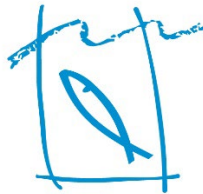


# Aquaculture in Spain

# 2024

LAYOUT EDITING



**APROMAR**

Asociación Empresarial de Acuicultura de España

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# 1. Executive Summary

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## 1.1. Aquaculture in Spain

- ❖ The aquaculture harvest in Spain in 2023 was 266,066 tonnes and a value at first sale of 750.5 million euros. The most abundant species was the mussel (*Mytilus spp.*), with 182,790 tonnes and an estimated value of €127.6 million. Followed by sea bass with 24,580 t and a value of €202.7 million; rainbow trout with 14,757 t and a value of €49.7 million; sea bream with 13,106 tonnes with a value of €75.5 million and bluefin tuna with 9,744 tonnes with a value of €136.2 million. According to MAPA data.
- ❖ In 2022, there were 5,057 aquaculture establishments in production. Of which 4,802 of molluscs and 252 of fish (149 in inland waters, 63 of seawater on land and 40 in nurseries in the sea).
- ❖ Employment in aquaculture in Spain in 2022 was 5,878, 2.73% more than in 2021. It was distributed among 10,253 people, (1,110 people less than the previous year). The majority of employees, 5,446 people, were non-salaried (self-employed), mainly in the mussel subsector. In 2022, the total number of employed women was 3,077 (30.0%) compared to 7,177 men (70.0%).
- ❖ In 2023, 181,000 tonnes of fish feed were used in Spain, 5.8% more than in 2021 (171,000 tonnes). The amount of aquaculture feed used in Spain barely accounts for 1% of the total livestock feed consumed in this country.
- ❖ The marine fish harvest in Spain in 2023 was 65,848 t, 12.2% more than in 2022 (58,664 t). The value of this production at first sale is estimated at €605.2 million, 3.3% more than in 2022 (€585.7 million). The Valencian Community topped the list with a total of 21,227 tonnes. Production is expected to remain stable in 2024, or with a slight increase of around 2.5% and occurring mostly in the Valencian Community, Catalonia and the Canary Islands.
- ❖ The aquaculture sea bream harvest in Spain in 2023 was 13,106 t, (+46.7%) and a value at first sale of €75.5 million. By 2024 it is estimated that it will remain stable. The Valencian Community led production with 9,360 t, 66.5% more than in 2022 (5,620 t), accounting for 71% of the total; followed by the Canary Islands 1,460 tonnes (11%); Andalusia 926 t (7%), Catalonia with 850 t (6% of the total) and the Region of Murcia with 510 t (4%). The production of juvenile sea bream in Spain in 2023 was 14.3 million units and it is estimated that production in 2024 will be higher and reach 20.3 million units. It was led by the Valencian Community (45% of the total) and followed by the Balearic Islands (42%) and the Region of Murcia (13%).

- ❖ The sea bass harvest in Spain in 2023 was 24,580 t, 4.0% more than in 2022 (23,622 t) and a value of €202.7 million. The Region of Murcia has led production with 7,580 t (31% of the total), followed by the Valencian Community (5,700 t, 23%), the Canary Islands (5,426 t, 22%), Andalusia with 5,024 t (20%) and Catalonia with 850 t (3%). By 2024, growth of 8.6% is expected with a sea bass harvest in Spain of 26,700 t. (I suggest joining this paragraph with the next one.) The production of juvenile sea bass in Spain in 2023 was 49.9 million units. The production of juvenile sea bass in Spain was carried out in the Balearic Islands (68%), the Valencian Community (27%) and the Region of Murcia (5%). By 2024 it is estimated to increase to 46.5 million units.
- ❖ Bluefin tuna aquaculture production in Spain in 2023 was 9,744 t and a similar production is estimated for 2024. The total estimated value of this production in Spain was €136.2 million.
- ❖ Rainbow trout production in Spain in 2023 is estimated to be 14,757 tonnes, 9.6% less than in the previous year, with a value of €49.7 million. By 2024, a slight growth is expected with about 15,400 t. Rainbow trout production is changing in recent years, with larger trout being farmed.
- ❖ In Spain, 4.4 t of caviar were produced in 2022 and 121 t of sturgeon meat. The two main species produced are Adriatic sturgeon and, to a lesser extent, Siberian sturgeon.
- ❖ The turbot harvest in 2023 in Spain according to APROMAR data was 9,600 t, 9.5% more than the previous year (8,766 t), and a value of €79.9 million. It is expected to remain similar in 2024. Galicia was the only turbot-producing autonomous community in Spain. (I suggest joining this paragraph with the next one.) The production of juvenile turbot in Spain in 2023 was 12.7 million units.
- ❖ Corvina production in 2023 was 7,383 tonnes, 55.7% more than in 2022 and with an estimated value at first sale of 35.7 million euros. The production of Spanish sea bass comes from the Valencian Community, the Region of Murcia and Andalusia. A similar production is expected for 2024. (I suggest joining this paragraph with the next one.) In Spain, some 2 million sea bass juveniles were obtained in 2023 mainly in the Region of Murcia, and a smaller number in Andalusia.
- ❖ In 2023, 1,077 tonnes of sole were produced from aquaculture in Spain, - 11.9% less than in 2022 (1,222 tonnes) with a value of €14.8 million. This production was located in Galicia (82.6%) and Andalusia (17.4%). The 2024 harvest is estimated to increase to 1,200 t. (I suggest joining this paragraph with the next one).
- ❖ In Spain, some 15.5 million sole juveniles were obtained in Galicia (94%), and a smaller number in Andalusia (6%), in 2023 and is expected to grow to 16.5 million in 2024.

- ❖ In 2023, according to APROMAR data, the cultivation of *Seriola dumerili* in Spain decreased to 44 t, i.e. -68.3% compared to 2022 (163 t). It is expected that in 2024, production will increase to 100 t. A total value of €0.6 million is estimated. As for juveniles, 0.35 million units were produced in Andalusia, and it is estimated that production in 2024 will double and reach 0.7 million units. This denotes the great interest that this species is generating.
- ❖ The Spanish production of European eel in 2023, mainly located in the Valencian Community, was 340 t. Its purpose is both the repopulation of rivers and for consumption. An estimated value of €3.8 million.

## **1.2. Aquaculture in the European Union and in the world**

- ❖ According to the Food and Agriculture Organization of the United Nations (FAO), global aquatic production (fisheries and aquaculture) in 2022 was 223.2 million tonnes, up 6.6% from 2020, representing a record volume. It is the first time that aquatic animal aquaculture has surpassed extractive fishing in production worldwide. Total aquaculture production, including algae, has already exceeded that of extractive fishing since 2013.
- ❖ In 2022, global aquaculture production reached 130.9 million tonnes, valued at €250,240 million, 59% of total global fisheries and aquaculture production.
- ❖ In 2022, the total aquatic production of the European Union (aquaculture plus fishing) totaled 4,778 thousand tonnes, 2.1% less than in 2021 (4,881 thousand tonnes). The decline in production continues for the fifth consecutive year with an average of -4.7% in those 5 years. As for the value of production in 2022, it was €4,018 million, 1.4% less than in 2021 (€4,073 million).
- ❖ The mussel continues to be the most produced species in the EU (27) in 2022 with 410,909 tonnes, -4.1% less than in 2021 (428,373 tonnes). Rainbow trout is the second most farmed species with 169,930 t, -10.2% less than in 2021 (189,327 t). The third place is occupied by sea bream with 106,837 tonnes, 5% more than the previous year (101,771 tonnes). Japanese oysters are in fourth place with 100,793 tonnes, 5.8% more than in 2021 (95,289 tonnes). Sea bass is in fifth place with 90,883 tonnes, -5.0% less than in the previous year (95,652 tonnes), according to FAO data.
- ❖ The list of producing countries within the European Union is led by Spain with a production in 2022 of 276,071 tonnes, with a decrease of 1.4% compared to 2021 (279,912 tonnes), according to the FAO. France is the second largest producer and in 2022 harvested 200,490 tonnes, 3.7% less than in 2021 (143,926 tonnes). It is followed by Italy with 132,661 t, -9.1% more than in 2021 and Poland with 46,110 t, a 3.0% increase. Spain accounted for 24.6% of the EU's entire production volume, followed by France with 17.9%, Greece with 12.7%, Italy with 11.8% and Poland with 4.1%, as the main producers.
- ❖ Aquaculture in the EU (27) in 2022 took place mostly in marine waters (75.9%) and 24.1% in freshwater.

- ❖ In 2022, 570.2 thousand tonnes of fish were farmed in the EU (27) with a value of €2,885 million. The value of fish production remained practically stable with a slight growth of 1.0% from €2,843 million in 2021 to €2,885 million in 2022.
- ❖ Total aquaculture production of sea bream (*Sparus aurata*) in Europe and the rest of the Mediterranean in 2023 is estimated at 332,966 t, -5.1% less than in 2022 (350,933 t) according to statistics from APROMAR, FEAP and FAO. A slight increase is expected in 2024, to a production of around 335,000 t. (I suggest joining this paragraph with the following one).
- ❖ The total value in the first sale of Mediterranean aquaculture sea bream harvested in 2023 is estimated at €1,665.2. (I suggest joining this paragraph with the next one.)
- ❖ The total production of juvenile sea bream in 2023 in Europe (including Turkey) is estimated to be 662.3 billion units, -2.5% less than in 2022 (704.7 million units).
- ❖ Total aquaculture production of sea bass (*Dicentrarchus labrax*) in Europe and the rest of the Mediterranean arc in 2023 was 284,438 tonnes, -6.3% less than in 2022 (303,586 tonnes), according to consolidated statistics from FAO, FEAP and APROMAR. By 2024 it is estimated that it will remain stable or slightly higher (3.0% more). (I suggest joining this paragraph with the next one.)
- ❖ The total value of aquaculture sea bass in 2023 was approximately €1,564.4 million. (I suggest joining this paragraph with the next one.)
- ❖ The production of juvenile sea bass in 2023 in Europe (including Turkey) amounted to 705.6 million units, -1.6% less than in 2022.
- ❖ The total production of turbot (*Scophthalmus maximus* = *Psetta maxima*) from aquaculture in the world in 2023 was 75,140 t, 3.3% more than the previous year (72,753 t). In Europe, the main producing country is Spain, which harvested 9,600 tonnes (12.8% of the total), 9.5% more than in 2022 (8,766 tonnes).
- ❖ In 2023, the global harvest of Senegalese sole (*Solea senegalensis*) from aquaculture was 2,284 tonnes, -10.5% less than the previous year (2,553 tonnes). By 2024 it is expected to increase by another 10% to about 2,600 t. These are data collected by FEAP and APROMAR.
- ❖ The global production of bluefin tuna from aquaculture (Pacific, Atlantic and South) estimated with 2022 data from FAO and APROMAR estimates was 70,244 t, which was an increase of 0.6% compared to the previous year (69,810 t).

- ❖ The production of sea bass (*Argyrosomus regius*) from aquaculture in the Mediterranean area in 2023 is estimated at 58,672 tonnes, 17.1% more than in 2022 (50,088 tonnes).
- ❖ Global aquaculture production of rainbow trout (*Oncorhynchus mykiss*) in 2022 was 1,004,161 t, an increase of 4.4% over the previous year with 961,765 t.
- ❖ Global caviar production was around 450 tonnes in 2022 according to FAO, of which 180 tonnes were produced in the European Union (27) (40%) according to FEAP.

## 2. Introduction

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The unstable world situation, with a high dose of political and economic uncertainty, marked by two main invasions: the one that has continued since February 2022 from Russia to Ukraine and the one that began in October 2023 from Israel to the Gaza Strip. Both have caused crises on several levels. Apart from the humanitarian crises, both conflicts are causing a strong imbalance in the global economy and therefore in the markets. They are particularly affecting sectors such as energy, with a notable increase in oil and gas prices, although recently mitigated, in addition to the previous inflationary pressure that has now also been resolved. In addition, the humanitarian crisis in Gaza will divert resources and attention from other global crises, further complicating post-pandemic economic recovery and efforts to address other challenges such as climate change.

Faced with the worrying situation, all governments have implemented measures both individually and as a group, as in the case of the European Union. The World Bank launched an aid package aimed at guaranteeing 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 Fund for Fisheries and Aquaculture-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 annual report of APROMAR it is worth remembering that aquaculture is the production of animals and algae in the water using techniques aimed at making more efficient use of natural resources. It is an activity equivalent to what livestock and agriculture are on land. It encompasses varied practices and a very wide range of species and production systems. One of the distinguishing features of fishing is that, throughout all or at least 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 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 all other 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 a different way in each of them. But this aid is punctual and there are several open fronts.

In Spain, the end of 2023 was especially complicated due to the drought, which has been conditioning the continuity of fish production in rivers. This has been added to the increase in the price of inputs (feed, oxygen and energy), transport costs, emerging diseases and production from third countries such as Turkey, which have boosted their export of rainbow trout at low prices in the EU. Since continental aquaculture is an activity that makes a non-consumptive use of water, that is, that does not use it and that returns it in the same or better condition to the environment, that generates employment in rural areas where it is difficult to reach another type of investment and that, therefore, helps to fix population, 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 make it very difficult for the sector to grow and get out of its stagnation. In 2023 it has faced strong price competition with other countries such as Turkey and Croatia that have introduced large quantities of fish to markets and emerging animal pathologies. For this reason, the business strategies have been to optimize resources and consolidate without risks and little growth.

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

A global situation like the one we are experiencing is a niche of opportunities, changes, adaptation and improvement of habits and way of life. It is time for aquaculture to take its rightful place as a key activity to feed the population while respecting the natural environments in which it is developed, as 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 requirement for fresh water is minimal, that the reproduction rates of aquatic animals are several orders of magnitude higher than those of terrestrial vertebrates, and that aquatic animals are more efficient converters of their food because they float in water and do not consume energy to maintain their body temperature.

Every day the population is more aware of the characteristics of the food they buy and consume. Citizens are 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 avenue for 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 declining 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 also 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 VAT on these products because they are highly healthy and carrying out national campaigns on their benefits.

Aquaculture will continue to have the Common Fisheries Policy (CFP) although, APROMAR hopes that changes will soon be made to it and make it more executive. It is also hoped that quantitative targets should be set for aquaculture at European Union level. In addition, it will continue to be protected under the Common Market Organization (CMO) as key tools for its development.

In addition, associations such as APROMAR, Producer Organizations, have been considered essential to carry out collective actions that allow the development of the sector in an integrated way through R+D+i actions and projects. These collective actions may be carried out supported by the European Maritime Fund for Fisheries and Aquaculture (EMFAF) which came 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 funding compared to the previous fund (EMFF) and aquaculture production remains stagnant and the consumption of aquatic products in general is falling.

APROMAR is aware of the difficulties that the sector has been accumulating for several years and thanks to its Production and Marketing Plans (PPyC) and with the help of the General Secretariat of Fisheries of the Ministry of Agriculture, Fisheries and Food, it is making important use of this fund obtaining innovative results for companies in terms of fish health and welfare. sustainability of feed, 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, the 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, aquariums or scientific research.

This publication is an exercise in sectoral transparency that respects the right to free competition. In its drafting, the publication of confidential information relating to the strategies of the producing companies from which anti-competitive practices could be derived has been avoided. Its objective is only to provide basic aggregate 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 data contained in this report has been collected and processed by APROMAR. In addition to the information collected by the association itself among its members, 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 Advisory Board on Aquaculture (JACUMAR-JACUCON) has also been a relevant source of data.

#### INFORMATIVE NOTES:

- This study refers only to quantities produced and placed on the market of species by aquaculture companies. All references to the term "production" refer to quantities produced and marketed. The volumes of product in the process of production (increase in biomass), but not yet harvested, are not considered.
- The weight of the species produced refers to live weight. All references to production volumes refer to weight prior to gutting or processing, if any.
- The value of world aquaculture productions 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 price time series, 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 to the figures published for the same years in previous editions of this same report.
- "First sale" means the sale made by the primary producer (aquaculturist) to the first commercial link in the value chain.

#### NOTES ON STATISTICS

- The data used for the preparation of this 2024 report refer 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 2022. While the data resulting from the surveys carried out by APROMAR and FEAP refer to 2023. When possible, a forecast for 2024 is offered.
- The statistical compilation of aquaculture productions in Europe for this report presents data from the European Union (27) separately in order to disaggregate them from those for Norway and Turkey.

The purpose of this report is to disseminate the information contained therein. To this end, APROMAR authorises the use by third parties of the text, graphics and tables shown therein on the sole condition that APROMAR is cited as the source.

## 3. Aquaculture in the world

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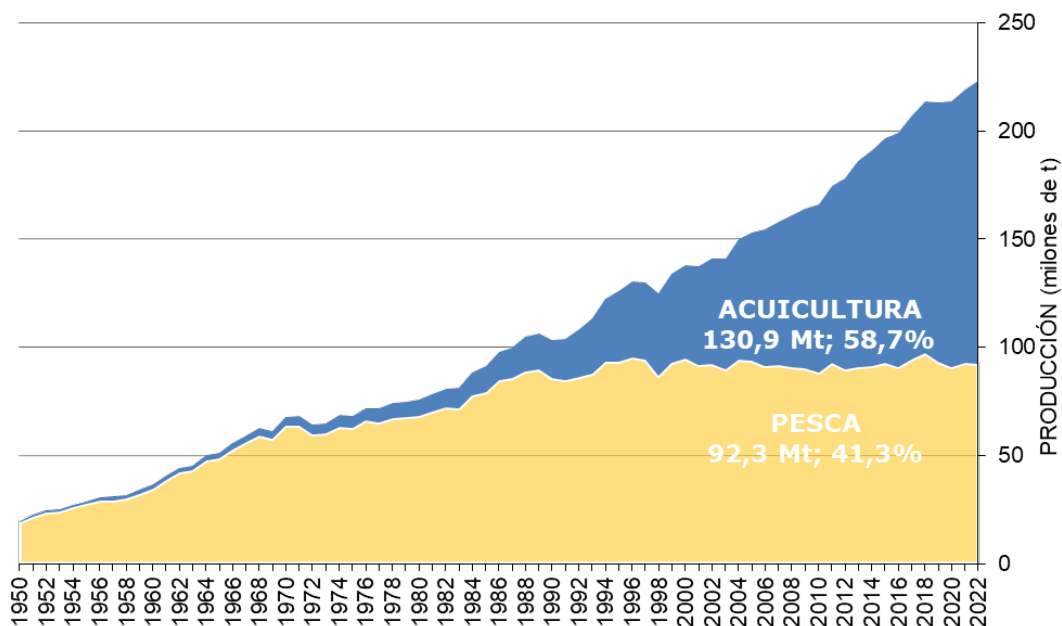
### 3.1. Global availability of aquatic products

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 FAO (Food and Agriculture Organization of the United Nations) Sofia Report published in 2024, aquatic products provided 15% of the world's animal protein and 6% of total protein in 2021, making an essential contribution to 3,200 million people (at least, at 20% per capita protein supply, about 20.7 kg /per capita). In general, lower-income countries are more dependent on aquatic animal protein and higher-income countries are less dependent. In several Asian and African countries, they exceed 50% of proteins.

In addition to offering high-quality, easily digestible protein 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), global aquatic production (fisheries and aquaculture) in 2022 was 223.2 million tonnes, up 6.6% from 2020, representing a record volume. Of this volume, 185.4 million tonnes were aquatic animals and 37.8 million tonnes were algae. 62% of aquatic animals have been from marine areas (69% from fishing and 31% from aquaculture, and 38% from inland waters (84% from aquaculture and 16% from fishing). Extractive fishing contributed 91.0 million tonnes (49%) and aquaculture 94.4 million tonnes (51%). It is the first time that aquatic animal aquaculture has surpassed extractive fishing in production worldwide. Total aquaculture production (animals plus algae) has exceeded that of extractive fishing since 2013. The following graph shows the total production of fisheries and aquaculture.

*Figure 3-1. Evolution of world aquatic production (aquaculture plus fishing) in the period 1951-2022 (FAO).*

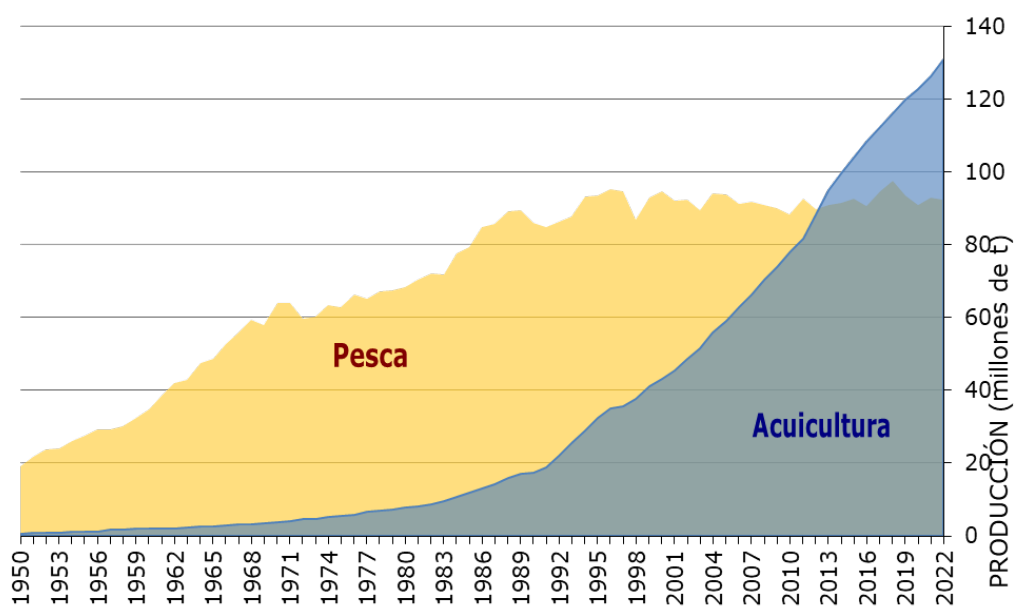


*Global aquatic production (aquaculture + fisheries) in 2022 was 223.2 million tonnes. Aquaculture, with a growth of 6.6% since 2020, surpassed (51%) for the first time extractive fishing in aquatic animal production.*

Fish aquaculture, and specifically inland water aquaculture, has experienced the greatest growth. It accounted for 58.1% of the total in 2022, followed by crustaceans (24.6%) and molluscs (15.6%). In other words, the production of fed species continued to exceed that of non-fed species, accounting for 73.3% of the total (it was 60.3% in 2020) according to FAO's Sofia Report.

Since 2017, total aquatic production has exceeded 200 Mt. In the same year, the increase in production volume compared to the previous year was 4.0%, going from 198.9 Mt in 2016 to 206.8 Mt in 2017. During 2019 and 2020, overall growth slowed dramatically, to less than 1.0%. This decline was mainly marked by the decrease in catches from extractive fishing, logically, given the circumstances experienced worldwide in those years. In fact, the volume of catches decreased by 4.1% in 2019 (93.5 Mt) compared to 97.5 Mt in 2018 and an additional 2.7% in 2020 (91.0 Mt) compared to 2019 according to FAO data. However, during those years aquaculture experienced a progressive increase in its production. In 2019 the increase was 3.3% (119.8 Mt) compared to 116.0 Mt in 2018 and 2.5% in 2020 (122.8 Mt) compared to 2019. It is necessary to highlight the great effort of these sectors to generate food for the population in the complicated situation that was experienced in that period. It is in 2021 when the extractive fishing sector once again experiences positive growth (2% with 92.8 Mt), aquaculture continues with a positive annual increase in 2021 (2.8%, with 126.2 Mt) and in 2022 (3.7%, with 130.9 Mt).

Figure 3-2. Evolution of world aquaculture and fisheries production in the period 1952-2022 (FAO).



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

By analyzing the data shown in the graphs above, it can be discerned that aquaculture is the key activity that underpins the increase in the supply of aquatic products worldwide. This is because, as mentioned above, the sustainable extractive fisheries sector has reached its Maximum Sustainable Yield (MSY) in numerous fisheries and has had a stabilized volume for almost 30 years, ranging between 80-90 million tonnes. In any case, it is expected that global extractive fisheries will continue to recover and may increase by around 6% in 2030 to reach 96 million tonnes.

FAO predicts a growth in aquatic animal production of around 10% until 2032, driven mainly by aquaculture and the recovery of extractive fisheries. But it believes that it must be done by ensuring sustainable growth that promotes both corporate profits and environmental conservation. To this end, she believes that greater recognition of small-scale fisheries and measures at the global level are necessary, since it is estimated that it contributes to 40% of the world's catches and supports 90% of the workforce in this extractive fishery (including 40% of women who work in the value chain).

FAO is promoting its "Blue Transformation" programme to support efforts to improve aquatic food production with the aim of generating healthy diets from healthy oceans, lakes and rivers. The United Nations Food Systems Summit and the United Nations Framework Convention on Climate Change recognize the potential of aquatic foods to contribute to food security, nutrition and poverty reduction.

*In addition to the sustainable growth of aquaculture, fisheries management and the improvement of value chains are also key to providing healthy food while ensuring social, economic and environmental sustainability.*

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 constraints of the extractive sector, it is key to promote the increase in aquaculture production in order to meet present and future global needs. Especially considering that, according to the FAO, the consumption of aquatic foods of animal origin has reached 165 Mt, increasing almost twice the rate of growth of the world population (it has grown at a rate of 3% since 1961, compared to 1.6% of the growth rate of the world population). This has been possible thanks to technological advances in food preservation and distribution, the increase in major supplies, changing consumption trends, and higher incomes.

It is expected that the consumption of aquaculture products can provide an average of 21.4 kg per capita in 2030 (15% more than today) promoted by increasing people's incomes and urbanization, improvements in post-harvest value chain practices and changing food trends.

The fisheries and aquaculture sectors are the livelihoods of millions of people around the world. FAO estimates that 61.8 million people are working in fisheries-related activities (54%) and aquaculture (36%) in 2022. 85% of these workers in Asia, 10% in Africa, 4% in Latin America and the Caribbean and in Europe, Oceania and North America together accounted for 1%. Of the total, 24% of workers are women (28% in aquaculture and 18% in extractive fishing).

On the other hand, international trade in aquatic products continues to grow. In 2022, a record figure of 156,000 million euros was generated. Trade in aquatic animal products accounted for 9.1% of total agricultural trade and more than 230 countries participated. The average annual growth from 1976 to 2022 has been 7.2% and has been thanks to new trade policies, lower transport costs, technological, logistical and storage improvements.

China remains the world's largest exporter of aquatic foods followed by Norway, Vietnam, Ecuador and Chile, according to FAO. The European Union was the largest market importing aquatic products of animal origin for 50,160 million euros in 2022 and the largest importer individually was the United States of America (17%) followed by China (12%), Japan (8%), Spain (5%) and France (4%).

Of the total seafood products, the proportion for direct human consumption has risen from 67% in 1960 to 89% in 2022. The rest is mainly used as a 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, in 2022 it accounted for 34% of the world's fishmeal production and 53% of the production of fish oils, according to the FAO.

### **3.2. Status of aquaculture in the world**

Aquaculture is an activity aimed at raising and producing 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 aquaculture adapted to the characteristics of its environment and the species that are raised there. Aquaculture is therefore a very diverse activity and adaptable to different environments and ways of life. This is a relevant socio-economic activity for the development of local communities, especially in environments where other economic activities are not viable and in developing countries where there are greater needs for healthy and nutritious food. In particular, the contribution of omega-3 polyunsaturated long-chain fats (EPA and DHA) contained in seafood are key to maintaining people's health and quality of life.

In addition to direct jobs on farms, there are jobs generated by the wide range of ancillary activities in support of aquaculture, such as processing and processing, packaging, marketing and distribution, manufacture of equipment, nets and technologies, production and supply of ice, 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.

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

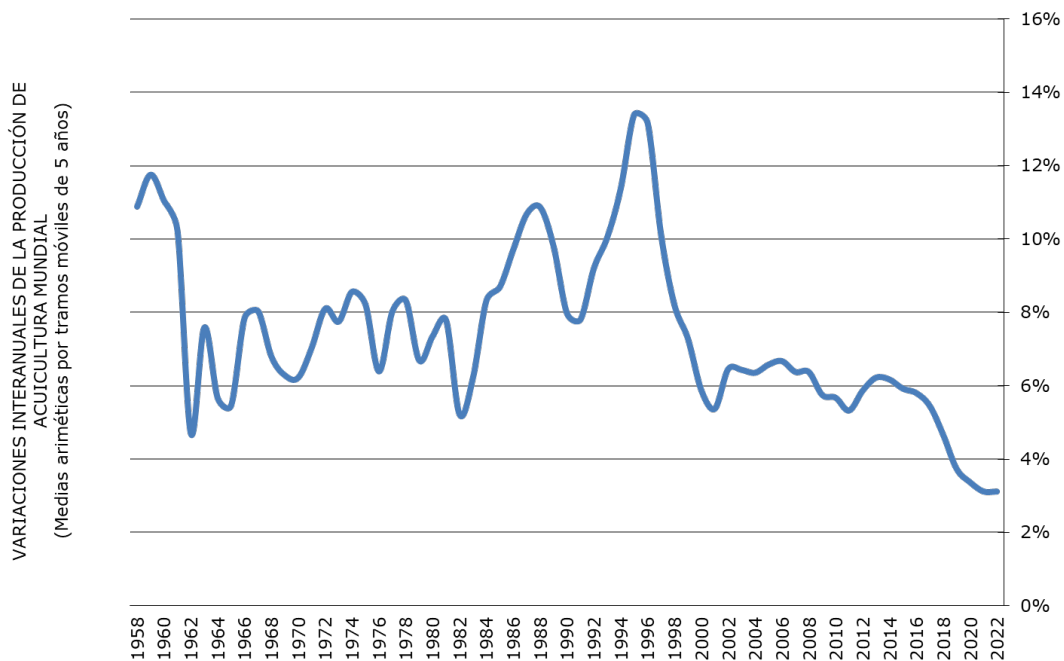
On the other hand, aquaculture is the activity with the lowest carbon footprint of livestock production activities and that is why FAO considers that aquaculture contributes to the efficient use of natural resources, food security and economic development, with a limited and controllable impact on the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

In 2022, global aquaculture production reached 130.9 million tonnes, valued at €250,240 million, 59% of total global fisheries and aquaculture production.

*In 2022, global aquaculture production reached 130.9 million tonnes, valued at €250,240 million, 59% of total global fisheries and aquaculture production.*

*Figure 3-3. Evolution of the year-on-year growth of world aquaculture production in the period 1957-2022, calculated on arithmetic averages by 5-year rolling periods to attenuate short-cycle oscillations (from FAO).*





To assess world aquaculture production, data from 1950 are taken into account. In that year, global production was 638.5 thousand tons, taking into account that in 2022 it has been 130.9 Mt, the growth has been very remarkable in the last 70 years.

Analysing the 5-year moving averages by rolling brackets, it can be seen that a growth rate of over 3.0%. The average year-on-year growth in the 1990s was very high, at 9.3%, rising to 6.0% between 2000 and 2010, and to 4.5% in the last 10 years. It is in 2021 and 2022 where growth is lower, at 3.1% each year.

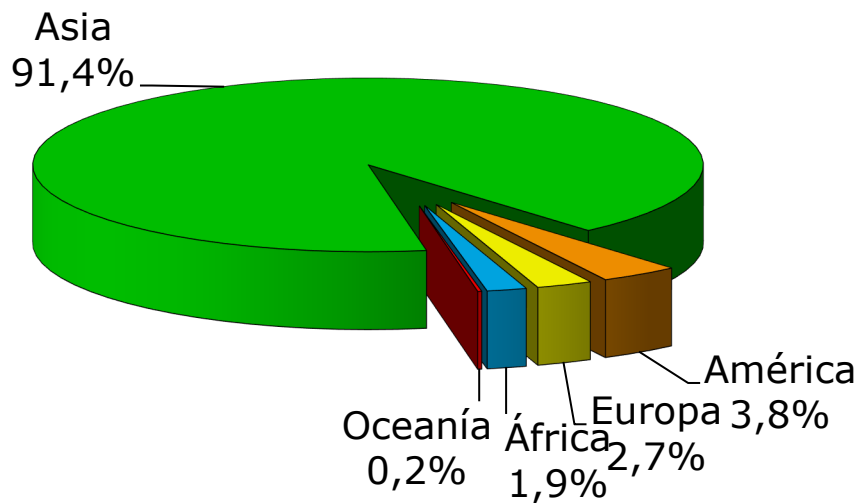
The overall value in first sale of the 130.9 Mt in 2022 was 250,200 million euros. This value is 5.1% higher than in 2021 (238,000 million euros). There is a notable difference compared to 2020, whose growth compared to 2019 was 1.6% (219,300 million euros), logically associated with the Covid-19 pandemic.

### 3.3. Aquaculture productions 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 has been cultivating aquaculture species for more than 2,000 years and is the world's largest producer. It topped the list of continents with 91.4% of production in 2022 producing 119.7 Mt, 3.7% more than in 2020 (112.4 Mt). The world's second largest producer is the Americas (3.8% of the total, 5.0 Mt), followed by Europe (2.7%, 3.5 Mt), Africa (1.9%, 2.5 Mt) and Oceania (0.2%, 0.25 Mt).

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



Production increased in Asia (3.7%), the Americas (10.3%) and Africa (0.7%) and decreased in Europe (-1.7%) and Oceania (-5.5%) compared to 2021. The continent with the highest growth was America with 10.3% going from 4.5 Mt to 5.0 Mt.

FAO's Sofia report highlights the importance of aquaculture development in Africa because of its potential. In addition, together with Asia, it is the continent where dependence on aquatic products of animal origin is greatest, accounting for 50% of the total animal protein consumed in several countries.

Asia also led in 2022 in the production obtained by extractive fishing with 47.5 Mt, representing 51.5% of world production. Followed by America with 18.6 Mt, 20.2%; Europe with 14.0 Mt, 15.1%; Africa with 10.6 Mt, 11.5% and Oceania with 1.6 Mt, 1.7%. Of these, Oceania was the continent that experienced the highest growth compared to the previous year (6.1%), followed by Africa (2.2%). On the other hand, the Americas was the only continent with a decrease (-6.1%) compared to 2021.

In the classification by country, the first positions are occupied by Asians, logically. The first place is occupied by China, followed by Indonesia, India, Vietnam and Bangladesh. These 5 countries are responsible for 82.6% of total global production, i.e. 108.2 Mt of the total 130.9 Mt in 2022. The rest of the countries that top the top 10 list are: Philippines, Republic of Korea, Norway, Egypt and Chile (see table below). In total, these 10 countries account for 89.8% of total world production, i.e. 117.5 Mt of the 130.9 Mt. This amount is 3.6% higher than in 2021. The rest of the countries that contributed 10.2%, i.e. 13.4 Mt, experienced a combined growth of 4.8% compared to the previous year.

*China continues to stand out as the world's leading aquaculture producing country, with 75.4 million tonnes harvested in 2022, accounting for 57.6% of global production.*

Table 3-1. Main aquaculture producing countries by annual tonnes in 2022 and year-on-year rate of change (FAO).

Tons			
	Country	Quantity (t)	Var. annual
1	China	75.388.639	3,5%
2	Indonesia	14.633.869	1,0%
3	India	10.235.300	8,8%
4	Viet Nam	5.170.375	8,8%
5	Bangladesh	2.731.070	3,5%
6	Philippines	2.349.252	4,6%
7	Republic of Korea	2.307.638	-5,3%
8	Norway	1.648.469	-1,0%
9	Egypt	1.552.430	-1,5%
10	Chile	1.524.149	5,6%
	TOTAL 10 PRALES. PRODUCERS	117.541.191	3,6%
	OTHER COUNTRIES	13.379.566	4,8%
	WORLDWIDE TOTAL	130.920.757	3,7%
24	Spain	202.532	-1,4%

India and Vietnam are the countries that experienced the sharpest growth in 2022, with 8.8%, in both. On the other hand, the Republic of Korea suffered the largest decrease (-5.5%) and lost sixth place in the ranking to the Philippines.

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The leading producing country, China, produced 75.4 Mt in 2022, 3.5% higher than in 2021. 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 consuming 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 farming 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 algae, Chinese carp and Japanese oyster. In addition, it tops the list as the largest producer of extractive fishing in both the marine and continental environments, and the leading exporter of aquatic products of animal origin.

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

Spain rose from 27th to 24th position, with 202.5 thousand tons and a decrease of 1.4%.

If the European Union (of the 27) were considered as a unit, its aquaculture harvest in 2022 would be in 13th place with 1.12 million tonnes, between Ecuador and Thailand.

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If instead of analyzing production volume the value of production is examined, the list of countries varies slightly. The top four positions corresponded to China, India, Vietnam and Indonesia and together they hosted 74.4% of the total value in 2022. Chile and Norway ranked fifth and sixth, respectively. The list continued with Bangladesh, Japan, Ecuador and Egypt. Egypt enters the top 10 rankings and replaces the Republic of Korea. These 10 countries together accounted for 86.5% of the global total, or €216.5 million. The rest of the countries only generated 33,000 million euros.

*Table 3-2. Main aquaculture producing countries by value of annual production (Million Euros) in 2022 (FAO) and year-on-year rate of change.*

Value (Euros)			
	Country	Value (M€)	Var. annual
1	China	146.625	4,5%
2	India	13.786	-0,2%
3	Viet Nam	11.947	12,6%
4	Indonesia	11.259	2,3%
5	Chile	9.266	28,0%
6	Norway	8.864	18,3%
7	Bangladesh	5.188	-1,0%
8	Japan	3.355	-19,8%
9	Ecuador	3.279	25,9%
10	Egypt	2.887	-2,4%
	TOTAL 10 PRALES. PRODUCERS	216.456	5,4%
	OTHER COUNTRIES	33.746	3,3%
	WORLDWIDE TOTAL	250.201	5,1%
31	Spain	689	10,4%

The most notable growth has been experienced in 2022, in order: Chile by 28.0% with a total of €9,266 million, Ecuador by 25.9% with €3,279 million and Norway with 18.3% and a total of €8,864 million. On the other hand, it was Japan that had a greater decrease in the value of its production with -19.8% and a total of €3,355 million.

Spain continued in 31st place with a production value of around €689 million, 10.4% more than in 2021.

In 2022, the main aquaculture species produced in the world were Japanese laminaria algae or kombu (*Saccharina japonica*) with 10.8 Mt, followed by eucheuma algae (genera *Eucheuma* and *Kappaphycus*) with 7.8 Mt and gracilaria algae (*Gracilaria sp.*) with 7.6 Mt. Then, the most produced species are the Japanese oyster

(*Crassostrea gigas*) with 6.9 Mt, the white shrimp (*Litopenaeus vannamei*) with 6.8 Mt and the Chinese carp (*Ctenopharyngodon idella*) with 6.2 Mt.

Table 3-3. Main species produced by aquaculture in the world (in tonnes) in 2022 (FAO) and year-on-year rate of change.

Toneladas				
	Especie	Nombre científico	Toneladas	Var. anual
1	Laminaria japonesa	( <i>Saccharina japonica</i> )	10.861.335	-17,1%
2	Alga Eucheuma	( <i>Eucheuma y Kappaphycus</i> )	7.803.037	10,2%
3	Alga Gracilaria	( <i>Gracilaria sp.</i> )	7.568.868	30,5%
4	Ostión japonés	( <i>Crassostrea gigas</i> )	6.879.650	6,1%
5	Langostino blanco	( <i>Litopenaeus vannamei</i> )	6.825.522	7,6%
6	Carpa china	( <i>Ctenopharyngodon idella</i> )	6.151.597	2,8%
7	Carpa plateada	( <i>Hypophthalmichthys molitrix</i> )	5.070.026	1,9%
8	Tilapia del Nilo	( <i>Oreochromis niloticus</i> )	5.002.798	3,5%
9	Almeja japonesa	( <i>Ruditapes philippinarum</i> )	4.429.564	2,0%
10	Catla	( <i>Gibelion catla</i> )	4.145.074	9,5%
	TOTAL 10 PRALES. ESPECIES		64.737.471	3,2%
	RESTO DE ESPECIES		66.183.290	4,2%
	TOTAL ACUICULTURA MUNDIAL		130.920.761	3,7%
28	Trucha arco iris	( <i>Oncorhynchus mykiss</i> )	1.004.299	-0,5%
52	Dorada	( <i>Sparus aurata</i> )	317.882	12,1%
59	Lubina	( <i>Dicentrarchus labrax</i> )	298.815	7,5%
63	Mejillones europeos	( <i>Mytilus galloprovincialis y edulis</i> )	257.544	11,1%
94	Rodaballo	( <i>Psetta maxima</i> )	78.206	3,6%

The top 10 species accounted for 49.4% of the total production, i.e. 64.7 Mt and increased their production compared to the previous year by 3.2%.

Of the species produced in Spain, the following stand out in the global context: rainbow trout, 28th species produced with 1.0 Mt in total; the 52nd species sea bream with 317,882 tonnes; sea bass 59th species with 298,815 tonnes; European mussels 63rd position with 257,544 tonnes; and turbot, 94th species, with 78,206 tons, according to FAO data.

In terms of production value by species, white shrimp (*Litopenaeus vannamei*) is the species that leads the ranking with €31,241 million, 6.9% more than in 2021. This is followed by the marsh crab (*Procambarus clarkii*) with a total of €20.3 million, 9.7% more than in 2021. Atlantic salmon obtained a profit of €17,540 million and had a significant growth of 14.9% compared to 2021. Below them are Chinese and silver carp with €11,249 million (2.7% more than in 2021) and €8,547 million (1.1% more than in 2021), respectively.

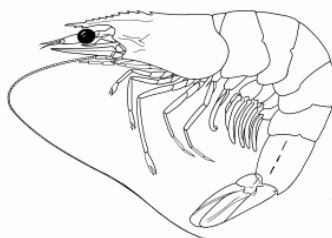
The top 10 most cultivated species together accounted for 49.9%, i.e. €124,797 million of the total €250,201 million.

Table 3-4. Main species by value (million euros) produced through aquaculture in the world in 2022 (FAO) and year-on-year change.

	Especie	Nombre científico	Valor (M €)	Var. anual
1	Langostino blanco	<i>(Litopenaeus vannamei)</i>	31.241	6,9%
2	Cangrejo de las marismas	<i>(Procambarus clarkii)</i>	20.273	9,7%
3	Salmón atlántico	<i>(Salmo salar)</i>	17.540	14,9%
4	Carpa china	<i>(Ctenopharyngodon idella)</i>	11.249	2,7%
5	Carpa plateada	<i>(Hypophthalmichthys molitrix)</i>	8.547	1,1%
6	Tilapia del Nilo	<i>(Oreochromis niloticus)</i>	8.386	5,4%
7	Cangrejo de canal chino	<i>(Eriocheir sinensis)</i>	8.286	0,9%
8	Carpa común	<i>(Cyprinus carpio)</i>	6.735	-3,0%
9	Ostión japones	<i>(Crassostrea gigas)</i>	6.366	3,9%
10	Carpa cabezona	<i>(Hypophthalmichthys nobilis)</i>	6.175	2,8%
	TOTAL 10 PRALES. ESPECIES		124.797	6,1%
	RESTO DE ESPECIES		125.405	4,1%
	TOTAL ACUICULTURA MUNDIAL		250.201	5,1%
17	Trucha arco iris	<i>(Oncorhynchus mykiss)</i>	3.242	-17,6%
34	Dorada	<i>(Sparus aurata)</i>	1.547	8,7%
38	Lubina	<i>(Dicentrarchus labrax)</i>	1.517	-3,1%
78	Rodaballo	<i>(Psetta maxima)</i>	406	-7,9%
84	Mejillones europeos	<i>(Mytilus galloprovincialis y edulis)</i>	332	-5,7%

#### WHITE WOLF (*Litopenaeus vannamei*)

Class: Crustacean Order: Decapod  
Family: Penaeoidea



#### Significant characters and morphology:

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

#### Cultivation:

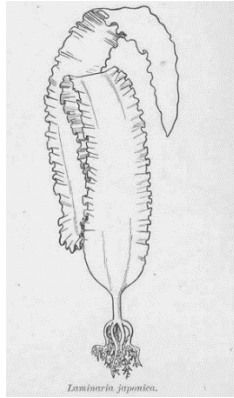
Its production is carried out on the coast, in ponds located in intertidal zones and with different levels of intensification.

#### Product Presentation:

It is presented on the market fresh, frozen, whole or headless.

#### JAPANESE LAMINARIA (*Saccharina japonica*)

Class: Phaeophyceae Order: Laminariales  
Family: Laminariaceae



**Significant characters and morphology:**

Brown algae formed by a brown-golden sheet and stipe. The edges of the central nerve expand in a pinatifid fashion along with the lamina.

**Cultivation:**

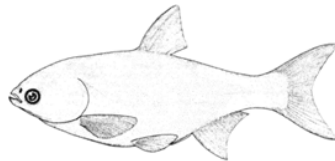
It is one of the world's most productive species due to its high growth speed, facilitating its large-scale cultivation. It can occur on both exposed and calm coasts.

**Marketing and consumption:**

Cultivated for human consumption, practically everything is used from it, even the stem. For each meter of rope, about 10.6 kilos can be obtained.

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

Class: Osteictios Order: Cypriniformes  
Family: Cyprinidae



**Significant characters and morphology:**

Robust fish with a slight elevation on its dorsal side. The body is laterally compressed fusiform and the ventral part forms an acute keel, which runs from the chest to the belly.

**Cultivation:**

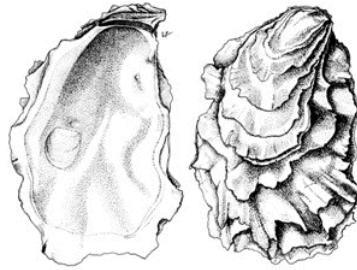
It is widely used in polyculture for the best use of the systems, when they do not contain fish that use the trophic level of phytoplankton. It is used in waters affected by eutrophication from anthropic action. Its reproduction is obtained induced in the laboratory, not spontaneously spawning in naturalized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

**Products and consumption:**

A species suitable for consumption, but with a large number of thorns that make it difficult to market.

**JAPANESE OYSTER (*Crassostrea gigas*)**

Class: Bivalvia Order: Ostrina  
Family: Ostreidae



**Significant characters and morphology:**

Bivalve mollusc, filter-feeder, dirty white or greyish in colour. The valves are slightly elongated on the anteroposterior axis with one of the ends (where the hinge is) ending in a point. The right or upper leaflet is relatively flat and the left or lower valve is concave and adheres to the substrate. The average size is 9 to 10 cm and reaches a maximum size of 20 cm.

**Cultivation:**

The breeding method used depends on the environment, as well as tradition. In "over-elevation" farming, oysters are placed in plastic nets attached to trestles above the ground. In "bottom" culture, they are placed directly on the shore or in shallow water. "Rope" culture is done with oysters on ropes. And in "deep water" farming, 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.

### 3.4. Aquaculture productions by groups and environments

In world aquaculture, the largest group of species produced are fish. In 2022, a total of 61.6 Mt was obtained, which represented 47.0% of the total production by species groups. The second position was occupied by algae with 36.5 Mt representing 27.9% of the total. Molluscs occupied the third position with 14.4 Mt and being 9.7% of the total.

Figure 3-5. Evolution of world aquaculture production (Mt), by group, for the period 1951-2022 (FAO).

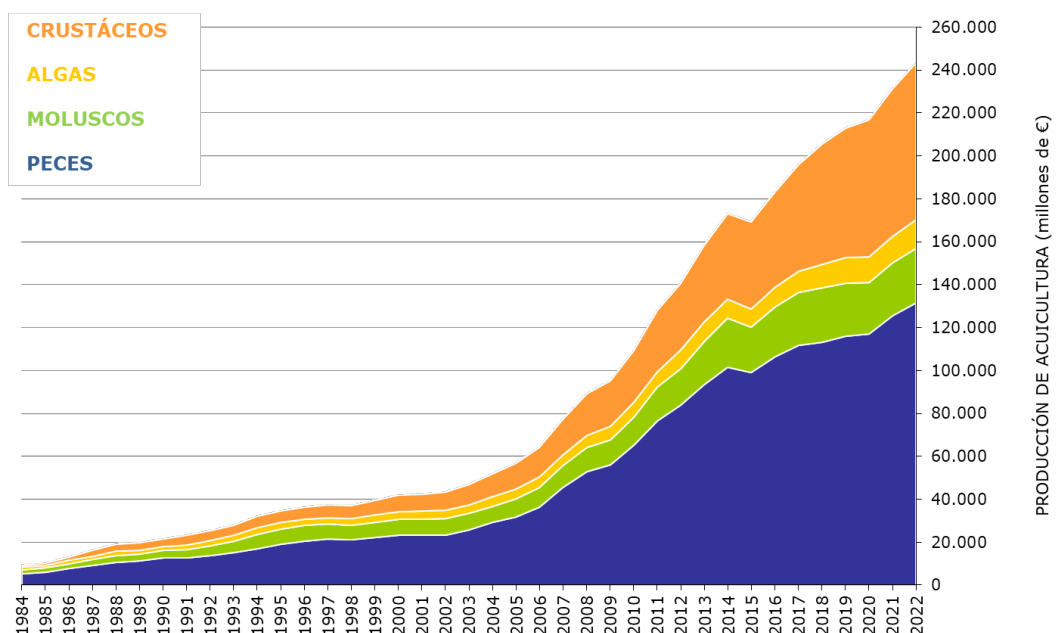
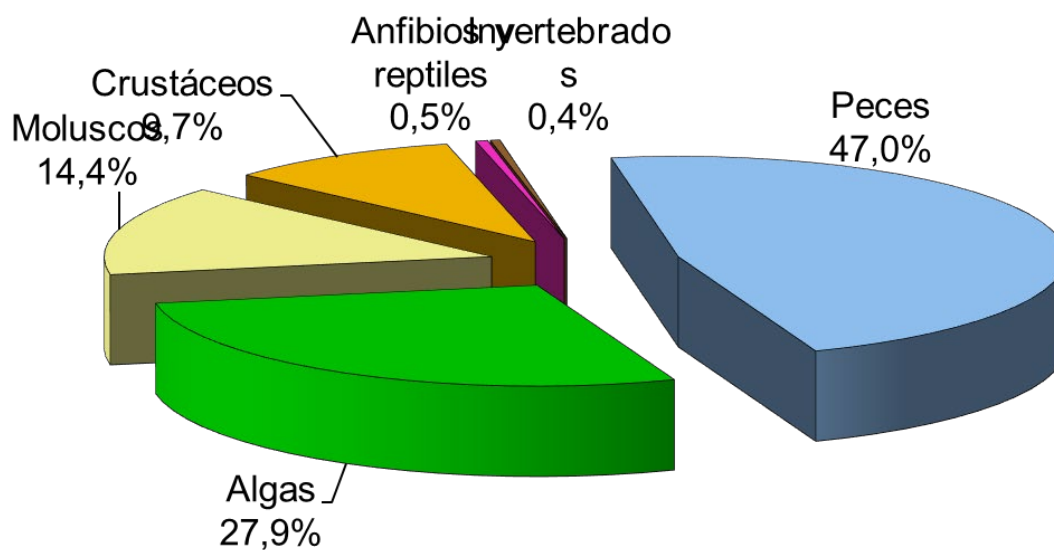


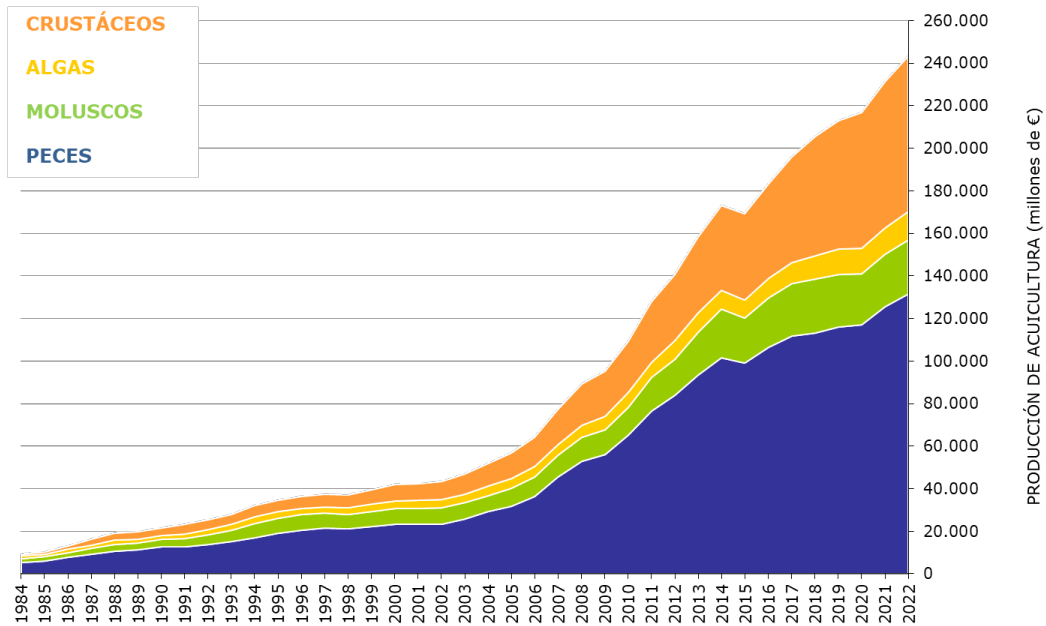


Figure 3-6. Percentage distribution of world aquaculture production (t) in 2022 by group (FAO).



If the value of production is analyzed by group of species, it is observed that the positions on 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 €131,499 million in 2022, which accounted for 52.6% of the total. Crustaceans generated €72,795 million, 29.1% of the total. The mollusc group generated €25,304 million, 10.1% and algae €13,564 million, 5.4%.

Figure 3-7. Evolution of the value of world aquaculture production, by group, for the period 1984-2022, in millions of euros (FAO).

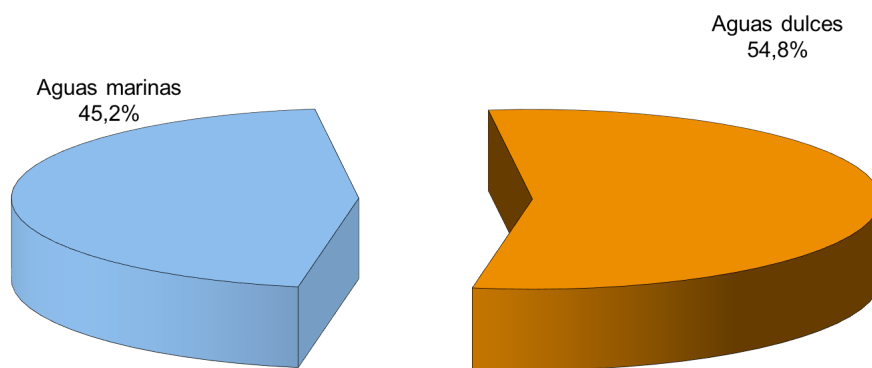


Contrary to terrestrial farming systems in which most production is obtained from a small number of highly domesticated species of animals and plants, in 2022 some 730 different aquatic species were being raised in the world, including fish, molluscs, crustaceans, algae and others, according to FAO. Of these, 17 accounted for 60% of global aquaculture production. This diversity is due to the richness of species in the aquatic environment, the adaptability of these organisms to controlled production systems and the ingenuity of people.

*In 2022, some 730 different aquatic species were being bred in the world, including fish, molluscs, crustaceans, algae and others, according to FAO. Of these, 17 represent 60% of the total production.*

If aquaculture production is divided by the production environment, it can be seen that 54.8% of the world's aquaculture production takes place in freshwaters, i.e. 71,751 Mt, and the remaining 45.2% in freshwaters, 59,169 Mt.

Figure 3-8. Percentage distribution of world aquaculture production (t) in 2022 by production setting (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 foods 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 in food security, was already recognized by the 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 confirmed over the years.

*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 foods and business organization.*

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 is based on the 1995 FAO 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 Advisory Mechanism (MAR) published its report "Food from the Oceans" in 2016. It indicates that, although the oceans account for about 50% of the new animal and plant biomass created annually on the planet, food

from the oceans only reaches 2% of daily calorie consumption per person and 15% of protein consumption on a global scale. Food from the oceans can and should make up a much larger percentage of the total amount of food consumed. These 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. In addition, the resources needed (energy, nutrients, space, water) to produce one kilogram of food suitable for consumption are lower in the oceans than on land. Therefore, increasing the proportion of food from the oceans will help to reduce the pressure of agriculture on terrestrial natural resources.

The 2015 United Nations 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, civil society organizations and other institutions on future opportunities, challenges and needs related to sustainable development in all sectors, with the ambitious aim of eradicating extreme poverty and hunger. The 2030 Agenda and the SDGs are very important for policymaking, planning and management of sustainable aquaculture development. 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 work to promote sustainable aquaculture development.

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 an EU aquaculture sector that is competitive and resilient, ensures the supply of nutritious and healthy food, reduces the Union's dependence on seafood imports, creates economic opportunities and jobs, and becomes a global benchmark for sustainability. APROMAR has positively valued these strategic guidelines and hopes that they will serve to revive Spanish aquaculture.

FAO published the Blue Transformation Programme in 2021. This vision has the objectives of improving food security, nutrition, eradicating poverty and supporting the achievement of the 2030 Agenda for Sustainable Development. This programme is in line with the Strategic Framework 2022-2031. For aquaculture, sustainable intensification and expansion are intended to meet the global demand for aquatic foods by contributing to equitable benefit-sharing.

In 2021, APROMAR published its first sectoral Sustainability Report and the second in 2023. They can be downloaded from this link:

<https://apromar.es/memorias/>

A document in which we analyse the Spanish aquaculture sector, putting on the table data on the activity and commitments to improvement in line with the improvement

of the health of our ecosystems, the nutritional quality of our products, the development of rural areas, the health and welfare of animals, gender equality, etc. And short, medium and long-term goals are established.

## 4. Aquaculture in the European Union

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### 4.1. Situation of aquaculture in the European Union

This section presents the state of aquaculture production in the European Union. Unfortunately, the situation remains as in previous years of this report, that is, stagnant, or perhaps experiencing a continuous progressive decrease. Despite all the efforts and policies of the European Union over the last 20 years to reverse the situation, the objectives set are not achieved.

The European Commission has sought to activate aquaculture's production potential with the publication of strategy and guidance documents, also with the support of the Aquaculture Advisory Council (AAC). That is why, on 12 May 2021, the Commission published its new strategic guidelines for more sustainable and competitive EU aquaculture. However, this new strategy is having a very limited impact, mainly because it is not binding on Member States. In addition, monitoring measures are not effective or timely, and the EU's objective for sustainable aquaculture does not include production quantities to be achieved. Therefore, at Member State level, the political priority is not to achieve a specific volume of production, but to give greater priority to environmental policies. This lack of equitable support results in insurmountable difficulties for the growth of the sector.

Aquatic production (aquaculture plus fishing) accounted for a total of 4,778 thousand tonnes in the European Union in 2022, 2.1% less than in 2021 (4,881 thousand tonnes). The decline in production continues for the fifth consecutive year with an average of -4.7% in those 5 years. As for the value of production in 2022, it was €4,018 million, 1.4% less than in 2021 (€4,073 million).

Of the EU's total aquatic production, aquaculture accounts for 23.5% and fisheries for the remaining 76.5%. Extractive fishing obtained a production in 2022 of 3,657 thousand tonnes, 2.1% less than in 2021 (3,744 thousand tonnes).

In 2022, 4,778 thousand tons of aquaculture products were harvested in the European Union with a value of €4,018 million.
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In 2022, 1,121 thousand tons of aquaculture products were harvested in the European Union. This figure represents a decrease of 2.2% compared to what was put on the market in 2021 (1,146 thousand tonnes).

The importance of aquaculture is different in each country of the European Union. In some, their 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 these same areas.

Figure 4-1. Evolution of total aquaculture and fisheries production of the 27 Member States of the European Union between 1951 and 2022, in million tonnes (FAO).

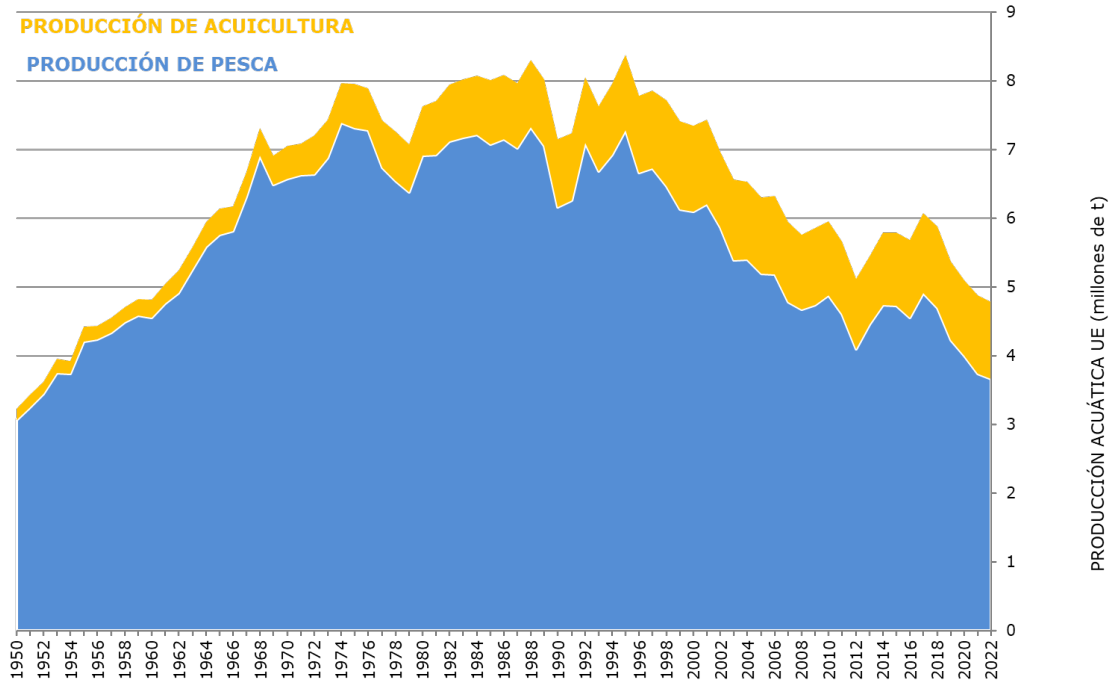
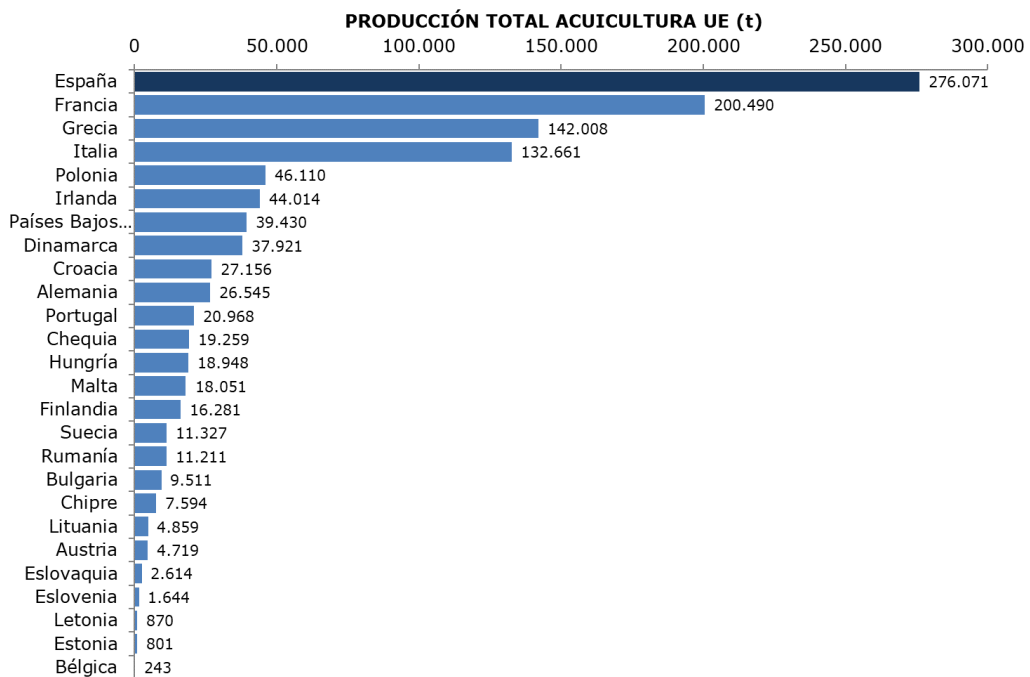
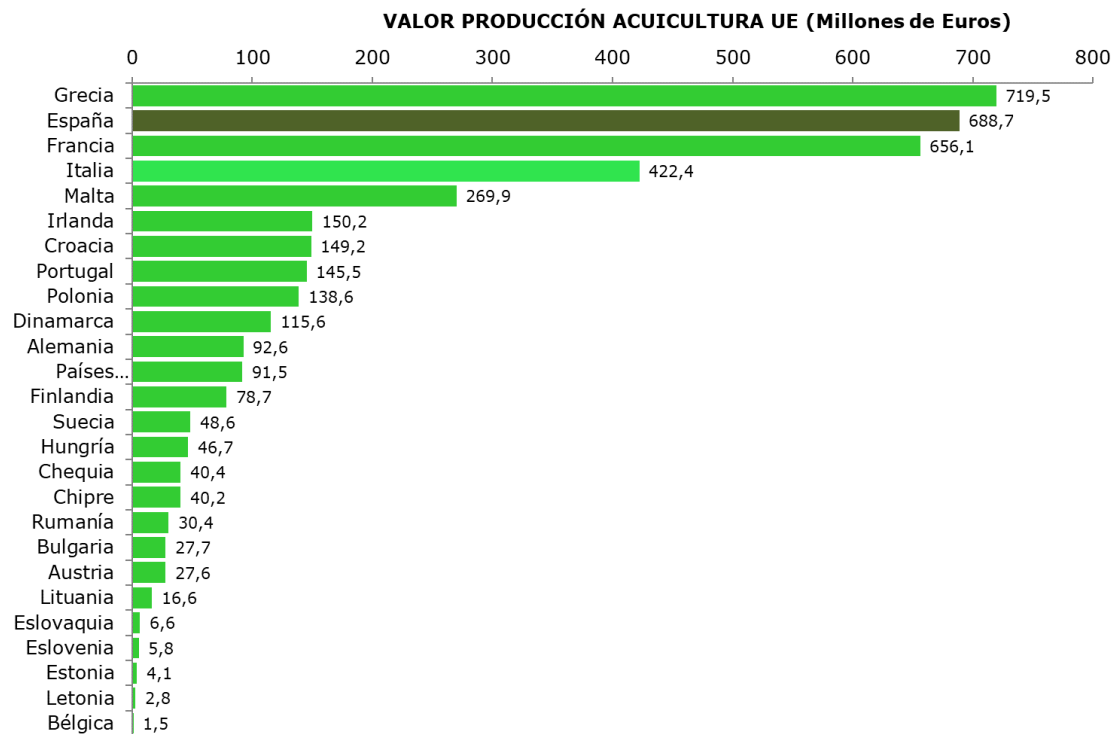


Figure 4-2. Distribution of aquaculture production in the Member States of the European Union (27) by quantity (tonnes) and value (million euros) in 2022 (FAO).





The list of aquaculture producing countries within the European Union is led by Spain with a production in 2022 of 276,071 tonnes, with a decrease of 1.4% compared to 2021 (279,912 tonnes). France is the second largest producer and in 2022 obtained 200,490 tonnes, 3.7% less than in 2021. It is followed by Italy with 132,661 tonnes, 9.1% less than in 2021 and Poland with 46,110 tonnes with a 3.0% increase.

Spain accounted for 24.6% of the entire production volume in the European Union, followed by France with 17.9%, Greece with 12.7%, Italy with 11.8% and Poland with 4.1%, as the main producers.

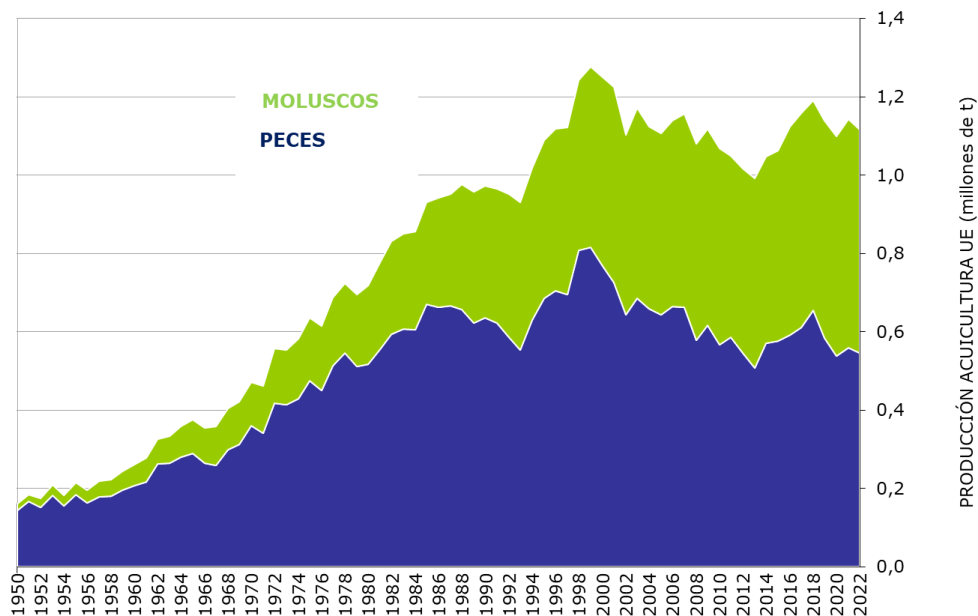
When analyzing the value of production in 2022, aquaculture in the European Union generated €4,018 million. Greece was the main producing Member State with €719.5 million, an increase of 16.2% compared to 2021 (€619.5 million) and representing 17.9% of the total value. Spain was in second place with €688.7 million and increased its value by 10.4% compared to the previous year (€624.1 million), accounting for 17.1% of the total. France ranked third and experienced a decrease of 11.1% from €737.9 million in 2021 to €656.1 million in 2022 and representing 16.3% of the total value. Italy was in fourth place with €422.4 million, 25.7% less than in 2021 (€568.3 million) and accounted for 10.5% of the total. Malta was in fifth place with a value of €269.9 million, 35% more than in 2021 (€198.9 million) and representing 6.7% of the total.

As for the groups of aquaculture species that are farmed in the European Union, the main ones are fish (50.9%) and molluscs (48.7%). Aquaculture of crustaceans, algae or other invertebrates is very small.

In 2022, 570.2 thousand tonnes of fish with a value of €2,885 million and 546.2 thousand tonnes of molluscs with a value of €1,108 million were farmed in the EU.

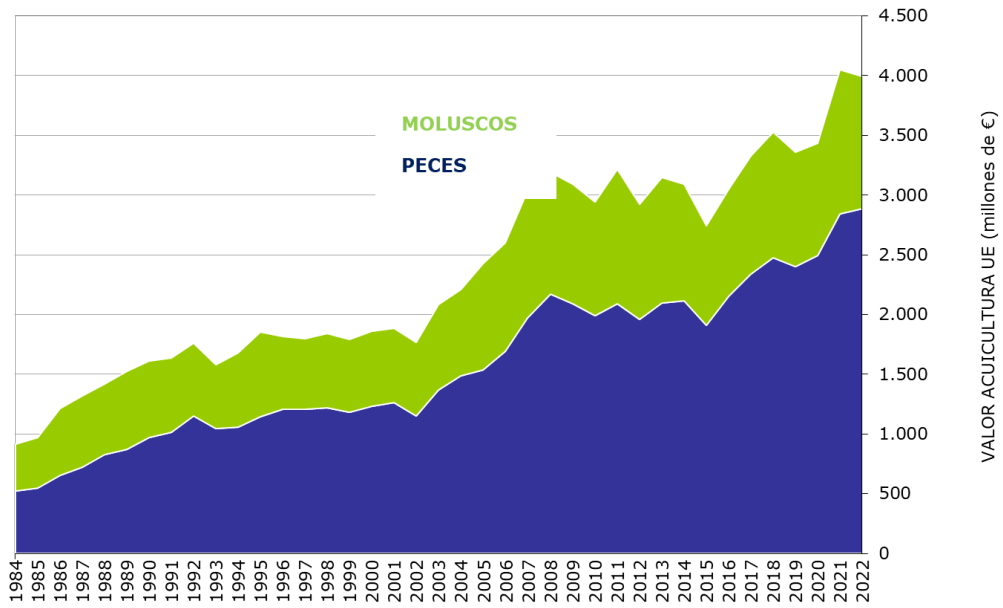


Figure 4-3 Evolution of aquaculture production (Mt) in the European Union by groups for the period 1951-2022 (FAO).



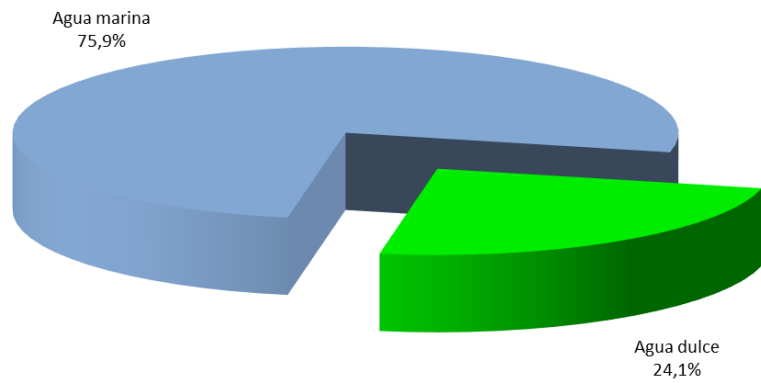
In 2022, 570,200 tonnes of fish with a value of €2,885 million and 546,200 tonnes of molluscs with a value of €1,108 million were farmed in the European Union. The value of fish production showed a slight growth of 1.0% from €2,843 million in 2021 to €2,885 million in 2022 and in the case of molluscs, a decrease of 2.4% from €1,205 million in 2021 to €1,108 million.

Figure 4-4. Evolution of the value of aquaculture production in the European Union in millions of euros, by groups for the period 1984-2022 (FAO).



In terms of the production environment, aquaculture in the European Union was mainly developed in marine waters (75.9%) and 24.1% in freshwater.

Figure 4-5. Percentage distribution of aquaculture production (tonnes) in the European Union in 2022 by production environment (FAO).



Analysing the farmed species, mussels continue to be the most produced species in the European Union for another year with 410,909 tonnes, 4.1% less than in 2021 (428,373 tonnes). Two species of mussels are produced, the common and the Mediterranean, which are not always adequately differentiated in the statistics.

Rainbow trout is the second most farmed species in the European Union with 169,930 t, 10.2% less than in 2021 (189,327 t). The third place is occupied by sea bream with 106,837 tonnes, 5% more than the previous year (101,771 tonnes). Japanese oysters are in fourth place with 100,793 tonnes, 5.8% more than in 2021 (95,289 tonnes). Sea bass is in fifth place with 90,883 tonnes, 5.0% less than in the previous year (95,652 tonnes).

Within the top 10 species is the Atlantic bluefin tuna (*Thunnus thynnus*) in seventh position. This species has experienced a notable increase compared to the previous year of 22.5%, with 32,231 tonnes. The next 5 species on the list of the 10 most cultivated have experienced decrease.

Table 4-1. Main species produced by aquaculture in the European Union, by tonnes, in 2022 (FAO).

Toneladas				
	Especie	Nombre científico	Toneladas	% var. anual
1	Mejillones	( <i>Mytilus spp</i> )	410.909	-4,1%
2	Trucha arco iris	( <i>Onchorynchus mykiss</i> )	169.930	-10,2%
3	Dorada	( <i>Sparus aurata</i> )	106.837	5,0%
4	Ostión japonés	( <i>Crassostrea gigas</i> )	100.793	5,8%
5	Lubina	( <i>Dicentrarchus labrax</i> )	90.883	-5,0%
6	Carpa común	( <i>Cyprinus carpio</i> )	63.865	-5,7%
7	Atún rojo del Atlántico	( <i>Thunnus thynnus</i> )	32.231	22,5%
8	Almeja japonesa	( <i>Ruditapes philippinarum</i> )	24.403	-2,1%
9	Salmón del Atlántico	( <i>Salmo salar</i> )	13.081	-9,9%
10	Rodaballo	( <i>Psetta maxima</i> )	12.632	3,5%
	TOTAL 10 PRALES. ESPECIES		1.025.564	-2,9%
	RESTO DE ESPECIES		95.740	6,0%
	TOTAL ACUICULTURA UE		1.121.304	-2,2%

Of the 1,121,300 tonnes of aquaculture products harvested in 2022 in the European Union, the production of the 10 main species together accounted for 91.5% of the total, with 1,025,500 tonnes, 2.9% less than the previous year (1,056,100 tonnes).

As for the value of total aquaculture production in the European Union in 2022, it was €4,018 million, 1.4% less than in the previous year. The 10 main species produced generated a total of €3,507 million, i.e. 87.3% of the total.

Table 4-2 Main species produced by aquaculture in the European Union, by value, in 2022 (FAO).

Valor				
	Especie	Nombre científico	Valor (Millones €)	% var. anual
1	Trucha arco iris	( <i>Onchorynchus mykiss</i> )	578,25	-14,4%
2	Lubina	( <i>Dicentrarchus labrax</i> )	563,44	3,1%
3	Dorada	( <i>Sparus aurata</i> )	529,84	0,8%
4	Atún rojo del Atlántico	( <i>Thunnus thynnus</i> )	479,80	33,7%
5	Mejillones	( <i>Mytilus spp</i> )	415,86	-5,9%
6	Ostión japonés	( <i>Crassostrea gigas</i> )	404,03	-8,0%
7	Almeja japonesa	( <i>Ruditapes philippinarum</i> )	190,05	-12,5%
8	Carpa común	( <i>Cyprinus carpio</i> )	162,00	-1,6%
9	Rodaballo	( <i>Psetta maxima</i> )	94,07	-3,9%
10	Salmón del Atlántico	( <i>Salmo salar</i> )	90,10	-16,7%
	TOTAL 10 PRALES. ESPECIES		3.507,4	-1,9%
	RESTO DE ESPECIES		510,2	2,7%
	TOTAL ACUICULTURA UE		4.017,7	-1,4%

When analysing the 10 species with the highest economic value in 2022, it is the rainbow trout that tops the list with €578.3 million, 14.4% less than in 2021. It is followed by sea bass (€563.4 million, +3.1%), sea bream (€529.8 million, +0.8%), bluefin tuna (€479.8 million +33.7%), mussels (€415.9 million, -5.9%) and Japanese oysters (€404.0 million, -8%).

In the table it can be seen how Atlantic salmon (-16.7%), rainbow trout (-14.4%) and Japanese clams (-12.5%), experience the sharpest decreases in value compared to the previous year.

EUMOFA's 2023 EU Fisheries Market report indicates that EU household spending on fishery and aquaculture products increased by around 11% compared to the previous year. And it highlights that it was related to the increase in inflation due to Russia's invasion of Ukraine. This increase affected the price of fish by more than 10%. In turn, this relative rise in inflation caused a decrease in household fish consumption by volume of almost 17% according to Europanel/Kantar/Gfk data.

## **4.2. Situation of fish aquaculture in the European Union**

In 2022, according to FAO data, 570,200 tonnes of fish were harvested in the European Union, 2.2% less than in 2021 (582,900 tonnes). This production was worth €2,885.5 million, 1.5% more than the previous year (€2,843.4 million).

In the European Union, 570,200 t of aquaculture fish were harvested in 2022 with a value of €2,885.5 million.

The 10 main fish species accounted for 90.5% of production, i.e. 515,900 tonnes, 2.4% less than in 2021, generating €2,637.1 million, 91.4% of the first sale value of total production. The average value of a kilo of aquaculture fish in the first sale was 5.06 euros/kg, 3.7% more than the previous year (4.88 €/kg in 2021).

In the list of the top 10 farmed species, rainbow trout occupies the first position with 166,930 t in 2022, 10.2% less than the previous year (189,327 t). This is followed by sea bream with 106,837 tonnes, 5.0% more than in 2021 (101,771 tonnes), sea bass with 90,883 tonnes, 5.0% less (95,652 tonnes in 2021). The next 4 species are common carp (63,865, -5.7%), bluefin tuna (32,231, +22.5%), salmon (13,081, -9.9%) and sea bass (11,489 t, +41.4%). The increase in bluefin tuna and sea bass is therefore remarkable.

Table 4-3. Main fish species produced by aquaculture in the European Union, by tonnes, in 2022 (FAO).

Toneladas				
	Especie	Nombre científico	Toneladas	% var. anual
1	Trucha arco iris	( <i>Onchorynchus mykiss</i> )	189.327	-10,2%
2	Dorada	( <i>Sparus aurata</i> )	101.771	5,0%
3	Lubina	( <i>Dicentrarchus labrax</i> )	95.652	-5,0%
4	Carpa común	( <i>Cyprinus carpio</i> )	67.730	-5,7%
5	Atún rojo del Atlántico	( <i>Thunnus thynnus</i> )	26.320	22,5%
6	Salmón del Atlántico	( <i>Salmo salar</i> )	14.512	-9,9%
7	Rodaballo	( <i>Psetta maxima</i> )	12.206	3,5%
8	Corvina	( <i>Argyrosomus regius</i> )	8.124	41,4%
9	Peces de agua dulce nep	( <i>varios</i> )	6.601	35,1%
10	Pez-gato	( <i>Clarias gariepinus</i> )	6.333	-5,2%
	TOTAL 10 PRALES. ESPECIES		515.871	-2,4%
	RESTO DE ESPECIES		54.399	0,2%
	TOTAL ACUICULTURA PECES UE		570.270	-2,2%

As for the value of aquaculture fish production in the European Union in 2022 mentioned above in the first sale of €2,885.5 million, as in the list of production volume, it is rainbow trout that tops the value list with €578.3 million, 14.4% less than in 2021, followed by sea bass with €563.4 million (+3.1%), sea bream with €529.8 million (+0.8%) and bluefin tuna with €479.8 million (+33.7%). The sea bass in eighth place experienced the largest increase in value, +50.6% to €60.1 million. As in 2021, snapper, in 10th place, experienced a notable rise with 33.7% or €37.2 million.

Salmon (€90.1 million, -16.7%) and European eel (€42.3 million, -15.9%) are the species with the greatest decrease.

The top 10 farmed species generated €2,637.1 million, 1.6% more than in 2021. These top 10 species accounted for 91.4% of the total value of production.

Table 4-4. Top fish species produced by aquaculture in the European Union, by value, in 2022 (FAO).

Valor				
	Especie	Nombre científico	Valor (Millones de €)	% var. anual
1	Trucha arco iris	( <i>Onchorynchus mykiss</i> )	578,3	-14,4%
2	Lubina	( <i>Dicentrarchus labrax</i> )	563,4	3,1%
3	Dorada	( <i>Sparus aurata</i> )	529,8	0,8%
4	Atún rojo del Atlántico	( <i>Thunnus thynnus</i> )	479,8	33,7%
5	Carpa común	( <i>Cyprinus carpio</i> )	162,0	-1,6%
6	Rodaballo	( <i>Psetta maxima</i> )	94,1	-3,9%
7	Salmón del Atlántico	( <i>Salmo salar</i> )	90,1	-16,7%
8	Corvina	( <i>Argyrosomus regius</i> )	60,1	50,6%
9	Anguila europea	( <i>Anguilla anguilla</i> )	42,3	-15,9%
10	Pargo	( <i>Pagrus pagrus</i> )	37,2	33,7%
	TOTAL 10 PRALES. ESPECIES		2.637,1	1,6%
	RESTO DE ESPECIES		248,5	0,2%
	TOTAL ACUICULTURA PECES UE		2.885,5	1,5%

When analysing fish production by country in the European Union, it can be seen that Greece is the leading producing country with 131,046 tonnes in 2022 with a value of

€713.4 million, followed by Spain with a notable difference, with a production of 78,113 tonnes with a value of €533.8 million. Third place is occupied by Italy with 47,283 tonnes and €193.8 million reported, Poland with 46,109 tonnes and €138.6 million and France later with 42,173 tonnes and a value of €140.2 million.

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

Class: Osteictios Order: Salmoniformes  
Family: Salmonidae



#### Significant characters and morphology:

Fish of bluish gray color on the dorsal part with some spots, 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. Narrow caudal peduncle.

#### Cultivation:

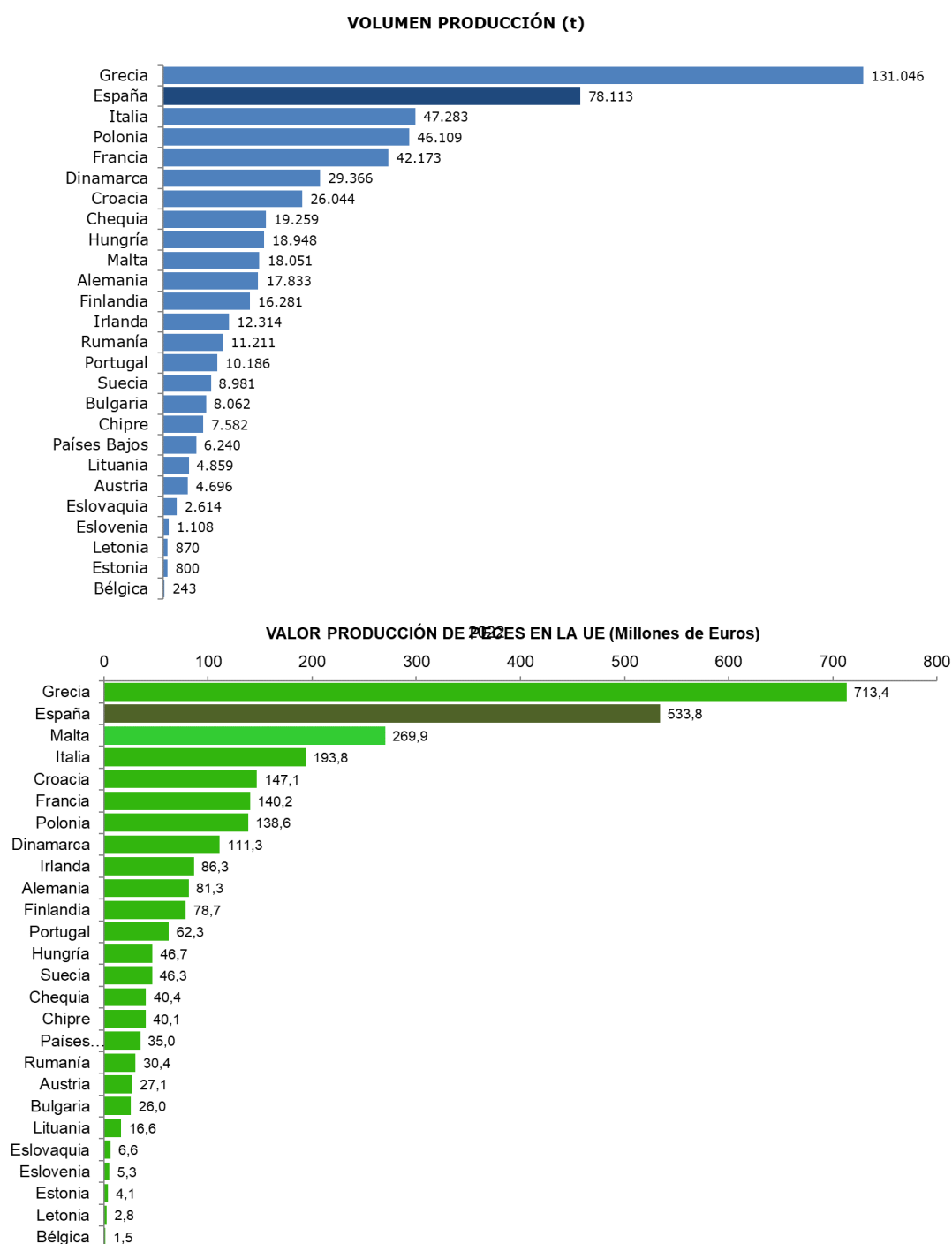
Atlantic salmon farming has an initial freshwater stage that takes place in land-based facilities. When they are between 1 year and 18 months, and reach a weight of 50-90 g, they are transferred to nurseries in the sea. There they are aged for 12 to 18 months, until they reach a harvest weight of 4 to 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 products with higher added value, such as whole smoked salmon or thinly sliced salmon, are also marketed.

Fish production using 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 that are also perfectly adapted to ecosystems and social uses.

Figure 4-6. Distribution of aquaculture fish production in the Member States of the European Union by volume (tonnes) and value (million euros) in 2022 (FAO).



The rate of growth of fish aquaculture in the European Union since 2000 has been very slow. In fact, over the past 22 years, fish aquaculture has grown by only an average of 1.0% per year compared to 5.1% globally. This situation has been even

worse in molluscs where since 2000 the harvest in the European Union has fallen by 1.5% per year, compared to a growth of 3.2% in the rest of the world. Thus, total EU aquaculture (mainly fish and molluscs) has decreased since 2000 by an average of 0.5% per year, while worldwide aquaculture has grown by an average of 5.2% per year. These figures 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.

Figure 4-7. Relative evolution of increases in total aquaculture production in the European Union, Europe (including Turkey) and world between 2001 and 2022. The cumulative percentage increases are shown, taking the year 2000 as a reference base (100) (based on FAO data).

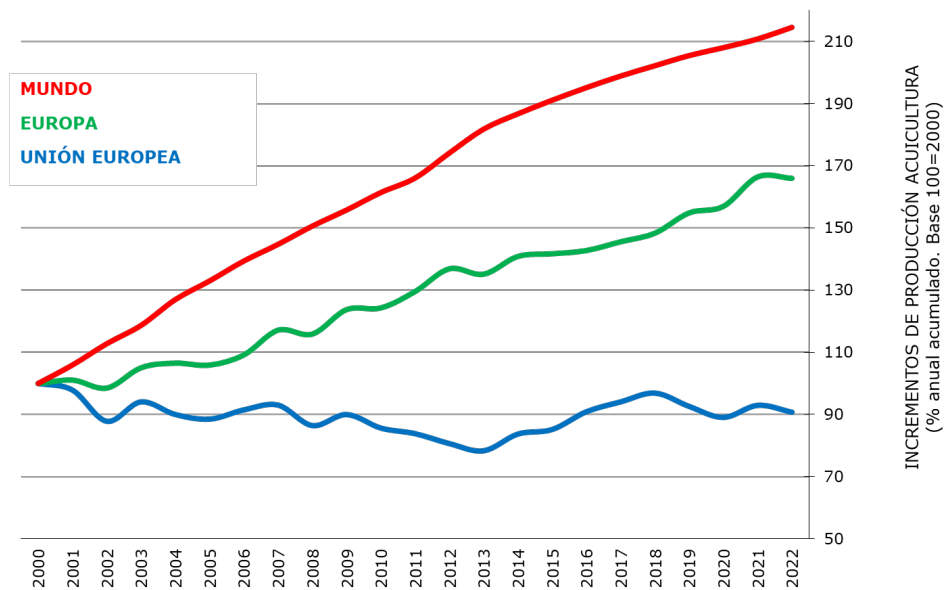


Figure 4-8. Relative evolution of increases in aquaculture fish production at the European Union, European (including Turkey) and global levels between 2001 and 2022. The cumulative percentage increases are shown, taking the year 2000 as a reference base (100) (based on FAO data).



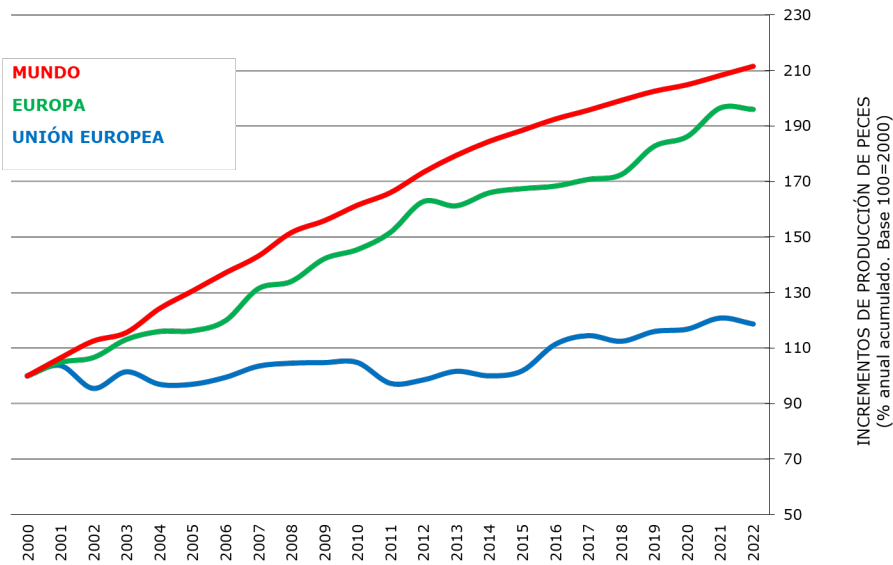
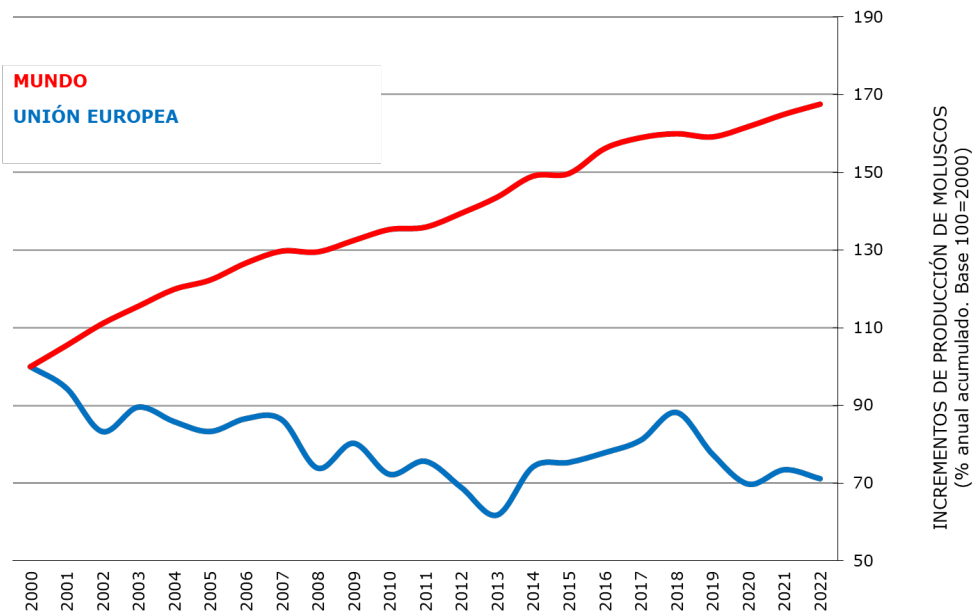


Figure 4-9. Relative evolution of the increases in aquaculture mollusc production in the European Union and world between 2000 and 2022. The cumulative percentage increases are shown, taking the year 2000 as a reference base (100) (based on FAO data).



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

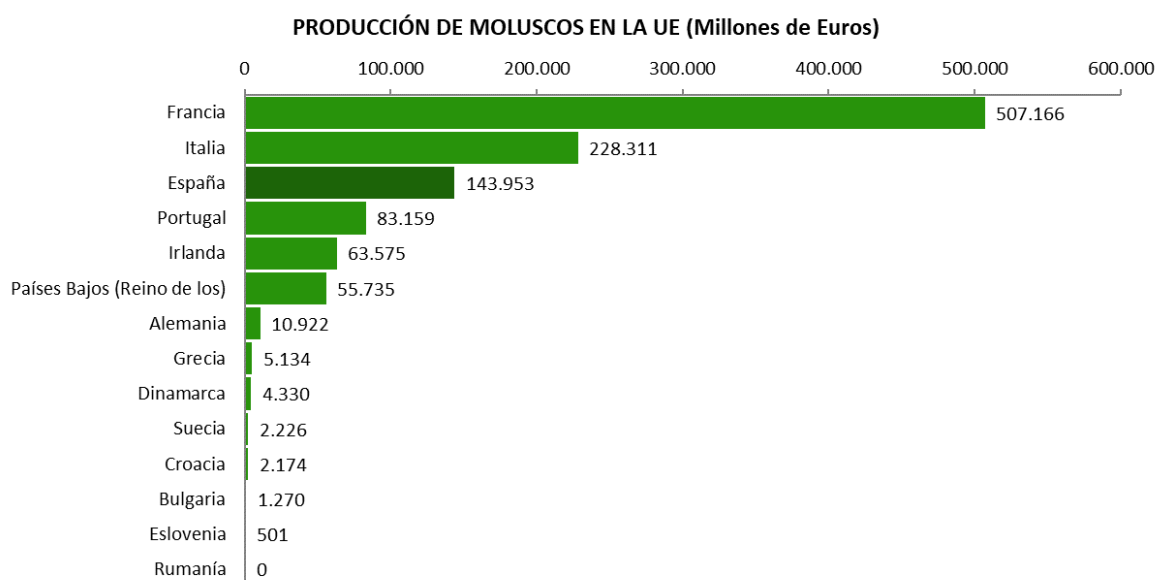
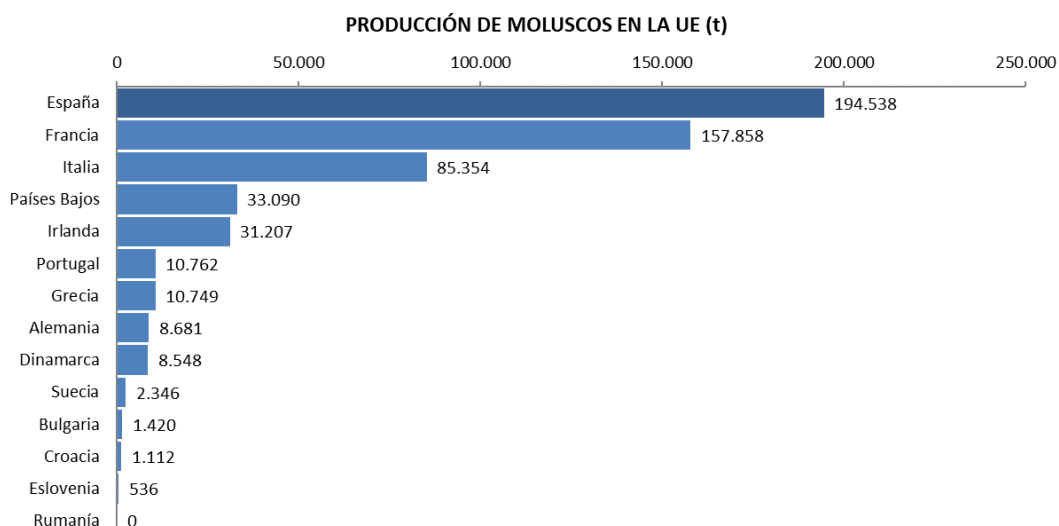
In 2022, 18,913,997 tonnes were harvested in the world of aquaculture molluscs. The European Union contributed 546,201 tonnes to this production, i.e. 2.9%, with a value of €1,108 million at the first sale.

The main producing country is Spain, based on mussel farming, followed by France (oysters) and Italy (clams). These three countries accounted for 80.1% of the total European aquaculture mollusc harvest in 2022, i.e. 437,750 t.

*In 2022, 18.9 Mt of aquaculture molluscs were harvested in the world. The European Union contributed 546,200 t to this production with a value of €1,108 million in first sale.*

Spain produced 194,500 t, therefore, it was the leading producing country and obtained a value in first sale of €144 million in 2022. The second place in volume was occupied by France with 157,800 t but in terms of value it is by far the first place in the ranking with €507.1 million. The third place in volume is occupied by Italy with 85,354 tonnes, while it is the second in value with €228.3 million in first sale.

*Figure 4-10. Production of aquaculture molluscs in EU Member States by volume (tonnes) and value (million euros) in 2022 (based on FAO data).*



European aquaculture mollusc production has remained virtually stagnant, with a year-on-year change of 0.2% over the past decade. Having had an all-time high of 815,239 tonnes in 1999, it has fallen to 546,201 tonnes in 2022. Its economic value has experienced an average year-on-year variation of 2.1% in the last 10 years.

Mussel aquaculture in the European Union put 410,900 t on the market in 2022, which represented 75.2% of the total mollusc harvest with a value of €415.9 million (37.5% of the total). It is followed in production by Japanese oysters with 101,800 tonnes (18.6% of the total) with a value of €407.0 million (36.7% of the total) and Japanese clams with 24,403 tonnes (4.5%) and a value of €190.0 million (17.1% of the total). Another species with significant productions is the 5,147 t fine clam with a value of €72.0 million.

The average value of the first sale of the Japanese oyster was 4.23 €/Kg, the mussel was 0.95 €/Kg and the Japanese clam was 7.63 €/Kg.

Table 4-5. Main species of molluscs produced by aquaculture in the European Union, by tonnes, in 2022 (FAO).

Toneladas				
	Especie	Nombre científico	Toneladas	% var. anual
1	Mejillones	( <i>Mytilus spp</i> )	410.909	75,2%
2	Ostión japonés	( <i>Crassostrea gigas</i> )	101.793	18,6%
3	Almeja japonesa	( <i>Ruditapes philippinarum</i> )	24.403	4,5%
4	Almeja fina	( <i>Ruditapes decussatus</i> )	5.147	0,9%
5	Ostra europea	( <i>Ostrea edulis</i> )	2.324	0,4%
6	Almeja babosa	( <i>Venerupis pullastra</i> )	1.214	0,2%
	TOTAL 6 PRALES. ESPECIES		545.790	16,7%
	RESTO DE ESPECIES		412	0,1%
	TOTAL ACUICULTURA MOLUSCOS UE		546.202	-2,3%

Table 4-6. Top mollusc species produced by aquaculture in the European Union, by value, in 2022 (FAO).

Valor				
	Especie	Nombre científico	Valor (Millones de €)	% var. anual
1	Ostión japonés	( <i>Crassostrea gigas</i> )	407,0	36,7%
2	Mejillones	( <i>Mytilus spp</i> )	415,9	37,5%
3	Almeja japonesa	( <i>Ruditapes philippinarum</i> )	190,0	17,1%
4	Almeja fina	( <i>Ruditapes decussatus</i> )	72,0	6,5%
5	Ostra europea	( <i>Ostrea edulis</i> )	15,0	1,4%
6	Almeja babosa	( <i>Venerupis pullastra</i> )	3,8	0,3%
	TOTAL 6 PRALES. ESPECIES		1.103,7	16,6%
	RESTO DE ESPECIES		4,7	0,4%
	TOTAL ACUICULTURA MOLUSCOS UE		1.108,5	27,6%

#### 4.4. Potential of European aquaculture

Aquaculture in the European Union remains stagnant or even in slight decline. In 2002, the commission published the "Strategy for the Sustainable Development of European Aquaculture" with the aim of creating more jobs, producing more feed and promoting environmentally friendly development. This strategy did not achieve either the objectives of employment or increased production, mainly due to competition from third countries, the governance crisis 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 due to develop their Multiannual Strategic Plans and in 2021, the commission published "Strategic Guidelines for a More Sustainable and Competitive EU Aquaculture for the Period 2021-2030". Further development of the sector continues to be sought through research, innovation and EU funding. In addition, the European Green Deal and the Farm to Fork Strategy are taken into account.

The potential of the European Union is remarkable. Europe has 55,000 km of coastline with environmental, physical and oceanographic conditions conducive to aquaculture. On the other hand, the European aquaculture business fabric 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 welcomed 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 mentioned, the environmental conditions are appropriate for the cultivation of many of the species that are currently most in demand by consumers. But, on the other hand, the high regulatory standards that the European Union has set itself up to ensure that 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 should be aware of.

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 Advisory Mechanism (MAR) recommends making aquaculture an explicit priority of the EU and global policies through the integration of its policies into a global 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 necessary changes 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 of 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 main agent in solving them. EU aquaculture provides healthy, nutritious feed, available all year round, at affordable prices and with care for the environment.

However, aquaculture in the European Union, both for fish and molluscs, has been practically stagnant for the last fifteen years for various reasons and is not exploiting its potential to create wealth and employment, as the FAO has been insistently recommending. This situation, together with lower catches from extractive fishing, has consolidated a situation of high dependence on fish imports to meet the growing European demand for seafood. Today, the fish import and processing industries of the European Union 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 no one 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 burden due to 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 fresh unpackaged fish).

This *sublimation* at the 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 for 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 of producing, entails abnormally 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 third developing countries. On the other hand, the growing demand for the use of spaces in coastal and river environments by other activities leads to an increase in competition between aquaculture and these other activities, including those related to the construction of residential housing, tourism or fishing. The planning 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, most of which are unfounded, which continue to prevent this activity from reaping the full benefits of the rigorous legal standards to which it must conform, whether 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 the national, and especially regional (subnational) level, there is still considerable work 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 strong foundation of trust for both consumers and neighbors of aquaculture farms.

## 4.5. Videos and reports of interest.

### VIDEOS



1 Conoce a MORRIS VILLARROEL - Comité de Expertos | Acuicultura de España  
Acuicultura de España 5:09

2 Conoce a DOLORS FURONES - Comité de Expertos | Acuicultura de España  
Acuicultura de España 4:38

3 Conoce a ROSAURA LEIS - Comité de Expertos | Acuicultura de España  
Acuicultura de España 3:17

4 Conoce a ARIADNA SITJÀ - Comité de Expertos | Acuicultura de España  
Acuicultura de España 3:39

5 Conoce a AURELIO ORTEGA - Comité de Expertos | Acuicultura de España  
Acuicultura de España 5:10

### Aquaculture Videos in Spain

#### Meet the Committee of Experts

We present the Committee of Aquaculture Experts of Spain, five stars from the scientific and research world that will guide you in a deeper and more truthful knowledge about aquaculture in Spain.

<https://www.youtube.com/watch?v=tBQkrnbd7Y&list=PLuX-qq--A21iF2wvNNcarqXNqiQt5ypha>



2x01 | Consultorio del Profesor Lubina | Acuicultura de España  
Acuicultura de España 2:59

14 2x02 | Consultorio del Profesor Lubina | Acuicultura de España  
Acuicultura de España 1:52

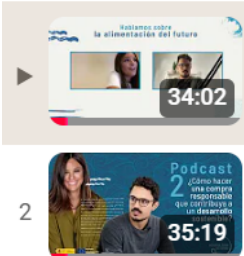
15 2x03 | Consultorio del Profesor Lubina | Acuicultura de España  
Acuicultura de España 2:03

### Aquaculture Videos in Spain

#### Professor Sea Bass's Office, 2nd Season

A series of videos in which Professor Sea Bass answers questions about #acuicultura.

<https://www.youtube.com/watch?v=QImSJH55DWc&list=PLuX-qq--A21hYoRU8QSpXEqxDPF-x8Unc&index=13>



Ep. #01 | "La despensa del futuro" con Carlos Ríos y...  
Acuicultura de España 34:02

2 Ep. #02 | "La despensa del futuro" con Carlos Ríos y...  
Acuicultura de España 35:19

### Aquaculture Videos in Spain

#### Podcast: The Pantry of the Future

"The Pantry of the Future" with Carlos Ríos and Mercedes Martín

<https://www.youtube.com/watch?v=bymUxvBObNY&list=PLuX-qg--A21h-SOvzHPPYJII6TfpUX8Ka>

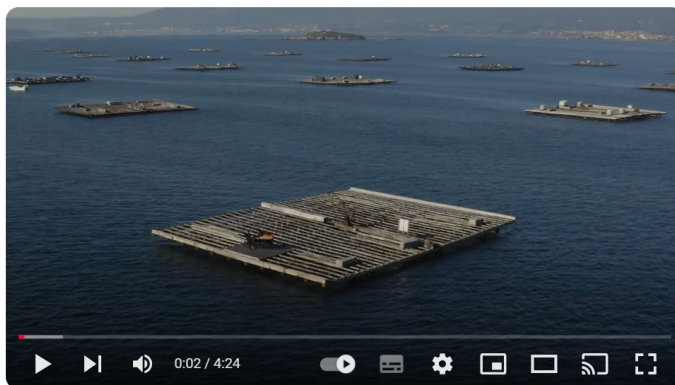


Newtecaqua Video

Final Conference

Project to expand and diversify European aquaculture of fish, molluscs and microalgae.

<https://www.youtube.com/watch?v=6ISsHH5YTsc>



Video of Food from Spain (MAPA)

Presentiment

Recognize and value the arduous task of seafarers.

<https://www.youtube.com/watch?v=oh0pZEE178>



Fishing Spain Video

Mercury and Selenium

[#MíticoMito](#) is a campaign by Pesca España to dismantle the myths generated around the mercury contained in fish and to present selenium.

<https://www.youtube.com/watch?v=lOqX4PQbTrg>





Video of Food from Spain (MAPA)

#AlimentosdeEspaña are Character

Short film that focuses on the link between artistic heritage and the richness and creativity of Spanish gastronomy

<https://www.youtube.com/watch?v=ekFkZlg-nyE>



Video of The Richest Country in the World

**Spotlights Campaign**

Empowering young women for a sustainable aquaculture sector in the Mediterranean and Black Sea.

## REPORTS




Welfare Guides for Sea Bream and Sea Bass from Spanish Aquaculture

### Fish welfare


Continuation of the series on aquaculture fish welfare. Good practice guides in Spanish and English.

<https://apromar.es/guia-bienestar/>

	<p>APROMAR Report</p> <p><b>Sustainability Report 2022</b></p> <p>The Sustainability Report is a technical and rigorous document in which you can transparently consult the sustainability indices of our sector through three prisms: social, environmental and economic.</p>
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<https://apromar.es/memorias/>

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	<p>SOFIA Report 2024</p> <p><b>FAO</b></p> <p>Report on the State of World Fisheries and Aquaculture.</p>
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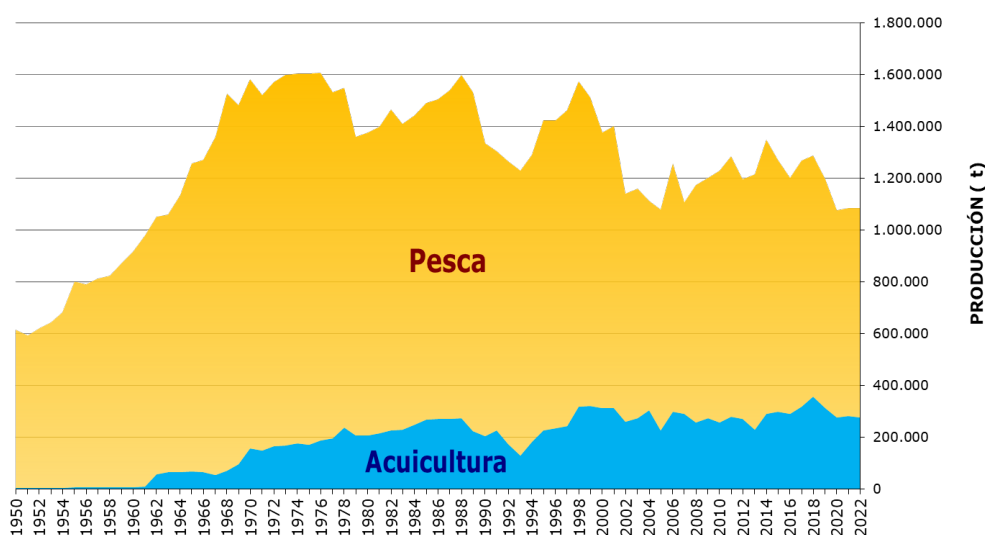
<https://www.fao.org/publications/home/fao-flagship-publications/the-state-of-world-fisheries-and-aquaculture/es>

## 5. Aquaculture production in Spain and Europe

### 5.1. Production of seafood in Spain

The total of aquatic products from fisheries and aquaculture in Spain in 2022 was 1.09 million tonnes, practically the same as the previous year. Fishing contributed 74.6% of the products, i.e. 0.81 Mt (0.7% more than in 2021) and aquaculture the remaining 25.4%, 0.28 Mt (1.4% less than in 2021). According to FAO, the average year-on-year variation in the last 10 years for aquaculture has been 0.9% and -1.2% for fisheries.

Figure 5-1. Evolution of total aquatic production (aquaculture + fishing) in Spain (tonnes) in the period 1950-2022 (FAO).



Data collected from FAO's FishStatj programme and data obtained by APROMAR from its member companies and verified with those published by the Ministry of Agriculture, Fisheries and Food (MAPA) differ, which is not uncommon. Aquaculture in Spain according to APROMAR data and comparisons with the rest of the Spanish reports indicates that aquaculture production in 2022 was 302,879 t, 7.2% less than in 2021 and 266,060 in 2023, 12.2% less than in 2022.

Aquaculture in Spain in 2023 was 266,060 tonnes, 12.2% less than in 2022 and with an estimated first sale value of 750.5 million euros.

The most abundant species was the mussel (*Mytilus spp.*), with 182,790 t in 2023 (255,200 t in 2022) with an estimated value of €127.6 million. Followed by sea bass

with 24,580 t in 2023 (23,622 t in 2022) and a value of €202.7 million; rainbow trout with 14,757 t in 2023 (16,328 t in 2022) with a value of €49.7 million; sea bream with 13,106 t in 2023 (8,932 t in 2022) with a value of €75.5 million and bluefin tuna with 9,744 t in 2023 (10,877 t in 2022) and a value of €136.2 million.

On the fisheries side, the main species caught by the Spanish fleet were skipjack tuna (*Katsuwonus pelamis*) of which 138,219 t were caught in 2022 (140,586 t in 2021), Argentine hake (*Merluccius hubbsi*) with 10,588 t in 2022 (96,277 t in 2021) and yellowfin tuna (*Thunnus albacares*) with 62,735 t in 2022 (68,143 t in 2021) according to FAO.

Figure 5-2. Evolution of the aquaculture harvest in Spain, in tonnes and by species, in the period 1953-2023 (MAPA and APROMAR data).

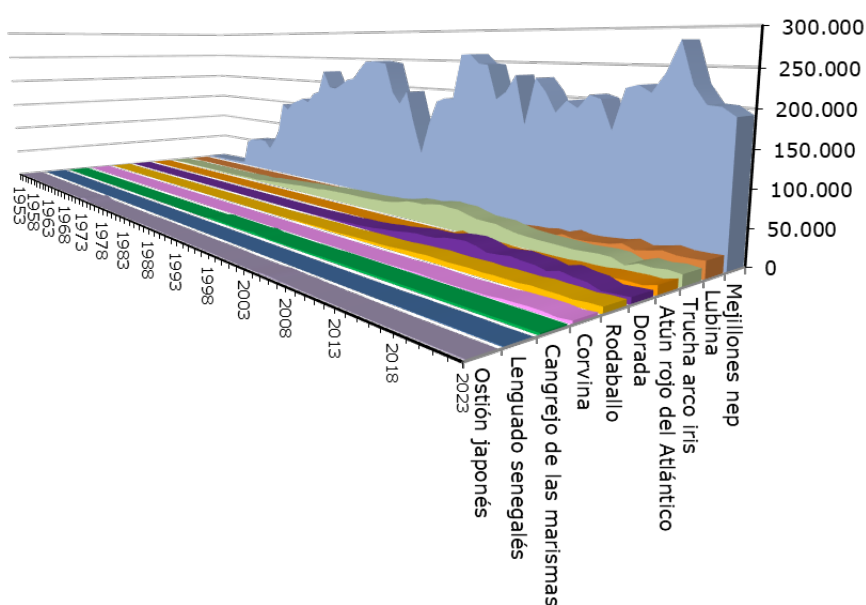


Figure 5-3. Evolution of the value of the aquaculture harvest in Spain, in millions of euros and by species, in the period 1987-2023 (MAPA and APROMAR data)

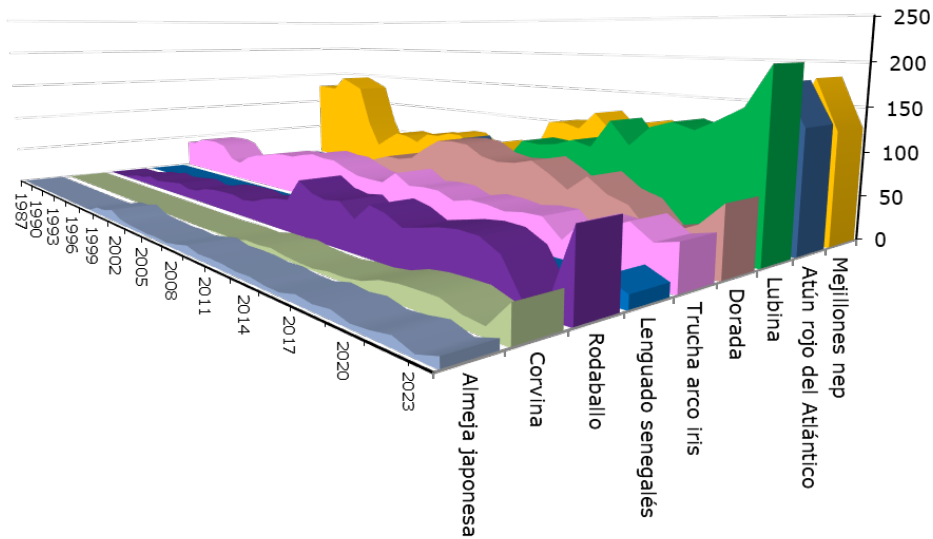
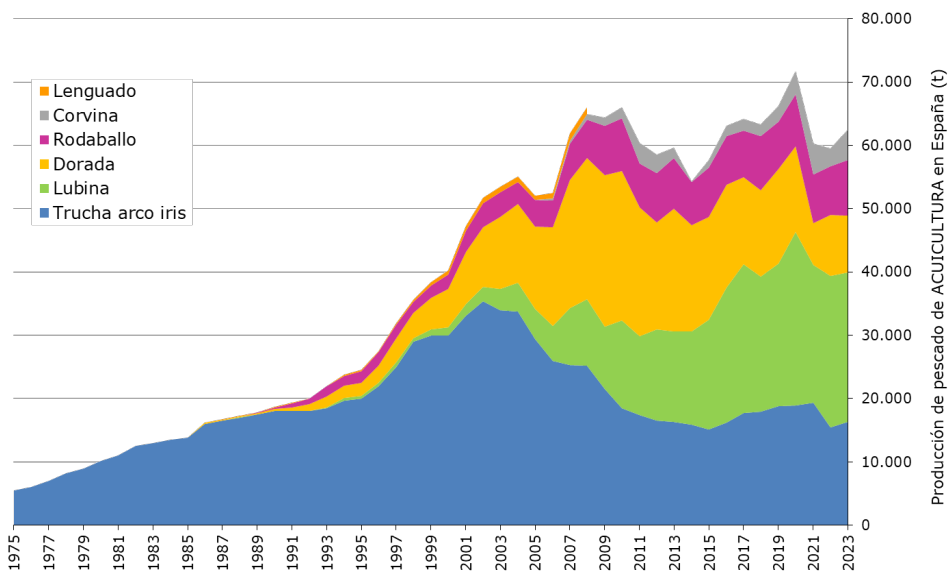


Figure 5-4. Evolution of aquaculture fish harvesting in Spain, in tonnes and for the main species, in the period 1975-2022 (MAPAMA and APROMAR).



## 5.2. Types of aquaculture establishments in Spain

Spain has a varied availability of water resources on which aquaculture is feasible, both in the marine and continental (freshwater) areas. Thus, in addition to the almost 8,000 km of coastline, there are nine large rivers, numerous minor river courses, lakes and a reservoir water capacity of more than 55,000 hm<sup>3</sup>, in addition to an orography and diversity of climates that provide ideal environmental and physical-chemical characteristics for the development of aquaculture.

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

- At sea in nurseries. These establishments consist of rigid plastic rings that support and float net bags inside which fish such as sea bream, sea bass or sea bass are stabled and raised.
- At sea in rafts and long-lines. These are floating structures for the cultivation of bivalve molluscs, mainly mussels. The rafts consist of a platform from which the culture ropes hang, and the *long-lines* are non-rigid structures that consist of a mother line, arranged between buoys linearly on the surface of the sea, from which the culture ropes hang in turn. Rafts operate better in sheltered waters, as in the case of Galician estuaries, while *long-lines* offer better results in open waters, as is the case of mussel farming in Andalusia.
- On dry land (salt water). These are establishments built on site on dry land on the coast and that obtain their water by pumping from catchments in the sea or wells. It is the type of farm where the production of turbot, for example, or sole is carried out.
- On the beach, intertidal zone and estuaries (salt water). These are aquaculture establishments in which farming is carried out with minimal physical intervention on the environment. This is the case of clam and oyster production. It is carried out in beach areas or intertidal areas where 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, an example of which is the estuaries for the production of fish such as sea bream, sea bass or sea bass.
- On dry land (fresh water). They consist of establishments 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 establishments in Spain**

In 2022, a total of 5,057 aquaculture establishments were in operation and producing in Spain, 125 fewer establishments than in 2021 with 5,182 according to MAPA data. Of these, 4,802 (126 fewer than in 2021) 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 (in freshwaters) had 149 active farms (6 more than in 2021), essentially for fish such as rainbow trout and sturgeon. The number of establishments on the coast, beaches, intertidal zones and estuaries was 63 (10 less than in 2021). And operating in nurseries at sea there were 40 (2 more than in 2021), for fish farming.

In 2022, there were 5,057 aquaculture establishments in production. Of which 4,802 of mollusks and 252 of fish (149 in inland waters, 63 on land and 40 in nurseries).

It is relevant to note that continental aquaculture is key to the development of rural areas in Spain. In these areas there is little economic activity and continental aquaculture represents an important focus of employment.

Figure 5-5. Evolution of the total number of aquaculture establishments in Spain with production between 2002 and 2022 (source MAPA/APROMAR).

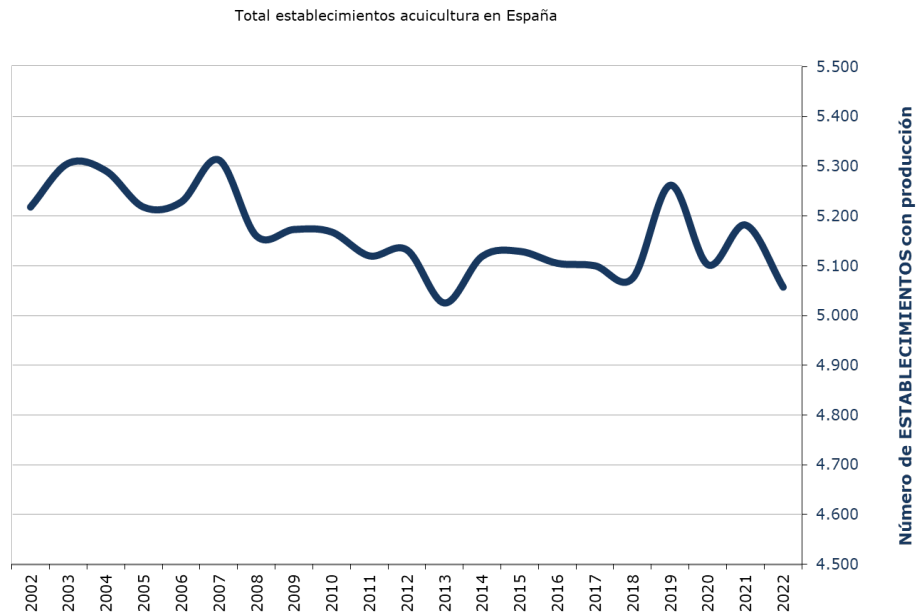
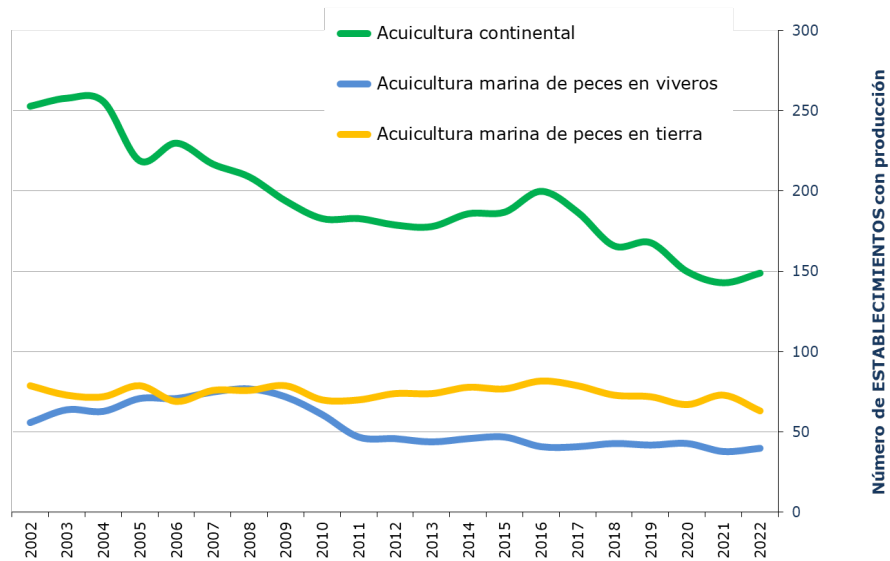


Figure 5-6. Evolution of the number of aquaculture establishments in Spain with production, dedicated to inland aquaculture, marine fish in nurseries and fish marina on land between 2002 and 2022 (source MAPA/APROMAR).



#### 5.4. Employment in aquaculture in Spain

Statistics prepared annually by the Ministry of Agriculture, Fisheries and Food (MAPA) indicate that the number of annual work units (AWUs) in aquaculture in Spain in 2022 was 5,878, 2.73% more than in 2021 with 5,722. This figure was distributed among 10,253 people, i.e. 9.77% less than in 2021 with 11,364 people. Therefore, although the number of work units increased slightly, the number of employees decreased by 1,110 people.

Most of the employees, 5,446 people, were non-salaried (self-employed), mainly in the mussel subsector. It was followed by 1,992 specialised operators, 1,836 non-specialised operators, 716 technicians with higher or intermediate qualifications, 195 administrative staff and 69 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 23 April 2024, the VII State Collective Agreement for Aquaculture was registered and published. This agreement is the first to cover both marine and continental aquaculture and it is APROMAR that promotes and coordinates it together with the trade union organizations.

Figure 5-7. Distribution of employment in aquaculture in Spain, by professional category, in 2022 calculated on Annual Work Units (ABPM).



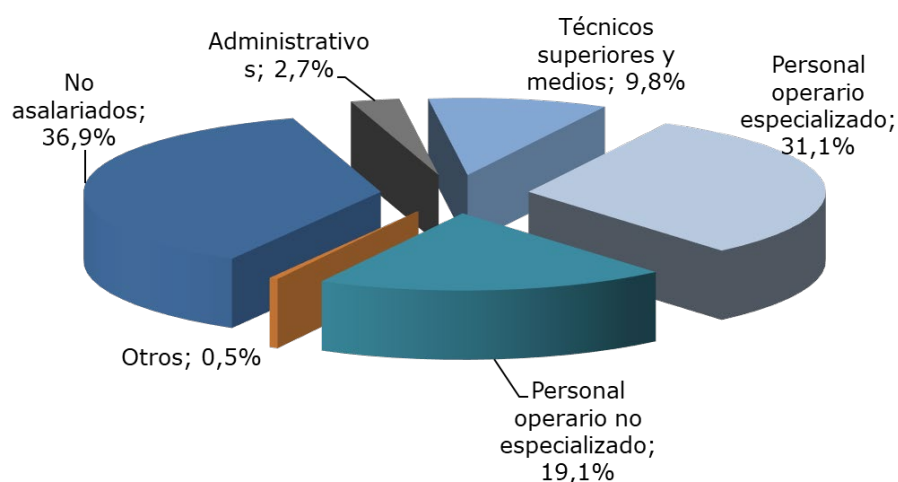
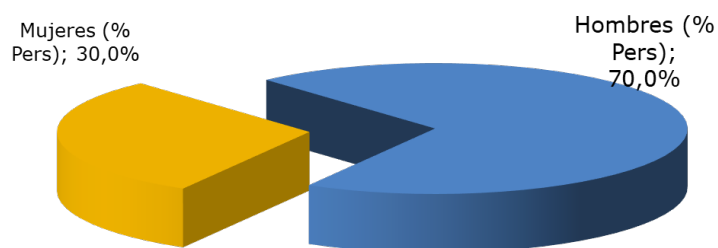
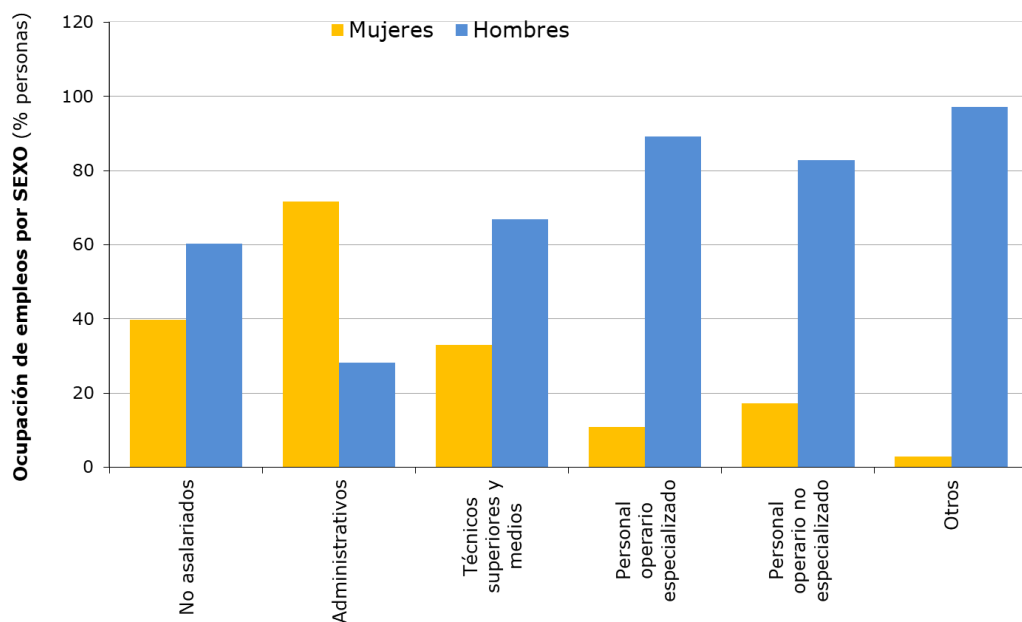


Figure 5-8. Distribution of employment by sex calculated on the number of people in aquaculture in Spain in 2022 (MAPA).



Employment in aquaculture is still mostly dominated by men, and there are also notable differences in the distribution of jobs between genders. In 2022, the total number of employed women was 3,077 (30.0%) compared to 7,177 men (70.0%). In relation to professional categories, the largest number of women occupy non-salaried (self-employed) positions with a total of 2,166 people, followed by non-specialized operating personnel (317 women), senior and middle technicians (237 people), specialized operators (216 people) and administrative (140 people). Men occupy the highest percentage of the categories of non-salaried (self-employed) with 60.2% (3,280 people), followed by specialized operators (1,828 men) and non-specialized (1,122 people).

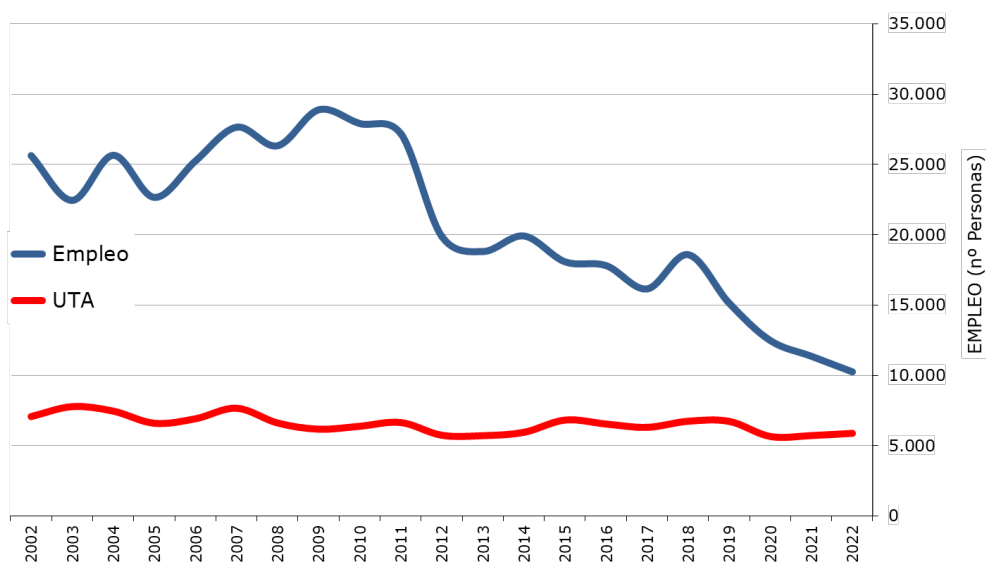
Figure 5-9. Employment occupation by sex calculated on the number of people in aquaculture in Spain in 2022 (MAPA).



The evolution of employment in aquaculture in Spain in the last 10 years shows a slight increase in AHU of 0.52% on average year-on-year and a decrease in people of 5.93%.

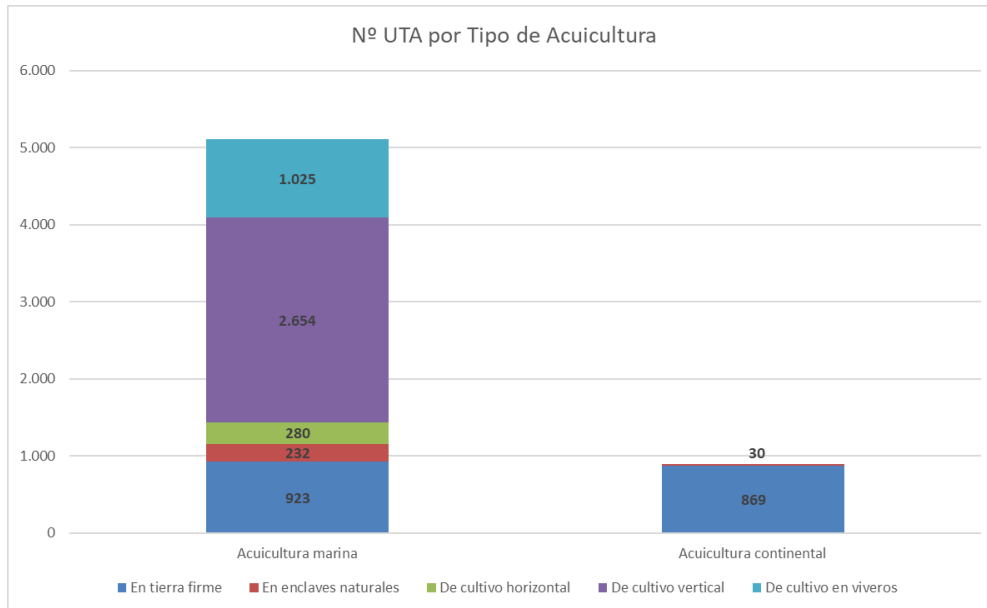
The estimate of indirect employment associated with the 10,253 people working in aquaculture was 25,634 jobs.

Figure 5-10. Evolution of employment in aquaculture in Spain during the period 2002-2022, showing the figures of people and Annual Work Units (MAPA).



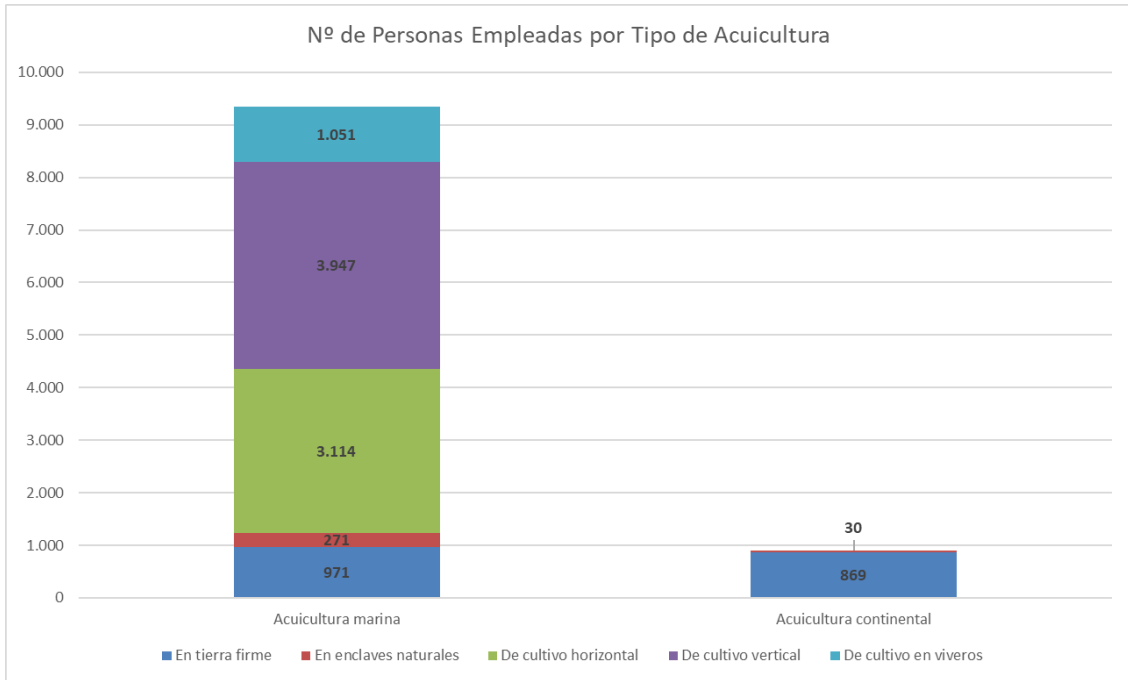
If the types of aquaculture are analysed by type of aquaculture, it can be seen that in terms of AHU, most of the employment is in marine aquaculture with 2,654 in vertical farming and 280 in horizontal farming, 1,025 in nurseries in the sea, 923 on land and 232 in natural enclaves. As for continental aquaculture, there are 869 people on land and 30 natural enclaves, according to MAPA data.

Figure 5-11. Number of AHUs in 2022 by type of aquaculture. Own elaboration of the MAPA data source.



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: 3,947 in vertical farming and 3,114 in horizontal farming, 1,051 in nurseries in the sea, 971 on land and 271 in natural enclaves. As for continental aquaculture, there are 869 people on land and 30 natural enclaves, according to MAPA data. Therefore, the largest decrease was experienced in marine aquaculture (vertical + horizontal farming), going from a total of 8,215 people in 2021 to 7,061 in 2022, mainly dedicated to the production of molluscs.

Figure 5-12. Number of People in 2022 by type of aquaculture. Own elaboration of the MAPA data source.



## 5.5. Consumption of aquaculture feed in Spain

Feeding aquaculture animals, particularly 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 2023, 181,000 tonnes were used in Spain, 5.8% more than in 2021 with 171,000 tonnes. 88.4%, 160,000 t of it was administered to marine fish: sea bass, sea bass, turbot, sea bream, eel and sole, mainly. And the remaining 11.6%, 21,000 tonnes, to continental species such as trout and sturgeon. The amount of aquaculture feed used in Spain barely adds up to 1% of the total livestock feed consumed in this country.

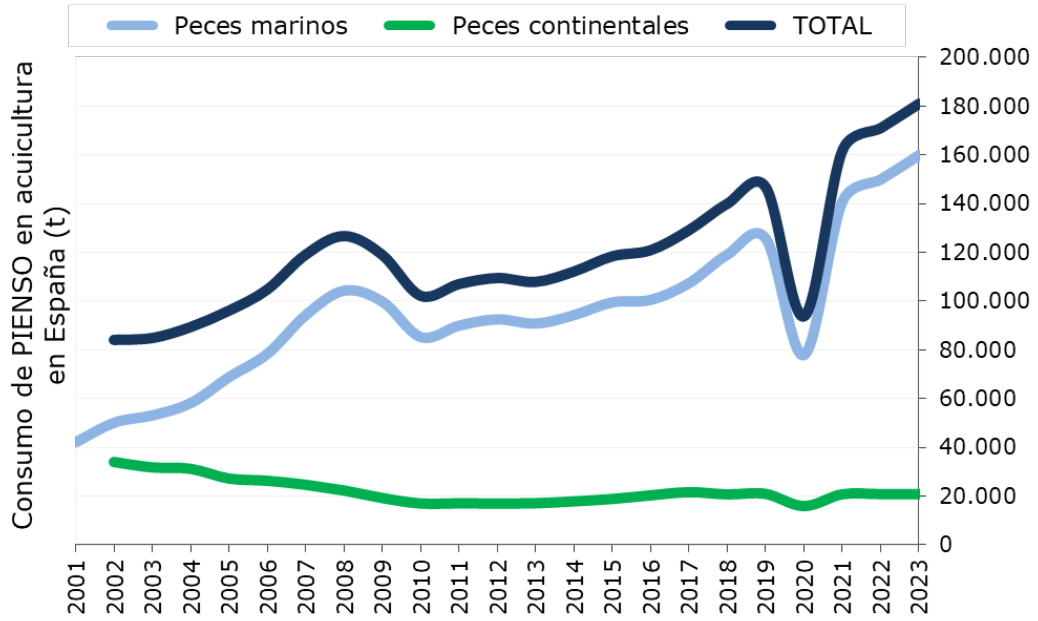
In 2023, 181,000 tonnes of fish feed were used in Spain, 5.8% more than in 2021 with 171,000 tonnes. The amount of aquaculture feed used in Spain barely adds up to 1% of the total livestock feed consumed in this country.

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

In mollusc farming there is no consumption of feed because they are filter feeders. Their diet is based on taking advantage of the natural productivity of the waters, whose nutrients favor the presence of plankton that is filtered and consumed by the

molluscs. 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. Aquaculture production in Spain and Europe (cont.)

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### 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, sea bass, sole, bluefin tuna, mussels, clams and oysters. Other species of interest such as eel, yellowtail, shrimp, microalgae and macroalgae are also analyzed, but with a lesser degree of detail.

#### **Marine fish farming**

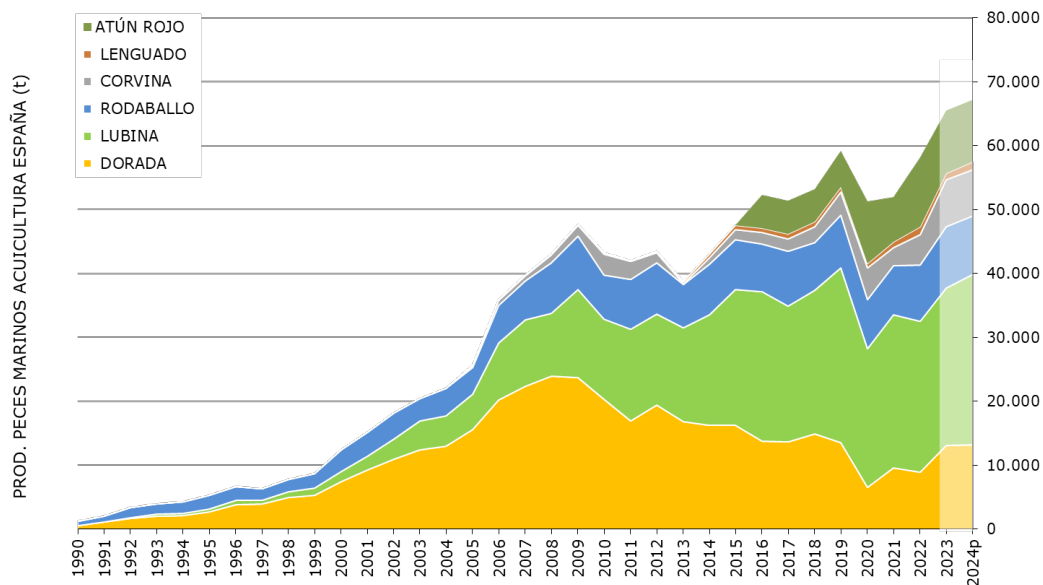
Marine fish farming in Spain in 2023 was 65,848 t, 12.2% more than in 2022 (58,664 t). The value of this production is estimated at €605.2 million, 3.3% more than in 2022 (€585.7 million).

The fish species that experienced the highest growth compared to 2022 were sea bream, whose production increased by 46.7%, and sea bass, whose production increased by 55.7%. On the other hand, those that experienced the greatest decreases compared to the previous year were: Senegalese sole (-11.9%) and bluefin tuna (-10.4%).

Marine fish farming in Spain in 2023 was 65,848 t, 12.2% more than in 2022 (58,664 t). The value of this production is estimated at €605.2 million, 3.3% more than in 2022 (€585.7 million).
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Production is expected to remain stable in 2024, with a slight increase of around 2.5% and occurring mostly in the Valencian Community, Catalonia and the Canary Islands.

*Figure 5-14. Evolution of the harvest (tonnes) of aquaculture marine fish in Spain in the period 1990-2024p.*



When analysing the production of fish (sea bream, sea bass, turbot, sea bass, sole, eel and yellowtail) by region, it can be seen that the Valencian Community topped the list with a total of 21,227 tonnes. Its production increased in 2023 by 52% compared to 2022 (13,975 t). This increase has occurred mainly in the production of sea bass and sea bream.

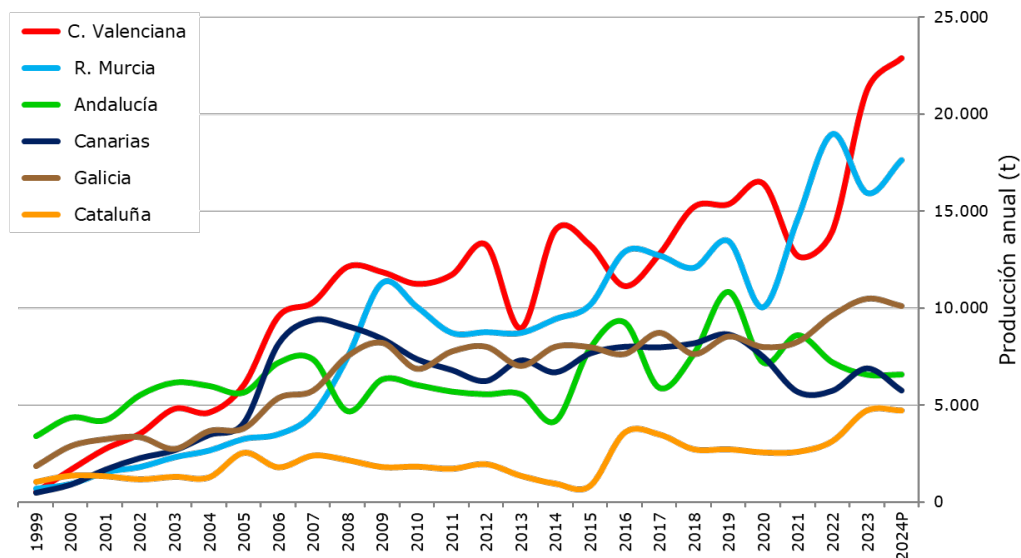
The next community in production was the Region of Murcia, with 17,611 tonnes, 16% less than in 2022 (18,953 tonnes). This decrease was mainly in the production of sea bream and bluefin tuna.

In third place was Galicia, with a total of 10,112 tonnes, 9% more than in 2022 (9,627 tonnes). This increase occurred mainly in turbot production.

Andalusia was the fourth community in terms of aquaculture marine fish production with a total of 6,582 t in 2023, although it experienced a decrease of 9% (7,221 t in 2022). Bass farming mainly declined.

The Canary Islands ranked fifth with 6,886 tonnes, increasing by 20% compared to 2022 (5,738 tonnes) due to the cultivation of sea bream and sea bass. And Catalonia, with 4,740 tonnes, ranked sixth and increased its production by 50% (3,150 tonnes in 2022).

Figure 5-15. Evolution of the harvest (tonnes) of marine aquaculture fish in the different Autonomous Communities of Spain in the period 1999-2024p.



### Cultivation of DORADA

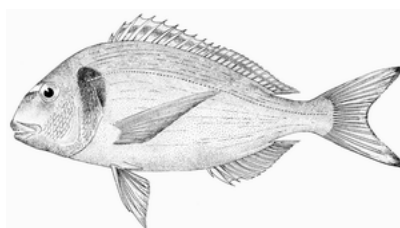
Total aquaculture production of sea bream (*Sparus aurata*) in Europe and the rest of the Mediterranean in 2023 is estimated at 332,966 t, 5.1% less than in 2022 (350,933 t) according to statistics from APROMAR, FEAP and FAO. A slight increase is estimated in 2024, with production around 335,000 t.

The total value in first sale of Mediterranean aquaculture sea bream harvested in 2023 is calculated at €1,665 million, with an estimated value of the first sale price per kilogram of €5.

There is aquaculture sea bream production in more than 20 countries, with the main producers being Turkey with 136,500 tonnes (representing 38.9% of total production), Greece with 65,400 tonnes (18.6%), Egypt with 45,000 tonnes (12.8%), Tunisia with 16,500 tonnes (4.7%), Spain with 13,016 tonnes (3.7%) and Italy with 10,750 tonnes (3.1%). Its cultivation is also carried out in Cyprus, Croatia and there are smaller productions in: Malta, Israel, France, Portugal, Albania, Algeria, United Arab Emirates and Bosnia, among others.

### SEA BREAM (*Sparus aurata*)

Class: Osteichthys Order: Perciformes  
Family: Sparidae



#### Significant characteristics:



High oval body 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 proterandral hermaphrodite animal, first maturing as a male and from the second or third year it becomes female. It can live more than 10 years.

**Cultivation:**

Its ageing takes place in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under highly 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 brine shrimp. They then start feeding feed made from natural raw materials. The 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 the time it hatches from the egg. The commercial size ranges from 250 g to more than 2,000 g.

Figure 5-16. Evolution of aquaculture sea bream production (tonnes) in the Mediterranean area and the rest of the world in the period 1985-2024p (Based on FAO, FEAP and APROMAR data).

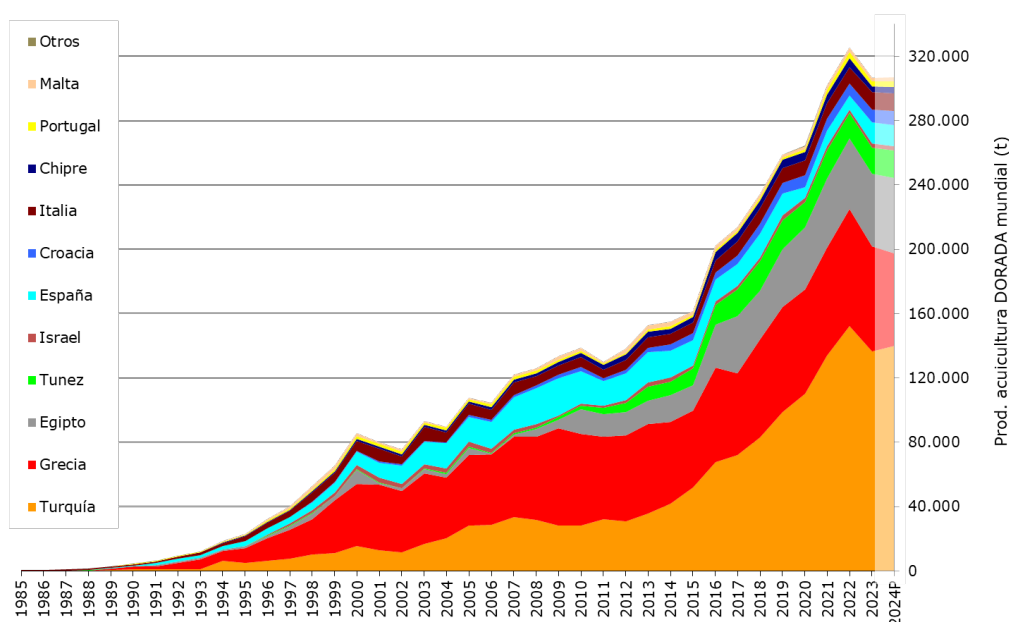
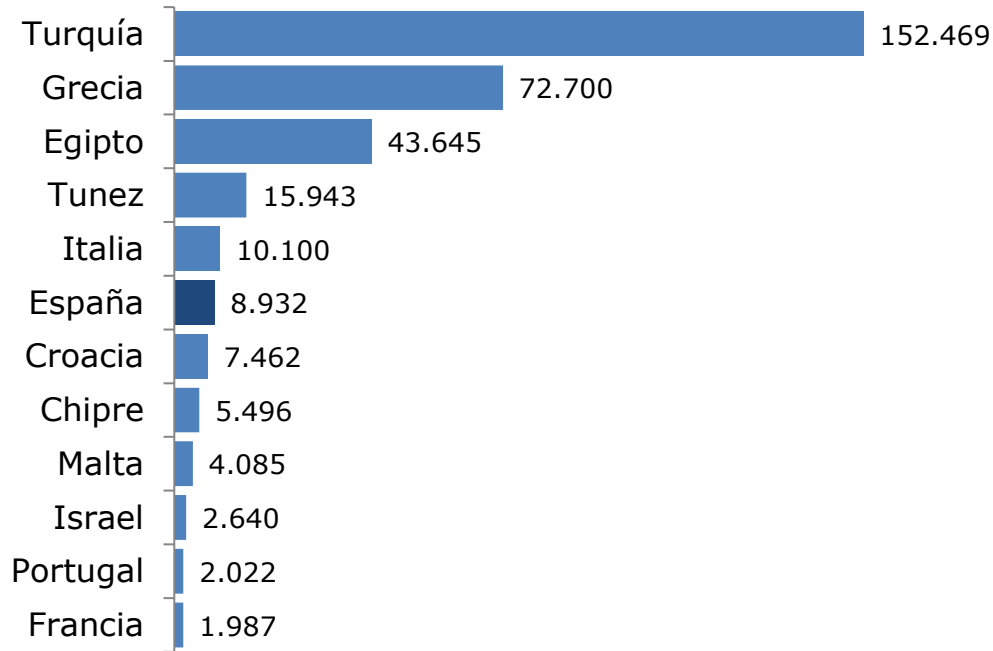


Figure 5-17. Distribution of aquaculture sea bream production in the Mediterranean area in 2023 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data.

Country	Value	Volume	% representation
Türkiye	762.3 M€	152,469 t	43,4%
Greece	363.5 M€	72,700 t	20,7%
Egypt	218.2 M€	43,645 t	12,4%
Tunisia	79.7 M€	15,943 t	4,5%
Italy	50.5 M€	10,100 t	2,9%
Spain	44.7 M€	8,932 t	2,5%
Croatia	37.3 M€	7,462 t	2,1%
Cyprus	27.5 M€	5,496 t	1,6%
Malta	20.4 M€	4,085 t	1,2%
Israel	13.2 M€	2,640 t	0,8%

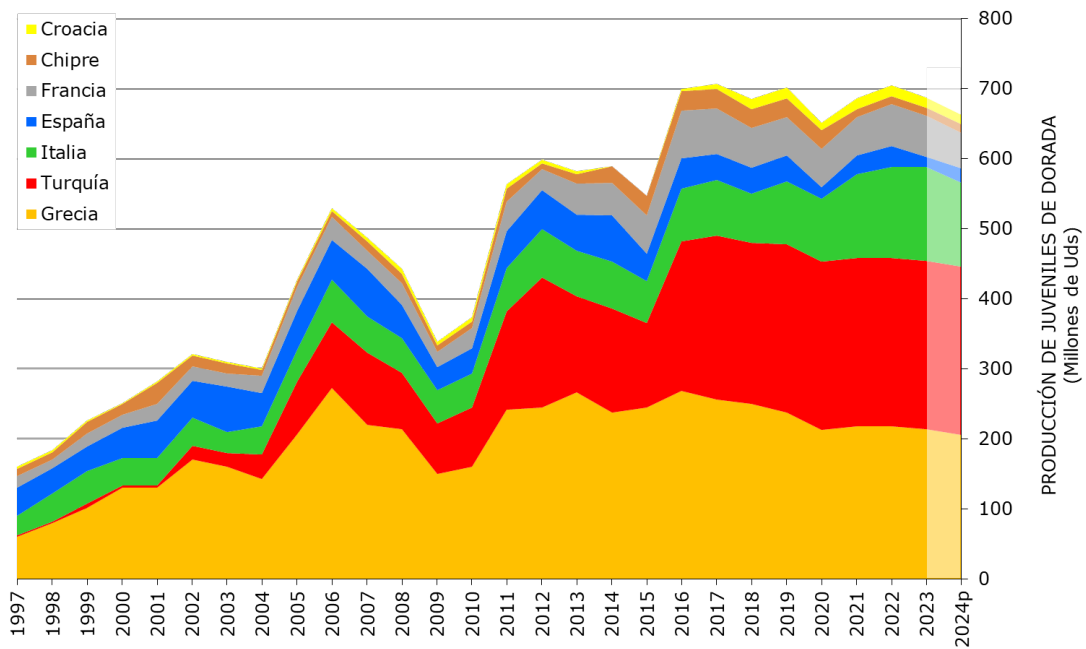
Portugal	10.1 M€	2,022 t	0,6%
France	9,9 M€	1,987 t	0,6%

### VOLUMEN PRODUCCIÓN (t)



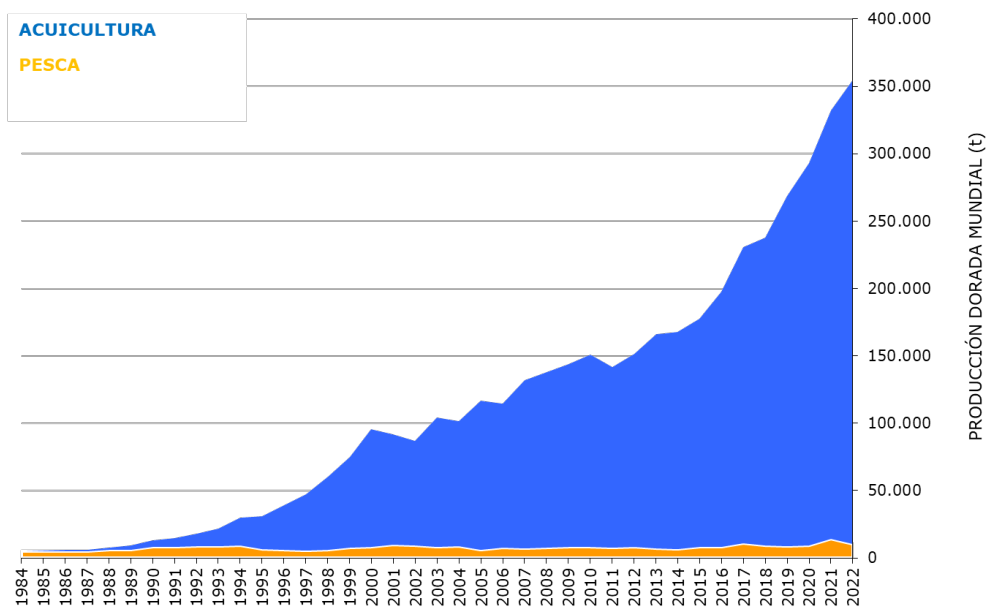
The total production of juvenile sea bream in 2023 in Europe (including Turkey) is estimated to be 662.3 billion units, down 2.5% from 2022 (704.7 million units). The main producing country was Turkey (240 million) followed by Greece (214 million), then Italy (135 million), France (58 million) and Spain (14 million juveniles). In any case, the difficulty of contrasting these figures must be pointed out again, especially in Greece and Turkey. It is estimated that the production of juvenile sea bream will decrease by 5.2% in 2024, to 657 million units.

*Figure 5-18. Evolution of the total production of juvenile sea bream (million units) in the Mediterranean area in the period 1997-2024p (on FEAP and APROMAR).*



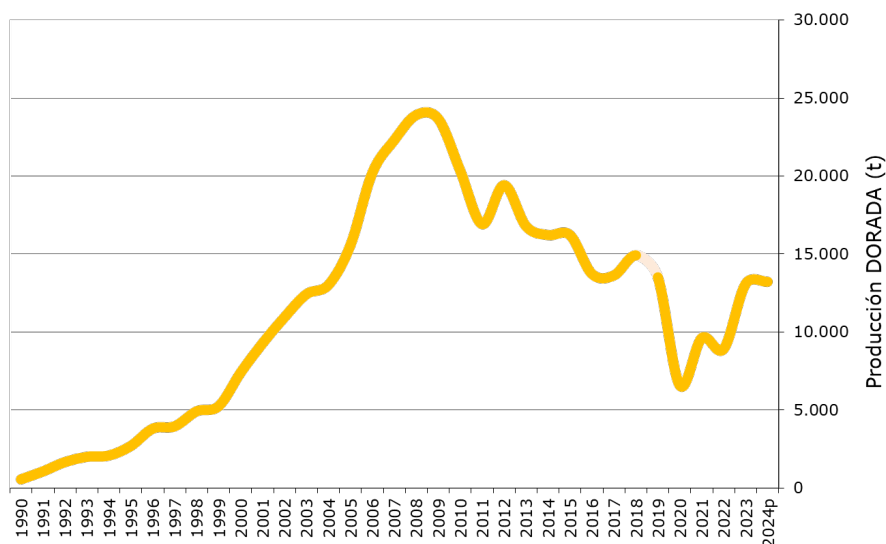
The unloading of sea bream from extractive fishing in the Mediterranean and Atlantic Ocean countries at fishing ports in the Mediterranean Sea and Atlantic Ocean countries totalled 10,526 tonnes in 2022, 24.8% less than in 2021 (13,997 tonnes). This amount remained relatively constant with an average of 9,000 tonnes per year in the last 10 years, while farmed sea bream accounted for 97.0% of the total supply of this species.

Figure 5-19. Evolution of total world production (tonnes) of sea bream (*Sparus aurata*), through aquaculture and fisheries, in the period 1984-2022 (FAO).



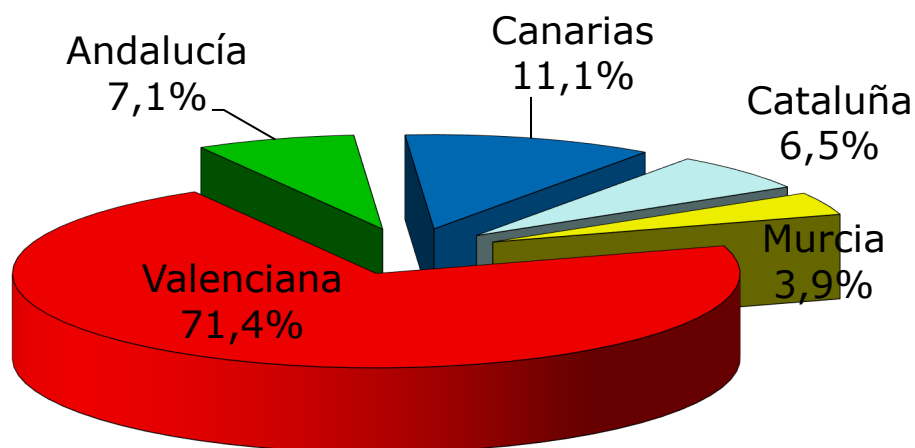
The aquaculture sea bream harvest in Spain in 2023 was 13,106 t, 46.7% more than the previous year with 8,932 t. By 2024 it is estimated that it will remain stable. The highest annual Spanish harvest of aquaculture sea bream took place in 2008, with 23,930 t. In 2023, the Valencian Community led aquaculture sea bream production with 9,360 t, 66.5% more than in 2022 (5,620 t), accounting for 71% of the total; followed by the Canary Islands, 1,460 tonnes, which represented an increase of 85% compared to 2022 (790 tonnes) and a total of 11% of the total. The third position went to Andalusia, production increased by 14% with 926 t (815 t in 2022) being 7% of the total, followed by Catalonia with 850 t grew by 124% (380 t in 2022) with 6% of the total; and the Region of Murcia, with 510 t, decreased by 61% compared to 2022 (1,327 t), accounting for 4% of the total.

Figure 5-20. Evolution of sea bream (*Sparus aurata*) aquaculture production in Spain in tonnes (1990-2024p).



As for the value of the first sale of sea bream production in Spain in 2023, an average price per kilogram is estimated at €5.76 and therefore, the total production was €75.5 million, 49.0% more than in 2022 (€50.7 million).

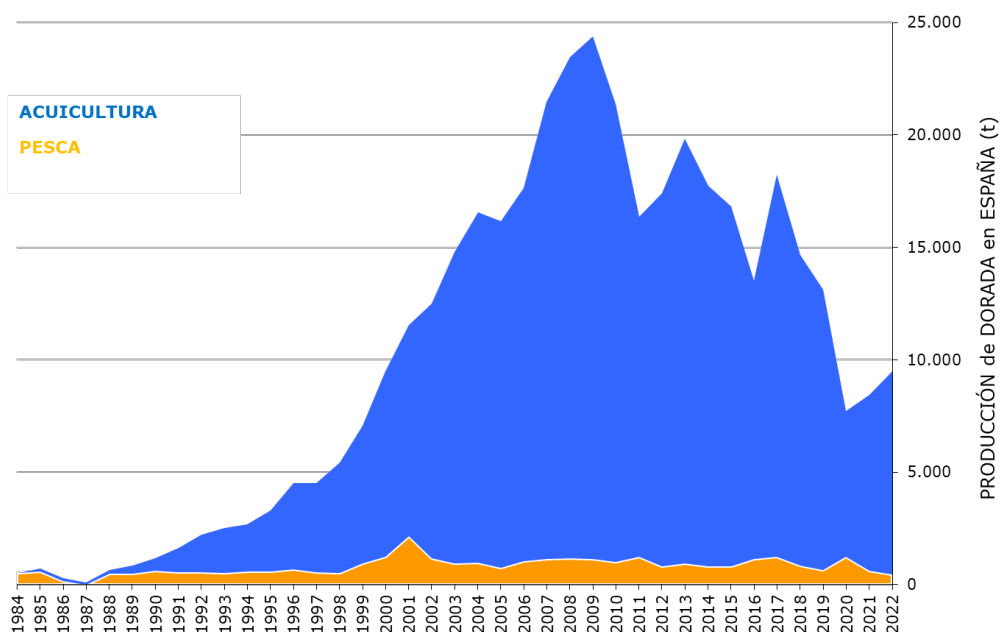
Figure 5-21. Percentage distribution of sea bream productions (tonnes) in Spain by Autonomous Communities in 2023.



Fishing contributed 463 tonnes to production in 2022, which was 23.7% less than in 2021 and representing 4.2% 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 95.8% of the total in 2022.

Aquaculture sea bream accounted for 97.0% of the total supply in the world compared to 3.0% of extractive fishing. In Spain, aquaculture sea bream accounted for 95.8% of the supply, according to FAO data.

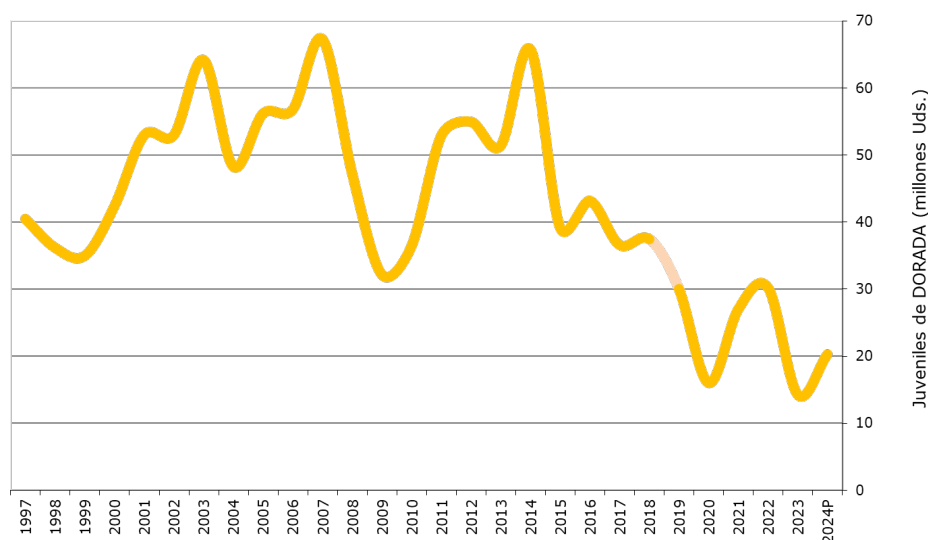
Figure 5-22. Evolution of the sources of sea bream (*Sparus aurata*) in Spain in tonnes: aquaculture and fisheries, in the period 1984-2022 (FAO-MAP).



The production of juvenile sea bream in Spain in 2023 was 14.3 million units and it is estimated that production in 2024 will be higher and reach 20.3 million units. It is important to bear in mind that these data collected by APROMAR differ from those reported by JACUMAR because they include all juveniles produced on Spanish farms and not only those destined for sale to third parties. The production of sea bream juveniles in 2023 was led by the Valencian Community (45% of the total) and followed by the Balearic Islands (42%) and the Region of Murcia (13%). The average purchase price of juvenile sea bream in Spain, at an equivalent weight of 2 g per unit, is estimated at 0.45 euros/unit in 2023.

The Spanish production of commercial sea bream requires the import of additional juveniles to those of national production, and these are not included in the aforementioned statistics. The origin of these fish is, in order of importance, France, Italy and Greece.

Figure 5-23. Evolution of the production of juvenile sea bream in Spain in millions of units (1997-2024p).



### Cultivation of BASS

Total aquaculture production of sea bass (*Dicentrarchus labrax*) in Europe and the rest of the Mediterranean arc in 2023 was 284,438 t, 6.3% less than in 2022 (303,586 t), according to consolidated statistics from FAO, FEAP and APROMAR. By 2024 it is estimated that it will remain stable or slightly higher (3.0% more).

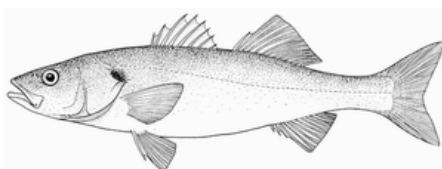
The total value of aquaculture sea bass in 2023 was approximately €1,564.4 million.

The main bass producing countries were Turkey with 136,500 tonnes (accounting for 45.0% of the total), Greece with 55,300 tonnes (18.2%), Egypt with 35,000 tonnes

(11.5%) and Spain with 24,580 tonnes (8.1%). Sea bass is also produced in Italy, Egypt, Croatia, France, Tunisia, Portugal, Cyprus, Israel, the United Kingdom, Bosnia, Algeria, Montenegro, Malta, Slovenia and Morocco.

**SEA BASS (*Dicentrarchus labrax*)**

Class: Osteichthyans Order: Perciformes  
Family: Moronidae



**Significant characteristics:**

Spindle-shaped and vigorous body with large scales. Pointed head with small nasal openings, small eyes and large mouth. The lower jaw is somewhat prominent. Leaden gray coloration, darker on the dorsal part and silver sides. On the operculum it has a black spot. Slightly forked caudal fin. It reaches a size of up to 70 cm in length. It tolerates wide variations in temperature and salinity of the water. The first sexual maturation usually occurs at 2-4 years of age. Its longevity is estimated at about 30 years.

**Cultivation:**

Sea bass is a fish whose breeding is carried out in almost all Mediterranean countries. Hatcheries produce eggs from breeding individuals under highly 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 brine shrimp. They then start feeding feed made from natural raw materials. The 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 from the time 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 1984-2024p (Based on FAO, FEAP and APROMAR data).

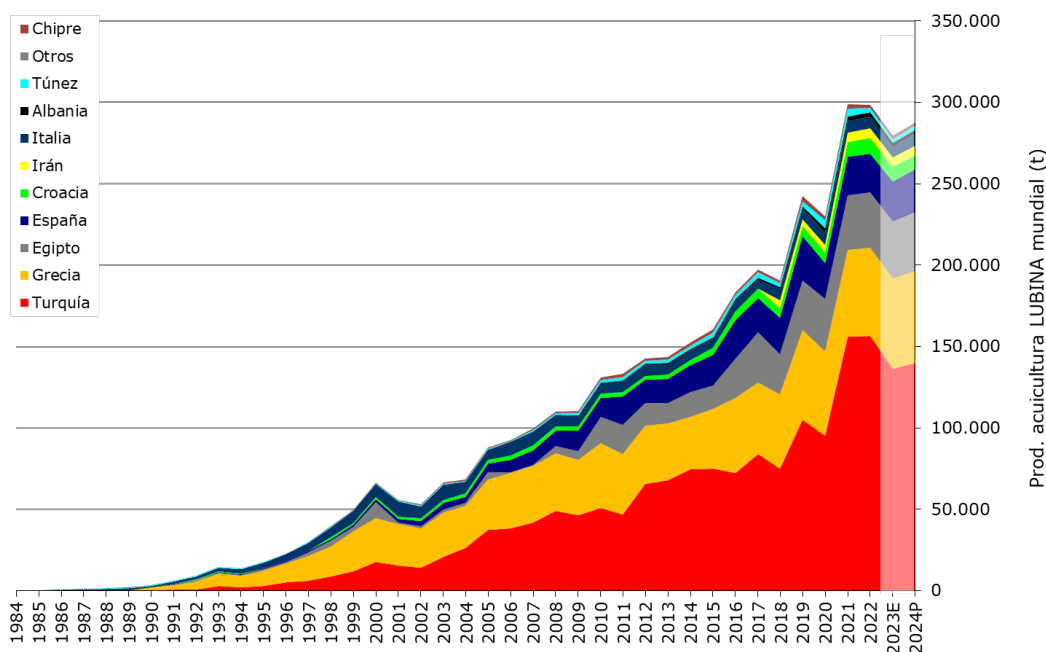
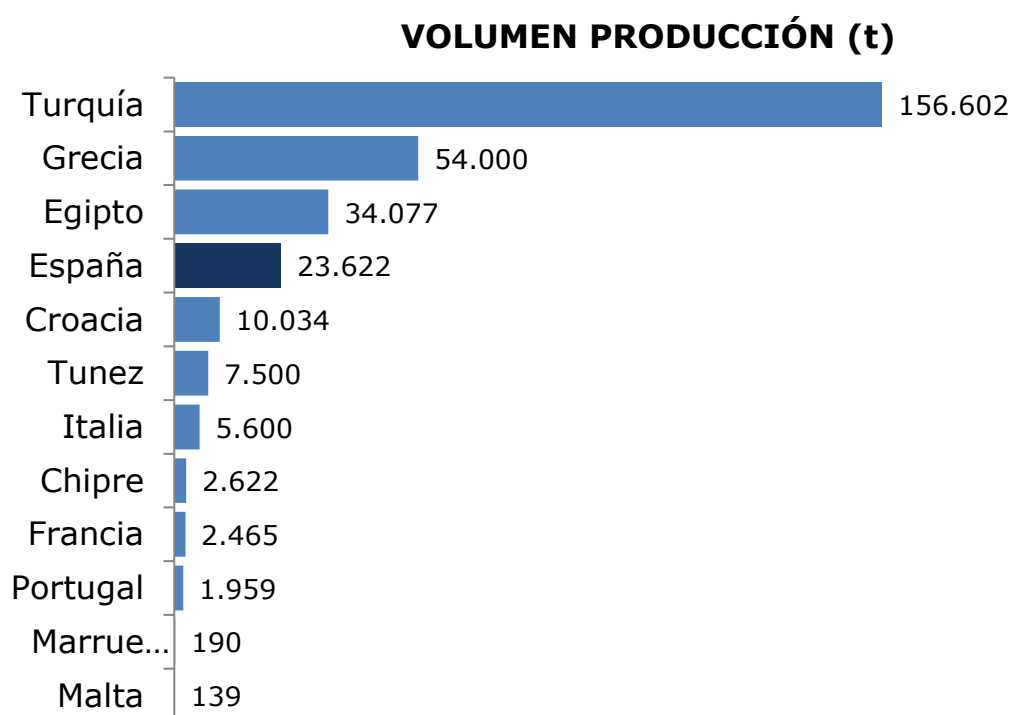


Figure 5-25. Distribution of sea bass aquaculture production in the Mediterranean area in 2023 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data.

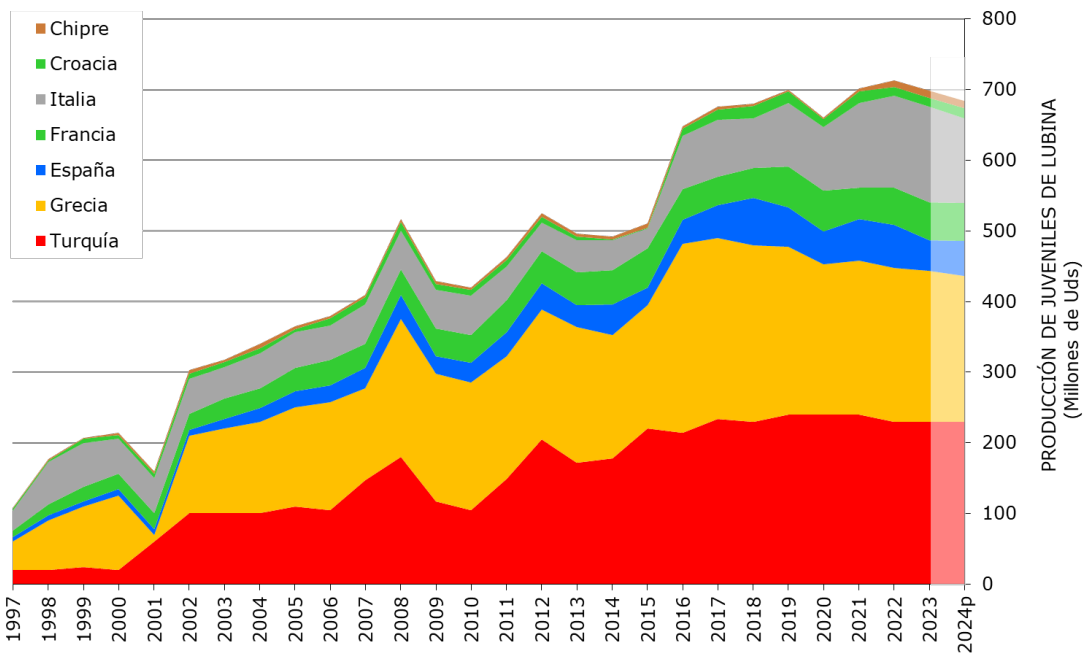
Country	Value	Volume	% representation
Türkiye	858.0 M€	156.602	51,6%
Greece	294.3 M€	54.000	17,8%
Egypt	182.8 M€	34.077	11,2%
Spain	131.6 M€	23.622	7,8%
Croatia	49.3 M€	10.034	3,3%
Tunisia	41.3 M€	7.500	2,5%
Italy	30.9 M€	5.600	1,8%
Cyprus	13.5 M€	2.622	0,9%
France	28.1 M€	2.465	0,8%
Portugal	14.7 M€	1.959	0,6%
Morocco	1.3 M€	190	0,1%
Malta	1.2 M€	139	0,0%



The production of juvenile sea bass in 2023 in Europe (including Turkey) was 705.6 million units, 1.6% less than in 2022 (713.5 M). The main producing country was Turkey with 230 million units, followed by Greece with 213.7 million and Italy 135 million, Spain in fourth place with 49.9 million and France produced about 54 million units. By 2024, a somewhat lower production is expected, around 657 million juvenile sea bass.

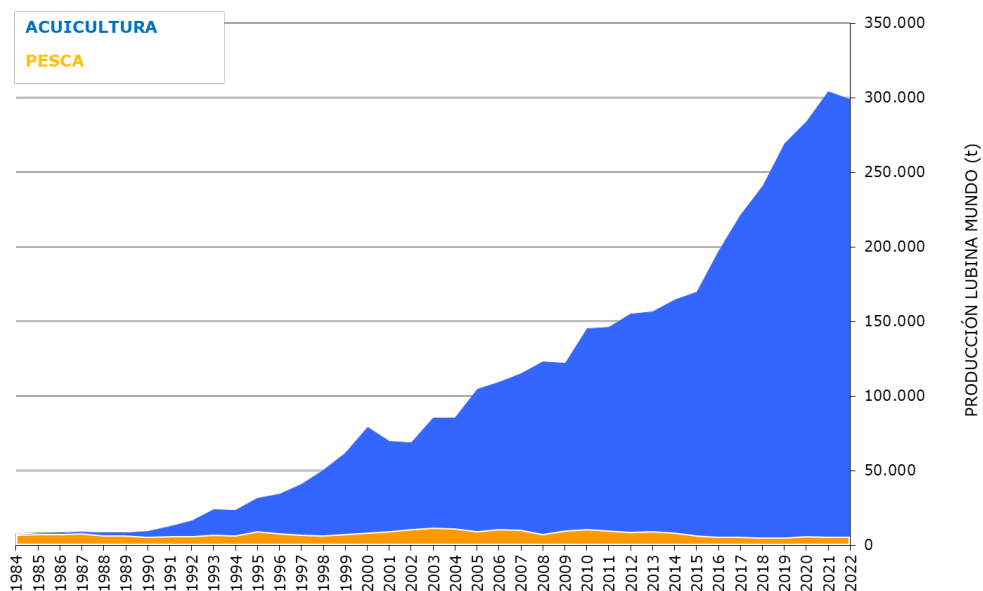
Figure 5-26. Evolution of the total production of juvenile sea bass in the Mediterranean area in the period 1997-2024p, in million units (on FEAP and APROMAR).





In 2022, 5,553 tonnes of sea bass were obtained from extractive fisheries worldwide. When compared with the amount of sea bass obtained through aquaculture in that same year, 293,618 tonnes, it can be seen that aquaculture provides 98.1% of the total sea bass found in the markets worldwide.

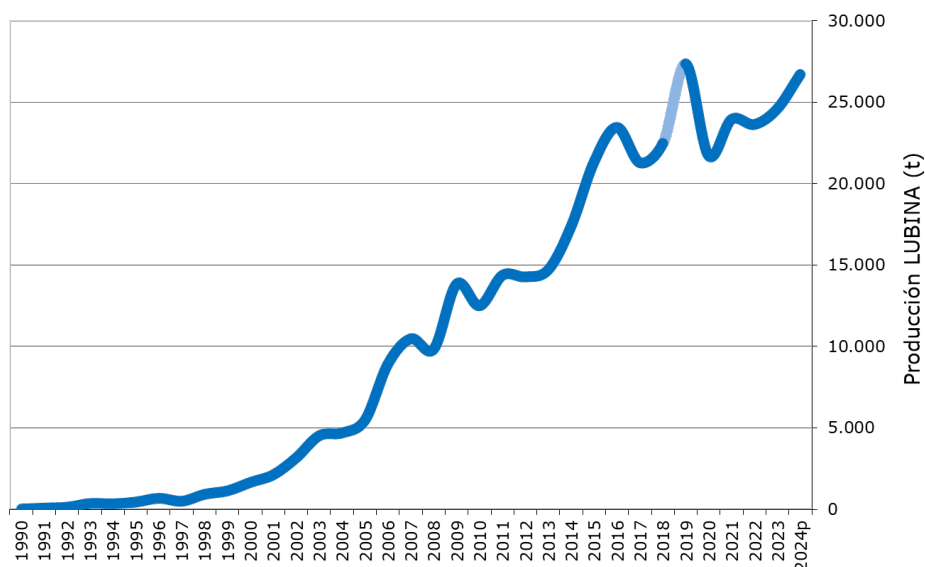
Figure 5-27. Evolution of total world production (tonnes) of sea bass (*Dicentrarchus labrax*), through aquaculture and fisheries, in the period 1984-2022 (FAO).



The aquaculture sea bass harvest in Spain in 2023 was 24,580 t, 4.0% more than in 2022 (23,622 t). The Region of Murcia has led production in 2023 with 7,580 t (31% of the total), followed by the Valencian Community (5,700 t, 23% of the total), the

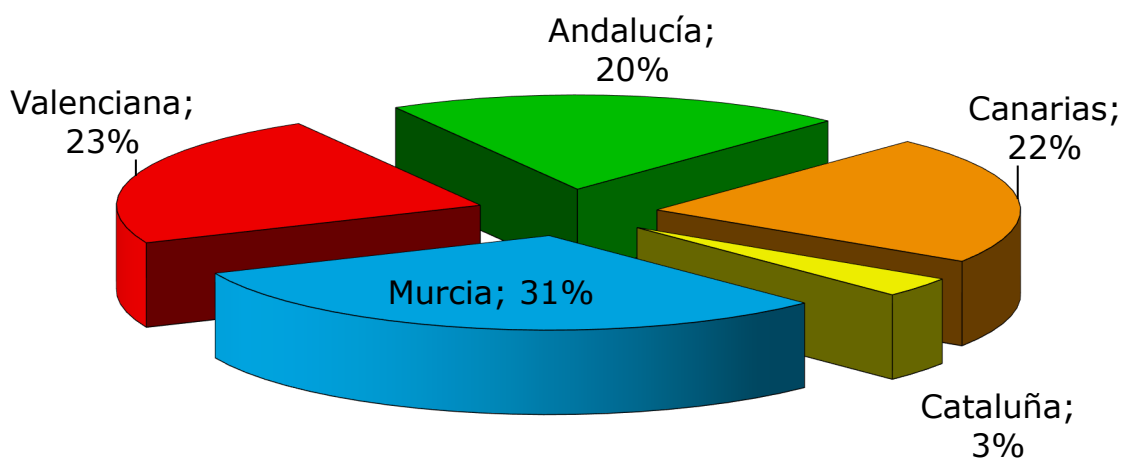
Canary Islands (5,426 t, 22%), Andalusia with 5,024 t (20% of the total) and Catalonia with 850 t (3% of the total). For 2024, growth of 8.6% is expected with a sea bass harvest in Spain of 26,700 t.

Figure 5-28. Evolution of aquaculture production of sea bass (*Dicentrarchus labrax*) in Spain in tonnes (1990-2024p).



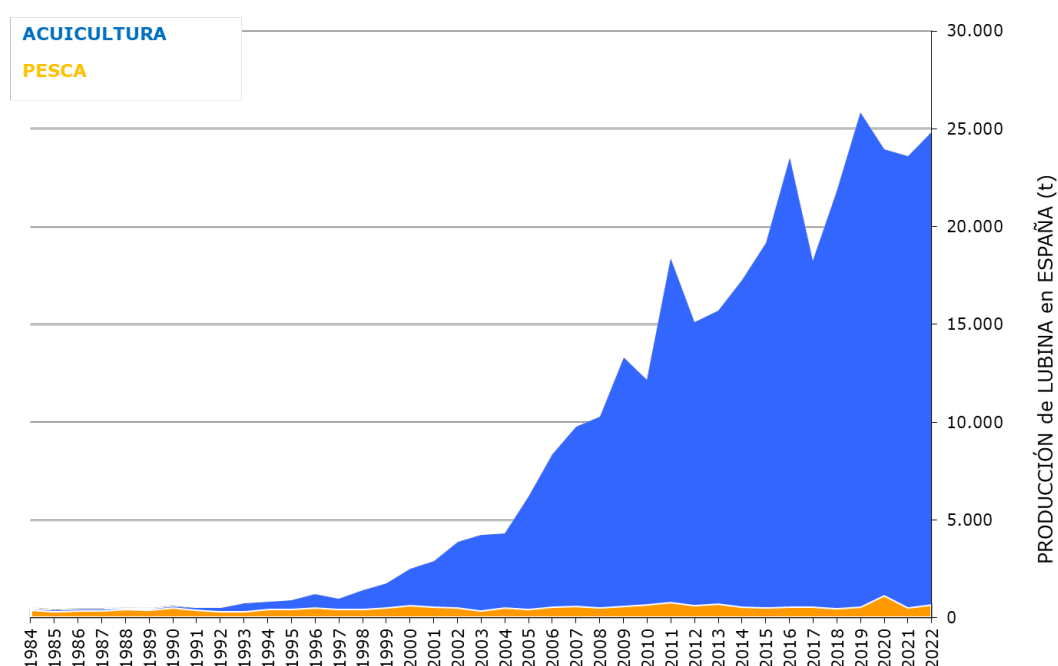
For 2023, an average first sale price of sea bass is estimated at €8.25/kg, 11.6% more than in 2022 (€7.69/kg) and a total value of Spanish production of €202.7 million.

Figure 5-29. Percentage distribution of sea bass productions (tonnes) in Spain by Autonomous Communities in 2023.



In 2022, 720 tonnes of sea bass were caught and arrived at Spanish ports. This was an increase of 32.1% compared to 2021 (545 t). As can be seen when comparing fisheries and aquaculture by species, aquaculture provides 97.1% of the Spanish sea bass that reaches the markets.

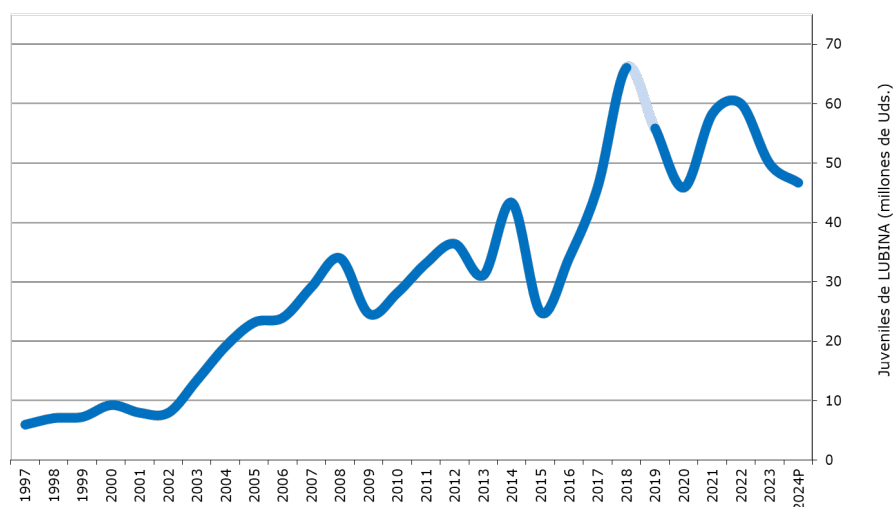
Figure 5-30. Evolution of sources of sea bass (*Dicentrarchus labrax*) in Spain: aquaculture and fishing in tonnes, in the period 1984-2022 (FAO-MAP).



The production of juvenile sea bass in Spain in 2023 was 49.9 million units. This was carried out in the Balearic Islands (68%), the Valencian Community (27%) and the Region of Murcia (5%). By 2024, it is estimated that the production of juvenile sea bass in Spain will increase to 46.5 million units. It is important to bear in mind that these data collected by APROMAR differ from those reported by JACUMAR because they include all juveniles produced on Spanish farms and not only those destined for sale to third parties. The average purchase price of juvenile sea bass in Spain, at an equivalent weight of 2 g per unit, is estimated at 0.32 euros/unit.

The Spanish production of commercial-size sea bass requires the import of juveniles in addition to those of national production, and these are not included in the aforementioned statistics. The origin of these fish is, in order of importance, France, Italy and Greece.

Figure 5-31. Evolution of the production of juvenile sea bass in Spain in millions of units (1997-2024p).



### Joint figures for the cultivation of SEA BREAM and SEA BASS

Given the very similar environmental and biological requirements of sea bream and sea bass, their forms of production are very similar. For this reason, they are often grown on the same farms and both are replaceable with 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.

Total aquaculture production of sea bream plus sea bass in Europe and the rest of the world in 2023 is estimated at 611,075 tonnes, 5.7% less than in 2022 (647,890 tonnes), according to consolidated statistics from FEAP, APROMAR and FAO. A similar or slightly lower production is expected for 2024 at around 621,497 t.

*Figure 5-32. Evolution of joint aquaculture sea bream and sea bass production (tonnes) in the Mediterranean area and the rest of the world in the period 1985-2024p (Based on FAO, FEAP and APROMAR data).*

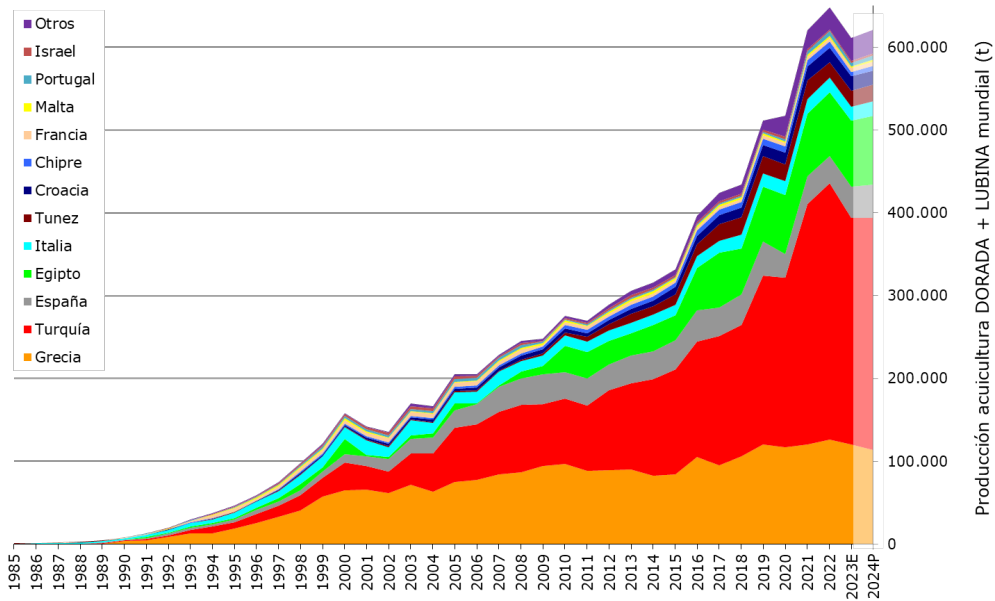
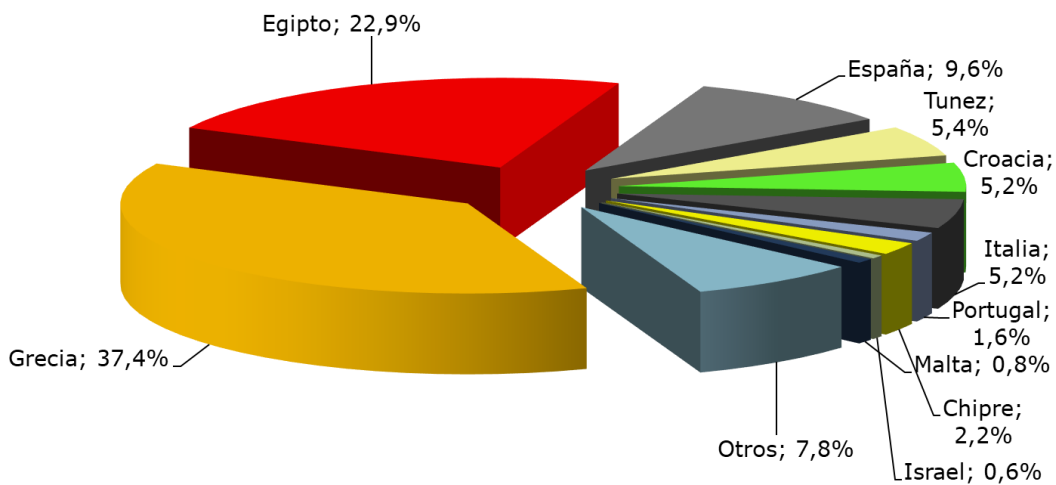
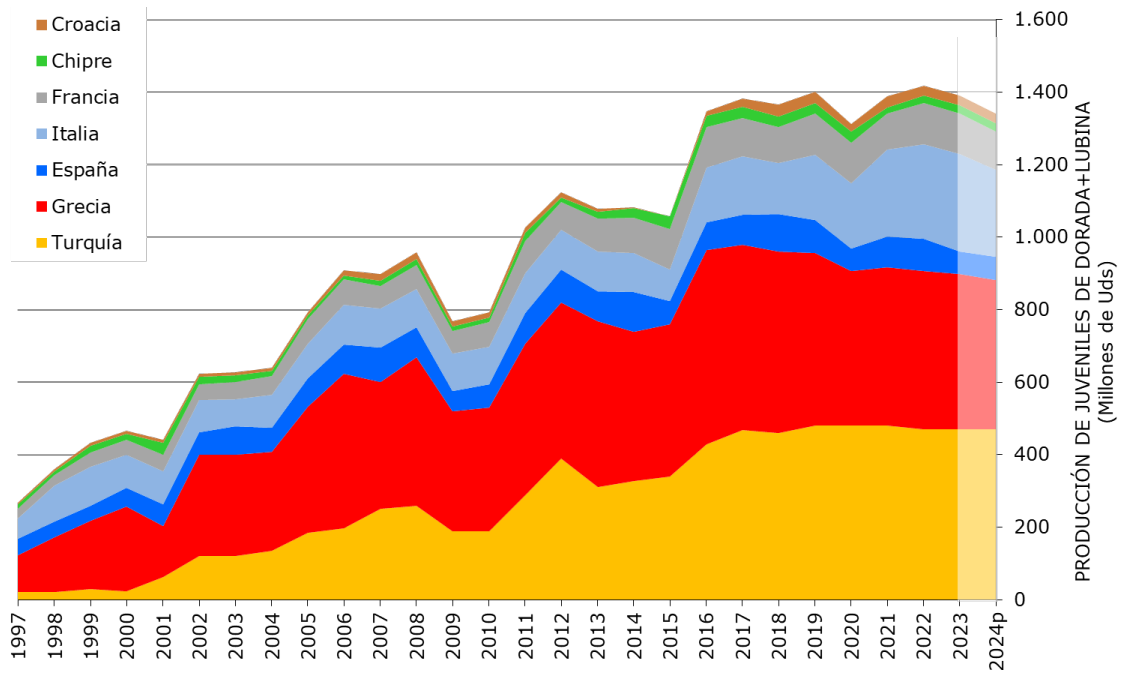


Figure 5-33. Distribution of aquaculture production of sea bream plus sea bass in the Mediterranean area in 2023 in volume (tonnes) and value (million euros), based on FAO, FEAP and APROMAR data.



The joint production of juveniles of sea bream plus sea bass in the Mediterranean area in 2023 (not including Egypt or Tunisia) was 1,392,852 units, which represents a decrease of 1.8% on the previous year's figure (1,418,196). The main producing countries in order of importance are Turkey (470 million), Greece (427.4 million), Italy (270 million), France (112.39 million) and Spain (64.2 million). In 2024, production is expected to be slightly lower with about 1,343,300 juveniles.

Figure 5-34. Evolution of the joint production of juvenile sea bream and sea bass in the Mediterranean area in the period 1997-2024p, in million units (on FEAP and APROMAR).



The total aquaculture production of sea bream plus sea bass in Spain in 2023 was 37,596 t, 15.5% more than the previous year (32,554 t). The largest production took place in the Valencian Community (15,060 t, 40.0% of the total), the Region of Murcia (8,090 t, 21.5% of the total), the Canary Islands (6,886 t, 18%) and Andalusia (5,950 t, 16.0%).

Figure 5-35. Evolution of aquaculture production of sea bream plus sea bass in Spain in tonnes (1990-2024p).

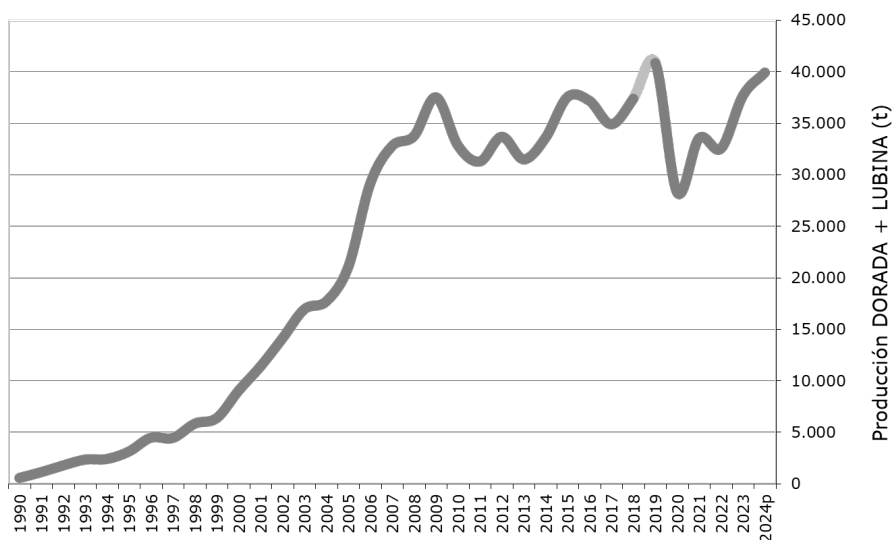
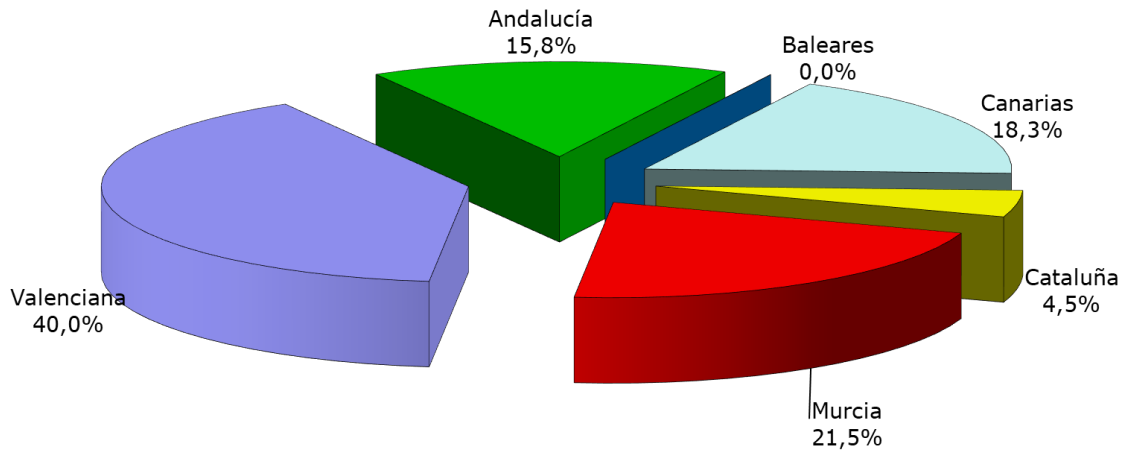


Figure 5-36. Percentage distribution of the productions (tonnes) of sea bream plus sea bass in Spain by Autonomous Communities in 2024.



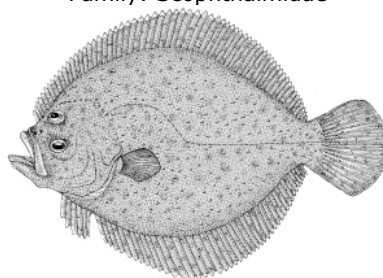
### RODABALLO Cultivation

The total production of turbot (*Scophthalmus maximus* = *Psetta maxima*) from aquaculture in the world in 2023 was 75,140 t, 3.3% more than the previous year (72,753 t).

In China there is a very significant production of aquaculture turbot, which obtained about 62,000 tonnes in 2023, although both the figures and the exact species are imprecise. In Europe, the main producing country is Spain, which harvested 9,600 tonnes (12.8% of the total), 9.5% more than in 2022 (8,766 tonnes). Portugal, with 3,300 tonnes, is the third largest producer (4.4% of the total), followed by Italy and France with 100 tonnes (0.1% of the total each) and the Netherlands with 50 tonnes. By 2024 it is expected to remain similar at around 76,750 t.

### RODABALLO (*Psetta maxima*)

Class: Osteichthyan Order: Pleuronectiformes  
Family: Scophthalmidae



#### Significant characteristics:

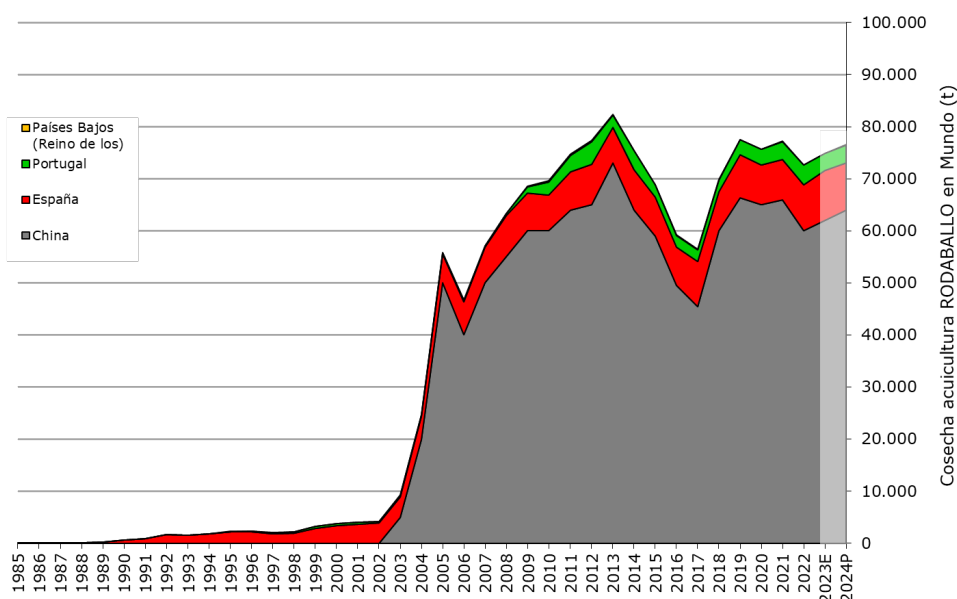
The body of adult specimens does not present bilateral symmetry, being rounded and flattened. Bulging eyes, located on the left side. Large mouth with prominent jaw. A brownish-brown upper colour more or

less dark, which varies according to the environment, with 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.

**Cultivation:**

In aquaculture, reproduction is carried out in hatcheries under very controlled conditions. The clutches are about 500,000 to 1,000,000 eggs per kilo of female weight. 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 brine shrimp. Then they start a diet based on feed made with natural ingredients. Breeding facilities are usually circular concrete tanks in facilities on the coast.

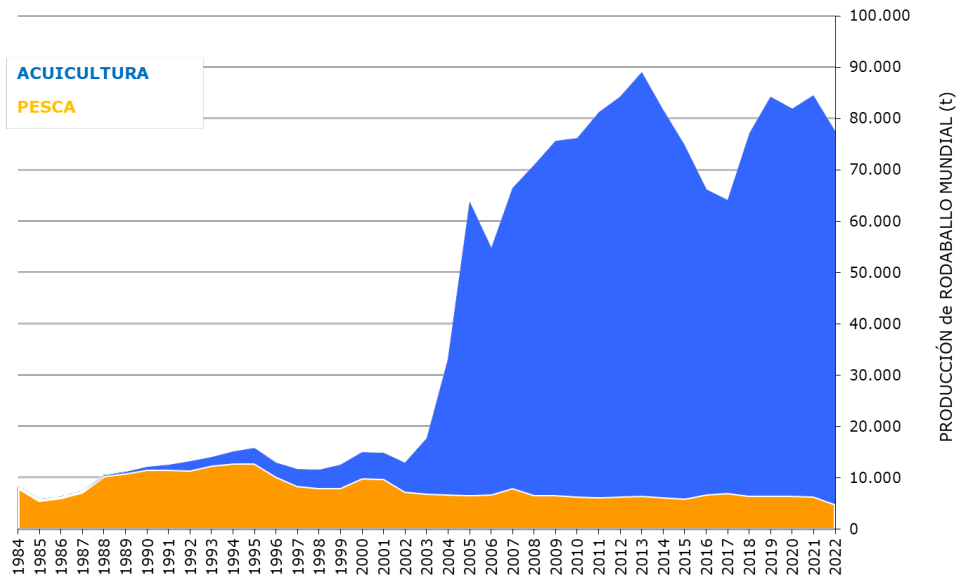
Figure 5-37. Evolution of the turbot aquaculture harvest (production) in the world (tonnes) for the period 1985-2024p (Based on FAO, FEAP and APROMAR data).



In the case of turbot, if we compare fish catches and aquaculture production, the latest data are from FAO for 2022 and indicate that 93.7% is from aquaculture (72,634 t in 2022) and the rest comes from extractive fishing (8,702 t).

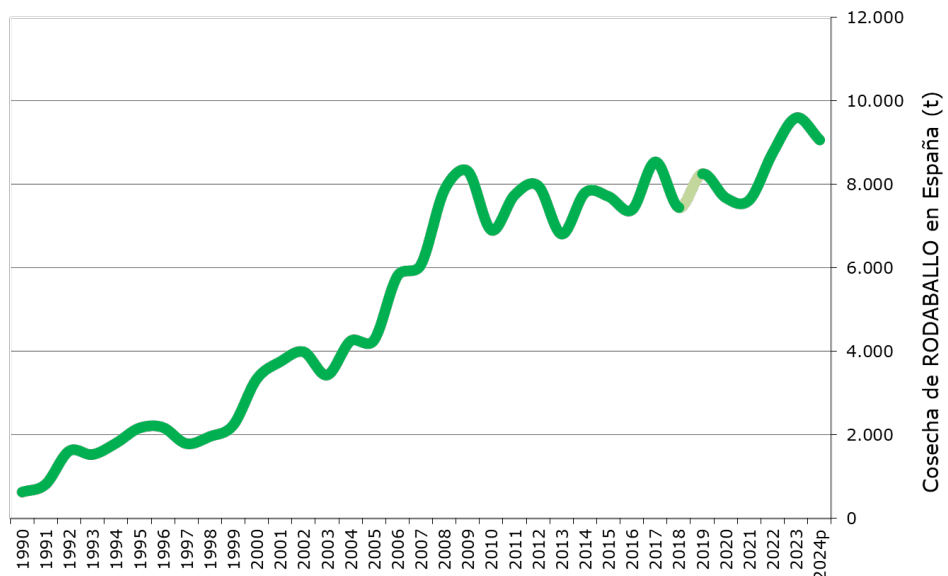
Figure 5-38. Evolution of world production (tonnes) of turbot (*Psetta maxima*), through aquaculture and fisheries, in the period 1985-2022 (FAO).





The turbot harvest in 2023 in Spain, according to APROMAR data, was 9,600 t, 9.5% more than the previous year (8,766 t). It is expected to remain similar in 2024. Galicia is the only turbot-producing autonomous community in Spain at present.

Figure 5-39. Evolution of the aquaculture harvest (production) of turbot (*Psetta maxima*) in Spain in tonnes (2006-2024p).



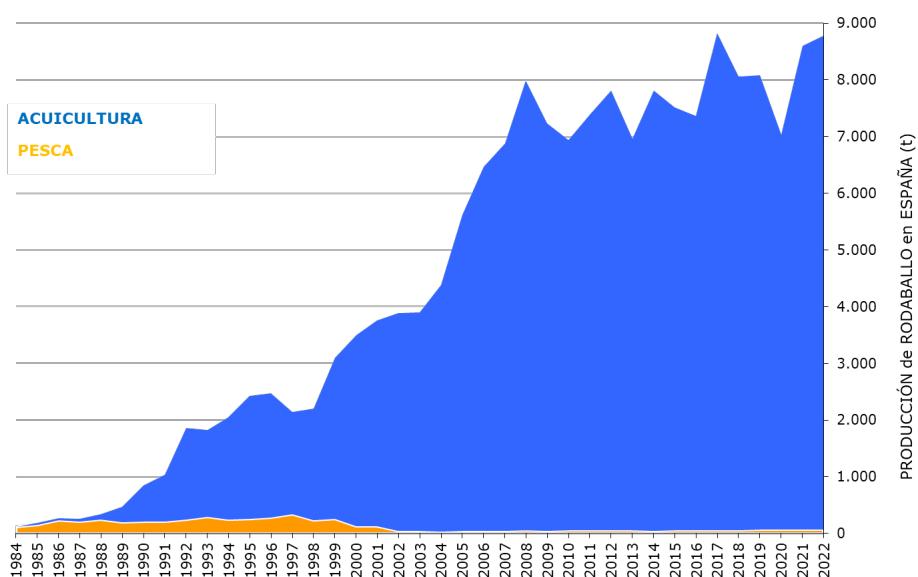
As for the average value in first sale in Spain, a price of 8.92 euros/kg is estimated for 2023 with a total of 85.6 M euros, 7.2% more than the previous year (79.9 M euros).

Figure 5-41. Distribution map of turbot production in Spain.



As in the case of sea bream and sea bass, the amount of wild turbot that is caught by the Spanish fleet is increasingly scarce and testimonial for the markets (72 t in 2022). The production of aquaculture turbot accounts for more than 99% of the production of this species in Spain. However, imports of turbot from Europe into Spain from Europe, mainly from the Netherlands, are relevant.

Figure 5-41. Evolution of the sources of turbot (*Psetta maxima*) in Spain: aquaculture and fisheries, for the period 1984-2022, in tonnes (FAO-MAP).



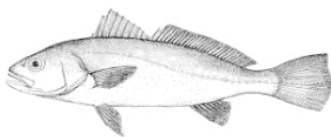
The production of juvenile turbot in Spain in 2023 was 12.7 million units. It was in Galicia where all the juveniles of this species were produced. The average purchase price of juvenile turbot in Spain is estimated at 0.71 euros/unit.

## **CORVINA Farming**

The production of sea bass (*Argyrosomus regius*) from aquaculture in the Mediterranean area in 2023 is estimated at 58,672 tonnes, 17.1% more than in 2022 (50,088 tonnes). The main producing countries are Egypt (37,000 t, 61.4% of the total), Spain (7,400 t, 12.6%), Greece (6,517 t, 11.1%), Turkey (6,000 t, 10.2%) and Croatia (1,200 t, 2.0%). By 2024, growth of 2.9% is expected to exceed 60,400 t.

### **CROAKER (*Argyrosomus regius*)**

Class: Osteichthyans Order: Perciformes  
Family: Scienidae



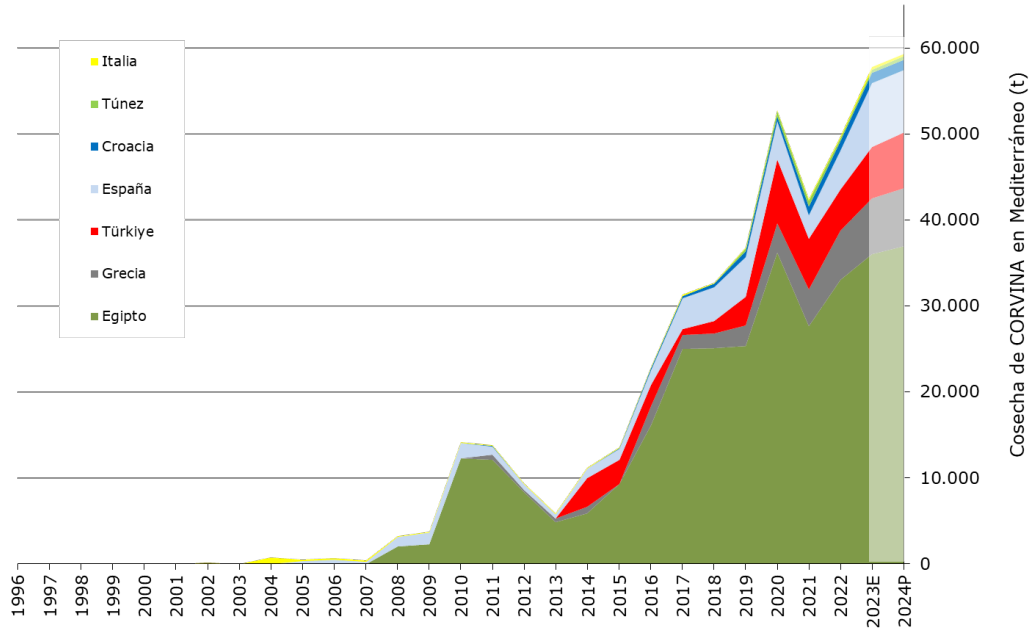
#### **Significant characteristics:**

Relatively large head and elongated, silvery-gray body with a mixture of dark tones. The head is colored yellow with a rounded muzzle. Mouth in terminal position without barbels, with conical and robust teeth. Small eyes. It reaches lengths between 50 cm and up to 2m, and a weight of up to 40 kg.

#### **Cultivation:**

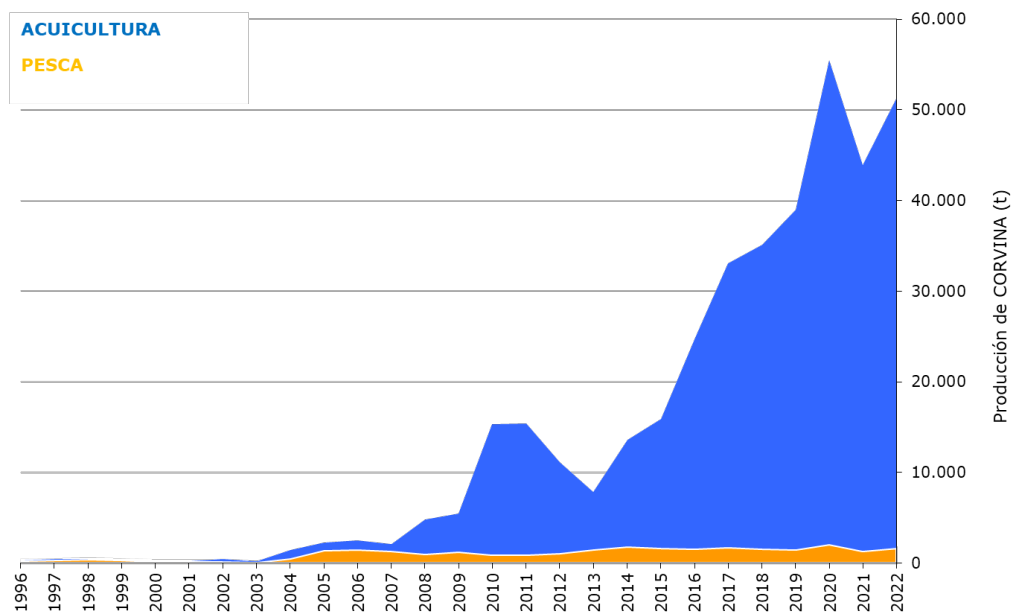
Corvina farming is carried out in several Mediterranean countries. Breeding centers produce eggs from breeding individuals under highly controlled conditions. A 1 m long female produces more than 1 million eggs per year, which have a diameter of less than 1 mm. During their first month of life in culture, the larvae feed on living organisms: rotifers and brine shrimp. They are then fed with feed made from natural raw materials. The breeding techniques are similar to those used for sea bass and sea bream, both in floating nurseries in the sea and in earthen ponds. Sea bass 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 harvest (production) of sea bass aquaculture (in tonnes) in the Mediterranean for the period 1996-2024p (Based on FAO, FEAP and APROMAR data).*



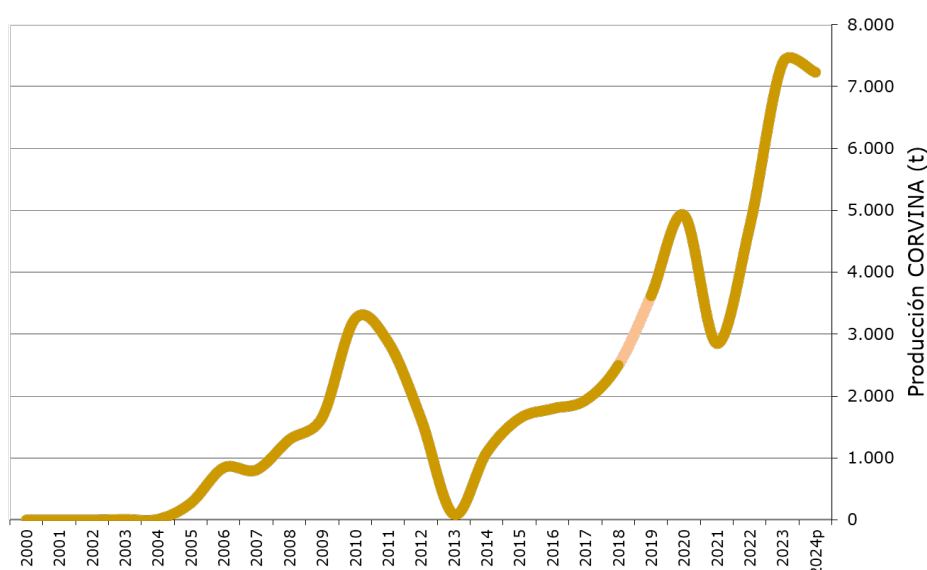
Corvina is a highly prized fish in those regions where it has been traditionally consumed. Recent increases in its aquaculture production have begun to make it recognized in many new markets. In 2022, global catches of this species were 4,000 t, 26.3% less than in 2021 (5,439 t). Aquaculture farming, therefore, represents 92.5% of the world's croaker production.

Figure 5-43. Evolution of Mediterranean production of sea bass (*Argyrosomus regius*), in tonnes, through aquaculture and fisheries, in the period 1996-2022 (FAO).



The production of sea bass through aquaculture in Spain in 2023 was 7,383 t, 55.7% more than in 2022 (4,742 t). This figure refers to fish finished and placed on the market, and not to live biomass increases. This nuance is important in a fish, such as sea bass, which is farmed up to several kilograms of individual weight. The bulk of the Spanish sea bass harvest comes from the Valencian Community with 79% and Murcia 21%, in addition, a small amount was produced in Andalusia. It is a species whose production is growing in interest for producers and consumers, and whose production in 2024 is expected to be similar.

Figure 5-44. Evolution of the croaker (*Argyrosomus regius*) harvest in Spain in tonnes (2000-2024p).



As for the value of sea bass at the first sale, an average value per kg of 4.84 euros is estimated for 2023, which represents a total of 35.7 million euros in Spain, 42% more than in 2022 with 25.2 million euros.

The catch of sea bass by fishing fleets in the world in 2022, according to FAO, was 4,000 tonnes, 26.3% less than the previous year (5,439 tonnes). Of these, Spain caught 343 tonnes, a figure lower than the previous year (183 tonnes). Therefore, 93.0% of sea bass in Spain is provided by aquaculture.

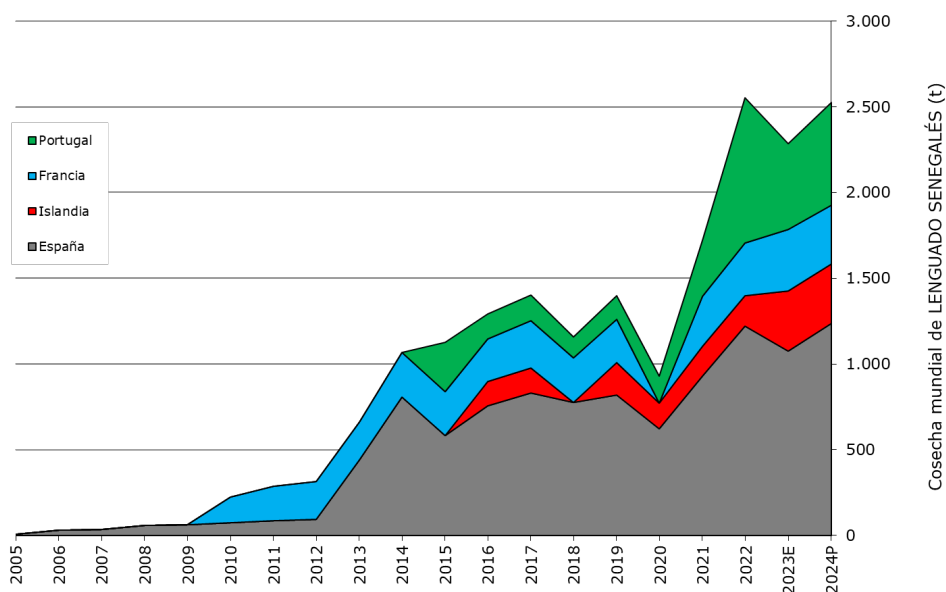
In Spain, about 2 million juveniles of this species were obtained mainly in the Region of Murcia, and a smaller number in Andalusia in 2023. A price of 0.36 euros/unit is estimated.

### SOLE Cultivation

In 2023, the global harvest of Senegalese sole (*Solea senegalensis*) from aquaculture was 2,284 tonnes, 10.5% less than the previous year (2,553 tonnes). By 2024 it is expected to grow by 10% to about 2,600 tonnes, according to data compiled by FEAP

and APROMAR. These figures differ from those published by FAO up to 2022 which indicate that the total for 2022 was 1,719 t, 16.7% more than the previous year (1,473 t). FAO reports that Senegalese sole fisheries landed 67 tonnes globally in 2022, of which 6 tonnes were in Spain, which means that 96.2% comes from aquaculture globally.

Figure 5-45. Evolution of the harvest (aquaculture production) of Senegalese sole (*Solea senegalensis*) in the world for the period 2005-2024p (based on FAO, FEAP and APROMAR data).



In 2023, 1,077 tonnes of aquaculture sole were produced in Spain, 11.9% less than in 2022 (1,222 tonnes). This production was located in Galicia (82.6%) and Andalusia (17.4%). The 2024 harvest is forecast to increase to 1,200 t.

In terms of value, it is a highly valued species in the markets and a value at first sale of 13.7 euros/kg is estimated with a total value in 2023 of 14.8 million euros, 3.5% less than the previous year (15.3 million euros).

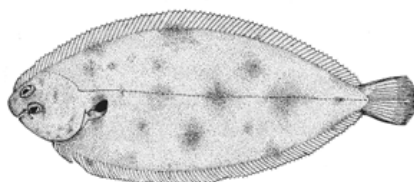
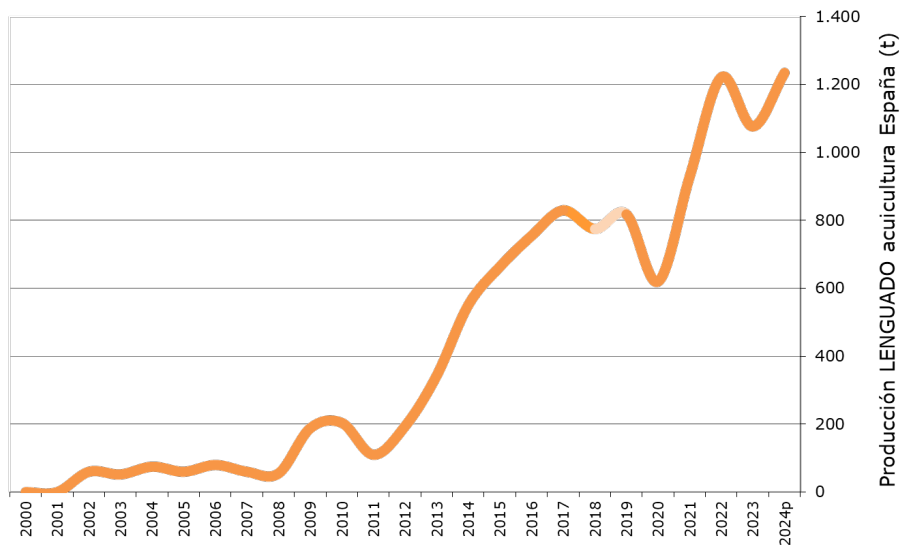
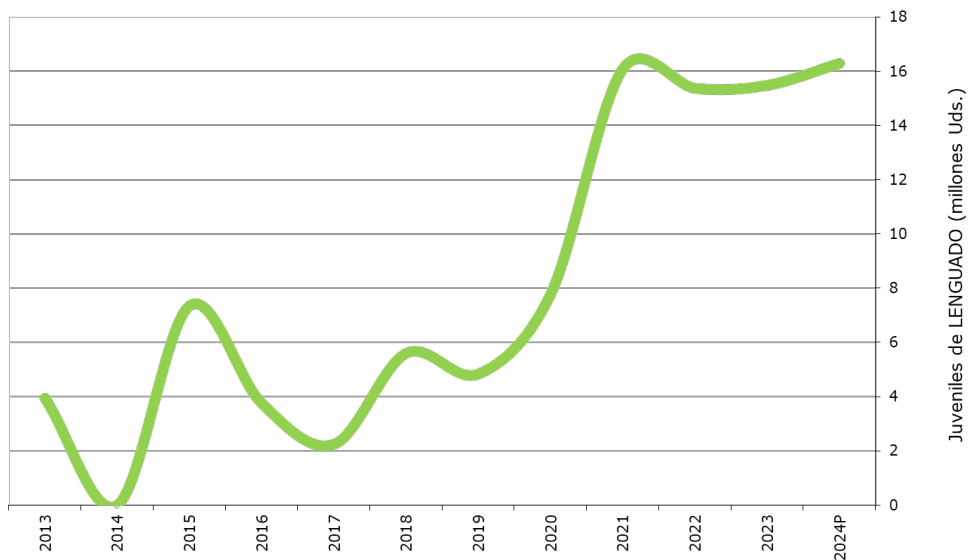


Figure 5-46. Evolution of the harvest (aquaculture production) of sole (*Solea senegalensis*) in Spain in tonnes (2000-2024p).

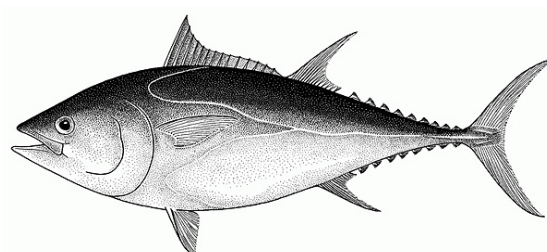


In Spain in 2023, some 15.5 million juveniles of this species were obtained, essentially in Galicia (94%), and a smaller number in Andalusia (6%) and it is expected to grow to 16.5 million units in 2024. A unit cost of the juniors is estimated at 0.34 euros.

Figure 5-47. Evolution of production of juvenile sole (*Solea senegalensis*) in Spain in millions of units (2013-2024p).



## BLUEFIN TUNA Farming



All bluefin tuna (*Thunnus thynnus*) available on consumer markets originates from wild stocks. A part of them are put on the market immediately after they are caught and are considered fishing products. But another part of the bluefin tuna, which is growing and now the majority, is caught alive by purse seine gear or traps and kept for months on aquaculture farms. In these farms, consisting of nurseries in the 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 parallel to this partial aquaculture activity, there is a notable scientific effort focused on closing the production cycle and raising bluefin tuna from egg to commercial size in captivity. Spain is a world leader in research into the integral culture of bluefin tuna, especially through the Spanish Institute of Oceanography, and very satisfactory results have been achieved both in its reproduction, which is already a fact, and in breeding to commercial size.

Global aquaculture bluefin tuna production (Pacific, Atlantic and South), based on 2022 data from FAO and APROMAR estimates, was 70,244 t, an increase of 0.6% compared to the previous year (69,810 t). The main producing countries are Japan with 21,500 tonnes which kept its production stable and accounts for 30.6% of the world total, Malta with 14,000 tonnes (19.9%), Spain with 9,744 tonnes (13.9% of the total), Australia with 8,000 tonnes (11.4% of the total) and Mexico with 6,000 tonnes (8.5%). Turkey also produces: about 5,000 tonnes, Croatia 4,500 tonnes and Tunisia with 1,500 tonnes. Turkey and Croatia experienced the highest growth, around 30%, and it was Spain and Australia that experienced some decrease, around -10%. It should be noted that bluefin tuna production is limited by the catch quotas established internationally by ICCAT.

*Figure 5-48. Evolution of aquaculture production (fattening) of bluefin tuna in the world for the period 1984-2024p, in tonnes (based on FAO data).*



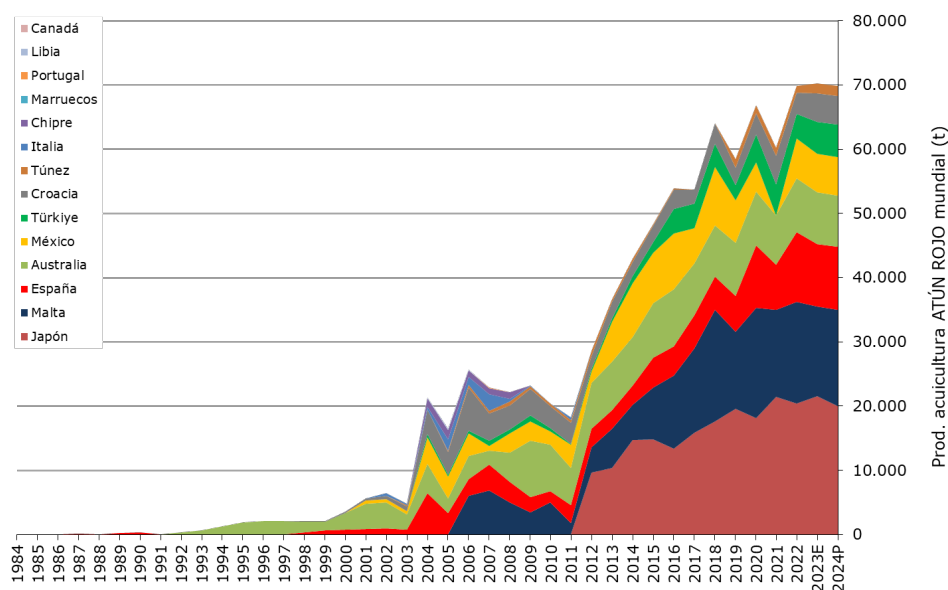
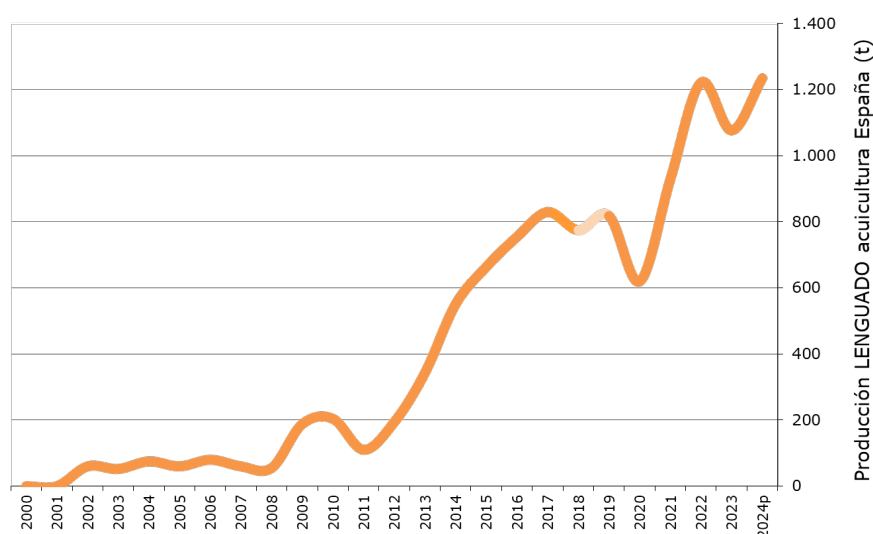


Figure 5-49. Evolution of the harvest (aquaculture production/fattening) of bluefin tuna in Spain for the period 1984-2024p in tonnes (based on FAO-MAP data).



Bluefin tuna aquaculture production in Spain in 2023 was 9,744 t and a similar production is estimated for 2024.

With an estimated sale value of 14 euros/kg, the total value in Spain in first sale was 136.2 million euros in 2023, 25.7 euros less than in 2022 (183.2 million euros).

Discussions are currently taking place at the level of the European Commission and the Member States of the European Union to increase the authorised production capacities of aquaculture farms in parallel with the increase in fishing quotas. These increased fishing quotas are made possible by the strong recovery of wild bluefin tuna stocks.

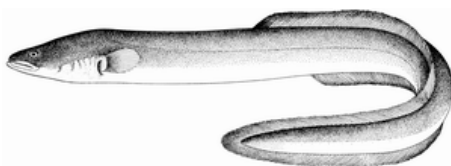
### **Farming of other marine fish species**

## Eel Farming

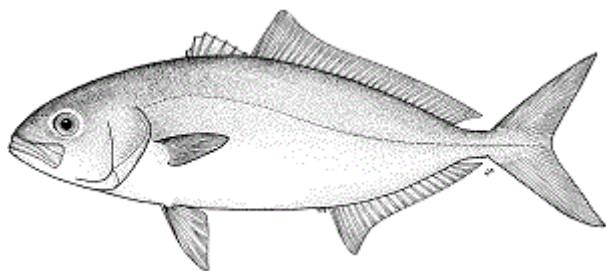
Eel farming (*Anguilla anguilla*) is a traditional activity in Spain, with varying levels of intensification. Its production depends on the capture of wild elvers since there is not enough scientific knowledge for their reproduction in captivity. For this reason, its future is highly conditioned by the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

At the European level, 5,135 t of European eel were produced through its cultivation in 2022, 13.9% less than in 2021 (5,847 t). The Netherlands (2,000 t), Germany (1,158 t) and Denmark (450 t) stand out as producing countries.

Spanish production at the commercial level in 2023, mainly located in the Valencian Community, was 340 t. Its purpose is both the repopulation of rivers and for consumption. In terms of value at the first sale, a price of 11.1 euro/kg is estimated for 2023, which represents a total value of 3.8 million euros, 3.4% less than in 2022 (3.9 million euros).



## Cultivation of YELLOWTAIL



Aquaculture in Spain of yellowtail of the species *Seriola dumerili*, also known as amberjack, is currently being incorporated into aquaculture production on a commercial scale. It is the culmination of many years of scientific research and technological development. With its cultivation, new business opportunities and job creation are opened, making it one of the species with the greatest potential for Spanish aquaculture.

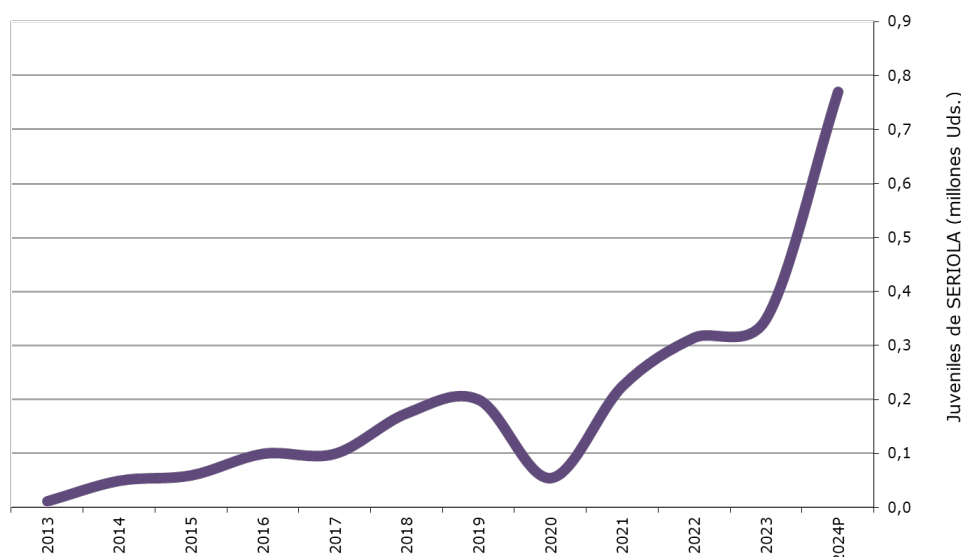
It is a fish that is highly valued in its quality by people who know it. In 2022, 200 tonnes were produced in Spain and 170 tonnes in Greece, according to FAO. There are other species of yellowtail cultivated in the world, such as *Seriola quinqueradiata*,

of which more than 138,900 tonnes are harvested annually in Japan, although they are grown from wild juveniles.

In 2023, according to APROMAR data, the cultivation of *Seriola dumerili* in Spain decreased to 44 t, i.e. -68.3% compared to 2022 (163 t). Production is expected to increase to 100 tonnes in 2024. As for the sale price, it is estimated in 2023 at 14.7 euros/kg and a total value of 0.6 million euros.

In addition, juveniles of this species are produced in Spain in Andalusia. In 2023 it was 0.35 million units and 2024 production is expected to double and reach 0.7 million units. This denotes the great interest that this species is generating. The average purchase price of juvenile yellowtail in Spain, at an equivalent weight of 2 g per unit, is calculated at 3.5 euros/unit in 2023.

Figure 5-50. Evolution of the production of juvenile yellowtail in Spain in millions of units (2013-2024p).



## **Shellfish culture**

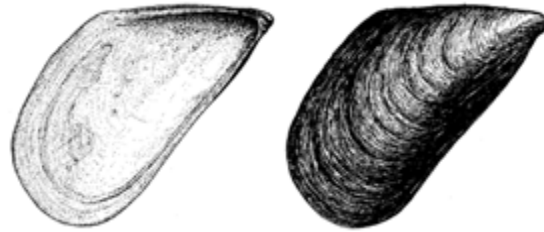
Spanish aquaculture stands out as a reference at European and world level for the quantity and quality of its mollusc breeding. In 2022, the harvest of molluscs in the European Union was 546,201 t, 2.4% less than in the previous year (559,109 t) with a value in first sale of 1,108.5 million euros, according to FAO data. The main producers were: Spain, France and Italy

## **MUSSEL Farming**

The mussel harvest in Spain has been around 233,000 tonnes on average over the last 10 years. The year-on-year differences are not so much conditioned by the production capacity, with a stable number of rafts, but by other incidents such as episodes of red tides, which prevent the regular harvesting of the mollusc. In 2023,

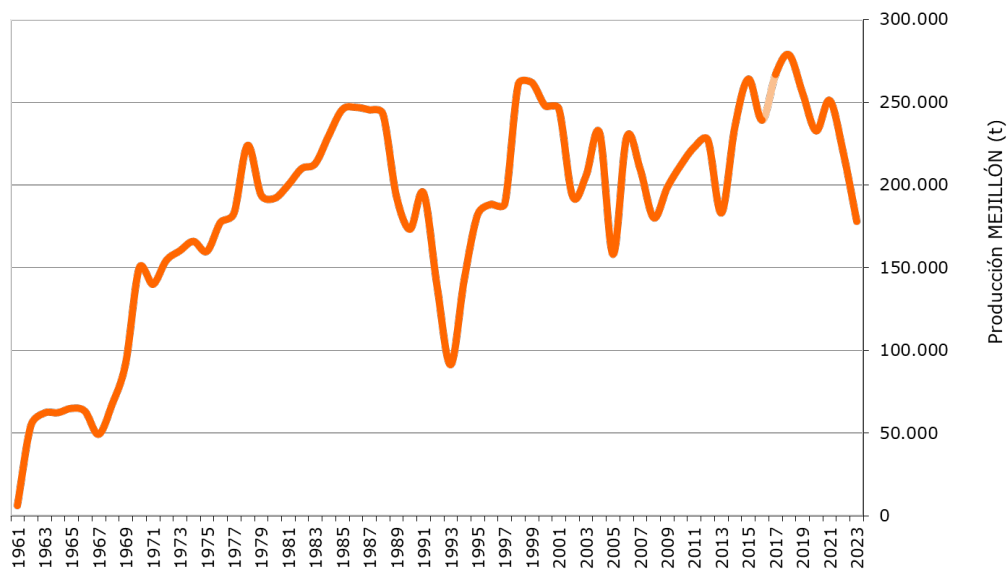
the mussel subsector has experienced serious problems, with low production caused, among other factors, by the rise in temperatures, which caused irregular spawning. All this resulted in the worst production year of the last 10.

According to the data collected by the MAPA, the harvest was 182,790 t, 23.2% less than in the previous year (225,200 t) with a value at first sale of 127.6 million euros (-24.8%, 159.3 M€).



There are five Spanish autonomous communities where mussels are cultivated, but they are mainly grown in the Galician estuaries through traditional cultivation in rafts. Galician production represents 97% of the total national mussels, but there is also production in Catalonia, Andalusia, the Valencian Community and the Balearic Islands.

Figure 5-51. Evolution of aquaculture production of mussels in Spain between 1961 and 2023 in tons (according to MAPA-APROMAR).

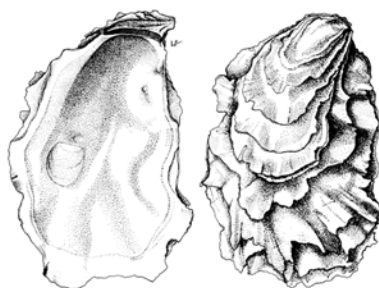


Mussel seed is usually collected from the natural environment, or collected using collecting ropes, for later stringing on rafts or long-lines. The sector has been facing a serious problem of seed recruitment from rocks for years, also motivated by various reasons. In 2023, the price of Galician mussels at first sale is estimated to have been 0.7 euros/Kg.

62% of mussels harvested in Spain are sold by producers to the fresh market, while the remaining 38% go to the processing industry, that is, to cooking plants and canneries.

### **Oyster farming**

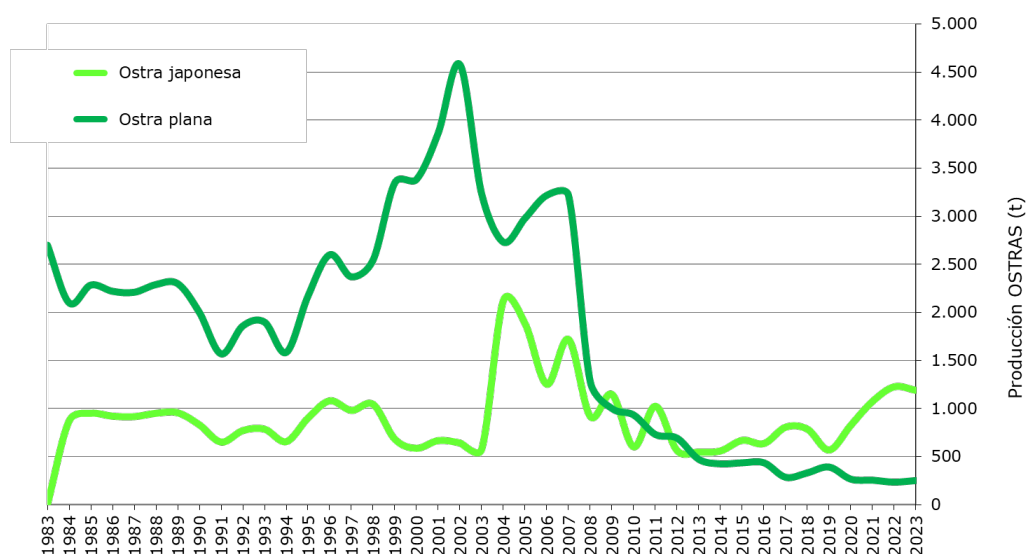
Oysters are an important group of molluscs in economic terms in Spain. There are two cultivated species: the flat oyster (*Ostrea edulis*) and the Japanese oyster (*Crassostrea gigas*). The combined production in 2023 of both species was 1,443 t, 1.3% less than in 2022 (1,463 t), and their economic value at first sale was 5.7 million euros, according to MAPA data.



Of the Japanese oyster species, 1,189 tonnes were produced in Spain in 2023, mainly in Galicia, Catalonia, Andalusia, Asturias, Cantabria and the Valencian Community. Its total value in the first sale was 4.2 million euros.

Galicia is the main autonomous community producing flat oysters, followed by the Valencian Community. In total, 254 tonnes of this species were produced in Spain in 2023, with a value of 1.5 million euros.

*Figure 5-52. Evolution of oyster aquaculture production in Spain between 1983 and 2023 in tons (according to MAPA-APROMAR).*

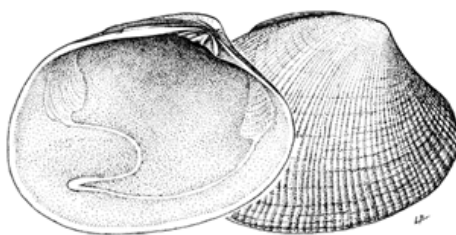


Oyster farming can be carried out through several techniques, but the common ones in Spain are intertidal cultivation in farming parks, or vertical cultivation from rafts using baskets. Oyster seed is obtained from farms, both domestic and imported.

## CLAM CULTIVATION

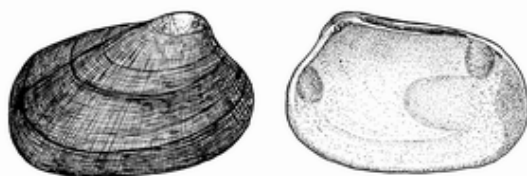
Three species of clams are farmed in Spain: fine, slug and Japanese, with a combined production in 2023 of 946 t and an economic value in first sale of 11.6 million euros, according to MAPA data.

The Japanese clam (*Ruditapes philippinarum*) is the main species of clam grown 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, due to the importance of its production in that country. In 2023, its production in Spain was 1,189 tonnes, 23.8% more than in 2022 (725 tonnes), when they reached an economic value of 10.4 million euros in their first sale.

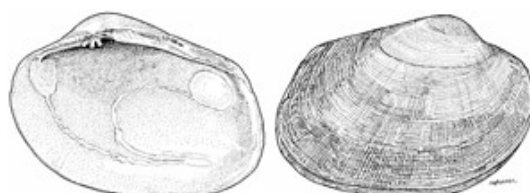


The fine clam (*Ruditapes decussatus*) is also known as the Carril clam. Its color, between white and light brown, varies depending on the sand where it is raised. The inner face is bright white with yellowish tones, sometimes bluish in the area near the

umbo that is located in the front of the shell. In 2023, 23 tonnes of this species were produced in Spain, with a total value of 0.9 M euros, a drastic drop compared to the 144 t in 2022.

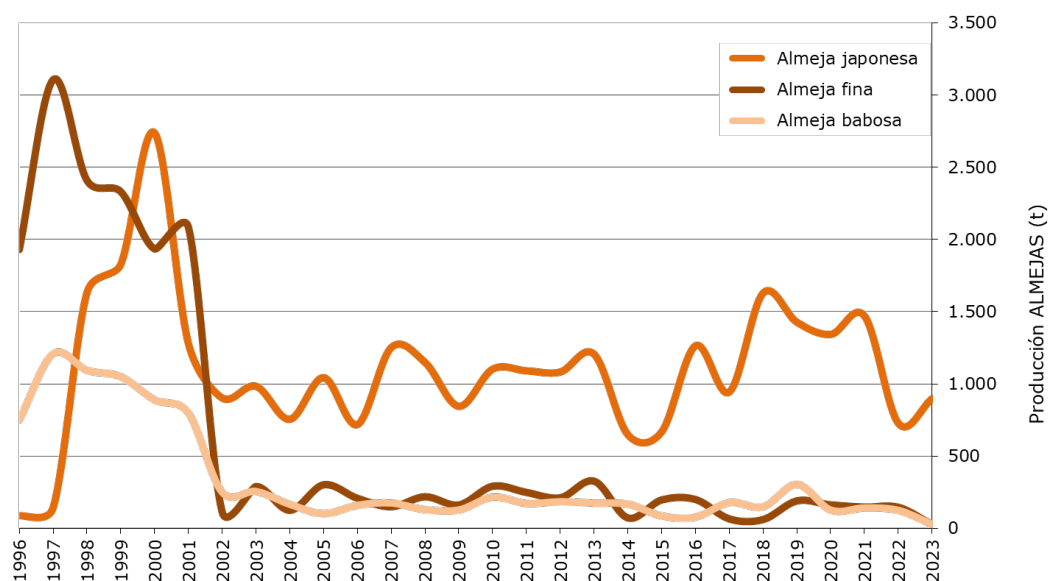


The slug clam (*Venerupis pullastra*) is gray or cream in color with brown spots. Its shell is oval and on its outer surface it has concentric lines that intersect with thinner radial lines. In 2023, 26 tonnes were produced in Spain, with an economic value in first sale of 0.3 million euros. Like the fine clam, it suffered a very notable drop in production compared to 124 t in 2022.



In Galicia, according to the Consellería do Mar, the drop in the slug clam harvest has been around 84% in the last 25 years. The Japanese clam has a greater capacity for adaptation and reproduces more quickly, therefore, in the Galician estuaries it displaces species such as the slug clam and the fine clam. It was in 2006 when a sharp decrease in the slug clam and a reversal of production were observed. In recent years, therefore, the Japanese clam has taken over from the slug clam as the main species produced due to the fact that the production is higher, although it is later sold at a lower price.

Figure 5-53. 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 cultivation parks or in natural banks with good water flow and at different depths depending on the species.

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 rarification of the population when it is excessive and the planting of juvenile specimens.

### **Cultivation of other species**

#### **MICROALGAE cultivation**

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 2 t of microalgae were produced in 2023. The main species farmed were *Nannochloropsis gaditana* (0.5 t) and *Tetraselmis chuii* (1.5 t) in Andalusia. In addition to direct marketing, the cultivation of microalgae is common in fish, mollusc and crustacean hatcheries as food for the larval stages of farmed animals.

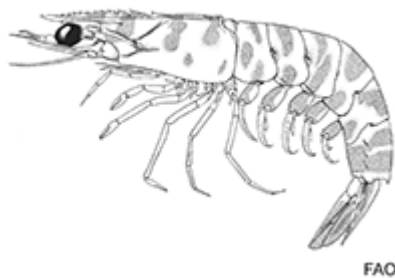
Microalgae were incorporated in 2015 into the European Regulation on organic production, as well as their recognition as food products a natural source of Omega-3 oils, which opens up new marketing possibilities.





### **Cultivation of ANGOSTINO**

There is currently only one shrimp farm in operation 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 they stand out for the quality and freshness of their productions. In 2023, 50 tonnes of this species were produced in Spain.



### **MACROALGAE Cultivation**

The use of macroalgae for uses such as obtaining different phycocolloids (alginates, agar and carrageenans) or as agricultural fertiliser is traditional on the northern coast of Spain. Most of the macroalgae are obtained from the natural environment without any human intervention other than the uprooting by hand or the collection of landslides, but there are several initiatives underway for their cultivation. These macroalgae aquaculture initiatives produce higher value-added species by being 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 of "ogonori" (*Gracilaria* spp., *Gracilariopsis* spp.). In 2023, around 228 tonnes were produced. They were grown in Galicia (96%) and Andalusia (4%) according to MAPA data.

## **5. Aquaculture production in Spain and Europe (cont.)**

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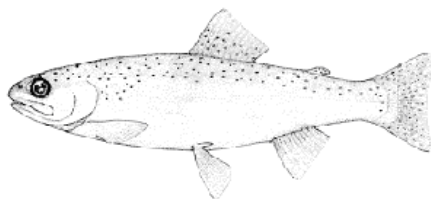
## 5.7. Continental aquaculture in Spain and Europe

Inland aquaculture is that which is carried out with fresh water. In Spain, the main species produced by continental aquaculture are rainbow trout, several species of sturgeon and tench. There are also smaller productions of common carp and Nile tilapia.

### RAINBOW TROUT Farming

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

Class: Actinopterygii Order: Salmoniformes  
Family: Salmonidae



#### **Significant characteristics:**

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

#### **Cultivation:**

Its upbringing takes place halfway around 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 fibre facilities and even cages in fresh or salt water. Rainbow trout usually take 10 months from hatching to reach portion size (250-300 g), although commercial sizes reach several kilograms in weight.

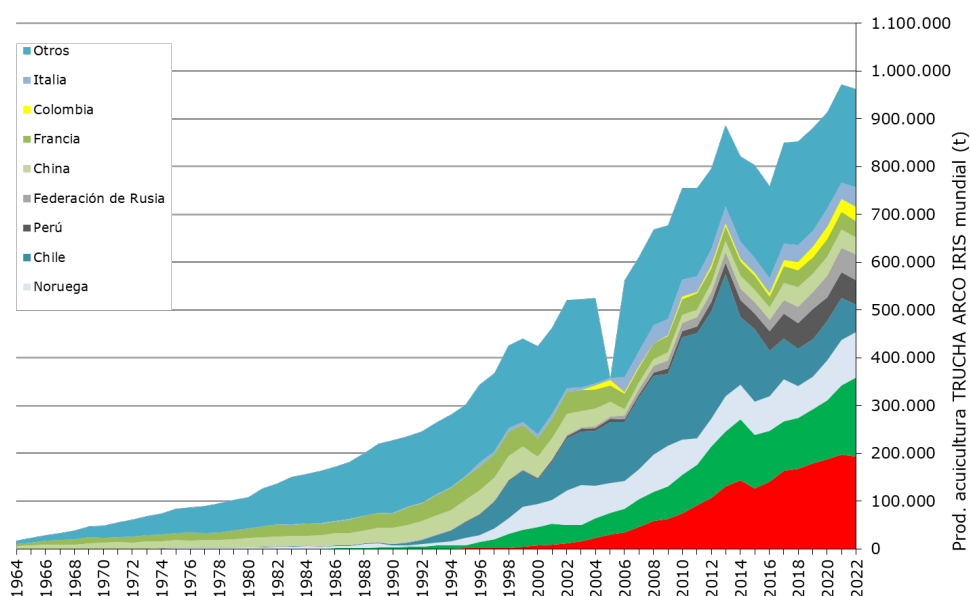
According to FAO data, global aquaculture production of rainbow trout (*Oncorhynchus mykiss*) in 2022 was 1,004,161 t, an increase of 4.4% compared to the previous year (961,765 t).

The main producing countries were Iran with 194,000 tonnes (19.3% of the world total), Turkey with 189,801 tonnes (18.9%), Norway with 84,928 tonnes (8.5%), Chile with 73,315 tonnes (7.3%), Peru with 61,573 tonnes (6.1%) and the Russian Federation with 54,640 tonnes (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 throughout the five continents, although it is native to North America.

Most rainbow trout are produced in fresh water (70%), but a significant part of their production ends their saltwater rearing period, especially in Chile and Norway.

Commercial extractive fishing for rainbow trout is very small, accounting for only 1,395 tonnes worldwide in 2022, in countries such as Uzbekistan, Finland, Mexico, Peru and the United Kingdom.

Figure 5-52. Evolution of rainbow trout aquaculture production in the world in the period 1964-2022 in tonnes (based on FAO data).



Rainbow trout production in Spain in 2023 is estimated to be 14,757 tonnes, 9.6% less than in the previous year. A slight growth is expected for 2024 with about 15,400 tonnes, although both productions are far from the maximum of 35,384 tonnes in 2001. The main producing regions are Castilla y León, Galicia, Andalusia, Catalonia, La Rioja, Castilla la Mancha, Asturias and Aragon.

In terms of value, a first sale price of 3.36 euros/kg is estimated in 2023, therefore a total of 49.7 million euros, 13.7% more than in 2022 (43.6 million euros), according to data from the MAPA.

The production of rainbow trout is evolving in recent years, with larger individuals being farmed. This is due to the stagnation of the price of trout and the new opportunities offered by the processing (smoking) and HORECA market for fish weighing more than 1 kg.

Figure 5-53. Evolution of rainbow trout aquaculture production in Spain in tonnes (1950-2024p). APROMAR data.

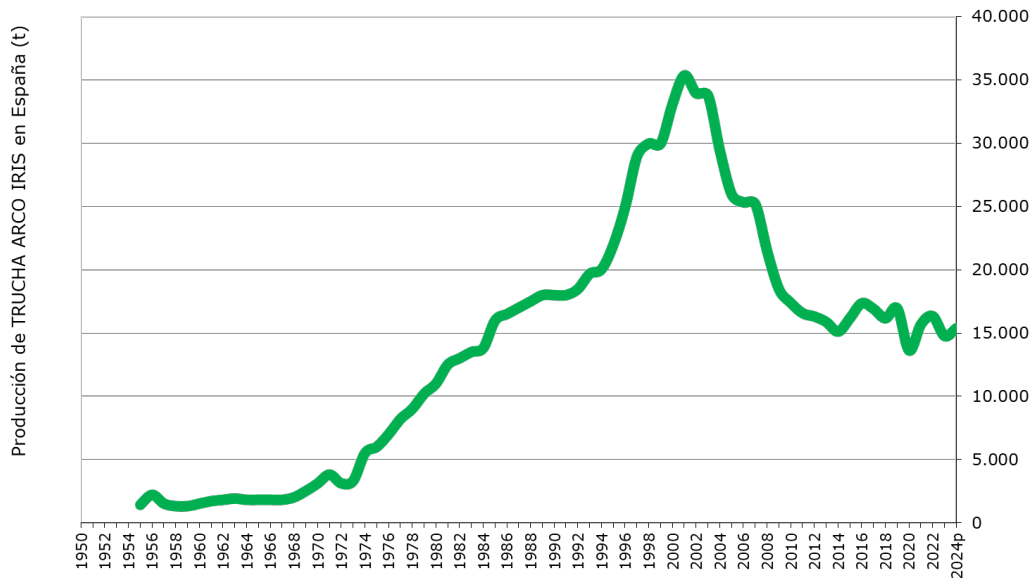
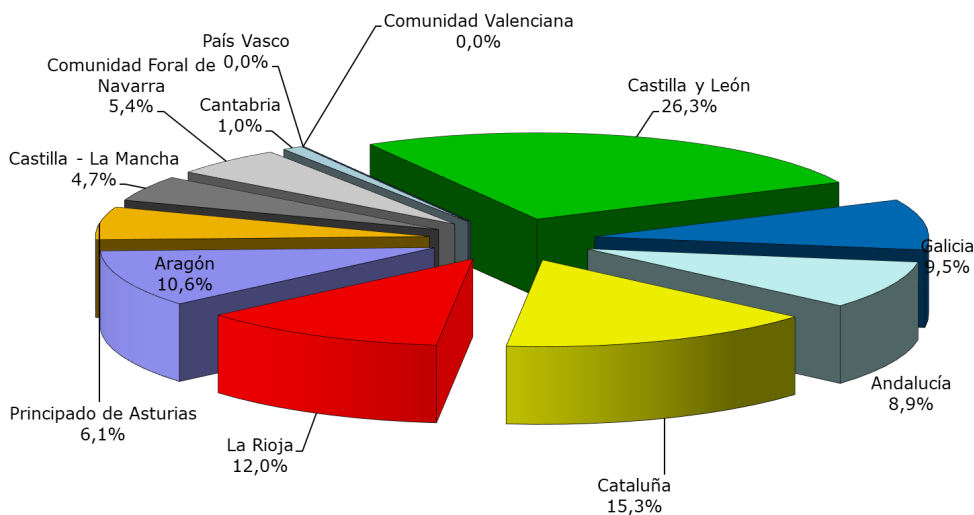


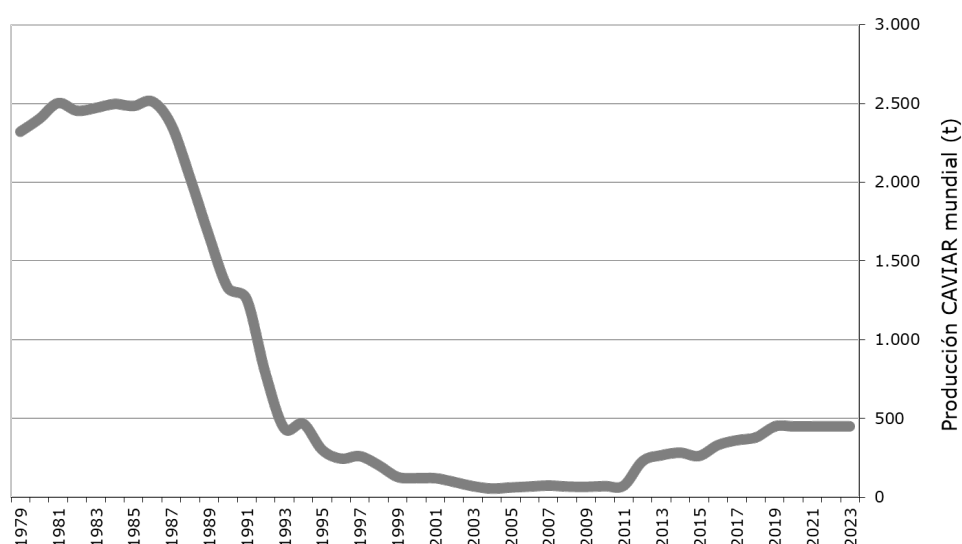
Figure 5-54. Distribution of the rainbow trout harvest among the autonomous communities in 2023 (MAPA data).



## Sturgeon Cultivation

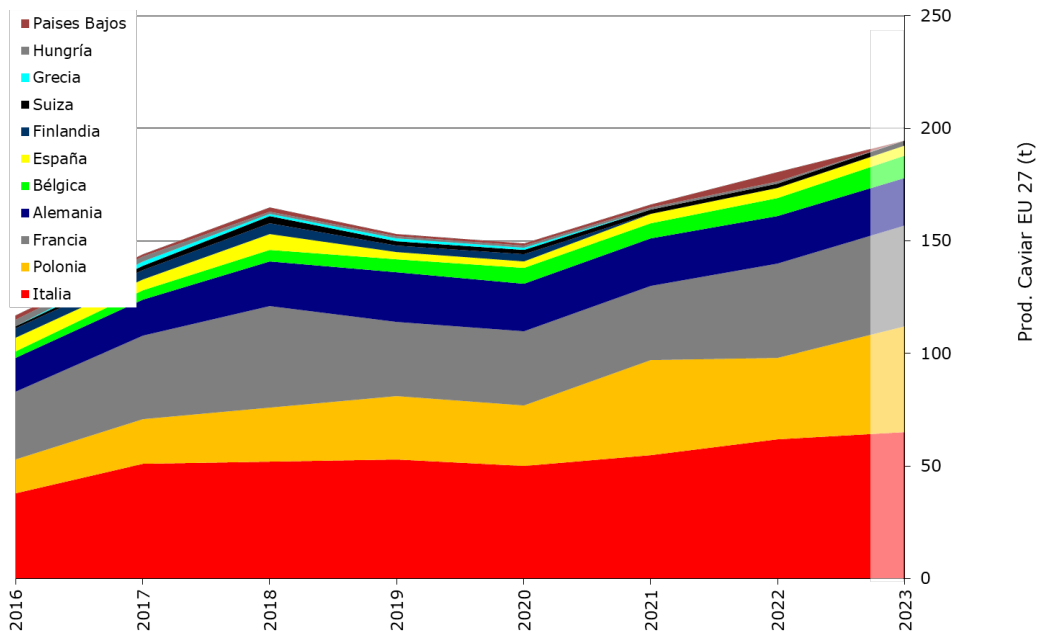
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) agreed in 2006 to ban caviar exports in the face of severe declines in wild sturgeon populations. From that moment on, interest began in the aquaculture of the various species of sturgeon for the production of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

Figure 5-55. Evolution of world caviar production (originating from both fishing and aquaculture) in tonnes, between 1979 and 2023 (FAO and FEAP data).



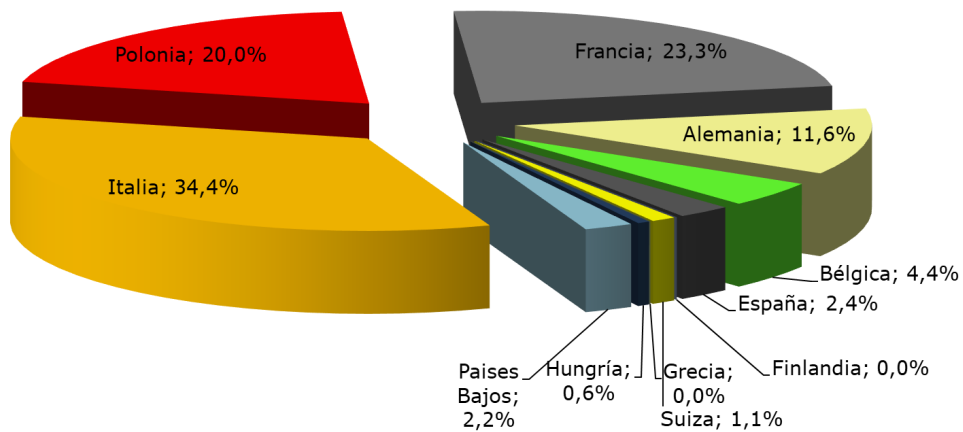
Global caviar production was around 450 tonnes in 2022 according to FAO, of which 180 tonnes were produced in the European Union (40%) according to FEAP. Global caviar production is expected to remain around 450 tonnes in 2023. And according to FEAP, in 2023 the European Union's production is expected to be 194 t.

Figure 5-56. Evolution of caviar production in the US (27) in tonnes (2016-2023). FEAP data.



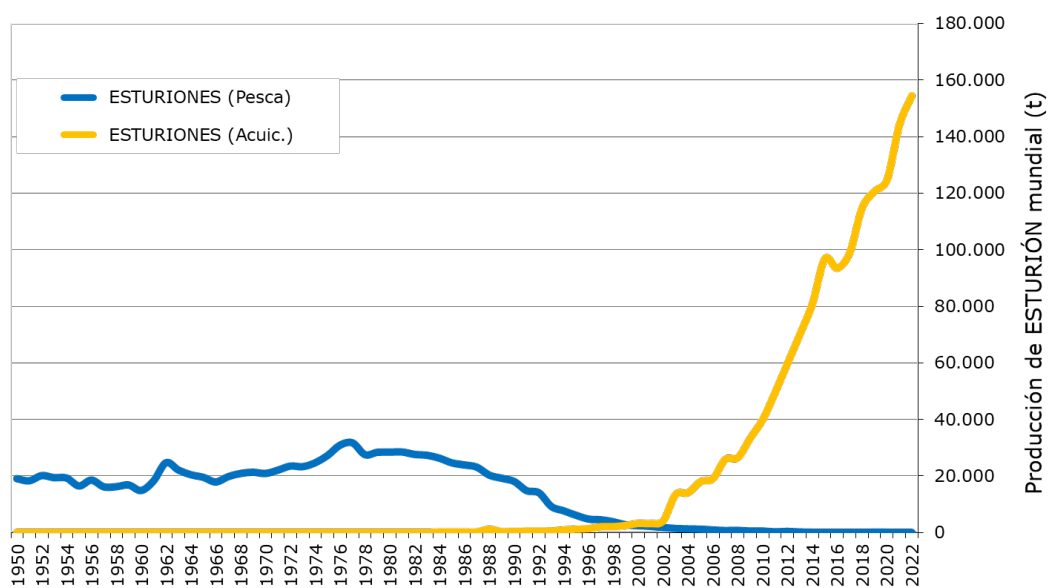
Production in the European Union in 2022 was led by Italy with 62 tonnes (34.4% of the total), France with 42 tonnes (23.3% of the total), Poland with 36 tonnes (20.0% of the total) and Germany with 21 tonnes (11.6%).

Figure 5-57. Distribution of the caviar harvest among EU countries (27) in 2022. FEAP data.



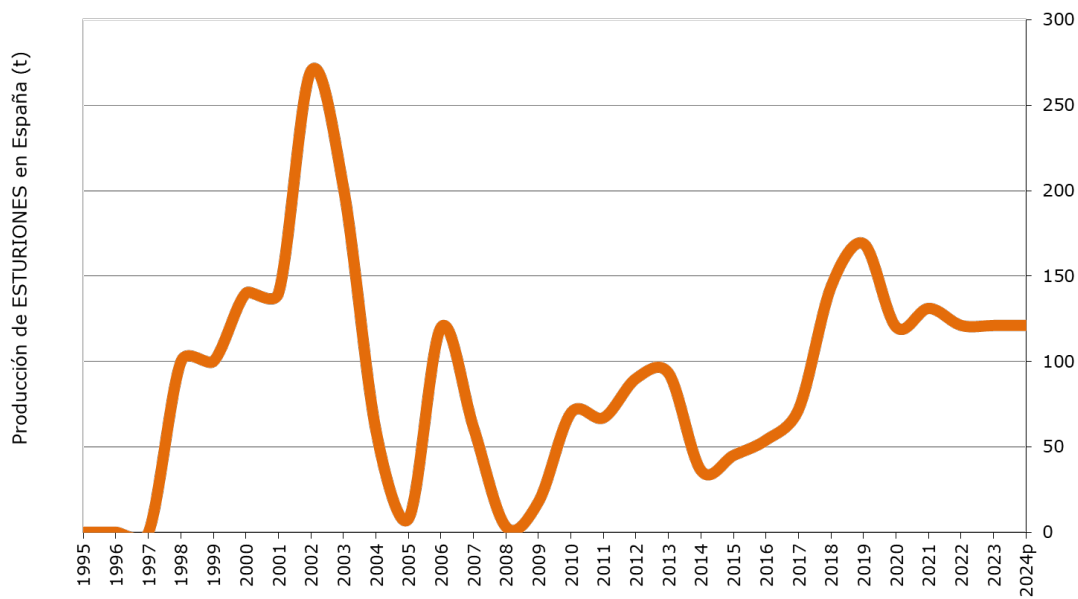
Although the main product of sturgeon aquaculture is the obtaining of caviar, the meat of these fish is also valued and put on the market for consumption. Globally, it is estimated that some 154,546 tonnes were produced in 2022, 7.1% more than in 2021 (144,266 tonnes). Extractive sturgeon fishing continues in some countries such as Canada, Russia, the United States and Iran; in 2022, 196 t of meat were obtained; Aquaculture accounts for 99.9% of production.

Figure 5-58. Evolution of world sturgeon production (fisheries and aquaculture) between 1950 and 2022 (FAO data).

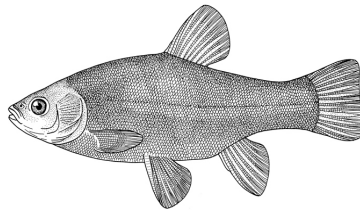


In Spain, 4.4 t of caviar were produced in 2023 and 121 t of sturgeon meat. The species produced in Spain are: Siberian sturgeon (*Acipenser baerii*), Adriatic sturgeon (*Acipenser naccarii*), Russian sturgeon or Danube sturgeon (*Acipenser gueldenstaedtii*), star sturgeon (*Acipenser stellatus*) and beluga sturgeon (*Huso huso*).

Figure 5-59. Evolution of aquaculture production of sturgeons (various species) in Spain in tonnes (1995-2024p). APROMAR-MAPA-FAO data.



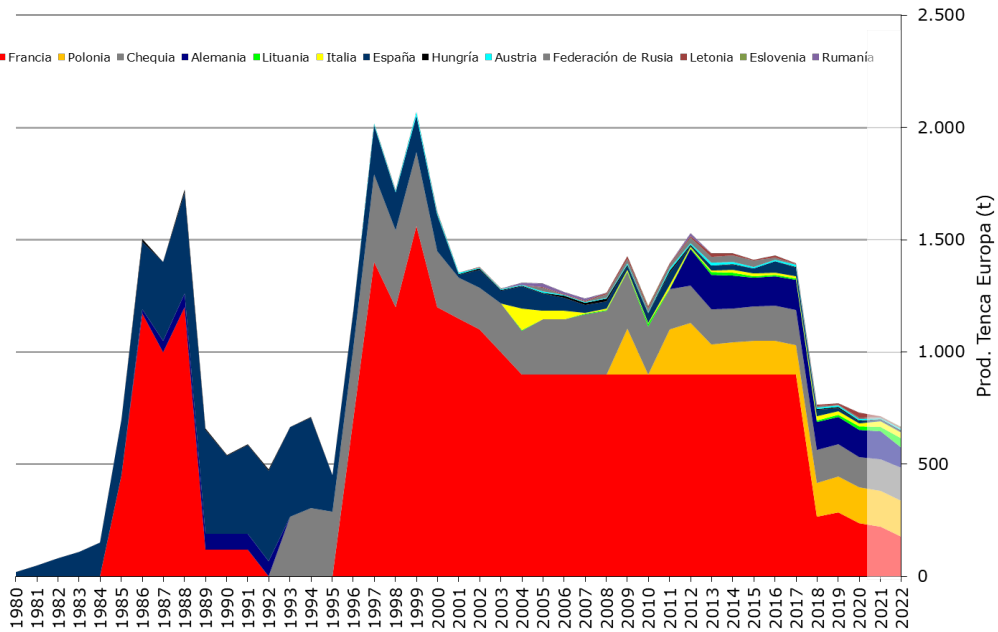
## TENCA Cultivation



The tench (*Tinca tinca*) is an exclusively European species. Its cultivation in 2022 amounted to a total of 666 t. France is the main producer (175 t, 26.3 percent of the total), followed by Poland (160 t, 24.0 percent of the total), the Czech Republic (150 t, 22.5 percent of the total), Germany (89 t, 13.4 percent of the total), Lithuania (41 t, 6.2 percent of the total) and Italy (24 t, 3.6 percent of the total). Tench is harvested in 20 countries.

Figure 5-60. Evolution of European tench aquaculture production in tonnes (1980-2022). FAO data.





In Spain, 14.4 t were produced in 2023, grown in ponds, mainly in the autonomous community of Extremadura and less in Castilla y León. This figure is far from the maximums reached at the end of the eighties, when it was around 450 tonnes. In 2022, APROMAR-REMA developed a project to analyse the causes of this decline and promote aquaculture of this species as a model of sustainable rural development together with the Association of Tenant Farmers of Extremadura (Ibertenca). It has been possible to mobilize the corresponding administration to help these producers. Even so, production remains the same in 2023 and foreseeably in 2024.

Figure 5-61. Evolution of tench (*Tinca tinca*) aquaculture production in Spain in tonnes (1978-2024p). FAO-MAP data.

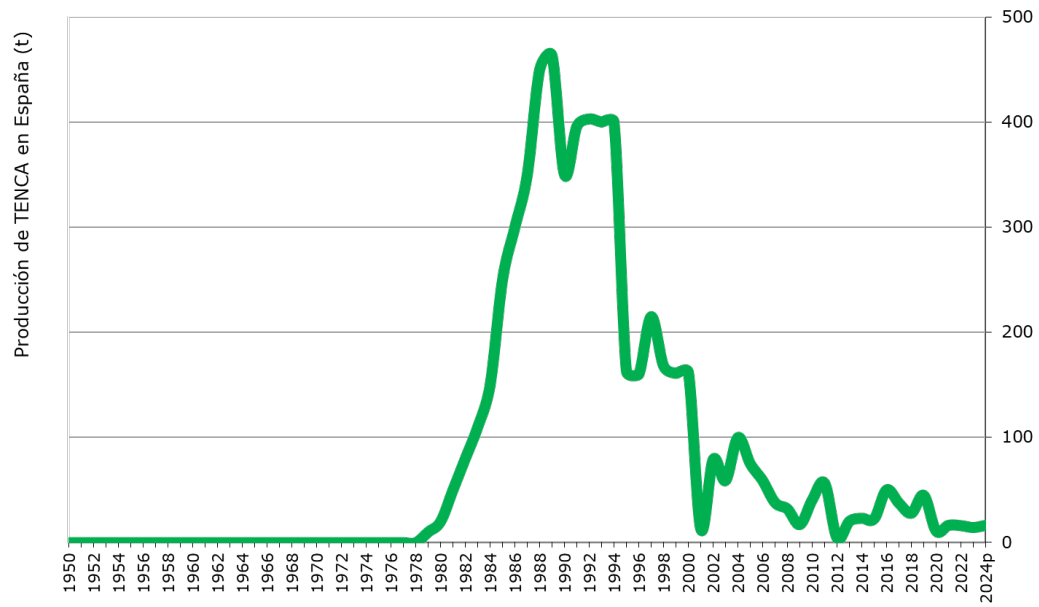


Table 5-1. Data on productions of farmed aquaculture species in Spain (tonnes).

<b>DORADA</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Andalucía	2.333	1.605	980	1.560	1.606	920	960	815	926	926
Baleares	0	0	0	0	0	0	0	0	0	0
Canarias	1.884	2.492	2.063	2.380	2.380	1.893	725	790	1.460	1.460
Cataluña	514	656	654	0	0	0	0	380	850	850
Murcia	4.103	3.368	4.356	3.184	2.906	1.107	2.461	1.327	510	600
Valenciana	7.397	5.619	5.590	7.806	6.629	2.668	5.486	5.620	9.360	9.400
<b>TOTAL</b>	<b>16.231</b>	<b>13.740</b>	<b>13.643</b>	<b>14.930</b>	<b>13.521</b>	<b>6.588</b>	<b>9.632</b>	<b>8.932</b>	<b>13.106</b>	<b>13.236</b>
Variación %	0,0%	-15,3%	-0,7%	9,4%	-9,4%	-51,3%	46,2%	-7,3%	46,7%	1,0%
Precio €/Kg.	5,84	5,78	4,87	4,37	4,10	4,20	4,18	4,89		
Valor (M€)	94,8	79,4	66,4	65,2	55,4	27,7	40,2	43,7		

<b>LUBINA</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Andalucía	5.356	6.081	3.261	4.479	7.120	3.950	7.365	6.020	5.024	5.025
Canarias	5.767	5.507	5.900	5.793	6.253	5.596	4.951	4.948	5.426	4.292
Cataluña	318	236	146	30	30	70	99	170	850	850
Murcia	6.009	8.164	6.990	7.525	9.181	3.585	7.285	7.244	7.580	7.900
Valenciana	3.874	3.457	4.972	4.633	4.751	8.508	4.228	5.240	5.700	8.621
<b>TOTAL</b>	<b>21.324</b>	<b>23.445</b>	<b>21.269</b>	<b>22.460</b>	<b>27.335</b>	<b>21.709</b>	<b>23.928</b>	<b>23.622</b>	<b>24.580</b>	<b>26.688</b>
Variación %	22,7%	9,9%	-9,3%	5,6%	21,7%	-20,6%	10,2%	-1,3%	4,1%	8,6%
Precio €/Kg.	5,64 €	5,67 €	5,18 €	4,64 €	3,80 €	4,30 €	4,66 €	5,56 €		
Valor (M€)	120,3	132,93	110,17	104,21	103,87	93,35	111,50	131,34		

<b>DOR + LUB</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
	37.555	37.185	34.912	37.390	40.856	28.297	33.560	32.554	37.686	39.924

<b>RODABALLO</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Asturias	0	0	0	0,00	0	0	0	0	0	0
Cantabria	108	50	105	100,00	0	0	0	0	0	0
Galicia	7.607	7.346	8.441	7.350,00	8.258	7.681	7.629	8.766	9.600	9.067
Pais Vasco	0	0	0	0,00	0	0	0	0	0	0
<b>TOTAL</b>	<b>7.715</b>	<b>7.396</b>	<b>8.546</b>	<b>7.450</b>	<b>8.258</b>	<b>7.681</b>	<b>7.629</b>	<b>8.766</b>	<b>9.600</b>	<b>9.067</b>

<b>CORVINA</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Andalucía	0	46	46	50	23	23	4	25	1	1
Canarias	0	0	0	0	0	0	0	0	0	0
Cataluña	0	0	0	0	0	0	0	0	0	0
Murcia	42	0	0	0	0	85	348	2.100	1.573	2.800
Valenciana	1.600	1.752	1.886	2.450	3.600	4.817	2.500	2.617	5.809	4.432
<b>TOTAL</b>	<b>1.642</b>	<b>1.798</b>	<b>1.932</b>	<b>2.500</b>	<b>3.623</b>	<b>4.925</b>	<b>2.852</b>	<b>4.742</b>	<b>7.383</b>	<b>7.233</b>

<b>ANGUILA</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Valenciana	380	315	330	330	360	350	340	340	340	350
<b>TOTAL</b>	<b>380</b>	<b>315</b>	<b>330</b>	<b>330</b>	<b>360</b>	<b>360</b>	<b>340</b>	<b>340</b>	<b>340</b>	<b>350</b>

<b>BESUGO</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
<b>TOTAL</b>	<b>104</b>	<b>178</b>	<b>142</b>	<b>113</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

<b>LENGUADO</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Andalucía	247	460	537	487	531	302	285	361	187	190
Galicia	388	295	293	287	287	318	644	861	890	1045
<b>TOTAL</b>	<b>664</b>	<b>755</b>	<b>830</b>	<b>774</b>	<b>818</b>	<b>620</b>	<b>929</b>	<b>1.222</b>	<b>1.077</b>	<b>1.235</b>

<b>LANGOSTINO</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
C y Leon	5	8	5	5	5	5	8	50	60	100
<b>TOTAL</b>	<b>5</b>	<b>8</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>8</b>	<b>50</b>	<b>60</b>	<b>100</b>

<b>SERIOLA</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Murcia					0	0	0	5	0	5
C. Valenciana					18	90	139	158	18	83
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>90</b>	<b>139</b>	<b>163</b>	<b>18</b>	<b>88</b>

<b>ATÚN ROJO</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
Andalucía		1.083	1.083	1.083	1.566	2.014	0	0	444	450
Cataluña		2.700	2.700	2.700	2.700	2.500	2.500	2.600	3.040	3.040
Murcia		1.360	1.360	1.360	1.360	5.262	4.500	8.277	6.260	6.306
<b>TOTAL</b>	<b>0</b>	<b>5.143</b>	<b>5.143</b>	<b>5.143</b>	<b>5.626</b>	<b>9.776</b>	<b>7.000</b>	<b>10.877</b>	<b>9.744</b>	<b>9.796</b>

<b>TOTAL</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024p</b>
	<b>48.065</b>	<b>52.778</b>	<b>51.840</b>	<b>53.705</b>	<b>59.546</b>	<b>51.664</b>	<b>52.318</b>	<b>58.664</b>	<b>65.848</b>	<b>67.705</b>
						-13,2%	1,3%	12,1%	12,2%	2,8%

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

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### 6.1. The consumption of aquatic products in the European Union

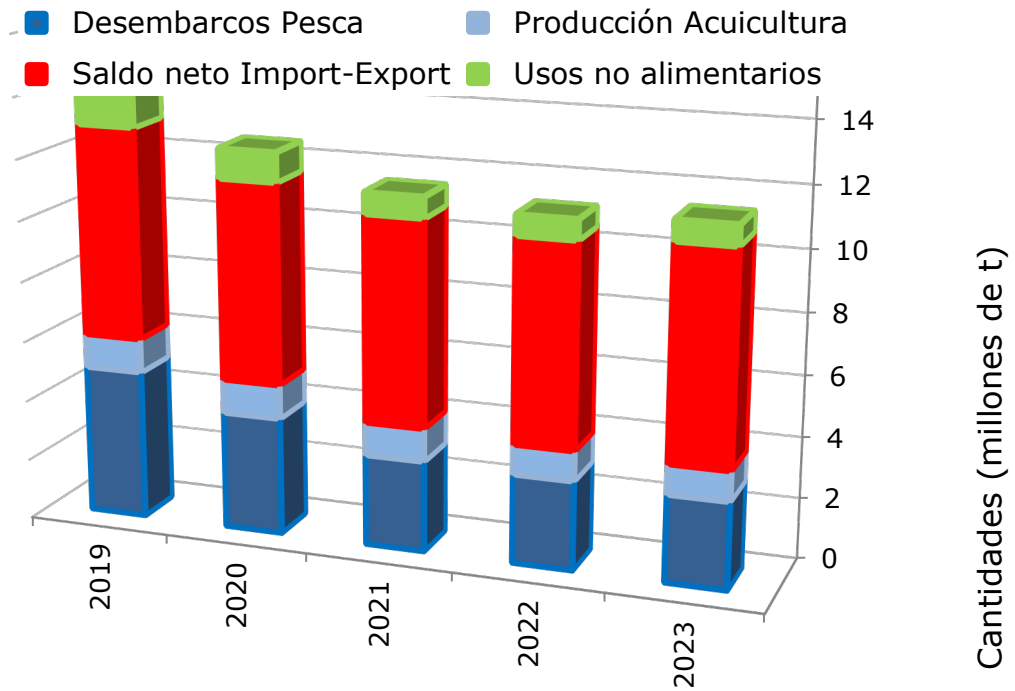
The European Union is the world's leading and most important market for aquatic products, i.e. the main market for food harvested through aquaculture or caught through fishing.

According to the 2023 AIPCE-CEP report, in 2022 the European Union had a total supply of 12.1 million tonnes of aquatic products. After adjusting for exports, an apparent consumption of 9.8 million tonnes is estimated. As regards the Union's self-sufficiency in aquatic products, the results are as follows:

- If all fisheries and aquaculture produced in the EU remained on the internal market, it would only cover 32.2% of the total supply. However, this figure, apart from exports, includes non-food products.
- Adjusting for food use only, the EU's domestic supply would account for 26.8% of the total available, assuming that everything remained within the single market.
- The final calculation is that imports account for 73,2% of the consumption of aquatic products in the Union.

Per capita consumption of aquatic products in the European Union in 2022 according to AIPCE-CEP was 22.1 kg (in whole fish equivalents) compared to 22.4 kg in 2021, down 1.4%. The fact that per capita consumption is falling for the fourth consecutive year is worrying, and measures such as increasing awareness of the benefits of the intake of aquatic products for the health of the population need to be adopted, as well as economic incentives (such as lower taxes, etc.) and other measures.

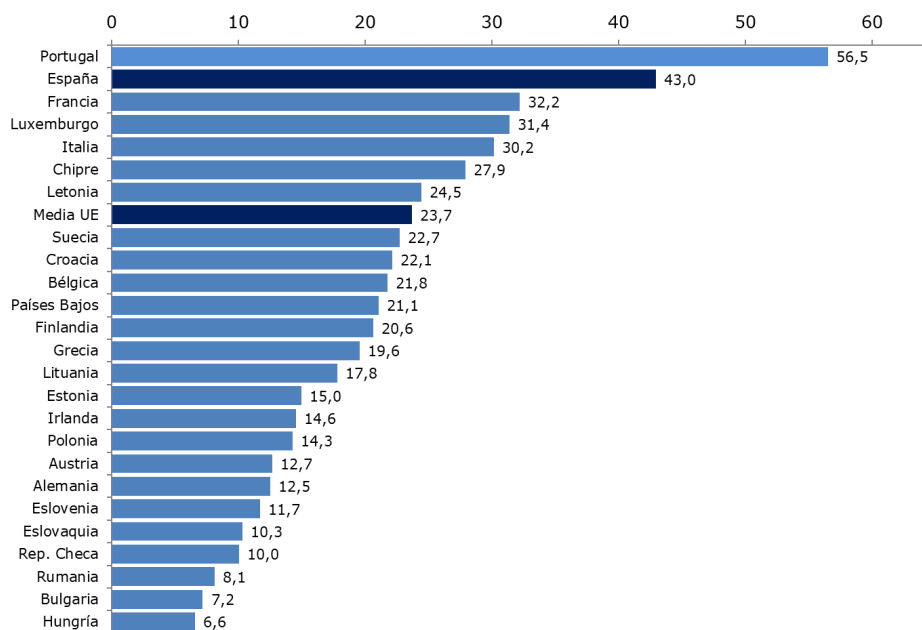
*Figure 6-1. Evolution of the origin of aquatic products consumed in the European Union (27) between 2019 and 2023, in tonnes of equivalent live weight. EU aquaculture and fisheries productions are considered in addition to the net balance of imports and exports and non-food uses (AIPCE).*



The AIPCE report states that species diversity and access to fish have increased thanks to innovations in packaging and logistics, offering more choice to consumers

The latest data from the EUMOFA 2023 edition report "The EU Fisheries Market" indicate that the apparent average per capita consumption of aquatic products in the European Union in 2021 was 23.7 kg (live weight)/capita/year, which was an increase of 2%, compared to the previous year. Note that these figures are slightly different from those of AIPCE-CEP.

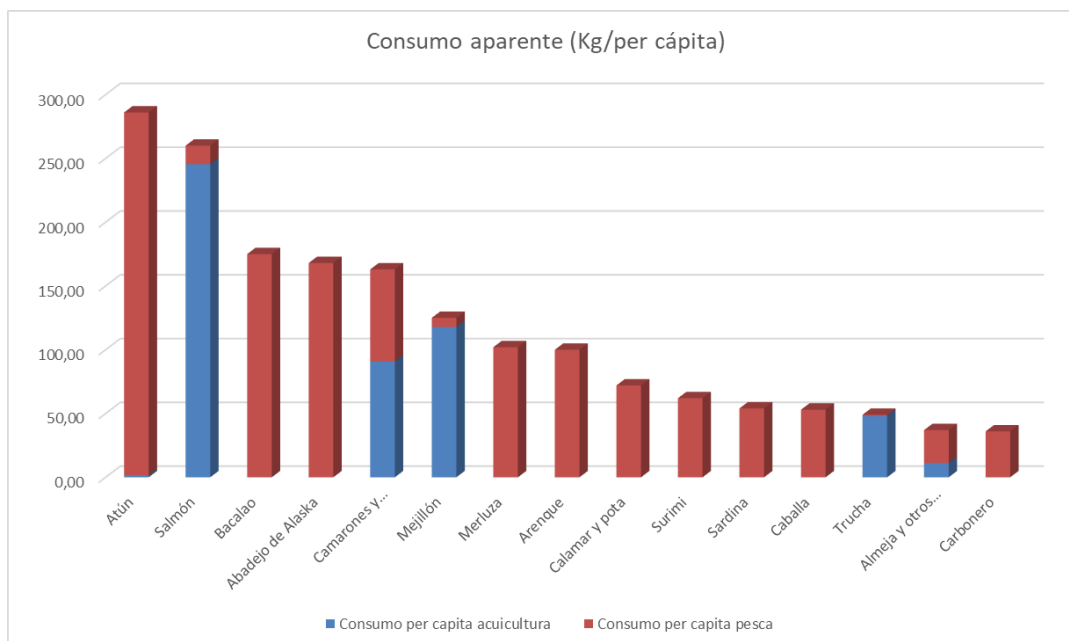
Figure 6-2. Per capita consumption of aquatic products in the member states of the European Union calculated on live weight (European Commission. EUMOFA 2023).



Portugal stands out with the highest figure, 56.5 kg/person (although it has continued to fall since 2018), followed by Spain with 43.0 (down 3% compared to 2020). This is followed by France (32.2) and Luxembourg (31.4), which are down 1% and 2% compared to 2020. Italy (30.2) increased by 0.4% compared to the previous year and was followed by Cyprus (27.9) which decreased by 4%.

The consumption of aquatic products in the Union is dominated by the supply of capture fish (71,3 %) and the rest (28,7 %) comes from aquaculture.

*Figure 6-3. Per capita consumption of the main species (segregating aquaculture and fisheries) in the European Union (European Commission. EUMOFA 2021).*



Tuna and salmon are the products with the highest per capita consumption, with 2.86 kg and 2.60 kg, respectively. Tuna consumption has decreased by 6%, while salmon has seen an increase of 7%. Prawns and prawns are the species that have grown the most in consumption, with an increase of 11%, which places them among the most consumed products with 1.63 kg per capita. Squid and squid have also registered a significant growth of 16%, although their per capita consumption is lower (0.72 kg). In terms of origin, most products, such as cod, Alaskan pollock, and hake, are mostly wild-caught (close to 100%), while products such as salmon (94.4%) and mussels (94.2%) come mainly from aquaculture.

## 6.2. Food consumption in Spain

Having quality and timely information on markets and consumption is an important element for producing 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 this country. The most up-to-date information published by the MAPA as of the date of publication of this APROMAR report refers to 2023.

In 2023, the Spanish population grew to 48,085,361 (1.4% more than in 2022). And the number of households also increased by 1.3% compared to 2022 with 19.3 million households.

In 2023 there were no notable changes in the agri-food market, consumption inside and outside the home was maintained with a slight decrease due to the increase in inflation. A total of 30,728.56 million kiloliters of food and beverages were purchased (-0.7% compared to 2022) with a total expenditure of 115,917.42 million euros (7.5% more than 2022). This meant an approximate total average expenditure of 2,732.77 euros/person in 2023. Therefore, inside (87.4%) and outside (12.6%) of the household consumed slightly less than in 2022 but the increase in prices (on

average 8.3%) caused the market to close with higher turnover than the previous year.

In 2023, the categories most consumed in households were: fruits, fresh vegetables, milk and derivatives (39.0% of the total), 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 food (-8.8% and -0.9% respectively).

### **6.3. The consumption of aquatic products in Spain**

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

In 2023, Spanish households bought 2.2% less fish products by volume. The reduction affected all three market segments. The purchase of fish decreased by 1.2%, both fresh and frozen. Consumption of shellfish, molluscs and crustaceans fell by 5.4%, despite a slight increase of 1.1% in the cooked segment, which did not compensate for losses in frozen and fresh products. Canned fish and molluscs registered the smallest decrease, with a fall of 0.4%. In terms of value, there is an increase of 4.8% as prices increased by an average of 7.1% (10.7 euros/kg).

Per capita consumption of aquatic products at the end of 2023 was 18.56 kg/person, 3.3% less than in 2022. This figure does not coincide with others, probably because it is estimated on purchases and not on apparent consumption. Even so, spending increased per person by 3.6%. Comparing this data with 2019 (before the pandemic) it can be seen that the purchase of aquatic products decreased by 16.5% even though turnover increased, due to an average price increase of 23.6%, according to the MAPA.

According to data from the MAPA's La Pesca Mes a Mes (MAPA) report for November 2023, at the end of the November 2023 mobile year, Spanish households had consumed 2.3% less fish, both fresh (-1.5%) and frozen (-5.7%). In terms of species, the purchase of sardines/anchovies (8.9%), hake/whiting (4.7%), salmon (2.3%) and sea bass (5.4%) increased.

*Figure 6-4. Evolution of the consumption of fishery products (aquaculture plus fishing) in Spanish households from December 2022 to November 2023. The total of aquatic products (= fishery products) and, within them, of fresh products (source: MAPA) are shown*



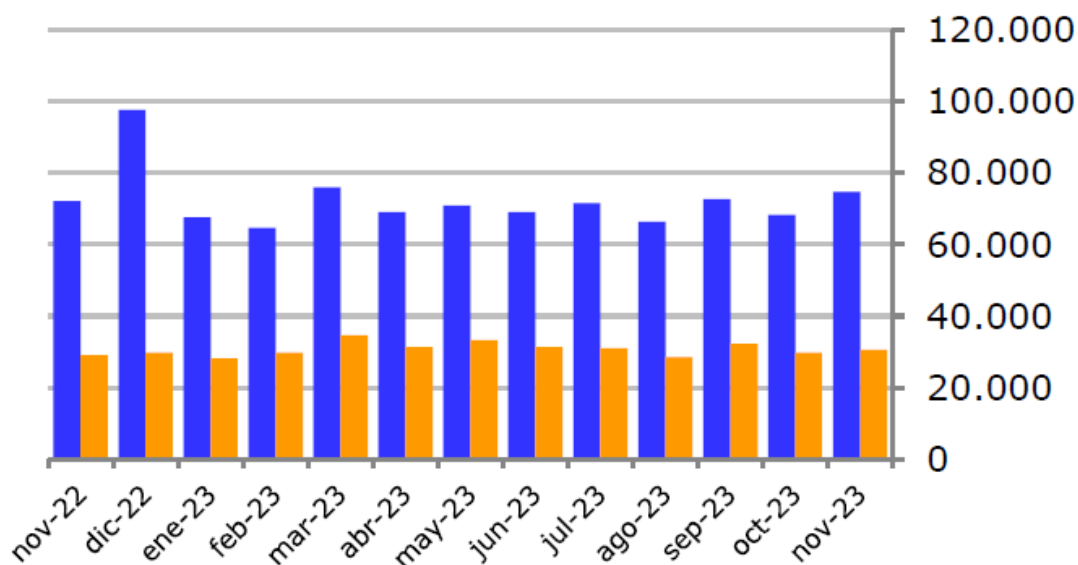


Table 6-1. Main statistical magnitudes in the marketing of fish in Spain for consumption in households between November 2022 and 2023. Data from the General Directorate of the Food Industry of the MAPA.

CONSUMO en HOGARES en el MES							
Productos	Cantidad consumida en el mes (miles de t.)		Evolución %23/22	Valor (Millones de €)		Evolución %23/22	PVP en el mes (€/Kg)
	2022	2023		2022	2023		
TOT. PROD. PESQUEROS***	72,19	74,77	3,6	750,10	803,87	7,2	10,75
TOT. PESCADO FRESCO	29,11	30,55	4,9	288,93	305,77	5,8	10,01
TRUCHA fresca	0,68	0,47	-30,9	5,68	4,42	-22,2	9,48
LENGUADO	4,02	3,81	-5,2	39,83	32,30	-18,9	15,49
SALMÓN	4,80	5,78	20,4	63,83	78,60	23,1	12,90
LUBINA	1,97	2,20	11,7	20,00	24,53	22,7	11,13
DORADA	2,99	2,99	0,0	24,84	25,88	4,2	8,65
RODABALLO	0,23	0,20	-13,0	3,27	2,82	-13,8	13,94
<b>TOTAL ALIMENTACIÓN</b>	<b>2.147,13</b>	<b>2.155,61</b>	<b>0,4</b>	<b>6.413,72</b>	<b>6.887,15</b>	<b>7,4</b>	<b>3,19</b>

CONSUMO en HOGARES TAM* MES 2023 vs 2022							
Productos	Cantidad consumida en el periodo (miles de t.)		Evolución %23/22	Valor (Millones de €)		Evolución %23/22	Kg per cápita TAM mes 2023
	TAM mes 2022	TAM mes 2023		TAM mes 2022	TAM mes 2023		
TOT. PROD. PESQUEROS***	904,80	868,40	-4,0	8.961,90	9.227,80	3,0	18,50
TOT. PESCADO FRESCO	376,10	370,60	-1,5	3.488,10	3.667,90	5,2	7,90
TRUCHA fresca	8,70	8,00	-8,0	68,90	72,60	5,4	0,20
LENGUADO	7,40	6,60	-10,8	90,10	92,80	3,0	0,10
SALMÓN	56,40	55,10	-2,3	707,50	787,40	11,3	1,20
LUBINA	23,80	22,50	-5,5	234,20	241,50	3,1	0,50
DORADA	31,50	33,20	5,4	259,50	296,10	14,1	0,70
RODABALLO	3,40	3,80	11,8	43,40	50,80	17,1	0,10
<b>TOTAL ALIMENTACIÓN</b>	<b>27.235,90</b>	<b>26.820,30</b>	<b>-1,5</b>	<b>73.779,90</b>	<b>80.372,30</b>	<b>8,9</b>	<b>570,80</b>

Figure 6-5. Importance of the different types of aquatic products in household consumption in Spain in 2023 (MAPA).

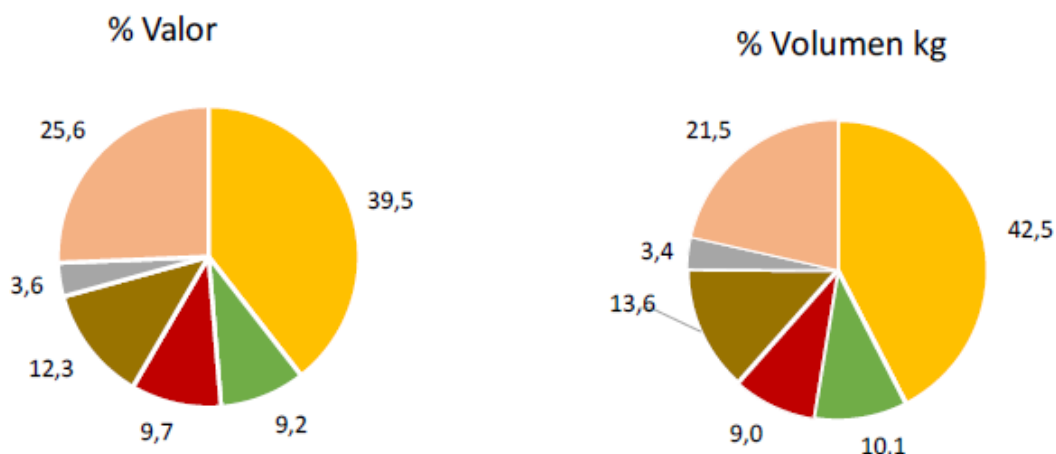


Figure 6-6. Percentage distribution of the purchase of aquatic products in 2022 by type of establishment and percentage variation over the previous year (MAPA data).

% Evolución 2023 vs 2022	Valor	Volumen
<b>TOTAL PESCA</b>	4,8 %	-2,2 %
<b>PESCADOS FRESCOS</b>	6,0 %	-0,5 %
<b>PESCADOS CONGELADOS</b>	2,3 %	-4,0 %
<b>MARISCO/MOLUSC CONG</b>	-0,9 %	-6,3 %
<b>MARISCO/MOLUSC FRES</b>	-0,7 %	-6,3 %
<b>MARISCO/MOLUSC COCI</b>	5,7 %	1,1 %
<b>CONS.PESCADO/MOLUSCO</b>	9,0 %	-0,4 %

At the end of 2023, the structure of the fishery products market remained stable. Fresh fish is the most relevant segment, representing 42.5% of the volume and 39.5% of the value, with a decrease in consumption lower than the average for the sector and a growth of 6% in turnover. Canned fish and molluscs were in second place, with 21.5% of the volume and 25.6% of the value, maintaining stability in purchases and increasing their turnover by 9%. Fresh seafood and crustaceans are the third segment, with 13.6% of the volume and 12.3% of the value, showing the largest drop (-6.3% in volume). Frozen fish accounts for 10.1% of volume and 9.2% of value, with a decrease in purchases of 4%, but a growth of 2.3% in value.

#### 6.4. The consumption of fresh aquatic products in Spain

In 2023 and according to the MAPA, the per capita consumption of fishery products in Spain was 18.56 kilos per person, 3.3% less than in 2022. Fresh fish was the most consumed product, with 7.88 kilos per capita, although it decreased by 1.6% compared to the previous year. Canned fish and molluscs registered 3.99 kilos per

capita, while fresh shellfish, molluscs and crustaceans fell by 7.4% to 2.52 kilos per capita.

Supermarkets were the main shopping channel, accounting for 50.6% of the volume, although with a drop of 1.5%. Traditional stores suffered the largest decline (-8.1%), while hypermarkets and discount stores increased their sales volume by 4.9% and 2.3%, respectively.

The average price of fishery products increased by 7.1%, reaching €10.70/kilo. E-commerce recorded the highest prices (12.38 euros/kilo), while discount stores offered the lowest prices (10.15 euros/kilo). Supermarkets closed with an average price below the market average, while traditional stores offered higher prices.

Figure 6-7. Percentage distribution of the purchase of fresh aquatic products in 2022 vs. 2023 by type of establishment 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 2023 vs. 2023 and percentage variation over the previous year (MAPA data).

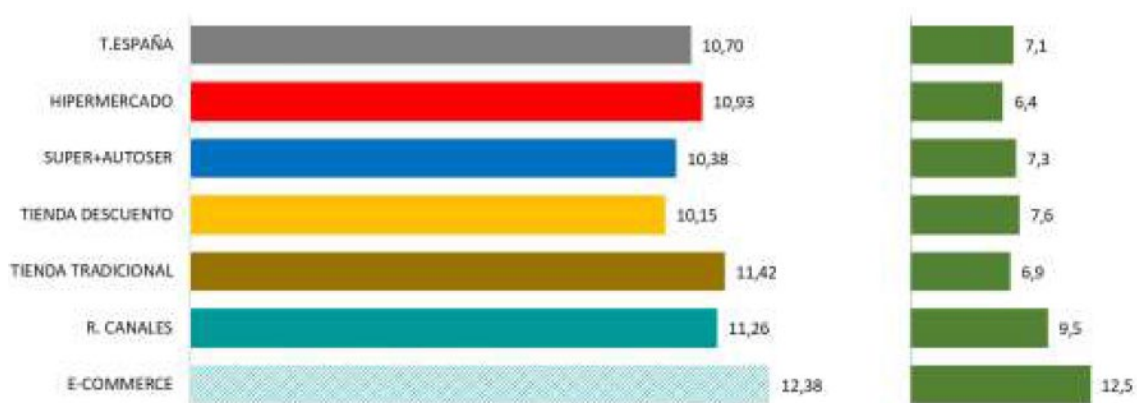
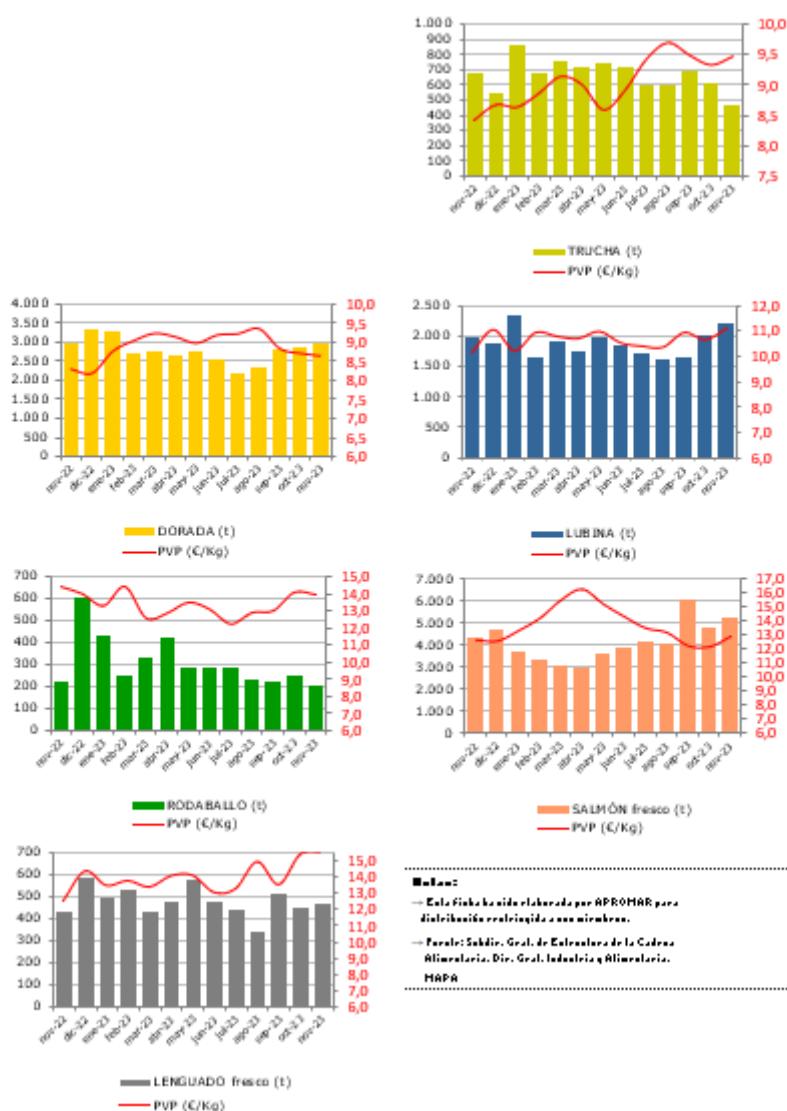


Figure 6-9. Evolution of fish consumption from aquaculture and fisheries in Spanish households between December 2022 and 2023. The quantity (t) and the retail price are indicated (source: MAPA).

## CONSUMO de los diferentes PRODUCTOS en HOGARES (toneladas y PVP)



### 6.5. Trading of sea bream

According to figures from the MAPA, the value in the first sale of the sea bream produced in Spain was 5.76 euros/kg with a total production value of 75.5 million euros. This amount refers to domestic production, without taking into account imports of this species.

According to the MAPA's Food Consumption Report, 4.2% more fresh sea bream was purchased than the previous year. The average price increased by 8.9% and closed at 9.01 euros/kg. It is estimated that on average each Spaniard consumed about 0.69 kg (3.1% more than in 2022). The sea bream represented 0.36% of the value of the purchase of products for households.

The average price in the first sale of aquaculture sea bream in 2023, including imports, calculated on the Mercases statistics obtained from the Mercas, was 4.71 euros/kg, 3.8% less than the previous year (4.89 euros/kg) according to APROMAR estimates. The value of sea bream up to 600 g varied significantly throughout the

year. In the first quarter the average price was 5.89 euros/kg, the second 5.17 euros/kg, the third 4.7 euros/kg and the fourth 4.76 euros/kg. Maximum values of 6.2 euros/kg were reached in January and April, and the lowest price of 4.5 euros/kg took place in October.

Figure 6-10. Evolution of the average prices (euros/kg) of sea bream (400/600 g.) in MercaMadrid and MercaBarna (Mercas starting prices) between 2020 and 2023 (data from the Ministry of Economy and Competitiveness). All price values are nominal and have not been adjusted for variations in the CPI.

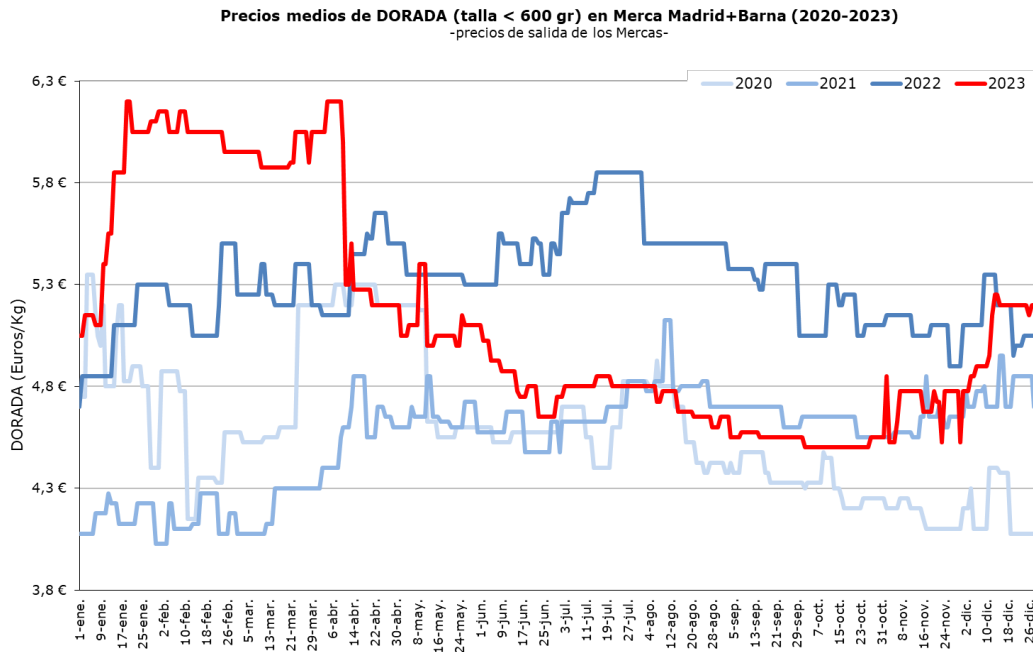


Figure 6-11. Evolution of the average prices (euros/kg) of the first sale of sea bream in its three main commercial sizes between 2019 and 2023 (Ministry of Economy and Competitiveness).

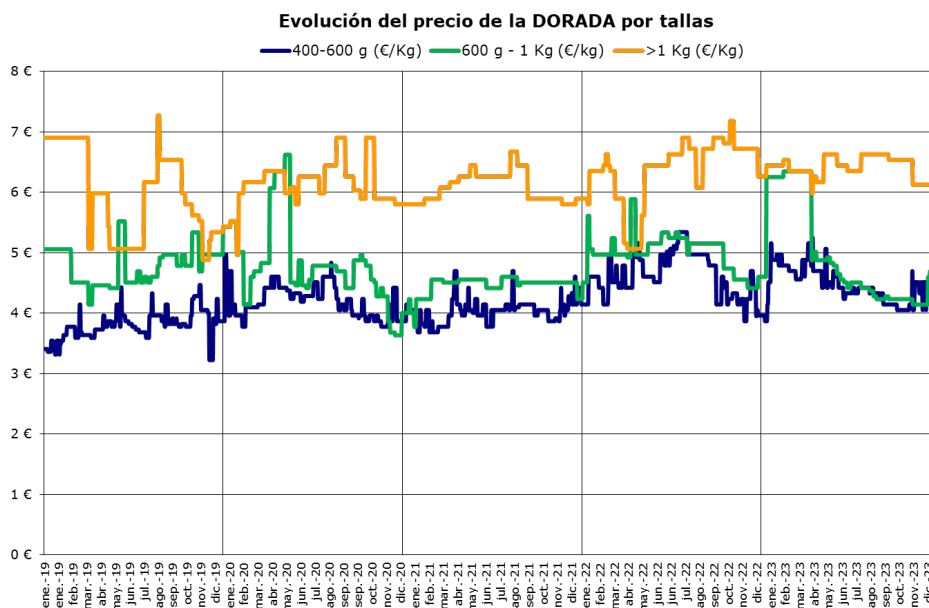
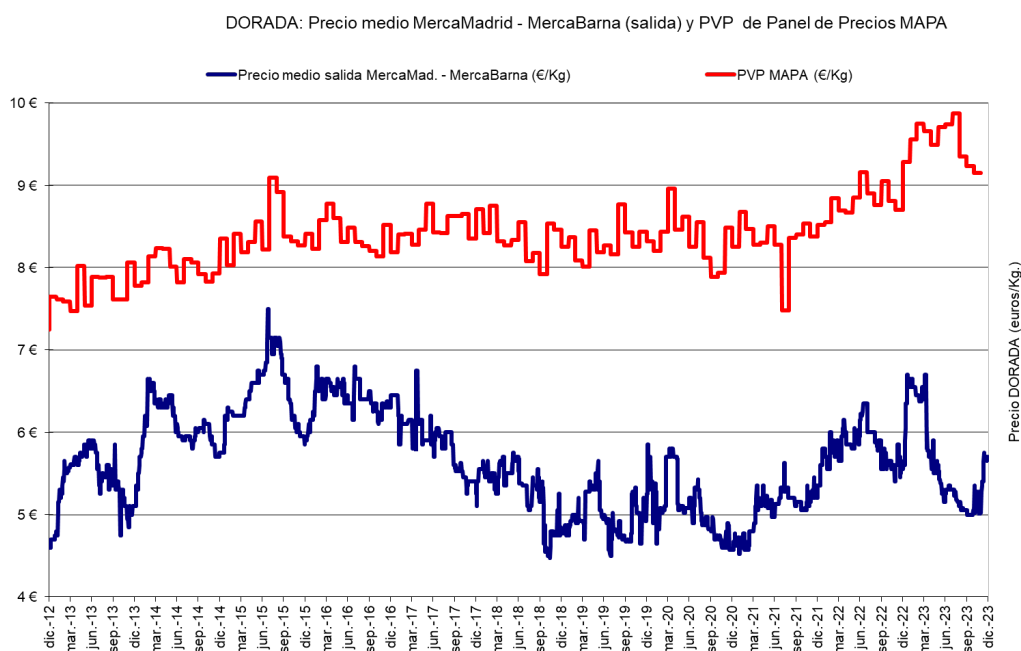


Figure 6-12. Evolution of Mercas exit sea bream prices and the RRP between 2012 and 2022 (euros/kg). All price values are nominal and have not been adjusted for variations in the CPI.



The marketing of aquaculture sea bream is mainly carried out through supermarkets and department stores. Traditional fishmongers (specialised trade) are the third way of selling. There is also marketing through the extra-domestic Horeca channel (Hotels, Restaurants and Catering), but most of the consumption is made in homes (approximately 80%). The consumption of sea bream at home in 2023 experienced a slight increase and so did its price.

At the Mediterranean level, the main market for sea bream continues to be Italy, where some 51,701 t were consumed in 2022. The next three markets were Turkey (53,028 t), Spain (25,578 t), Greece (23,100 t), Portugal (17,615 t) and France (15,931 t).

According to EUMOFA data, in Spain in 2023 the total apparent consumption of sea bream was 32,350 t (production + imports - exports), 8.9% less than the previous year. The national harvest of this species was 13,106 t and the fishing 600 t, while 27,092 t were imported and 8,448 t were exported. As a result, only 16.6% of the sea bream consumed in Spain in 2023 was produced domestically (assuming that all sea bream exports from Spain were of Spanish productive origin). These data do not coincide exactly with the data from the MAPA Consumption Panel, which refer only to household consumption, while those from APROMAR cover total consumption of this species in Spain.

Figure 6-13. Percentage distribution of the country of origin of sea bream marketed in Spain in 2023 according to EUMOFA.

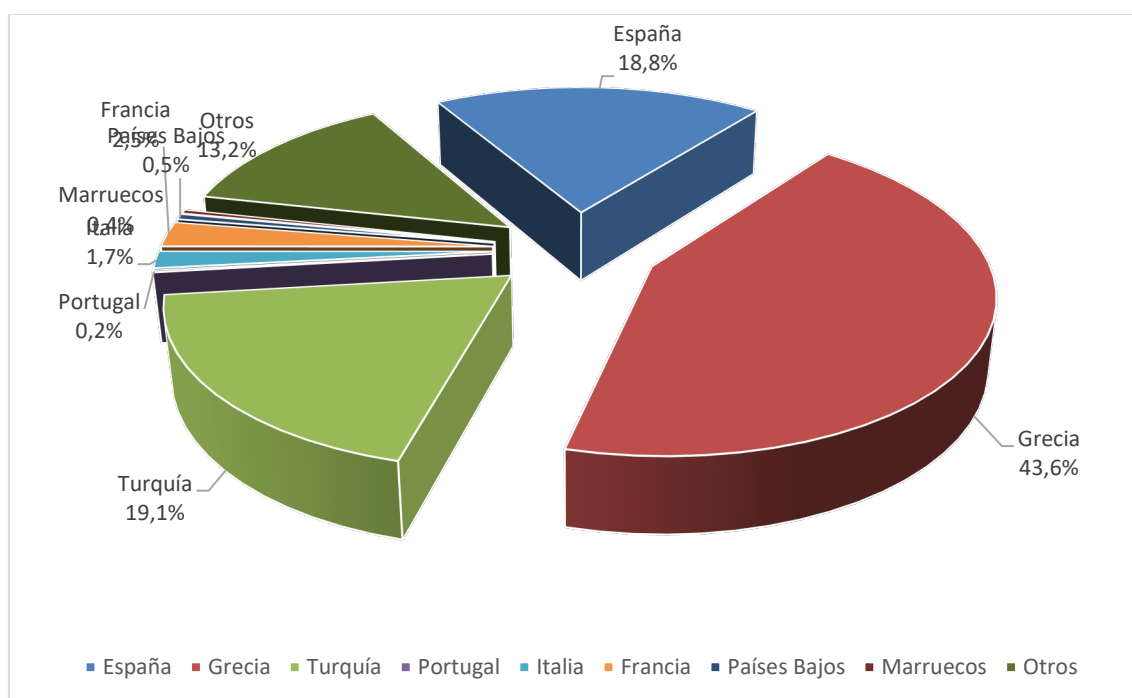


Figure 6-13. Diagram of productions, trade flows and apparent markets for sea bream in Europe in 2023. Based on data from FEAP, FAO and APROMAR.

## Flujos DORADA

<b>Francia</b>		<b>Italia</b>		<b>España</b>		<b>Croacia</b>	
Acuicultura	1.987	Acuicultura	10.100	Acuicultura	8.932	Acuicultura	7.462
Pesca	1.728	Pesca	453	Pesca	463	Pesca	229
Import.	12.982	Import.	48.323	Import.	22.610	Import.	826
Export.	766	Export.	7.175	Export.	6.427	Export.	5.278
Mercado	15.931	Mercado	51.701	Mercado	25.578	Mercado	3.239

<b>Portugal</b>		<b>Grecia</b>		<b>Turquía</b>	
Acuicultura	4.085	Acuicultura	72.700	Acuicultura	152.469
Pesca	212	Pesca	700	Pesca	559
Import.	13.906	Import.	8.464	Import.	0
Export.	588	Export.	58.764	Export.	100.000
Mercado	17.615	Mercado	23.100	Mercado	53.028

<b>SE Med. y Or. Med.</b>		<b>Resto Sur Europa</b>		<b>N-E Europa</b>	
Acuicultura	66.637	Acuicultura	8.136	Acuicultura	158
Pesca	6.134	Pesca	48	Pesca	0
Import.	13.000	Import.	8.487	Import.	55.960
Export.	8.291	Export.	5.504	Export.	0
Mercado	77.480	Mercado	11.167	Mercado	56.118

<b>Merc. lejanos (EEUU, Japón,...)</b>	
Acuicultura	300
Pesca	0
Import.	7.800
Export.	0
Mercado	8.100

<b>Totales DORADA</b>	
Acuicultura	332.966
Pesca	10.526
Mercado	343.057

### 6.6. Marketing of sea bass

According to figures from the MAPA, the value of the sea bass produced in Spain was 8.25 euros/kg with a total production value of 202.7 million euros. This amount refers to domestic production, without taking into account imports of this species.

In 2023, households bought 1.5% more than in 2022, according to the MAPA's Consumption Panel. The expenditure made on this species also increased by 8.9% with a closing price of 10.68 euros/kg. Each Spaniard consumed about 0.5 kg in the year.



The average price in the first sale of aquaculture sea bass in 2023, including imports, calculated on the Mercases statistics obtained from the Mercas, was 5.23 euros/kg, 10.9% less than the previous year (4.71 euros/kg) according to APROMAR estimates.

The prices, according to the first sale in the Mercas, of sea bass up to 600 g are shown in figure 6-15. In the first quarter the average price was 6.06 euros/kg, in the second 5.93 euros/kg, in the third 5.49 euros/kg and in the last, 5.27 euros/kg. The maximum value was reached in April with 6.5 euros/kg and the lowest in December with 5.10 euros/kg.

Figure 6-15. Evolution of the average prices (euros/kg) of sea bass (400/600 g.) in MercaMadrid and MercaBarna (Mercas starting prices) between 2020 and 2023 (data from the Ministry of Economy and Competitiveness). All price values are nominal and have not been adjusted for variations in the CPI.

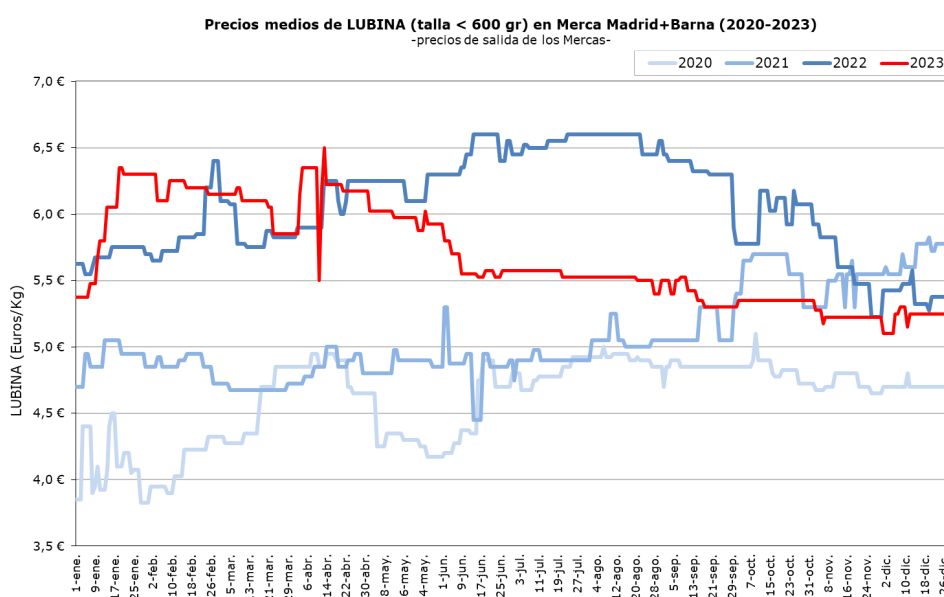


Figure 6-16 shows the evolution of the price by size and highlights the increase in the price of sea bass over 1 kg in the last quarter.

Figure 6-16. Evolution of the average prices (euros/kg) of the first sale of sea bass in its three main commercial sizes between 2019 and 2023 (Ministry of Economy and Competitiveness).

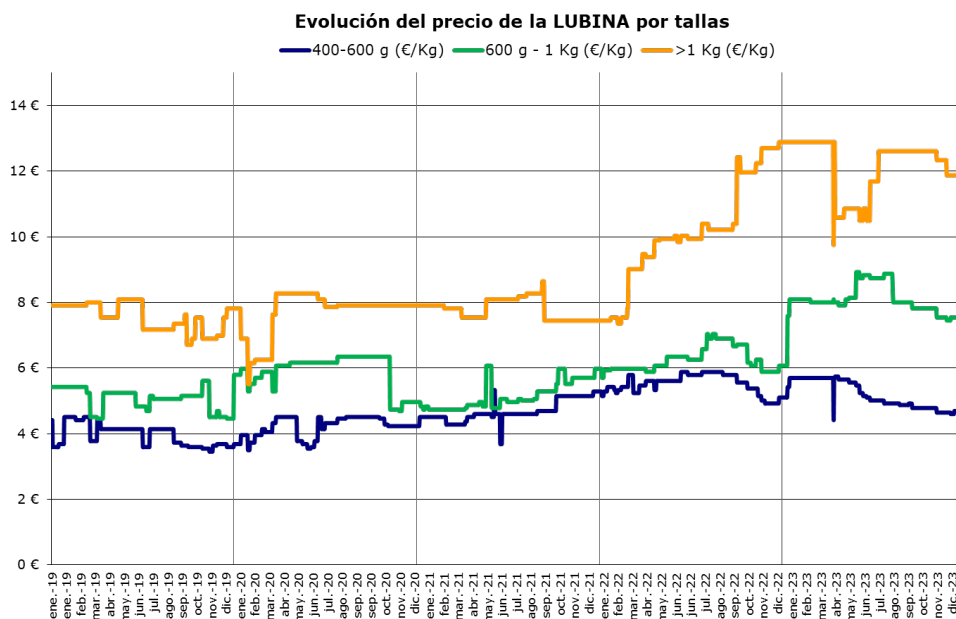
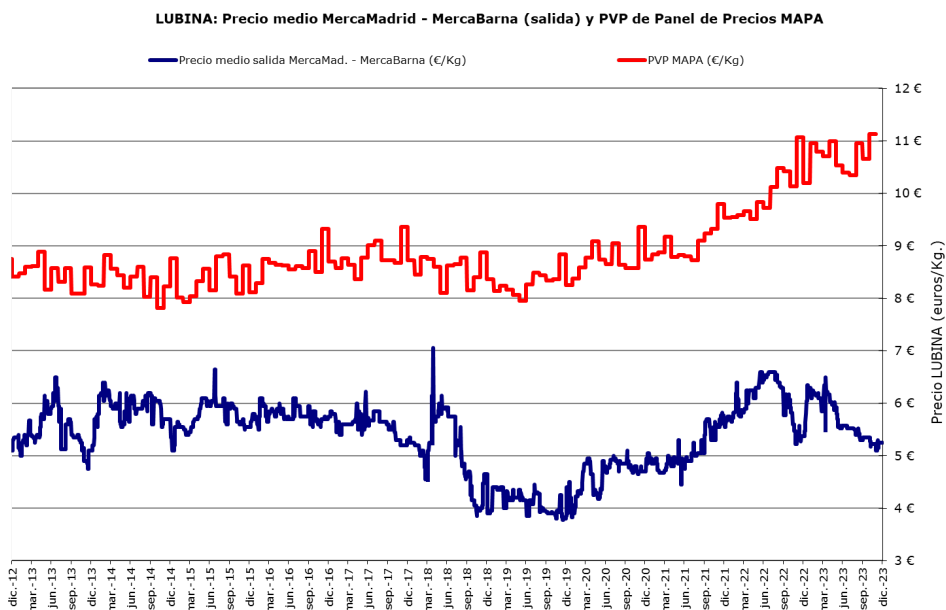


Figure 6-17. Evolution of the prices of sea bass from Mercas and the RRP between 2012 and 2023 (Euros/kg). All price values are nominal.



The marketing of aquaculture sea bass, like that of sea bream, is mainly carried out through supermarkets and department stores. The specialized channel (traditional fishmongers) are the third way of sale. There is also marketing through the Horeca channel (Hotels, Restaurants and Catering), but most of the consumption takes place in homes (approximately 80%).

In 2022, the main international markets for sea bass were Italy and Spain with 53,146 and 32,139 tonnes per year respectively. The next markets are Turkey (36,601 t), Greece (27,993 t), France (12,625 t) and Portugal (7,945 t).

APROMAR estimates the consumption (production + imports - exports) of sea bass in 2023 in Spain at 31,669 tonnes, 10.8% more than the previous year. The national harvest of this species was 24,580 t and fishing 1,178 t, while 18,606 t were imported and 12,695 t were exported. As a result, 41.2% of the sea bass consumed in Spain in 2023 were harvested domestically (assuming that all sea bass exports from Spain were of Spanish productive origin). These data do not coincide exactly with the data from the MAPA Consumption Panel, which refer only to household consumption, while those from APROMAR cover total consumption in Spain of this species.

Figure 6-18. Percentage distribution of the country of origin of sea bass marketed in Spain in 2023.

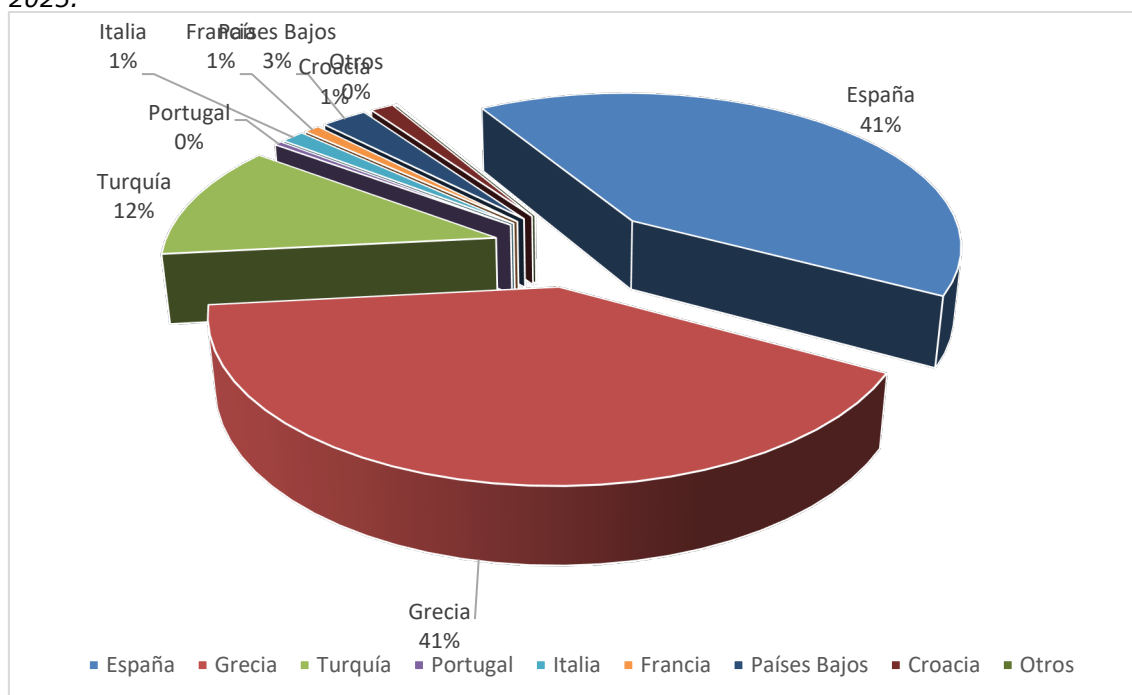


Figure 6-19. Diagram of productions, trade flows and apparent markets for sea bass in Europe in 2023. Based on data from FEAP, FAO and APROMAR.

## Flujos LUBINA

<b>Francia</b>		<b>Italia</b>		<b>España</b>		<b>Croacia</b>	
Acuicultura	2.273	Acuicultura	7.500	Acuicultura	23.622	Acuicultura	10.032
Pesca	2.522	Pesca	203	Pesca	720	Pesca	13
Import.	9.189	Import.	48.514	Import.	19.140	Import.	259
Export.	1.359	Export.	3.071	Export.	11.343	Export.	7.849
Mercado	12.625	Mercado	53.146	Mercado	32.139	Mercado	2.455

<b>Portugal</b>		<b>Grecia</b>		<b>Turquía</b>	
Acuicultura	1.275	Acuicultura	54.000	Acuicultura	156.602
Pesca	477	Pesca	374	Pesca	0
Import.	6.360	Import.	4.110	Import.	0
Export.	167	Export.	30.491	Export.	120.000
Mercado	7.945	Mercado	27.993	Mercado	36.602

<b>SE Med. y Or. Med.</b>		<b>Resto Sur Europa</b>		<b>N-E Europa</b>	
Acuicultura	46.131	Acuicultura	1.959	Acuicultura	0
Pesca	302	Pesca	53	Pesca	887
Import.	15.000	Import.	3.000	Import.	45.000
Export.	1.500	Export.	800	Export.	0
Mercado	59.933	Mercado	4.212	Mercado	45.887

<b>lejanos (EEUU, Japón,...)</b>	
Acuicultura	0
Pesca	0
Import.	25.000
Export.	0
Mercado	25.000

<b>Totales LUBINA</b>	
Acuicultura	303.394
Pesca	5.551
Mercado	307.937

### 6.7. Marketing of turbot

Turbot consumption in Spanish households increased significantly in 2023 by 17.7%, according to the MAPA Consumption Panel. In addition, it grew in value by 20.1% and closed at 13.4 euros/kg. Per capita consumption was 0.08 kg (16 percent higher than the previous year).

According to the MAPA, the average first sale price of turbot in Spain was 8.92 euros/kg and the production had a total value in first sale of 85.6 million euros.

According to the comparison of first sale prices in the markets, in 2023 the price of turbot remained around 13.1 euros/kg. In the first quarter it was on average 12.8 euros/kg, in the second and third it was 12.6 euros/kg and in the last it increased to 14.3 euros/kg.

Figure 6-20. Evolution of the average prices (euros/kg) of turbot (1,000/2,500 g.) in MercaMadrid and MercaBarna (Mercas starting prices) between 2018 and 2023 (data from the Ministry of Economy and Competitiveness).

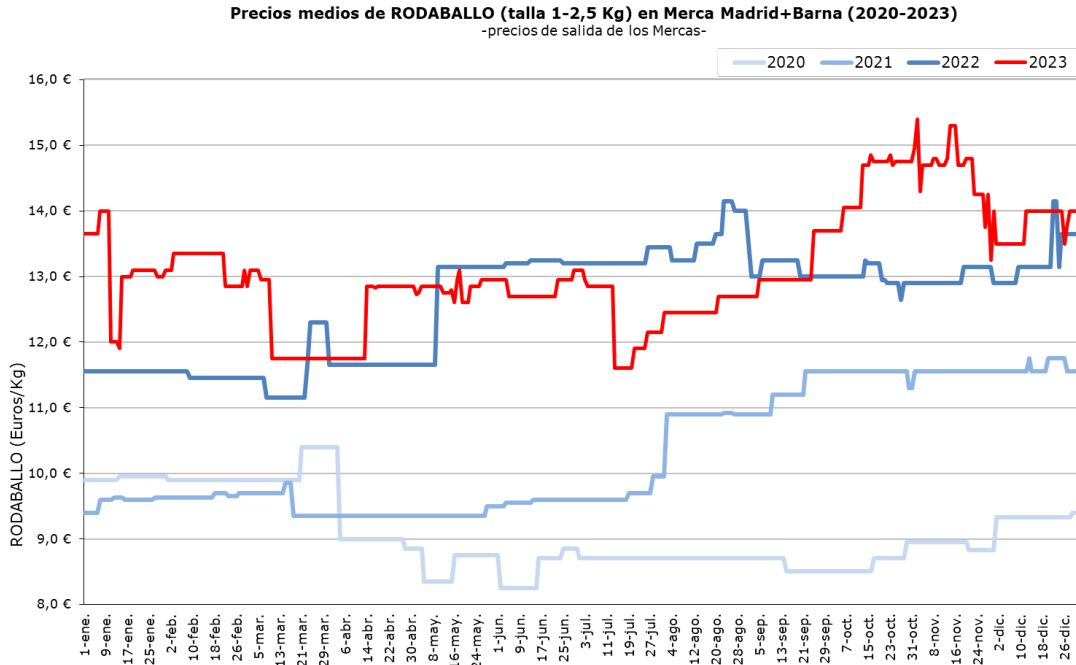
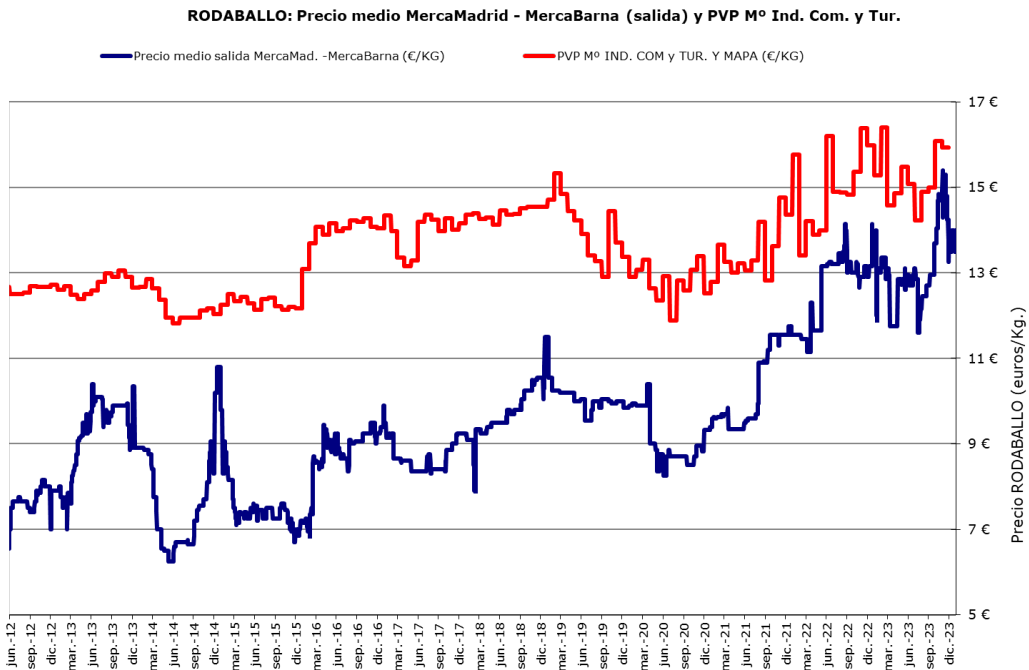


Figure 6-21. Evolution of prices in the marketing of turbot (1,000/2,500 g.) in MercaMadrid and the RRP between 2012 and 2022. All price values are nominal.



Spanish aquaculture turbot is marketed through various channels, but mainly through Horeca, and to a lesser extent through traditional fishmongers, although also, and increasingly, in supermarkets and large 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 around 70% of the aquaculture turbot in Europe.

## 7. Challenges of aquaculture in Spain

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Over the years, aquaculture has been consolidating itself as an activity of notable implementation in Spain, being already traditional and relevant in many localities. Aquaculture facilities are located in remote rural areas, river or coastal, where other types of investment rarely reach and where aquaculture is often the only business activity that generates 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 has long been 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 specialise in specific species and are at the forefront of European aquaculture, attracting investors of multiple nationalities. As far as the marketing of their fish, molluscs, crustaceans and algae is concerned, they do so both in Spain and in demanding international markets.

However, Spain continues to suffer from a serious external trade deficit in terms of seafood, i.e. food from fisheries and aquaculture. A deficit that also continues to grow, reaching 2,718 million euros in 2023. For example, two out of every three sea bream and one out of every two sea bass consumed in Spain are imported. Food sovereignty, now framed within the concept of strategic autonomy, is a priority of the European Union and nationally, and the limitations of the traditional fishing grounds of the Spanish fishing fleet are permanent. Therefore, national aquaculture can and should help to alleviate this deficit, as an activity that generates wealth and employment throughout the length and breadth of Spain.

As a whole, Spanish aquaculture companies are business-competitive entities, but this position is being seriously compromised by various perfectly identified issues. The most relevant issues are related to the legal regulatory framework that they must comply with and are those that are outlined in this document. This situation limits the growth capacity of companies while reducing their competitiveness by entailing superfluous or lightenable administrative burdens.

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

### SIMPLIFICATION AND COHERENCE OF THE REGULATORY FRAMEWORK.

Aquaculture is a food-producing activity of the primary sector that takes place, in whole or in part, in areas of public domain. This forces it to comply with numerous regulations in a multitude of areas: occupancy concessions, emissions, food safety, waste, fees, fees, occupational risks, etc. This sector must comply with extensive European legislation, so for the proper functioning of the internal market, a uniform and coherent application of these rules is necessary. In this sense, it is essential to strengthen the coordination of the different administrations at the 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 the environment, food safety, labelling, etc. Although the competent administrations in aquaculture production are certain departments of the autonomous communities, the state administration plays a role in its coordination while being central to 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.

The shortcomings of the regulatory framework that applies to aquaculture in Spain begin at the level of the European Union. From that point on, it is the case that Member States give higher political priority to the environment, agriculture and fisheries than to aquaculture, and this leads to a lack of commitment to developing sustainable and powerful aquaculture in the Union. This is evidenced by the fact that the European Commission's strategic guidelines for a more sustainable and competitive EU aquaculture are non-binding and have a very limited impact on the governance of the Member States. In addition, effective and timely follow-up measures have not been put in place, and the policy objective of promoting sustainable aquaculture is not quantifiable.

At the Spanish level, the laudable effort of the General Secretariat of Fisheries (MAPA) to promote the regulatory alignment that applies to aquaculture in Spain through the work for Spain's Contribution to the EU Strategic Aquaculture Guidelines 2021-2030 (EsACUI) should be recognized and highlighted. This initiative is the result of a process of analysis and reflection that began in December 2019 with the in-depth evaluation of the Strategic Plan for Spanish aquaculture 2014-2020. Based on the results and lessons learned, and from an integrative and cooperative work approach, EsACUI is working to develop a new key strategic instrument to address the challenges of Spanish aquaculture, identifying common problems in detail, analysing different ways of dealing with them and optimising the efforts to be made. APROMAR is fully involved in its development and convinced that its results will soon become evident.

In relation to the regulatory challenges, APROMAR proposes the following questions:

- Holistic review of the administrative framework that applies to aquaculture under the European concept of "*Better regulation*" eliminating unnecessary burdens and promoting measures to increase its effectiveness, efficiency, predictability and transparency; in addition to the shortening and transparency of the deadlines of administrative procedures.
- Surveillance of Market *Unity* 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 Register of Livestock Farms (REGA), the requirements in environmental monitoring plans and port taxes, among other aspects.

- Rationalisation of the fees applied to aquaculture (e.g. state and regional port fees) and fees (e.g. discharge into rivers). For this tax adjustment, the lessons learned from the impact of the Covid-19 crises and the war in Ukraine must 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 its overall operationality.
- To remove aquaculture from the scope of Directive 2006/123/EC on Services in the Internal Market (known as Bolkestein) as it affects concessions for the occupation of the public domain. Failure to do so leads the sector to the obligation of public tenders for the granting of concessions, especially in the situation of application of extraordinary extensions. This situation does not occur in other EU countries such as Italy, Greece or Croatia. APROMAR is convinced that there are sufficient legal arguments to argue that the Services Directive is not so broad as to include aquaculture.
- Sharing between the different administrations of the statistical data provided by 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 with forward-looking approaches and alleviating past inertia, definitively establishing priority use areas for aquaculture and aquaculture to fit into areas of high potential. Also, the biological (ecological) load capacities in each of these areas must 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.
- To promote greater knowledge of the aquaculture sector among public administration staff and legislators, covering the fields of animal health, environmental protection, animal welfare, and others.
- Creation in Spain of a single web portal, at the national and regional level, which informs citizens about legislative initiatives and public consultations, similar to the "*Welcome to Have your say*" of the European Commission.

#### OPTIMIZATION OF AQUACULTURE IN HYDROLOGICAL PLANNING.

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 after use it returns it to the environment in similar conditions both in terms of quantity and quality. The recognition of this non-consumptive use of freshwater by aquaculture facilities in rivers is especially critical in times of drought such as those of recent years, and probably for the future. Taking into account the increasingly frequent situation of prolonged droughts, it is essential that aquaculture receives a treatment that recognizes this type of circumstance, so



that its preferential access to water is guaranteed since that same water is returned to the channel. In this regard, it proposes the following three measures:

- Application of reductions in fees and fees to aquaculture in a manner similar to those offered to agriculture and livestock.
- Carry out a legislative adaptation so that the ecological flows are adjusted to the reality of each river section. APROMAR considers that the current ecological flows are oversized in many channels and there is room for a reduction without putting the ecosystems at risk in the affected river sections.
- Always offer aquaculture companies time periods to adapt to changes in authorized flows and possible new obligations that require significant investments. Fish stocks on the premises cannot be changed in a controlled manner from one day to the next and business investments must fit into their annual budgetary capacities.

#### COMPATIBILITY OF AQUACULTURE WITH OTHER USES OF SPACE.

Spain's coasts and rivers are areas where numerous economic and social activities converge, including aquaculture. In this sense, work must be done for the positive integration of activities and take advantage of the positive synergies that arise between them. Aquaculture can fit seamlessly with other economic activities with which it shares space. Occasional conflicts may arise with other uses and users of the space, but these can and should 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 other sectors that also carry out their activity around the sea and rivers. In this sense, public institutions play a central role in planning activities and arbitrating solutions. APROMAR proposes the following:

- Promote the search for synergies between aquaculture and fishing, tourism and eco-environmental activities.
- Avoid the spurious interposition of conflicts between sectors as an excuse to cover underlying problems with personal or political motivations.
- Promote from 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.

People are subjected to an incessant torrent of information, sometimes factual and sometimes misleading, which leads them to doubt basic questions about the production of the food they eat, the conservation of the environment, nutritional issues, animal welfare and food safety. Providing people with the most correct possible interpretation of this information is an obligation of many: public administrations, the media, economic sectors, scientists and social organizations. To this end, significant investments in promotional and communication campaigns are necessary to aspire to achieve sufficient teaching minimums. In this way, the following is necessary:

- Improve consumption statistics in Spain of seafood. APROMAR considers that the most appropriate calculation of per capita consumption is the one made on the apparent consumption of whole fish. Apparent consumption results from computing national production, adding imports and subtracting exports, divided by the number of people including tourists. And whole fish is calculated by applying correction coefficients when the imports or exports are of eviscerated or filleted products.
- Recover the consumption of aquatic products in Spain. This would benefit people's overall health and support the continuity of the fisheries and aquaculture sectors. These campaigns must be tackled 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 with institutional support to society on the characteristics of aquaculture. These communication activities should be coordinated with those carried out by the sector itself.
- Public administrations such as the Ministry of Agriculture, Fisheries and Food, the Ministry of Health, the Ministry of Consumer Affairs, and especially the Spanish Agency for Food Safety and Nutrition (AESAN), must publicly clarify doubts and respond to false communications in the media.

### **Spanish scientific production in the field of aquaculture in 2023**

In this section, we quantify the Spanish scientific production related to aquaculture research in 2023, counted in terms of scientific publications, generally called articles. This analysis is based on a search of all the scientific articles of impact in which at least one Spanish scientist has participated, in the most relevant journals for aquaculture in the main collection of *the Web of Science Core Collection*, a database of scientific bibliographic information managed by the company Clarivate.

#### *How much have Spanish scientists published on aquaculture in 2023?*

To get a general idea about the number of "Spanish" scientific articles published in impact journals in 2023, we have used the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) methodology, which consists of four phases: (1) the identification of the articles, (2) screening to detect errors, (3) a check of the eligibility of articles, and (4) the final decision on the articles to be included.

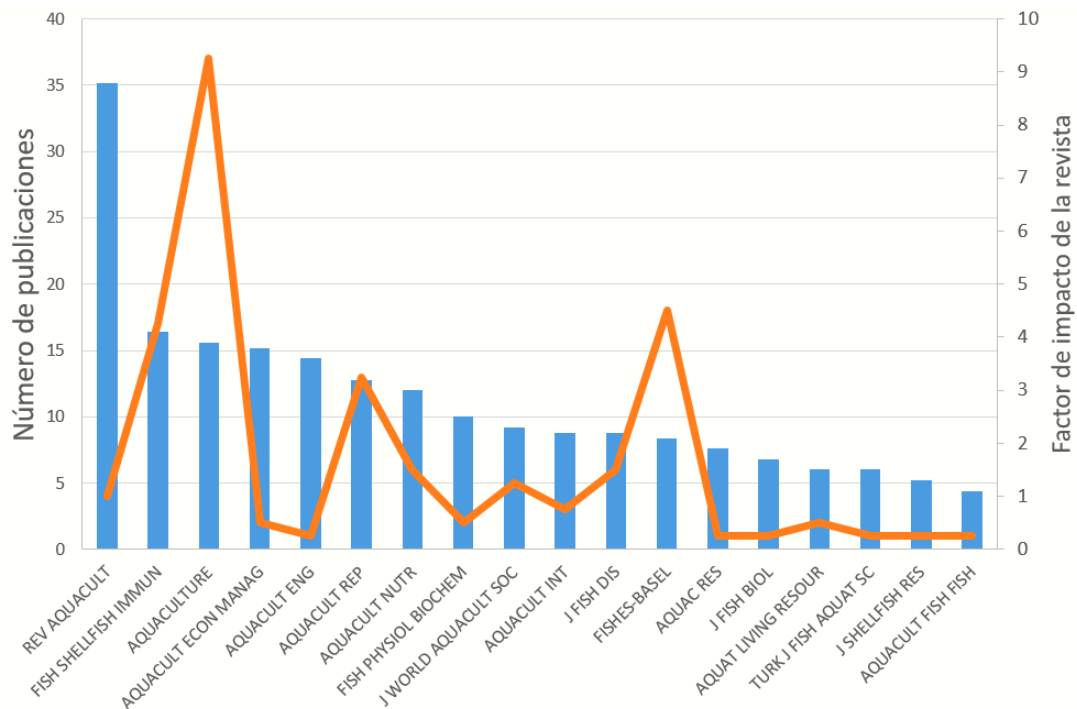
Before the first phase of identification, all impact journals associated with the field of aquaculture were selected in the *Journal Citation Reports* (<https://jcr.clarivate.com/>), a database within the *Web of Science*, which allows to have a complete list of journals in a category or field of study. Within the "Fisheries" category, which includes journals specializing in aquaculture, we find 64 journals with an impact in 2023, of which we have chosen 27 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 27 journals selected for the year 2023, their abbreviations and their impact factors are summarized in Table 8-1.

**Table 8-1.** Summary of the journals, their acronyms and their impact factor (IF), in order of impact, chosen to calculate Spanish scientific production in aquaculture during the year 2023.

<b>Full name of journal</b>	<b>Abbreviation</b>	<b>IF</b>
Reviews in Aquaculture	Rev Aquacult	8,8
Reviews in Fisheries Science & Aquaculture	Rev Fish Sci Aquac	6,4
Fish & Shellfish Immunology	Fish Shellfish Immun	4,1
Aquaculture	Aquaculture	3,9
Aquaculture Economics & Management	Aquacult Econ Manag	3,8
Aquacultural Engineering	Aquacult Eng	3,6
Aquaculture Reports	Aquacult Rep	3,2
Aquaculture Nutrition	Aquacult Nutr	3,0
Fish Physiology and Biochemistry	Fish Physiol Biochem	2,5
Journal of the World Aquaculture Society	J World Aquacult Soc	2,3
Journal of Fish Diseases	J Fish Dis	2,2
Aquaculture International	Aquacult Int	2,2
Aquaculture Environment Interactions	Aquacult Env Interac	2,2
Fish and Shellfish Immunology Reports	Fish Shell Immun Rep	2,2
Fishes	Fishes-Basel	2,1
Canadian Journal of Fisheries and Aquatic Sciences	Can J Fish Aquat Sci	1,9
Aquaculture Research	Aquac Res	1,9
Journal of Fish Biology	J Fish Biol	1,7
Knowledge and Management of Aquatic Ecosystems	Knowl Manag Aquat Ec	1,6
Turkish Journal of Fisheries and Aquatic Sciences	Turk J Fish Aquat Sc	1,5
Journal of Aquatic Animal Health	J Aquat Anim Health	1,5
Aquatic Living Resources	Aquat Living Resour	1,5
North American Journal of Aquaculture	N Am J Aquacult	1,4
Journal of Applied Aquaculture	J Appl Aquacult	1,3
Journal of Shellfish Research	J Shellfish Res	1,3
Diseases of Aquatic Organisms	Dis Aquat Organ	1,1
Aquaculture, Fish and Fisheries	Aquacult Fish Fish	1,1

After identifying these journals, the first phase of PRISMA continued, searching for scientific articles in the Main Collection of the *Web of Science* that had been published (final publication) in 2023 ("publication date" field), which contained authors with the word "Spain" in the address field and which were articles or reviews ("document type" field): Articles or Reviews), within the 27 journals chosen. Thus, 161 Spanish publications were collected, of which the titles and abstracts were analyzed to ensure that they corresponded to studies in the field of aquaculture (screening phase). Finally, there were 121 articles published in 18 different journals, which we take as the Spanish scientific production for 2023.

Figure 8-1 shows the number of Spanish papers in 2023, together with the impact factor of the journal in question. It can be seen that the most popular journal is *Aquaculture*, with 37 published papers, followed by *Fishes-Basel* and *Fish & Shellfish Immunology* with 18 and 17 published articles, respectively. On the other hand, only one publication appears in the journals *Aquacultural Engineering*, *Aquaculture Fish and Fisheries*, *Aquaculture Research*, *Journal of Shellfish Research* and the *Turkish Journal of Fisheries and Aquatic Sciences*.

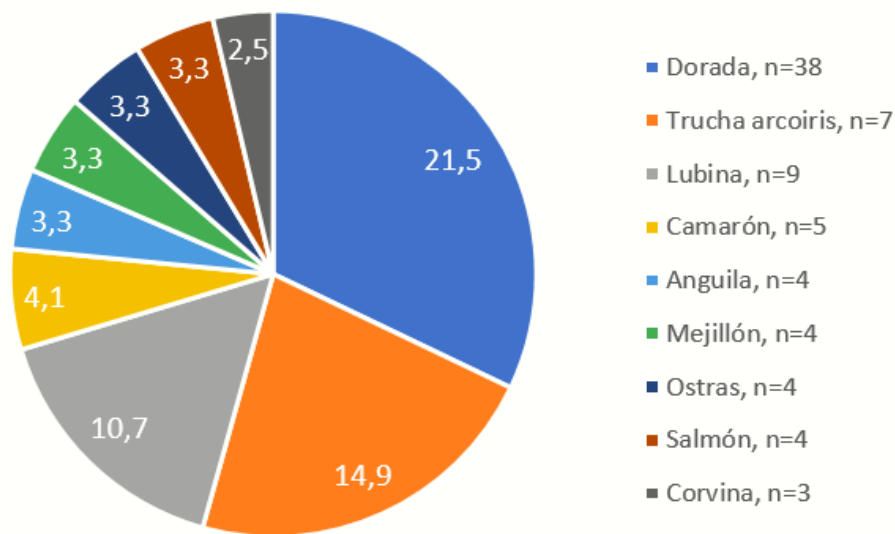


**Figure 8-1.** Summary of the number of Spanish publications (articles) (orange line) in the 18 journals where there were publications on aquaculture in 2023, and the impact factor of each journal (blue bars).

*Which species have been the target of research in Spain in 2023?*

Reviewing the 121 Spanish articles published in 2023, we identified the species under study in each article. In total, the articles dealt with more than 31 different species of fish, crustaceans, molluscs and algae. Some articles have dealt with more than one species and others were of a more general nature (a total of 13), without focusing on a specific species.

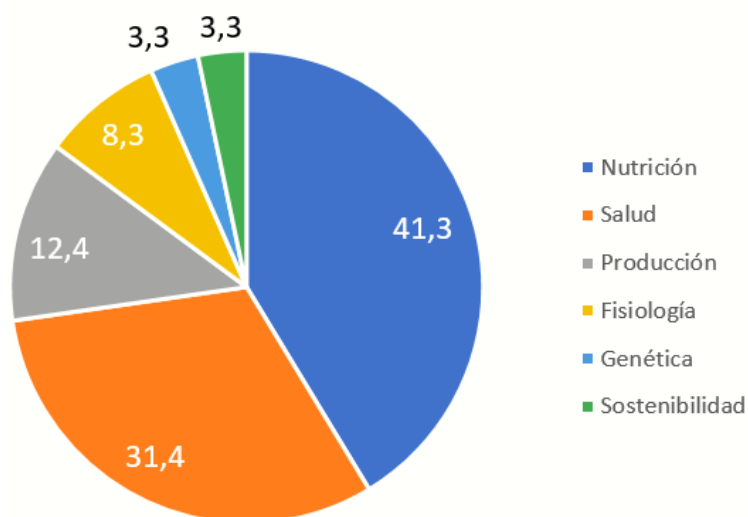
Almost a quarter of the Spanish articles (21.5%) dealt with sea bream (*Sparus aurata*), followed by trout (*Oncorhynchus mykiss*) and sea bass (*Dicentrarchus labrax*). Figure 8-2 shows the percentage of jobs for the nine most popular species.



**Figure 8-2.** Percentage of Spanish articles by species (blank number in the pie chart) out of the total of 121 articles published in 2023. The total number of articles per species appears to the right of each species name in the legend (n = number of articles).

*What were the most relevant issues?*

The 121 Spanish articles were reviewed according to the subject of the study. The main topics were nutrition, physiology, health, production, sustainability, and genetics. More than 40% of the studies were in the field of nutrition, followed by health.



**Figure 8-3.** Graph of the percentage of articles by topic (blank number in the pie chart) out of the total of 121 articles published in 2023.

### What were the most relevant studies?

To consider the relevance of the papers, we have estimated it according to the number of citations it receives from other articles. Likewise, Table 8-2 summarizes the articles from 2023 that have received the most citations to date (June 2024), along with the authors and the topic. The article with the most citations is an international work on bacterial diseases in tilapia, with the participation of the Department of Microbiology and Ecology and the Institute of Biotechnology and Biomedicine (BIOTECMED) of the University of Valencia.

**Table 8-2.** Summary of Spanish articles of the year 2023 with the most citations in the area of aquaculture, included in the 27 impact journals chosen.

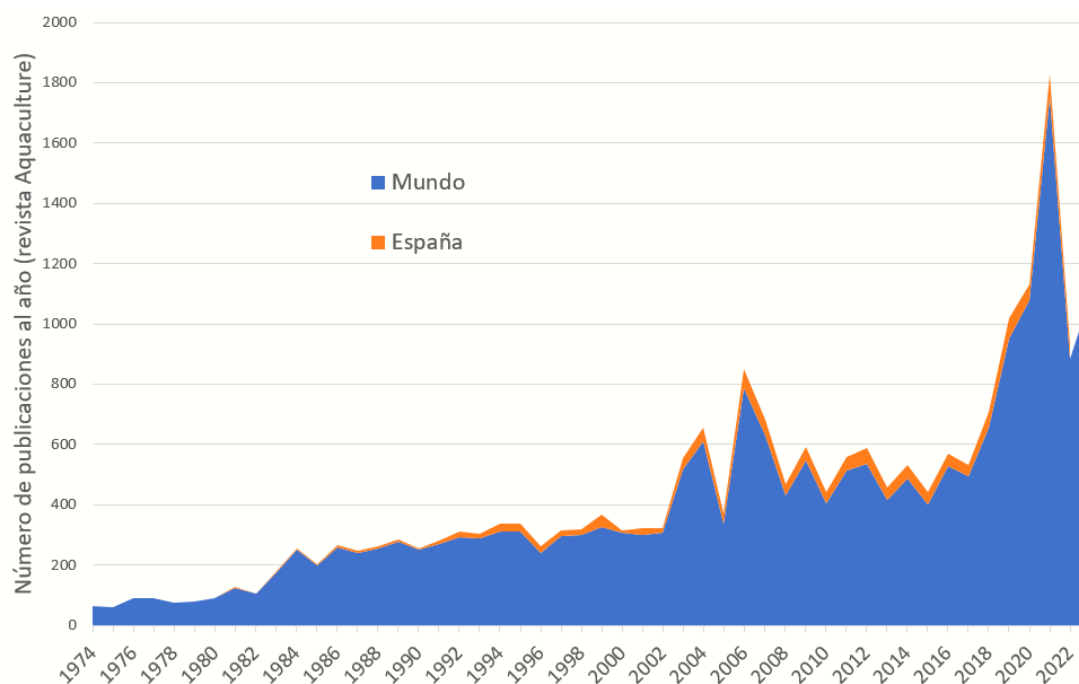
<i>Magazine</i>	<i>Authors</i>	<i>Datin g</i>	<i>Article Title</i>
Reviews in Aquaculture	Haenen <i>et al.</i>	23	Bacterial diseases of tilapia, their zoonotic potential and risk of antimicrobial resistance
Reviews in Aquaculture	Bahi <i>et al.</i>	19	Microalgae with immunomodulatory effects on fish
Journal of the World Aquaculture Society	Glencross <i>et al.</i>	16	Harvesting the benefits of nutritional research to address global challenges in the 21st century
Aquaculture	Carvalho <i>et al.</i>	16	Insect and single-cell protein meals as replacers of fish meal in low fish meal and fish oil diets for gilthead sea bream ( <i>Sparus aurata</i> ) juveniles
Reviews in Aquaculture	Chen <i>et al.</i>	13	Retrospect of fish meal substitution in Pacific white shrimp ( <i>Litopenaeus vannamei</i> ) feed: Alternatives, limitations and future prospects

### How does Spain compare with other countries in terms of scientific production?

In order to be able to compare the scientific production of Spain with that of other countries, we can simplify the analysis and reduce it to an impact journal, the one called *Aquaculture*, and the one that has been, over the years, the most popular journal. It is the oldest journal mentioned in Table 8-1 and covers more topics and species than the other journals, being useful for making more cross-sectional comparisons at the international level.

Following the PRISMA methodology, all the articles of the journal were searched as follows in the Main Collection of the Web of Science, and then divided by countries ("Name of the publication" field: *Aquaculture*, "Document type" field: Article and Review, "Date of publication" field: 1900-2023).

Figure 8-4 shows the evolution of the number of scientific articles published throughout the history of the journal, which total 20,306. Since 2018, there has been a clear increase in the number of articles published per year, reaching more than 1,500 articles in 2021, falling to 886 in 2022 and rising again to more than 1000 (n=1089) in 2023.



**Figure 8-4.** Evolution of the number of scientific articles published in the journal *Aquaculture* per year from 1974 to 2023, taking into account all annual publications (blue) and Spanish papers (orange), where at least one of the authors is Spanish.

At the international level, Spain is the fifth country that participates the most in the publication of articles in the journal *Aquaculture*, with more than one thousand three hundred in total (Table 8-3). Likewise, the Spanish National Research Council (CSIC) is among the 15 institutions worldwide that signs the most articles in that same journal (Table 8-4).

**Table 8-3.** Summary of the countries with the highest number of articles published in the journal *Aquaculture* since 1974, including the percentage of total publications.

<b>Country</b>	<b>Articles</b>	<b>%</b>
PEOPLES R CHINA	4024	14,7
USED	2982	10,9
NORWAY	1781	6,5
AUSTRALIA	1448	5,3
<b>SPAIN</b>	<b>1306</b>	<b>4,8</b>
FRANCE	1175	4,3
CANADA	1072	3,9
JAPAN	998	3,7
BRAZIL	832	3,0
INDIA	795	2,9

**Table 8-4.** Summary of the institutions that are most involved in the publication of scientific articles in the journal *Aquaculture*, since 1974.

<b>Country</b>	<b>Articles</b>
----------------	-----------------

MINISTRY OF AGRICULTURE RURAL AFFAIRS (CHINA)	748
CHINESE ACADEMY OF FISHERY SCIENCES	611
CHINESE ACADEMY OF SCIENCES	590
IFREMER	585
OCEAN UNIVERSITY OF CHINA	562
INRAE	467
LAOSHAN LABORATORY	449
UNIVERSITY OF STIRLING	423
INSTITUTE OF MARINE RESEARCH NORWAY	404
INDIAN COUNCIL OF AGRICULTURAL RESEARCH ICAR	400
FISHERIES OCEANS CANADA	357
<b>SPANISH NATIONAL RESEARCH COUNCIL (CSIC)</b>	<b>349</b>
SHANGHAI OCEAN UNIVERSITY	329



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