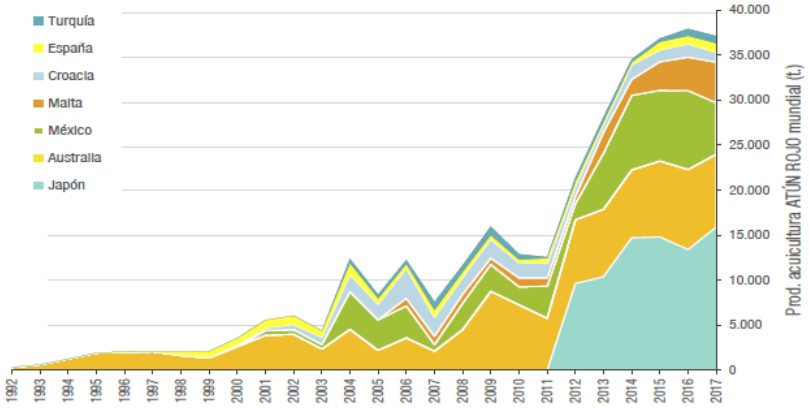



Figure 5-45.
Evolution of aquaculture production (fattening) of bluefin tuna in the world for the period 1992-2017, in tonnes (on FAO data).

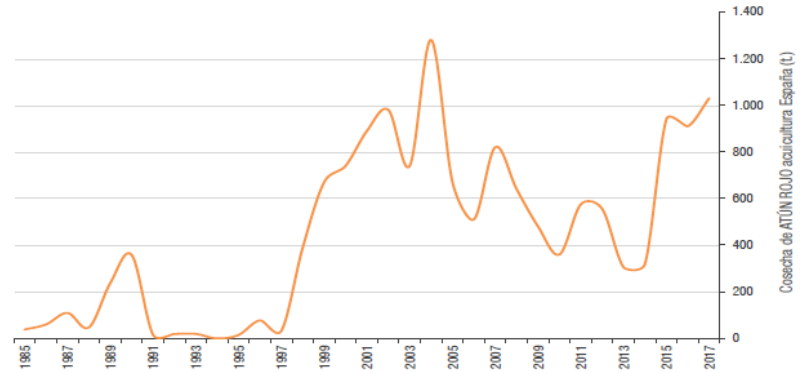
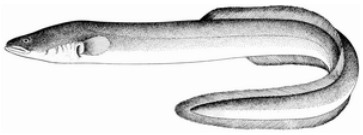



*Figure 5-46.*
*Harvest evolution (aquaculture production/fattening) of bluefin tuna in Spain for the period 1984-2017 in tonnes (on MAPA-FAO data).*

## Farming of other marine fish species

# Farming of EEL

The cultivation of European eel (*Anguilla anguilla*) is a traditional activity in Spain, with various levels of intensification. Its production depends on the capture of wild eels since there is not enough scientific knowledge for its reproduction in captivity. Therefore, its future is very conditioned by the European Recovery Plan of this species.

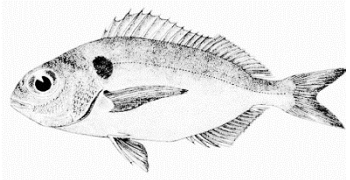


*Anguilla anguilla*

Spanish production at the commercial level in 2018, located essentially in the Valencian region, was 330 tonnes. Its destination is both the restocking of rivers and for human consumption. At European level, 6,794 tonnes of European eel were produced in 2017, with the Netherlands (2,100 t), Italy (1,250 t) and Germany (1,202 tonnes) being the main producing countries.

# Farming of BLACKSPOT SEABREAM

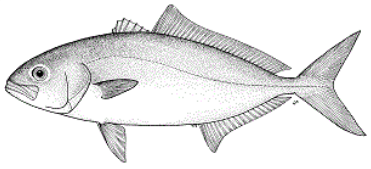
The aquaculture of Blackspot seabream (*Pagellus bogaraveo*) in Europe is carried out only in Galicia. In 2018 113 tonnes were harvested. No significant increases in the production of this species in the coming years are foreseen, although there are lines of research on its farming in several other Spanish autonomous regions that could reverse this situation.



*Pagellus bogaraveo*

# Farming of GREATER AMBERJACK

Aquaculture of Greater amberjack (*Seriola dumerili*), also known in Spain as Lemon fish, is currently being incorporated into mainstream aquaculture production on a commercial scale in Spain, although still incipient. It is the culmination of many years of scientific research and technological development. With its cultivation new business opportunities and job creation are opened, becoming one of the species with the greatest potential for Spanish aquaculture.



*Seriola dumerili*

It is a very well valued fish in its quality by the markets which know it. There is a production of 70 tonnes per year in the United Arab Emirates and 11 tonnes in Spain. There are other species of amberjack produced in the world, such as *Seriola quinqueradiata*, more than 139,000 tonnes per year in Japan, cultivated from wild juveniles.

## Farming of molluscs

Spanish aquaculture stands out as a reference at European and global level for the quantity and quality of its mollusc farming. In 2017 it accounted for a harvest of 244,233 tonnes, 11.2% more than in the previous year, being the highest figure of the last 15 years, with a value at first sale of 132.3 million Euros.

# Farming of MUSSELS

The harvest of mussels in Spain in the last decades moves in a fork between 170,000 and 240,000 tonnes. Year-on-year differences are not conditioned by production capacity, which is stable, but by the higher or lower incidence of red tide episodes that disturb regular harvesting of the mussels. The mussel harvest in Spain in 2018 is estimated at 273,600 tonnes, which is a record amount in the history of the production of this species, with a total first-sale value of 133.2 million Euros.

Five are the Spanish autonomous regions in which mussels are grown, but it is mainly produced in the Galician estuaries ("rias") through its traditional farming in floating platforms. Galician production accounts for 97% of the national total mussel production, but there are also productions in Catalonia, Andalusia, the Valencian Community and the Balearic Islands.

Mussel seed is usually collected from the natural environment, or collected by using collecting ropes, for later placing in platforms or long-lines.

62.8% of the mussel harvested in Spain is placed on the fresh market depuration treatment plants; while the remaining 37.2% goes to the processing industry, that is, towards cookers and canners.

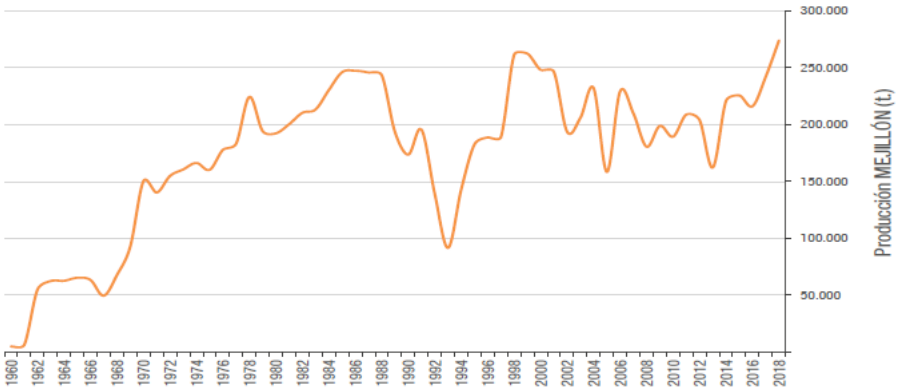



Figure 5-47. Evolution of aquaculture production of mussels in Spain between 1960 and 2018 in tonnes (according to MAPA-APROMAR).

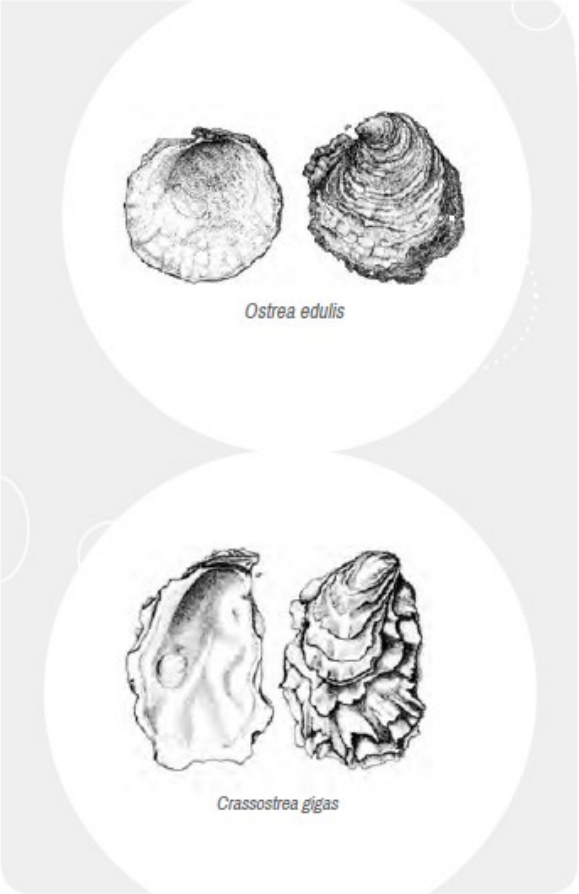
# Farming of OYSTERS

Oysters are an important group of molluscs in economic terms in Spain. Two are the farmed species: the European flat oyster (*Ostrea edulis*) and the Pacific cupped oyster or Japanese oyster (*Crassostrea gigas*). Joint production in 2018 of both species was 1,140 tonnes and their economic value in first sale 3.8 million Euros.

Of the Pacific cupped oyster 820 tonnes were produced in 2018 in Spain, mainly in Galicia, Catalonia, Andalusia, Asturias, Cantabria and the Valencian region. Its total value in first sale was 1.8 million Euros.

Galicia is the main autonomous community producing European flat oysters, followed by the Valencian region. In total, 320 tonnes of this species in 2018 were produced in Spain, with a value of 2.0 million Euros.

Oyster farming can be done through several techniques, but the usual ones in Spain are intertidal production in ongrowing plots, or in vertical cultivation from platforms using hanging baskets. Oyster seed is obtained from domestic and imported hatcheries.



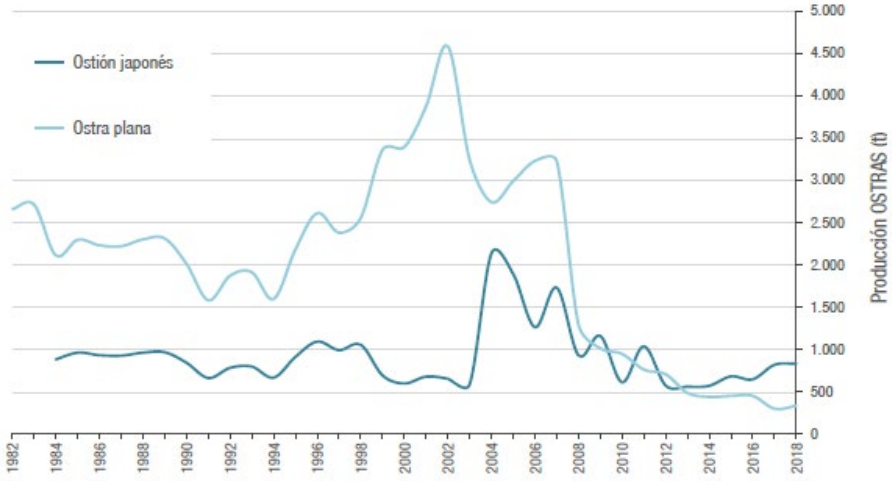




Figure 5-48. Evolution of aquaculture production of oysters in Spain between 1982 and 2018 tonnes (according to MAPA-APROMAR).

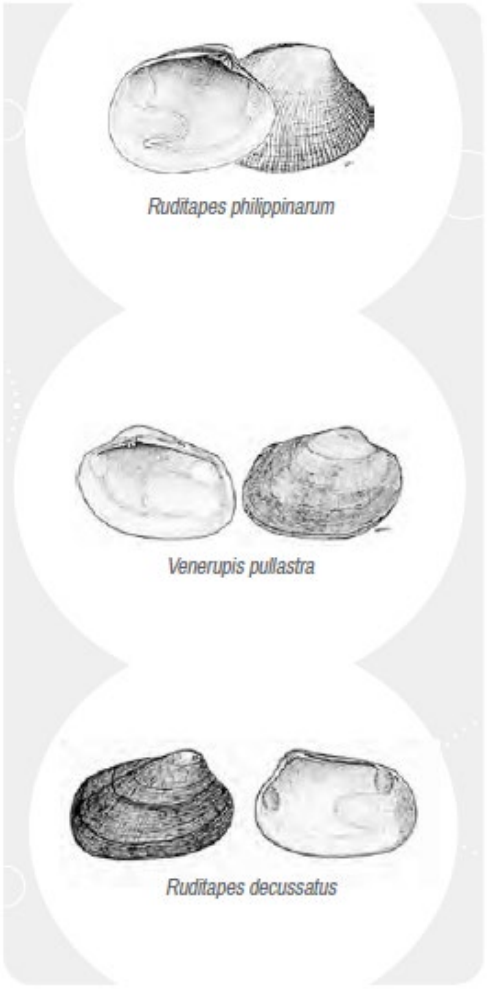
# Farming of CLAMS

In Spain, three species of clams are farmed: Grooved carpet shell, slug and Japanese carpet shell, with a combined production in 2018 of 1,275 tonnes and an economic value in first sale of 13.1 million euros.

The Japanese carpet shell clam (*Ruditapes philippinarum*) is the main species of clam grown in Spain. It has a shell whose colour varies between brown, grey and black, with very marked stretch marks that form grids. It is also known as Italian clam, because of the importance of its production in that country. In 2018 its production in Spain was 1,025 tonnes, with a first sale value of 9.2 million Euros.

The Grooved carpet shell (*Ruditapes decussatus*) is between white and light brown colour, varies depending on the sand where it is bred. The inner face is bright white with yellowish tones, sometimes bluish in the area near the umbo that is located at the front of the shell. In 2018 Spain produced 178 tonnes of this species, which reached an economic value in its first sale of 1.4 million Euros.

The Pullet carpet shell (*Venerupis pullastra*) is grey or cream with brown spots. Its shell is oval and on its outer surface presents concentric lines that intersect with finer radial lines. In 2018 Spain produced 70 tonnes of this species, with an economic value in first sale of 2.6 million Euros.



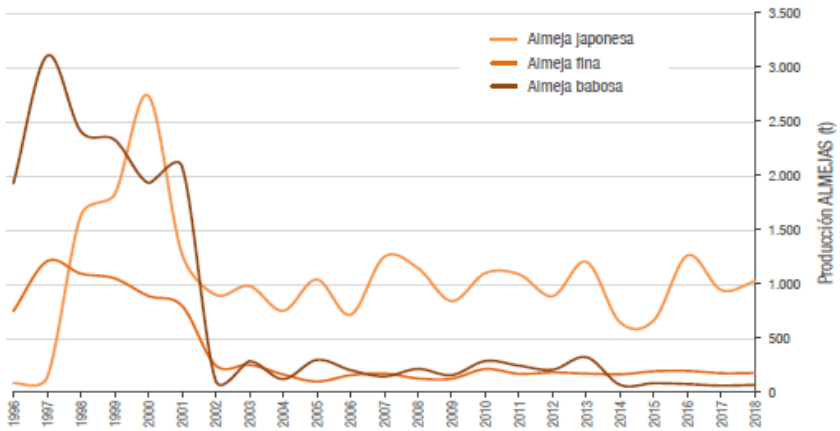




Figure 5-49. Evolution of aquaculture production of clams in Spain between 1996 and 2018 in tonnes (according to MAPA-APROMAR).

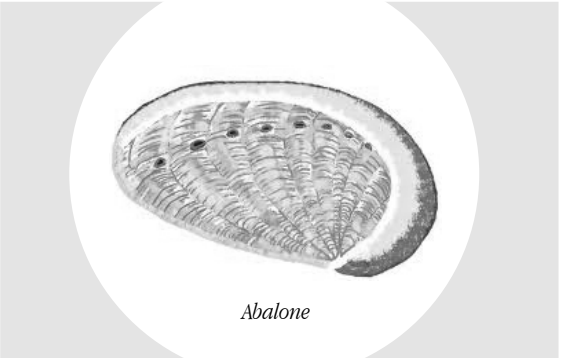
The seed for the production of clams comes from hatcheries and to a lesser extent from its collection in natural banks. In Spain clam farming is carried out in plot parks or in natural banks with good water current and at different depths depending on the species.

In all three cases its farming is based on the care of sandy bottoms, the elimination of algae, the control of predators, the oxygenation of the substrate, the grading of the population when it is excessive and the stocking of juvenile specimens.

## Farming of ABALONE

The abalone is a gastropod mollusc whose consumption is highly appreciated in the Asian consumer market. Its shells are also esteemed for the quality of its mother-of-pearl. Since 2014, an abalone farm is in operation in Galicia. Its production system is technologically more sophisticated than that of the rest of molluscs farmed in Spain.

Globally, 168,244 tonnes of abalone of various species were harvested in 2017. China is the first producer, with 88% of the total harvested production.



*Abalone*

# Farming of other species

## Farming of MICROALGAE

In various regions of Spain, companies dedicated to the commercial production of microalgae are located. Its facilities are sophisticated and make significant efforts in research, development and innovation. The destination of the microalgae produced is human nutrition, animal feed (including aquaculture), biofuels and cosmetics, among others. In Spain, more than 8,000 kilograms of microalgae were produced in 2017. The main cultivated species are *Nannochloropsis gaditana*, *Tetraselmis chuii*, *Isochrysis galbana* and *Phaeodactylum tricornutum*. In addition to direct placing on the market, the farming of microalgae is normal in finfish, mollusc and crustacean hatcheries as food for the larval phases of those species.

*Microalgae*

Microalgae have been incorporated into the European Organic Production Regulation in 2015, as well as their recognition as natural foodstuffs of Omega-3 oils, opening up new marketing possibilities.

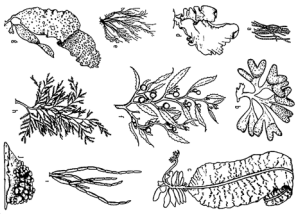
## Farming of SHRIMP

There is currently a single prawn farm in operation in Spain, located in Medina del Campo (Valladolid), which has been demonstrating a great dynamism and capacity for innovation. The species produced is white shrimp (*Litopenaeus vannamei*) and stand out for the quality and freshness of its production. In 2018 there was a production of 5 tonnes of this species in Spain.


*Litopenaeus vannamei*

## Farming of MACROALGAE (SEAWEED)

The use of macroalgae for uses such as obtaining agar and gelatines or as an agricultural fertilizer is traditional on the northern coast of Spain. Most are obtained from the natural environment without greater human intervention than the harvesting of algae brought to the coast by storms, but there are several initiatives underway for their farming. These macroalgae aquaculture initiatives produce species of the genera Laminaria and Gracilaria also for direct human consumption. In 2017 they harvested 8.5 tonnes of macroalgae.



*Macroalgae*

# 5.7. Freshwater aquaculture in Spain and Europe

Freshwater aquaculture is carried out in rivers. In Spain the main species produced by freshwater aquaculture are rainbow trout, several species of sturgeons and tench. There are also minor productions of common carp and Nile tilapia.

## Farming of RAINBOW TROUT

Global aquaculture production of rainbow trout (*Oncorhynchus mykiss*) in 2017 was 811,590 tonnes, down -0.6% from the previous year.
The main rainbow trout farming countries are Iran with 167,830 tonnes (20.7% of the global total), Turkey with 106,733 tonnes (13.2%), Chile with 76,971 tonnes (9.5%), Norway with 66,902 tonnes (8.2%) and Peru with 54,878 tonnes (6.8%). Other relevant countries are the US, China, Italy, Denmark, France and Russia, but it is a species produced in 79 countries distributed across five continents, although it is native to North America.

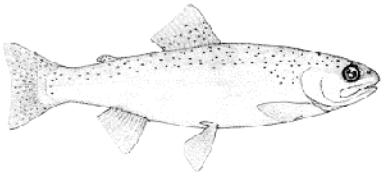
Most rainbow trout are produced in fresh water (70%), but a relevant part of their production ends up being finalised in saltwater, especially in Chile and Norway.

Commercial capture fishing for rainbow trout is very small and amounted to only 3,539 tonnes worldwide in 2017, in countries such as Peru, Russia and Finland.

The production of rainbow trout in Spain in 2018 is estimated to be 18,856 tonnes, 5.1% more than in the previous year. A similar harvest in terms of tonnes is expected for 2019. Even though both productions are still far from the maximum of 35,384 tonnes in 2001 it shows a consolidation of their recovery. The main producing Spanish regions are Castilla y León, Galicia, Andalusia, Catalonia, La Rioja, Castilla la Mancha, Asturias and Aragon.

Species

RAINBOW TROUT



*Oncorhynchus mykiss*

**RAINBOW TROUT** (*Oncorhynchus mykiss*)

Clase: Actinopterygii - Orden: Salmoniformes - Familia: Salmonidae

**Significant characters:** Elongated body, fusiform and adipose fin present. Blue to olive green coloration on a pink destitious band along the sideline and silver below it. Back, sides, head and fins covered with small black dots. The coloration varies from intense dark to bright-silver.

**Habitat and biology:** The natural distribution covers the eastern Atlantic, from Senegal to the north of France, including the Canary Islands and the Mediterranean Sea.

**Farming:** Its farming takes place all over the world. Females are able to produce up to 2,000 eggs per kg of body weight. The eggs are relatively large (3-7 mm in diameter). After hatching, the fry nourish from the reserve food provided by the vitelin vesicle for a short period of time. They then startto eat on feed made with natural ingredients. Aquaculture farms are varied, with ponds on land, concrete or fiberglass facilities and even pens in fresh or salt water. Rainbow trout usually take 10 months from hatching to portion size (250-300 g), although commercial sizes reach several kilograms of weight.

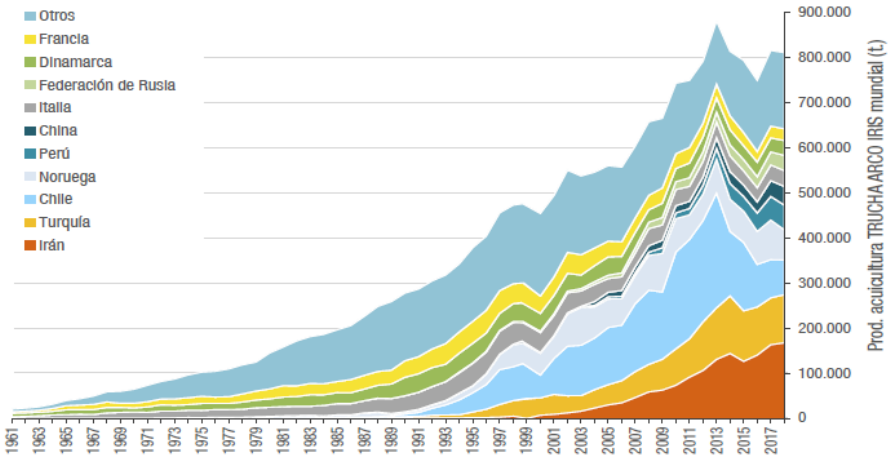



Figure 5-50. Evolution of rainbow trout aquaculture production in the world in the period 1960-2017 in tonnes (on FAO data).

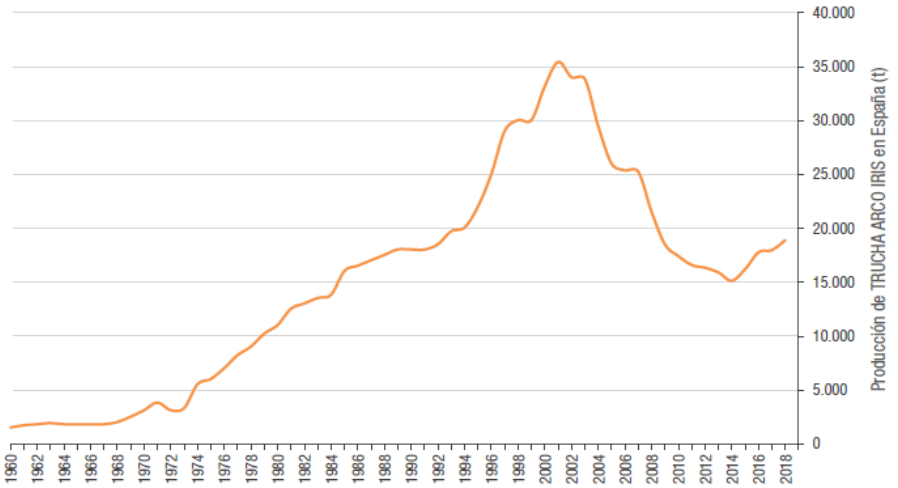



*Figure 5-51. Evolution of aquaculture production of rainbow trout in Spain in tonnes (1954-2018). MAPA-APROMAR data.*

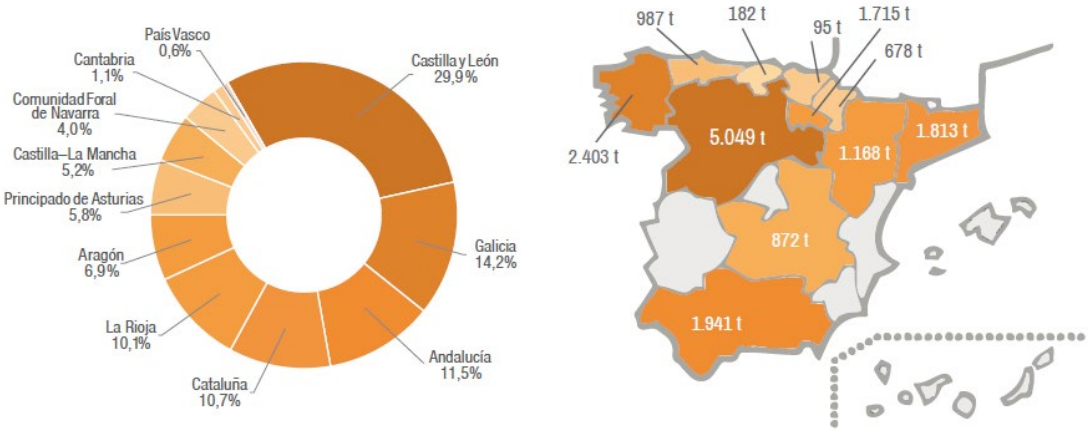


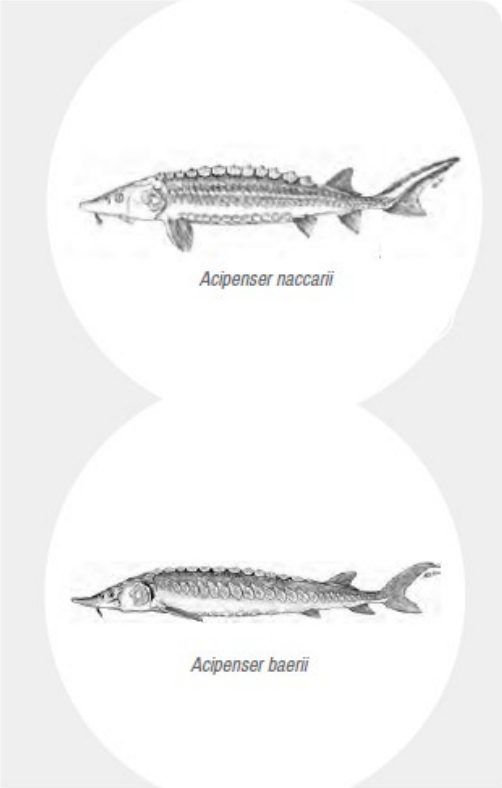

Figure 5-52. Distribution of the rainbow trout harvest among the autonomous regions in 2017 (MAPA data).

# Farming of STURGEON

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) agreed in 2006 to ban exports of caviar in the face of a severe decline in wild sturgeon populations. From that moment began the interest in aquaculture of the various species of sturgeon for the production of farmed caviar which is authorized to be traded internationally. Since then, the only caviar that can be purchased in international markets is the one obtained by the cultivation of these fish. There are several species of sturgeon cultivated in the world, all encompassed within the family Acipenseridae: Siberian Sturgeon (*Acipenser baerii baerii*), Russian sturgeon or the Danube (*Acipenser gueldenstaedtii*), Beluga sturgeon (*Huso huso*), sterlete sturgeon (*Acipenser ruthenus*), starry sturgeon or Sevruga (*Acipenser stellatus*), white sturgeon (*Acipenser transmontanus*) and Adriatic sturgeon (*Acipenser naccarii*).

Global caviar production was approximately 386 tonnes in 2018, of which 176.5 tonnes have been produced in Europe (45.5%). It is estimated that global caviar production could reach 516 tonnes by 2020.

Although the main product of sturgeon aquaculture is the production of caviar, the meat of these fish is also valued and placed on the market for consumption.




Worldwide, an estimated 117,565 tonnes of sturgeon meat were produced.

In Spain, 8 tonnes of caviar were produced in 2017 and 72 tonnes of sturgeon meat. The two species produced are Adriatic sturgeon and to a lesser extent Siberian sturgeon.

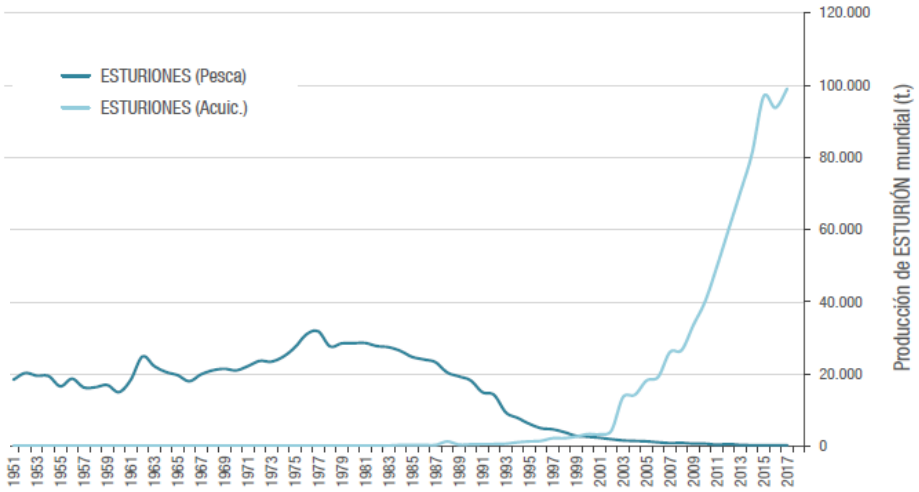



Figure 5-53. Evolution of global sturgeon production (fishing and aquaculture) between 1950 and 2017 (FAO data).

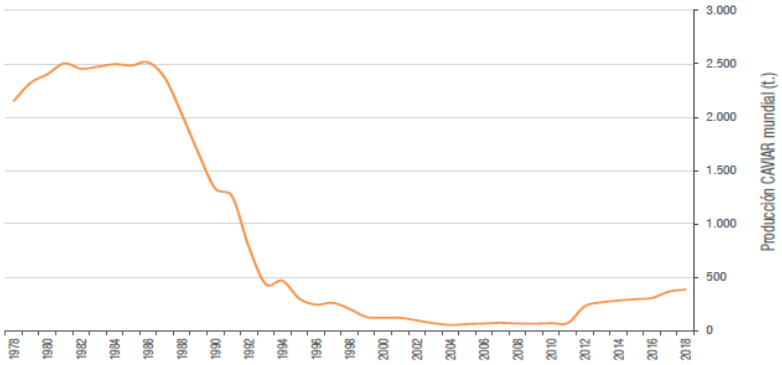



Figure 5-54. Evolution of global caviar production (originating in both fisheries and aquaculture) in tonnes, between 1978 and 2018 (FAO and FEAP data).

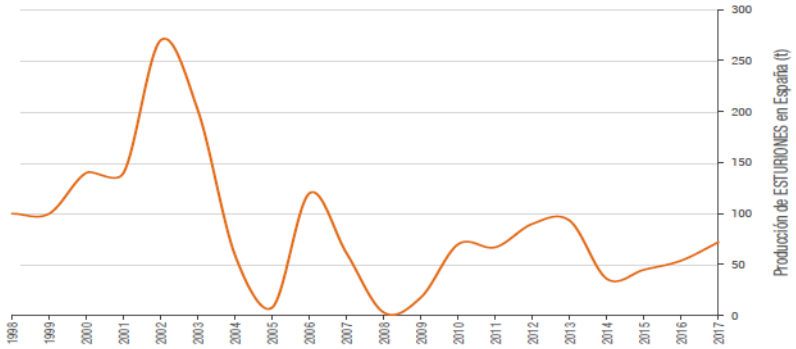
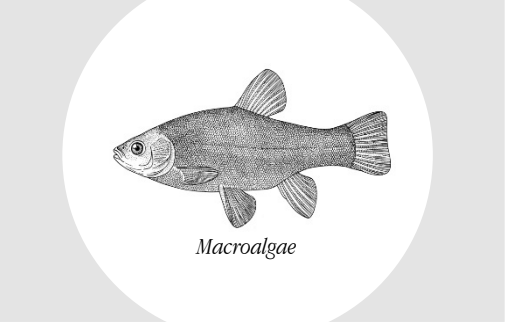



Figure 5-55. Evolution of aquaculture production of sturgeons (several species) in tonnes in Spain (1998-2017). MAPA-FAO data.

## Farming of TENCH

Tench (*Tinca tinca*) is an exclusively European species. Its cultivation totalled 1,401 tonnes in 2017. France is the main producer (900 t), followed by the Czech Republic (158 t) and Germany (134 t). Tench is harvested in 13 countries.

In Spain 38 tonnes were produced in 2017, grown in ponds, mainly in the autonomous region of Extremadura and less in Castile and León. This figure is far from the highs it reached in the late 1980s by around 460 tonnes.



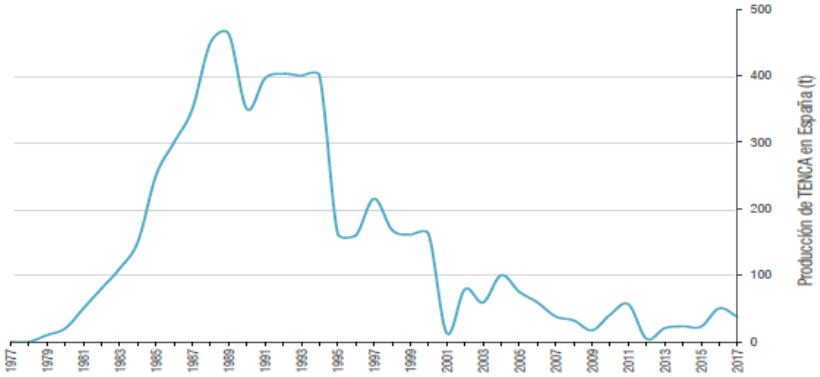




Figure 5-56. Evolution of aquaculture production of tench (*Tinca tinca*) in tonnes (1978-2016) in Spain. MAPA-FAO data.

Table 5-1. Data on production of aquaculture breeding species in Spain (tonnes).

| DORADA | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| Andalucía | 2.360 | 1.818 | 1.530 | 1.786 | 1.136 | 2.333 | 1.605 | 980 | 1.560 | 1.450 |
| Baleares | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canarias | 3.010 | 3.259 | 2.740 | 3.013 | 1.588 | 1.884 | 2.492 | 2.063 | 2.380 | 2.265 |
| Cataluña | 1.560 | 1.471 | 1.570 | 1.292 | 952 | 514 | 656 | 654 | 0 | 0 |
| Murcia | 5.840 | 3.469 | 3.880 | 3.730 | 3.892 | 4.103 | 3.368 | 4.356 | 3.184 | 3.342 |
| Valenciana | 7.590 | 6.913 | 9.710 | 6.974 | 8.662 | 7.397 | 5.619 | 5.590 | 7.806 | 6.143 |
| **TOTAL** | **20.360** | **16.930** | **19.430** | **16.795** | **16.230** | **16.231** | **13.740** | **13.643** | **14.930** | **13.200** |
| Variación % | -14,1% | -16,8% | 14,8% | -13,6% | -3,4% | 0,0% | -15,3% | -0,7% | 9,4% | -11,6% |
| Precio €/Kg. | 4,20 € | 5,00 € | 4,31 € | 4,79 | 5,45 | 5,84 | 5,78 | | | |
| **Valor (M€)** | **85,5** | **84,7** | **83,7** | **80,4** | **88,5** | **94,8** | **79,4** | | | |

| LUBINA | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| Andalucía | 3.660 | 3.895 | 4.000 | 3.777 | 2.815 | 5.356 | 6.081 | 3.261 | 4.479 | 7.089 |
| Canarias | 3.800 | 3.478 | 3.500 | 4.286 | 5.097 | 5.767 | 5.507 | 5.900 | 5.793 | 5.601 |
| Cataluña | 250 | 250 | 390 | 66 | 0 | 318 | 236 | 146 | 30 | 30 |
| Murcia | 2.395 | 3.956 | 3.880 | 4.987 | 5.519 | 6.009 | 8.164 | 6.990 | 7.525 | 7.298 |
| Valenciana | 2.390 | 2.788 | 2.500 | 1.591 | 3.945 | 3.874 | 3.457 | 4.972 | 4.633 | 6.722 |
| **TOTAL** | **12.495** | **14.367** | **14.270** | **14.707** | **17.376** | **21.324** | **23.445** | **21.269** | **22.460** | **26.740** |
| Variación % | -9,7% | 15,0% | -0,7% | 3,1% | 18,1% | 22,7% | 9,9% | -9,3% | 5,6% | 19,1% |
| Precio €/Kg. | 4,29 € | 4,96 € | 5,42 € | 5,35 € | 5,79 € | 5,64 € | 5,67 € | | | |
| **Valor (M€)** | **53,6** | **71,3** | **77,3** | **78,7** | **100,6** | **120,3** | **132,93** | | | |

| RODABALLO | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| Asturias | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cantabria | 200 | 50 | 100 | 75 | 75 | 108 | 50 | 105 | 100 | 100 |
| Galicia | 6.710 | 7.690 | 7.845 | 6.729 | 7.733 | 7.607 | 7.346 | 8.441 | 7.350 | 7.880 |
| País Vasco | 0 | 15 | 25 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **6.910** | **7.755** | **7.970** | **6.814** | **7.808** | **7.715** | **7.396** | **8.546** | **7.450** | **7.980** |

| CORVINA | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| Andalucía | 23 | 0 | 40 | 0 | 0 | 0 | 46 | 46 | 50 | 39 |
| Canarias | 550 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cataluña | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Murcia | 1.824 | 1.300 | 1.000 | 0 | 23 | 42 | 0 | 0 | 0 | 0 |
| Valenciana | 828 | 1.510 | 600 | 89 | 1.067 | 1.600 | 1.752 | 1.886 | 2.450 | 3.361 |
| **TOTAL** | **3.250** | **2.880** | **1.640** | **89** | **1.090** | **1.642** | **1.798** | **1.932** | **2.500** | **3.400** |

| ANGUILA | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | **446** | **505** | **460** | **315** | **366** | **380** | **315** | **330** | **330** | **400** |

| BESUGO | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | **185** | **200** | **187** | **228** | **172** | **104** | **178** | **142** | **113** | **117** |

| LENGUADO | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P |
|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | **204** | **110** | **194** | **343** | **551** | **664** | **755** | **830** | **774** | **845** |

| LANGOSTINO | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019P | x |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | **38** | **32** | **30** | **0** | **4** | **5** | **8** | **5** | **5** | **5** | |

| TOTAL MARINOS | 43.888 | 42.779 | 44.181 | 39.291 | 43.597 | 48.065 | 47.635 | 46.697 | 48.562 | 52.687 |
|---|---|---|---|---|---|---|---|---|---|---|

| TRUCHA | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|
| Castilla y León | 5.318 | 5.318 | 5.318 | 5.780 | 5.670 | 5.477 | 5.318 | 5.413 | 5.049 |
| Galicia | 2.993 | 2.993 | 2.993 | 4.017 | 4.034 | 3.146 | 2.993 | 3.101 | 2.403 |
| Andalucía | 1.896 | 1.896 | 1.896 | 1.645 | 1.422 | 1.375 | 1.896 | 2.159 | 1.941 |
| Cataluña | 1.727 | 1.727 | 1.727 | 1.172 | 1.179 | 1.247 | 1.727 | 1.872 | 1.813 |
| La Rioja | 1.260 | 1.260 | 1.260 | 1.104 | 934 | 1.019 | 1.260 | 1.304 | 1.715 |
| Aragón | 595 | 595 | 595 | 550 | 550 | 833 | 595 | 1.076 | 1.168 |
| Principado de Asturias | 855 | 855 | 855 | 627 | 589 | 688 | 855 | 733 | 987 |
| Castilla - La Mancha | 1.043 | 1.043 | 1.043 | 1.003 | 1.027 | 762 | 1.043 | 861 | 872 |
| Comunidad Foral de Navarra | 200 | 200 | 200 | 118 | 165 | 245 | 200 | 555 | 678 |
| Cantabria | 179 | 179 | 179 | 180 | 178 | 174 | 179 | 180 | 182 |
| País Vasco | 108 | 108 | 108 | 100 | 111 | 144 | 108 | 95 | 95 |
| Comunidad Valenciana | | | | 9 | 9 | 0 | 6 | 5 | 0 |
| **Total** | **16.173** | **16.173** | **16.173** | **16.305** | **15.868** | **15.111** | **16.179** | **17.354** | **16.902** |

# 6. Marketing and consumption of aquaculture products in Europe and Spain

## 6.1. Consumption of aquatic products in the European Union

The European Union is the world's first and most relevant market for aquatic products, i.e. the main market for aquaculture harvest and capture fisheries produce. The average per capita consumption of aquatic products in the European Union is approximately 24.3 kilograms (in whole fish equivalents) but shows huge differences between countries and regions.

In 2018 the European Union consumed 13 million tonnes of aquatic products, as in the previous year. But in the face of steady global increases in the production of aquatic products, essentially through the growth of aquaculture, the European Union sees as a declining trend in its domestic production. This implies the need to import very high quantities of aquatic products into the European Union each year, 9.5 million tonnes in 2018, 3% more than in 2017, which in 2017 created a negative net trade balance of 7.2 million tonnes, corresponding to 72.6% of consumption, with the self-sufficiency of aquatic products (aquaculture plus fishing) at only 27.4%.

**In the European Union, there is a declining production of aquatic products despite a steady increase in aquatic consumption. The self-sufficiency of aquatic products in the EU is only 27.4%.**

The increases in the consumption of aquatic products are due to a concurrence of factors. On the one hand, to a greater awareness about the nutricinal benefits of these foods, as well as the valorization of their gastronomic properties. Also due to the increase in the supply of value-added products, together with the extensive development of the logistics distribution chains. In addition, and in general, globalization has led to a greater knowledge of other cultures and about new ways of consumption that have fish and algae as protagonists.

The economic value of imports of aquatic food from non-EU countries has been increasing since 2009. The deficit in the European Union's trade balance (exports minus imports) of fishery and aquaculture products has been on the rise since 2013. In 2016, it reached its highest figure ever recorded, at 19.6 billion Euros. Comparatively, imports are in terms of value four times that of meat. Norway and China are the main supplier countries of the European Union. Imports from Norway, covering 25% of the total, peaked in 2014, consisting mostly of Atlantic salmon. China is, on the other hand, the leader of processed white fish (processed cod and pollock) for the European Union.

In 2018, exports of aquatic products from the European Union were estimated to be 2.22 million tonnes. These exports consist almost exclusively of processed catch products, leaving European aquaculture production marketed in the domestic market.

The average consumption of aquatic products per person per year in the European Union is 24.3 kg (in 2016) but varies between 5.2 kg/year in Hungary and 57 kg/year in Portugal.

Consumption of aquatic products in the Union is dominated by the supply of catched fish, which accounts for 80.8% of the total, while the remaining 19.2% of consumption comes from aquaculture. Preferred aquatic species include, in order from

highest to lowest, tuna (several species), cod, salmon, pollock, herring, mussels, mackerel and hake. It is noteworthy the preferential position of several species of aquaculture besides Atlantic salmon, such as Gilthead seabream, European sea bass, in addition to mussels.

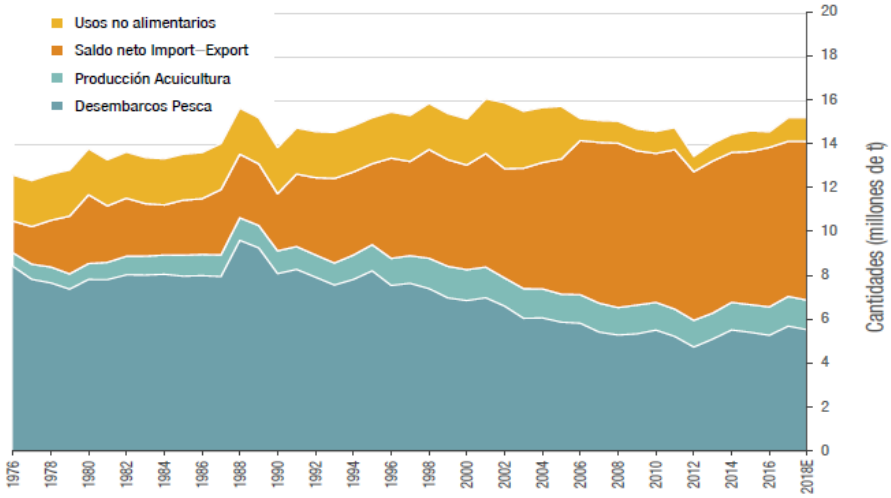



Figure 6-1. Evolution of the origin of aquatic products consumed in the European Union until 2018, in tonnes of equivalent body weight. EU aquaculture and fisheries productions are considered in addition to the net balance of imports and exports and non-food uses (CETA and FAO).

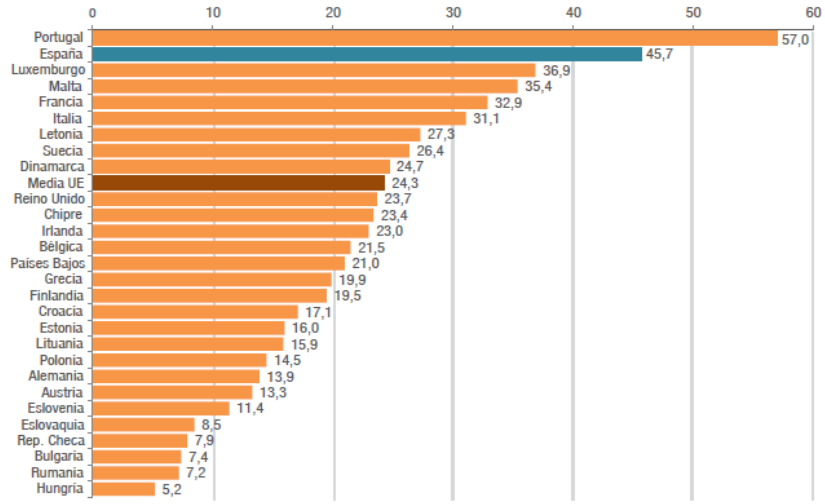



Figure 6-2. Per capita consumption of aquatic products in the member states of the European Union in 2019 (European Commission. EUMOFA).

## 6.2. Food consumption in Spain

Having quality and timely information on markets and consumption is a relevant element for companies to make informed decisions. For more than a decade the Spanish Ministry of Agriculture, Fisheries and Food (MAPA) has been publishing reports on the situation of food consumption in Spain. The most up-to-date information published by the MAPA at the date of edition of this APROMAR report refer to 2018.

Analysis of the evolution of the Spanish population, tourism and the number of households shows a decrease in the Spanish population in the last seven years of 0.7%, from 47,021,031 people in 2010 to 46,733,038 in 2018. There is also a significant increase in smaller households, single-person households made up of a young person or an independent adult. A smaller total population along with a higher proportion of smaller, childless households means that household consumption does not grow. In addition, reducing food waste and increased consumption outside the home could also explain the lower purchases of food by households. Given the two factors above, food consumption in Spain in absolute numbers is not expected to grow in the near future.

At this crossroads, adding consumption inside and outside the homes, during the year 2018 each Spaniard ingested on average around 767.87 kilos-litres of food and drinks. According to these figures, total consumption in Spain reached 103,077.41 million Euros, an average expenditure of 2,526.28 Euros per person per year.

Fresh food accounts for 39.5% of the total food consumed in 2018. In value the proportion is slightly higher (42.9 %). In 2018 there is a decrease in volume terms of 1.3% compared to 2017. In value however, the data is more stable (-0.2%). The rest of the food has a stable evolution compared to the previous year (+0.5 %). In value, however, the impact for the rest of food is noticeable and grows very significantly by 2.7%.

Comparing consumption inside and outside households, 86.1% of the volume of food and beverages are consumed at home, with only 13.9% of the total consumed outside. In relation to per capita consumption, the distribution is similar, with 82.0% of consumption ingested within the household. In terms of value distribution, the difference is not so large, as consumption outside the home reach 33.5% of total expenditure.

## 6.3. Consumption of aquatic products in Spain

This food category includes fresh fish, frozen fish, molluscs, crustaceans and canned fish and molluscs. Imports of aquatic products in general in Spain in 2018 were 1,707,304 tons, with a value of 7.253 million Euros. Exports accounted for 1,157,845 tonnes, worth 4,223 million Euros. This means that the Spanish trade balance in this area is clearly in deficit amounting to -3,030 million Euros, a figure very similar to that of 2017, and which implies a rate of market coverage, by domestic production, of 58.22%.

Household consumption of aquatic products fell -2.4% compared to 2017. In terms of value it also fell, although slightly (-0.9%) as a result of the increase in the average price of 1.5%, to 8.42 Euros/kg. In 2018, Spanish households allocated 12.97% of their total expenditure on food and beverages for the purchase of aquatic products, making a per capita expenditure of 194.19 Euros and consumption of 23.07 kg per person per year, 2.8% less than the amount eaten in 2017. Domestic fish consumption has been progressively reduced since 2010 by 15.8%. The main species consumed in Spanish households are hake, sardines, salmon, sole, cod and tuna. With the exception of canned consumption there is a gradual decline in the purchases of aquatic products in the long term, especially in the case of fresh fish and shellfish. Apart from the consumption of seafood in households there is a notable consumption in Spain in

restaurants and Horeca not quantified by the MAPA in their annual reports.

51.9% of the kilos of aquatic products purchased in Spain for domestic consumption are purchased in supermarkets, with a positive variation of 0.2%. The only favourable development is for e-commerce, with an increase of 11.0% despite its reduced share (0.8% of the volume). The traditional fish store is a channel with a very significant weight, assuming 23.5% of the total, but with a volume reduction of -8.3% during 2018.

Fresh fish consumption accounts for 40.2% of the volume of fish consumed in Spanish households, being the main type in 2018. The second most purchased type corresponds to canned fish and molluscs with a 19.4% share in the segment, and a 23.0% in value, while fresh and frozen seafood mean 14.3% by volume and 13.1% of the value respectively. The months of greatest purchases of fish and other aquatic foods, both in volume and value are always the last ones of the year, coinciding with the Christmas period. Specifically, December is a key month in the consumption of aquatic products, invoicing a 50% higher than the rest of months.

There is no clear statistic on the consumption of aquatic products per capita in Spain, although the European Commission calculates it at 45.7 kg/habit/year. Further statistical information is lacking from the Ministry of Agriculture and Fisheries in this area, including clarifications of if this figure corresponds to kg of biomass live equivalent or of kg of product actually purchased or ingested by each inhabitant.

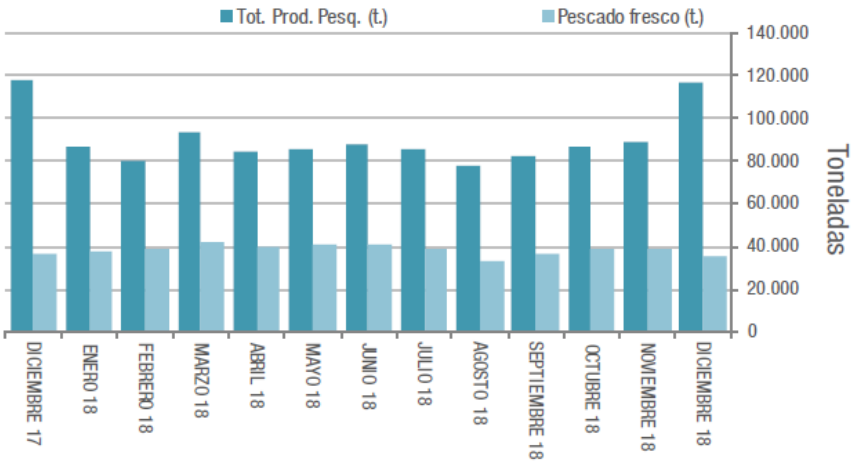



Figure 6-3. Evolution of the consumption of aquatic products (aquaculture plus capture fishing) in Spanish households in 2018. It shows the total of aquatic products (or fishery products) and, within them, of the frescoes (MAPA).

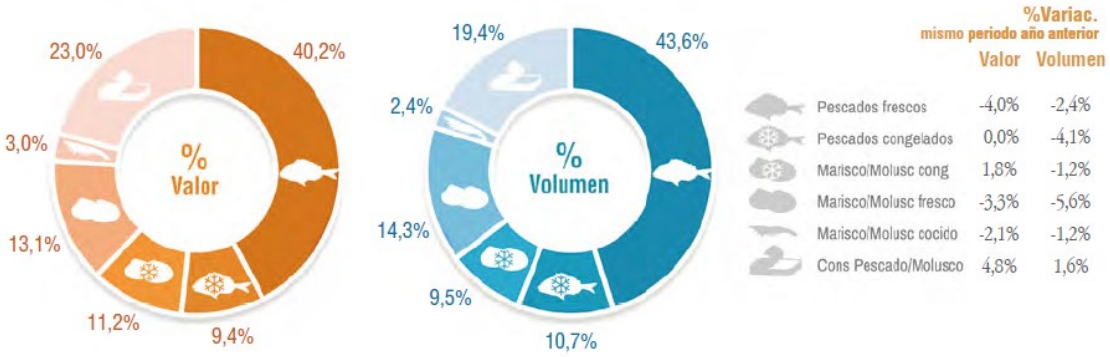



Figure 6-4. Main statistical magnitudes in the marketing of fish in Spain for consumption in households in 2018. Data of MAPA.

Table 6-1. Importance of the different types of aquatic products in their consumption in households in Spain in 2018 (MAPA).

| Productos | TAM* Dicembre 2018 vs Diciembre 2017 | | | | | | |
|---|---|---|---|---|---|---|---|
| | Cantidad consumida en el periodo (miles de t.) | | Evolución | Valor (Millones de €) | | Evolución | Kg per cápita |
| | TAM dic. 2017 | TAM dic. 2018 | %18/17 | TAM dic. 2017 | TAM dic. 2018 | %18/17 | TAM dic. 2018 |
| TOT. PROD. PESQUEROS | 1.082,40 | 1.056,30 | -2,4 | 8.971,30 | 8.889,90 | -0,9 | 23,10 |
| TOT. PESCADO FRESCO | 480,80 | 461,00 | -4,1 | 3.724,20 | 3.577,10 | -3,9 | 10,10 |
| TRUCHA fresca | 13,30 | 11,70 | -12,0 | 84,50 | 76,90 | -9,0 | 0,30 |
| LENGUADO | 30,20 | 29,90 | -1,0 | 295,90 | 288,60 | -2,5 | 0,70 |
| SALMÓN | 49,40 | 51,80 | 4,9 | 549,20 | 561,00 | 2,1 | 1,10 |
| LUBINA | 21,50 | 24,40 | 13,5 | 189,50 | 209,10 | 10,3 | 0,50 |
| DORADA | 25,80 | 27,10 | 5,0 | 205,70 | 213,70 | 3,9 | 0,60 |
| RODABALLO | 4,30 | 4,40 | 2,3 | 44,60 | 47,30 | 6,1 | 0,10 |
| TOTAL ALIMENTACION | 28.885,90 | 28.827,00 | -0,2 | 67.490,80 | 68.538,10 | 1,6 | 629,70 |

| Productos | PARTICIPACIÓN del MERCADO en VALOR ** | | GASTO per CÁPITA (€) | | PRECIO MEDIO (€/Kg.) | | Evolución |
|---|---|---|---|---|---|---|---|
| | TAM dic. 2017 | TAM dic. 2018 | TAM dic. 2017 | TAM dic. 2018 | TAM dic. 2017 | TAM dic.. 2018 | Var. % |
| TOT. PROD. PESQUEROS | 13,30 | 13,00 | 197,58 | 194,60 | 8,21 | 8,41 | 2,4 |
| TOT. PESCADO FRESCO | 5,50 | 5,20 | 82,54 | 78,69 | 7,69 | 7,77 | 1,0 |
| TRUCHA fresca | 0,10 | 0,10 | 1,93 | 1,70 | 6,29 | 6,56 | 4,3 |
| LENGUADO fresco | 0,40 | 0,40 | 6,19 | 5,89 | 9,92 | 9,62 | -3,0 |
| SALMÓN fresco | 0,70 | 0,70 | 10,15 | 10,98 | 10,89 | 10,57 | -2,9 |
| LUBINA | 0,30 | 0,30 | 4,33 | 4,40 | 8,78 | 8,64 | -1,6 |
| DORADA | 0,30 | 0,30 | 4,66 | 4,58 | 7,93 | 7,88 | -0,6 |
| RODABALLO | 0,10 | 0,10 | 0,91 | 0,97 | 10,40 | 10,56 | 1,5 |

Notas: * TAM = Mes en curso + 11 meses anteriores.
** PARTICIPACIÓN del MERCADO en VALOR representa el % de gasto en cada producto comprado con el Gasto Total en Alimentación (= 100%)
Fuente: Subdir. Gral. de Estructura de la Cadena Alimentaria. Dirección Gral. de Industria y Mercados Alimentarios. MAPA.

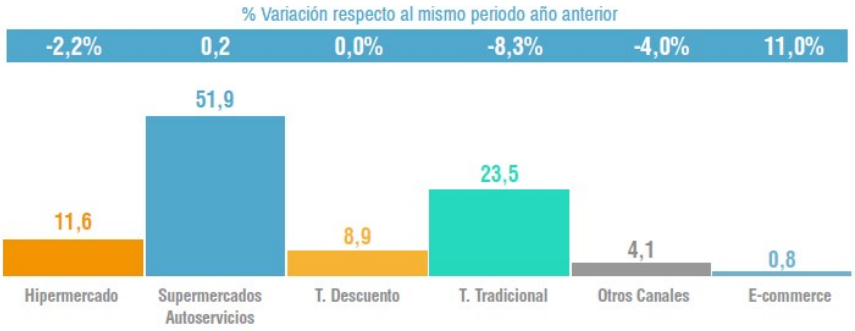



Figure 6-5. Percentage distribution of the purchase of aquatic products in 2018 by type of establishments and percentage variation over the previous year (MAPA data).

## 6.4. Consumption of fresh aquatic products in Spain

Household consumption of fresh finfish in Spain has decreased by -4.1% during 2018. The value of this finfish has contracted in a very similar proportion (-4.0%).

Supermarkets and self-service, next to the traditional fish shops, are the channels with the highest proportion of purchases of fresh aquatic products in 2017. The variation is negative for the entire dynamic channel (hypermarkets, supermarkets and self-service and discount store), with the greatest contraction (11.6%) discount stores.

In 2018 there has been a widespread price increase across all channels, with the discount stores being where the most marked increase has occurred. However, it is the traditional store that offers the highest prices with 8.32 Euros/kg, despite having increased its prices less than the rest of the stores (+2.8 %). Supermarkets and self-service are the channels that offer the lowest prices on the market, 4.9% below the national average.

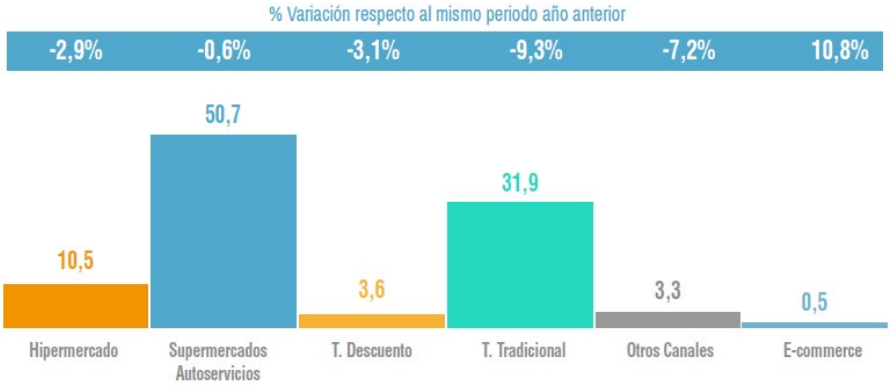



Figure 6-6. Percentage distribution of the purchase of fresh aquatic products in 2018 by type of establishments and percentage variation over the previous year (MAPA data).

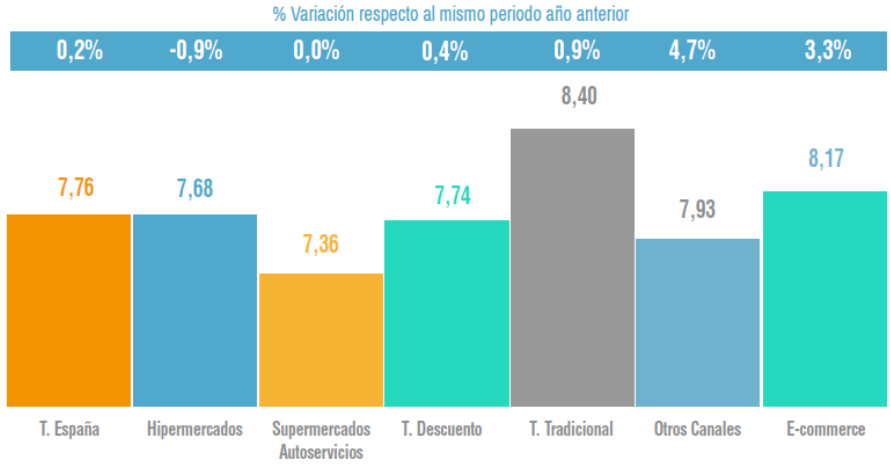



Figure 6-7. Percentage distribution of the average price of fresh aquatic products by sales channels in 2018 and percentage change over the previous year (MAPA data).

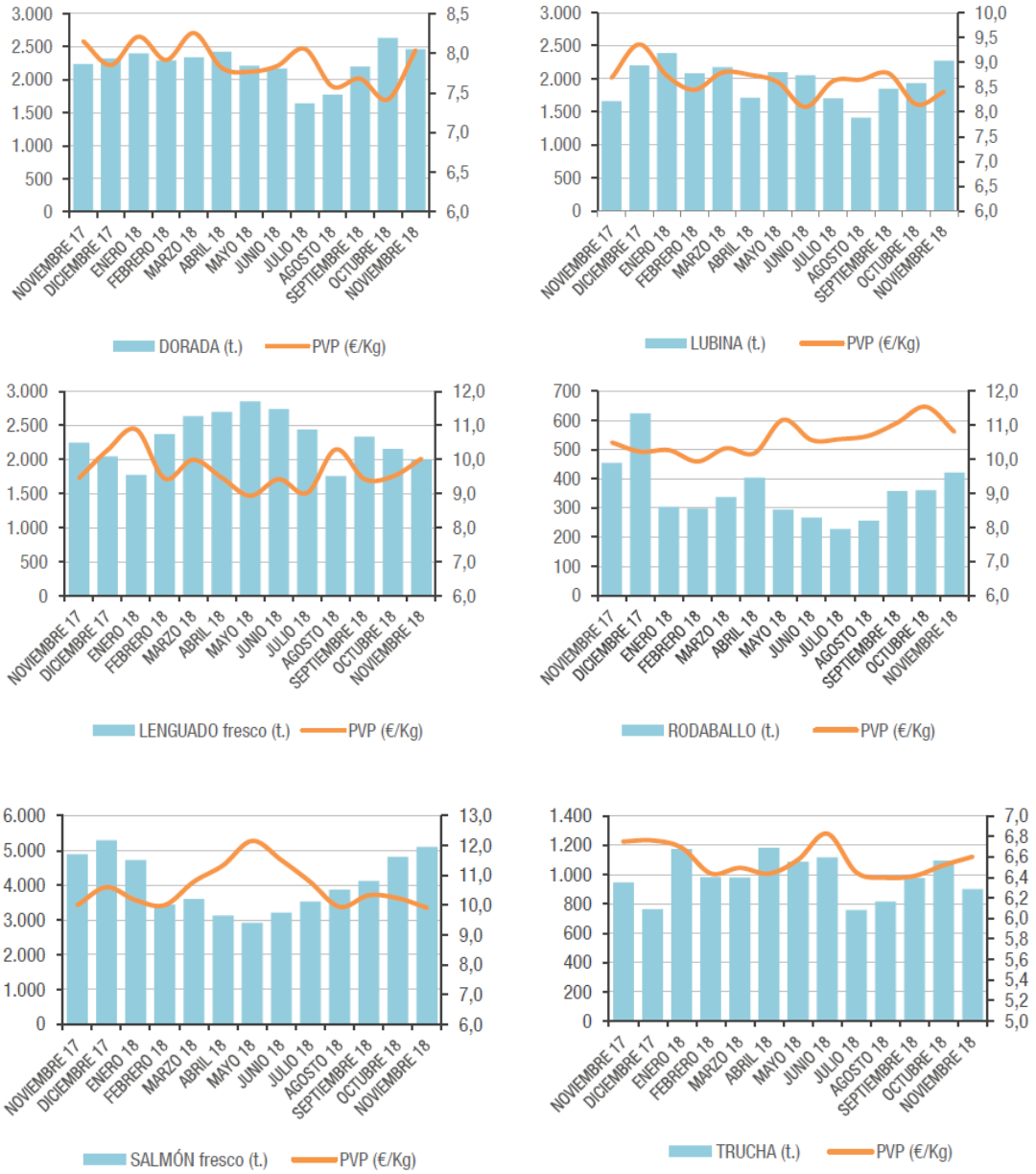



Figure 6-8. Evolution of fish consumption from aquaculture and fisheries in Spanish households in 2018. The quantity (t.) and the retail price (source: Di. General of the Food Industry of the MAP) is indicated.

## 6.5. Marketing of Gilthead seabream

The average first sale price of aquaculture Gilthead seabream produced in Spain in 2018 was 4.41 Euros/kg. This figure is -9.5% lower than the average price in 2017. The total value of the 14,930 tonnes of Spanish gilthead sea breams marketed was 65.8 million Euros.

The consumption of gilthead sea bream in Spanish households in 2018 increased by 5.0%, reaching 27,100 tons, according to the MAPA Consumption Panel. This figure would mean consumption in households of 600 g of gilthead seabream per person (in kg of body weight equivalent) in 2018, i.e. only two rations per year. APROMAR considers that, although small, these household consumption figures (excluding domestic extra) are magnified by procedural reasons in the sampling used by the MAPA's Consumption Panel. However, the association considers the reported trends of variation as appropriate and illustrative.

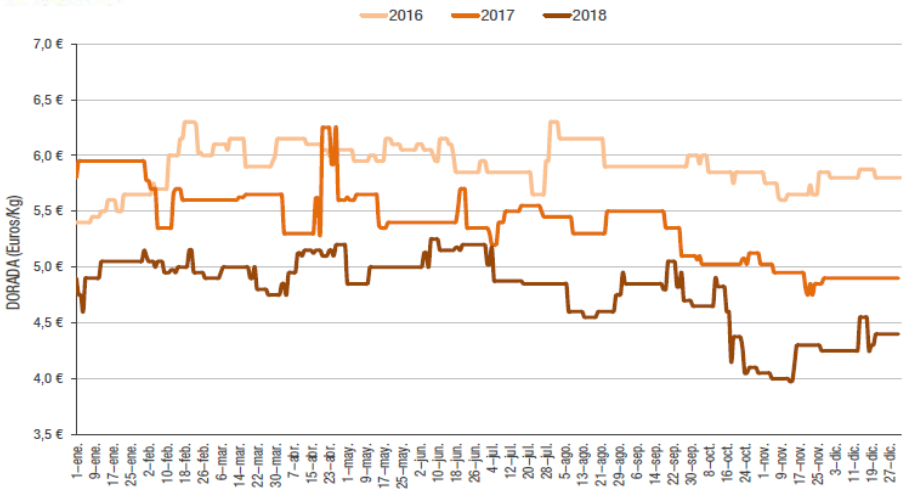



*Figure 6-9. Evolution of average prices (Euros/kg) of sea bream (400/600 g.) sold in MercaMadrid and MercaBarna (Mercas exit prices) between 2016 and 2018 (data from the Ministry of Economy and Competitiveness). All price values are nominal and have not been adjusted to IPC variations.*

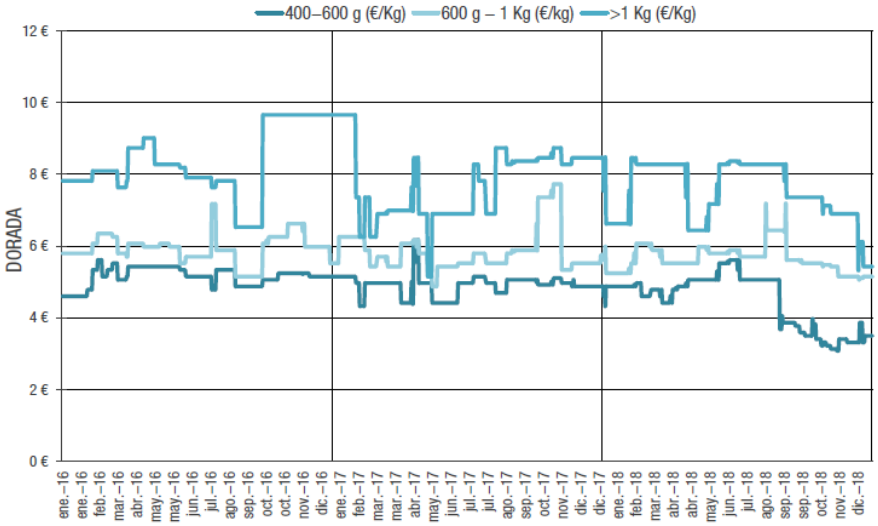



Figure 6-10. Evolution of average prices (Euros/kg) of first sale of gilthead sea bream in its three main commercial sizes between 2016 and 2018 (Ministry of Economy and Competitiveness).

The total retail value of these quantities of sea bream for consumption in households, reported in MAPA's statistics, has increased by 3.9% in 2018 to 213.70million Euros, with an average retail price of 7.88Euros/kg, which meant a lowering of -0.6 %. This average retail price represented an increase 78.7% above the first sale price, which in absolute values means 3.47Euros more paid by end consumers for each kilogram than those obtained by fish farmers.

The commercialization of aquaculture Gilthead sea bream is mainly carried out through supermarkets and multiple retailers. Traditional fishmongers (specialized trade) are the third largest channel to sell. There is also marketing through the extra domestic channel Horeca (Hostelry, Restoration and Catering), but most of the consumption is done in households (approximately 80%).

At the Mediterranean level, the main market for gilthead sea bream remains to be Italy, where some 50,500 tonnes per year are consumed. The next three markets are Turkey (26,432 t.), Spain (23,161 t.), Greece (13,980 t.) and France (15,039 t.).

APROMAR estimates in 23,161 tonnes the consumption (production + imports - exports) of gilthead sea bream in 2018 in Spain, 0,7 % more than the previous year. The national harvest of this species was 14,930 t and fishing 1.231 t, at the same time that 14,500 t were imported and 7.500 t exported. As a result, only 37.4% of the gilthead sea breams consumed in Spain in 2018 were domestically produced (assuming that all exports of sea bream from Spain were of Spanish productive origin).

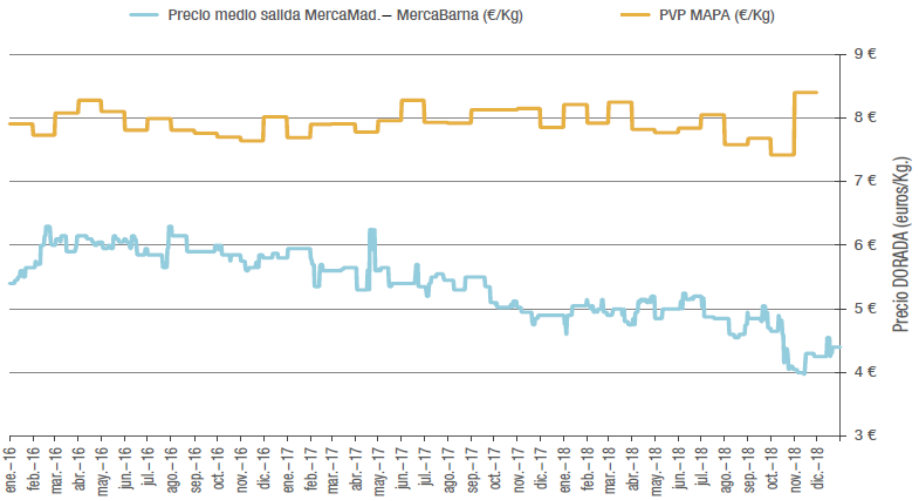



Figure 6-11. Evolution of the prices of Sea bream output of Mercas and the final consumer prices between 2016 and 2018 (Euros/kg). All price values are nominal and have not been adjusted with IPC variations.

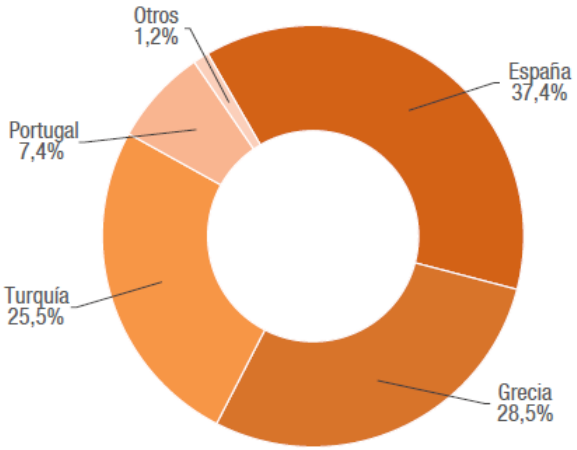
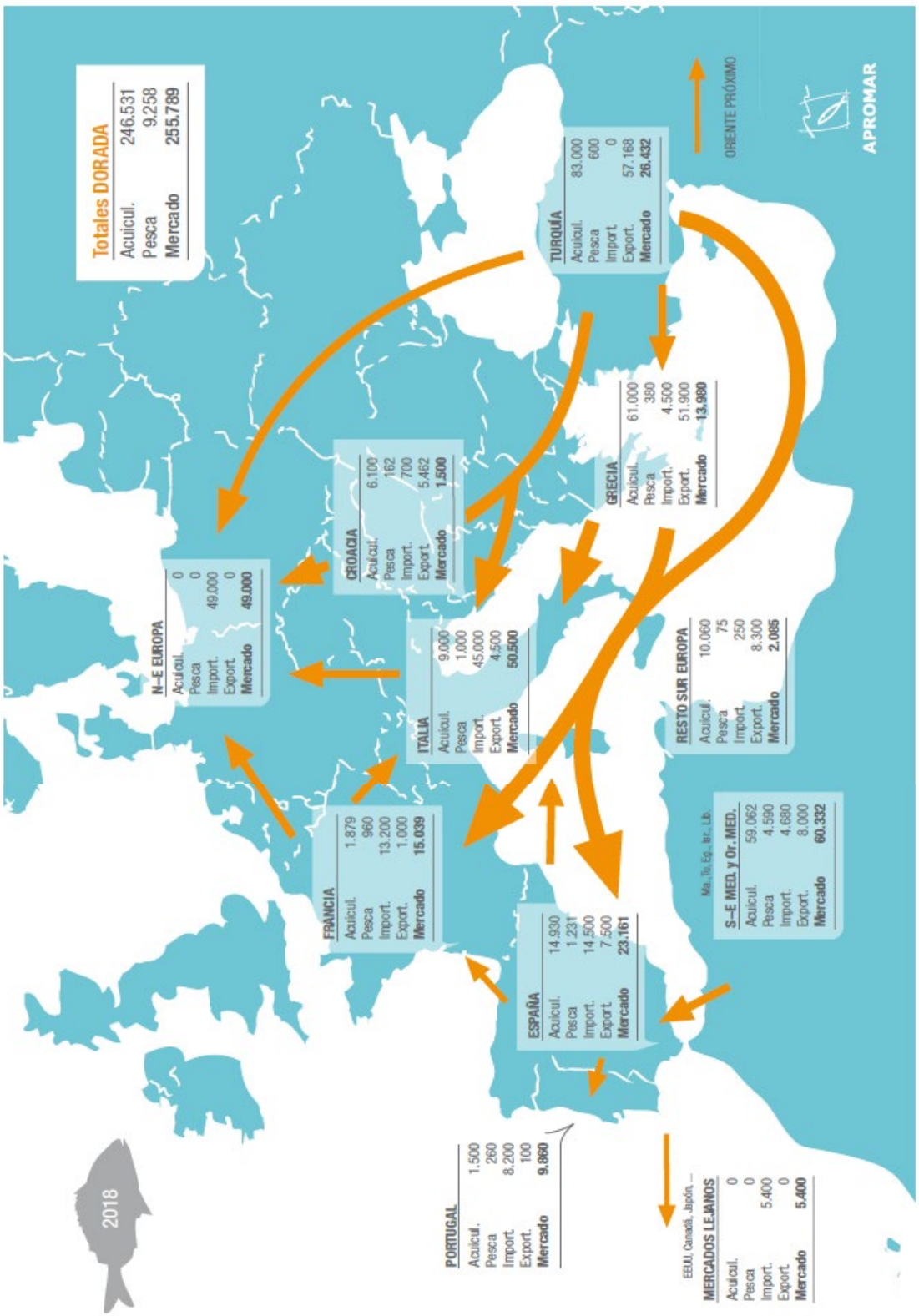



Figure 6-12. Percentage distribution of the country of origin of Gilthead sea bream sold in Spain.

Figure 6-13. Diagram of production, trade flows and apparent markets for sea bream in Europe in 2018. Based on data from FEAP, FAO and APROMAR.



## 6.6. Marketing of European sea bass

The average first-sale price of aquaculture European sea bass produced in Spain in 2018 was EUR 4.68/kg. This figure is -0.1% lower than the average price of the previous year. The total value of the 22,460 tonnes of Spanish produced sea bass was 104.2 million Euros.

Sea bass consumption in Spanish households increased in 2018 by 13.5% in quantity compared to 2017, reaching 24,400 tonnes, according to the MAPA Consumption Panel. This figure would mean consumption in households of 500 g of sea bass per Spaniard in 2018. APROMAR considers that, as in the case of gilthead seabream, although the percentages of variation (trends) in sea bass consumption may be correct, the numbers magnified by procedural errors in the sampling used by the Consumption Panel of the MAPA, although the evolution of the magnitudes is probably correct.

The total value of the final sale to the public of these tonnes of sea bass for consumption in households would have reached, according to the MAPA 209.10 million Euros, with an increase of 10.3% compared to 2017. The average retail price for sea bass in 2018 was 8.64 Euros/kg, a reduction of -1.6%. This retail value for sea bass paid by consumers means an 84.6% increase over the first-sale price, which in absolute values was 3.96 Euros per kilo more paid by consumers than those paid to producers in the first sale.

The marketing of aquaculture European sea bass, as well as that of gilthead seabream, is mainly carried out through supermarkets and multiple retailers. The specialized canal (traditional fishmongers) are the third channel of sale. There is also marketing through the Horeca channel (Hostelery, Restoration and Catering), but most consumption occurs in households (approximately 80%).

The main international markets for sea bass are Italy and Spain, where approximately 39,800 and 28,360 tonnes per year are consumed respectively. The following markets are Turkey (20,000 t.), Greece (9,840 t.) and France (9,483 t.).

APROMAR estimates in those 28,360 tonnes the consumption (production + imports - exports) of sea bass in 2018 in Spain, 7.0% more than the previous year. The national harvest of this species was 22,460 t and fishing 600 t, while 11,300 t were imported and 6.000 t were exported. As a result, 60.2% of the sea bass consumed in 2018 in Spain were domestically produced (assuming that all of the exports of sea bass from Spain were of Spanish productive origin).

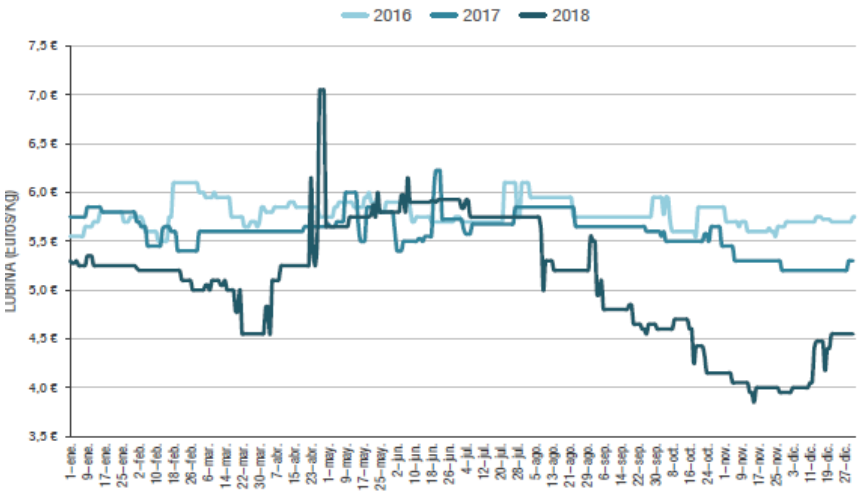



Figure 6-14. Evolution of the average prices (Euros/kg) of first sale of sea bass in its three main commercial sizes between 2016 and 2018 (Ministry of Economy and Competitiveness).

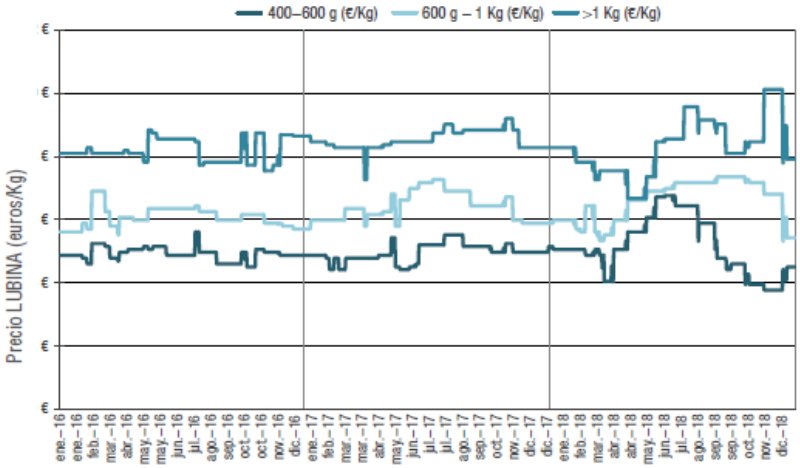



*Figure 6-15.*
*Evolution of the prices of off-sea bass from Mercas and the final consumer prices between 2016 and 2018 (Euros/kg). All price values are nominal.*

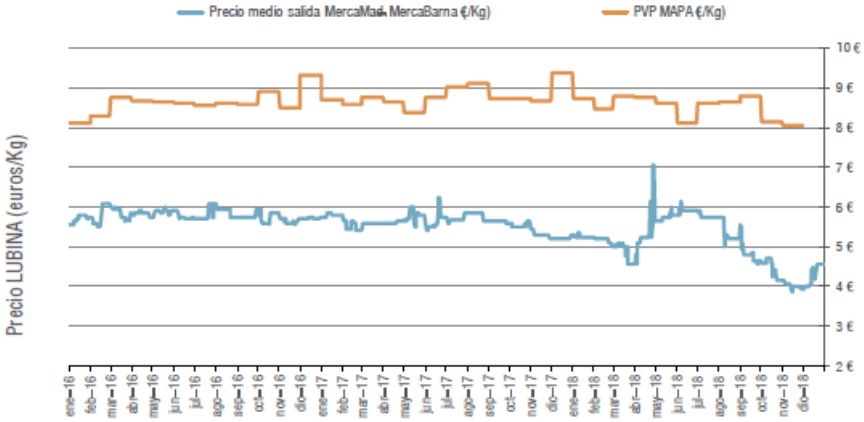



Figure 6-16.
Percentage distribution of the country of origin of the sea bass sold in Spain.

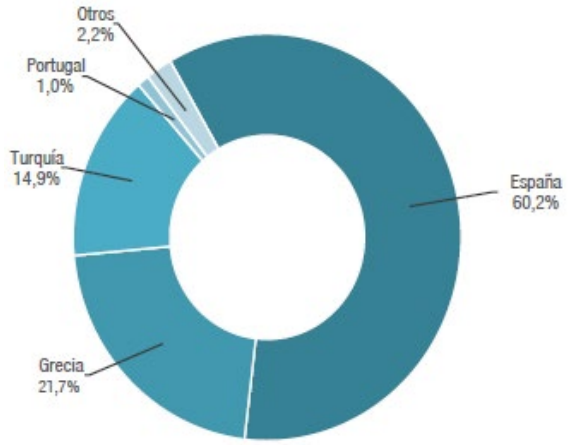
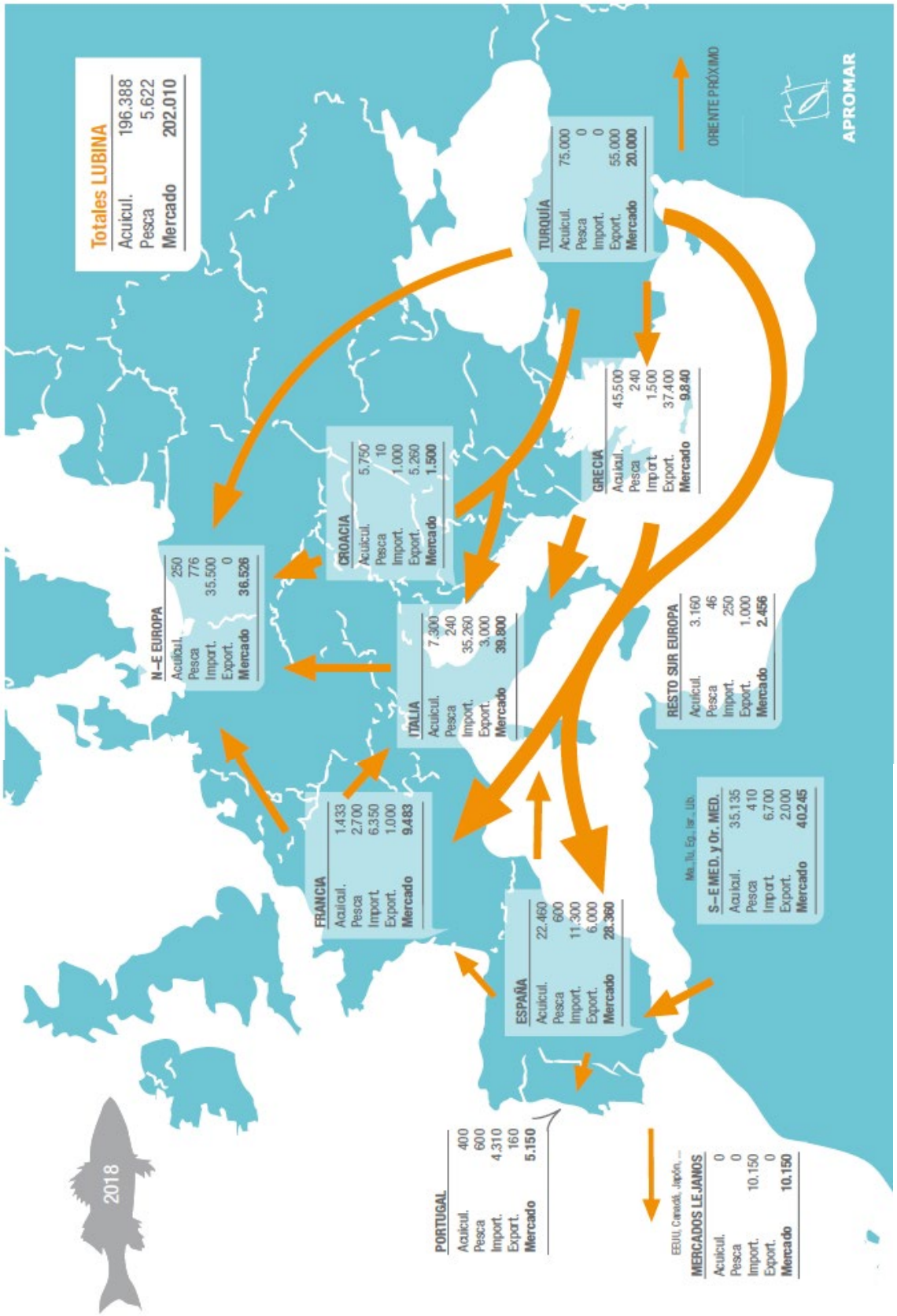



Figure 6-17.
Diagram of productions, trade flows and apparent sea bass markets in Europe in 2018. Based on data from FEAP, FAO and APROMAR.

Figure 6-18. Diagram of production, trade flows and apparent markets for sea bass in Europe in 2018. Based on data from FEAP, FAO and APROMAR.



## 6.7. Marketing of turbot

The average first-sale price for aquaculture turbot produced in Spain in 2018 was EUR 8.89/kg. This figure is virtually similar to the previous year one (0.7%) and accounted for a total amount of 72.9 million Euros.

Turbot consumption in Spanish households increased by 2.3% in 2018 to 4,400 tonnes, according to the MAPA Consumption Panel. This figure means consumption in households of an average of 100 g of turbot per person this year.

The total retail value of these tonnes of turbot increased by 6.1% and totalled 47.3 million Euros, with an average retail price of 10.56 Euros/kg. This average selling price represents an 18.7% increase over the first sale price, which in absolute values is 1.67 Euros more per kilo.

Spanish aquaculture turbot is marketed through various channels, but essentially through the Horeca, and to a lesser extent through traditional fishmongers, but also, and increasingly, in supermarkets and multiple retailers. Unlike in the case of sea bream or sea bass, a greater export trend stands out with turbot, due, inter alia, to Spain producing 74% of aquaculture turbot from across Europe.

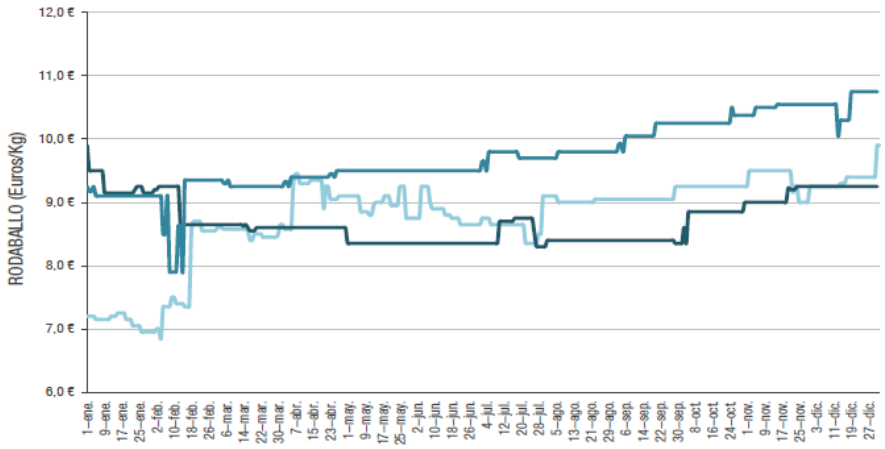



Fig.6-19.
Price evolution in the sales of turbot (1,000/2,500 g.) in MercaMadrid and final consumer prices between 2016 and 2018. All price values are nominal.

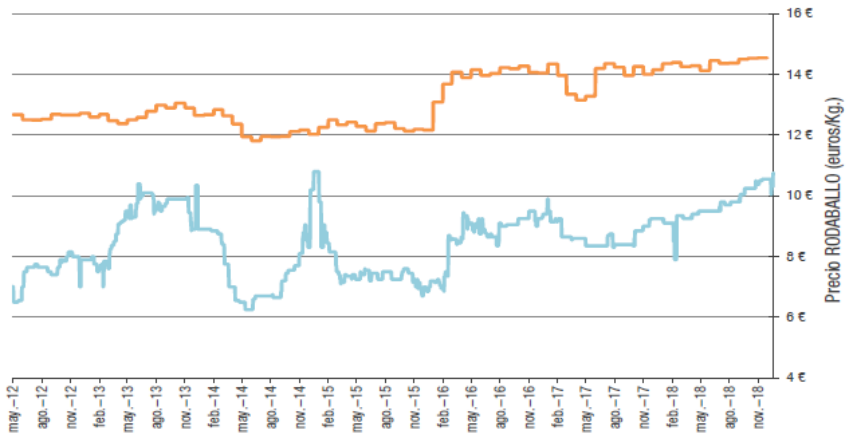



Figure 6-20
Price evolution in the commercialization of turbot (1,000 / 2,500 g) in MercaMadrid and PVP between 2016 and 2018.
All values of Price are nominal.

# 7. Aquaculture challenges in Spain

Aquaculture is an economic activity that has a remarkable tradition in Spain and is socially relevant in many of its coasts and rivers. This primary sector, of which this country is the main producer in the European Union as can be read in the previous chapters of this report, consists of micro, small and medium-sized enterprises. As a whole, they are competitive entities, each at their own level, but that still constantly innovate to optimize their activity. Many of these companies are even at the forefront of aquaculture in Europe and attract investors of all nationalities. And as for the commercialization of their productions they do it both in Spain and in demanding international markets.

Aquaculture facilities are often located in remote rural, river or coastal areas, rarely reaching other types of investment and where aquaculture is frequently the only business activity generating stable and quality employment. In addition, it offers a significant percentage of inclusive employment, both in productive positions, as well as technicians and managers.

**Aquaculture offers employment options to the population in numerous Spanish coastal and river locations where it becomes the main engine of the local economy.**

As a consequence of the requirements inherent to its production process, i.e. the production of food destined for people and the need for water, which in Spain is a public good, the legal framework in which aquaculture must be carried out becomes easily a tangle that is tremendously complex to unravel. This adds additional economic costs and administrative burdens which undermine the companies' competitiveness.

The Spanish Aquaculture Multiannual Strategic Plan 2014-2020, approved in 2014by the General Secretariat for Fisheries of the Ministry of Agriculture and Fisheries, Food and Environment, analysed the situation of this sector and oriented it towards sustainable growth developments for the horizon 2020 and 2030. This plan provides answers to the issues raised in the Strategic Guidelines for the Sustainable Development of European Aquaculture published by the European Commission in 2013 on common priorities and needs for the development of this sector. The European Commission is expected to revise these Guidelines by 2020.


The Strategic Plan of Spanish Aquaculture set ambitious targets for aquaculture in this country, from 266,684 tonnes of production in 2012, to 369,470 tonnes in 2020 and to 527,766 tonnes in 2030. The first-sale value of these figures would be from 435 million Euros in 2012 to 780 million Euros in 2020 to 1.465 million Euros by 2030. If these data are met, aquaculture employment in Spain could reach 30,000 people by 2030. But as from 2019 these figures seem clearly unattainable.

The Strategic Plan of Spanish Aquaculture pointed out eight strategic lines of action and within these a total of 37 strategic actions. APROMAR agrees with the definition of these lines and the selection of actions, and hopes that they will be carried out, but doubts the effective involvement in them of several departments of the administration, both state and regional , that were not involved in the drafting of the strategic plan but which nevertheless play a crucial role in the public administrative management of aquaculture. This is the case, at the state level, of the general direction of Marina Mercante (Ministry of Development), the general direction of water and the general directorate of Sustainability of the Coast and the Sea (Ministry for Ecological Transition), and at the regional level, of the environment and port authorities.

**Spain will not achieve by far the growth forecasts set out in the Spanish Aquaculture Multiannual Strategic Plan. It is important to analyse the causes. Having a strategic plan is not enough. The goal is to achieve the goals. Spanish aquaculture continues to face difficult-to-solve challenges from private initiative side without the determined support from the public administrations.**

It is the responsibility of each company to improve its own competitiveness, but in the last few years the development of Spanish aquaculture has been hampered by the inadequacy of the legal-administrative framework in which it must be carried out. Having the strategic plan is not enough. The objective should be to achieve its goals because Spanish aquaculture continues to face challenges that are difficult to solve solely from the private initiative without the determined support of public administrations. The main challenges are explained below. It is paradoxical that Spanish aquaculture, being able to deploy exceptional potential, is being forced to a stagnation for perfectly surmountable issues.

## 1. Need to streamline administrative procedures

Aquaculture is an extremely regulated activity by public administrations. This is basically true for two reasons: because it is the production of food for people and secondly because of the use of water and public domain spaces. This entails compulsory obtention of permits, concessions and authorizations whose achievement and renewal are now so difficult and slow that they discourage entrepreneurship.

The Spanish political-administrative framework, with strong divisions between the state, regional and municipal levels, is lacking sufficient coordination, represents a fragmentation of the national market, carries inefficiencies in its implementation and the absence of equality of conditions between Spanish actors based on their geographical location due to divergent regulations. This situation creates heterogeneous situations and complicates the work of companies that have production facilities in several different autonomous regions. These differences are heightened by the different interpretation by the Autonomous Regions of higher-ranking regulations (national or European). This situation occurs, for example, with environmental monitoring standards, with the requirements for the granting of authorisations, with mandatory labelling of fish, with compatibilities between professional qualifications (diving, for example), animal health requirements, immersion permits (fish stocking), enabling titles for the exercise of activity, marketing regulations, access to public aid, etc., which increase the costs of companies and make the mobility of enterprises and workers difficult within the national territory. All this results in the lack of a level playing field for companies in their domestic and external operations. The latter circumstance is a factor of imbalance in adding to the inequality already suffered by European domestic producers against unfair imports by non-EU players.

The solution could begin with the establishment of effective coordination between Spanish Autonomous Regions in the enactment of their own regulations.

The failure of any specific autonomous region to be responsible for its own competences does not necessarily mean that it has to propose solutions other than those of its neighbouring regions. And the solution would continue with the adoption of the same criterion when interpreting or improving higher-ranking legal regulations.

## 2. Lack of a stable and legally secure regulatory framework for the occupation of the public maritime-terrestrial domain

Thirty years after the 2018 Spanish Coast Law, the conditions for the occupation of concessions on the Spanish coast are unclear despite the cautions set out in that law. The Spanish Constitution states that the maritime-terrestrial zone, the beaches and the territorial sea are in any case under state public domain and, in a country with such a coastal length it is correct that the coast must have such a high range of guarantees. However, the realization of this protection must be carried out with full respect for the rights of companies and the decisions of the political representatives embodied in the laws. The Government's obligation is to develop these decisions by regulation in a manner that is fully respectful of the principle of legality.

The 1988 Coast Law is a highly protectionist coastal rule, but it does not intend the eradication of economic activities in the coast. On the contrary, the law established a regime of full respect for those rights. According to the second transitional provision of the Law, these productive activities should remain in their legal position. However, a regulatory development in 1992 limited the duration of the concessions covering productive activities to thirty years since the entry into force of the Coast Law. All economic activities located on the coast on the basis of these old titles were therefore to be extinguished simultaneously in 2018, which was unreasonable. The problem could easily have been solved by repealing the regulatory provision to recover, without distortion, the regime provided for in the second transitional provision of the Coasts Law. However, the reform of the Coasts Law 2/2013, which was expected to improve legal certainty and solve the problem of the extinction of the old concessions in 2018, merely provided for the possibility of a concessional time extension that could have a longer time limit up to seventy-five years. Indeed, this regulatory development, in line with the 2013 lawmakers intention to review concessional extinctions in 2018, provided for an automatic extension, for a period of seventy-five years (the maximum period). Despite this, there have been interpretative problems since the 2013 reform of the extensions that have once again placed the companies, and the workers who depend on them, in the difficult rope of legal uncertainty.

## 3. Insufficient availability of the European Maritime and Fisheries Funds

The Common Fisheries Policy (CFP) is the legislative framework that applies to the European Union's entire aquaculture sector, including Spanish companies and other stakeholders. With a view to making it easier for aquaculture (and capture fisheries) companies to fulfil their obligations to the CFP, the European Union provided for the European Maritime and Fisheries Fund (EMFF) for the period 2014-2020. Spain, with an allocation of 1,161 million Euros of total shared management resources between Member States, 20.2% of the total, is the first EMFF recipient in its target budget. But at the time of the preparation of this annual report, the granting of EMFF money to aquaculture and fisheries projects in Spain has been highly insufficient. At the end of 2018 Spain had to pay back to the European Commission 50 million Euros for failing to meet the expenditure of the committed funds. So much that it is already evidently impossible, in the short time that remains, the full use in Spain of the funds of the EMFF that it was allocated. The causes of this unfortunate situation are diverse: the complex Spanish administrative and competitive framework; the excessive number of intermediate management administrations of the EMFF in Spain (Intermediate Management Organizations), many of them with very little interest in aquaculture; insufficient collaboration between administrations; public budgetary constraints in Spain (because of the public deficit) that limit its ability to contribute its co-financing to the EMFF; the European Commission's inhibition on responding in a binding manner to doubts from the Member States; mismatches in the working rhythms of different

agents; the non-implementation of the Financial Instrument as a financing element; and the complexity of the EMFF Regulation itself. In such a way that today we can say that the entities responsible for this situation are all and none: European Parliament, European Commission, General Administration of the Spanish State (MAPA) and Autonomous Communities (its competent aquaculture departments). APROMAR has already warned public administrations that when the end time of the EMFF is reached, and its insufficient funds are used, fish farmers should not be held accountable as responsible for the unused funds.

## 4. Spatial planning

APROMAR promotes the development and sustainable growth of aquaculture through coordinated space management. It has been demonstrated that the implementation of spatial management plans can contribute to reducing uncertainty, facilitating investment and accelerating the coexistence of sectors such as aquaculture with the production of renewable energy, or with fisheries, or tourism. The lack of legal availability of space, often cited as an obstacle to the expansion of marine aquaculture, is a circumstance that can be resolved by determining which are the most suitable places for aquaculture activities, as these require a very limited part of the territory and the coastline.

APROMAR supports that the spatial management of aquaculture is an essential element for its sustainable development. But we see how each autonomous region addresses this issue differently and, even assuming that specifically tailored solutions will have to be sought in each situation, there are basic principles that must be assumed by all. The basic objective of aquaculture spatial management should be to accelerate the required administrative procedures (use concessions, environmental monitoring and activity permits) so that when an enterprise requests an authorization the greatest part of these efforts are already settled in advance. But there is a second factor, undoubtedly more important than the previous one, which should guide the spatial management of aquaculture farms, especially for those located at sea: fish health policy. The health of the species has been shown, in all its crudeness on many occasions (e.g. in Chile, Feroe or Ecuador), as to be the main factor of viability of the aquaculture sector, both fish, molluscs or crustaceans. It is a matter already overcome in terrestrial livestock, but not so in aquaculture. More advanced countries in this area such as Norway, the Faroe Islands or Scotland have adopted solutions that here in Spain there is no doubt that will have to be fulfilled in the future, but the sooner the better: sanitary fallowing with production rotating between several implementation of the "all-in-all-out" principle in terms of juvenile stocking and market size fish harvesting, synchronization of health operations in terms of treatments and minimum distances between farms.

Several approaches to this issue are currently being addresses in Spain according to the autonomous region concerned. They range from the authorization of individual farms, as in the Valencian Community, to the establishment of large areas declared as suitable (or of interest), as in Andalusia. But without a doubt the least convenient option is the creation of polygons in the sea. Within each polygon including farms belonging to different aquaculture companies. It is the path followed by the Region of Murcia. Although the existence of polygons greatly simplifies the management of the necessary authorisations (concessions, environmental and activity) the risk to fish health is immense and this way of ordering the sector is contrary to basic zootechnical and zoosanitary principles. The proximity between farms turns each polygon into an epidemiological unit and the effort of companies to work in coordination, even with the work of the Aquaculture Livestock Health Defence Groups (ADS), is not enough to minimise the risks. APROMAR's message is that, in the case of marine aquaculture in farms at sea, the main criterion for spatial management of the sector should be zoosanitary. The streamlining of administrative procedures should be addressed through a simplification of procedures, greater coordination between public administration departments, the internal better qualification of civil servants in matters of aquaculture and structured planning of the strategic development of aquaculture. And all this not only between the general administration of the country and the regions, but also between different ministries within each of the Autonomous Regions. One of the research priorities in Europe should be to learn how to manage knowledge in this area, including the

public administration. Spain will have to do so if it wants to have a viable and competitive aquaculture industry with guarantees for the future.

## 5. Equal conditions for imports

The aquaculture industry is particularly competitive, especially in Spain and the European Union where more than half of aquatic products are imported from third countries. It should be known that companies compete with each other not only on the basis of their own competitiveness but also by comparing the regulatory frameworks to which they are bound in their respective countries. The wide disparity between the administrative and legal requirements required to carry aquaculture inside and outside the European Union, especially in respect of countries that are clearly exporter of aquaculture products, means that in the EU two different market realities coexist: what is produced in the EU is bound by very demanding conditions while what is produced in third countries has a minimum of environmental, social or even animal health requirements. It is true that all foodstuffs placed on the European market meet the minimums to ensure the health of consumers, but above that threshold the differences are enormous. It makes no sense that products whose production is prohibited in the European Union can be placed legally on the European Union market.

This paradoxical situation is meaningless and is a huge harm to the Spanish aquaculture sector. It happens, for example, in environmental control. But also in relation to food security, where traceability, which in European Union products is required from the time of the birth of animals until they reach the consumer, in the case of third-countries products exported to the Union are only required to keep records from the processing plant after slaughter, omitting the entire long farming period. This lack of reciprocity is not exceptional of aquaculture and is repeated for numerous agricultural and livestock products. Its solution depends on political decisions at the highest European level, but where the weight of the Spanish Government, as a large EU agricultural and fishing Member state, must be noted. The solution to this problem is to correct those inequality by requiring all aquatic products marketed in the EU to comply with equivalent conditions of production and traceability.

## 6. Unfair competition in subsidies from Turkey

Competition in the production and marketing of rainbow trout, gilthead seabream and European sea bass in Europe has been distorted over the past ten years by direct subsidies for the production of these species in Turkey. This country has developed its aquaculture sector in recent years at an exponential rate, orienting it to exports and directed from the public sectors to make it one of the most important in the European area. APROMAR is convinced that Turkey has achieved this through unfair economic support from its government. The excellent natural conditions of that country for aquaculture, both continental and marine, and the know-how of its companies are undeniable, but such a breakneck growth speed would have been impossible without a favourable administrative and political framework, and in this case unfair promotion.

APROMAR, together with other European aquaculture associations, has tackled this damaging situation by filing successive legal claims against Turkey with the European Commission's Directorate-General for Trade in Brussels. The resulting scenarios have been positive but different depending on the species. In any event, the European aquaculture sector producing these 3 species remains vigilant in the face of this situation. These successes must make Third country governments aware that if they want to support their productive sectors, they must do so with aid that does not distort free competition.

# 8. Spanish scientific production in the field of aquaculture

By Morris Villarroel Robinson, Polytechnic University of Madrid

Many Spanish scientists have been working for years on aquaculture research, but it is not always clear how much is investigated, or in what areas. This article quantifies Spanish scientific production in the field of aquaculture, both in quantity and quality since, as many international institutions claim, science helps to drive business and technological innovation. Specifically, all scientific articles in which at least one Spanish scientist has participated in the 15 most relevant to aquaculture journals in the main collection of the *Web of* Science, a database of scientific bibliographic information that allows to evaluate and analyse the performance of research in any country.

## 1. Publications by Spanish scientists on aquaculture

Using the keyword "Spain" in the field of "Address", and the official name of each of the 15 journals in the field of "Name of publication" delivers the total number of scientific articles in which one or more Spanish scientists has participated. The result is the information presented in Figure 8-1. From 1979 to 2018 Spanish scientists have published a total of 3,275 articles in the 15 most impacted journals analysed, of which 1,080 articles, about one third of the total, appear in the journal "Aquaculture", the oldest in the area. Since 2010 Spanish scientists have produced an average of 175 items per year, increasing annually by 8% on average.

To provide an idea of the quality of the magazines and the proportion of articles in each journal, the total articles have been counted by the 15 journals objects of the analysis (Figure 8-2). Generally, the quality of a journal is reflected in its "impact factor", a measure of the number of times other works cite the journal. In 2018 the two most impactful journals in the field of aquaculture were *Reviews in Aquaculture,* with a factor of 7.1 and Reviews in *Fisheries Science and Aquaculture* with a 4.8. However, those two magazines are relatively new (they started after 2012) and the next two magazines in the ranking are better known (Fish *and Shellfish Immunology* and *Aquaculture).* In total, over the years, Spanish scientists have published more than 200 articles in six journals on the list, *Fish and Shellfish Immunology, Aquaculture, Journal of Fish Biology, Diseases of Aquatic Organisms, Aquaculture Research and Journal of Fish* Diseases, demonstrating the great collective research capacity of this country.

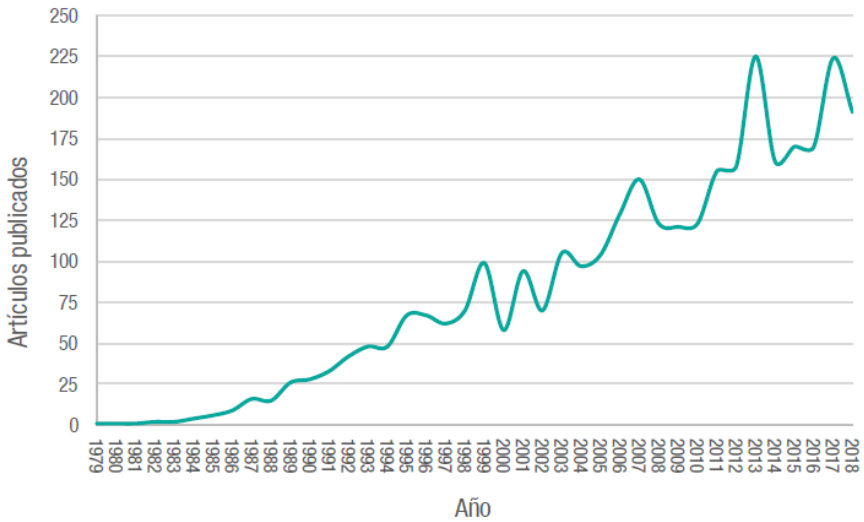



Figure 8-1. Evolution of the number of scientific impact articles published by Spanish scientists in the 15 most relevant journals in the area of aquaculture internationally from 1979 to 2018.

## 2. Comparison of Spain in relation to other European countries in terms of scientific production

In order to compare Spanish scientific production with that of other European countries (EU-15), the total number of scientific articles in aquaculture per country have been added in each of the 15 targeted journals of the analysis (Figure 8-3). According to this data, Spain is the first European country of this list in terms of quality production, above neighbours such as France, Italy, the Netherlands or Germany. Norway, although officially not belonging to the EU-15, has been included comparatively and because it is the world's first power in aquaculture in this matter.

## 3. Institutions that publish more in Spain

To find out which centres or institutions publish most at the national level, the results obtained in the preceding figures have been analysed as to the origin of each signatory scientist. Scientists working in the Higher Council for Scientific Research (CSIC) publish the most, followed by the University of Santiago de Compostela, the University of Murcia and the University of Barcelona (Figure 8- 4).

## 4. Spanish scientists with the highest number of scientific papers published

For each journal there are more prolific authors, who have published a greater number of articles. In the case of Spain, most of these scientists are women. For example, María de los Angeles Esteban, of the University of Murcia, is the Spanish scientist who has published the most in *Fish and Shellfish Inmunology,* with 115 articles. Marisol Izquierdo, researcher at the University of Las Palmas de Gran Canaria, has published more than 40 articles in *Aquaculture,* 10 articles in *Aquaculture Nutrition* and almost 20 in *Aquaculture Research.* And another woman, Alicia Estévez Toranzo, is the one who has published the most articles in the *journals Of Fish Diseases* and Diseases of *Aquatic Organisms.* All these data highlight the important role of women in the field of aquaculture research in Spain.

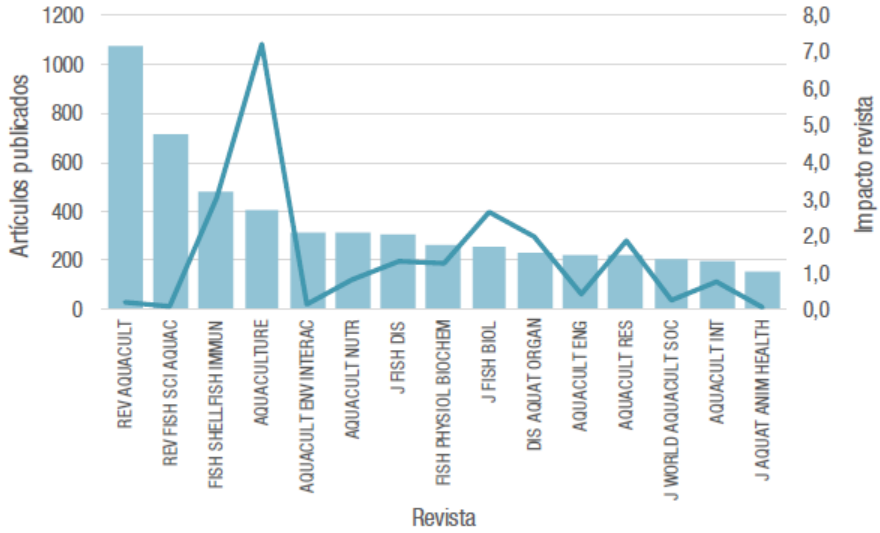



Figure 8-2. Summary of the impact of the 15 most important journals in the area of aquaculture at the international level and the total number of articles published in each journal by Spanish scientists since 1979.

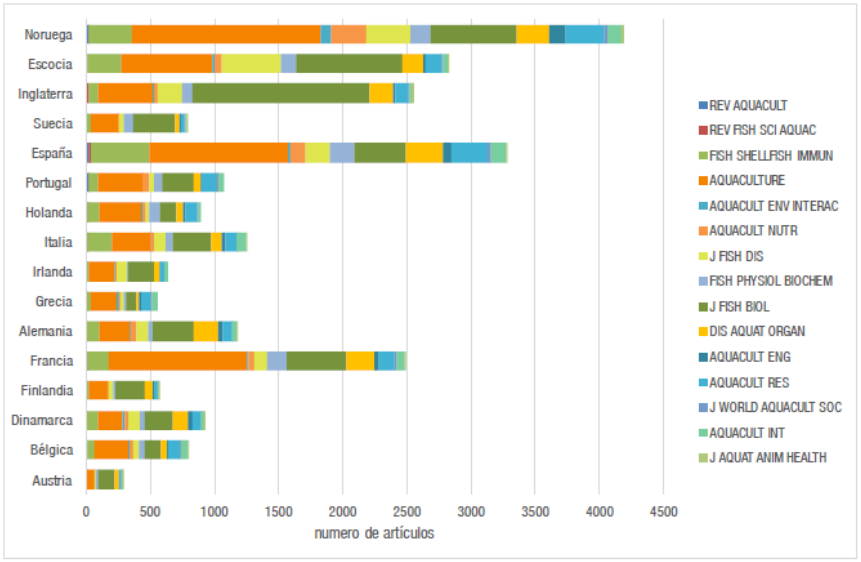



Figure 8-3. Summary of the total scientific papers published in each of the 15 most important aquaculture impact journals for European countries (EU-15) and Norway from 1979 to 2018.

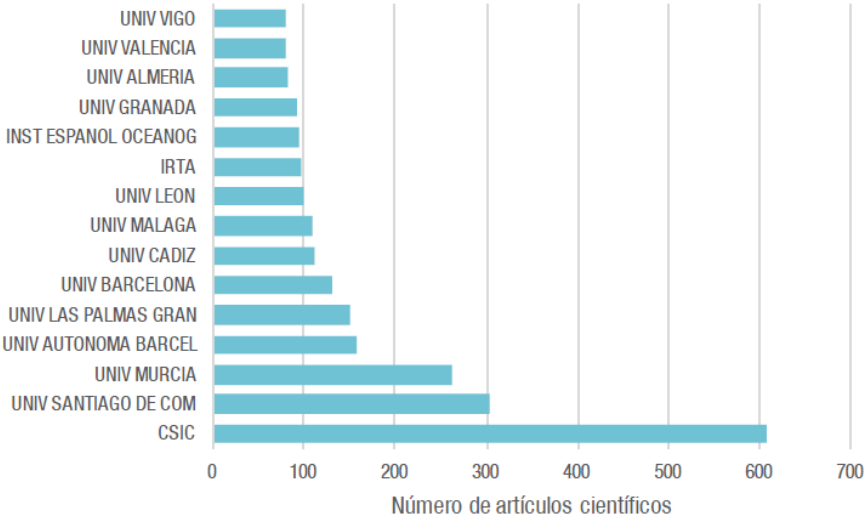



Figure 8-4. Summary of the institutions that publish the most in the 15 most important impact journals in the area of aquaculture from 1979 to 2018.

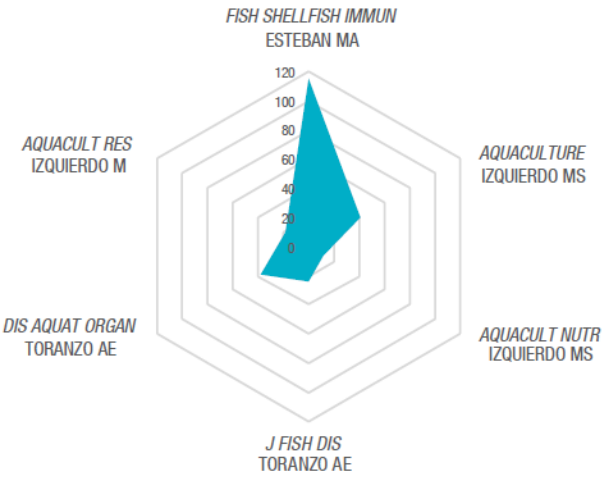



Figure 8-5. Summary of the most publicized scientists in the six journals in the area of aquaculture and the number of articles published.

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