AQUACULTURE IN SPAIN

2023

APROMAR

Índice

1. Executive summary 4
   1.1. Aquaculture in Spain 4
   1.2. Aquaculture in the European Union and in the world 5

2. Introduction 9

3. Aquaculture in the world 13
   3.1. Global availability of aquatic products 13
   3.2. State of aquaculture in the world 15
   3.3. Aquaculture production in the world 16
   3.4. Aquaculture production by groups and environments 21
   3.5. Potential of aquaculture and sustainable development 23

4. Aquaculture in the European Union 26
   4.1. Situation of aquaculture in the European Union 26
   4.2. Situation of fish aquaculture in the European Union 31
   4.4. Potential of European aquaculture 35
   4.5. Videos and reports of interest. 37

5. Aquaculture production in Spain and Europe 41
   5.3. Number of aquaculture facilities in Spain 45
   5.4. Employment in aquaculture in Spain 46
   5.5. Consumption of aquaculture feed in Spain 49
   5.6. Marine aquaculture in Spain and Europe 50

6. Marketing and consumption of aquaculture products in Europe and Spain 82
   6.1. Consumption of aquatic products in the European Union 82
   6.2. Food consumption in Spain 84
   6.3. Consumption of aquatic products in Spain 84
   6.4. Consumption of fresh aquatic products in Spain 86
   6.5. Marketing of sea bream 88
   6.6. Placing on the market of sea bass 91
   6.7. Marketing of turbot 94

7. Challenges of aquaculture in Spain 96

8. Spanish scientific production in the field of aquaculture 100

9. Bibliography 105

1

Executive summary

1. Executive summary

1.1. Aquaculture in Spain

- The aquaculture production in Spain in 2022 was 326,520 tonnes and it reached a value in first sale of 760.7 million Euros. The most abundant species was mussels with 255,218 t in 2022 with an estimated value of € 159.3 million. Followed by sea bass with 23,622 t and a value of € 181.6 million, rainbow trout with 16,328 t with a value of € 43.6 million and bluefin tuna with 10,877 t and a value of € 183.2 million. According to MAPA's data.
- In 2021 there were 5,182 aquaculture facilities in production. Of which 4,928 of molluscs and 254 of fish (143 in freshwater, 73 on land and 38 in sea pens).
- Employment in aquaculture in Spain in 2021 was 5,722 AWU, although this figure was distributed among 11,364 people. Although AWUS increased, the number of people decreased compared to 2020. Most employees (5,849 people) were non-salaried (self-employed). In 2021, the total number of employed women was 3,013 (20.3%) compared to 8,351 men (79.7%).
- In 2022, 114,177 tonnes of feed were used in Spain (84.5% to marine fish and 15.5% to continental species). The amount of aquaculture feed used in Spain barely amounts to 1% of the total livestock feed consumed in this country.
- Marine fish farming in Spain in 2022 was 58,672 t, 11.8% more than in 2021 (52,457 t). The value of this production is estimated at 527.8 million Euros, 36.3% more than in 2021. The Region of Murcia topped the list with a total of 18,953 t. Production is expected to increase by around 10% in 2023.
- The aquaculture sea bream production in Spain in 2022 was 8,932 tonnes, -7.3% less than the previous year with an estimated first-sale value of 40.2 million Euros. The Valencian Community led the production of sea bream with 5,620 t (63% of the total), followed by the Region of Murcia with 1,327 (15% of the total), Andalusia (815 t, 9%), Canary Islands (790 t, 9% of the total) and Catalonia with 380 t (4% of the total). By 2023 it is estimated to increase to 11,000 tonnes.
- The production of juvenile sea bream in Spain in 2022 was 30.2 million units, 11.8% more than in 2021. The production of juvenile sea bream in 2022 was led by the Valencian Community with about 13.4 M (44% of the total), followed by Andalusia with about 11 M (36% of the total) and the Balearic Islands with about 6 M (20%).
- The sea bass production in Spain in 2022 was 23,622 t, -1.3% less than in 2021 and a total value in first sale of 131.34 million Euros. The Region of Murcia has led the production in 2022 with 7,244 t (31% of the total), followed by Andalusia with 6,020 t (25% of the total), Valencian Community (5,240 t, 22% of the total), Canary Islands (4,948 t, 21%) and Catalonia with 170 t (1% of the total). A growth of 1.2% is forecast for 2023.
- The production of juvenile sea bass in Spain in 2022 was 60 million units, 2.9% more than the previous year (58.3 M). The production of juvenile sea bass in Spain was carried out in the Balearic Islands (56%), Valencian Community (15%) and Andalusia (29%). By 2023 it is estimated that the production of juvenile sea bass in Spain will increase to 67.6 million units.
- The production of rainbow trout in Spain in 2022 is estimated to be 16,328 tonnes, 4.1% more than in the previous year. A slight decrease is expected for 2023. Rainbow trout production is changing in recent years to larger trout farming.
- The aquaculture turbot production in Spain in 2022 was 8,766 t, 14.9% more than the previous year and with a first-sale value of 101.8 million Euros. It is expected to

increase in 2023 to 9,200 tonnes. Galicia was the only autonomous community producing turbot in Spain.

- The production of juvenile turbot in Spain in 2022 was 13.4 million units.
- The production of meagre through aquaculture in Spain in 2022 was 4,742 t, 66.3% more than in 2021 and with an estimated first-sale value of 41.7 million Euros. The production of Spanish meagre comes from the Valencian Community, Murcia and Andalusia. By 2023, a production of 37% higher is estimated.
- In 2022, 1,752 tons of sole were produced in Spain, 19.9% more than in 2021 and with an estimated first-sale value of 20.4 million Euros. This production was in Galicia (70%) and Andalusia (30%). The 2023 production is estimated to be 5% higher.
- In 2022, the production of seriola dumerili in Spain increased reaching 163 t and it is expected that in 2023, production will continue to increase slightly. In addition, in Spain juveniles of this species are produced in Andalusia.

1.2. Aquaculture in the European Union and in the world

- Global aquatic production (aquaculture + fisheries) in 2021 was 218.4 million tonnes, 2.0% more than the previous year.
- In 2021, aquaculture put 126.0 million tons on the market, 2.7% more than the previous year (122.7 Mt) and surpassing extractive fishing for the ninth consecutive year by 33.7 Mt.
- The aquatic production (aquaculture + fishing) of the European Union (27) in 2021 a total of 4,865 thousand t, -4.5% less than in 2020. The decrease in production continues for the fourth consecutive year with an average of -5.4% in those 4 years mainly due to the decrease in fishing. As for the value of production in 2021, it was €3,960 M, 14.9% more than in 2020.
- The aquaculture production of the European Union (27) in 2021 was 1,142.5 thousand t, 3.6% more than in 2020, with a first-sale value of € 3,960 M. Mussels continue once again to be the most produced species in the EU (27) with 423,379 tonnes, followed by rainbow trout with 193,266 tonnes.
- Spain is the Member State of the European Union (27) with the highest aquaculture production in 2021 with 271,060 tonnes (23% of the total), according to FAO. When considering the value of production, Spain was in fourth position with 554.1 million Euros.
- Aquaculture in the EU (27) developed mostly in marine waters (73.8 %) and 26.2 % in freshwater in 2021.
- In 2021, 578.1 thousand tonnes of fish with a value of €2,757.6 million were farmed in the EU (27).
- Rainbow trout occupies the first position with 193,266 t in 2021, followed by sea bream with 103,130 t and sea bass with 96,647 t.
- It is also rainbow trout that tops the list of value with € 665.5 million, followed by sea bass with € 554.5 million, sea bream with € 537.1 million and bluefin tuna with € 358.9 million.
- The rate of growth of fish aquaculture in the European Union (27) since 2000 has been very slow. In fact, over the past 10 years, fish aquaculture has grown by only an average of 2.5% per year compared to 4.2% globally.
- Total aquaculture production of sea bream in Europe and the rest of the Mediterranean is estimated in 2022 at 320,630 tonnes, 1.8% higher than in 2021. The total value in first sale is estimated at 1,574.8 million Euros. A slight decrease is estimated for 2023.
- Total production of juvenile sea bream in 2022 in Europe (including Turkey) is estimated to be 732.9 billion units, up 2.6% from 2021.
- Total aquaculture production of sea bass in Europe and the rest of the Mediterranean arc in 2022 was 301,420 tonnes, 1.2% higher than the previous year. The total value in first sale was 1,488.7 million Euros. By 2023 it is estimated to remain stable or increase slightly.
- Production of juvenile sea bass in 2022 in Europe (including Turkey) amounted to 576.2 million units, -2.8% less than in 2021.
- The estimated total production of aquaculture turbot in the world in 2022 was 78,566 tonnes, 1.5% higher than the previous year.
- In 2022 the world production of Senegalese sole from aquaculture was 1,752 tonnes, 19.9% more than the previous year. Production occurs mainly in Spain.
- The production of aquaculture meagre in the Mediterranean area in 2022 is estimated at 54,917 tonnes, representing a growth of 5% over the previous year.
- Global aquaculture production of rainbow trout in 2021 was 948,663 t, representing a decrease of -0.4% compared to the previous year..

1.3. Marketing of aquaculture products

- The EU (27) is the world's largest and most important market for aquatic products. The per capita consumption of aquatic products in the European Union in 2022 was 21.1 kilograms (in whole fish equivalents) as opposed to 22.6 kilograms in 2021, -7.1% less than the previous year according to AIPCE.
- In 2022, the EU (27) generated a total of 4.6 million tonnes of aquatic products between fisheries and aquaculture. Of these, it exported 2.1 million tonnes and spent another 1.1 million tonnes for non-food uses. In addition, 2.2 million t were exported and 8.55 million t of aquatic products were imported, this means that in total for consumption there were 9.4 million t in 2022. As a result, the self-sufficiency rate was 33 per cent.
- In 2022, dependence on imported aquatic products was 67%. It grew mainly due to a reduction in catches from extractive fishing.
- The average apparent per capita consumption of aquatic products in the EU (27) was 23.3 kg (live weight)/capita/year in 2020, a decrease of -7 % compared to the previous year.
- The year 2022 was marked by a decrease in consumption within the household (87.2%) and an increase in consumption outside it (12.8%). In 2022, fewer aquatic products are purchased for Spanish households (-15.6% compared to 2021). To this is added that the value did not compensate for the decrease despite the fact that the average price increased by 7.4% to € 9.99 / Kg. In 2022, 19.2 kg per person were consumed, assuming an expenditure of € 191.6 / pers.
- Fresh fish has the highest proportion of both volume and value with 41.8% and 39.0% respectively. Although it has experienced a reduction of -16.9% in volume and -11.3% in value compared to 2021.
- The supermarket and self-service were the favorite channels for the purchase of fish products in 2022, accounting for 50.2% of the total volume, despite decreasing by -14.2%. The traditional store gained relevance with 22.9% for purchases of aquatic products. E-commerce stands out for the highest average price of these products, € 11 / Kg, 10.2% more than the market average.
- The average first-sale price of aquaculture sea bream produced in Spain in 2022 was 4.89 Euros/kg. This figure is 17.1% higher than the average price of 2021 (4.18 Euros/kg). The total value of the 8,932 t of Spanish sea bream marketed in first sale has been 43.7 million Euros according to APROMAR estimates that do not coincide exactly with those of the MAPA.
- The average first-sale price of aquaculture sea bass produced in Spain in 2022 was 5.57 Euros/kg. This figure is 19.3% higher than the average price of the previous year, 4.66 Euros/kg. The total value of the 23,622 tons of Spanish sea bass marketed was 131.5 million Euros according to APROMAR estimates that do not coincide exactly with those of the MAPA.
- The average first-sale price of aquaculture turbot produced in Spain in 2022 was 13.12 Euros/kg (14.2% higher than the previous year). The total value of the 8,766 t was estimated at 101.8 million Euros according to APROMAR estimates that do not coincide exactly with those of MAPA.

BRIEFING NOTES

- This study refers only to quantities produced and placed on the market of species by aquaculture enterprises. All references to the term "production" refer to quantities produced and marketed. The volumes of product in the production process (increase of biomass), but without having yet been harvested, are not considered.
- The weight of the species produced refers to live weight. All references to production volumes refer to weight prior to evisceration or processing, if this is done.
- The value of world aquaculture production offered by FAO is given in US dollars. In this report, US dollars have been converted into euros at the exchange rate 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 revision 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 (fish farmer) to the first commercial link in the value chain.

NOTES ON STATISTICS

- The data that has been used for the preparation of this 2023 report refers to last year, and even to 2 previous years, depending on the source consulted. Thus, the most recently published FAO and MAPA data refer to 2021. While the data resulting from the surveys carried out by APROMAR and FEAP refer to 2022. Where possible, a forecast for 2023 is offered.
- The statistical compilation of aquaculture production in Europe for this report presents data from the European Union (27) separately in order to disaggregate them from those for Norway and Turkey.

2

Introduction

2. Introduction

The global context of 2022 and early 2023 has been turbulent. Russia's invasion of Ukraine that began in February 2022 is still active at the time of publication of this report. In addition to the unjustified human losses of the war, the situation has been a blow to the global economy. At present, inflation is high, there is a shortage of raw materials, energy costs are high and endless problems derived from the interrelation and globalization that are affecting families and businesses at all levels.

This added to the previous global situation of Covid-19 is making the desired recovery very complicated.

This framework with a negative perspective is framed in a pressing climate change that affects biodiversity, ecosystems and that puts at risk our well-being and that of our future generations in every way.

Faced with the worrying situation, all governments have implemented measures both individually and in groups, as in the case of the European Union. The World Bank launched an aid package aimed at ensuring food security in the most vulnerable countries; and in the European Union, cost compensation initiatives were launched, thanks to various financial funds (e.g. Next Generation EU-NGEU Funds, European Maritime, Fisheries and Aquaculture Fund (EMFAF, etc.) for the different sectors adapted to the particularities of the economic activities of each Member State. At the same time, new ways of adapting to the situation continue to be sought in all areas.

In each new edition of the APROMAR annual report, it is worth remembering that aquaculture is the production in the water of animals and plants using techniques aimed at making more efficient use of natural resources. It is an activity equivalent to what on land are livestock and agriculture. It covers varied practices and a very wide range of species and production systems. One of the differential characteristics about fishing is that, throughout all, or at least a part, of its life cycle, the organisms produced are owned by some person. Aquaculture has a history of 4,000 years, but it has been since 50 years ago when it has become a relevant socio-economic activity, employing more than 14 million people in the world.

The aquaculture sector, like the rest of economic activities, has been affected and is facing all the current difficulties. Companies have received financial support to cope with the increase in inputs in the different Member States of the European Union, although in different ways in each of them. But these aids are punctual and there are several open fronts.

In Spain, the drought situation is conditioning the survival of fish production in rivers. Being an activity that makes a non-consumptive use of water, that is, that does not spend it and that returns it in the same or better condition to the environment, that generates employment in rural areas where another type of investment hardly arrives and that, therefore, helps to fix population, improve quality and feed people with high value animal protein, it does not receive enough support or aid.

In the case of marine aquaculture, the difficulties in increasing production due to administrative obstacles or the start of new companies makes it very difficult for the sector to grow and get out of its stagnation.

European policies (Green Deal, Farm to Fork Strategy, etc.) place aquaculture as a fundamental pillar to guarantee the supply of food in a sustainable and secure way. However, these messages do not reach the local scale and local governments that should promote having aquaculture farms in their localities to increase employment, the economy and the local food supply, do not. On the other hand, in many localities other economic activities with which aquaculture could coexist prevail, it could establish synergies, but on the other hand, this does not happen.

A global situation like the one we live in is a niche of opportunities, changes, adaptation and improvement of our

habits, our systems and way of life. It is time for aquaculture to occupy its rightful place as a key activity to feed the population respecting the environments in which it takes place since it complies with strict environmental regulations and is the livestock activity with the lowest carbon footprint. It also has in its favor that 70% of the planet's surface is water, that its freshwater requirement 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 maintain their body temperature.

Aquaculture has a history of 4,000 years, but it has not been until 50 years ago that it has become a relevant socioeconomic activity, providing employment to more than 14 million people in the world.

Every day the population is more aware of the characteristics of the food they buy and consume. We are all aware of the benefits of fish as a source of protein, fatty acids and essential nutrients. The consumption of aquatic products and their incorporation into the diets of pregnant and lactating women, as well as young children, represents an important pathway to improving food security and nutrition. Firstly, because the lipid composition of fish is irreplaceable as it comprises long-chain polyunsaturated fatty acids (Omega-3 DHA and EPA) that offer multiple beneficial effects for health in adulthood and for child development. Second, fish protein has a higher bioavailability, approximately 5% to 15%, than that derived from plant sources, in addition to containing amino acids essential for human health. And thirdly, because fish is an exceptional source of vitamins (A, B and D) and mineral micronutrients (calcium, phosphorus, iodine, zinc, iron and selenium).

Although there is greater awareness of the benefits of aquatic products, the current reality is that consumption is decreasing in the European Union and in Spain in particular. Aquaculture offers products all year round and at an affordable price. At the same time, consumers have less money for the purchase and in addition, they have doubts about the method itself. That is why, although associations such as APROMAR make significant economic efforts to launch communication and promotion campaigns for aquaculture, it could be supported with consumer aid such as lowering the VAT on these products because they are highly healthy and making national campaigns about their benefits.

Aquaculture will continue to count on the Common Fisheries Policy (CFP) although, hoping that soon there will be a specific Common Aquaculture Policy for aquaculture soon. It is also expected that a productive objective will be set at the level of the European Union of increase, so that it will be the engine of impulse of governments to achieve greater development. In addition, it will continue to be covered by the Common Market Organization (CMO) as key tools for its development.

In addition, associations such as APROMAR, Producer Organizations were determined as essential to carry out collective actions that allow the development of the sector in an integrated way through actions and projects of R+D+i. These collective actions may be carried out supported by the European Maritime Fisheries and Aquaculture Fund (EMFAF) which enters into force in 2023 for a period of 7 years (initially planned between 2021-2027). Even so, there has been a decrease in the percentage of financing compared to the previous fund (EMFF) although production remains stagnant and consumption falls.

APROMAR is very present in the difficulties that the sector has been accumulating for several years and thanks to its Production and Marketing Plans (PMP) and the hand of the General Secretariat of Fisheries of the Ministry of Agriculture, Fisheries and Food is making important use of this fund obtaining innovative results for companies in terms of health and welfare of fish, feed sustainability, veterinary treatments, market observatory, communication and promotion of aquaculture products.

Scope of the report

The preparation of this annual report on the evolution of the aquaculture sector is important to know the state of the activity and promote its sustainable development. The target audience is companies and professionals in the sector, but also public administrations, legislators, politicians, researchers, media, liberal professionals, trade unions, 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 products of this activity, such as the production of pharmaceutical products, the release of specimens for sport fishing, the repopulation of the natural environment, aquarium farming or scientific research.

This publication is an exercise in sectoral transparency that respects the right to free competition. Its drafting has avoided the publication of confidential information relating to the strategies of the producing companies from which anti-competitive practices could be derived. It aims only to provide basic aggregated information that may be of interest to anyone interested in aquaculture, both producers and researchers, non-governmental organizations, suppliers, public administrations, trade unions, trainers 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 partners, information from the European Commission, the Spanish Ministry of Agriculture, Fisheries and Food (MAPA), the European Federation of Aquaculture Producers (FEAP) and the Food and Agriculture Organization of the United Nations (FAO) has been used. The National Aquaculture Advisory Board (JACUMAR-JACUCON) has also been a relevant source of data.

3

Aquaculture in the world

3. Aquaculture in the world

3.1. Global availability of aquatic products

Aquatic products from aquaculture and extractive fisheries globally are key to feeding a growing population in a healthy and nutritious way.

Seafood is one of the most important sources of animal protein in the world. As reflected in the Sofia Report of FAO (Food and Agriculture Organization of the United Nations), aquatic products provided 17% of the world's animal protein and 7% of the total protein in 2020, exceeding 50% in some countries of the African and Asian continents. Aquatic products accounted for 20% of the average per capita intake of animal protein for 3.3 billion people and up to 50% in countries such as Bangladesh, Cambodia, Sierra Leone, Indonesia, Ghana, Mozambique and several Small Island Developing States (SIDS) in that year.

In addition to offering high-quality protein, easily digestible and containing all essential amino acids, seafood contains omega-3 essential 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.

According to the Food and Agriculture Organization of the United Nations (FAO), world aquatic production (fisheries and aquaculture) in 2021 was 218 million tonnes, 2.0% more than in 2020. Of this value, as can be seen in the following graph, extractive fishing contributed 92 million tonnes (57.7%) and aquaculture 126 million tonnes (42.3%).

Global aquatic production (aquaculture + fisheries) in 2021 was 218.4 million tonnes, 2.0% more than the previous year.

Since 2017, aquatic production has exceeded 200 Mt. In that same year, the increase in production volume compared to the previous year was 4.1% (198.9 Mt in 2016).

During the years 2019 and 2020, the joint growth slowed drastically, being less than 1.0%. This decrease was mainly marked by the decrease in catches from extractive fishing,

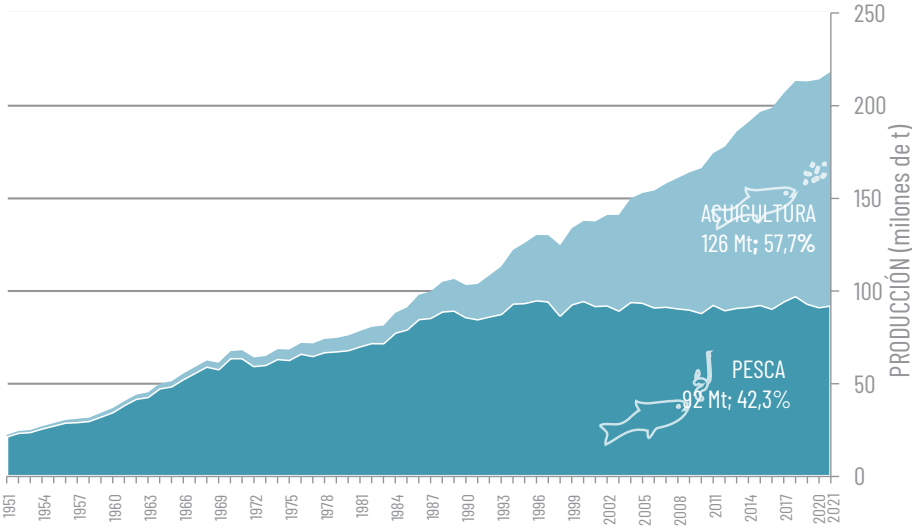


Figure 3-1. Evolution of world aquatic production (aquaculture plus fisheries) in the period 1951-2021 (FAO).

logically, given the circumstances experienced worldwide in those years. In fact, the volume of catches decreased by -4.3% in 2019 (93.3 Mt) compared to 97.5 Mt in 2018 and by -2.0% in 2020 (91.4 Mt) compared to 2019 according to FAO data. On the other hand, during those years aquaculture achieved an increase in its production, although in a less pronounced way. In 2019 the increase was 3.4% (119.8 Mt) compared to 115.9 Mt in 2018 and 2.3% in 2020 (122.6 Mt) compared to 2019. It is in 2021 when the recovery begins for both sectors. Extractive fishing experienced 1.0% and aquaculture 2.7% compared to 2020.

If the last 30 years are taken into account, joint production has grown at an average rate of 2.5% per year, exceeding the rate of growth of the world population that has been 1.0% according to World Bank data in 2020.

Analyzing the data shown in the graphs above, it can be discerned that aquaculture is the key activity to increase the supply of aquatic products worldwide. This is because, as mentioned above, the sustainable extractive fishing sector has reached its Maximum Sustainable Yield (MSY) and has been with a stabilized volume for almost 30 years, ranging between 80-90 million tons. However, global extractive fisheries are expected to continue to recover and may increase by around 6% in 2030 to reach 96 million tonnes. Of course, FAO considers it essential to improve global fisheries management to achieve both ecosystem restoration and to protect the long-term supply of aquatic food.

Sustainable fisheries and aquaculture are therefore key complementary activities for feeding the world's growing population. At the same time, taking into account the growth limitations of the extractive sector, it is key to encourage the increase of aquaculture production in order to meet present and future global needs. Especially, considering that according to the FAO, that the consumption of aquatic foods (without taking into account algae) has grown at a rate of 3% since 1961, compared to 1.6% of the rate of growth of the world population. Therefore, it is expected that aquafeed consumption can supply an average of 21.4 kg per capita in 2030 (15% more than currently) promoted by rising incomes and urbanization, improvements in post-harvest practices and changing food trends. FAO forecasts an increase in production, consumption and trade in fisheries and aquaculture in 2030, although at lower growth rates.

Taking into account the limitations of growth of the extractive sector, it is key to promote the increase of aquaculture production in order to meet present and future global needs.

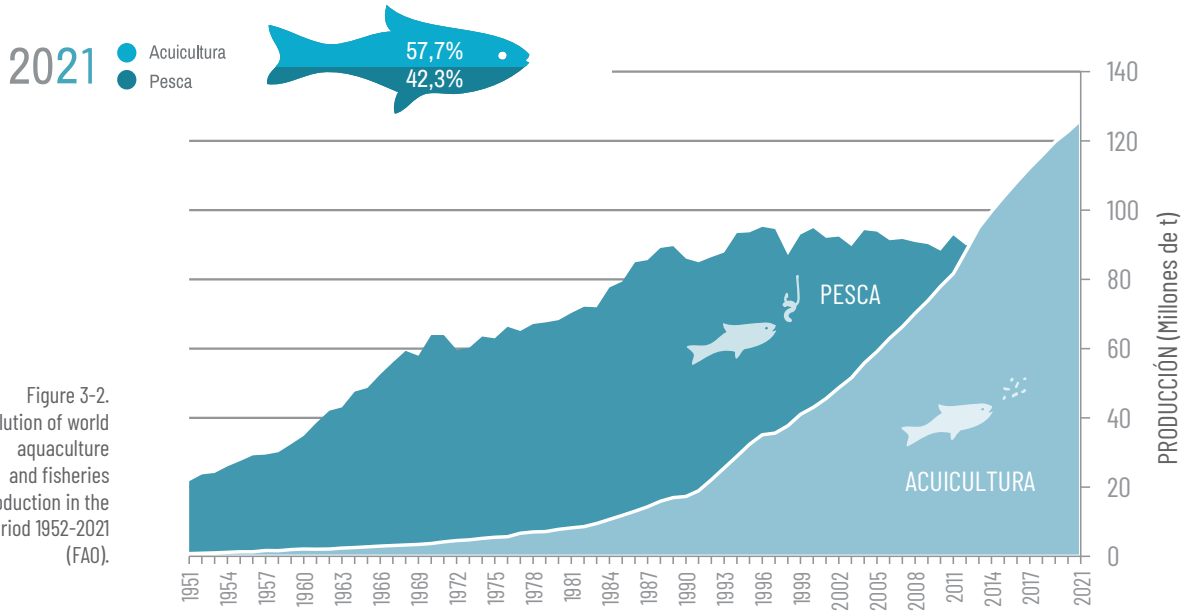


Figure 3-2. Evolution of world aquaculture and fisheries production in the period 1952-2021 (FAO).

The fisheries and aquaculture sectors are the livelihood of millions of people in the world. FAO estimates that 58.5 million people currently work in fisheries and aquaculture-related activities, with around 35% in aquaculture. Of the total, 21% of workers are women (28% in aquaculture and 18% in extractive fishing).

On the other hand, international trade in aquatic products has increased markedly in recent decades. China remains the world's largest exporter followed by Norway and Viet Nam, according to FAO. In 2020, 33.7 percent of global production of aquatic products was traded internationally, or about 59.8 million tonnes worth USD 150.5 million, according to FAO.

Of the total products of aquatic origin, the proportion directed to direct human consumption has increased from 67% in 1960 to 89% in 2020. The rest is mainly used as raw material for animal feed, including aquaculture. It is important to note that more and more by-products are used for food and non-food purposes (more than 27% of world fishmeal production and 48% of total fish oil production), according to FAO.

3.2. State of aquaculture in the world

Aquaculture, according to FAO, is an activity aimed at producing and fattening aquatic organisms in their environment. It is also defined as the cultivation under controlled conditions of species that develop in the aquatic environment (fish, molluscs, crustaceans and algae) and that are useful for humanity.

Each region of the world has an aquaculture adapted to the characteristics of its environment and the species that are raised there. So aquaculture is a very diverse activity and adaptable to different environments and ways of life. With what it supposes a relevant socioeconomic activity for the development of local communities, especially in environments to which other economic activities are not viable and in developing countries whose needs for healthy and nutritious food are greater. In particular, the contribution of long-chain omega-3 polyunsaturated fats (EPA and DHA) contained in seafood are key to maintaining people's health and quality of life.

Aquaculture is the activity with the lowest carbon footprint of livestock production activities.

In addition to direct jobs on farms, there are jobs generated by the large number of ancillary aquaculture support activities, such as processing and processing, packaging, marketing and distribution, manufacture of equipment, nets and technologies, ice production and supply, construction and maintenance of aquaculture vessels and facilities, consultancy services, scientific activity and that of the administrations involved in the monitoring and development of aquaculture.

In 2021, aquaculture put 126.0 Mt on the market, 2.7% more than the previous year (122.7 Mt) and surpassing extractive fishing by 33.7 Mt for the ninth consecutive year.

On the other hand, aquaculture is the activity with the lowest carbon footprint of livestock production activities and that is why FAO considers that aquaculture contributes to the efficient use of natural resources, food security and economic development, with a limited and controllable impact on the environment.

To assess world aquaculture production, data from 1950 are taken into account. In this year, the global production was 638.5 thousand tons, taking into account that in 2021 it has been 126.0 Mt, the growth has been very remarkable in the last 70 years.

The value of the global aquaculture harvest in 2021 reached 237.2 billion euros, 6.2% more than in 2020.

Analyzing the averages by 5-year rolling tranches, it can be observed that a growth rate above 3.0%. The average year-on-year growth of the 90s was very high, 9.3%, going to

6.0% between 2000 and 2010, and 4.5% in the last 10 years. It is in the years 2020 and 2021 where growth is lower, of 2.4% and 2.7% respectively.

The global first-sale value of the 126.0 Mt in 2021 was €237.2 billion. This value is 6.4% higher than in 2020 (€222.9 thousand). This is a notable difference with respect to 2020, whose growth compared to 2019 was 1.6% (€219.3 billion), logically associated with the Covid-19 pandemic.

The average increase in the total value of aquaculture production in the last 10 years has been 6.2% and in the last 5 years, 4.7%.

The value of the global aquaculture harvest in 2021 reached 237.2 billion euros, 6.2% more than in 2020.

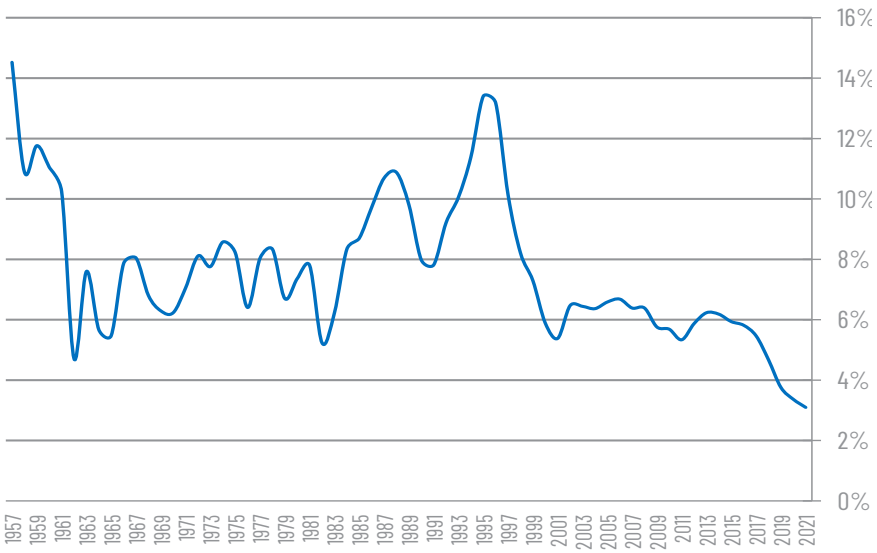


Figure 3-3. Evolution of the year-on-year growth of world aquaculture production in the period 1957-2021, calculated on arithmetic averages for 5-year moving tranches to attenuate short-cycle oscillations (from FAO).

3.3. Aquaculture production in the world

Aquaculture production is different on each continent. It is a sector that has developed differently in each place depending on the environment, culture, economic level, governance and other intrinsic factors of each locality, country or continent.

Asia is the world's largest producer of aquaculture and its leadership is indisputably far from the rest. It tops the list of continents hosting 91.5% of production in 2021. Asia has been producing aquaculture species for more than 2,000 years. Therefore, in 2021 it was responsible for producing 115.3 Mt, 2.5% more than in 2020 (112.4 Mt). The second world producer is the American continent (3.6% of the total, 4.5 Mt), followed by Europe (2.9%, 3.6 Mt), Africa (1.9%, 2.4 Mt) and Oceania (0.2%, 0.27 Mt).

The increase in production is positive on all continents. It is higher in Oceania, of 12.1% (0.27 Mt compared to 0.24 Mt in 2020), followed by Europe with 9.2% (3.59 Mt compared to 3.29 Mt in 2020), then Asia with 2.5% (115.17 Mt compared to 112.4 Mt in 2020), followed by America with 2.3% (4.49 Mt compared to 4.39 Mt in 2020) and finally, Africa with 2.2% increase (2.42 Mt compared to 2.37 Mt in 2020).

In the classification by countries, the first positions are occupied by Asians, logically. The first place is occupied by China, followed by Indonesia, India, Viet Nam and Bangladesh. These 5 countries are responsible for 82.7% of total global production, i.e. 104.2 Mt of the total 126.0 Mt in 2021. The rest of the countries that top the top 10 list are: Republic of Korea, Philippines, Norway, Egypt and Chile (see table below). In total, these 10 countries account for 90.1% of total world production, i.e. 113.6 Mt of the 126.0 Mt. This amount is 2.8% higher than in 2020. The rest of the countries that contribute 9.9%, that is, 0.12 Mt have experienced a joint growth of 1.7% compared to the previous year.

China continues to stand out as the first aquaculture producing country in the world, with 72.8 million tons harvested in 2021, accounting for 57.8% of global production.

Norway and India are the countries that have experienced the strongest growth in 2021, with 11.7% and 8.9%, respectively. According to a report by Meno Economics, Nofima and Norce, Norwegian industry grew in value, exports and employment in 2021 unlike 2020, when its production was affected by the pandemic. The Republic of Korea and China have also experienced significant growth of 4.0% and 3.3% in 2021.
On the contrary, the countries that experienced a decrease in 2021 were: Chile (-4.1%), the Philippines (-2.2%), Indonesia (-1.6%) and Egypt (-1.0%).

The first producing country, China, produced 72.8 Mt in 2021, 3.3% higher than in 2020. The difference with the next country, Indonesia is high since it cultivated 14.6 Mt. The key to China's success is due to: on the one hand, the positive culture of consumption of aquatic products with a large population, and on the other hand, the thousands of years of farming experience (the first recognized form of aquaculture in the world was carp culture and its references date back to 3,500 BC, precisely in ancient China). The three main species produced in aquaculture today in this country are Japanese laminaria seaweed, grass carp and Japanese oyster.

Norway experienced the most significant growth with 11.7% in 2021 compared to 2020.

In Indonesia, the second largest producer, the largest productions are eucheuma and Japanese laminaria algae, along with Nile tilapia.

Spain drops to 27th position, 2 places below compared to 2020 with 279.9 thousand tons and a growth of 1.2%.

If the European Union (of the 27) were considered as a unit, its aquaculture harvest in 2021 would be 1.14 million tonnes in 11th place, between Chile and Thailand.

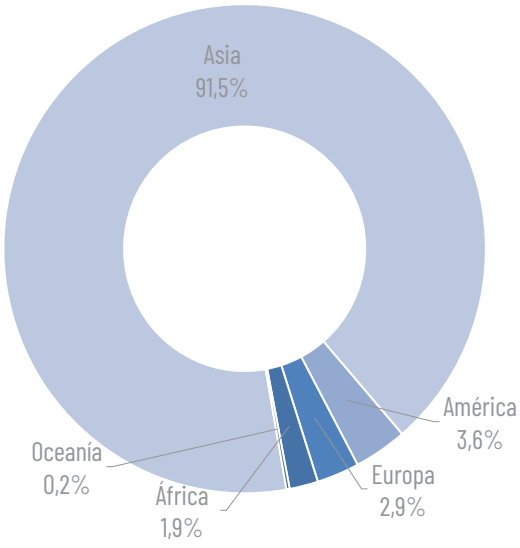


Figure 3-4.
Distribution of aquaculture production across five continents (from FAO).

If, instead of analysing production volume, the value of production is examined, the list of countries varies slightly. The top 4 positions are likewise, with China, India,

If the European Union (of the 27) were considered as a unit, its aquaculture harvest would be 1.14 million tonnes in 11th place, between Chile and Thailand.

Indonesia and Viet Nam and together they house 74.1% of the total value. Norway and Chile rank fifth and sixth, respectively. They are followed by Bangladesh, Japan, Ecuador and the Republic of Korea. These 10 countries together represent 86.4% of the world total, i.e. €204.9 thousand out of €237.2 billion. The rest of the countries generated a total of €0.32 billion.

The most outstanding growths have been experienced in 2021, in order: Norway by 28.3% with €7,491 million, Indonesia by 13.8% with €11,000 million, Republic of Korea by 13.3% with €2,526 million and India by 10.9% with €13,810 million.

In contrast, Japan and Ecuador have decreased their gains compared to 2020. Being Japan in 2021 – 2.6% less with 4,184 M € and Ecuador -1.5% with 2,588 M€.

Spain continues in 31st place with a production value of about 527 million euros, -8.0% less than in 2020 according to FAO.

In 2021, the main aquaculture species produced in the world were Japanese laminaria algae or kombu (*Saccharina japonica*) with 13.5 Mt and eucheuma algae (*genera Eucheuma and Kappaphycus*) with 7.1 Mt. The third and fourth species are the Japanese oyster (*Crassostrea gigas*) with 6.5 Mt and the white shrimp (*Litopenaeus vannamei)* with 6.3 Mt and surpassing this year the grass carp (*Ctenopharyngodon idella*) with 5.9 Mt.

The first 10 species accounted for 50.1% of total production, i.e. 63.1 Mt, and increased their production by 2.9% compared to the previous year.

Of the species produced in Spain, the production of rainbow trout stands out in the world context: rainbow trout 29th

Table 3-1.
Main aquaculture producing countries by annual tonnes in 2021 and year-on-year rate of change (FAO).

País	Cantidad (t)	% Var. anual
China	72.805.297	3,3%
Indonesia	14.606.534	-1,6%
India	9.408.300	8,9%
Viet Nam	4.749.274	1,4%
Bangladesh	2.638.745	2,1%
República de Corea	2.427.677	4,0%
Filipinas	2.272.528	-2,2%
Noruega	1.665.112	11,7%
Egipto	1.576.189	-1,0%
Chile	1.443.520	-4,1%
TOTAL 10 PRALES. PRODUCTORES	113.593.176	2,8%
RESTO DE PAISES	12.442.121	1,7%
TOTAL MUNDIAL	126.035.297	2,7%
España	279.910	1,2%

Table 3-2.
Main aquaculture producing countries by value of annual production (Million Euros) in 2021 (FAO) and year-on-year rate of change.

País	Valor (M€)	% Var. anual
China	140.248	4,4%
India	13.810	10,9%
Indonesia	11.000	13,8%
Viet Nam	10.609	4,6%
Noruega	7.491	28,3%
Chile	7.241	6,9%
Bangladesh	5.242	4,0%
Japón	4.184	-2,6%
Ecuador	2.588	-1,5%
República de Corea	2.526	13,6%
TOTAL 10 PRALES. PRODUCTORES	204.939	6,0%
RESTO DE PAISES	32.280	9,4%
TOTAL MUNDIAL	237.219	6,4%
España	527	-8,0%

species produced with 952,691 t in total; the 54th species gilthead bream with 319,215 t; sea bass 57th species with 299,810 t; European mussels 61st position with 251,178 t; and turbot 98th species with 69,668 t.

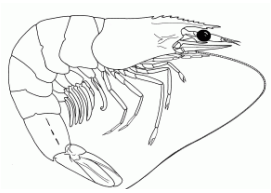
If we analyze the value of production by species, the white shrimp (*Litopenaeus vannamei*) is the species that leads the ranking with € 29,166 M, 8.3% more than in 2020. Next is the crawfish (*Procambarus clarkii*) with a total of €18,481 million, 9.9% more than in 2020. Atlantic salmon obtained a profit of € 15,208 M and had a significant growth of 25.5% compared to 2020. Below are grass carp and silver carp with €8,463 M (1.3% more than in 2020) and €8,214 M (4.2% more than in 2020), respectively.

The top 10 most cultivated species together accounted for 48.4% of the €244,179 million, or €118,163 million.

Especie	Nombre científico	Toneladas	% Var. anual
Laminaria japonesa	*(Saccharina japonica)*	13.087.512	5,0%
Alga Eucheuma	*(Eucheuma y Kappaphycus)*	7.081.071	-12,9%
Ostión japones	*(Crassostrea gigas)*	6.476.076	6,9%
Langostino blanco	*(Litopenaeus vannamei)*	6.324.579	9,0%
Carpa china	*(Ctenopharyngodon idella)*	5.982.995	3,3%
Carpa plateada	*(Gracilaria sp.)*	5.800.676	12,0%
Tilapia del Nilo	*(Hypophthalmichthys molitrix)*	4.977.165	1,6%
Almeja japonesa	*(Oreochromis niloticus)*	4.827.581	5,6%
Carpa común	*(Ruditapes philippinarum)*	4.343.390	1,8%
Alga Gracilaria	*(Cyprinus carpio)*	4.181.487	0,5%
TOTAL 10 PRALES. ESPECIES		63.082.532	2,9%
RESTO DE ESPECIES		62.952.765	2,6%
TOTAL ACUICULTURA MUNDIAL		126.035.297	2,7%
Trucha arco iris	*(Oncorhynchus mykiss)*	952.691	-0,9%
Dorada	*(Dicentrarchus labrax)*	319.215	12,6%
Lubina	*(Sparus aurata)*	299.810	7,9%
Mejillones europeos	*(Mytilus galloprovincialis y edulis)*	251.178	8,4%
Rodaballo	*(Psetta maxima)*	69.668	-7,7%

Tabla 3-3. Main species produced by aquaculture in the world (in tonnes) in 2021 (FAO) and year-on-year rate of change.

LANGOSTINO



Litopenaeus vannamei

WHITE PRAWN *(Litopenaeus vannamei)*

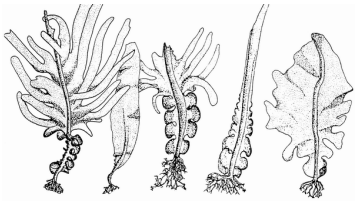
Class Crustácea Order: Decápoda • Family: Penaeoidae

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

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

Product presentation: It is presented in the market fresh, frozen, whole or headless.

KOMBU



Saccharina japonica

JAPANESE LAMINARIA *(Saccharina japonica)*

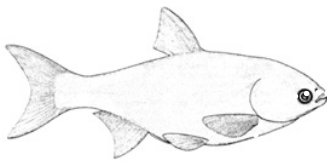
Class: Phaeophyceae Order: Laminariales • Family: Laminaraciae

Significant characters and morphology: Brown algae formed by a sheet and a golden-brown stipe. The edges of the central nerve expand pinatifidly along with the lamina.

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

Marketing and consumption: Cultivated for human consumption, it takes advantage of practically everything, even the stem. For each meter of rope can be obtained about 10.6 kilos.

CARPA



Hypophthalmichthys molitrix

SILVER CARP *(Hypophthalmichthys molitrix)*

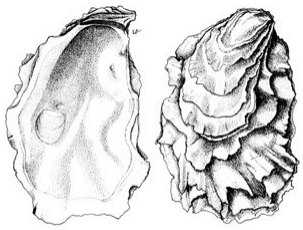
Class:: Osteictios Order: Cypriniformes • Family: Cyprinidae

Significant characters and morphology: Robust fish with a slight elevation in its dorsal part. The body is laterally compressed fusiform and the ventral part forms a sharp keel, running from the chest to the belly.

Production: 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 induced in the laboratory, not spawning spontaneously in naturalized or closed environments.

Products and consumption: ESpecies suitable for consumption, but with a large number of thorns that hinder its commercialization.

OSTRA



Crassostrea gigas

JAPANESE OSCION *(Crassostrea gigas)*

Class: Bivalvia Ordenr Ostrina • Family: Ostreidae

Significant characters and morphology: Bivalve mollusc, filter, dirty white or grayish. The leaflets are slightly elongated on the anteroposterior axis with one end (where the flap is) ending in a point. 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 9-10 cm and reaches a maximum size of 20 cm.

Production: The breeding method used depends on the environment, in addition to the tradition. In "elevation" cultivation, oysters are placed in plastic nets fixed to trestles above the ground. In "bottom" cultivation they are placed directly on the shore or in shallow water. "Rope" culture is carried out with oysters on ropes. And in "deep water" culture oysters are placed in parks located at depths of up to ten meters.

Marketing: It is marketed fresh, frozen (meat and half shell) and canned.

Especie	Nombre científico	Valor (M€)	% Var. anual
Langostino blanco	*(Litopenaeus vannamei)*	29.166	8,3%
Cangrejo de las marismas	*(Procambarus clarkii)*	18.481	9,9%
Salmón atlántico	*(Salmo salar)*	15.208	25,5%
Carpa china	*(Ctenopharyngodon idella)*	10.955	3,4%
Carpa plateada	*(Hypophthalmichthys molitrix)*	8.463	1,3%
Cangrejo de canal chino	*(Eriocheir sinensis)*	8.214	4,2%
Tilapia del Nilo	*(Oreochromis niloticus)*	7.752	8,2%
Carpa común	*(Cyprinus carpio)*	6.957	0,6%
Ostión japones	*(Crassostrea gigas)*	6.959	2,2%
Almeja japonesa	*(Venerupis philippinarum)*	5.855	3,2%
TOTAL 10 PRALES. ESPECIES		118.163	7,9%
RESTO DE ESPECIES		126.015	4,9%
TOTAL ACUICULTURA MUNDIAL		244.179	6,3%
Trucha arco iris	*(Oncorhynchus mykiss)*	3.496	1,3%
Dorada	*(Sparus aurata)*	1.449	21,5%
Lubina	*(Dicentrarchus labrax)*	1.435	27,1%
Rodaballo	*(Psetta maxima)*	375	-8,1%
Mejillones europeos	*(Mytilus galloprovincialis y edulis)*	334	17,5%

Tabla 3-4.
Main species by value (million euros) produced by aquaculture in the world in 2021 (FAO) and year-on-year change.

3.4. Aquaculture production by groups and environments

In aquaculture, the largest group of species produced are fish. In 2021, a total of 59.4 Mt was obtained, representing 47.1% of the total production by species groups. The second position is occupied by algae with 35.2 Mt representing 27.9% of the total. Algae occupy the third position with 18.4 Mt and being 9.4% of the total.

If the value of production by species group is analyzed, it is observed that the positions in the list vary. Fish continue to occupy the first place followed by crustaceans, molluscs, algae, amphibians and reptiles, and invertebrates. Fish accounted for a total of €124,990 M in 2021, which represents 52.7% of the total. Crustaceans were €68,435 million, 28.8% of the total. The mollusc group generated €24,784 million, 10.4% and algae €12,360 million, 5.2%.

Contrary to terrestrial farming systems in which most production is obtained from a small number of highly domesticated species of animals and plants, in 2020 some 444 different aquatic species were being raised in the world, including fish, molluscs, crustaceans, algae and others, according to FAO. Of these, some 322 are in significant quantities (more than 100 tons per year). This diversity is due to the richness in species of the aquatic environment, the adaptability of these organisms to controlled production systems and the ingenuity of people.

In 2020, some 444 different aquatic species were being farmed in the world, including fish, molluscs, crustaceans, algae and others, according to FAO. Of these, some 322 are in significant quantities (more than 100 tons per year).

If aquaculture production is divided by the production environment it can be seen that 55.3% of world aquaculture production takes place in marine waters, i.e. 69,737 Mt and 44.7% in freshwaters, 56,298 Mt.

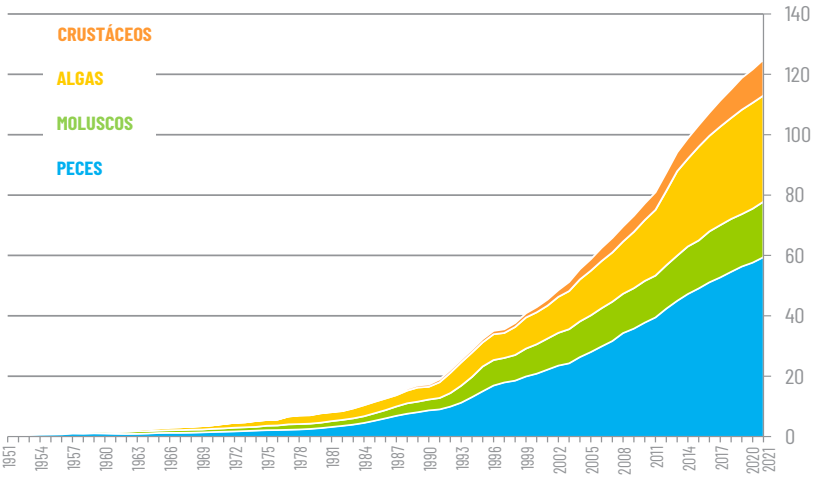


Figura 3-5. Evolution of world aquaculture production (Mt), by groups, for the period 1951-2021 (FAO).

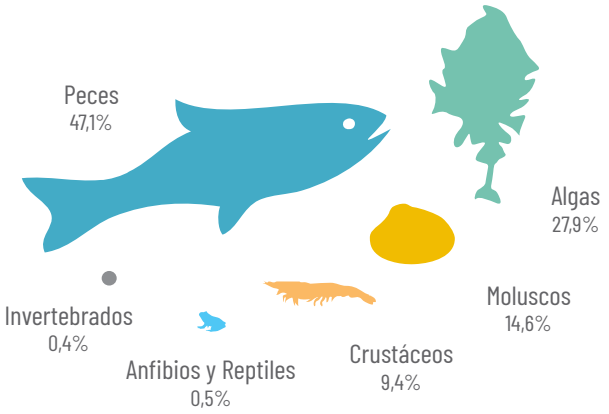


Figura 3-6. Percentage distribution of world aquaculture production (t) in 2021 by groups (FAO).

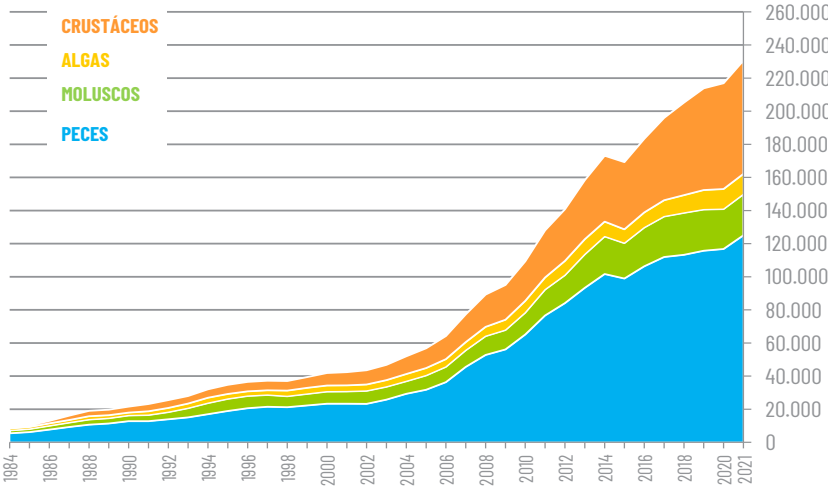


Figure 3-7. Evolution of the value of world aquaculture production, by group, for the period 1984-2021, in millions of euros (FAO).

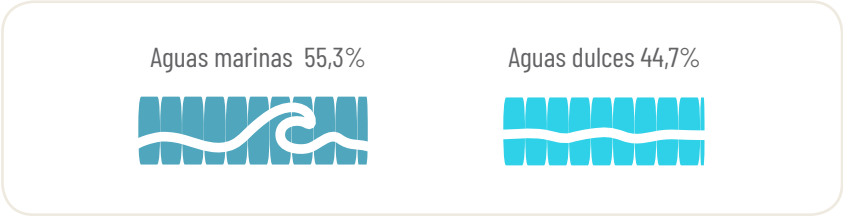


Figure 3-8.
Percentage distribution of global aquaculture production (t) in 2021 by production settings (FAO).

3.5. Potential of aquaculture and sustainable development

Over the past five decades, aquaculture has developed, diversified and made remarkable technological and scientific advances. The success of modern aquaculture is based on the proper management of the biology of farmed species, the introduction of technological innovations, the development of specific feeds and business organization. The potential of these advances for economic growth, both in developed and developing countries, for the improvement of living standards and for the increase of food security, was already recognized by FAO in its Bangkok Declaration and Strategy of 2000, which stressed that aquaculture must continue its development until it offers its full potential to humanity. And this has been verified over the years.

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

The European Commission's Scientific Advice Mechanism (SAM) published its report "Food from the Oceans" in 2016. It shows that while the oceans account for about 50% of the new animal and plant biomass created annually on the planet, food from the oceans only accounts for 2% of daily calorie consumption per person and 15% of protein consumption globally. Food from the oceans can and should make up a much larger percentage of the total amount of food consumed. They are foods that, in addition to being generally very healthy, are essential for the fight against hunger and malnutrition in some parts of the world.

The success of modern aquaculture is based on the proper management of the biology of farmed species, the introduction of technological innovations, the development of specific feeds and business organization.

In addition, the resources needed (energy, nutrients, space, water) to produce one kilogram of safe food are less in the oceans than on land. Therefore, increasing the share of food from the oceans will help reduce the pressure of agriculture on terrestrial natural resources.

The 2015 UN Summit endorsed the 2030 Agenda for Sustainable Development. It includes 17 Sustainable Development Goals (SDGs) and 169 targets, covering a broad set of issues related to the technical, institutional and policy changes required to achieve sustainable development. The 2030 Agenda applies to all countries, integrates the three dimensions of sustainable development (economic, social and environmental) and provides guidance to Members, the United Nations and other intergovernmental organizations, the civil society organizations and other institutions on future opportunities, challenges and needs related to

sustainable development in all sectors, with the ambitious purpose of eradicating extreme poverty and hunger. The 2030 Agenda and the SDGs are very important for policy-making, the Planning and management of the sustainable development of aquaculture. In particular, SDG 1 (end poverty); SDG 2 (end hunger), SDG 5 (gender), SDG 8 (growth, employment), SDG 12 (production and consumption), SDG 13 (climate change), SDG 14 (marine resources and ecosystems) and SDG 15 (biodiversity) will be highly relevant to aquaculture, although other SDGs will also influence efforts to promote the sustainable development of aquaculture.

The translation of the European Green Deal and the Farm to Fork strategy to aquaculture has materialised in the European Commission's Communication on Strategic Guidelines for a more sustainable and competitive EU aquaculture for the period 2021-2030 which was published in May 2021. These guidelines aim to contribute to the development of a competitive and resilient EU aquaculture sector, ensure the supply of nutritious and healthy food, reduce the Union's dependence on seafood imports, create economic opportunities and jobs, and become a global benchmark for sustainability. APROMAR has positively valued these strategic guidelines and hopes that they will serve to revive Spanish aquaculture.

In 2021, APROMAR published its firstsectoral Sustainability Report and the second in 2023. They can be downloaded from this link: *https://apromar.es/memorias/*

A document in which we analyze the Spanish aquaculture sector, putting on the table activity data and improvement commitments in line with the improvement of the health of our ecosystems, the nutritional quality of our products, the development of rural areas, animal health and welfare, gender equality, etc. And short, medium and long-term goals are established.

4

Aquaculture in the European Union

4. Aquaculture in the European Union

4.1. Situation of aquaculture in the European Union

Aquaculture production in the European Union (27) remains relatively stagnant compared to the increase in production worldwide. In the last twenty years, although the Commission has tried to activate production potential with the publication of strategy and guidance documents, and the Aquaculture Advisory Council in 2016, the proposed objectives have not been achieved. That is why, on 12 May 2021, the Commission published its new strategic guidelines for more sustainable and competitive EU aquaculture. The year 2021 was also the year in which the pandemic began to emerge, and the economic recovery began.

In 2021 in the European Union (27th), 1,142.5 thousand t were produced with a value of € 3,960 M.

Aquatic production (aquaculture and fisheries) accounted for a total of 4,865 thousand tons in 2021, -4.5% less than in 2020 (5,096 thousand tons). The decline in production continues for the fourth consecutive year with an average of -5.4% in those 4 years. As for the value of production in 2021, it was €3,960 M, 14.9% more than in 2020 (€3,445 M).

Of the total aquatic production, aquaculture in the EU accounts for 23.5% and fisheries for 76.5%. Extractive fishing obtained a production in 2021 of 3,722.5 thousand tons, -6.8% less than in 2020 (3,993.4 thousand tons) according to FAO data.

In 2021, 1,142.5 thousand tons of aquaculture products were produced in the European Union. This figure represents an

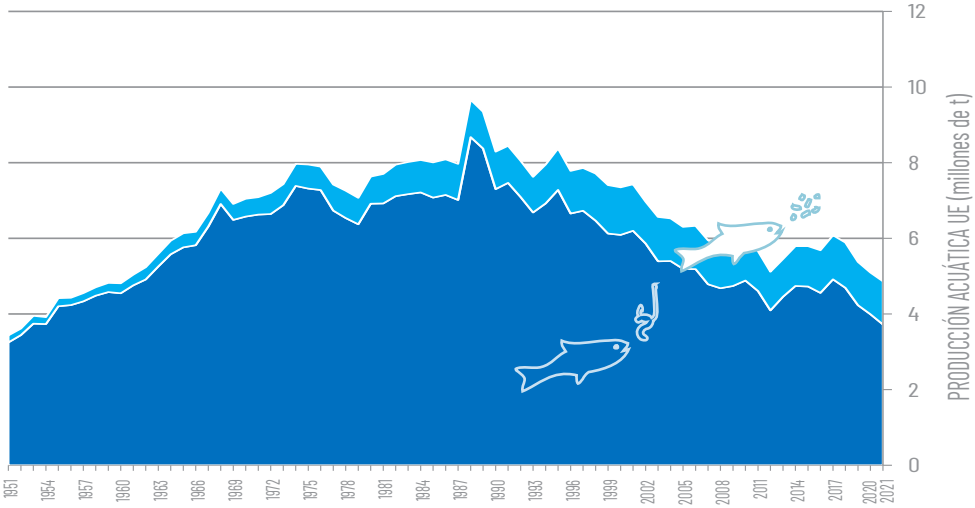


Figura 4-1. Evolution of the total aquaculture and fisheries production of the 27 Member States of the European Union between 1951 and 2021, in millions of tonnes (FAO).

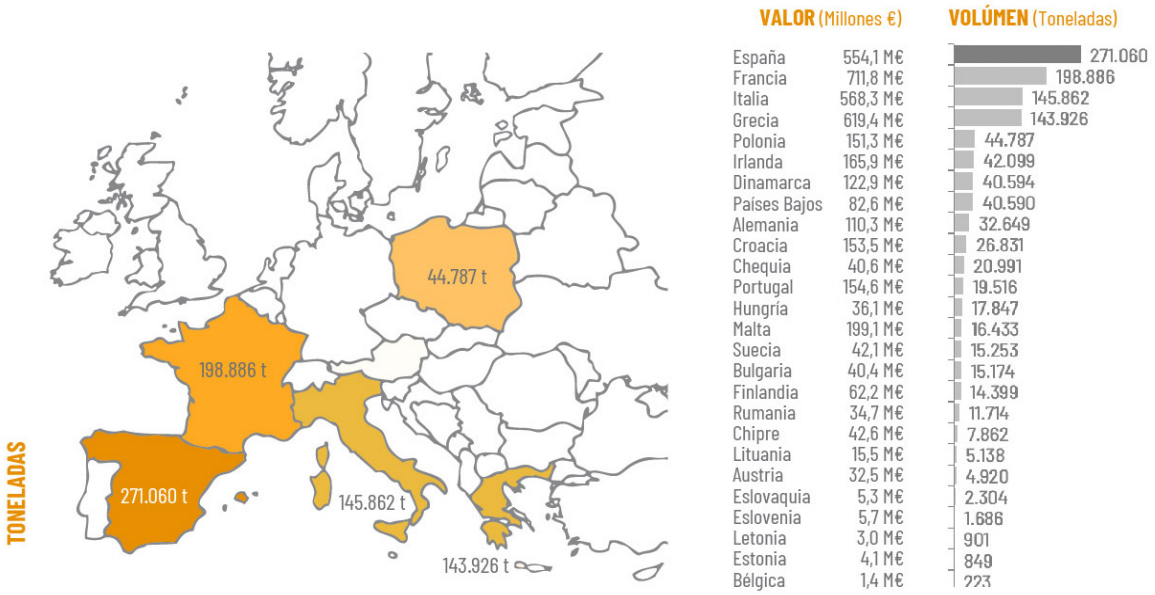


Figure 4-2. Distribution of aquaculture production in the Member States of the European Union (27) by quantity (tonnes) and value (million euros) in 2021 (FAO).

increase of 3.6% compared to what was put on the market in 2020 (1,103 thousand t).

The role of aquaculture is different in each country of the European Union. In some, its economic and social relevance already exceeds that of fishing, as is also the case 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.

Designer note: in the "graph" tab of the Excel "2023_UE by EEMM-Aquaculture.xlsx" are the data that should appear in the corresponding countries on the maps of Europe and their corresponding graph. View reports from previous years.

The list of producing countries within the European Union is led by Spain with a production in 2021 of 271,060 t with a decrease of -0.2% compared to 2020 (276,627 t). France is the second largest producer and in 2021 obtained 198,886 t, 4.1% more than in 2020 (191,050 t). It is followed by Italy with 145,862 t, 16.0% more than in 2020, Greece with 143,926 t, a 9.3% increase and Poland with 44,787 t, -6.1% less than the previous year.

Spain accounted for 23.7% of all EU production volume, followed by France with 17.4%, Italy 12.8%, Greece 12.6% and Poland with 3.9%, as the main producers.

When analyzing the value of production in 2021, aquaculture in the European Union generated €3.96 billion. France was the main producing Member State with €711.8 million, an increase of 7.8% compared to 2020 (€660 million) and representing 18.0% of the total value. Greece ranked third with €619.4 million and increased its value by 22.3% over the previous year (€506.4 million), accounting for 15.6% of the total. Italy ranked third and experienced the largest increase in its production value, up 48.8% from €382 million in 2020 to €568.3 million in 2021 and representing 14.4% of the total value. Spain ranked fourth with €554.1 million, 5.2% more than in 2020 (€526.5 million) and represented 14.0% of the total. Malta ranked fifth with a value of €199.1 million, 1.1%

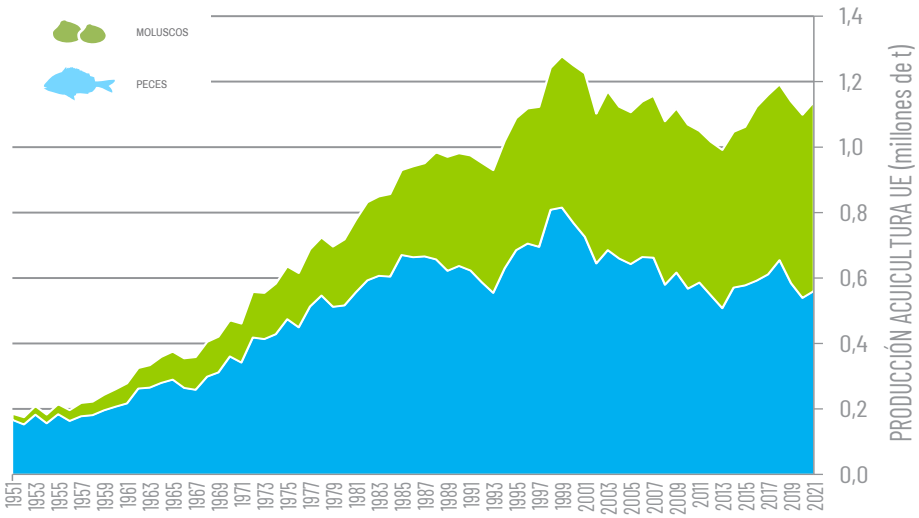


Figure 4-3
Evolution of aquaculture production (Mt) in the European Union by groups for the period 1951-2021 (FAO).

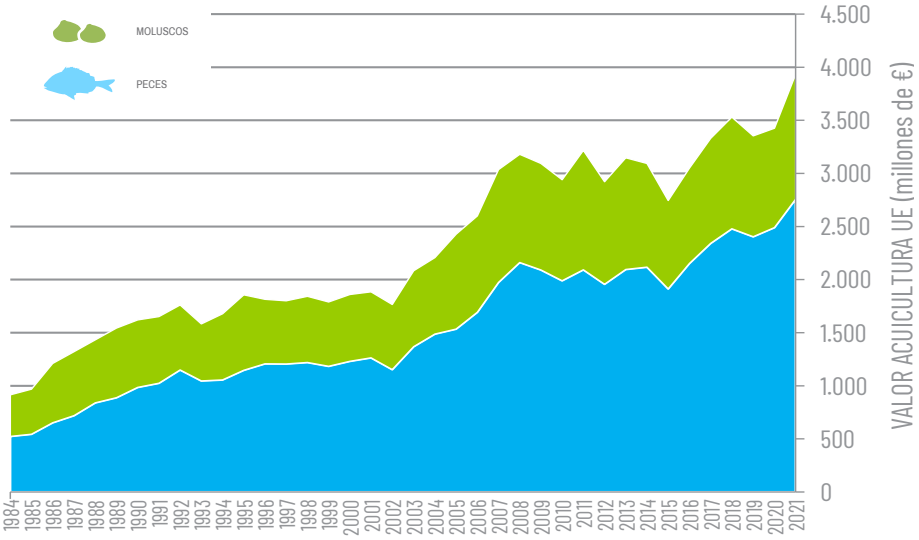


Figure 4-4.
Evolution of the value of aquaculture production in the European Union in millions of euros, by groups for the period 1984-2021 (FAO).

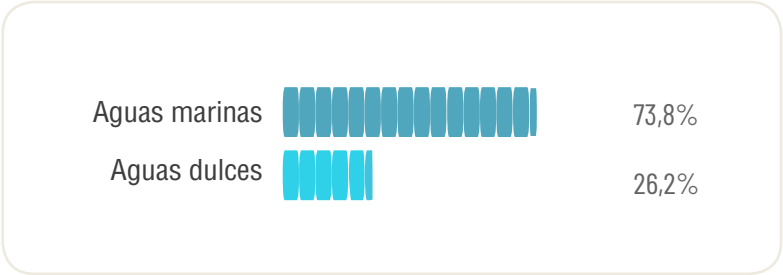


Figure 4-5.
Percentage distribution of aquaculture production (tonnes) in the European Union in 2021 by production setting (FAO).

more than in 2020 (€169.6 million) and representing 4.9% of the total.

As for the groups of aquaculture species farmed in the European Union, the main ones are fish (70.2%) and molluscs (29.2%). Aquaculture of crustaceans, algae or other invertebrates is very limited.

In 2021, 578.1 thousand tonnes of fish with a value of €2,757.6 M and 560.2 thousand tonnes of molluscs with a value of €1,172.2 M were farmed in the EU (27). The value of fish production increased by 10.7% from €2,490 M in 2020 to €2,757.6 M in 2021 and in the case of molluscs, by 25.5% from €934.2 M to €1,172.2 M. You can see the difference with the main year of the pandemic.

In terms of the production environment, aquaculture in the EU (27) was mainly developed in marine waters (73.8%) and 26.2% in freshwater.

Analyzing the cultivated species, the mussel continues one more year being the most produced species in the EU (27) with 423,379 tons, 3.4% more than in 2020 (406,621 t). Two species of mussels are produced, the common and the Mediterranean, not always adequately differentiated in the statistics.

Rainbow trout is the second most cultivated species with 193,266 t, 4.8% more than in 2020 (184,420 t). The third place is occupied by the gilthead with 103,130 t, 8.9% more than the previous year (93,131 t). The Japanese oyster ranks fourth with 98,826 t, 6.1% more than in 2020 (94,670 t). Sea bass ranked fifth with 96,647 t, 16.7% more than in the previous year (82,825 t). According to FAO data.

The next 5 species on the list of the 10 most cultivated have experienced decrease. Common carp, in sixth place, produced 68,036 t (-6.2%), bluefin tuna 26,320 t (-10.3%), Japanese clam 25,232 t (-3.2%), salmon 14,512 t (-2.0%) and meagre 8,844 t (-2.4%).

In the European Union (27), a total of 1,142.5 thousand t were produced in 2021, 3.6% more than in 2020 (1,103.1 thousand t). The total production of the 10 main species accounted for 92.6% of the total, with 1,058 thousand t, 5.0% more than the previous year (1,007.4 t).

As for the value of total EU aquaculture production (27) in 2021, it was €3.96 billion, 14.8% more than in the previous year. The top 10 species produced generated a total of €3.53 billion, or 89.2% of the total. According to FAO data.

In 2021, 578.1 thousand tonnes of fish with a value of €2,757.6 M and 560.2 thousand tonnes of molluscs with a value of €1,172.2 M were farmed in the EU (27).

The 2022 EUMOFA report indicates that in 2021 the increase in household expenditure on fishery and aquaculture products exceeded the inflation of the prices of these products. Therefore, the increase in spending, in addition to being due to inflation, was mainly due to higher spending on these products. This is mainly explained by the remaining effects of the pandemic, that is, longer time in households favored greater consumption in them.

When analyzing the 10 species with the most economic value in 2021, it is rainbow trout that tops the list with € 665.5 million, 11.4% more than in 2020. It is followed by sea bass (€554.5 million, +25.3%), sea bream (€537.1 million, +20.6%), mussels (€427.7 million, +22.1%), Japanese oysters (€412.6 million, 12.0%) and bluefin tuna (358.9, +5.4%).
The second half of the list is headed by the Japanese clam (€ 217.9 M) which also experiences together with the fine clam (€ 82 M), the highest growth in value of this list of species, 53.3% and 68.3% respectively.

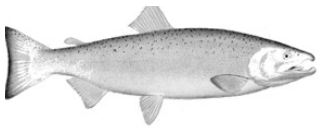
Table 4-1.
Main species produced by aquaculture in the European Union, by tonnes, in 2021 (FAO).

Especie	Nombre científico	Toneladas	% Var. anual
Mejillones	*(Mytilus spp)*	423.379	3,4%
Trucha arco iris	*(Onchorynchus mykiss)*	193.266	4,8%
Dorada	*(Sparus aurata)*	103.130	8,9%
Ostión japonés	*(Crassostrea gigas)*	98.826	6,1%
Lubina	*(Dicentrarchus labrax)*	96.647	16,7%
Carpa común	*(Cyprinus carpio)*	68.036	-6,2%
Atún rojo del Atlántico	*(Thunnus thynnus)*	26.320	-10,3%
Almeja japonesa	*(Ruditapes philippinarum)*	25.232	-3,2%
Salmón del Atlántico	*(Salmo salar)*	14.512	-2,0%
Corvina	*(Argyrosomus regius)*	8.844	-2,4%
TOTAL 10 PRALES. ESPECIES		1.058.192	5,0%
RESTO DE ESPECIES		84.589	-11,6%
TOTAL ACUICULTURA UE		1.142.500	3,6%

Table 4-2
Main species produced by aquaculture in the European Union, by value, in 2021 (FAO).

Especie	Nombre científico	Valor (M€)	% Var. anual
Trucha arco iris	*(Onchorynchus mykiss)*	665,53	11,4%
Lubina	*(Dicentrarchus labrax)*	554,52	25,3%
Dorada	*(Sparus aurata)*	537,11	20,6%
Mejillones	*(Mytilus spp)*	427,70	22,1%
Ostión japonés	*(Crassostrea gigas)*	412,63	12,0%
Atún rojo del Atlántico	*(Thunnus thynnus)*	358,94	5,4%
Almeja japonesa	*(Ruditapes philippinarum)*	217,91	53,3%
Carpa común	*(Cyprinus carpio)*	165,08	-0,2%
Salmón del Atlántico	*(Salmo salar)*	108,20	-7,9%
Almeja fina	*(Ruditapes decussatus)*	82,08	68,3%
TOTAL 10 PRALES. ESPECIES		3.529,7	16,9%
RESTO DE ESPECIES		427,0	0,0%
TOTAL ACUICULTURA UE		3.960,0	14,8%

especies



Salmo salar

SALMÓN

ATLANTIC SALMON *(Salmo salar)*

Class: Osteictios Order: Salmoniformes • Family: Salmonidae

Significant characters and morphology: Fish bluish gray on the dorsal part with some points, lighter on the flanks and with a silver belly. Elongated body covered with small scales. Large mouth provided with strong teeth. Second adipose dorsal fin. Caudal peduncle narrow

Production: Atlantic salmon farming has an initial stage in freshwater that is carried out in land-based facilities. When they are between 1 year and 18 months, and reach a weight of 50-90 g, they are moved to nurseries at sea. There they are bred for 12 to 18 months, until reaching a harvest weight of 4 to 5 kg.

Products and presentation: The main final product is fresh fillet, although it is also marketed whole (or gutted) fresh. Frozen fillets and other higher value-added products, such as whole or thinly sliced smoked salmon, are also marketed.

4.2. Situation of fish aquaculture in the European Union

In 2021, according to FAO data, 578.1 thousand tonnes of fish were obtained in the EU (27), 3.3% more than in 2020 (559.8 thousand tonnes). This production had a value of €2,757.6 million, 10.7% more than the previous year (€2,490.1 million).

The 10 main fish species accounted for 91.5% of production, i.e. 529.0 thousand tonnes, 4.9% more than in 2020 generating €2,543.1 million, 92.2% of the first-sale value of total production. The average value per kilo of aquaculture fish in first sale was 4.77 euros/kg, 7.2% more than the previous year (4.45 €/kg in 2020).

The EU (27) 578.1 thousand tonnes of fish were farmed in 2021 with a value of €2,757.6 million.

In the list of the top 10 cultured species, rainbow trout occupies the first position with 193,266 t in 2021, 4.8% more than the previous year (184,420 t). Followed by sea bream with 103,130 t, 8.9% more than in 2020 (94,670 t), sea bass with 96,647 t 16.7% more (82,825 t in 2020). The next 4 species on the list experienced a decrease in production: common carp (68,036, -6.2%), bluefin tuna (26,320, -10.3%), salmon (14,512, -2.0%) and meagre (8,844 t, -2.4%).

As for the value of fish production in 2021, a first-sale value of €2,757.6 M was generated. As in the list of production volume, it is rainbow trout that tops the value list with €665.5 million, 11.4% more than in 2020, followed by sea bass with €554.5 million (+25.3%), sea bream with €537.1 million (+20.6%) and bluefin tuna with €358.9 million (+5.4%). Snapper, in 10th place, experienced a notable increase with 32.8% or € 27.8 M and the largest decrease was for turbot with -54.8%, or € 31.5 M.

The top 10 cultivated species generated €2,543.1 million, 11.2% more than in 2020. These top 10 species accounted for 92.2% of the total value of production.

When analysing fish production by country in the EU (27), it can be seen that Greece is the first producing country with 130,171 t in 2021 with a value of € 613.8 million followed by Spain with a notable difference, with a production of 61,703 t with a value of € 378.3 million. The third place is occupied by Italy with 60,484 t and 311.9 M€ reported, France later with 47,910 t and a value of 182.1 M€ and Poland, in fifth position with 44,786 t with a value of 151.3 M€.

The production of fish through modern aquaculture systems has been a success story in Europe in the development of a new and innovative economic activity. Despite its current limited 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 noted that in parallel there are aquaculture systems plus traditions perfectly adapted also to ecosystems and social uses.

The rate of growth of fish aquaculture in the European Union (27) since 2000 has been very slow. In fact, over the past 10 years, fish aquaculture has grown by only an average of 2.5% per year compared to 4.2% globally. This situation has occurred in the same way for the mollusc species produced, i.e. in the EU (27) the rate of growth has decreased, by -1.9 % compared to 2.9 % in the rest of the world. Thus, the total aquaculture in the EU (mainly fish and molluscs) has decreased since 2000 by an average of -0.9% per year, while in the world aquaculture has grown in that time by an average of 4.5%. It should be clarified that these production figures for the Member States of the European Union do not, logically, include data for other European countries such as Norway or, where appropriate, Turkey. The average annual growth in the last decade for aquaculture across Europe was 3.7% covering all aquaculture and 4.5% for fish farming (including Turkey, but taking Norway into account). These data confirm the existence of severe limitations for the development of aquaculture in the European Union and that they do not occur in other countries or occur to a lesser extent.

Especie	Nombre científico	Toneladas	% Var. anual
Trucha arco iris	*(Onchorynchus mykiss)*	193.266	4,8%
Dorada	*(Sparus aurata)*	103.130	8,9%
Lubina	*(Dicentrarchus labrax)*	96.647	16,7%
Carpa común	*(Cyprinus carpio)*	68.036	-6,2%
Atún rojo del Atlántico	*(Thunnus thynnus)*	26.320	-10,3%
Salmón del Atlántico	*(Salmo salar)*	14.512	-2,0%
Corvina	*(Argyrosomus regius)*	8.844	-2,4%
Peces de agua dulce nep	(varios)	6.727	11,3%
Pez-gato	*(Clarias gariepinus)*	6.083	5,3%
Anguila europea	*(Anguilla anguilla)*	5.486	9,9%
TOTAL 10 PRALES. ESPECIES		529.051	4,9%
RESTO DE ESPECIES		49.054	-11,4%
TOTAL ACUICULTURA PECES UE		578.105	3,3%

Table 4-3.
Main fish species produced by aquaculture in the European Union, by tonnes, in 2021 (FAO).

Especie	Nombre científico	Valor (M€)	% Var. anual
Trucha arco iris	*(Onchorynchus mykiss)*	665,5	11,4%
Lubina	*(Dicentrarchus labrax)*	554,5	25,3%
Dorada	*(Sparus aurata)*	537,1	20,6%
Atún rojo del Atlántico	*(Thunnus thynnus)*	358,9	5,4%
Carpa común	*(Cyprinus carpio)*	165,1	-0,2%
Salmón del Atlántico	*(Salmo salar)*	108,2	-7,9%
Anguila europea	*(Anguilla anguilla)*	50,2	13,7%
Corvina	*(Argyrosomus regius)*	44,1	2,5%
Rodaballo	*(Psetta maxima)*	31,5	-54,8%
Pargo	*(Pagrus pagrus)*	27,8	32,8%
TOTAL 10 PRALES. ESPECIES		2.543,1	11,2%
RESTO DE ESPECIES		214,5	5,4%
TOTAL ACUICULTURA PECES UE		2.757,6	10,7%

Table 4-4.
Main fish species produced by aquaculture in the European Union, by value, in 2021 (FAO).

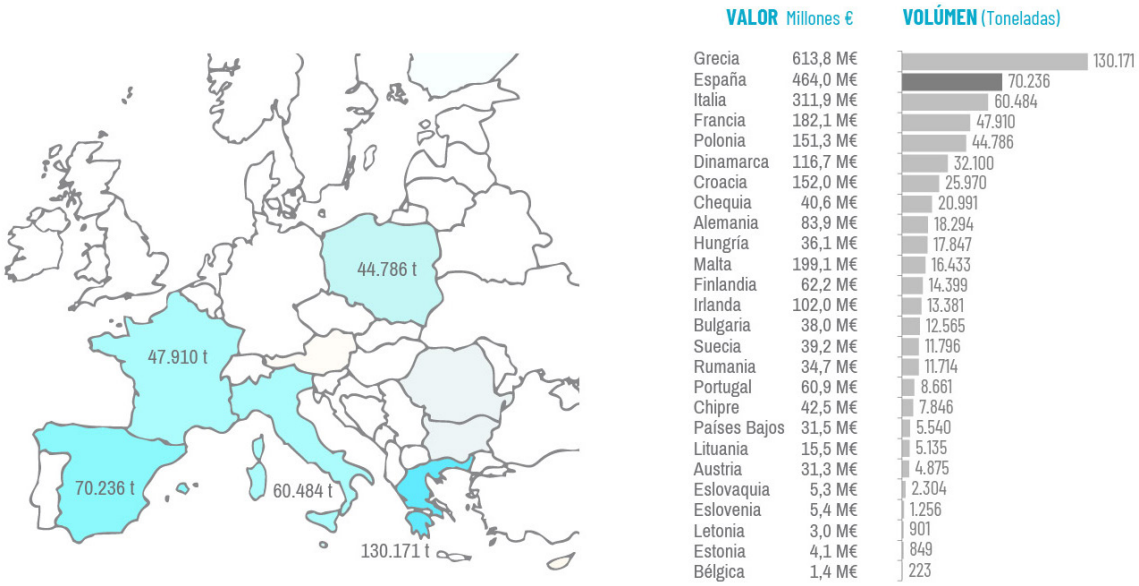


Figure 4-6. Distribution of aquaculture fish production in the Member States of the European Union by volume (tonnes) and value (million euros) in 2021 (FAO).

Figure 4-7. Relative evolution of increases in total aquaculture production in the European Union, Europe (including Turkey) and world between 2000 and 2021. Cumulative percentage increases are shown, based on the year 2000 (based on FAO data) as a baseline (100).

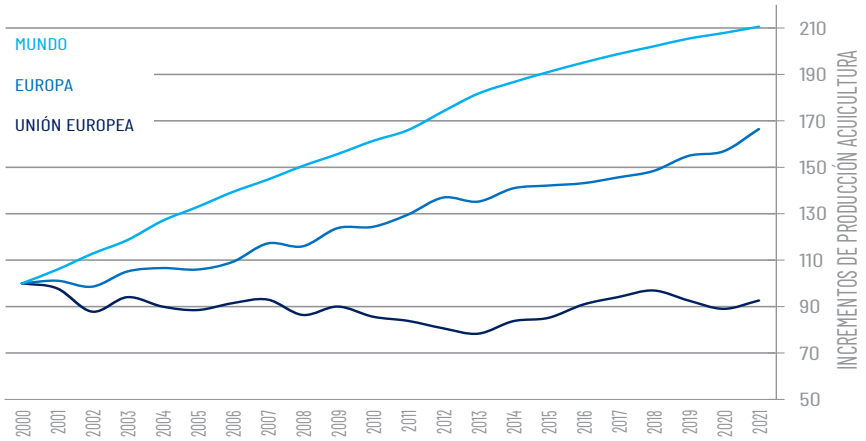


Figure 4-8. Relative evolution of increases in aquaculture fish production in the European Union, Europe (including Turkey) and world between 2000 and 2021. Cumulative percentage increases are shown, based on the year 2000 (based on FAO data) as a baseline (100).

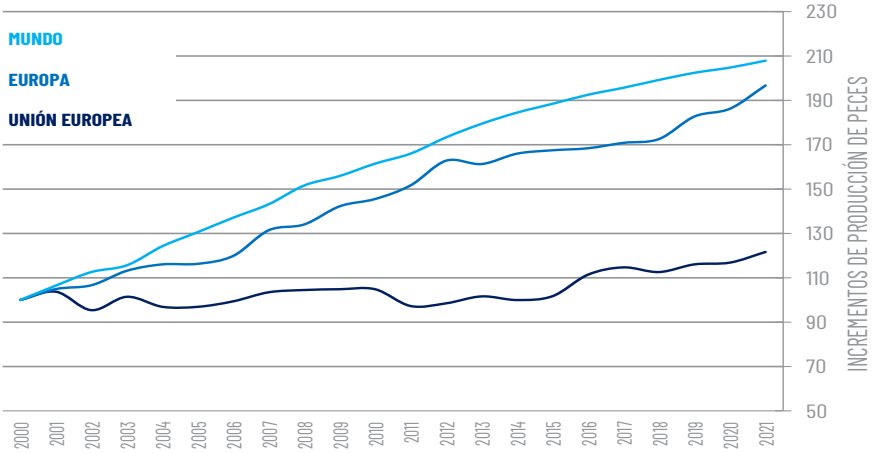
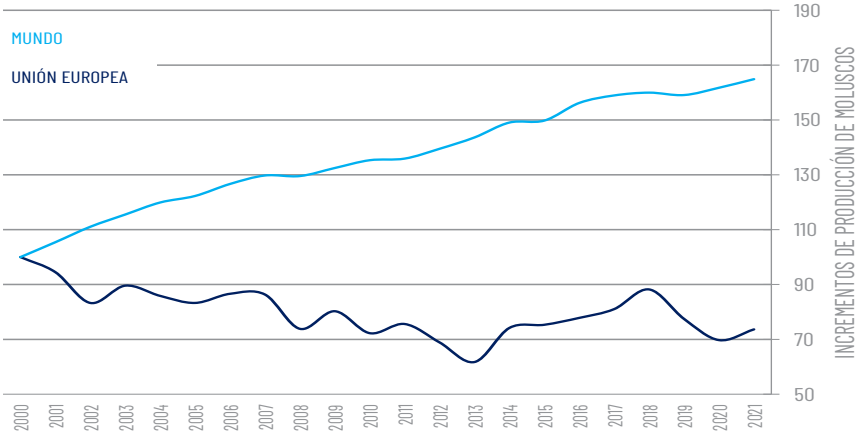


Figure 4-9. Relative evolution of increases in aquaculture mollusc production at European Union and global levels between 2000 and 2021. Cumulative percentage increases are shown, based on the year 2000 (based on FAO data) as a baseline (100).



4.3. Situation of mollusc aquaculture in the European Union

In 2021, 18,418,981 t were produced in the world of aquaculture molluscs. The European Union (27) contributed 560,205 t, or 3.0 %, to this production, with a first-sale value of €1,175 million.

The main producing country is Spain, based on mussel farming, followed by France (oysters) and Italy (clams). These three countries accounted for 78.9% of the total European harvest of aquaculture molluscs in 2021, i.e. 442,252 t.

In Spain, 206.4 thousand tons were produced, therefore, it was the first producing country and obtained a value in first sale of € 150.4 million in 2021 according to FAO. The second place in volume was occupied by France with 150.5 thousand t but in terms of value it is by far the first place in the ranking with € 517.9 M. The third place in volume is occupied by Italy with 85,354 t, while it is the second in value with € 256.1 M in first sale.

European production of aquaculture molluscs has remained practically constant, with a year-on-year variation of 1.0% in the last decade. From a peak of 826,140 tonnes in 1999 to 560.2 Mt in 2021. Its economic value has experienced an average year-on-year variation of 0.5% in the last 10 years.

Mussel aquaculture in the European Union (27) put on the market 423.4 thousand t in 2021, which represented 75.6 %

In 2021, 18.4 Mt of aquaculture molluscs were produced worldwide. The European Union contributed 560 thousand t to this production and with a first-sale value of €1,175 million.

of the total mollusc harvest with a value of 350.3 M€ (29.9% of the total). It is followed in production by the Japanese oyster with 101.8 thousand t (18.2% of the total) with a value of € 422.7 M (36.1% of the total) and the Japanese clam with 25.2 (4.5%) and a value of € 142.1 M. Another species with significant productions is the 5.2 thousand t fine clam with a value of € 48.8 million.

The average value of the first sale of the Japanese oyster was 4.15 €/Kg, the mussel was 1.0 €/Kg and the Japanese clam 5.63 €/Kg.

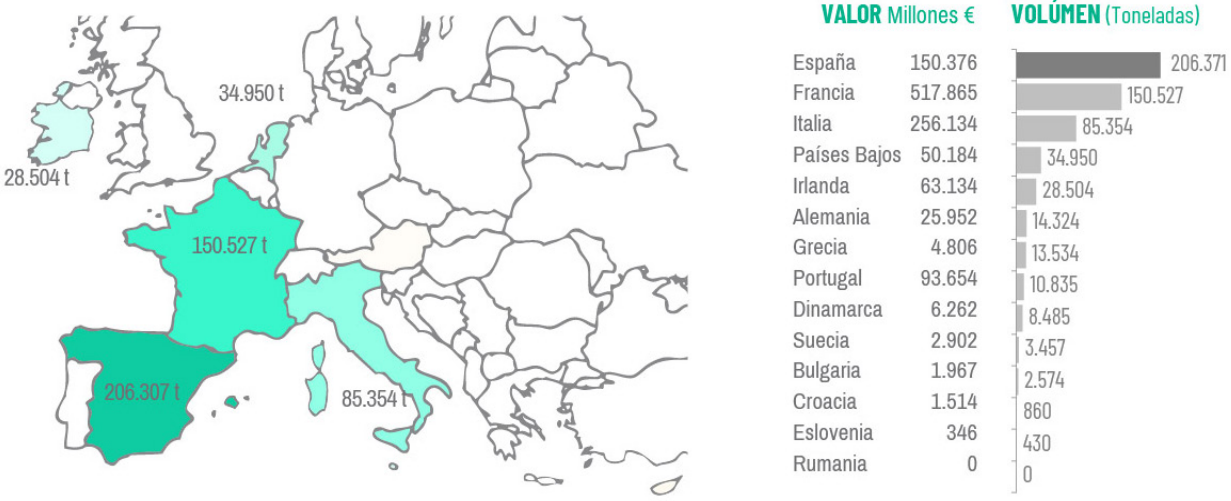


Figure 4-10. Production of aquaculture molluscs in EU Member States by volume (tonnes) and value (million euros) in 2021 (based on FAO data).

Table 4-5. Main species of molluscs produced by aquaculture in the European Union, by tonnes, in 2021 (FAO).

Especie	Nombre científico	Toneladas	% Var. anual
Mejillones	*(Mytilus spp)*	423.379	75,6%
Ostión japonés	*(Crassostrea gigas)*	101.846	18,2%
Almeja japonesa	*(Ruditapes philippinarum)*	25.232	4,5%
Almeja fina	*(Ruditapes decussatus)*	5.193	0,9%
Ostra europea	*(Ostrea edulis)*	2.240	0,4%
Almeja babosa	*(Venerupis pullastra)*	1.946	0,3%
TOTAL 6 PRALES. ESPECIES		559.836	16,7%
RESTO DE ESPECIES		368	0,1%
TOTAL ACUICULTURA MOLUSCOS UE		560.204	3,9%

Table 4-6. Main species of molluscs produced by aquaculture in the European Union, by value, in 2021 (FAO).

Especie	Nombre científico	Valor M€	% Var. anual
Ostión japonés	*(Crassostrea gigas)*	422,7	36,1%
Mejillones	*(Mytilus spp)*	350,3	29,9%
Almeja japonesa	*(Ruditapes philippinarum)*	142,1	12,1%
Almeja fina	*(Ruditapes decussatus)*	48,8	4,2%
Ostra europea	*(Ostrea edulis)*	9,4	0,8%
Almeja babosa	*(Venerupis pullastra)*	4,2	0,4%
TOTAL 6 PRALES. ESPECIES		977,6	13,9%
RESTO DE ESPECIES		2,7	0,5%
TOTAL ACUICULTURA MOLUSCOS UE		980,3	24,8%

4.4. Potential of European aquaculture

Aquaculture in the European Union remains stagnant. In 2002, the Commission published the "Strategy for the Sustainable Development of European Aquaculture" with the aim of creating more jobs, producing more food and promoting environmentally friendly development. This strategy did not achieve either the employment or production growth objectives, mainly due to competition from third countries, the crisis of governance and the effects of the economic crisis. In 2009, the commission published a second communication entitled "Building a sustainable future for aquaculture. New impetus to the Strategy for the Sustainable Development of European Aquaculture". And in 2013, with the aim of helping Member States define their national targets, the "Strategic Guidelines for the Sustainable Development of EU Aquaculture" were published. Member States were to develop their Multiannual Strategic Plans and in 2021, the commission published "Strategic Guidelines for more sustainable and competitive EU aquaculture for the period 2021-2030". Further development of the sector continues to be pursued through research, innovation and EU funding. In addition, the European Green Deal and the Farm to Fork Strategy are taken into account.

The EU's potential is remarkable. Europe has 55,000 km of coastline with environmental, physical and oceanographic conditions conducive to aquaculture. On the other hand, the business fabric of European aquaculture has demonstrated that it has the knowledge, experience and technical means to be an environmentally sustainable activity, economically profitable, offering safe, healthy and quality food, and socially welcome 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, they have well-trained human resources, and as has been mentioned, the environmental conditions are appropriate for the cultivation of many of the species that consumers currently demand most. But, on the other hand, the high regulatory standards with which the European Union has endowed itself aimed at ensuring that the aquaculture products grown in it are as safe as a food can be, that the natural environment of its production is scrupulously respected, that workers have safe and motivating working conditions, and that the welfare of the animals raised has been complied with, offer an added value that society must know.

EU countries have revised their national strategies according to the strategic guidelines and have access to the European Maritime Fisheries and Aquaculture Fund (EMFAF).

The European Commission's Scientific Advice Mechanism (SAM) recommends making aquaculture an explicit priority of the EU and global policies by integrating its policies into a comprehensive food production policy framework that takes into account the needs of producers and consumers. In June 2023, it published a report entitled "Towards sustainable food consumption" indicating the changes needed to be made in the food production system to address climate change, biodiversity loss and environmental degradation. It includes actions that include aquaculture such as: developing a vision on healthy and sustainable diets including all actors in the chain, making these diets more affordable, bringing consumers closer to producers, restricting imports from places where production is causing greater environmental damage, among others. Aquaculture production currently suffers from these problems and is a major agent in solving them. EU aquaculture provides healthy, nutritious food, available all year round, at affordable prices and taking care of the environment.

However, aquaculture in the European Union, both fish and molluscs, has been practically stagnant for the last fifteen years for various reasons and is not exploiting its potential for creating wealth and employment, as the FAO has been insistently recommending. This situation, together with the lower catches of extractive fishing, has consolidated a situation of high dependence on fish imports to meet the growing European demand for seafood. Today, the European Union's fish import and processing industries are more relevant in terms of turnover and employment than fisheries and aquaculture producers combined.

Having a demanding but tight legal regulatory framework is a plus of competitiveness that nobody disputes. But when these standards are taken to higher levels without sufficient justification, or without that greater demand providing added value to society, then they become a slab for the non-compensable economic costs they entail. This circumstance of sublimation of the 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 society (for example, indicating at the final points of sale the date of capture or harvest of unpackaged fresh fish).

The sublimation at national or regional level, also called gold galvanizing, of European regulations has the consequence that the procedures to obtain an authorization to carry out aquaculture, or to obtain the granting of a concession of a space in the public domain, last up to 8 years and unnecessarily raise business costs. With this, the possibility of growing and taking advantage of economies of scale, or simply producing, entails anomalously high costs when you want to operate within the European Union. And with these higher costs it is difficult to compete with imported fish from developing third countries. On the other hand, the growing demand for the use of spaces in coastal and river environments by other activities leads to increased competition between aquaculture and these other activities, including those related to residential housing construction, tourism or 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 unfounded, which continue to prevent this activity from reaping the full benefits of the rigorous legal standards to which it must conform, both related to the environment, 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 especially regional (subnational) level, considerable work remains to be done in relation to the establishment of a framework conducive to the development of this activity that guarantees a level playing field for entrepreneurs vis-à-vis imports, and provide a solid foundation of trust for both consumers and neighbors of aquaculture farms.

4.5. Videos and reports of interest.

"Acuicultura de España" Video

APROMAR Sustainability Report

In July 2022, the presentation of our first Sustainability Report took place from Illana (Guadalajara).
https://youtu.be/SnchYIkB9eI

"Acuicultura de España" Video

Professor Lubina's Office

Series of 12 videos in which Professor Sea Bass answers questions about #aquaculture.
https://www.youtube.com/playlist?list=PLuX-qq--A21hYoRU8QSpxEqxDPF-x8Unc

"Acuicultura de España" Video

Podcast: The Pantry of the Future

"The pantry of the future" with Carlos Ríos and Mercedes Martín.
https://youtu.be/bymUxvB0bNY

"Acuicultura de España" Video

Podcast: The Pantry of the Future

"The pantry of the future" with Carlos Ríos and Mercedes Martín 2.
https://youtu.be/00T9Uqil_ok

Video of euronews.com

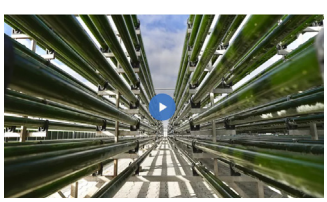
Artisanal fisheries and aquaculture

Artisanal fishing and aquaculture: competitive business in harmony with nature.
https://www.euronews.com/green/2022/08/23/fishing-for-the-future

Video of euronews.com

Inland aquaculture

Ecological tradition of fishpond farming in the Czech Republic.
https://www.euronews.com/green/2022/08/23/eco-friendly-tradition-of-fish-pond-farming-in-the-czech-republic



Video of euronews.com

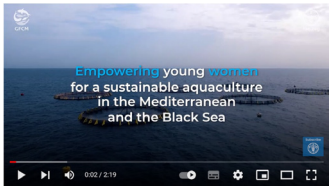
Microalgae

Researchers in Europe turn to microscopic algae to find answers to our environmental problems
https://www.euronews.com/green/2023/01/31/researchers-in-europe-turn-to-microscopic-algae-for-answers-to-our-environmental-problems

Video of euronews.com

Microalgae

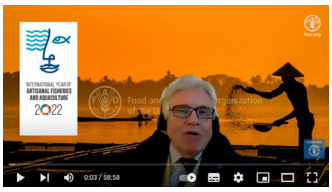
'Blue Revolution': How farmed seaweed is good for us and the planet
https://www.euronews.com/green/2022/10/25/blue-revolution-how-farmed-seaweed-is-good-for-us-and-the-planet



FAO Video

Women and aquaculture

Empowering young women for a sustainable aquaculture sector in the Mediterranean and Black Sea.
https://youtu.be/stJkAilx0wg?si=4QKVUo8N3zuu9TLn



FAO Video

Sustainability

Sustainability of fisheries and aquaculture: Certification, Environmental, social and corporate governance.
https://youtu.be/stJkAilx0wg

REPORTS

APROMAR Report

Sustainability Report 2023

The Sustainability Report is a technical and rigorous document in which you can transparently consult the sustainability indexes of our sector through three prisms: social, environmental and economic.

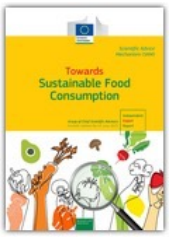
https://apromar.es/memorias/

Using ethology to improve welfare and production of farmed fish

AAC

Report is on welfare performance indicators

https://aac-europe.org/wp-content/uploads/2023/06/AAC_ethology-and-welfare_final_with-annex.pdf

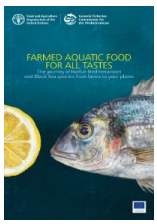


SAM Report

Towards sustainable food consumption

Recommendations for a combination of policy interventions to overcome barriers that prevent consumers from eating in a healthier and more sustainable way.

https://op.europa.eu/en/publication-detail/-/publication/9f582c41-1565-11ee-806b-01aa75ed71a1/language-en/format-PDF/source-288593316



GFCM-FAO Report

Farmed aquatic foods for all tastes

The journey of twelve Mediterranean and Black Sea species from farms to your plates.

https://www.fao.org/3/cc5140en/cc5140en.pdf

FAO Reports

Strategic Guidelines

1- Guidelines on restocking and improvement of aquaculture stocks
2- Guidelines to assess and minimize the possible impacts of the use of non-native species in aquaculture
3-Guidelines in support of social acceptability for the development of sustainable aquaculture
4-Guidelines for streamlining aquaculture licensing and leasing processes

https://www.fao.org/gfcm/publications/en/

MAPA Report

Spain's contribution to the Strategic Guidelines

For more sustainable and competitive EU aquaculture 2021-2030

https://www.mapa.gob.es/es/pesca/temas/acuicultura/plan-estrategico/estrategia-2021-2030/documentos.aspx

5

Aquaculture production in Spain and Europe

5. Aquaculture production in Spain and Europe

5.1. Production of seafood in Spain

The total products from fisheries and aquaculture in Spain in 2021 was 1.08 million tonnes, practically the same as the previous year, according to FAO data. Fisheries contributed 74.9% of the products, i.e. 0.81 Mt (0.5% more than in 2020) and aquaculture the remaining 25.1%, 0.28 Mt (-2.0% less than in 2020). According to this source, the average year-on-year variation in the last 10 years for aquaculture has been 0.5% and -2.1% for fisheries.

The data collected from FAO's FishStatj programme and the data obtained by APROMAR from its associated companies and verified with those published by the Ministry of Agriculture, Fisheries and Food (MAPA) differ, as is usually the case. Aquaculture in Spain according to our data and comparisons with the rest of Spanish reports indicates that aquaculture production in 2021 was 326,520 t and in 2022 it was 332,855 t, 1.9% more.

The most abundant species was the mussel (*Mytilus spp.*), with 255,218 t in 2022 with an estimated value of €159.3 million. Followed by sea bass with 23,622 t and a value of € 181.6 million, rainbow trout with 16,328 t with a value of € 43.6 million and bluefin tuna with 10,877 t and a value of € 183.2 million.

Aquaculture in Spain in 2022 was 332,855 t, 1.9% more than in 2021 and with an estimated first-sale value of €760.7 million.

On the fishing side, the main species caught by the Spanish fleet were skipjack tuna (*Katsuwonus pelamis*) of which 140,586 t were caught, Argentine hake (*Merluccius hubbsi*) with 96,277 t and yellowfin tuna (*Thunnus albacares*) with 68,143 t in 2021 according to FAO.

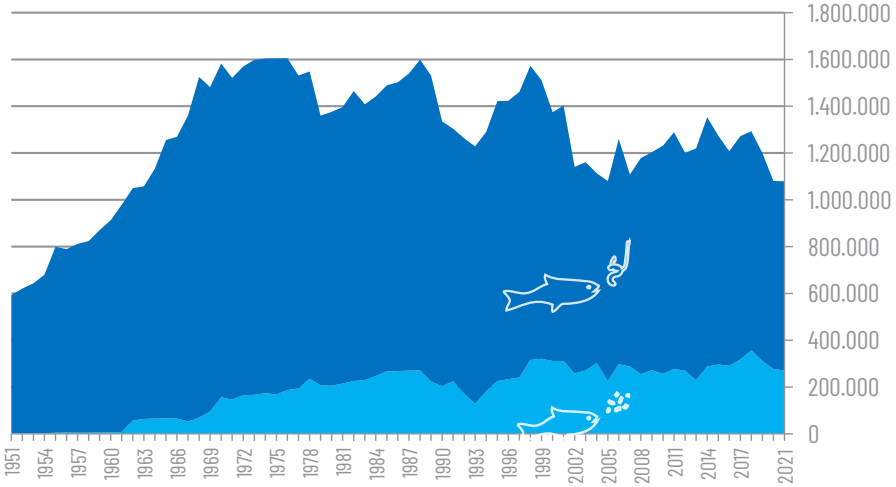


Figure 5-1. Evolution of total aquatic production (aquaculture + fishing) in Spain (tonnes) in the period 1951-2021 (FAO).

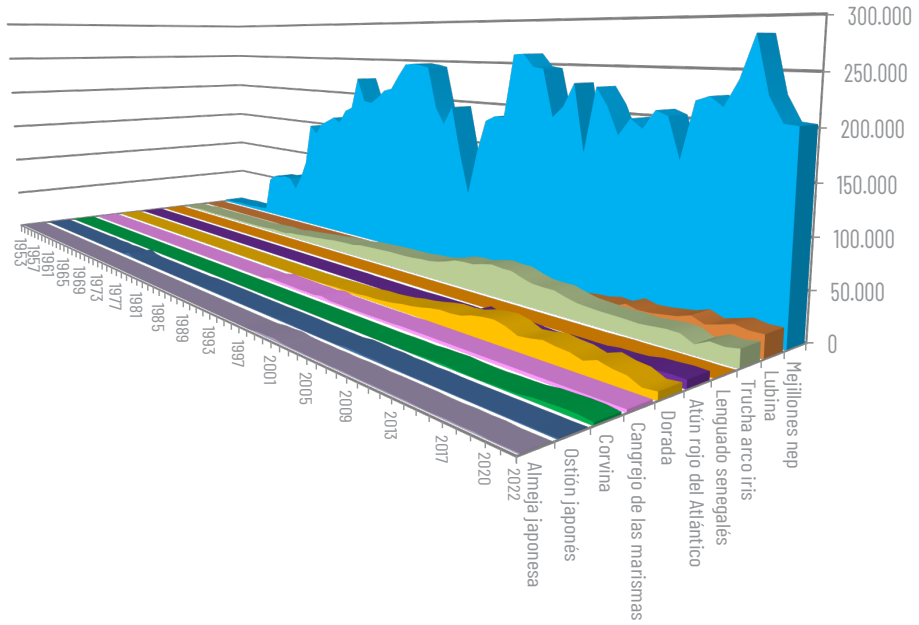


Figure 5-2. Evolution of the aquaculture production in Spain, in tonnes and by species, in the period 1953-2022 (MAPA and APROMAR data).

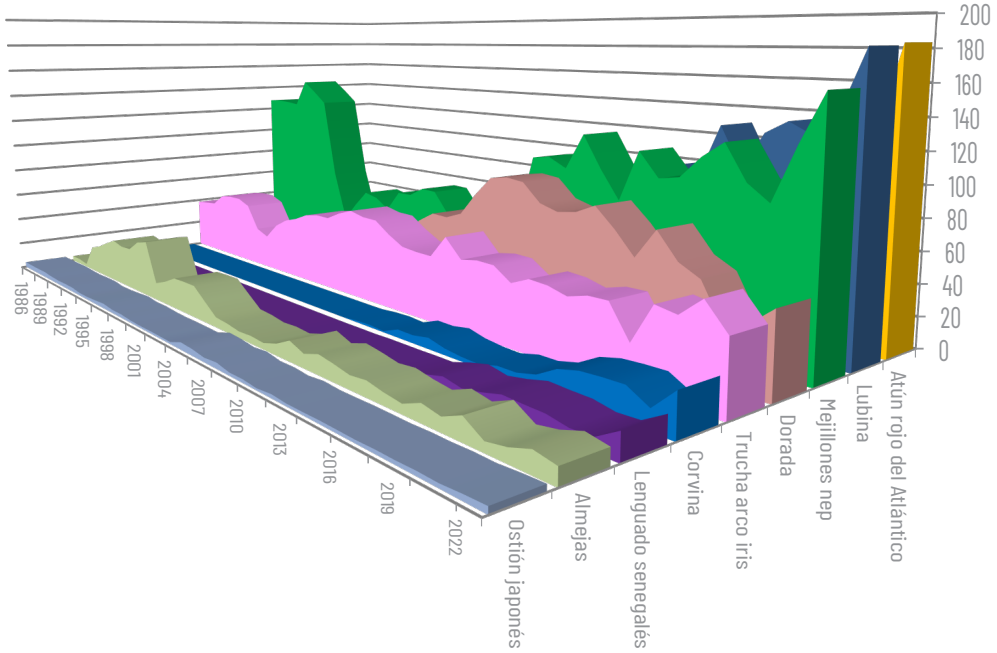


Figure 5-3. Evolution of the value of the aquaculture production in Spain, in millions of euros and by species, in the period 1986-2022 (MAPA and APROMAR data)

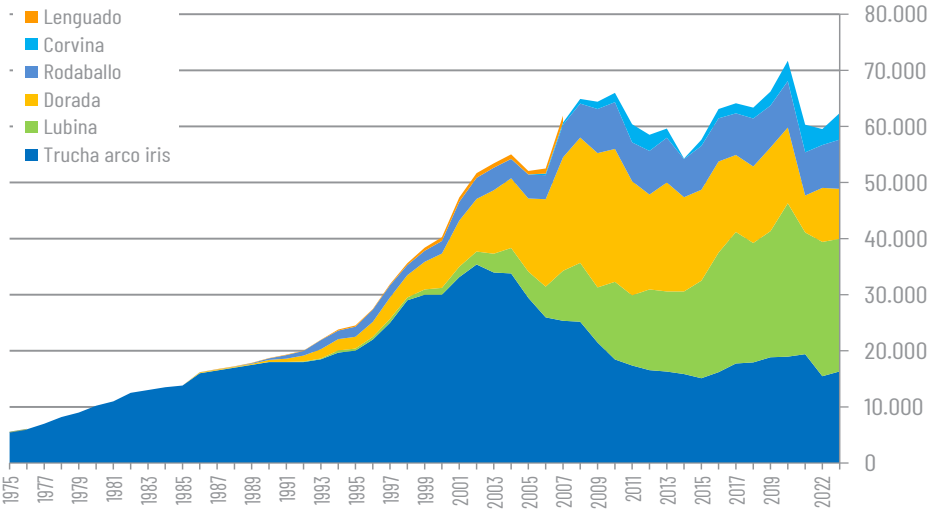


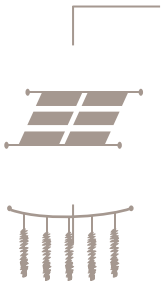
Figure 5-4. Evolution of the production of aquaculture fish in Spain, in tons and for the main species, in the period 1975-2022 (MAPAMA and APROMAR).

5.2. Types of aquaculture facilities in Spain

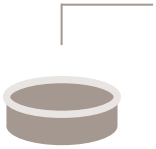
Spain has a varied availability of water resources on which it is feasible to carry out aquaculture, both in the marine and continental areas (fresh waters). Thus, to the almost 8,000 km of coastline are added nine large rivers, numerous minor river courses, lakes and a reservoir water capacity of more than 55,000 hm3, in addition to an orography and diversity of climates that provide environmental and physicochemical characteristics suitable for the development of aquaculture. Aquaculture facilities are designed and built to meet the needs of the species produced and adapt to the conditions of the physical environment. In this way, the following categorization of aquaculture facilities in Spain can be made:

TYPES OF AQUACULTURE FACILITIES IN SPAIN

- At sea in pens.
  These facilities consist of rigid plastic rings that support and float net bags inside which fish such as bream, sea bass or meagre are stabled and raised.



- At sea in platforms and long-lines. These are floating structures for the cultivation of bivalve molluscs, mainly mussels. The platform consists in structure from which the cultivation 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 the culture ropes hang in turn. The platform operates better in sheltered waters, as in the case of the Galician estuaries, while the long-lines offer better results in open water, as is the case of mussel cultivation in Andalusia.



- On the coastline (salt water).
  These are facilities built on site, on land or on the coast and that obtain their water by pumping from sea water or wells. It is the kind of farm in which the production of turbot, for example, or sole is carried out.

- On the beach, intertidal area and estuaries (salt water).
  They are aquaculture facilities in which the cultivation is carried out with a minimum physical intervention on the environment. This is the case of the production of clams and oysters. It is carried out in beach areas or intertidal areas in which the animals are deposited directly on the substrate or in meshes on tables. It is also the type of farms located in ponds dug into the earth in old salt areas or marshes, being an example of this the estuaries for the production of fish such as sea bream, sea bass or meagre.

- In land (fresh water).
  They consist of facilities built on site on the banks of rivers, or their sources, which take advantage of the gravity circulation of water. It is the type of facility in which the production of rainbow trout or sturgeon is carried out.

5.3. Number of aquaculture facilities in Spain

In 2021, a total of 5,182 aquaculture facilities were in operation and with production in Spain, 80 facilities more than in 2020 with 5,102 according to MAPA data. Of these, 4,928 (86 more than in 2020) were molluscs in marine aquaculture, consisting of rafts and "long-lines" in which vertical cultures of mussels and other molluscs are carried out. Inland aquaculture (freshwater) had 143 active farms (7 fewer than in 2020), mainly for fish such as rainbow trout and sturgeon. The number of facilities on the coast, beaches, intertidal areas and estuaries was 73 (6 more than in 2020). And operating in nurseries at sea there were 38 (5 less than in 2020), for fish farming.

In 2021 there were 5,182 aquaculture facilities in production. Of which 4,928 of molluscs and 254 of fish (143 in inland waters, 73 on land and 38 in nurseries).

It is key to highlight that inland aquaculture is key to the development of rural areas in Spain. In these areas, the establishment of new companies is low and inland aquaculture represents an important focus of employment.

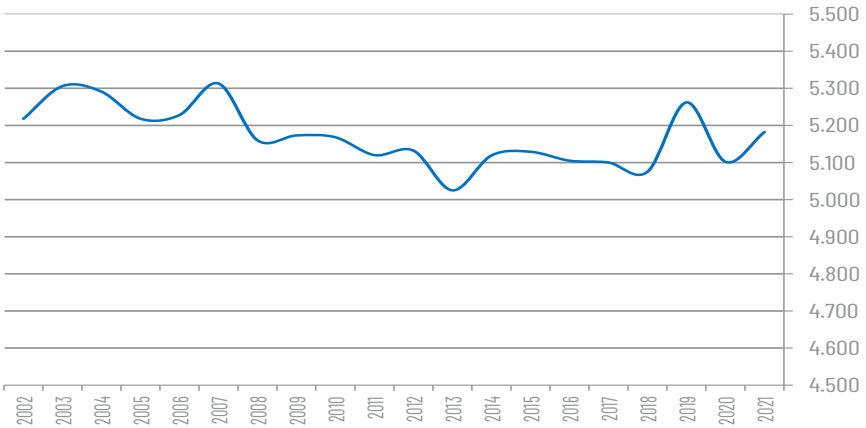


Figure 5-5. Evolution of the total number of aquaculture facilities in Spain with production between 2002 and 2021 (source MAPA/ APROMAR).

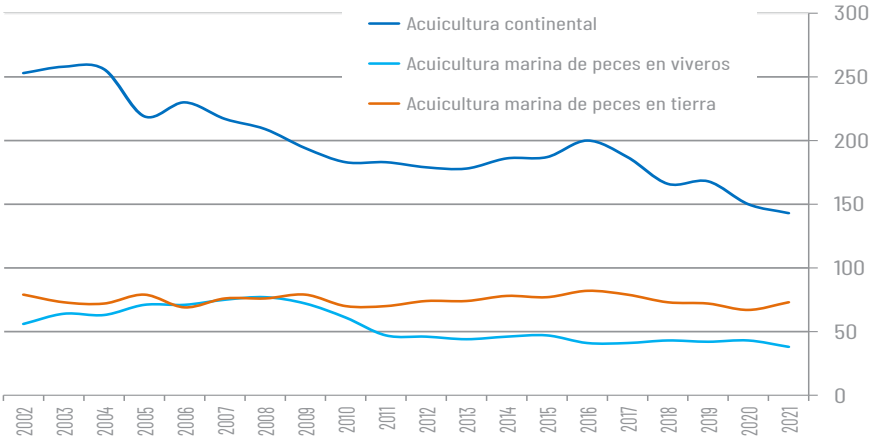


Figure 5-6. Evolution of the number of aquaculture facilities in Spain with production, dedicated to inland aquaculture, marine fish in nurseries and fish marine on land between 2002 and 2021 (source MAPA/ APROMAR).

5.4. Employment in aquaculture in Spain

The statistics prepared annually by the Ministry of Agriculture, Fisheries and Food (MAPA) indicate that the number of annual work units (AWU) in aquaculture in Spain in 2021 was 5,722, 1.2% more than in 2020 with 5,656. This figure was distributed among 11,364 people, that is, -8.9% less than in 2020 with 12,478 people. Therefore, although the work units increased slightly, the number of employees decreased by 1,114 people.

Most of the employees, 5,849 people were non-salaried (self-employed), mainly from the mussel subsector. It was followed by 2,717 specialized operators, 1,671 non-specialized operators, 813 qualified or intermediate technicians, 247 administrative staff and 67 people with other professional categories.

Since 2007 there has been an agreement in Spain between unions and employers to regulate minimum labour relations in marine aquaculture. On December 2, 2021, the VI National Collective Agreement for Marine Aquaculture that applies for the period 2021-2022 was published in the BOE.

Employment in aquaculture is still mostly taken up by men, and there are also notable differences in the distribution of jobs between genders. In 2021, the total number of employed women was 3,013 (20.3%) compared to 8,351 men (79.7%). In terms of professional categories, the largest number of women hold non-salaried (self-employed) positions with a total of 2,093 persons, followed by senior and mid-level technicians (348 persons), skilled operators (239 persons) and non-specialised operative personnel (199 women). Men occupy a higher percentage of the categories of non-salaried (self-employed) with 64.2% (3,756 people), and above 90% in specialized operating personnel (2,478 men) and non-specialized operating personnel (1,472 men).

The evolution of employment in aquaculture in Spain in the last 10 years shows a decreasing trend, of -1.1% year-on-year average in AWU and -7.64% in number of people.

The estimated indirect employment associated with the 11,364 people working in aquaculture was 28,409 jobs.

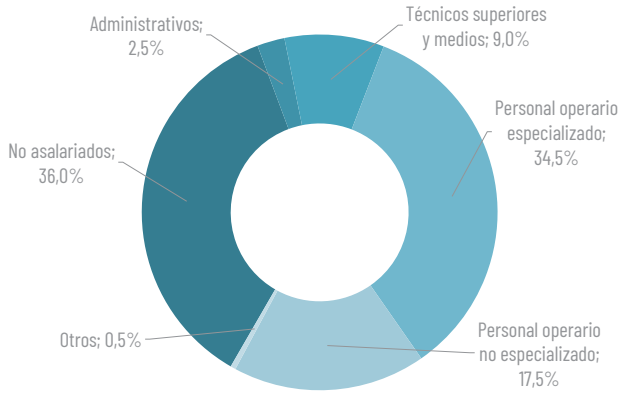


Figure 5-7. Distribution of employment in aquaculture in Spain, by professional category, in 2021 calculated on Annual Work Units (MAPA).

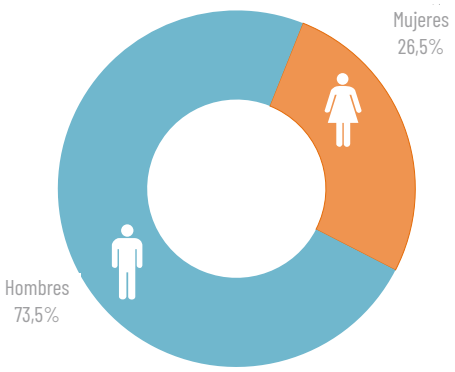


Figure 5-8. Distribution of employment by sex calculated on the number of people in aquaculture in Spain in 2021 (MAPA).

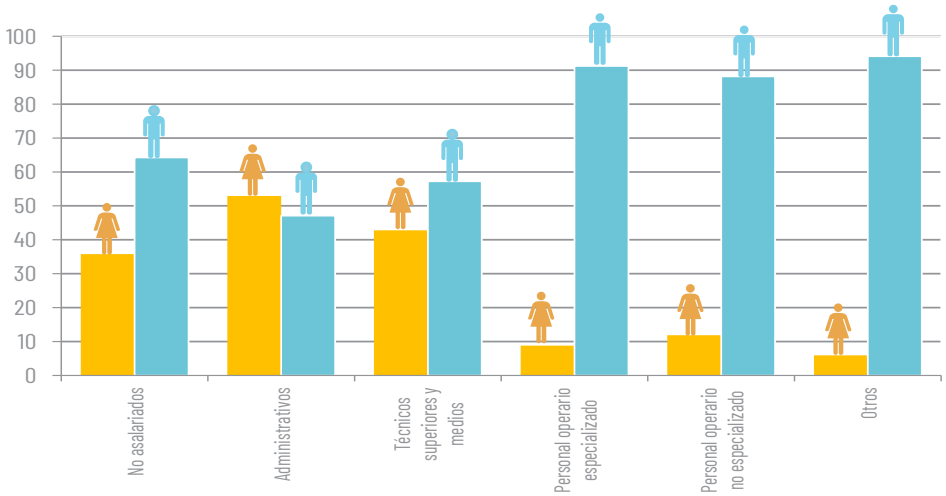


Figure 5-9. Employment occupation by sex calculated on the number of people in aquaculture in Spain in 2021 (MAPA).

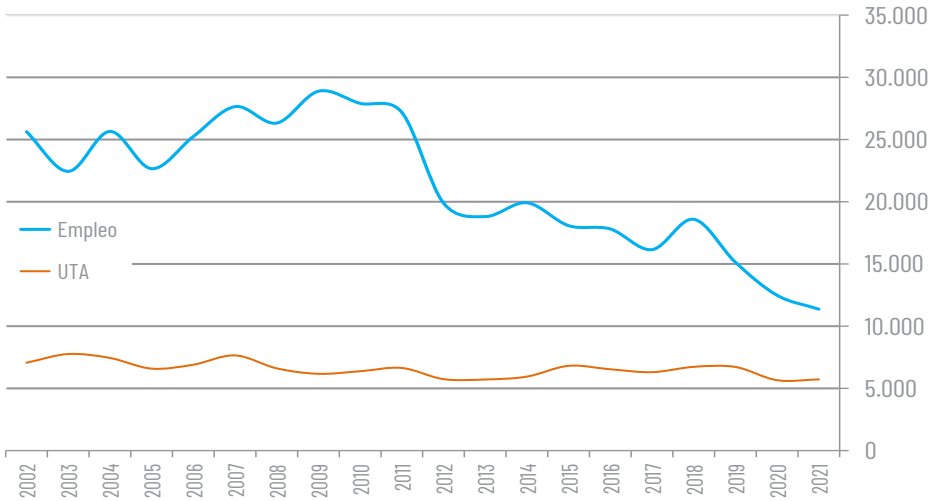


Figure 5-10. Evolution of employment in aquaculture in Spain during the period 2002-2021, showing the figures of people and Annual Work Units (MAPA).

If the types of aquaculture are analyzed by type of aquaculture, it can be seen that most of the employment is in marine aquaculture, with a total of 4,935 AWU. Of these, 2,586 belong to vertical farming facilities and employ 5,637 people, in nurseries 946 AWU and 1,332 people, on land 853 AWU and 1,015 people, in horizontal cultivation 301 AWU and 3,076 people and in natural enclaves 249 AWU and 546 people. In inland aquaculture, it is divided into land with 710 AWU and 832 people and natural enclaves with 11 AWU and 39 people. In the classification by number of people and types of aquaculture, it is observed that it is higher in marine aquaculture and that it is divided into: 5,637 in vertical culture and 3,076 in horizontal, 1,332 in nurseries in the sea, 1,015 on land and 546 in natural enclaves. As for inland aquaculture, there are 832 people on land and 39 natural enclaves, according to MAPA data.

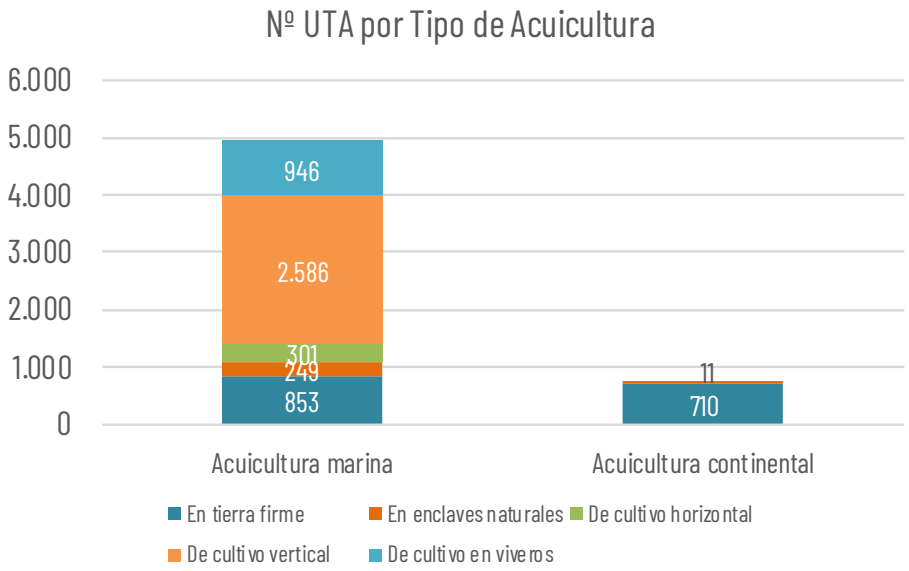


Figure 5-11. Number of AWUs per type of aquaculture. Own elaboration source data MAPA.

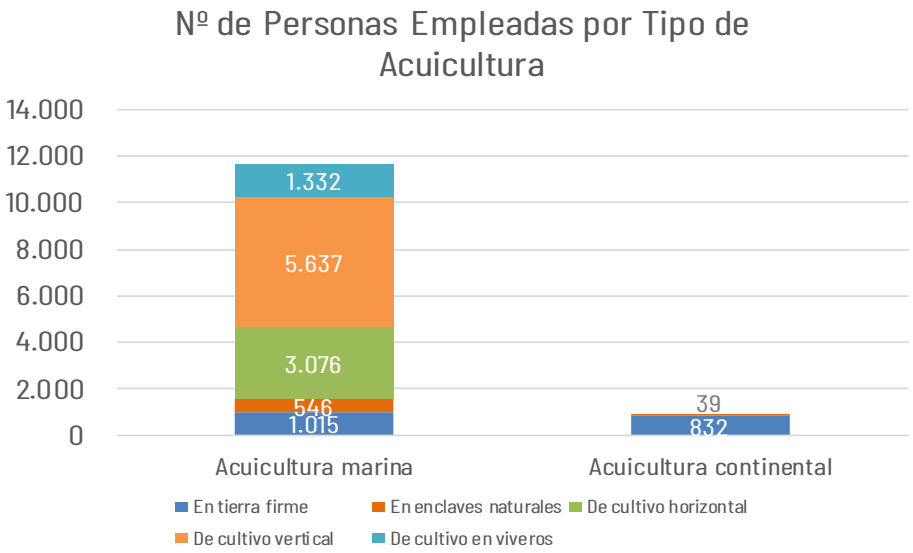


Figure 5-12 Number of AWUs per type of aquaculture. Own elaboration source data MAPA.

5.5. Consumption of aquaculture feed in Spain

The feeding of aquaculture animals, in particular fish, is a key element of their viability. The optimization of the use of raw materials, knowledge about nutrients, their digestibility and the correct handling of feed are essential for the responsible development of this activity. In 2022, 114,177 t were used in Spain, -18.2% less than in 2021 with 139,526 t. 84.5%, 96,494 t of it was administered to marine fish: sea bass, meagre, turbot, sea bream, eel and sole, mainly. And 15.5%, 17,683 t remaining to continental species such as trout and sturgeon. The amount of aquaculture feed used in Spain barely amounts to 1% of the total livestock feed consumed in this country.

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

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

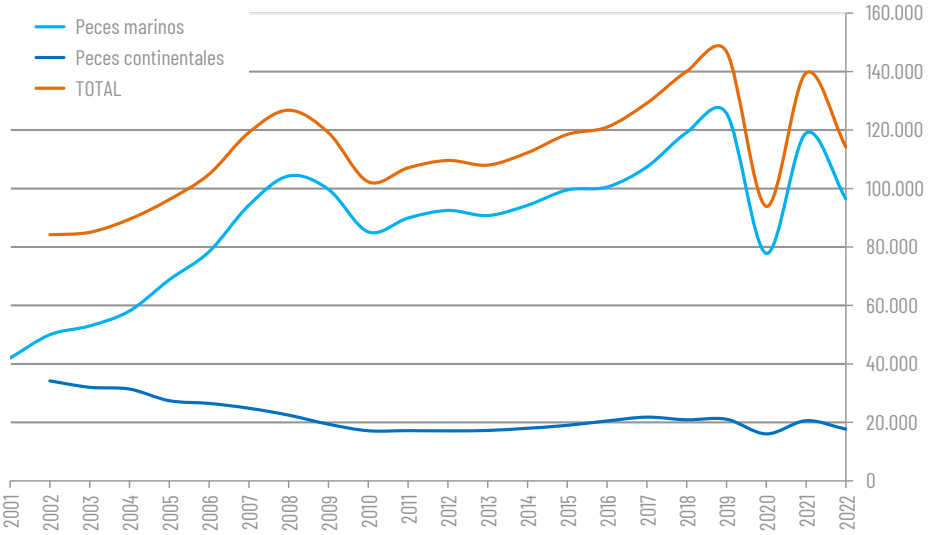


Figure 5-13. Evolution of feed consumption (tonnes) for aquaculture in Spain broken down between marine and inland fish during the period 2001-2022 (sources Skretting and Biomar).

5.6. Marine aquaculture in Spain and Europe

The species produced by aquaculture in Spanish marine waters, and covered in greater detail in this report, are sea bream, sea bass, turbot, meagre, sole, bluefin tuna, mussels, clams, oysters and abalone. Other species of interest such as eel, sea bream, greater amberjack, shrimp, microalgae and macroalgae are also analyzed, but with less detail.

Marine fish culture

Marine fish farming in Spain in 2022 was 58,672 t, 11.8% more than in 2021 (52,457 t). The value of this production is estimated at 527.8 million euros, 36.3% more than in 2021. This increase in prime value is mainly marked by bluefin tuna, since its production doubled compared to the previous year (it went from 4,500 t in 2021 to 8,277 t in 2022).

It is expected that in 2023 production will increase by around 10% and will occur mostly in the Valencian Community, Andalusia and Galicia.

When analyzing the production of fish (sea bream, sea bass, turbot, meagre, sole, eel, greater amberjack and shrimp) by communities, it is observed that the Region of Murcia tops the list with a total of 18,953 t. Its production increased in 2022 by 30% compared to 2021 (14,594 t). This increase has occurred mainly in the production of meagre and bluefin tuna, however, the production of sea bream decreased.

The next community in production was the Valencian Community, with 13,975 t, 10% more than in 2021 (12,693 t). This increase took place in the production of sea bass.

In third place was Galicia, with a total of 9,627 t, 16% more than in 2021 (8,273 t). This increase occurred mainly in turbot production.

Marine fish farming in Spain in 2022 was 58,672 t, 11.8% more than in 2021 (52,457 t). The value of this production is estimated at 527.8 million euros, 36.3% more than in 2021.

Andalusia was the fourth community in terms of production with a total of 7,221 t in 2022, although it experienced a decrease of -16% (8,614 t in 2021). Mainly the cultivation of sea bass decreased.

The Canary Islands occupied the fifth position with 5,738 t, remaining stable compared to 2021 (+1%, 5,676 t). And Catalonia with 3,150 t ranked sixth and increased its production by 21% (2,599 t in 2021).

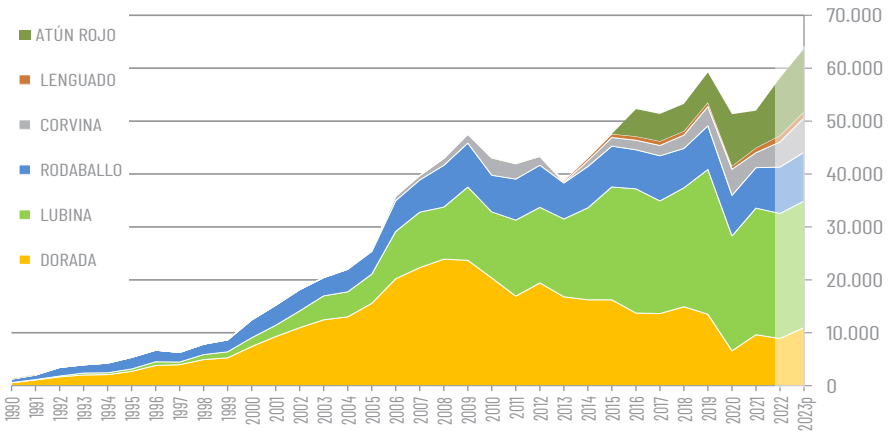
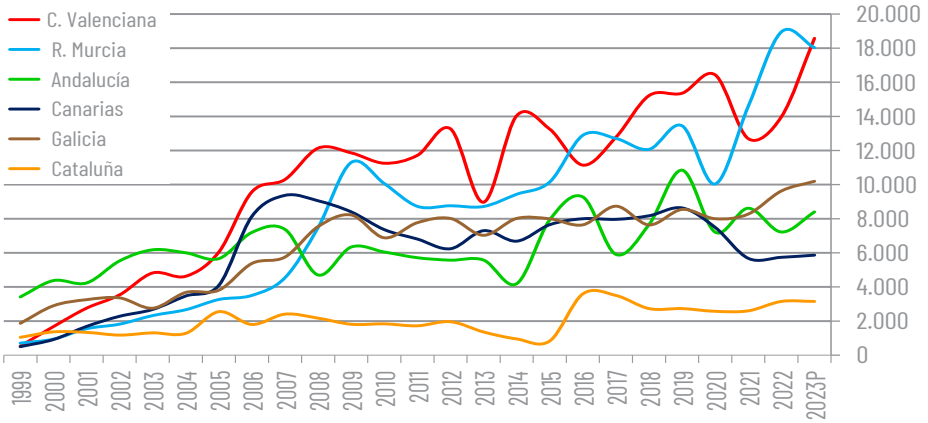


Figure 5-14. Evolution of the production (tonnes) of marine aquaculture fish in Spain in the period 1990-2023p.

Figure 5-15. Evolution of the production (tonnes) of marine aquaculture fish in the different Autonomous Communities of Spain in the period 1999-2023p.



SEA BREAM PRODUCTION

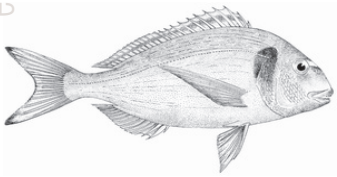
The total aquaculture production of sea bream *(Sparus aurata)* in Europe and the rest of the Mediterranean in 2022 is estimated at 320,630 t, 1.8% more than in 2021 (314,964 t) according to statistics from APROMAR, FEAP and FAO. A slight decrease is estimated in 2023, with a production of around 315,500 t.

The total value in first sale of Mediterranean aquaculture sea bream production in 2022 is calculated at € 1,574.8 having an estimated price value in first sale per kilogram of € 5.

There is aquaculture seabream production in more than 20 countries, with the main producers being Turkey with 133,500

especies

DORADA



Sparus aurata

SEA BREAM *(Sparus aurata)*

Class: Osteíctios Order: Perciformes • Family: Sparidae

Significant characters: High oval body and flattened laterally. Large head with arched profile. Silver-gray coloration with a dark spot at the beginning of the lateral line and a small scarlet band on the upper edge of the operculum. It 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 hermaphrodite proprotein animal, first matures as a male and from the second or third year becomes female. It can live more than 10 years.

Production: Its breeding is carried out in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under tightly controlled conditions. Each female lays 2 million eggs of 1 mm in diameter per kilo of weight. During their first month of life in culture, the larvae feed on living organisms: rotifers and artemia. Then they start a diet with feed made from natural raw materials. Breeding facilities are varied: floating nurseries at sea, concrete tanks or ponds on land. Each sea bream takes between 18 and 24 months to reach 400g from hatching from the egg. The commercial size ranges from 250 g to more than 2,000 g.

tonnes (representing 41.6% of total production), Greece with 67,000 tonnes (22.7%), Egypt with 36,000 tonnes (11.2%), Tunisia with 16,000 tonnes (5.0%) and Spain with 8,932 tonnes (2.8%). Its cultivation is also carried out in Italy, Cyprus, Croatia and there are minor productions in: Malta, Israel, France, Portugal, Albania, Algeria, United Arab Emirates and Bosnia, among others.

When analyzing the total production of juvenile sea bream in 2022 in Europe (including Turkey) it is estimated that it was 732.9 billion units, 2.6% more than in 2021 (714.4 million units).

The main producer country was Turkey (240 million) followed by Greece (218 million), then Italy (130 million), France (59.7 million) and Spain (30.2 million juveniles). In any case, the difficulty of contrasting these figures should be noted again, especially in Greece and Turkey. It is estimated that the production of juvenile sea bream will increase by 0.5% in 2023, to 733 million units.

The unloading in fishing ports in the countries of the Mediterranean Sea and the Atlantic Ocean of sea bream from extractive fishing totaled 13,997 t in 2021, 47.3% more than in 2020 (9,500 t). This amount remained relatively constant with an average of 8,000 tonnes per year over the last 10 years, while breeding sea bream accounted for 95.8% of the total supply of this species.

The aquaculture sea bream production in Spain in 2022 was 8,932 t, -7.3% less than the previous year with 9,632 t. By 2023 it is estimated to increase to reach 11,000 t. The maximum annual Spanish production of aquaculture sea bream took place in 2008, with 23,930 t.

Aquaculture sea bream accounted for 95.8% of the total supply in the world compared to 4.2% of extractive fishing. In Spain, aquaculture sea bream accounted for 92.8% of the supply, according to FAO data.

In 2022, the Valencian Community led the production of aquaculture sea bream with 5,620 t (63% of the total), followed by the Region of Murcia with 1,327, (15% of the total), Andalusia (815 t, 9%), the Canary Islands (790 t, 9% of the total) and Catalonia with 380 t (4% of the total). In the Region of Murcia and in Andalusia was where productions decreased.

As for the first-sale value of sea bream production in Spain in 2022, an average price per kilogram of €4.89 is estimated and therefore, total production was €43.7 million, 8.6% more than in 2021 (€40.2 million).

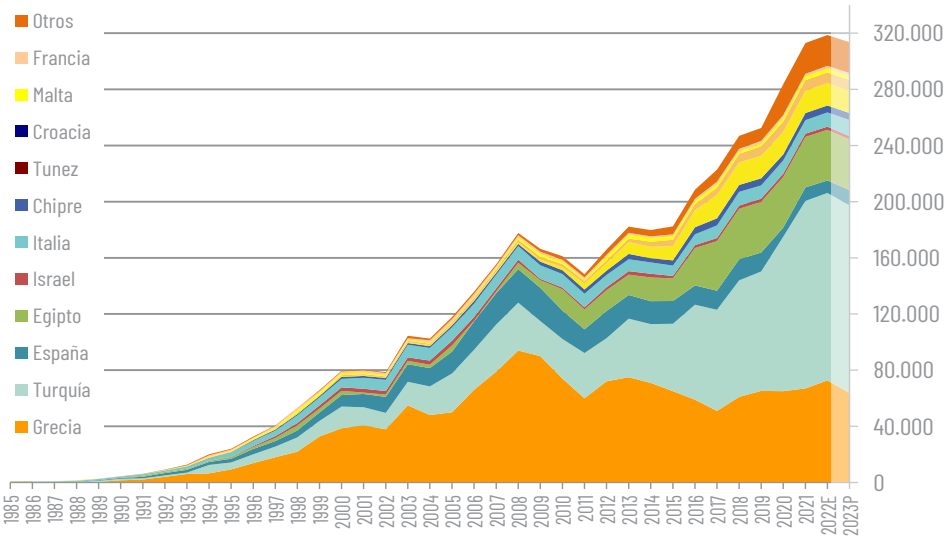


Figure 5-16. Evolution of production (tons) of aquaculture sea bream in the Mediterranean area and the rest of the world in the period 1985-2023p (Based on FAO, FEAP and APROMAR data).

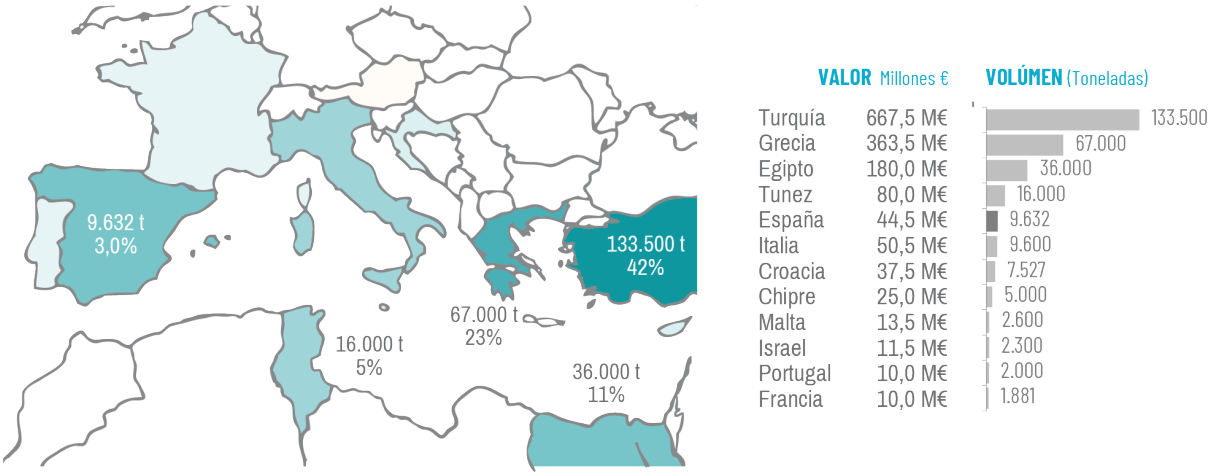


Figure 5-17. Distribution of aquaculture sea bream production in the Mediterranean area in 2022 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data.

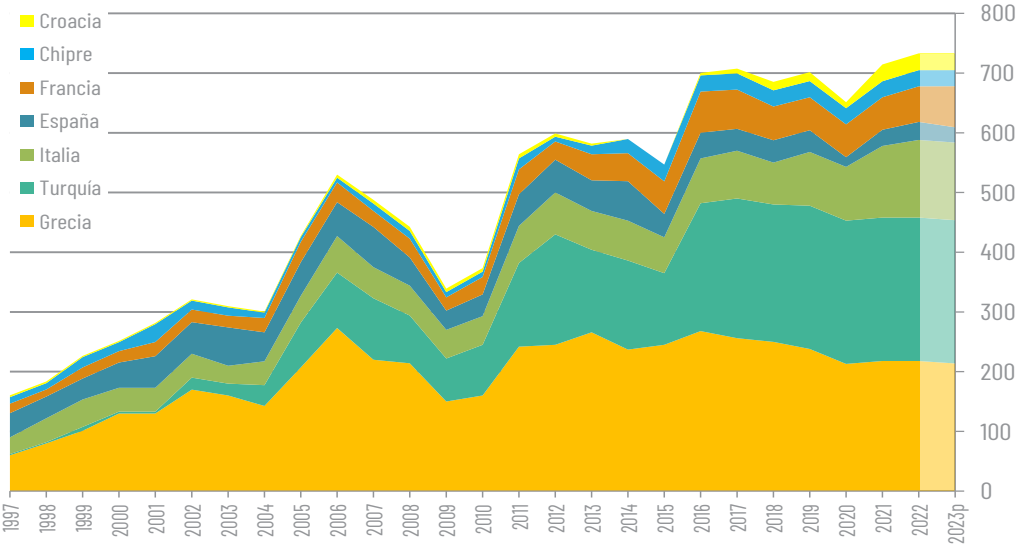


Figure 5-18. Evolution of the total production of juvenile sea bream (million units) in the Mediterranean area in the period 1997-2023p (on FEAP and APROMAR).

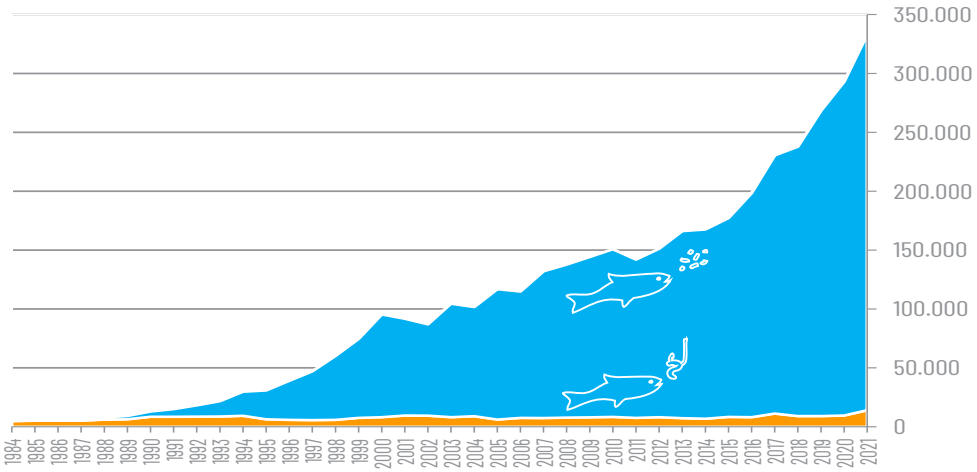


Figure 5-19. Evolution of world production (tonnes) of sea bream *(Sparus aurata)*, through aquaculture and fisheries, in the period 1984-2021 (FAO).

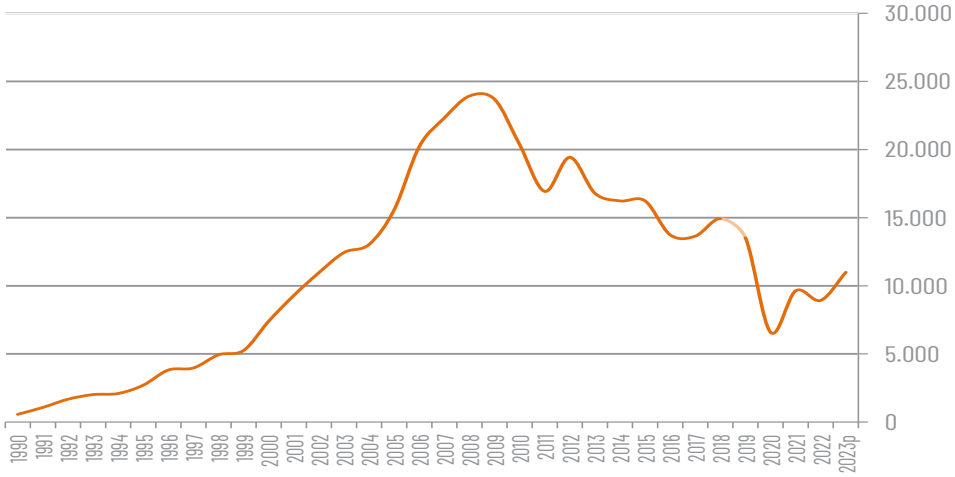


Figure 5-20. Evolution of aquaculture production of sea bream *(Sparus aurata)* in Spain in tonnes (1990-2023p).

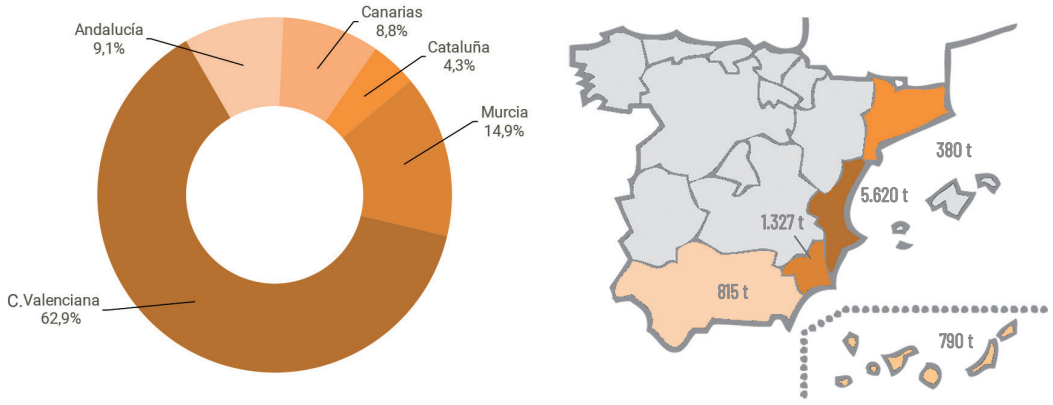


Figure 5-21. Percentage distribution of production (tons) of sea bream in Spain by Autonomous Communities in 2022.

According to FAO, fishing contributed 607 t to production in 2021, which is -51.3% less than in 2020 and occupies only 7.2% of the total. The volume of catches has varied between 800 and 1,200 tonnes in the last 10 years, while farmed sea bream accounted for 82.8% of the total in 2022.

The production of juvenile sea bream in Spain in 2022 was 30.2 million units, 11.8% more than in 2021 (27 million units). It is estimated that production in 2023 will decrease by around -15% and reach 25.5 million units.

The production of juvenile sea bream in 2022 was led by the Valencian Community with about 13.4 M (44% of the total), followed by Andalusia with about 11 M (36% of the total) and the Balearic Islands with about 6 M (20%).

The average purchase price of juvenile sea bream in Spain, at a weight equivalent to 2 g per unit, is estimated at 0.44 euros/unit in 2022.

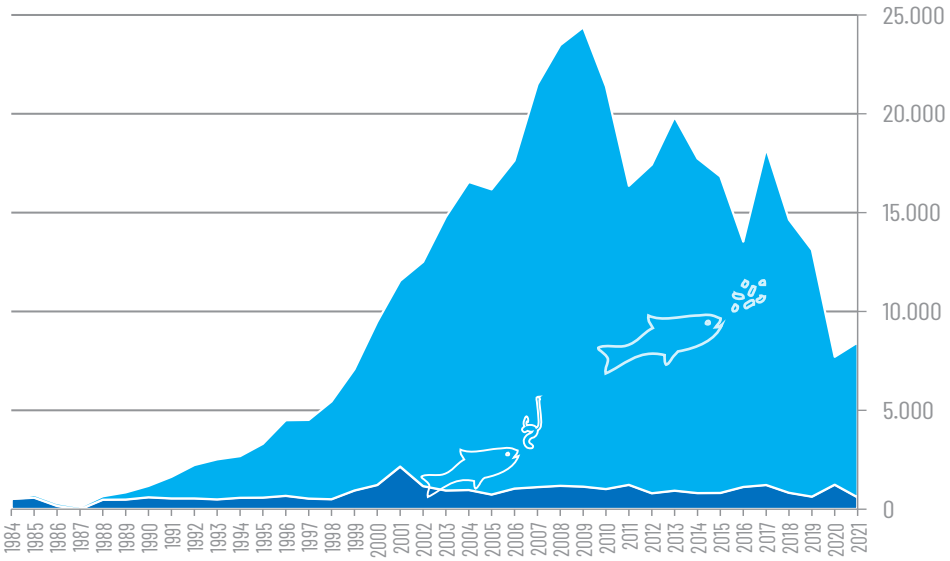


Figure 5-22. Evolution of the sources of obtaining sea bream (Sparus aurata) in Spain in tonnes: aquaculture and fisheries, in the period 1984-2021 (MAPA-FAO).

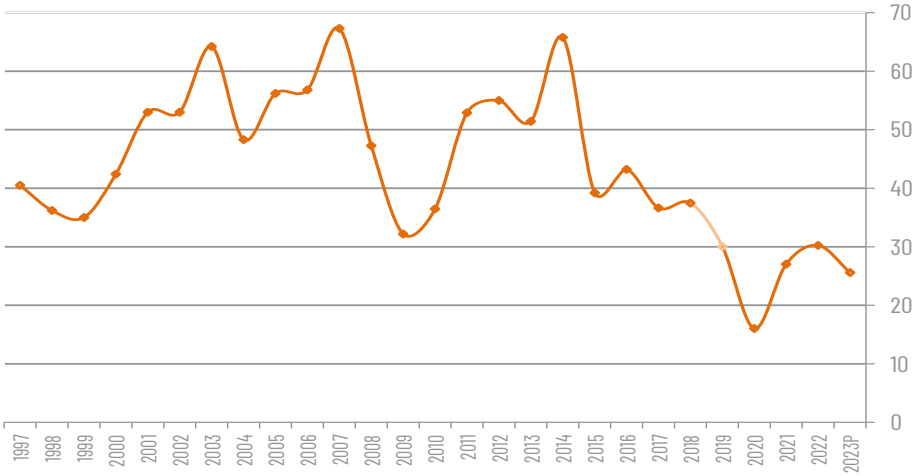


Figure 5-23. Evolution of the production of juvenile sea bream in Spain in millions of units (1997-2023p).

SEA BRASS PRODUCTION

The total aquaculture production of sea bass (*Dicentrarchus labrax*) in Europe and the rest of the Mediterranean arc in 2022 was 301,420 t, 1.2% more than in 2021 (297,742 t), according to consolidated statistics from FAO, FEAP and APROMAR. By 2023 it is estimated to remain stable or slightly higher (0.5% more).

The total first-sale value of aquaculture sea bass in 2022 was approximately €1,488.7 million.

The main bass producing countries are Turkey, with 156,000 tonnes (representing 51.8% of the total), Greece with 54,000 tonnes (17.9%), Egypt with 35,000 tonnes (11.6%) and Spain with 23,600 tonnes (7.8%). Sea bass is also produced in Italy, Egypt, Croatia, France, Tunisia, Portugal, Cyprus, Israel, United Kingdom, Bosnia, Algeria, Montenegro, Malta, Slovenia and Morocco.

Production of juvenile sea bass in 2022 in Europe (including Turkey) was 576.2 million units, -2.8% less than in 2021 (58.3 M). The main producing country was Turkey with 230 million units, followed by Greece with 164 million and Spain with 60 million. France produced about 53.2 million units and Italy 50 million. By 2023, a somewhat lower production is estimated, around 567 million juvenile sea bass.

In 2021, 5,570 t of sea bass were obtained from extractive fishing worldwide. When compared with the amount of sea bass obtained through aquaculture in that same year, 299,810 t, it is aquaculture that provides 98.2% of the total sea bass found in the markets worldwide.

The aquaculture sea bass production in Spain in 2022 was 23,622 t, -1.3% less than in 2021 (23,928 t). The Region of Murcia has led the production in 2022 with 7,244 t (31% of the total), followed by Andalusia with 6,020 t (25% of the total), Valencian Community (5,240 t, 22% of the total), Canary Islands (4,948 t, 21%) and Catalonia with 170 t (1% of the total). By 2023, growth of 1.2% is expected with a sea bass production in Spain of 23,910 t.

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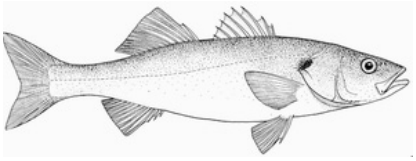


Dicentrarchus labrax

SEA BASS *(Dicentrarchus labrax)*

Class: Osteíctios Order: Perciformes • Family: Moronidae

Significant characters: Body fusiform and vigorous with large scales. Pointed head with small nasal openings, small eyes and large mouth. The lower jaw is somewhat prominent. Leaden grey coloration, darker on the dorsal and silvery sides. On the operculum has a black spot. Caudal fin slightly forked. 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.

Production: Sea bass is a fish whose rearing is carried out in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under tightly controlled conditions. Each female lays 250,000 eggs of 1 mm in diameter per kilo of weight. During their first month of life in culture, the larvae feed on living organisms: rotifers and artemia. Then they start a diet based on feed made from natural raw materials. Breeding facilities are varied: floating nurseries at sea, concrete tanks or ponds on land. Each sea bass takes between 20 and 24 months to reach 400g since it hatches from the egg. The commercial size ranges from 250 g to more than 2,500 g.

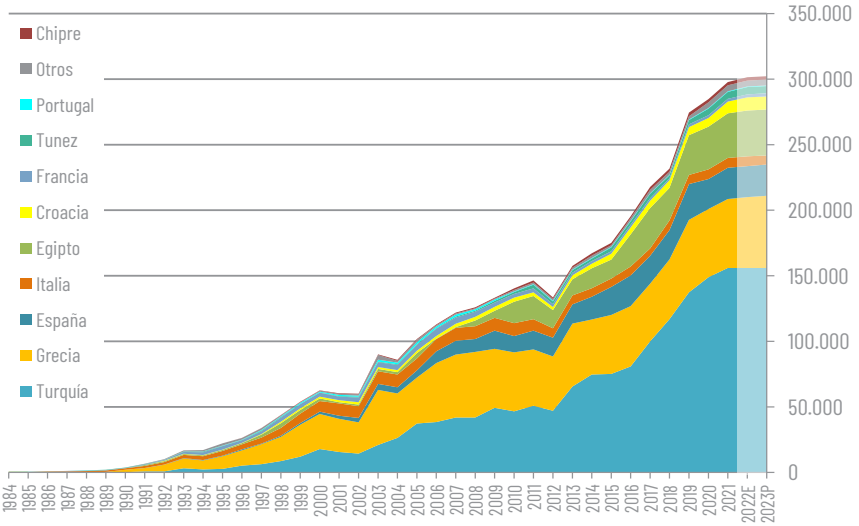
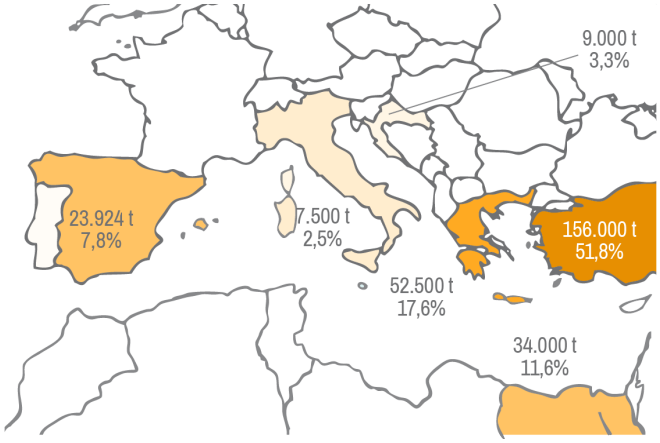


Figure 5-24. Evolution of total production (tonnes) of aquaculture sea bass in the Mediterranean area and the rest of the world in the period 1984-2023p (Based on FAO, FEAP and APROMAR data).



	VALOR Millones €	VOLÚMEN (Toneladas)
Turquía	858,0 M€	156.000
Grecia	288,8 M€	52.500
Egipto	187,0 M€	34.000
España	131,6 M€	23.924
Croacia	49,5 M€	9.000
Italia	41,3 M€	7.500
Tunez	28,6 M€	5.200
Chipre	13,8 M€	2.500
Francia	11,7 M€	2.128
Portugal	2,8 M€	500
Marruecos	1,2 M€	210
Malta	0,8 M€	150

Figure 5-25. Distribution of seabass aquaculture production in the Mediterranean area in 2022 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data.

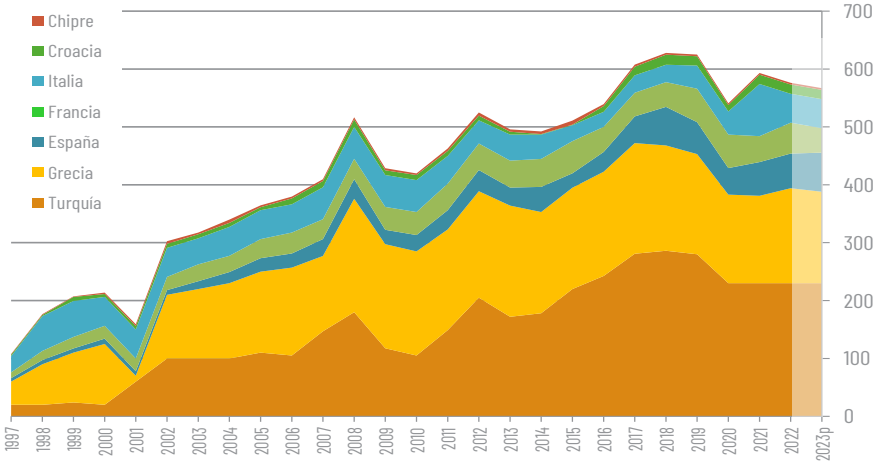


Figure 5-26. Evolution of the total production of juvenile sea bass in the Mediterranean area in the period 1997-2023p, in millions of units (on FEAP and APROMAR).

In 2022, an average first-sale price of sea bass of €5.56/Kg was estimated in 2022, 19.3% more than in 2021 (€4.66/Kg) and a total value of Spanish production of €131.34 M.

In 2022, 545 t of sea bass arrived at Spanish ports. This represented a decrease of -53.7% compared to 2021 (1,178 t). As can be seen when comparing fishing and aquaculture species, it is aquaculture that provides 97.7% of the products that reach Spanish markets.

The production of juvenile sea bass in Spain in 2022 was 60 million units, 2.9% more than the previous year (58.3 M). The production of juvenile sea bass in Spain was carried out in the Balearic Islands (56%), Valencian Community (15%) and Andalusia (29%). By 2023 it is estimated that the production of juvenile sea bass in Spain will increase to 67.6 million units.

The average purchase price of juvenile sea bass in Spain, at a weight equivalent to 2 g per unit, is estimated at 0.32 euros/unit.

The Spanish production of commercial size sea bass requires the importation of juveniles in addition to those of national production. The origin of these fish is, in order of importance, France, Italy and Greece. Although juveniles are also exported from Spain to other countries.

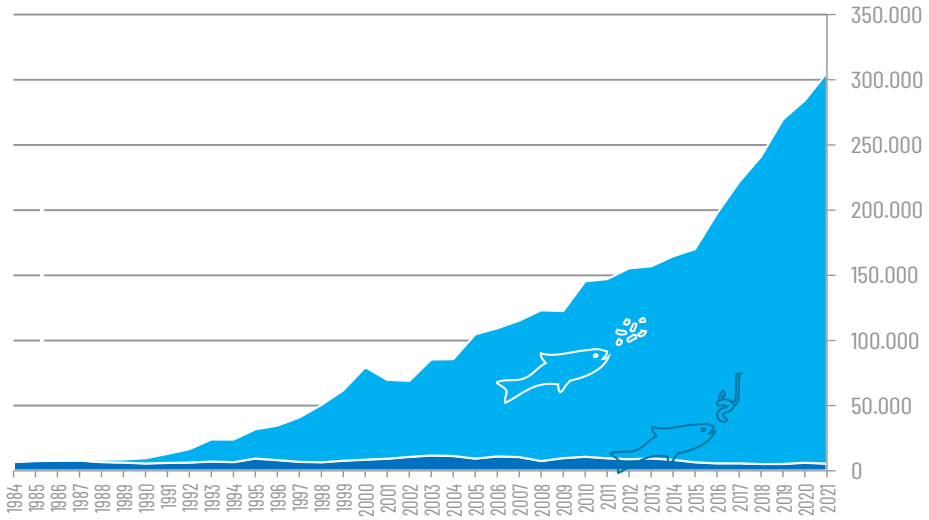


Figure 5-27. Evolution of total world production (tonnes) of sea bass (Dicentrarchus labrax), through aquaculture and fisheries, in the period 1984-2021 (FAO).

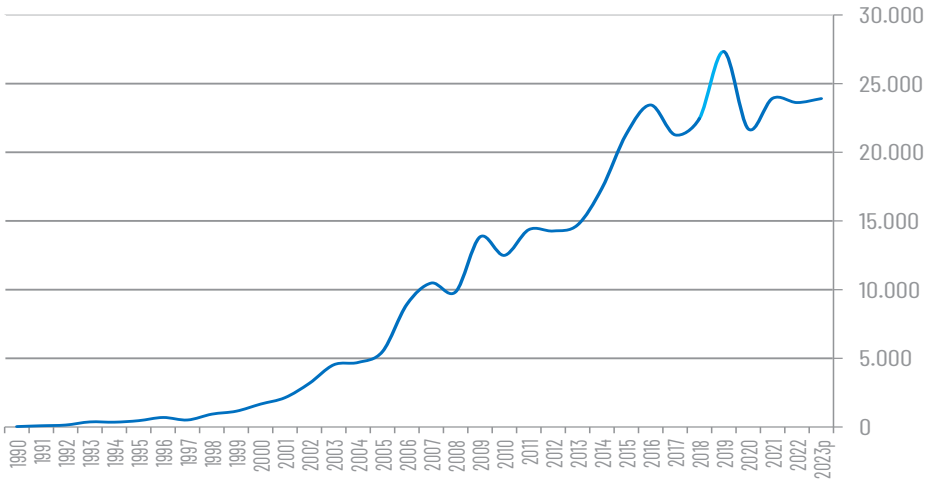


Figure 5-28. Evolution of aquaculture production of sea bass (Dicentrarchus labrax) in Spain in tonnes (1990-2023p).

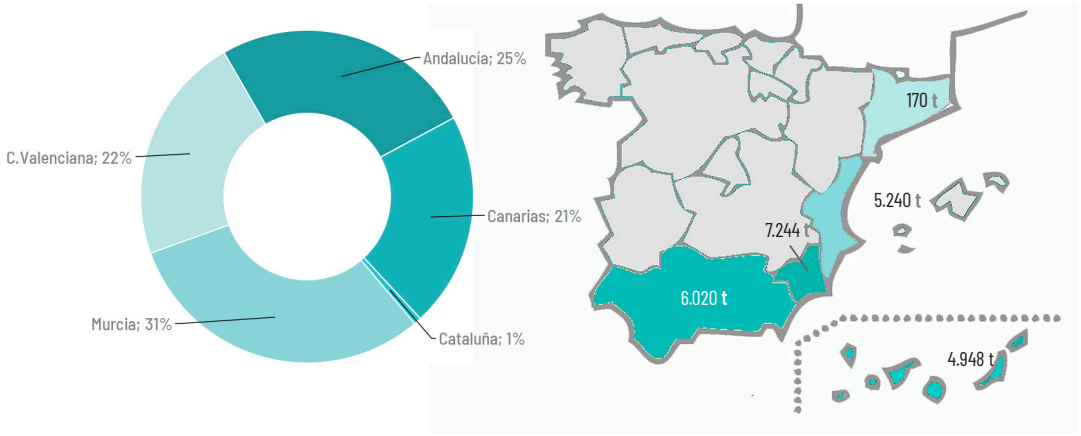


Figure 5-29. Percentage distribution of sea bass production (tonnes) in Spain by Autonomous Communities in 2022.

Figure 5-30. Evolution of the sources of obtaining sea bass (Dicentrarchus labrax) in Spain: aquaculture and fishing in tons, in the period 1984-2021 (MAPA-FAO).

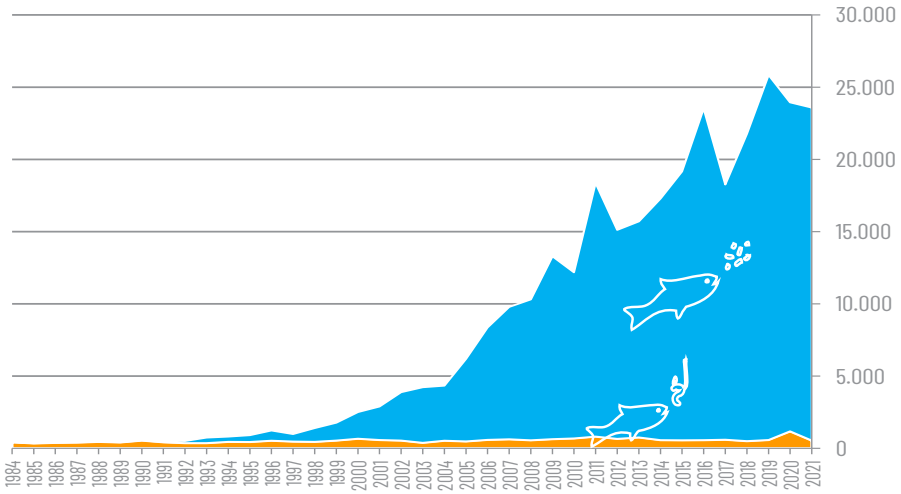
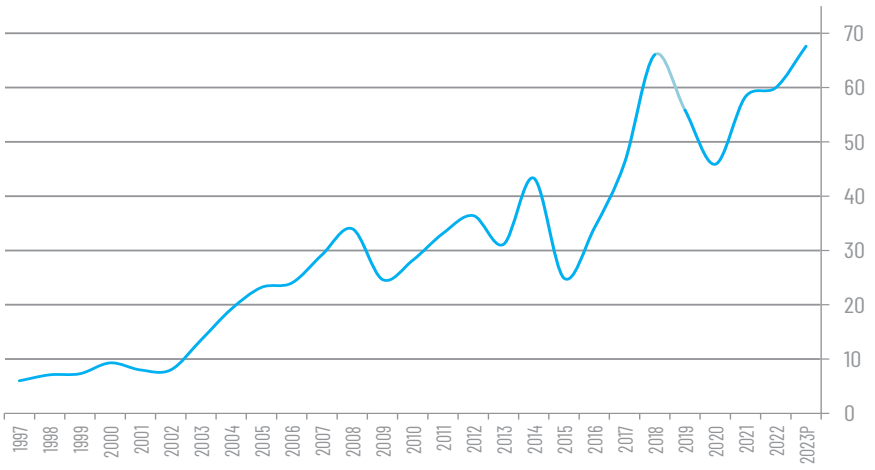


Figure 5-31. Evolution of juvenile sea bass production in Spain in millions of units (1997-2023p).



Joint figures for the production of SEA BREAM and SEA BRASS

Given the very similar environmental and biological requirements of sea bream and sea bass, their production methods are very similar. Therefore, on numerous occasions they are grown on the same farms and both are replaceable from each other. Even at the market level, the situation of sea bream affects that of sea bass, and vice versa. Therefore, it is interesting to show the joint analysis of the production of both species.

The total aquaculture production of sea bream plus sea bass in Europe and the rest of the world in 2022 is estimated at 621.5 thousand tonnes, 1.5% more than in 2021 with 612.2 tonnes, according to consolidated statistics from FEAP, APROMAR and FAO. For 2023, a similar or slightly lower production is expected with around 618 thousand t.

The combined production of juvenile sea bream plus sea bass in the Mediterranean area in 2022 (excluding Egypt and Tunisia) was 1.3 million units, an increase of 0.1% over the previous year. The main producing countries in order of importance are Turkey (470 million), Greece (382 million), Italy (180 million), France (112.9 million) and Spain (90.2 million). In 2023, production is expected to be slightly lower with about 1.29 million juveniles.

The total aquaculture production of sea bream plus sea bass in Spain in 2022 was 32,554 t, -3.0% less than the previous year (33,560 t). The highest production took place in the Valencian Community (10,860 t, 33.4% of the total), Region of Murcia (8,571 t, 26.3% of the total), Andalusia (6,835 t, 21%) and the Canary Islands (5,738 t, 17%).

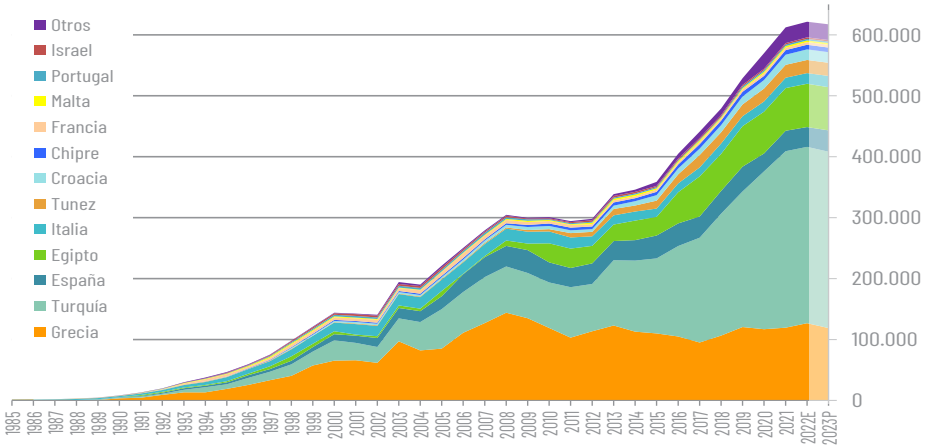


Figure 5-32. Evolution of the joint production of sea bream and aquaculture sea bass (tonnes) in the Mediterranean area and the rest of the world in the period 1985-2023p (Based on FAO, FEAP and APROMAR data).

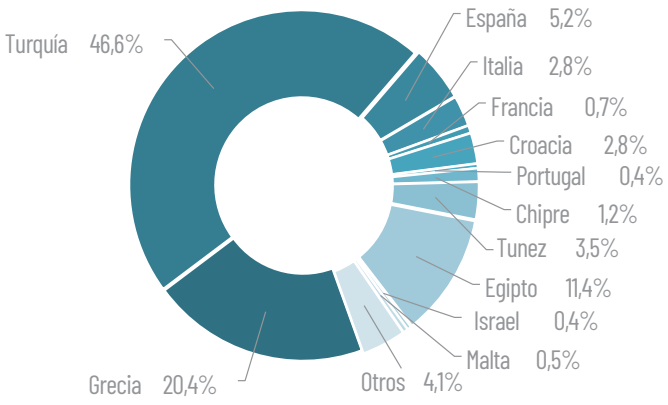


Figure 5-33. Distribution of aquaculture production of sea bream plus sea bass in the Mediterranean area in 2022 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data

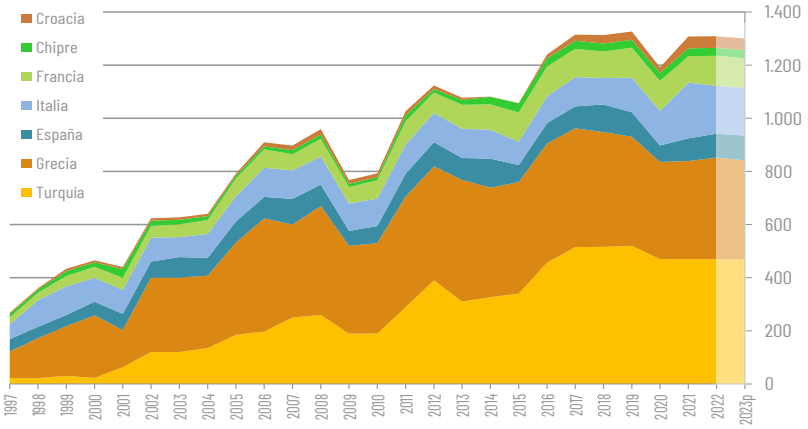


Figure 5-34. Evolution of the joint production of juvenile sea bream and sea bass in the Mediterranean area in the period 1997-2023p, in millions of units (on FEAP and APROMAR).

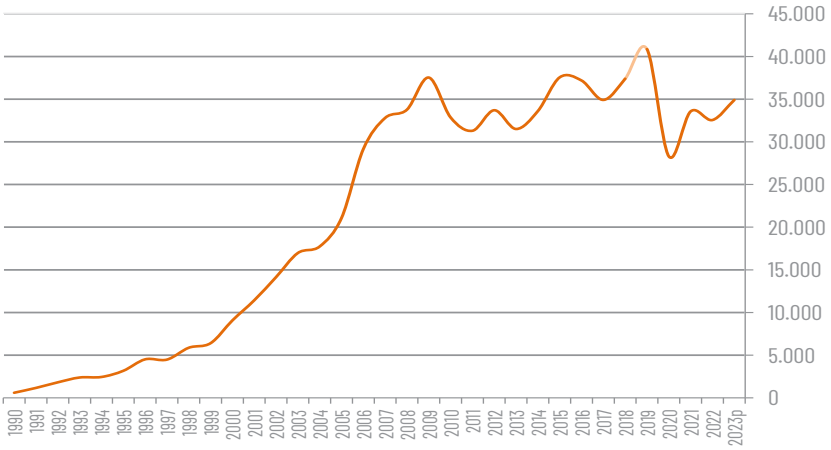


Figure 5-35. Evolution of aquaculture production of sea bream plus sea bass in Spain in tonnes (1990-2023p).

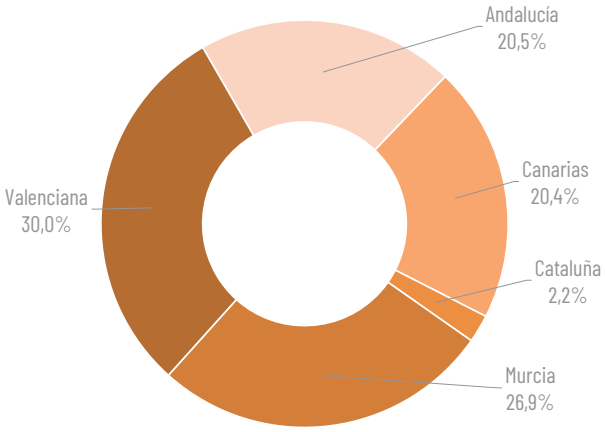


Figure 5-36. Percentage distribution of productions (tons) of sea bream plus sea bass in Spain by Autonomous Communities in 2022.

TURBOT PRODUCTION

The total production of turbot *(Scophthalmus maximus = Psetta maxima)* from aquaculture in the world in 2022 was 78,566 t, 1.5% more than the previous year.

In China there is a very relevant production of aquaculture turbot of about 66,000 tons in 2022, although both the figures and the exact species are imprecise. In Europe, the main producing country is Spain, which production 8,766 t (11.2% of the total), 1.5% more than in 2021. Portugal, with 3,600 t is the third producer (4.6% of the total), followed by the Netherlands and France with 100 t (0.1% of the total each). By 2023 it is expected to remain similar at about 79,000 tonnes.

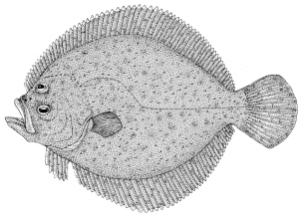
In the case of turbot, if we compare fish catches and aquaculture production, the latest data are from FAO in 2021 and indicate that 91.7% is aquaculture (69,668 t in 2021) and the rest comes from extractive fishing (6,322 t).

The turbot production in 2022 in Spain according to APROMAR data in 2022 has been 8,766 t, 14.9% more than the previous year (7,629 t). It is expected to increase in 2023 to 9,200 tonnes. Galicia was the only autonomous community producing turbot in Spain.

As for the average value in first sale, a price of € 11.6 / Kg is estimated in 2022 with a total of € 101.8 million.

As in the case of sea bream and sea bass, the amount of wild turbot caught by the Spanish fleet is increasingly scarce and testimonial for the markets (67 t in 2021). The production of turbot from aquaculture accounts for more than 99% of the production of this species in Spain. Although imports to Spain of turbot from fisheries from Europe, mainly from the Netherlands, are relevant.

The production of juvenile turbot in Spain in 2022 was 13.4 million units. In Galicia was where all the juveniles of this species were produced. The average purchase price of juvenile turbot in Spain is estimated at 0.12 euros / unit.



Psetta maxima

RODABALLO

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TURBOT *(Psetta maxima)*

Class: Osteíctios Order: Pleuronectiformes • Family: Scophthalmidae

Significant characters: **The body of adult specimens does not present bilateral symmetry, being rounded and flattened. Bulging eyes, located on the left side. Large mouth with prominent jaw. Brownish brownish upper color more or less dark, which varies according to 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.**

Production: **In aquaculture, reproduction takes place in hatcheries under very controlled conditions. The clutches are about 500,000 to 1,000,000 eggs per kilo of weight of the female. After an incubation period of 5 to 7 days, the larvae hatch. During their first month of life in culture they feed on living organisms: rotifers and artemia. Then they start a diet based on feed made with natural ingredients. Rearing facilities are usually circular concrete tanks in facilities on the coast.**

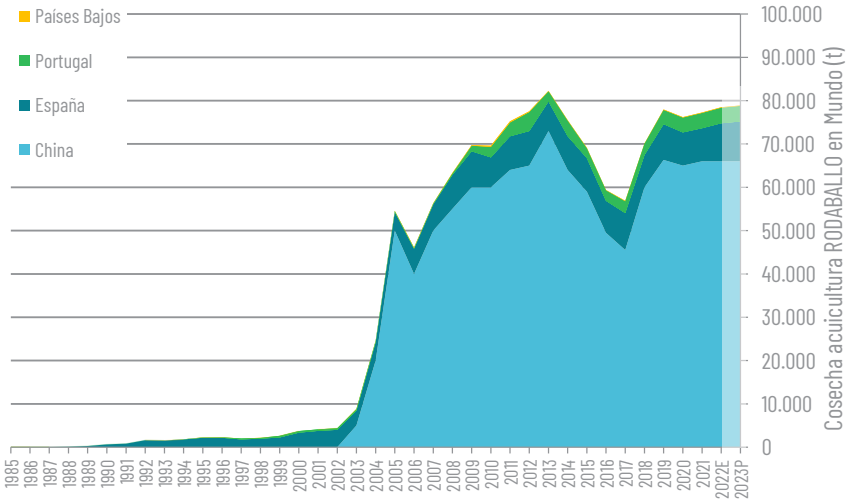


Figure 5-37. Evolution of the aquaculture turbot production (production) in the world (tonnes) for the period 1985-2023p (Based on FAO, FEAP and APROMAR data).

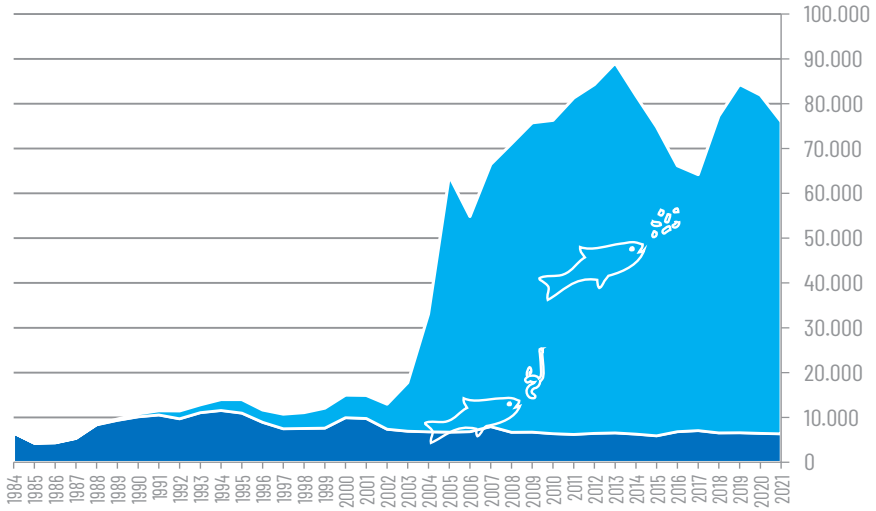


Figure 5-38. Evolution of world production (tonnes) of turbot (Psetta maxima), through aquaculture and fisheries, in the period 1985-2021 (FAO).

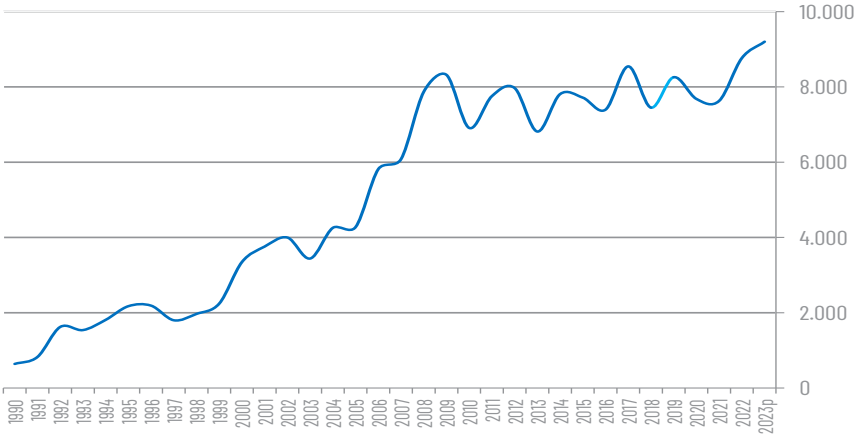


Figure 5-39. Evolution of the aquaculture production (production) of turbot (Psetta maxima) in Spain in tonnes (2006-2023p).

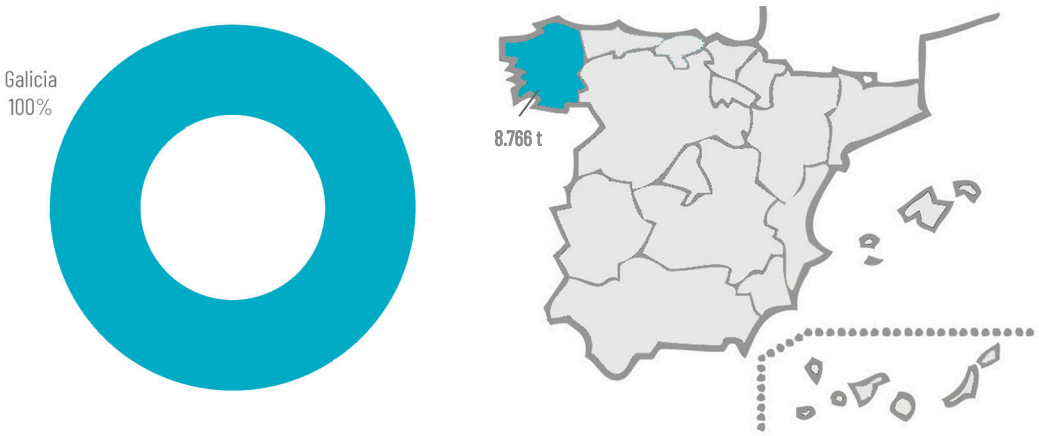


Figure 5-41. Map of distribution of turbot production in Spain.

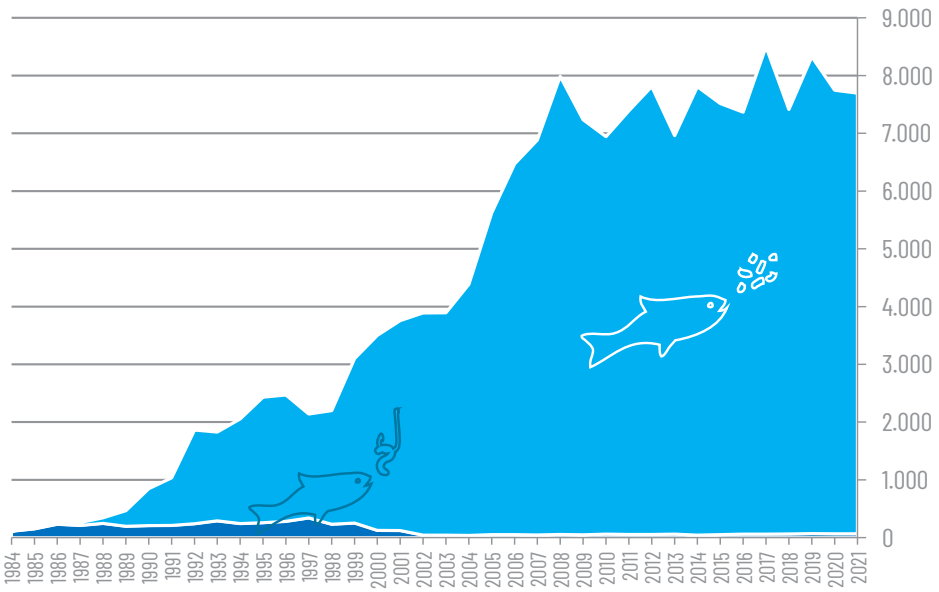


Figure 5-41. Evolution of the sources of turbot (Psetta maximum) in Spain: aquaculture and fisheries, for the period 1984-2021, in tonnes (MAPA-FAO).

MEAGRE PRODUCTION

The production of aquaculture meagre (*Argyrosomus regius*) in the Mediterranean area in 2022 is estimated at 54,917 t, 5% more than in 2021 (56,802 t). The main producing countries are Egypt (37,000 t, 67.4% of the total), Turkey (8,200 t, 14.9%), Spain (4,742 t, 8.6%) and Greece (2,500 t, 4.6%). By 2023, growth of 3.4% is estimated to exceed 56,800 t.

The sea bass is a very appreciated fish in those regions where it has been traditionally consumed. Recent increases in its aquaculture production have begun to make it recognized in many new markets. In 2021, global catches of this species were 5,439 t, -26.8% less than in 2020. Aquaculture culture, therefore, represents 88.8% of corvina production in the world.

Corvina production through aquaculture in Spain in 2022 was 4,742 t, 66.3% more than in 2021. This figure refers to fish finished and placed on the market, and not to increases in live biomass. This nuance is important in a fish, such as meagre, which is cultured up to several kilograms of individual weight.

The bulk of the Spanish meagre production comes from the Valencian Community and Murcia and in addition, a small amount was produced in Andalusia. It is a species whose production grows in interest for producers and consumers, by 2023 a higher production is estimated to 6,517 t, that is, 37% more.

As for the first-sale value of sea bass, an average value per kg of €8.8 is estimated for 2022, representing a total of €41.7 million in Spain.

The catch of meagre by fishing fleets in the world in 2021, according to FAO was 5,439 t, -26.8% less than the previous year (7,431 t). Of these, Spain caught 183 t, a figure significantly lower than the previous year (1,110 t).

In Spain, juveniles of this species are produced in the Region of Murcia and a smaller amount in Andalusia. Some 6.7 million units were obtained in 2022 with an estimated value of €0.30.

Argyrosomus regius

MEAGRE (*Argyrosomus regius*)

Class: Osteíctios Order: Perciformes • Family: Scienidae

Significant characters: Relatively large head and elongated body, gray-silver with a mixture of dark tones. The head is colored yellow with a rounded muzzle. Mouth in terminal position without chins, 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.

Productiion: The cultivation of corvina is carried out in various Mediterranean countries. Breeding centres produce eggs from breeding individuals under very controlled conditions. A female of 1 m in length produces more than 1 million eggs per year, which have a diameter of less than 1 mm. During their first month of life in culture, the larvae feed on living organisms: rotifers and artemia. They are then fed on feed made from natural raw materials. Farming techniques are similar to those used for sea bass and sea bream, both in floating nurseries at sea and in earthen ponds. Meagres grow substantially faster than sea bream or sea bass, and can reach 1 kg in 12 months. The commercial size is between 1 and 4 kg.

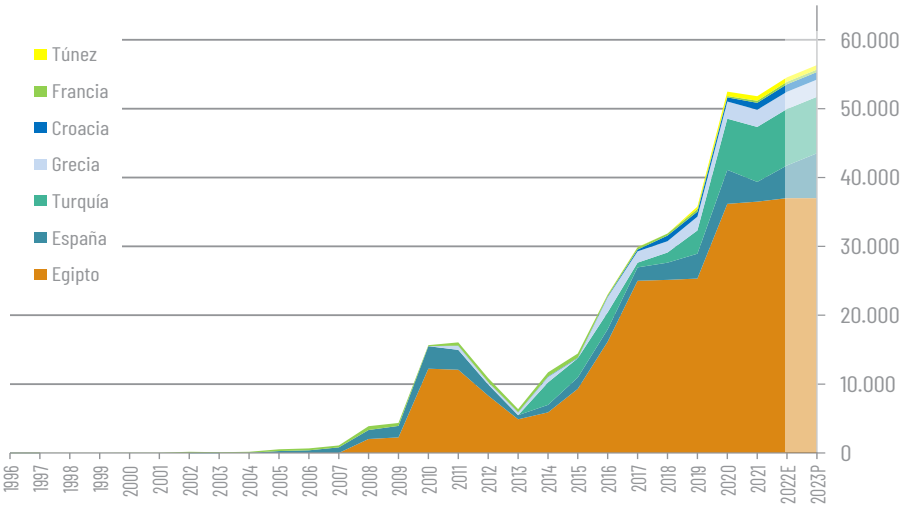


Figure 5-42. Evolution of the production (production) of corvina aquaculture (in tonnes) in the Mediterranean for the period 1996-2023p (Based on FAO, FEAP and APROMAR data).

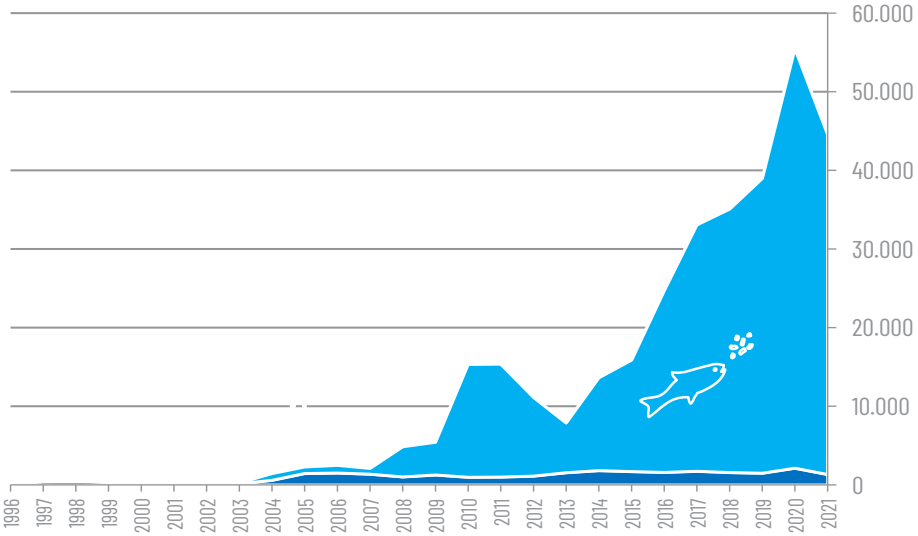


Figure 5-43. Evolution of Mediterranean production of meagre (*Argyrosomus regius)*, in tonnes, through aquaculture and fisheries, in the period 1996-2021 (FAO)..

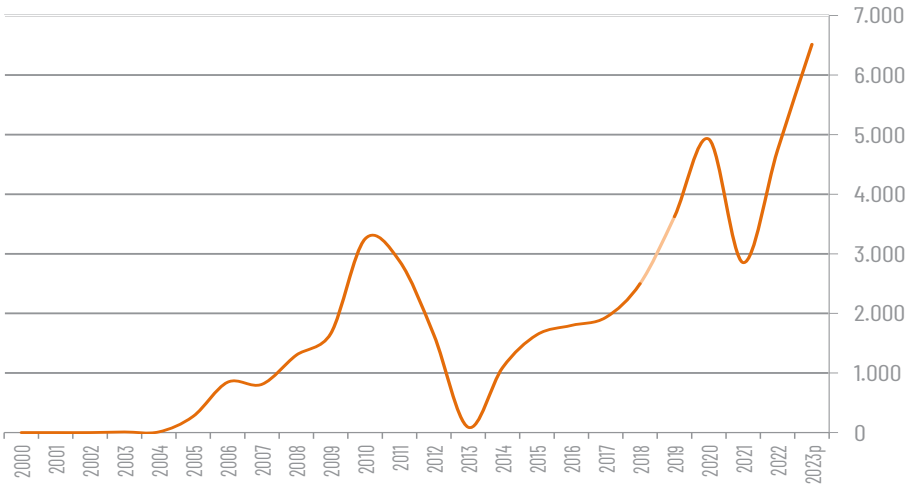
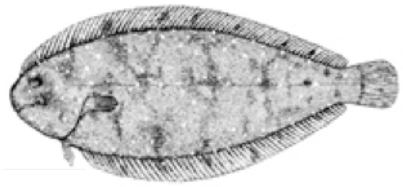


Figure 5-44. Evolution of the meagre (*Argyrosomus regius*) production in Spain in tonnes (2000-2023p).

SOLE PRODUCTION

In 2022 the world production of Senegalese sole *(Solea senegalensis)* from aquaculture was 1,752 t, 19.9% more than the previous year. By 2023 it is expected to increase by around 5% to about 1,800 tonnes. The Senegalese sole fishery landed 65 tonnes globally in 2021, of which 5 tonnes in Spain, according to FAO.



Solea senegalensis

In 2022, 1,222 t of aquaculture sole were produced in Spain, 69.7% more than in 2021. This production was in Galicia (70%) and Andalusia (30%). The 2023 production is estimated to be similar.

In terms of value, it is a highly valued species in the markets and an estimated value in first sale of € 16.7 / Kg with a total value in 2022 of € 20.4 M.

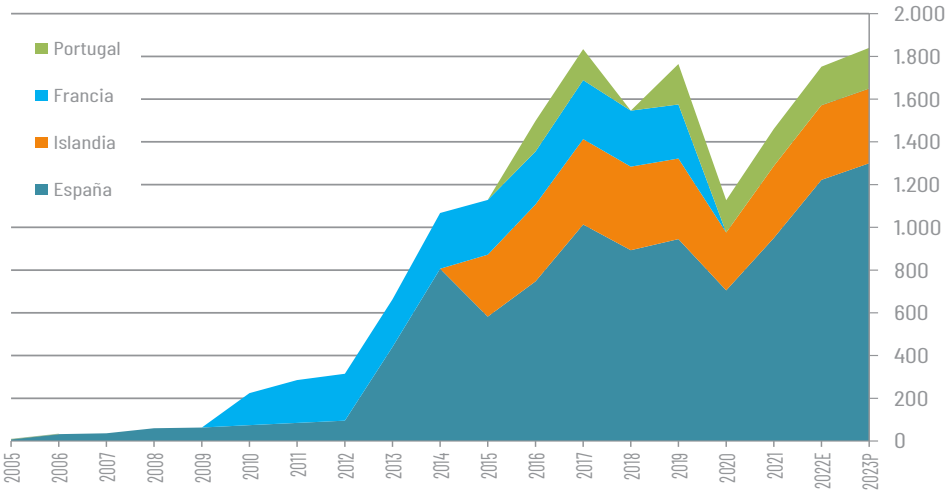


Figure 5-45. Evolution of the production (aquaculture production) of Senegalese sole (*Solea senegalensis*) in the world for the period 2005-2023p (on FAO, FEAP and APROMAR data).

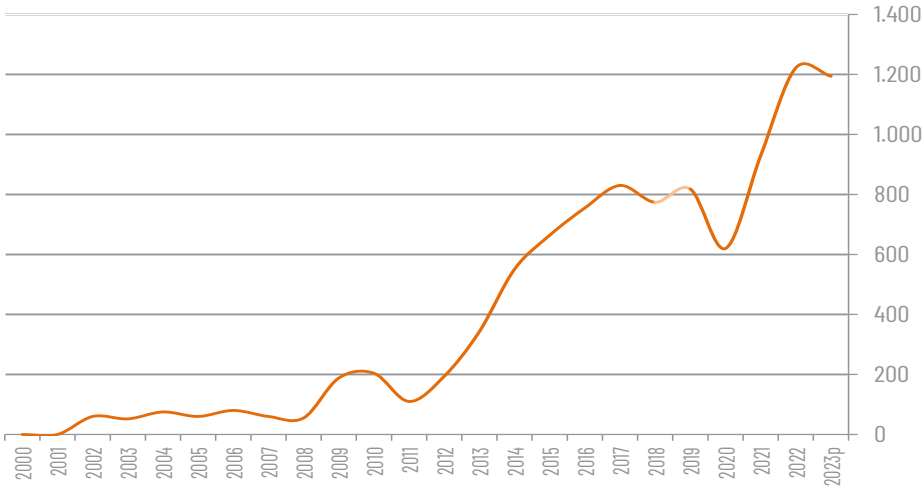
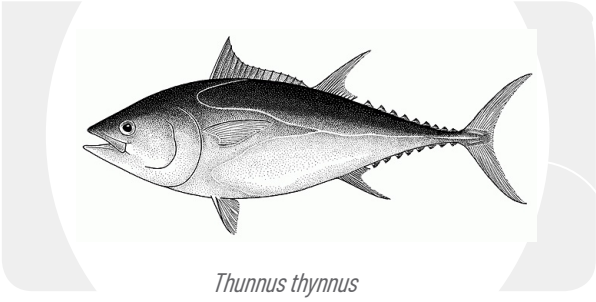


Figure 5-46. Evolution of the production (aquaculture production) of sole (*Solea senegalensis*) in Spain in tonnes (2000-2023p).

BLUEFIN TUNA PRODUCTION

Almost all bluefin tuna (*Thunnus thynnus*) available on consumer markets originates from wild stocks. Some of them are placed on the market immediately after capture and are considered fishery products. But another part of the bluefin tuna, growing and now the majority, is caught alive by purse seines or traps and kept for months in aquaculture farms. In these farms, consisting of nurseries at sea, bluefin tuna are fed to recover their optimal body condition after the reproductive 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 productive cycle and to breed bluefin tuna from egg to commercial size in captivity. Spain is a world leader in the research of the integral culture of bluefin tuna, especially through the Spanish Institute of Oceanography, and very satisfactory results have been achieved both in its reproduction and in the breeding up to commercial size.



Thunnus thynnus

Global production, estimated with 2021 FAO data and APROMAR estimates, of aquaculture bluefin tuna (Pacific, Atlantic and South) in 2022 was 71,400 t, representing an increase of 8.6% over the

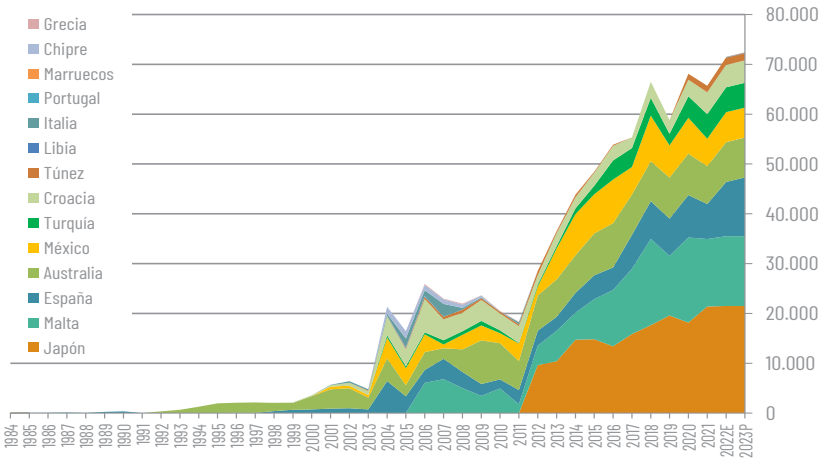


Figure 5-47. Evolution of aquaculture production (fattening) of bluefin tuna in the world for the period 1984-2023p, in tonnes (based on FAO data).

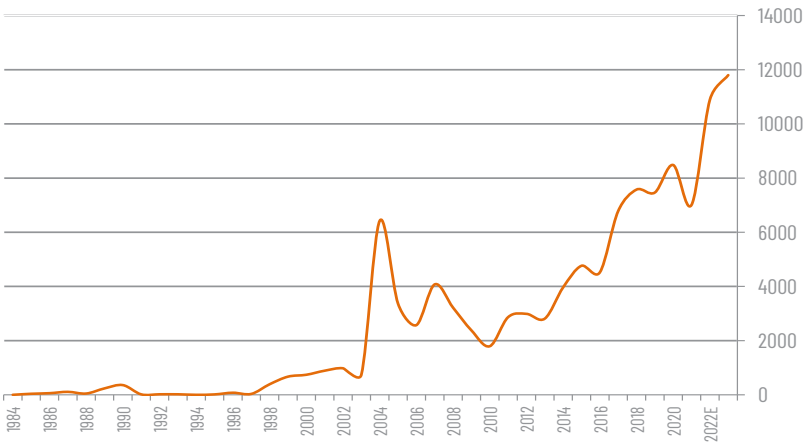


Figure 5-48. Evolution of the production (aquaculture production/ fattening) of bluefin tuna in Spain for the period 1984-2023p in tonnes (based on MAPA-FAO data).

previous year. The main producing countries are Japan with 21,500 t that kept its production stable and that represents 30.1% of the world total, Malta with 14,000 tons that represent 19.6%, Spain with 10,890 t (15.3% of the total), Australia with 8,000 t (11.2% of the total) and Mexico with 6,000 t (8.4%). Also producing: Turkey about 5,000 t, Croatia 4,500 t and Tunisia with 1,500 t. Bluefin tuna production is limited by internationally established catch quotas.
The aquaculture production of Bluefin Tuna in Spain in 2022 was 10,891 t. and a production of 11,800 t is estimated for 2023.
There is a debate at European level about the production of aquaculture bluefin tuna. The wild population of the species has recovered following conservation measures and catch quotas have increased accordingly. But while vessels can catch more tuna, the capacity of tuna aquaculture farms did not allow for an increase in quantity commensurate with the volume caught.

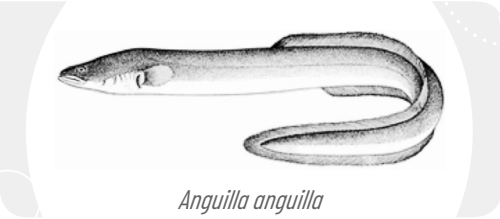
Culture of other marine fish species

EEL Production

Eel farming *(Anguilla anguilla)* is a traditional activity in Spain, with varying levels of intensification. Its production depends on the capture of wild elvers since there is not enough scientific knowledge for their reproduction in captivity. That is why its future is very conditioned by the European Recovery Plan for this species.

At European level, 5,847 tonnes of European eel were produced in 2021, 10.6% more than in 2020 (5,287 tonnes). The Netherlands (1,950 t), Germany (1,160 t) and Denmark (1,157 t) stand out as producing countries.

Spanish production at commercial level in 2022, located essentially in the Valencian Community, was 350 t. Its destination is both the repopulation of rivers and for consumption.

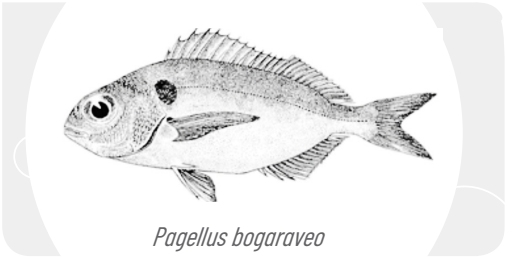


Anguilla anguilla

In terms of value in first sale, a price of € 11.5 / Kg is estimated for 2022, with a total of € 3.9 M.

BLACKSPOT SEABREAM Production

The cultivation of Blackspot seabream *(Pagellus bogaraveo)* in Europe was carried out only in Galicia but this cultivation ended in 2019. There are lines of research on its cultivation in several other Spanish autonomous communities that could reverse this situation.



Pagellus bogaraveo

GREATER AMBERJACK Production

Greater amberjack aquaculture of the species greater amberjack *dumerili*, also called Lemonfish, is currently being incorporated into aquaculture production on a commercial scale in Spain, although it is incipient arouses great interest. 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 fish very well valued in its quality by the people who know it. In 2021, 172 tonnes were produced in Greece and 140 tonnes in Spain, according to FAO. There are other species of greater amberjack more produced in the world, such as greater amberjack *quinqueradiata*, from which more than 138,900 t are production annually in Japan, although cultivated from wild juveniles.

In 2022, the cultivation of greater amberjack *dumerili* in Spain increased reaching 163 t and it is expected that in 2023, production will continue to increase slightly. In addition, in Spain juveniles of this species are produced in Andalusia.

Mollusc Production

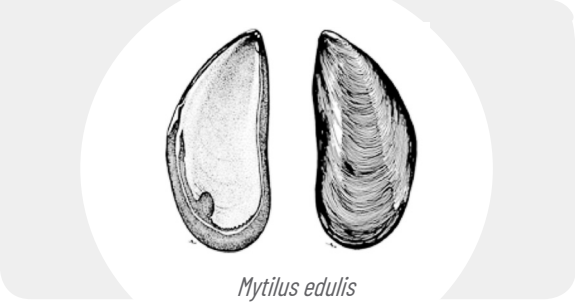
Spanish aquaculture stands out as a reference at European and global level for the quantity and quality of its mollusc breeding. In 2022 it represented the production of 227,673 t, -11.9% less than in the previous year (258,388 t) with a first-sale value of 174.0 million euros.

Mussel culture

The mussel production in Spain was around 228,000 tons on average in the last 10 years. The interannual differences are not conditioned so much by the production capacity, which is stable, but by the greater or lesser incidence of episodes of red tides that prevent the regular collection of the mollusc. The mussel production in Spain in 2022 is estimated at 225,218 t, and a total first-sale value of 159.3 million euros.

There are five Spanish autonomous communities in which mussels are grown, but it settles mainly in the Galician estuaries through its traditional cultivation in rafts. Galician production represents 97% of the national total mussel, but there are also productions in Catalonia, Andalusia, the Valencian Community and the Balearic Islands.

The mussel seed (cheek) is usually collected from the natural environment, or collected through the use of collecting ropes, for subsequent stringing in rafts or long-lines. The sector



Mytilus edulis

faces a serious problem after experiencing a fall of the seed of the rocks in which it usually grows and also has a competition problem with the barnacle sector. In 2022, the price of Galician mussels reached 0.55 €/Kg, breaking a historical record.

62% of the mussels production in Spain are marketed by producers to the fresh market, that is, destined for treatment plants; while the remaining 38% goes to the processing sector industry, that is, to cookers and canneries.

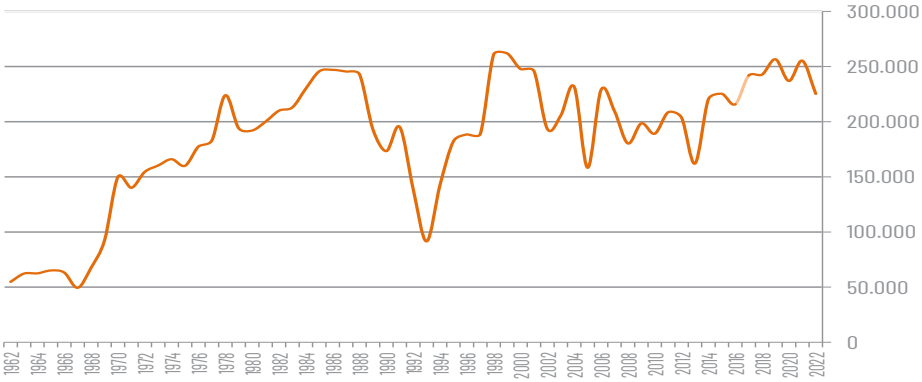


Figure 5-49. Evolution of mussel aquaculture production in Spain between 1962 and 2022 in tonnes (according to MAPA-APROMAR).

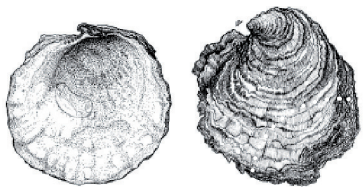
OYSTER Production

Oysters are an important group of molluscs in economic terms in Spain. There are two cultivated species: the flat oyster (*Ostrea edulis*) and the Japanese oyster or Japanese oyster (*Crassostrea gigas*). The joint production in 2021 of both species was 1,463 t, 9.8% more than in 2021 (1,331 t), and their economic value at first sale was 5.1 million euros.

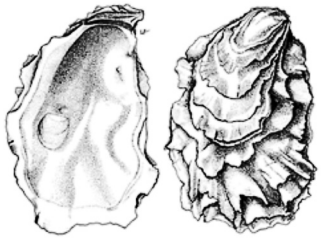
Of the Japanese oyster species, 1,226 t were produced in Spain in 2022, mainly in Galicia, Catalonia, Andalusia, Asturias, Cantabria and the Valencian Community. Its total value at first sale was 3.7 million euros.

Galicia is the main autonomous community producing flat oysters, followed by the Valencian Community. In total, 237 tons of this species were produced in Spain in 2022, with a value of 1.4 million euros.

Oyster culture can be done through several techniques, but the usual ones in Spain are intertidal culture in cultivation parks, or in vertical cultivation from rafts using baskets. Oyster seed is obtained from hatcheries, both domestic and imported.



Ostrea edulis



Crassostrea gigas

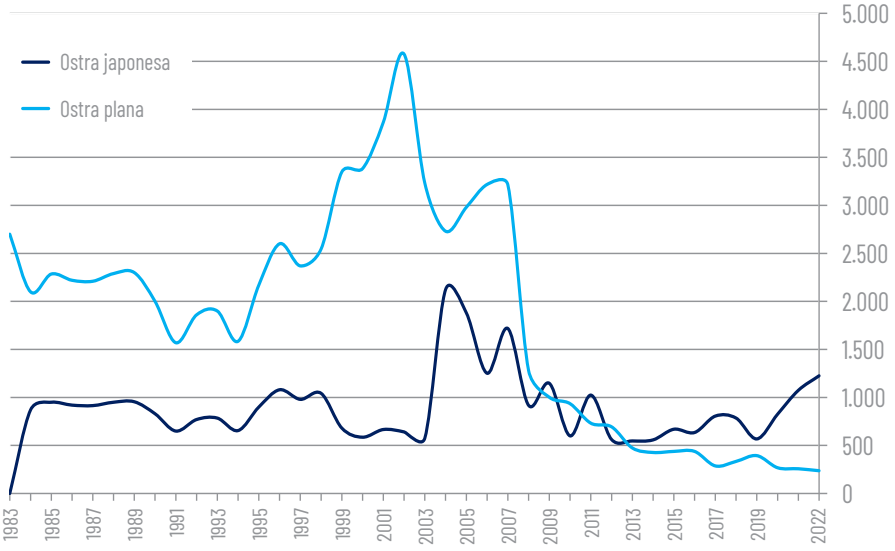


Figure 5-50. Evolution of oyster aquaculture production in Spain between 1983 and 2022 in tons (according to MAPA-APROMAR).

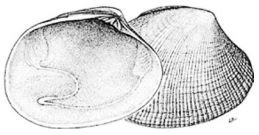
Cultivo de ALMEJAS

In Spain, three species of clams are cultivated: fine, slug and Japanese, with a joint production in 2022 of 993 t and an economic value in first sale of 9.6 million euros, according to MAPA data.

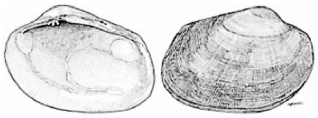
The Japanese clam *(Ruditapes philippinarum)* is the main species of clam cultivated in Spain. It has a shell whose color varies between brown, gray and black, with very marked striations that form grids. It is known as Italian clam, because of the importance of its production in that country. In 2022 its production in Spain was 725 ts, with a first-sale value of 7.2 million euros.

The fine clam *(Ruditapes decussatus)* is also known as the Carril clam. Its color, between white and light brown, varies depending on the sand where it is raised. The inner face is bright white with yellowish tones, sometimes bluish in the area near the umbo that is located in the anterior part of the shell. In 2022, 144 t of this species were produced in Spain, which reached an economic value in its first sale of 0.9 million euros.

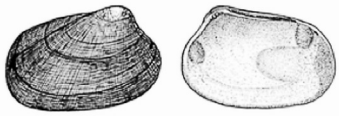
The slug clam *(Venerupis pullastra)* is gray or cream with brown spots. Its shell is oval and on its outer surface it has concentric lines that intersect with thinner radial lines. In 2022, 124 t were produced in Spain, with an economic value at first sale of 1.5 million euros.



Ruditapes philippinarum



Venerupis pullastra



Ruditapes decussatus

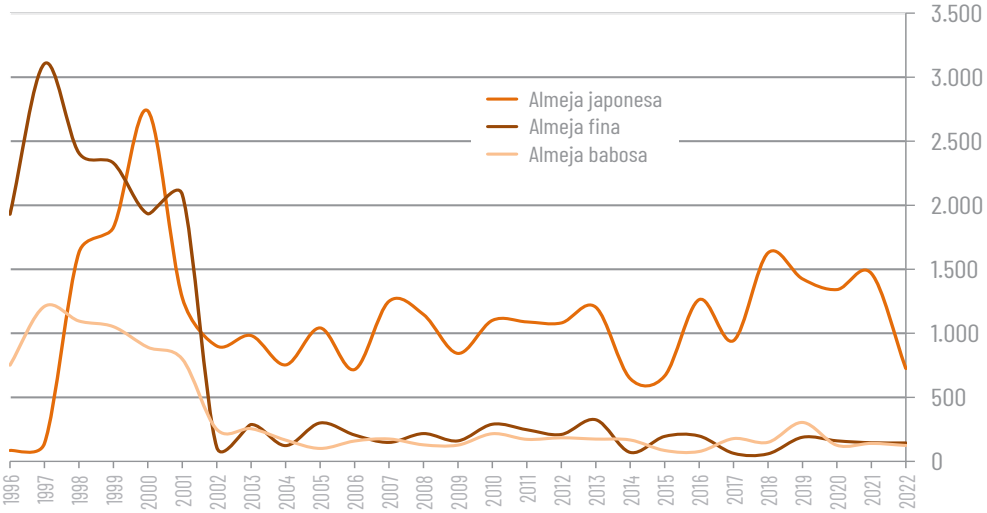


Figure 5-51. Evolution of clam aquaculture production in Spain between 1996 and 2022 in tonnes (according to MAPA-APROMAR).

The seed for clam production comes from hatcheries and to a lesser extent from its collection in natural banks.

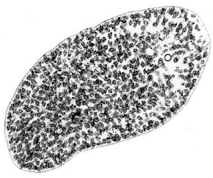
In Spain, clam farming is carried out in farming parks or in natural banks with good water flow and at different depths depending on the species.

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

Production of other species

MICROALGAE Production

In various regions of Spain there are companies dedicated to the commercial production of microalgae. Its facilities are sophisticated and develop important 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 Andalusia, some 1.2 t of microalgae were produced in 2022. The main cultivated species are *Nannochloropsis gaditana, Tetraselmis chuii, Isochrysis galbana* and *Phaeodactylum tricornutum*. In addition to its direct commercialization, the cultivation of microalgae is usual in the hatcheries of fish, molluscs and crustaceans as food for the larval stages of the cultivated animals.



Microalga

Microalgae were incorporated in 2015 into the European Regulation of organic production, as well as their recognition as food products natural source of Omega-3 oils, which opens up new marketing possibilities.

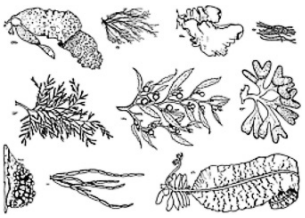
SHRIMP Production

Currently there is only one shrimp farm in Spain, located in Medina del Campo (Valladolid), which has been demonstrating great dynamism and capacity for innovation. The species produced is white shrimp (*Penaeus vannamei*) and stand out for the quality and freshness of their productions. In 2022, 8 t of this species were produced in Spain

Litopenaeus vannamei

MACROALGAE Production

The use of macroalgae for uses such as obtaining different phycocolloids (alginates, agar and carrageenan) or as an agricultural fertilizer is traditional on the north coast of Spain. Most of the macroalgae are obtained from the natural environment without greater human intervention than the removal by hand or the collection of arribazones, but there are several initiatives underway for their cultivation. These macroalgae aquaculture initiatives produce species with superior added value because they are used for direct human food or as a source of bioactive compounds. The species currently cultivated are "sugar kombu" (*Saccharina latissima*), "sea lettuce" (*Ulva spp.*) and red algae known under the name "ogonori" (*Gracilaria spp., Gracilariopsis spp.*). In 2022, 20.6 t were produced mainly in Galicia (91%) and Andalusia (9%).



Macroalgas

5.7. Freshwater Aquaculture in Spain and Europe

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

Production of RAINBOW TROUT

World aquaculture production of rainbow trout (*Oncorhynchus mykiss*) in 2021 was 948,663 t, representing a decrease of -0.4% compared to the previous year with 952,342 t.

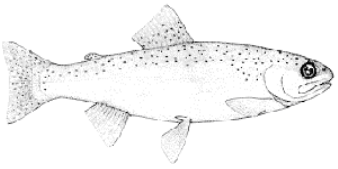
The main producing countries were Iran with 193,852 t (20.4% of the world total), Turkey with 165,683 t (17.5%), Norway with 94,660 t (10%), Chile with 56,656 t (6.0%), Russian Federation with 52,929 t (5.6%) and Peru with 51,571 t (5.4%). Other relevant countries are by production volume: China, Russia, Italy, Denmark, France, Colombia and the USA. It is a species produced in 79 countries distributed by the five continents, although it is native to North America.

Most rainbow trout is produced in fresh water (70%), but a significant part of its production ends up being reared in salt water, especially in Chile and Norway.

Commercial extractive fishing of rainbow trout is very small and accounted for only 1,442 tonnes worldwide in 2021, in countries such as Uzbekistan, Finland, Mexico, Peru and the United Kingdom.

The production of rainbow trout in Spain in 2022 is estimated to be 16,328 t, 4.1% more than in the previous year. By 2023 a slight decrease is expected with about 15,500 tons, although both productions are far from the maximum of 35,384 tons in 2001. The main producing regions are Castilla y León, Galicia, Andalusia, Catalonia, La Rioja, Castilla la Mancha, Asturias and Aragón.

Rainbow trout production is changing in recent years to larger trout farming. This is due to the stagnation of the price of ration trout and the new opportunities offered by the HORECA market for fish over 1Kg in weight.



Oncorhynchus mykiss

RAINBOW TROUT *(Oncorhynchus mykiss)*

Class: Actinopterygii Order: Salmoniformes • Family: Salmonidae

Significant characters: Body of elongated shape, fusiform and adipose fin present. Blue to olive green coloration on a pinkish iridescent band along the lateral line and silver below it. Loin, sides, head and fins covered with small black dots. The coloration varies from intense dark to shiny-silvery.

Production: Its upbringing takes place in half the world. Females are capable of producing up to 2,000 eggs per kg of body weight. The eggs are relatively large in size (3-7 mm in diameter). After hatching, the fry are nourished for a short period of time by the reserve food provided by the yolk vesicle. Then they start a diet based on feed made with natural ingredients. Aquaculture farms are varied, with ponds on land, concrete or fiber facilities and even cages in fresh or salt water. Rainbow trout usually take 10 months from hatching to reach ration size (250-300 g), although commercial sizes reach several kilograms in weight.

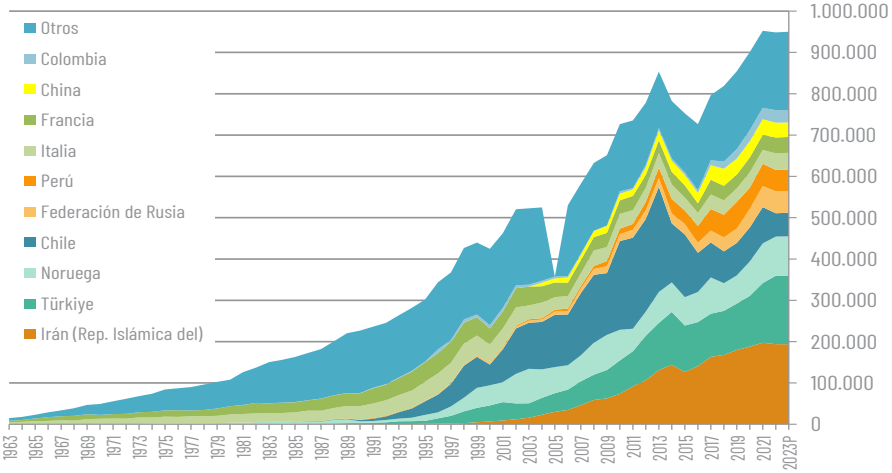


Figure 5-52. Evolution of rainbow trout aquaculture production in the world in the period 1963-2023P in tonnes (on FAO data)..

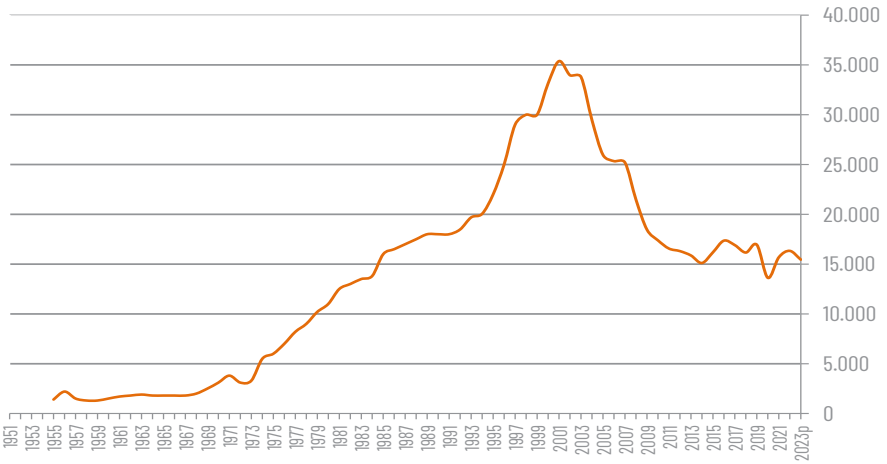


Figure 5-53. Evolution of rainbow trout aquaculture production in Spain in tonnes (1951-2023p). APROMAR data.

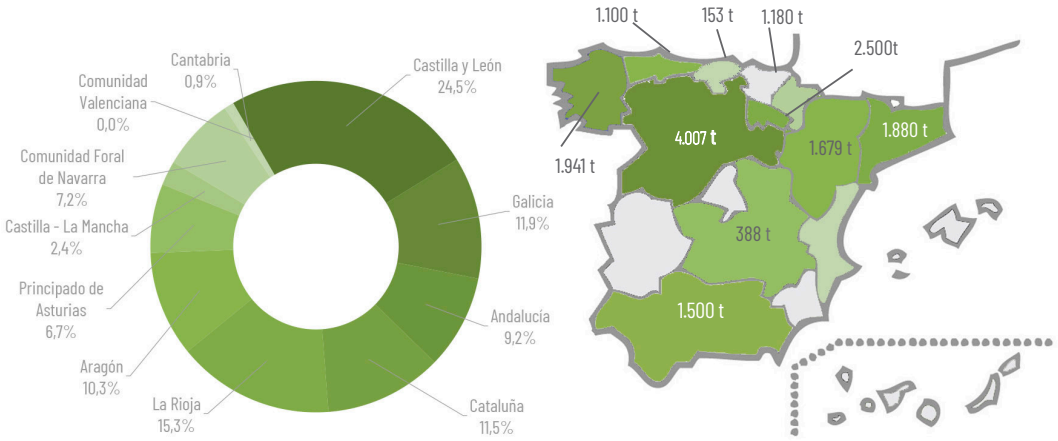


Figure 5-54. Distribution of the rainbow trout harvest among the autonomous communities in 2022 (MAPA data).

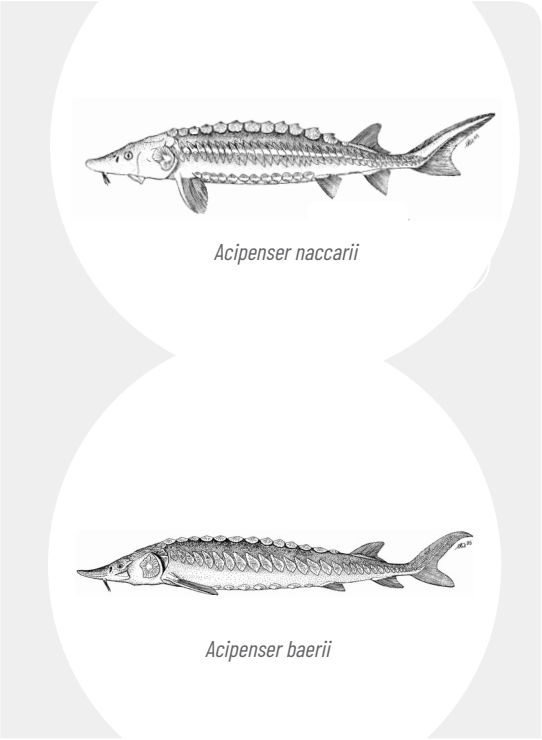
STURGEON Production

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) agreed in 2006 to ban caviar exports in the face of severe declines 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 that obtained by farming these fish. There are several species of sturgeon cultivated in the world, all included within the family Acipenseridae: Siberian sturgeon *(Acipenser baerii baerii)*, Russian or Danube sturgeon (*Acipenser gueldenstaedtii*), beluga sturgeon (Huso spindle), sterlet sturgeon (*Acipenser ruthenus*), stellate sturgeon or Sevruga (*Acipenser stellatus*), white sturgeon (*Acipenser transmontanus*) and Adriatic sturgeon *(Acipenser naccarii)*.

World production of caviar was about 450 tonnes in 2021, of which 170 tonnes were produced in the European Union (27) (37.8%). Global caviar production is estimated to remain at 450 tonnes by 2022.

Production in the European Union in 2021 was led by Italy with 55 t (32.4% of the total), Poland with 42 t (24.7% of the total), France with 33 t (19.4% of the total) and Germany with 21 t (12.4%).

Although the main product of sturgeon aquaculture is the production of caviar, the meat of these fish is also valued and put on the market for consumption. In the world, it is estimated that some 142,744 t were produced in 2021, 15.5% more than in 2020 (123,476 t). Extractive fishing for sturgeon continues in some countries such as Canada, Russia, the United States and Iran; in 2021, 204 t of meat were obtained; Aquaculture accounts for 99.9% of production.



Acipenser naccarii

Acipenser baerii

In Spain, 4.4 t of caviar were produced in 2022 and 121 t of sturgeon meat. The two species produced are Adriatic sturgeon and to a lesser extent Siberian sturgeon.

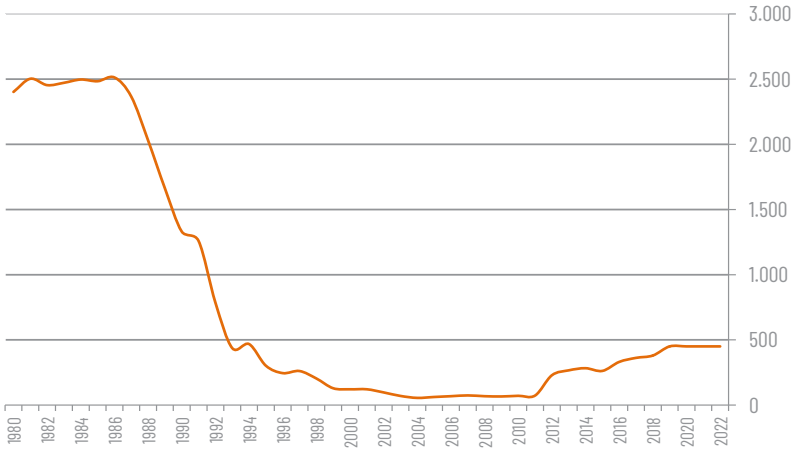


Figure 5-55. Evolution of world caviar production (originating from both fisheries and aquaculture) in tonnes, between 1979 and 2021 (FAO and FEAP data).

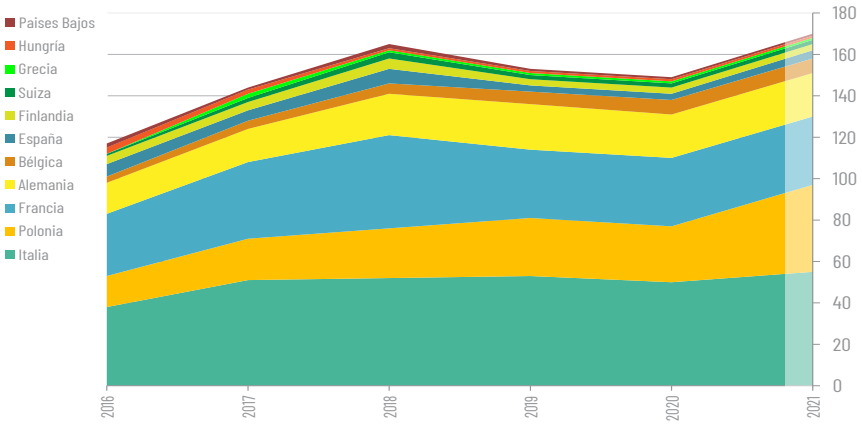


Figure 5-56. E volution of caviar production in the US (27) in tons (2016-2021). FEAP data

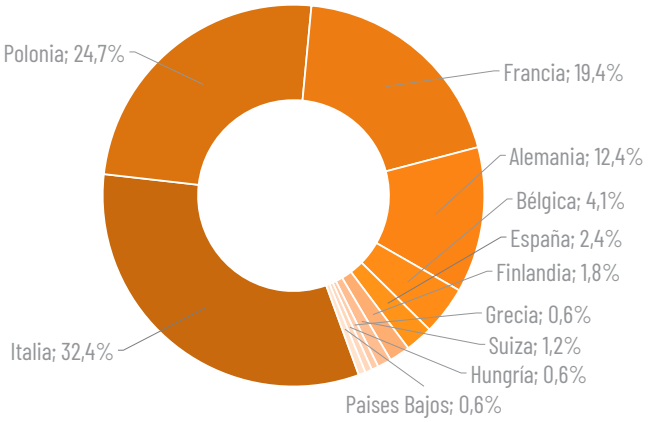


Figure 5-57. Distribution of the caviar harvest among EU countries (27) in 2021. FEAP data.

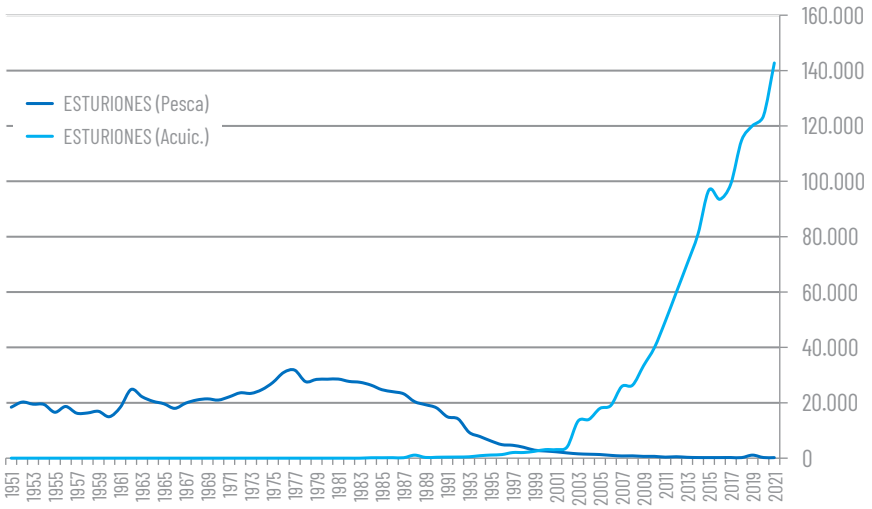


Figure 5-58. Evolution of world sturgeon production (fisheries and aquaculture) between 1951 and 2021 (FAO data).

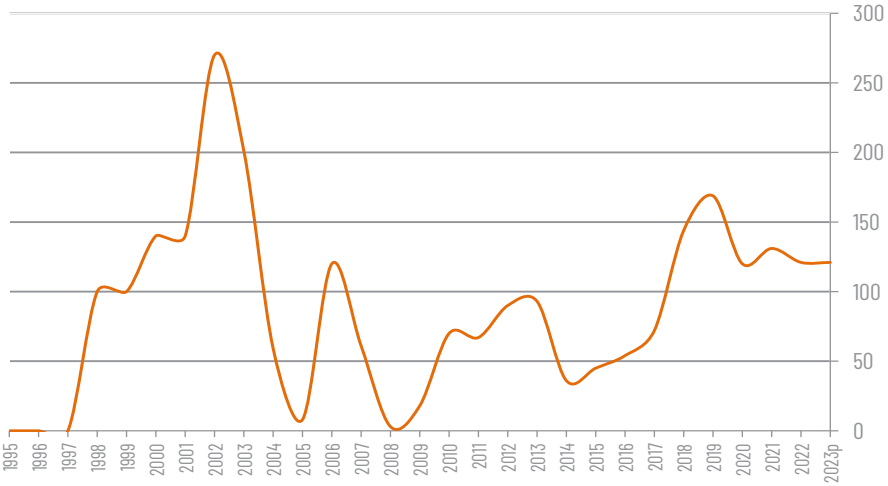
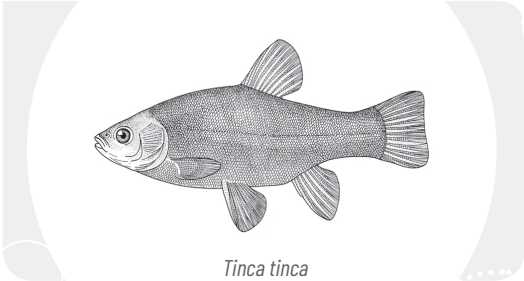


Figure 5-59. Evolution of aquaculture production of sturgeons (several species) in Spain in tonnes (1995-2023p). Data APROMAR-MAPA-FAO.

TENCH Production

Tench (*Tinca tinca)* is a uniquely European species. Its production accounted for a total of 739 t in 2021. France is the main producer (240 t, 32.5% of the total), followed by Poland (160 t, 21.7% of the total), the Czech Republic (139 t, 18.8% of the total), Germany (125 t, 16.9% of the total), Italy (24 t, 3.2% of the total) and Lithuania (20 t, 2.7% of the total). Tench is harvested in 20 countries.

In Spain, 16.2 t were produced in 2022, grown in ponds, mainly in the autonomous community of Extremadura and less in Castilla y León. This figure is far from the maximums it reached at the end of the eighties around 450 tons. APROMAR-REMA developed in 2022 a project to analyze the causes of this decline and promote aquaculture of this species as a model of sustainable rural development together with the Association of Tencicultores de Extremadura (Ibertenca). It has been possible to mobilize the corresponding administration to help these producers. Even so, similar production is expected in 2023.



Tinca tinca

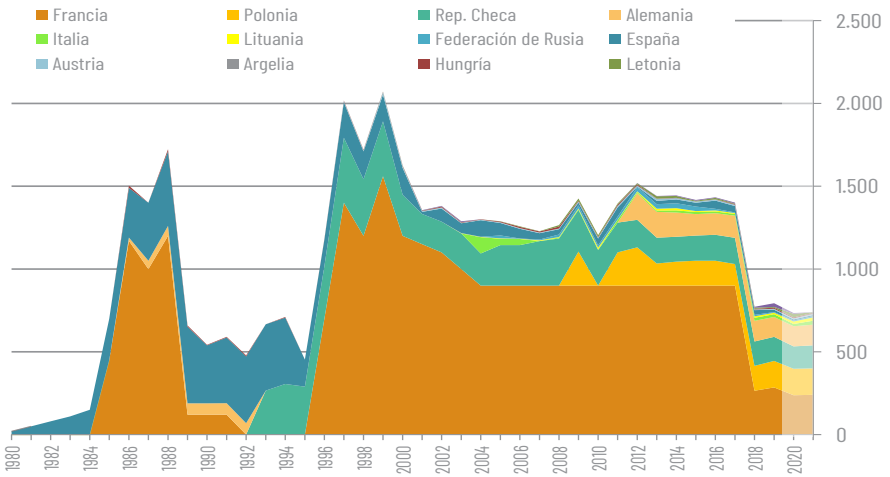


Figure 5-60. Evolution of European tench aquaculture production in tonnes (1980-2021). FAO data..

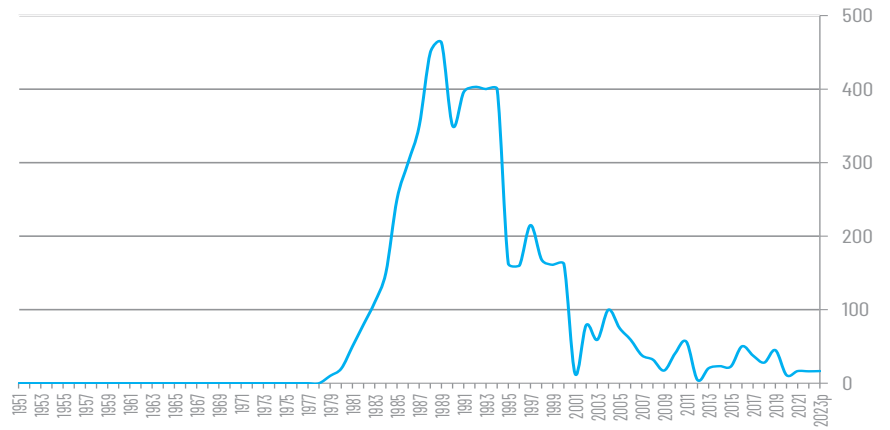


Figure 5-61. Evolution of aquaculture production of tench (Tinca tinca) in Spain in tonnes (1978-2023p). MAPA-FAO data.

Table 5-1. Production data of aquaculture species in Spain (tonnes)

DORADA	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Andalucía	1.136	2.333	1.605	980	1.560	1.606	920	960	815	840
Baleares	0	0	0	0	0	0	0	0	0	0
Canarias	1.588	1.884	2.492	2.063	2.380	2.380	1.893	725	790	790
Cataluña	952	514	656	654	0	0	0	0	380	380
Murcia	3.892	4.103	3.368	4.356	3.184	2.906	1.107	2.461	1.327	815
Valenciana	8.662	7.397	5.619	5.590	7.806	6.629	2.668	5.486	5.620	8.164
TOTAL	**16.230**	**16.231**	**13.740**	**13.643**	**14.930**	**13.521**	**6.588**	**9.632**	**8.932**	**10.989**
Variación %	-3,4	0,0%	-15,3%	-0,7%	9,4%	-9,4%	-51,3%	46,2%	-7,3%	23,0%
Precio €/Kg.	5,45	5,84	5,78	4,87	4,37	4,10	4,20	4,18	4,89	
Valor (M€)	**88,5**	**94,8**	**79,4**	**66,4**	**65,2**	**55,4**	**27,7**	**40,2**	**43,7**	

LUBINA	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Andalucía	2.815	5.356	6.081	3.261	4.479	7.120	3.950	7.365	6.020	6.333
Canarias	5.097	5.767	5.507	5.900	5.793	6.253	5.596	4.951	4.948	5.074
Cataluña	0	318	236	146	30	30	70	99	170	170
Murcia	5.519	6.009	8.164	6.990	7.525	9.181	3.585	7.285	7.244	7.933
Valenciana	3.945	3.874	3.457	4.972	4.633	4.751	8.508	4.228	5.240	4.400
TOTAL	**17.376**	**21.324**	**23.445**	**21.269**	**22.460**	**27.335**	**21.709**	**23.928**	**23.622**	**23.910**
Variación %	18,1	22,7%	9,9%	-9,3%	5,6%	21,7%	-20,6%	10,2%	-1,3%	1,2%
Precio €/Kg.	5,79 €	5,64 €	5,67 €	5,18 €	4,64 €	3,80 €	4,30 €	4,66 €	5,56 €	
Valor (M€)	**100,6**	**120,3**	**132,93**	**110,17**	**104,21**	**103,87**	**93,35**	**111,50**	**131,34**	

RODABALLO	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Asturias	0	0	0	0	0,00	0	0	0	0	0
Cantabria	75	108	50	105	100,00	0	0	0	0	0
Galicia	7.733	7.607	7.346	8.441	7.350,00	8.258	7.681	7.629	8.766	9.201
País Vasco	0	0	0	0	0,00	0	0	0	0	0
TOTAL	**7.808**	**7.715**	**7.396**	**8.546**	**7.450**	**8.258**	**7.681**	**7.629**	**8.766**	**9.201**

CORVINA	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Andalucía	0	0	46	46	50	23	23	4	25	25
Canarias	0	0	0	0	0	0	0	0	0	0
Cataluña	0	0	0	0	0	0	0	0	0	0
Murcia	23	42	0	0	0	0	85	348	2.100	998
Valenciana	1.067	1.600	1.752	1.886	2.450	3.600	4.817	2.500	2.617	5.494
TOTAL	**1.090**	**1.642**	**1.798**	**1.932**	**2.500**	**3.623**	**4.925**	**2.852**	**4.742**	**6.517**

ANGUILA	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Valenciana	366	380	315	330	330	360	350	340	340	350
TOTAL	**366**	**380**	**315**	**330**	**330**	**360**	**360**	**340**	**340**	**350**

BESUGO	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
TOTAL	**172**	**104**	**178**	**142**	**113**	**0**	**0**	**0**	**0**	**0**

LENGUADO	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Andalucía	240	247	460	537	487	531	302	285	361	200
Galicia	283	388	295	293	287	287	318	644	861	994
TOTAL	**551**	**664**	**755**	**830**	**774**	**818**	**620**	**929**	**1.222**	**1.194L**

LANGOSTINO	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
C y Leon	4	5	8	5	5	5	5	8	8	8
TOTAL	**4**	**5**	**8**	**5**	**5**	**5**	**5**	**8**	**8**	**8**

SERIOLA	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023P
Murcia						0	0	0	5	5
C. Valenciana						18	90	139	158	167
TOTAL	**0**	**0**	**0**	**0**	**0**	**18**	**90**	**139**	**163**	**172**

ATÚN ROJO	V2014	2015	2016	2017	2018	2019	2020	2021	2022	2023p
Andalucía			1.083	1.083	1.083	1.566	2.014	0	0	1.000
Cataluña			2.700	2.700	2.700	2.700	2.500	2.500	2.600	2.600
Murcia			1.360	1.360	1.360	1.360	5.262	4.500	8.277	8.277
TOTAL	**0**	**0**	**5.143**	**5.143**	**5.143**	**5.626**	**9.776**	**7.000**	**10.877**	**11.877**

TOTAL MARINOS	**43.597**	**48.065**	**52.778**	**51.840**	**53.705**	**59.546**	**51.664**	**52.318**	**58.509**	**64.046**

TRUCHA	2018	2019	2020	2021	2022	2023P
Castilla y León	4.975	5.888	3.617	3.834	4.007	3.773
Galicia	2.689	1.840	1.363	1.750	1.941	2.128
Andalucía	1.380	1.448	1.587	1.561	1.500	1.550
Cataluña	1.630	1.921	1.652	1.650	1.880	1.870
La Rioja	1.728	1.912	1.728	1.950	2.500	1.702
Aragón	1.191	1.098	637	1.609	1.679	1.679
Principado de Asturias	704	922	1.160	1.100	1.100	1.150
Castilla - La Mancha	773	797	991	845	388	518
Comunidad Foral de Navarra	791	856	685	1.180	1.180	920
Cantabria	184	168	129	150	153	160
País Vasco	115	89	66	55	0	0
Comunidad Valenciana	0	0	6	0	0	0
Total	**16.160**	**16.939**	**13.620**	**15.684**	**16.328**	**15.45Z**

6

Marketing and consumption of aquaculture products in Europe and Spain

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 important import and export market for aquatic products, i.e. the main market for food harvested through aquaculture or caught through its fishing.

According to data from the AIPCE-2022 report, per capita consumption of aquatic products in the European Union (27) in 2022 was 21.1 kilograms (in whole fish equivalents) as opposed to 22.6 kilograms in 2021, -7.1% less. That per capita consumption is falling for the fourth consecutive year is worrying. It is necessary to take measures such as increasing the communication of the benefits of increasing the intake of aquatic products for the health of the general population to reverse this situation, in addition to economic incentives (such as lower taxes, etc.) and other measures.

In 2022, dependence on imported aquatic products was 67%.

The EU's internal supply integrates catches and aquaculture production. In 2022, 76.7% was supplied by EU catches (27) (3,209 million tonnes) and the rest by aquaculture (974 thousand tonnes). The share of catches destined for food use was 2.4 million tonnes in 2021.

In 2022, the EU (27) generated a total of 4.6 million tonnes of aquatic products between fisheries and aquaculture. Of these, it exported 2.1 million tonnes and spent another 1.1 million tonnes for non-food uses. In addition, 2.2 million t were exported and 8.55 million t of aquatic products were imported, this means that in total for consumption there were 9.4 million t in 2022. As a result, the self-sufficiency rate was 33 per cent, with the remaining 67 per cent coming from imports.

In the graph below, you can see a progressive decrease in the last 4 years caused mainly by the decrease in fish catches and aquaculture production, while the net import-export balance remains similar.

The average apparent per capita consumption of aquatic products in the EU (27) in 2021 was 23.3 kg (live weight)/capita/year in 2020, a decrease of -7 % compared to the previous year, according to the EUMOFA 2022 report.

The countries with the highest per capita consumption are: Portugal with 57.7 Kg/capita/year with -4% compared to 2019, Spain with 44.2 Kg/capita/year -4% less, Denmark with 35.2 Kg/capita/year -16% less and France with 32.6 Kg/capita/year -2% compared to 2020. In the lowest positions of the ranking are: Bulgaria with 7.4 Kg/capita/year (6% more), Hungary with 6.5 Kg/capita/year (3% more) and Czech Republic with 5.7 Kg/capita/year (-5% more).

It can be seen that consumption has decreased in most countries, there was a negative trend in the European Union in 2020.

The consumption of aquatic products in the Union is dominated by the supply of catch fish. Among the preferred aquatic species in 2020 are, in order of highest to lowest per

capita consumption: tuna (3.06 Kg, down -3% and aquaculture comes from 1.35%), salmon (2.44 Kg, up 4% and aquaculture is 94%), pollock (1.72 Kg, -1%, 100% fishing), cod (1.72 Kg, -13% and 99.9% fishing), shrimp and prawn (1.46 Kg, -1% and 55% aquaculture), mussels 1.19 kg, +2% and 94% aquaculture), herring (1.1 kg, +3% and 100% fishing) and hake (1.03 kg, -11% and 100% fishing).

Figure 6-1. Evolution of the origin of aquatic products consumed in the European Union (27) between 2019 and 2022, in tonnes live weight equivalent. EU aquaculture and fisheries productions are considered in addition to the net balance of imports and exports and non-food uses (AIPCE).

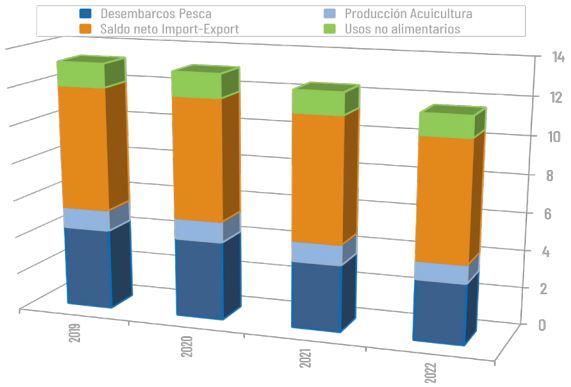


Figure 6-2. Per capita consumption of aquatic products in the member states of the European Union (European Commission. EUMOFA 2022).

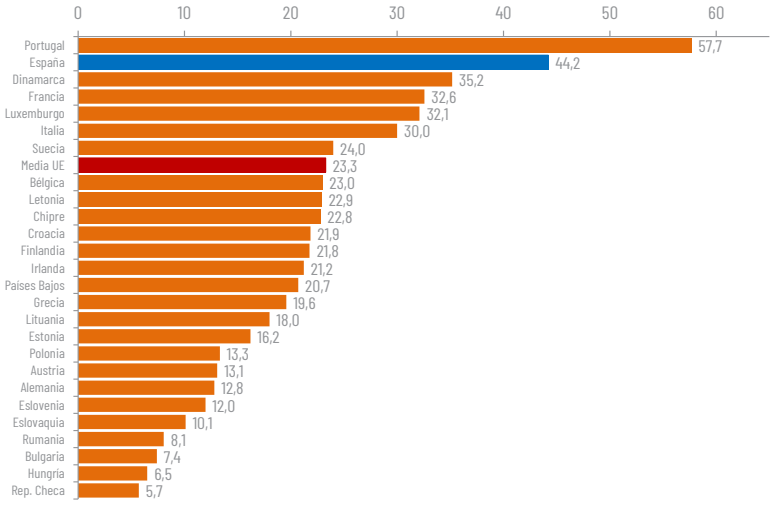
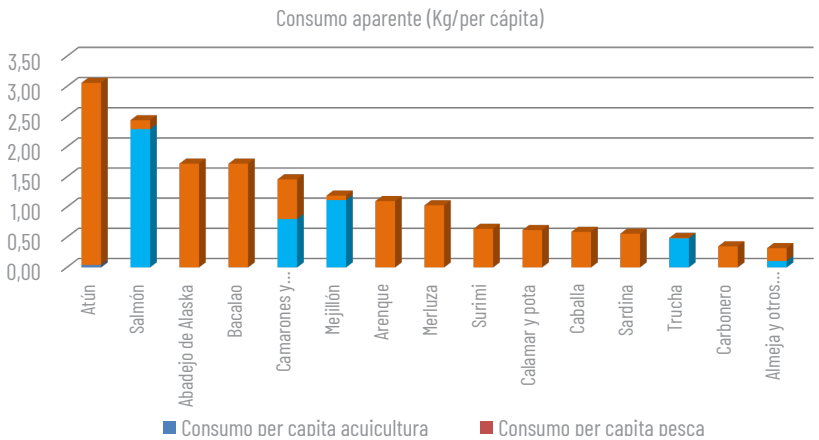


Figure 6-3. Per capita consumption of the main aquaculture products and its comparison with the consumption of the fishery product in the European Union (European Commission. EUMOFA 2020).



6.2. Food consumption in Spain

Having quality and timely information on markets and consumption is a relevant element for companies to make 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 MAPA as of the date of publication of this APROMAR report refers to 2022.

The Spanish population has remained stable compared to the previous year. It stood at 47,615,034 million in November 2022, according to INE data.

In 2022, the number of households grew by 0.3% compared to 2021, breaking a record since 2015 with 18,737,475 households.

The year 2022 was marked by a decrease in consumption within the household (87.2%) and an increase in consumption outside it (12.8%). A total of 30,946.87 million kilos or liters of food and beverages have been acquired (-7.1% to 2021) with a total value of €107,780.51 million (2.7% more than in 2021) whose increase is also due to a rise in the prices of these foods and beverages (10.6% as a whole). If the amount is divided into people, the intake was around 698.5 Kg-L (-6.6% less than in 2021) and this meant an average total expenditure of approximately € 2,582 / person in 2022.

In 2022 the most consumed categories were: fruits, vegetables and potatoes, milk and derivatives, as in previous years. Fresh food accounted for 37.3% in households. The consumption of these foods decreased in volume by -12.2% and in value by -4.6% compared to the average diet (-8.8% and -0.9% respectively).

6.3. Consumption of aquatic products in Spain

This category of aquatic food includes fresh fish, frozen fish, molluscs, crustaceans and canned fish and molluscs.

In 2022, fewer aquatic products are purchased for Spanish households (-15.6% compared to 2021). To this is added that the value did not compensate for the decrease despite the fact that the average price increased by 7.4% to € 9.99 / Kg. These products accounted for 12% of the purchase budget, i.e. 3.3% of the total. In 2022, 19.2 kg per person were consumed, assuming an expenditure of € 191.6 / pers.

According to data from the MAPA Fishing Report Month to Month of November 2022, at the end of the November 2022 mobile year, Spanish households reduced the purchase of fish by 15.7%, as a result of a lower purchase of especially fresh fish (16.4%). However, the purchase of frozen fish also accumulates a negative variation of 12.4% of its kilos. The species that contribute most to this decline are; salmon (-25.0%), hake / whiting (-11.4%), sardine / anchovy (-14.3%), sea bass (-4.3%), or sea bream with a decrease of -13.8% among others. However, those species that lose the most volume during these twelve months have been turbot and sole, with negative variations in their demand reaching -39.4% and -32.5% respectively. Canned fish/mollusc also did not grow, losing -9.8% in volume and -1.4% in value.

Fresh fish has the highest proportion of both volume and value with 41.8% and 39.0% respectively. Although it has experienced a reduction of -16.9% in volume and -11.3% in value compared to 2021.

Canned fish and molluscs are the next product in Spanish households with a volume of 21.1% and a value of 24.7%. But both values evolve in negative, -10.5% and -1.2%.

The third segment is fresh shellfish/molluscs with a volume share of 142% and value of 13.0% and also decreasing in 2022 (-19.6% volume and -15.8% in value).

Frozen fish are the products that perform worst in 2022 with -12.8% in volume and -5.2% in value.

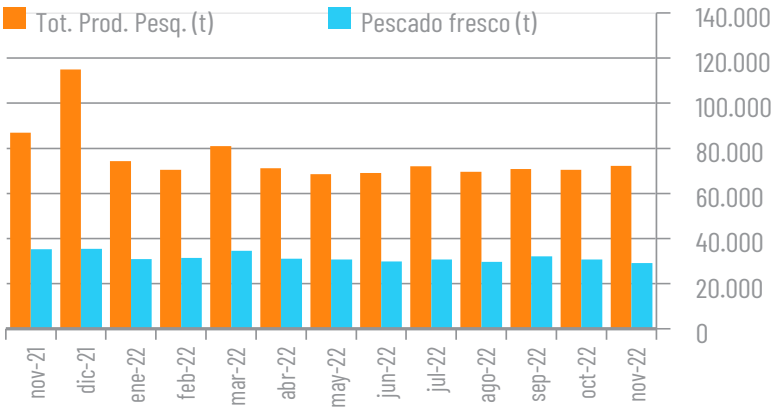


Figure 6-4.
Evolution of the consumption of fishery products (aquaculture plus fishing) in Spanish households from November 2021 to November 2022. The total of aquatic products (= fishery products) and, within them, of fresh products is shown (source: MAP)

Table 6-1. Main statistical magnitudes in the commercialization of fish in Spain for consumption in households between December 2021 and 2022. Data from the General Directorate of the Food Industry of the MAPA.

CONSUMO HOGARES EN EL MES

Productos 2	Cantidad consumida en el mes (miles de t)		Evolución	Valor (millones de €)		Evolución	PVP en el mes (€/Kg)
	2021	2022	%2/21	2021	2022	%22/21	2021
TOT. PROD. PESQUEROS***	86,99	72,19	-17,0	821,20	750,10	-8,7	10,39
TOT. PESCADO FRESCO	35,27	29,11	-17,5	314,49	288,93	-8,1	9,93
TRUCHA fresca	0,76	0,68	-10,5	5,51	5,68	3,1	8,41
LENGUADO	3,63	4,02	10,7	34,84	39,83	14,3	12,50
SALMÓN	6,43	4,80	-25,3	66,88	63,83	-4,6	12,65
LUBINA	2,50	1,97	-21,2	23,34	20,00	-14,3	10,14
DORADA	3,22	2,99	-7,1	25,91	24,84	-4,1	8,31
RODABALLO	0,40	0,23	-42,5	5,13	3,27	-36,3	14,39
TOTAL ALIMENTACIÓN	2.320,09	2.147,13	-7,5	6.208,29	6.413,72	3,3	2,99

CONSUMO en HOGARES TAM* MES 2021 vs 2020

Productos	Cantidad consumida en el período (miles de t)		Evolución	Valor (millones de €)		Evolución	Kg per cápita
	TAM mes 2021	TAM mes 2022	%22/21	TAM mes 2021	TAM mes 2022	%22/21	TAM mes 2022
TOT. PROD. PESQUEROS***	1.067,30	904,80	-15,2	9.907,70	8.961,90	-9,5	19,50
TOT. PESCADO FRESCO	450,00	376,10	-16,4	3.924,80	3.488,10	-11,1	8,10
TRUCHA fresca	10,10	8,70	-13,9	72,50	68,90	-5,0	0,20
LENGUADO	10,90	7,40	-32,1	127,40	90,10	-29,3	0,20
SALMÓN	75,30	56,40	-25,1	775,30	707,50	-8,7	1,20
LUBINA	30,80	23,80	-22,7	277,60	234,20	-15,6	0,50
DORADA	36,50	31,50	-13,7	286,70	259,50	-9,5	0,70
RODABALLO	5,60	3,40	-39,3	62,40	43,40	-30,4	0,10
TOTAL ALIMENTACIÓN	29.821,90	27.235,90	-8,7	75.086,70	73.779,90	-1,7	586,80

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.

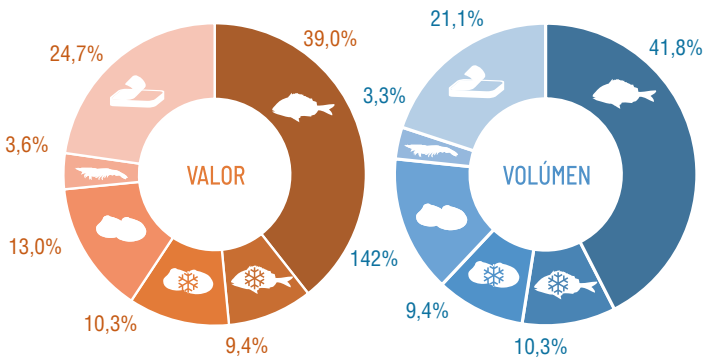


Figure 6-5. Importance of different types of aquatic products in their consumption in households in Spain in 2022 (MAPA).

	%Variación mismo periodo año anterior	
	Valor	**Volumen**
Total Pesca	-9,4 %	-15,6 %
Pescados Frescos	-11,3 %	-16,9 %
Pescados Congelados	-5,2 %	-12,8%
Marisco/Molusc Cong	-12,9 %	-17,0 %
Marisco/Molusc Fres	-15,8%	-19,6%
Marisco/Molusc Cocido	-14,2 %	-17,3 %
Cons.pescado/Molusco	-1,2 %	-10,5%

Figure 6-6. Percentage distribution of the purchase of aquatic products in 2022 by types of establishments and percentage variation over the previous year (MAPA data).

6.4. Consumption of fresh aquatic products in Spain

The supermarket and self-service were the favorite channels for the purchase of fish products in 2022, accounting for 50.2% of the total volume, despite decreasing by -14.2%. The traditional store gained relevance with 22.9% for purchases of aquatic products. E-commerce stands out for the highest average price of these products, € 11 / Kg, 10.2% more than the market average.

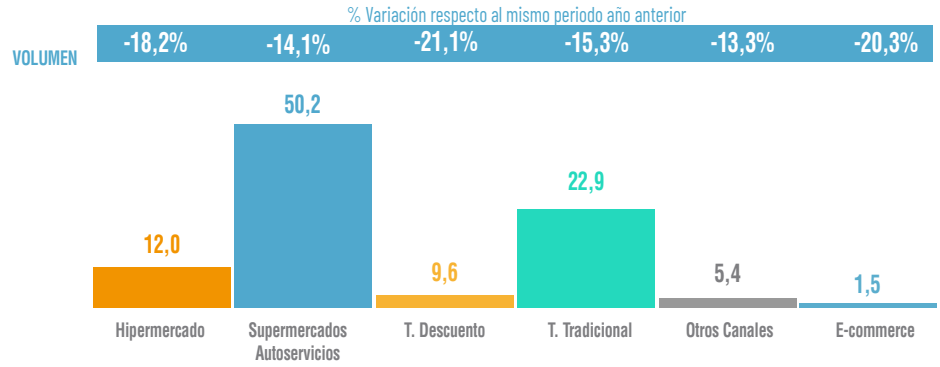


Figure 6-7. Percentage distribution of the purchase of fresh aquatic products in 2021 vs. 2022 by types of establishments and percentage variation over the previous year (MAPA data).

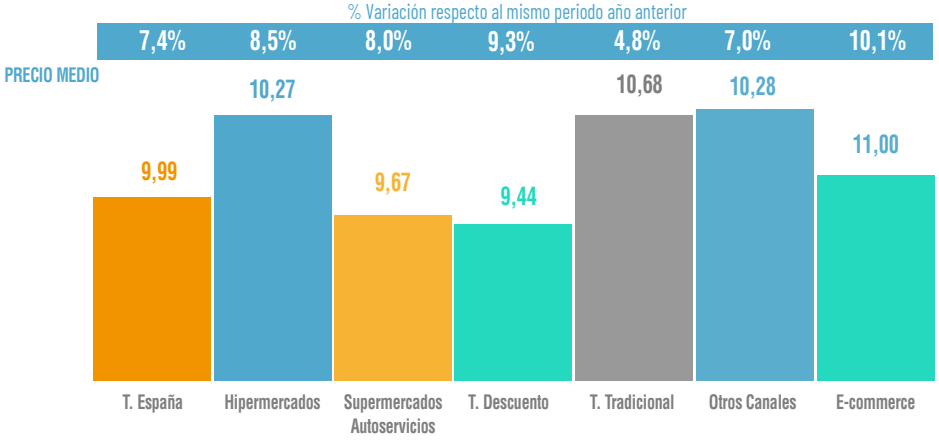


Figure 6-8. Percentage distribution of the average price of fresh aquatic products by sales channels in 2022 vs. 2021 and percentage variation over the previous year (MAPA data).

NOTAS: 1. Esta ficha ha sido elaborada por APROMAR pa distribución restringuida a sus miembros.
2. Fuente: Subdir. Gral. de Estructura de la Cadena Allimentaria. Dir. Gral. Industria y Alimentaria. MAPA

Figure 6-9. Evolution of fish consumption from aquaculture and fisheries in Spanish households between December 2021 and 2022. The quantity (t) and the retail price are indicated (source: MAPA).

6.5. Marketing of sea bream

The average first-sale price of aquaculture sea bream produced in Spain in 2022 was 4.89 euros/kg. This figure is 17.1% higher than the average price of 2021 (4.18 euros/kg). The total value of the 8,932 t of Spanish sea bream marketed has been 43.7 million euros according to APROMAR estimates that do not coincide exactly with those of the MAPA.

The purchase of fresh sea bream fell in 2022 by -14.4% in volume. The average price increased by 5.6% and according to the MAPA Food Consumption Report in Spain 2022, the price remains at € 8.27 / Kg.
It is estimated that on average each Spaniard consumed about 0.67 kg (-14.3% compared to 2021). Sea bream accounted for 0.35% of the value of the purchase of household products.

The prices, according to the first sale in the Mercas, of gilthead bream up to 600 g is reflected in the following table. A trend can be observed in 2022 with a price that increases until July, where it reaches its peak around € 5.8c / Kg and as it progressively decreases in the last quarter until reaching the initial prices of € 4.8 / Kg.

You can see the notable difference between the price of first sale and therefore, the profit of the producer and that of the sale to the final consumer, almost double, in the following table.

The marketing of aquaculture sea bream is mainly carried out through supermarkets and supermarkets. Traditional fishmongers (specialized trade) are the third way of sale. There is also marketing through the extra-domestic channel Horeca (Hospitality, Catering and Catering), but most of the consumption is made in households (approximately 80%). Home consumption of sea bream in 2022 suffered a sharp decline.

At the Mediterranean level, the main market for sea bream continues to be Italy, where some 53,180 t were consumed in 2022. The next three markets are Turkey (57,584 t), Spain (34,462 t), Greece (21,600 t), France (15,250 t) and Portugal (12,090 t).

APROMAR estimates in these 34,462 t the consumption (production + imports - exports) of sea bream in 2022 in Spain, 8.1% less than the previous year. The national harvest of this species was 8,962 t and fishing 600 t, while 29,500 t were imported and 4,600 t were exported. With this, only 14.4% of the sea bream consumed in Spain in 2022 were of national production (assuming that all seabream exports from Spain were of Spanish productive origin). These data do not coincide exactly with the data of the MAPA Consumption Panel that refer only to household consumption while those of APROMAR cover the total consumption in Spain, of this species.

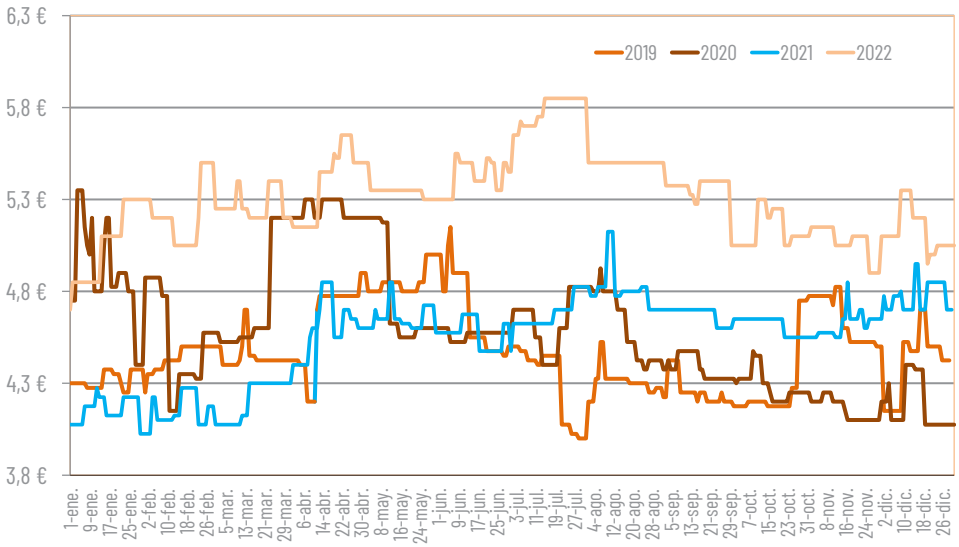


Figure 6-10. Evolution of the average prices (euros/kg) of seabream marketing (400/600 g.) in MercaMadrid and MercaBarna (Mercas starting prices) between 2019 and 2022 (data from the Ministry of Economy and Competitiveness). All price values are nominal and have not been adjusted to changes in the CPI.

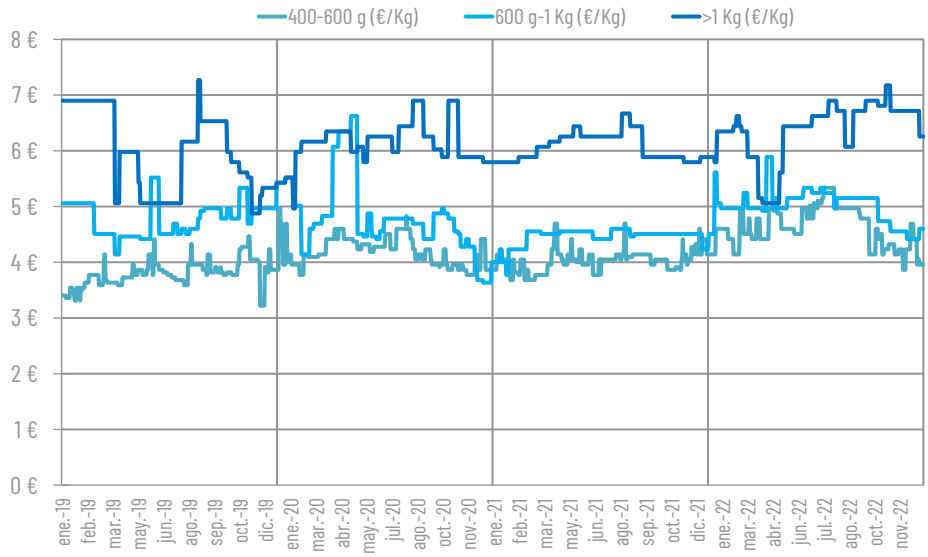


Figure 6-11. Evolution of the average prices (euros/kg) of first sale of gilthead bream in its three main commercial sizes between 2019 and 2022 (Mº of Economy and Competitiveness).

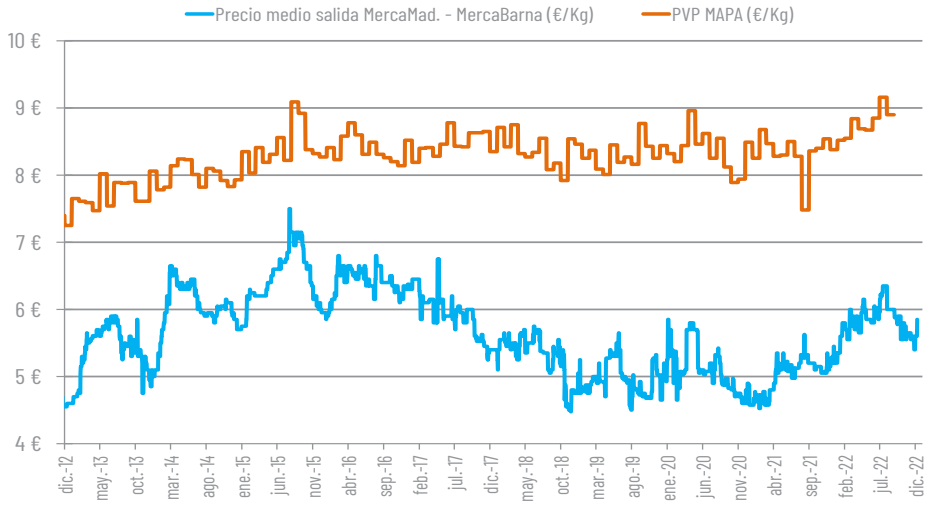


Figure 6-12. Evolution of the prices of Mercas starting sea bream and the RRP between 2012 and 2022 (euros/kg). All price values are nominal and have not been adjusted for CPI variations..

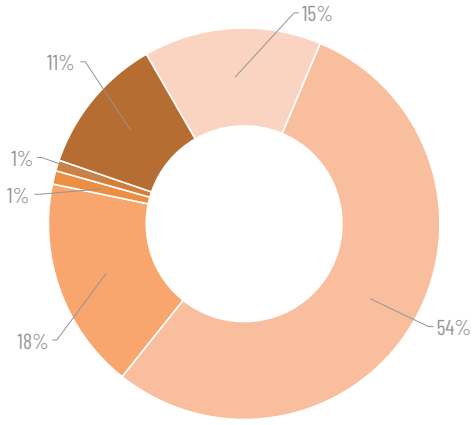
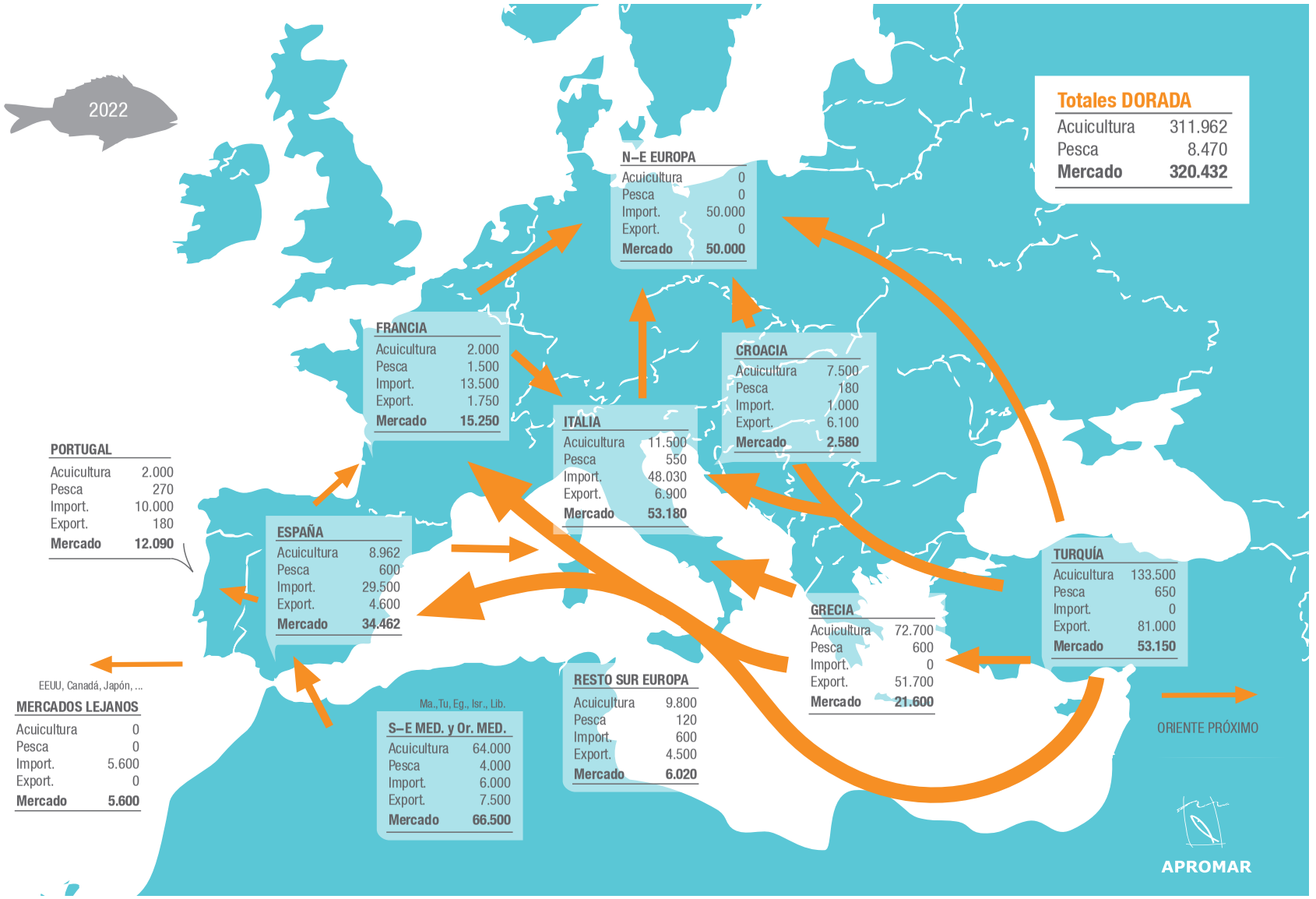


Figure 6-13. Percentage distribution of the country of origin of sea bream marketed in Spain in 2022 according to EUMOFA.

Figure 6-14. Diagram of productions, trade flows and apparent markets of sea bream in Europe in 2022. Based on data from FEAP, FAO and APROMAR.



6.6. Placing on the market of sea bass

The average first-sale price of aquaculture sea bass produced in Spain in 2022 was 5.57 euros/kg. This figure is 19.3% higher than the average price of the previous year, 4.66 euros/kg. The total value of the 23,622 tons of Spanish sea bass marketed was 131.5 million euros according to APROMAR estimates that do not coincide exactly with those of the MAPA.

In 2022, households bought -24.6% less than in 2021, remaining at 30,293 tons, according to the MAPA Consumption Panel. The expenditure on this species also decreased by -17.0%. This figure would mean that each Spaniard consumed about 0.49 kg in the year.

The average price was € 9.95 / Kg according to the MAPA Food Consumption Report.

The prices, according to the first sale in the Mercas, of sea bass up to 600 g is reflected in the following graph. It can be seen how there is a growth from 5.5 €/Kg to 6.6 €/Kg in the first 9 months of 2022 but then there is a notable decrease in the last quarter to go down to 5.3 €/Kg.

It can be observed the remarkable difference between the price of first sale and therefore, the profit of the producer and that of the sale to the final consumer, almost double.

The following graph shows the evolution of the price by size and highlights the increase in the last quarter of the price of sea bass greater than 1 kg.

The marketing of aquaculture sea bass, like sea bream, is mainly carried out through supermarkets and supermarkets. The specialized channel (traditional fishmongers) are the third way of sale. There is also marketing through the Horeca channel (Hospitality, Catering and Catering), but most of the consumption occurs in households (approximately 80%).

The main international markets for sea bass are Spain and Italy, where they have 52,502 and 51,160 tonnes per year respectively. The next markets are Turkey (26,000 t), Greece (12,370 t), France (14,400 t) and Portugal (8,940 t).

APROMAR estimates in these 52,502 tons the consumption (production + imports - exports) of sea bass in 2022 in Spain, 25% more than the previous year. The national harvest of this species was 23,924 t and fishing 1,178 tons, while 35,100 t were imported and 6,800 t exported. With this, 33% of the sea bass consumed in 2022 in Spain were of national harvest (assuming that all seabass exports from Spain were of Spanish productive origin). These data do not coincide exactly with the data of the MAPA Consumption Panel that refer only to household consumption while those of APROMAR cover the total consumption in Spain, of this species.

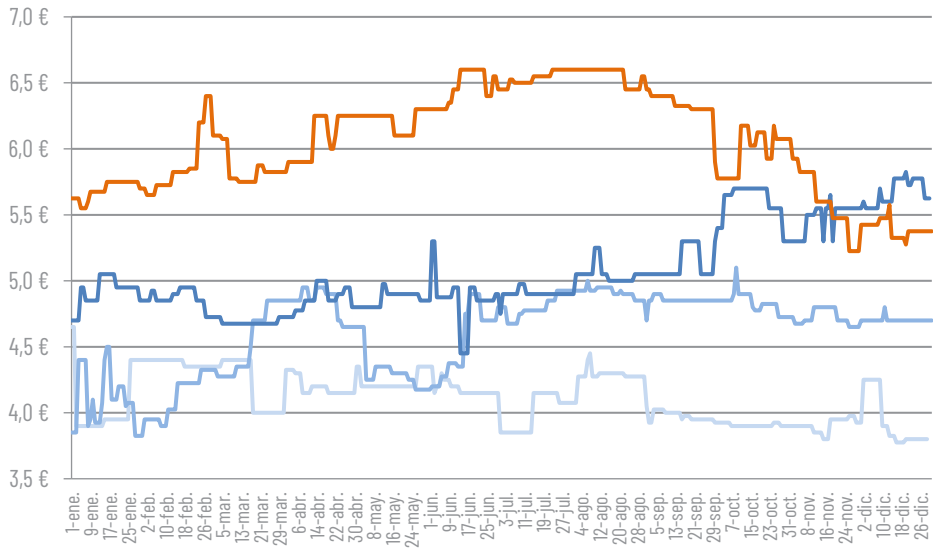


Figure 6-15. Evolution of the average prices (euros/kg) of commercialization of sea bass (400/600 g.) in MercaMadrid and MercaBarna (starting prices of Mercas) between 2019 and 2022 (data from the Ministry of Economy and Competitiveness). All price values are nominal and have not been adjusted for CPI variations.

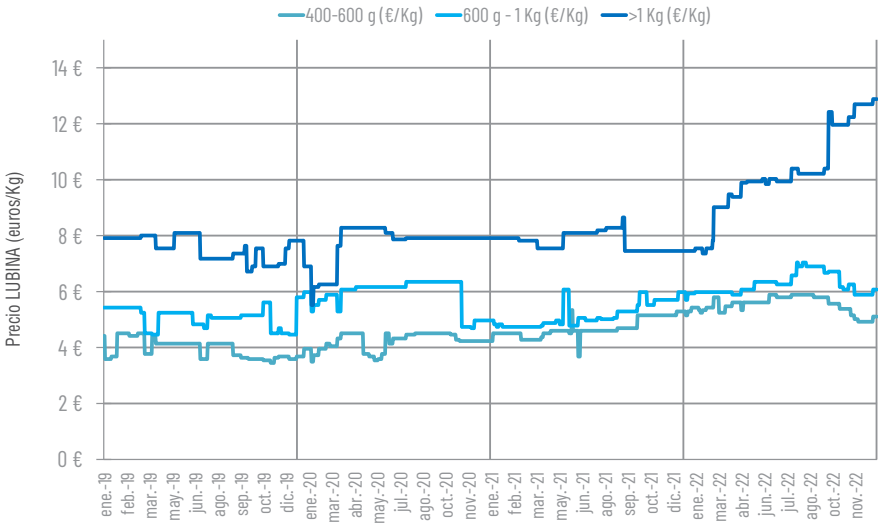


Figure 6-16. Evolution of the average prices (euros/kg) of first sale of sea bass in its three main commercial sizes between 2019 and 2022 (Mº of Economy and Competitiveness).

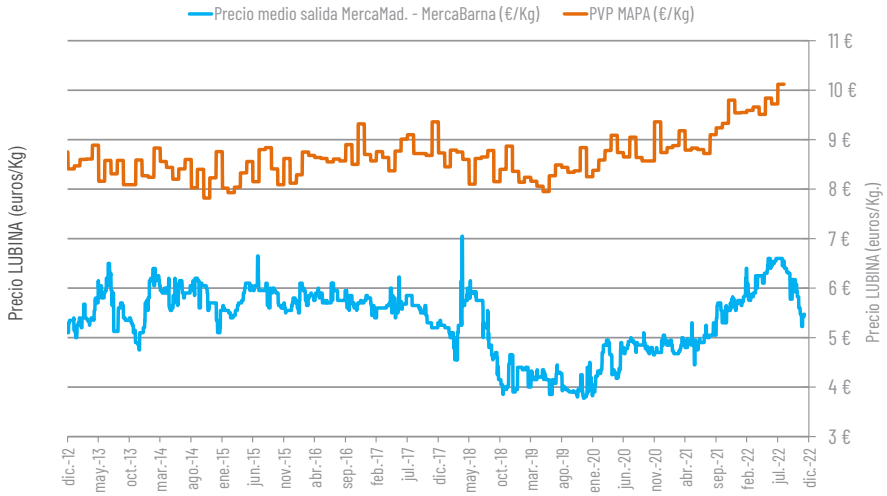


Figure 6-17. Evolution of the prices of Mercas starting sea bass and the RRP between 2012 and 2022 (Euros/kg). All price values are nominal.

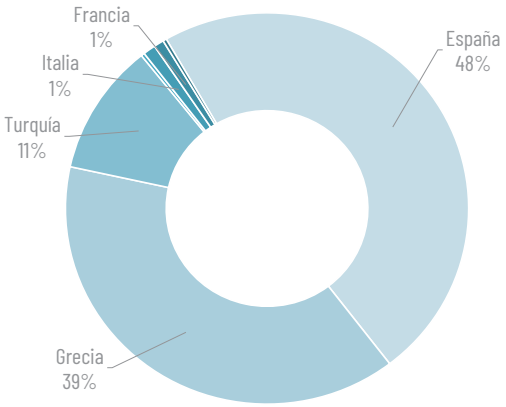


Figure 6-18. Percentage distribution of the country of origin of the sea bass marketed in Spain.

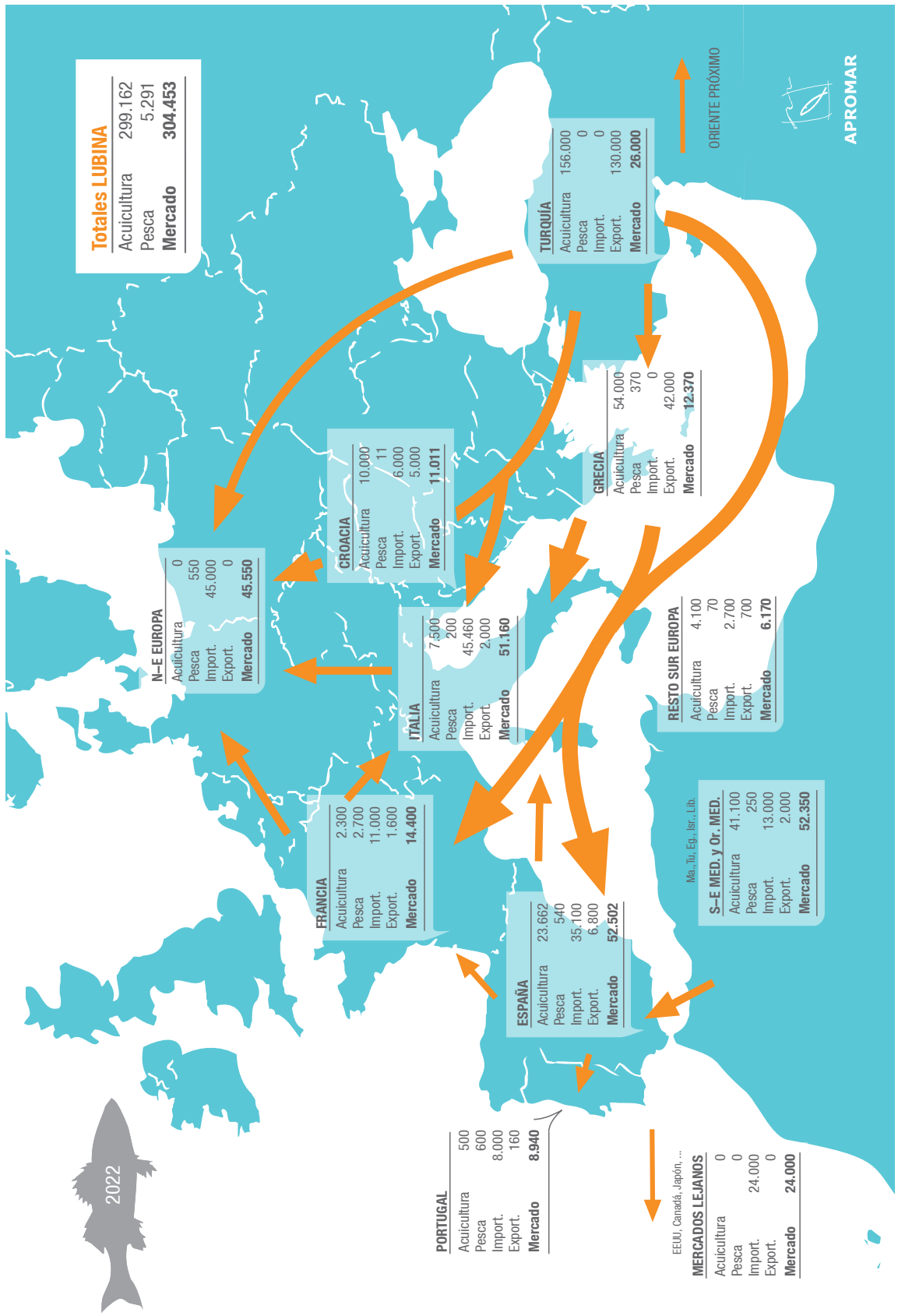


Figure 6-19. Diagram of productions, trade flows and apparent markets of sea bass in Europe in 2022. Based on data from FEAP, FAO and APROMAR.

6.7. Marketing of turbot

Turbot consumption in Spanish households fell by -37% in households in 2022, according to the MAPA Consumption Panel. This figure means a per capita consumption of 0.07 kg.

The average first-sale price of aquaculture turbot produced in Spain in 2022 was 13.12 euros/kg. This figure is 14.2% higher than the previous year.

Spain, according to APROMAR data, produced 8,766 t of aquaculture turbot with an average value in first sale of € 11.61 / Kg, which represents a total value of 101.8 million euros (22.6% more than in 2021) according to APROMAR estimates that do not coincide exactly with those of the MAPA.

According to the comparison of first-sale prices in the markets, in 2022 the price of turbot remained around € 11.5 / Kg in the first quarter and increased significantly from May to end the year with an approximate price of € 14 / Kg.

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 supermarkets. Unlike in the case of sea bream or sea bass, there is a greater tendency to export, due, among other things, to the fact that Spain produces 74% of the aquaculture turbot in Europe. During the pandemic, the consumption of HORECA has been redirected to consumption in households.

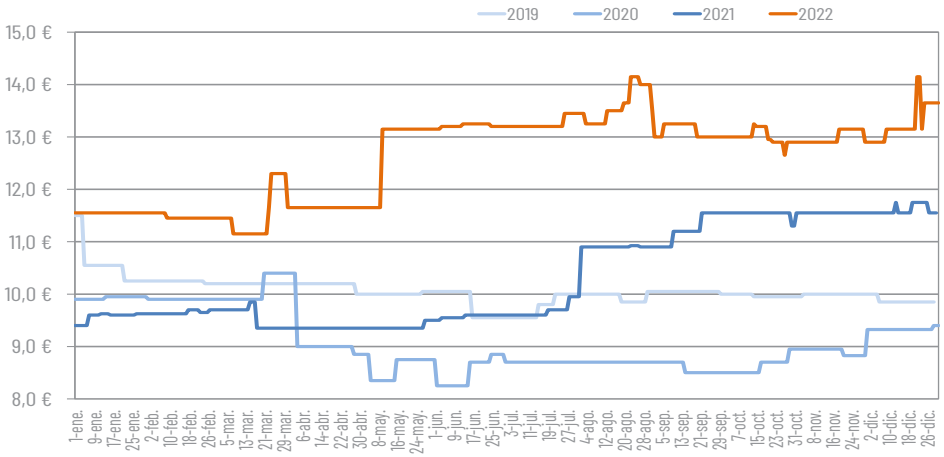


Figure 6-20. Evolution of the average prices (euros/kg) of turbot marketing (1,000/2,500 g.) in MercaMadrid and MercaBarna (Mercas starting prices) between 2018 and 2021 (data from the Ministry of Economy and Competitiveness).

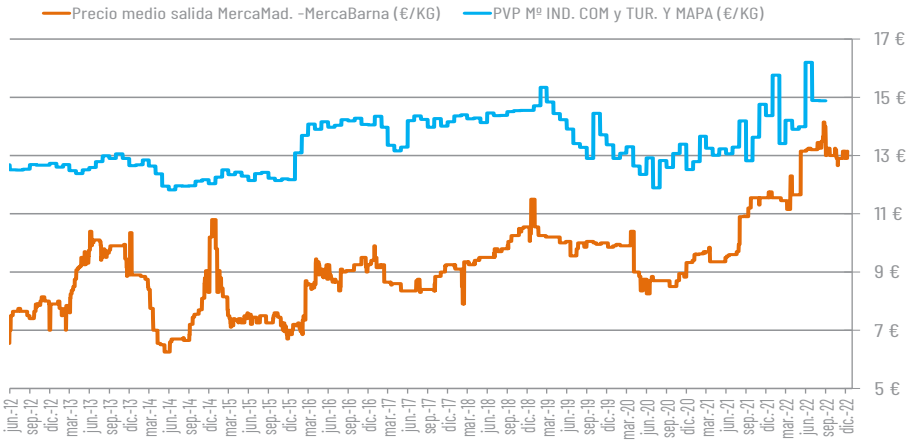


Figure 6-21. Evolution of prices in the commercialization of turbot (1,000/2,500 g.) in MercaMadrid and the RRP between 2012 and 2022. All price values are nominal.

7

Challenges of aquaculture in Spain

7. Challenges of aquaculture in Spain

Aquaculture is an activity that has a remarkable tradition in Spain and is socially and economically relevant in many areas. Aquaculture facilities are located in remote rural, river or coastal areas, where other types of investment are scarcely available and where aquaculture is often the only business activity generating stable and quality employment. In addition, it is an inclusive job, both in productive, technical and managerial jobs. This primary sector, of which this country is the main producer in the European Union, is made up of micro, small and medium-sized enterprises, as well as some large companies. Many of these companies are at the forefront of European aquaculture and attract investors from multiple nationalities. With regard to the commercialization of their productions, they do so both in Spain and in demanding international markets.

Spain is suffering a huge trade deficit in fishery and aquaculture products, which continues to grow exponentially, reaching 3,581 million euros in 2022 (more than 1,000 million more than in 2015). Two out of every three sea bream and one out of every two sea bass consumed in Spain are imported. Food sovereignty is a European and national priority, and the limitations of the traditional fishing grounds of the Spanish fishing fleet are permanent. National aquaculture can and should help alleviate this deficit, with activity that generates wealth and employment throughout the geography of Spain.

As a whole, Spanish aquaculture companies are business-competitive entities, but this position is being severely compromised by several well-identified issues. The most relevant issues are related to the administrative framework that must be complied with and are those that are detailed in this document. This situation limits the growth capacity of companies while reducing their competitiveness by imposing superfluous administrative burdens.

This chapter breaks down the main challenges facing the Spanish aquaculture sector.

SIMPLIFICATION OF THE ADMINISTRATIVE FRAMEWORK

Aquaculture is an activity of the primary food producing sector that takes place, totally or partially, in spaces of public domain. This forces it to comply with numerous regulations in many areas: occupation concessions, emissions, food safety, waste, taxes, fees, etc. This sector must comply with extensive European legislation so that a uniform and consistent application of these rules is necessary for the proper functioning of the internal market. In this sense, it is essential to strengthen the coordination of the different administrations at central and regional level and the dialogue with the sector, so that an adequate implementation and interpretation of the legislation is carried out on issues as relevant as environment, food safety, labeling, etc. Although the competent administrations in the field of aquaculture production are the autonomous communities, the state administration also plays an essential role in its coordination while being central to central issues such as hydrological planning (in rivers), the management of the coastal and marine environment, and the marketing of products. This association is firmly committed to a public-private collaboration that allows the development of this activity in a propitious, stable and positive business environment for the progress of the country as a whole.

In this sense, APROMAR proposes the following questions:

- Holistic review of the administrative framework that applies to aquaculture under the concept of "Better regulation" eliminating unnecessary burdens and promoting measures to increase its effectiveness, efficiency, predictability and transparency. In addition to the fixation, shortening and transparency in the deadlines of administrative procedures.
- Surveillance of the Market Unit in Spain for the benefit of workers, consumers and companies in terms of professional qualifications, fish labelling and traceability requirements. Including the standardization of the regional regulatory framework with regard to the data required for the Registry of Livestock Farms (REGA), the requirements in environmental monitoring plans and port taxes, among other aspects.
- Downward revision of the fees that apply to aquaculture (for example, the rates of state and regional ports) and fees (for example, the discharge into rivers). For this tax reduction, the impact of the Covid-19 crisis and the war in Ukraine must also be taken into account. Both events have tested the aquaculture sector on issues such as the supply of raw materials and inputs, the cost of energy, inflation, the food supply chain and overall operability.
- Sharing between the different administrations of the statistical data provided by the companies in the surveys to which they are obliged by the different state or regional departments. This will avoid redundant surveys and lighten the cost for companies.
- Define maritime spatial planning on all coasts, definitively establishing areas of priority use for aquaculture and high potential for aquaculture. The bioburden capacities in each of these areas must also be determined.
- Define potential areas for aquaculture in watersheds to expedite permitting, facilitating the identification of suitable and unsuitable areas, as an economic development tool for rural areas.
- Promote greater knowledge of the aquaculture sector among public administration staff and legislators. For example, through visits to aquaculture production facilities.

SUPPORT AGAINST DROUGHT

Freshwater is a key resource for freshwater (inland) aquaculture activity and aquaculture companies that depend on it are committed to using it responsibly. It should be noted that this sector is not a consumer of this water since it only needs it as a means of production and returns it to the environment in similar conditions of both quantity and quality. This non-consumptive use of freshwater by aquaculture facilities in rivers is especially critical in times of drought such as the current ones. Taking into account the situation of prolonged drought and water scarcity that is being suffered in a large part of the national territory, it is essential that aquaculture receives special treatment in this type of circumstances, so that it is guaranteed preferential access to water. The damage that drought is causing to the agricultural and livestock sectors affected by the drought is evident. With this, public administrations are offering other sectors aid to alleviate the damage they are suffering. APROMAR requests similar consideration for inland aquaculture enterprises. In this regard, it proposes the following three measures:

- Reduction in fees and fees in a similar way to those offered in Royal Decree-Law 4/2023, of May 11, which adopts urgent measures in agricultural and water matters in response to drought. In addition, the opening of direct economic aid that by simplification could be linear and direct compensation per kilogram of production.
- Make a legislative adaptation so that ecological flows can be temporarily reduced. APROMAR considers that the current ecological flows are oversized in many channels and there is room for this reduction without putting at risk the ecosystems in the affected river sections. With this, the reduction in the water abstractions of the facilities would be less and the damages more moderate.
- Always offer aquaculture companies time periods to adapt to possible reductions in authorized flows. The fish stock in the facilities cannot be modified in a controlled manner from one day to the next.

COMPATIBILITY OF AQUACULTURE WITH OTHER USES OF MARINE SPACE

The coasts and rivers of Spain are areas where many economic and social activities converge, including aquaculture. In this sense, work should be done for the positive integration of activities and take advantage of the positive synergies that arise between them. Aquaculture usually fits easily with other economic activities with which it shares the space but sometimes specific conflicts arise with tourism or fishing that must be resolved to the satisfaction of all parties. Aquaculture is a strategic economic sector within the framework of the EU Blue Economy and synergies must be sought and developed with all those sectors that also operate around the sea. In this sense, public institutions play a central role in arbitrating solutions. APROMAR proposes the following:

- Promote the search for synergies of aquaculture with fisheries, the tourism sector and eco-environmental activities and solutions with an institutional treatment.
- Promote from the political groups the resolution of possible conflicts in local communities aligning local policy with the national and European objectives of the Blue Economy.

RELATIONSHIP WITH SOCIETY

Society is subjected to an incessant rain of information that leads people to ignore basic questions about the production of the food they eat, about the conservation of the environment, about nutritional issues and about food safety. Proof of this is the 20% reduction in the consumption of aquatic products in Spain in the last ten years. With this, significant investments in promotion and consumption campaigns are necessary to aspire to achieve sufficient didactic minimums. In this way, the following is necessary:

- Promote the consumption of aquatic products in Spain. This would benefit people's overall health (including reducing overweight) and support the continuity of the fisheries and aquaculture sectors. These campaigns should be addressed in two ways: by increasing campaigns to promote fish consumption (including for children), and by reducing VAT on aquatic products.
- Implementation of general communication and information actions to society with institutional support on the characteristics of aquaculture. These communication activities should be coordinated with those carried out by the sector itself.

8

Spanish scientific production in the field of aquaculture

8. Spanish scientific production in the field of aquaculture

By Morris Villarroel Robinson, Polytechnic University of Madrid

In this section we will quantify the Spanish scientific production related to aquaculture research, counted in terms of scientific publications, generally called articles. We will consider the evolution in recent years and highlight the production during the year 2022.

Materials and methods

Next, we carry out a quantitative analysis of all the scientific articles in which at least one Spanish scientist has participated, in the most relevant journals for aquaculture in the main collection of Web of Science, a database of scientific bibliographic information managed by the company Clarivate. We have chosen this collection because it is the largest database of scientific publications in the world and allows to evaluate and analyze the performance of research in an objective and contrasted way.

How much have Spanish scientists published about aquaculture in 2021?

To get a general idea about the number of "Spanish" scientific articles published in high-impact journals in 2022, we have used the PRISMA methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which consists of the following four phases: (1) the identification of articles, (2) screening for errors, (3) a check of article eligibility, and (4) the final decision on the items to be included.

First, and before the identification phase, all impact journals associated with the field of aquaculture were selected in the Journal Citation Reports (https://jcr.clarivate.com/), a database within the Web of Science, which allows to have a complete list of journals in a category or field of study. Within the "Fisheries" category, which includes journals specialized in aquaculture, there were 54 impact journals (in 2022), of which 26 have been chosen with an impact factor greater than 1.0 and that publish works on aquaculture, thus avoiding journals more specialized in extractive fishing. The list of the 26 journals selected for the year 2022, their abbreviations and their impact factors are summarized in Table 1.

We identified 144 Spanish publications (articles and reviews) in the Main Collection of the Web of Science, published in 2022. Of these, the titles and abstracts of each article were analyzed to ensure that they corresponded to studies in the field of aquaculture (screening phase). Finally, there were 127 articles, which represents the Spanish scientific production in 2022 in the field of aquaculture in the 26 journals with the greatest impact.

Figure 1 shows the number of Spanish papers in 2022, along with the impact factor of the journal in question. It can be seen that the most popular journal is Aquaculture, with 48 published papers, followed by Fish & Shellfish Immunology with 18 papers and Fishes with 17 published papers.

Table 1. They summarize the journals, their acronyms and their impact factor (IF), in order of impact, chosen to calculate Spanish scientific production in aquaculture during the year 2022.

Full name of journal	Abbreviation	FI
Reviews in Aquaculture	Rev Aquac	10,618
Reviews in Fisheries Science & Aquaculture	Rev Fish Sci Aquac	10,405
Aquaculture	Aquaculture	5,135
Fish & Shellfish Immunology	Fish Shellfish Immun	4,622
Aquaculture Economics & Management	Aquacult Econ Manag	4,016
Aquaculture Nutrition	Aquac Nutr	3,781
Journal of The World Aquaculture Society	J World Aquac Soc	3,402
Aquaculture Reports	Aquacult Rep	3,385
Aquacultural Engineering	Aquac Eng	3,273
Fishes	Fishes-Basel	3,170
Aquaculture Environment Interactions	Aquac Environ Interact	3,149
Canadian Journal of Fisheries and Aquatic Sciences	Can J Fish Aquat Sci	3,102
Fish Physiology and Biochemistry	Fish Physiol Biochem	3,014
Aquaculture International	Aquac Int	2,953
Journal of Aquatic Animal Health	J Aquat Anim Health	2,925
Journal of Fish Diseases	J Fish Dis	2,580
Journal of Fish Biology	J Fish Biol	2,504
Aquaculture Research	Aquac Res	2,184
North American Journal of Aquaculture	N Am J Aquacult	1,977
Knowledge and Management of Aquatic Ecosystems	Knowl Manag Aquat Ec	1,928
Diseases of Aquatic Organisms	Dis Aquat Org	1,769
Aquatic Living Resources	Aquat Living Resour	1,592
Turkish Journal of Fisheries and Aquatic Sciences	Turk J Fish Aquat Sc	1,423
Journal of Applied Icthyology	J Appl Icthyol	1,222
Journal of Shellfish Research	J Shellfish Res	1,218
Latin American Journal of Aquatic Research	Lat Am J Aquat Res	1,022

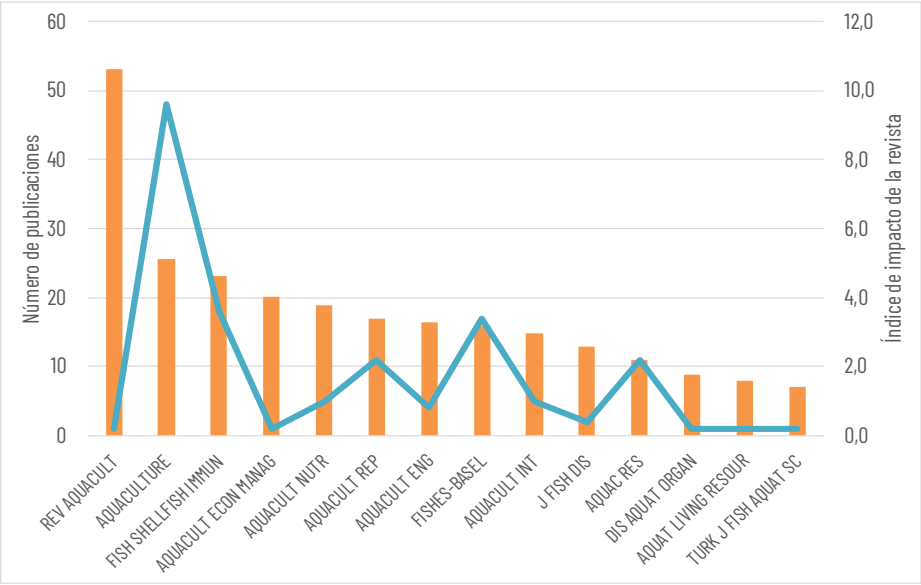


Figure 1. Summary of the number of Spanish publications (articles) (maroon line) in the 14 journals where there were publications in 2022 in aquaculture, internationally and the impact index of each journal (blue bars) in each journal.

Which species have been the target of research in Spain in 2022?

Reviewing the 127 Spanish articles published in 2022, we identified the species under study in each article. Some articles (a total of 4) deal with two or more species. Other articles (a total of 10) are general and do not focus on a specific species. In total the articles dealt with more than 40 different species of fish, crustaceans, molluscs and algae.

Half of the Spanish studies (49.4%) in 2022 corresponded to work on sea bream (*Sparus aurata*), followed by sea bass (*Dicentrarchus labrax*), trout (*Oncorhynchus mykiss*), and tuna (*Thunnus thynnus*). Figure 2 shows the percentage of papers for the 10 most popular species.

What were the most relevant issues?

The 127 Spanish articles published in 2022 were reviewed according to the theme of the study. The main themes were nutrition, physiology, health, production, sustainability, and genetics. Almost 40% of the studies that have been published fall within the field of nutrition, followed by health.

What were the most relevant studies?

We have estimated the importance of each article based on the number of citations it receives from other articles. Likewise, in Table 2 we summarize the 2022 articles that have received the most citations to date (May 2023), along with the authors and the theme. The

Figure 2.
Graph of the percentage of articles by species (blank number in the pie chart) on the total of 127 articles published in 2022. The number of articles per species appears to the right of each species name in the legend (n= number of articles).

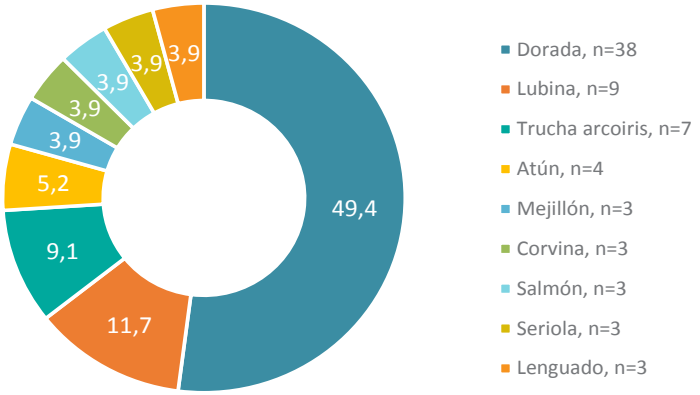
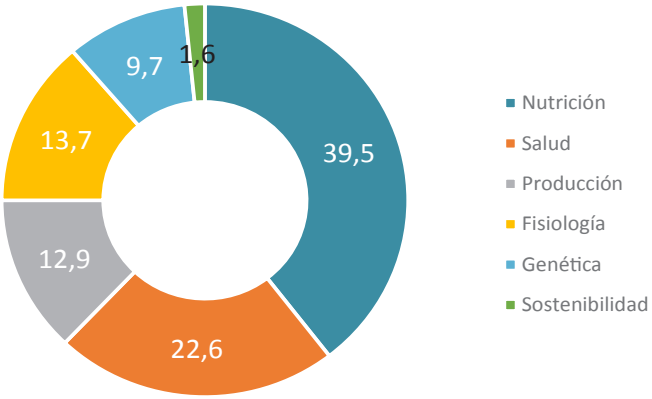


Figure 3.
Graph of the percentage of articles by topic (blank number in the pie chart) on the total of the 127 articles selected in the year 2022.



article with the most citations is from the Aquaculture Research Group-Ecoaqua Institute, of the University of Las Palmas de Gran Canaria on the beneficial effects of the probiotic Bacillus velezensis on the production of sea bass and the immune mechanisms it stimulates.

Table 2. Summary of Spanish articles of the year 2022 with the most citations in the area of aquaculture, included in the 26 chosen impact journals.

Magazine	Authors	Dating	Article title
Fish & Shellfish Immunology	Monzon- Atienza et al.	7	Dietary supplementation of Bacillus velezensis improves Vibrio anguillarum clearance in European sea bass by activating essential innate immune mechanisms
Aquaculture	Sanchez-Jerez et al.	6	Cumulativeclimaticstressorsstranglesmarineaquaculture: Ancillary effects of COVID 19 on Spanish mariculture
Aquaculture	Sanchez et al.	6	AssessingtheeconomicimpactofdiseasesinMediterranean grow-out farms culturing European sea bass
Fish & Shellfish Immunology	Beltran et al.	6	Nature-identicalcompoundsasfeedadditivesinaquaculture
Fishes	Pastorino et al.	6	Changesinserumbloodparametersinfarmedrainbowtrout fed with diets supplemented with waste derived from supercritical fluid

9

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