

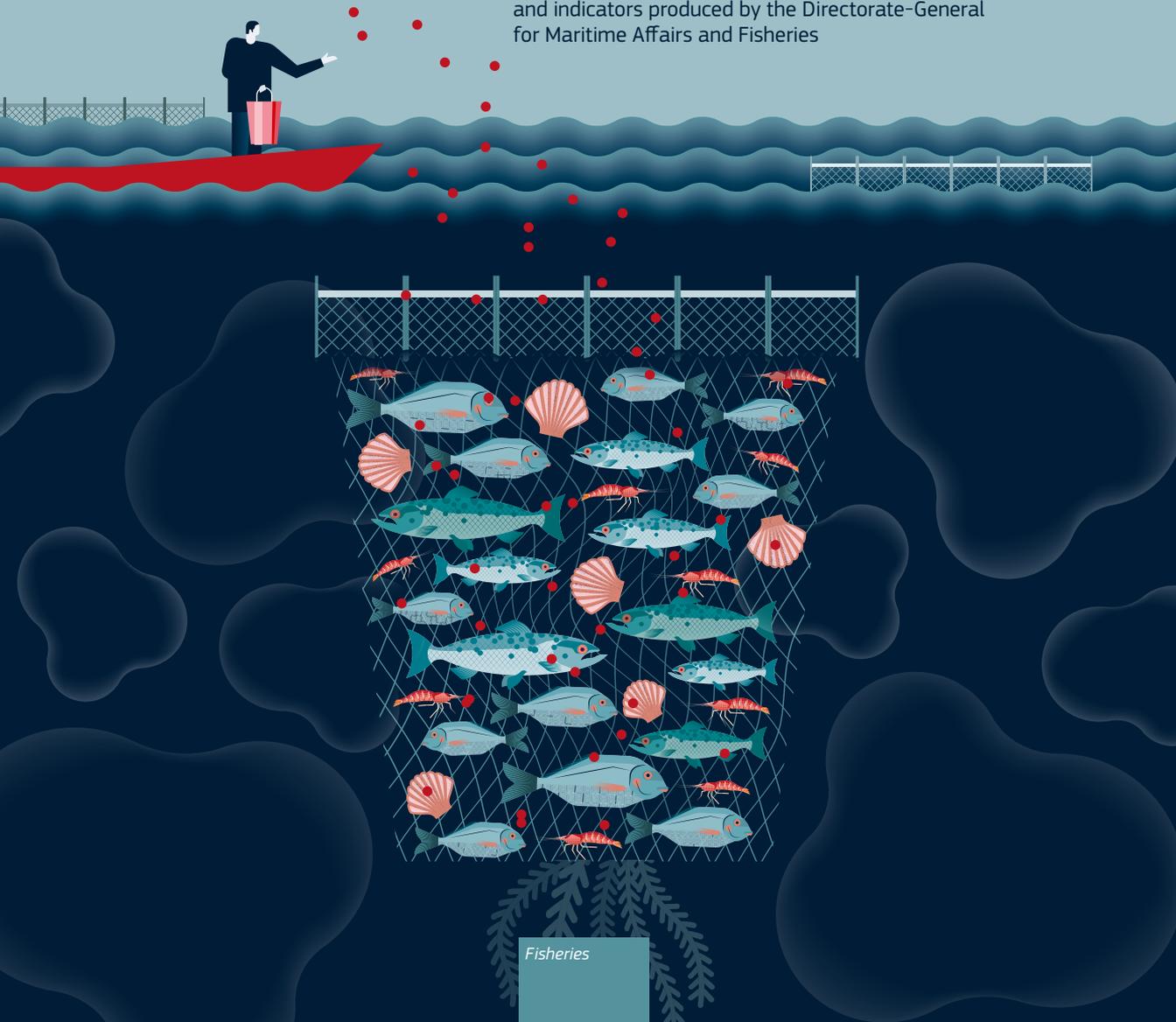


EU aquaculture

An economic analysis

MARITIME ECONOMIC PAPERS N° 06/2019

A series of short papers on economic analysis and indicators produced by the Directorate-General for Maritime Affairs and Fisheries



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THE EU AQUACULTURE SECTOR AN ECONOMIC ANALYSIS 2019

MARITIME ECONOMIC PAPERS N° 06/2019
A series of short papers on economic analysis
and indicators produced by the Directorate-
General for Maritime Affairs and Fisheries



Maritime Economic Papers are published by the Directorate-General for Maritime Affairs and Fisheries (DG MARE) and are intended to increase awareness of the economic performance of the EU fisheries, aquaculture and fish processing sectors. DG MARE welcomes comments on the report's utility and content and any suggestions for future enhancements. The findings and interpretations expressed in this document do not necessarily reflect the views of the European Commission.

The Economic Paper n° 06/2019 was produced by experts of the Economic analysis, Markets and Impact Assessment Unit of DG MARE and experts of the Water and Marine Resources Unit at the Joint Research Centre (JRC).

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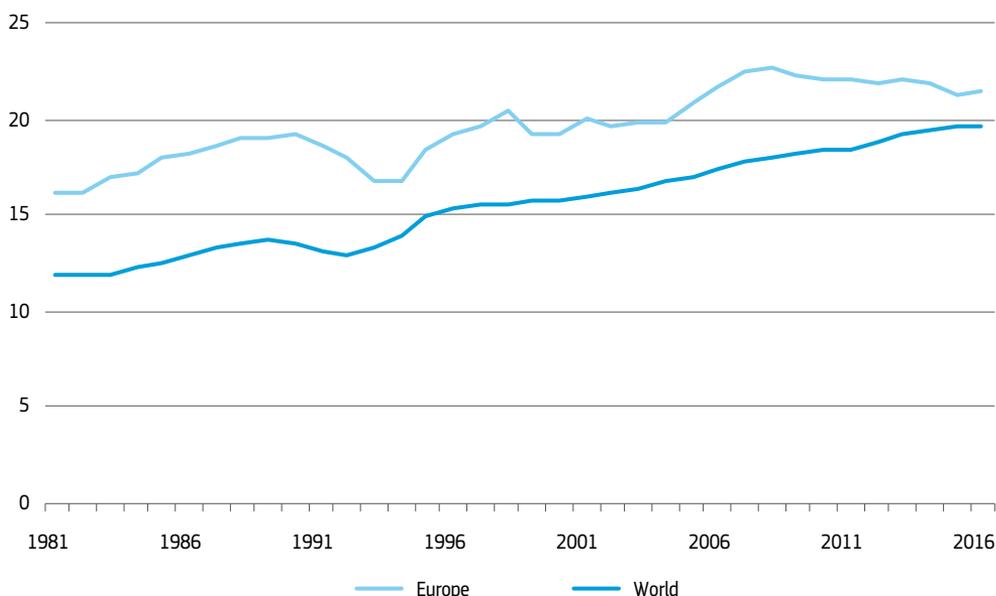
1. Introduction and executive summary

Besides contributing to ensure the availability of food supplies for consumers, the fisheries sector plays an important role in providing a fair standard of living for coastal communities, often located in rural areas where few economic alternatives exist. Europe represents one of the largest markets for seafood products in the world and consumption has steadily increased over the past decades. Per capita consumption was estimated to be 24 kg, in 2016. While on a global level production of seafood for human consumption are almost equally divided between aquaculture and fishery, the EU market is still dominated by catches from wild fisheries (about 75% of available domestic seafood products¹). With imports representing up to 70% of EU's apparent consumption of seafood, the EU is therefore highly dependent on international trade².

At global level, the future demand for fish is expected to increase due to increasing population and income levels and to the health benefits associated with fish consumption (Figure 1). The growing demand offers a unique opportunity to expand the aquaculture production in the EU. However, this also requires EU farmers to continuously succeed in staying competitive on the global seafood market.

Aquaculture seems to be the most promising choice to increase the EU and global supply of seafood since the supply from wild fisheries has been stagnating since the mid 1990's. However, the EU aquaculture production has also been stagnating and growth in global production is currently dominated by Asian countries covering about 90% of the global production volume. In contrast, the EU contribution to world aquaculture production represented only 1.2% (in terms of weight) and 1.9% (in terms of value) of global production in 2016³.

Figure 1: **Per capita supply of seafood, Kg**



Source: FAO. 2019. *FAO yearbook. Fishery and Aquaculture Statistics 2017*.

¹ See EUMOFA (2018). *The EU fish market, 2018*.

² EUMOFA (2018).

³ Data according to FAO, 2018.

This paper summarizes the main results of the *2018 Economic Report of the EU Aquaculture Sector*, which provides a comprehensive overview of the latest information available on the production, economic value, structure and competitive performance of the aquaculture sector at national and EU levels for the years 2008 to 2016. The reporting of freshwater aquaculture is not compulsory under the DCF. As a consequence, some Member States do not report this data. When possible, we have estimated the figures for the overall EU aquaculture sector. A precondition to move the EU aquaculture sector forward is to establish and increase the knowledge of the existing aquaculture production. The report contributes to monitor the developments of the EU aquaculture sector in terms of main species produced and its economic trends.

According to the latest data, the **economic performance** indicators point to a continuous improvement in performance of the EU aquaculture sector over the period 2014-2016. In 2016, the EU aquaculture sector placed 1.4 million tonnes of seafood in the market worth almost €5 billion; a 2.2% yearly increase between 2014 and 2016 in volume and 3.1% in value. The EU aquaculture production represents 28% of the volume and 65% of the value produced by the EU fishing fleet.

The profit doubled between 2014 and 2016 reaching almost €800 million total EBIT in 2016 for the reporting Member States⁴, mainly driven by the positive development in the marine finfish

segment, though a recovery in the activity after negative environmental impacts (e.g. diseases and red tides) which was also accompanied by an increase in labour productivity of 10% yearly. This marks a strong recovery from the bad year of 2013 in most of the large aquaculture countries. However, despite this recovery, it should be noted that the EU aquaculture sector continues to be lagging behind the countries that lead the sector in the World⁵.

Employment has remained stable in terms of total employees (about 75 000) but continuously expanded in terms of full-time equivalent (FTEs) (from 36 000 in 2013 to almost 44 000 in 2016, an annual increase of 6.6%). Therefore, aquaculture firms are providing more stable employment opportunities.

We observe some degree of **country “species” specialisation**: salmon was mostly produced in the United Kingdom (90% of the EU turnover from salmon); trout, in Denmark, France and Italy (a combined 48%); seabass and seabream, in Greece (50%); and oyster, in France (86%).

The aquaculture industry can be divided into three main sub-sectors: marine, shellfish and freshwater. The marine (finfish) sector is the most important economically, generating a turnover of €2.7 billion in 2016, followed by the shellfish sector with €1.1 billion and then the freshwater sector with €1 billion.

⁴ The EBIT for the EU as a whole is estimated at €950 million, when the non-reporting countries are included as well as the missing data on freshwater aquaculture.

⁵ China is the world's leading aquaculture producer with 58% of global production, followed by Indonesia, India, Vietnam and several other developing countries in East Asia. Overall, Asian countries produce 90% of global aquaculture. For developed countries, Norway and Chile are the leaders of marine aquaculture of salmon.

Highlights of the EU aquaculture sector

Table 1: **Main indicators of EU aquaculture, 2016**

Segment	Firms	Production		Employment		Economic performance	
	Number	Volume Ton million	Value € million	Total thousand	FTE thousand	GVA € million	EBIT € million
Marine finfish aquaculture	598	398.3	2 526.5	9.6	8.2	799.1	445.9
Shellfish aquaculture	7 840	667.5	1 106.6	37.8	16.4	700.3	249.8
Freshwater aquaculture	2 000	179.6	649.7	7.6	5.1	219.9	91.9
Total	10 438	1 245.4	4 282.8	55.0	29.7	1 719.3	787.6
<i>pm Non-reporting countries</i>	2,058	176.6	610.3	20.5	14.0	278.7	166.1
pm EU 28	12 496	1 422.0	4 893.1	75.5	43.7	1 998.0	953.7

Note: Reporting is voluntary for countries with less than 1% on the EU share and for freshwater aquaculture.

Source: STECF 2018, FAO, Eurostat, The EU Blue Economy Report. 2019 and own elaboration.

Main countries: Spain, France, Italy, the United Kingdom and Greece cumulate more than 70% of the production.

Main species: mussel, salmon, seabream, seabass, oyster, carpet shell and trout cumulate more than 90% of the production.

Marine finfish aquaculture generated most of the profit (EBIT) (€446 million or 56% of the total). The sector being capital intensive explains the relative low number of companies (600 out of 12.500) and the high labour productivity (almost €80 thousand compared to €60 thousand for the whole aquaculture sector by employing 9.600 people out of a total of 75 000). About 85% of the production concentrates in salmon, seabass and seabream. Between 2000 and 2016 the production of salmon and trout production increased by 23% while the production of seabass and seabream increased by 62%; this resulted in an overall increase of 38% in the marine finfish production during that period.

The significant recovery in profit observed in 2016, (€446 million) was driven by Croatia, Greece and Portugal, which passed from combined losses of €130 million in 2014 to a combined profit of €181 million in 2016. Similarly, the profit in marine finfish aquaculture increased significantly in Spain from a marginal €6 million in 2014 to €72 million in 2016. On the other hand, the profits generated by UK contracted from €180 to €120 million. This was driven by a decrease in the production of

salmon in 2015 and 2016 attributed to mortality or early harvest due to diseases and plankton. Recent data (2017) indicate a large increase in salmon production (+16%) which, if confirmed, will most probably help to mitigate the contraction observed.

Shellfish aquaculture generated €250 million in profit. We observe a recovery of profits in France and Spain after the disease in the oysters and the red tides, respectively. Worldwide seafood demand for bivalves continues to grow, which have already resulted in a 5-10% price increase. Therefore, a positive outlook is expected for the marine shellfish aquaculture. EU shellfish farming facilities focus mainly on mussels, oysters and clams (carpet shell), the production of other species is marginal.

The marine shellfish segment is, to a large extent, based on family owned enterprises. It concentrates over 60% of the number of enterprises and half of the total number of employees in the EU aquaculture sector. There are many part time jobs and, further, a large part of the employment is not recorded under a formal contract⁶.

⁶ Because many workers are either the firm owners or their family members.

Freshwater aquaculture generated €92 million in profit in 2016⁷. Prices of freshwater fish are significantly lower than for marine aquaculture. In 2016, the freshwater segment included 7.600 employees (5.100 in FTE). It produced mainly trout (61% of freshwater value), through intensive technologies; and carp (20%), through extensive technologies. Trout production has declined by 22% from 2000 to 2016, while carp production has remained steady, resulting in an overall 18% decline in freshwater production.

Multiannual National Strategic Plans (MNSP) developed by all MSs between 2014 and 2015 are addressing most of the administrative issues that had been mentioned as important impediments for further developing the sector and some EU Member States have adopted measures to simplify licensing procedures and identify areas suitable for aquaculture.

The rest of the paper is organised in 4 Sections. Section 2 provides an overview of the main economic performance indicators of the EU aquaculture. Section 3 provides a more detailed analysis by segment. Finally, Section 4 provides an assessment of the Multiannual National Strategic Plans for aquaculture.

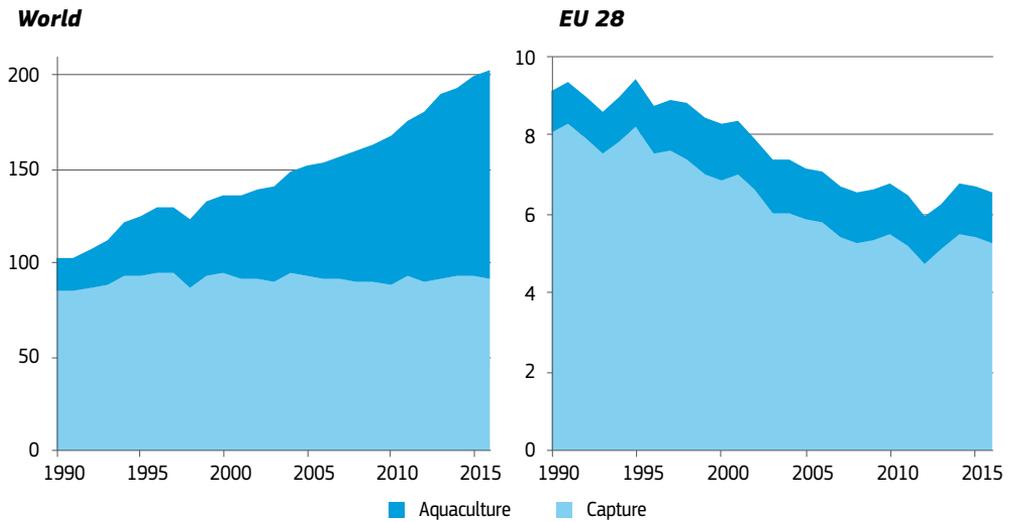
2. Economic performance of the European aquaculture sector

2.1. Introduction

Globally, aquaculture is one of the fastest growing food producing sectors in the world and is an increasingly important contributor to global food supply and economic growth. Consequently, the share of global aquaculture production within the supply of seafood increased from 16% in 1990 to 54% in 2016 (Figure 2, left-hand panel). In Europe, the production of aquaculture has fluctuated around 1.3 million ton since the late 1990s. However, given the decline in the catches of wild seafood, the share has increased from about 10% to almost 20% in 2016 (Figure 2, right-hand panel). While the European production represents a small proportion of global aquaculture production, imports represent up to 70% of apparent consumption of seafood making the EU highly dependent on international trade. Therefore, the expansion observed in Asian countries, particularly China, provides an indication of the potential of the sector and an important venue to mitigate the external dependency.

⁷ Note that data on freshwater aquaculture are compiled on a voluntary basis and, therefore, may be incomplete. Taking into account other sources, the profit in freshwater aquaculture for the overall EU is estimated in €200 million and employment in 20 000 employees and 10 000 FTEs.

Figure 2: **Seafood production**, million ton



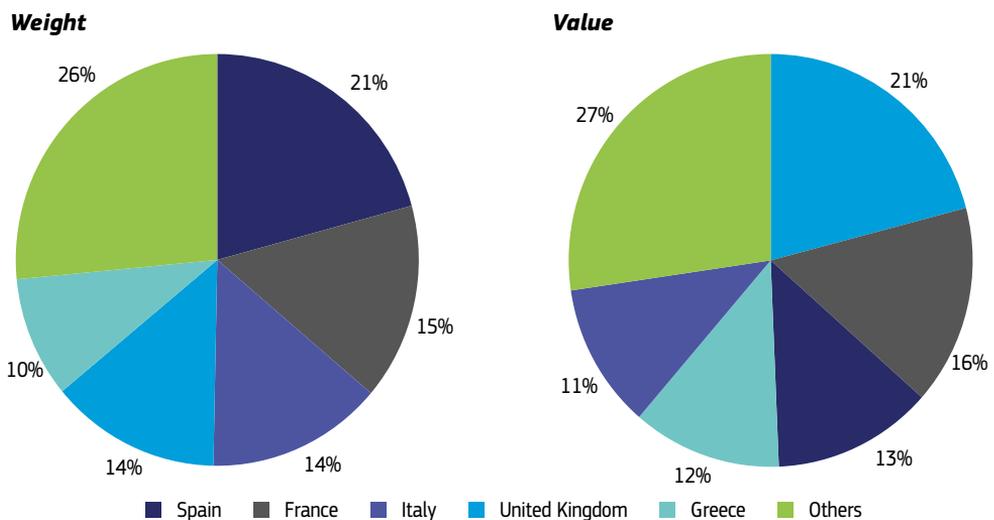
Source: FAO.

2.2. The EU aquaculture sector

In 2016, the EU aquaculture sector placed 1.4 million tonnes of seafood in the market worth almost €5 billion. Production is very concentrated, with the top 5 Member States producing almost three quarters of the EU total: Spain, France, Italy, the United Kingdom and Greece (Figure 3)⁸. In

these Member States, aquaculture production was between 125 and 300 thousand tonnes, while all other countries have reported production below 50 thousand tonnes. Similarly, the turnover in these Member States was between €550 and €1,100 million, while all other countries have reported turnovers below €200 million.

Figure 3: **EU Aquaculture production, MS distribution, 2016**



Source: STECF 2018.

⁸ The STECF report includes a national chapter with further details per Member State.

2.3. Socio-Economic performance of the EU aquaculture sector

Aquaculture production in the EU increased by 2.2% yearly between 2014 and 2016 in volume and 3.1% in value. The gross value added (GVA) of the sector increased by 3.2% yearly, between 2014 and 2016, leading to a direct contribution of €2.0 billion in salaries and profits for the EU Blue Economy.

The total number of firms in the EU aquaculture has fluctuated around 12 thousand since 2008. The majority of them (almost 90%) are micro-enterprises with less than 10 employees. They tend to be family owned and are use rather extensive production methods and systems.

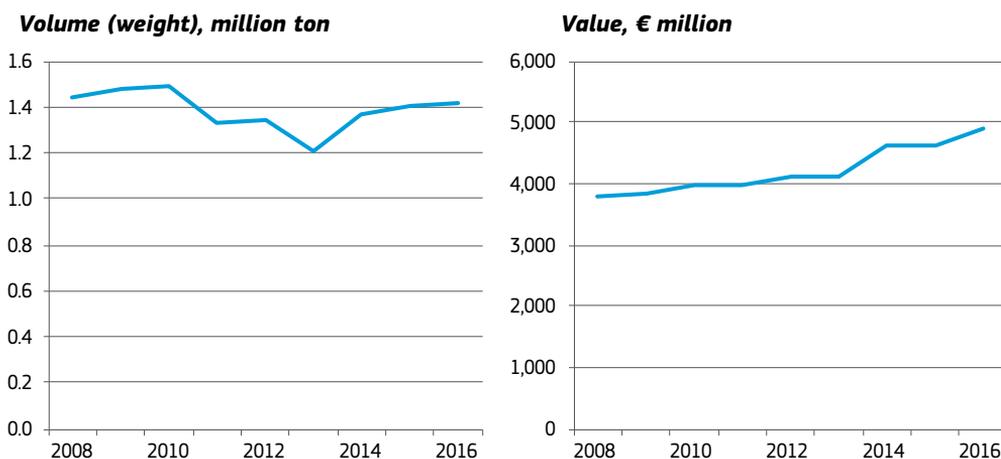
A noticeable decrease in production is observed between 2010 and 2013, which is mainly due to a decrease in the production of mussels affected by environmental conditions, such as “red tides” (i.e. harmful algae blooms) in Spain, and shellfish diseases. From 2014 we observe a recovery above 1.4 million tonnes explained by an increasing production of shellfish, catching up from earlier years. In terms of value of sales, we observe a slight (nominal) increase between 2008 and 2013, which corresponds to a stagnation in real terms (taking into account inflation). However, a clear acceleration is observed from 2013 onwards, mainly explained by a general rise in prices, particularly for species like salmon, in parallel to the increase in production already mentioned (Figure 4).

In 2016, the EU 28 aquaculture sector was estimated to directly employ around 75 000 people. Given the significant component of part-time work, particularly in the shellfish segments, the aquaculture sector employs 44 000 full time equivalents (FTEs). The employment depends on the most common aquaculture production species and technique used in each Member State. The shellfish sector is labour intensive and use a lot of part time workers such as in Spain and France, whereas the marine production is more capital intensive and use mostly full time employees such as in the UK and Greece. Spain, France, Poland and Italy concentrate 62% of total employment and 54% of FTEs (Figure 5).

The average wage per FTE was about €25 000 per year in 2016. This is an increase of around 7% from the €23 400 reported in 2014. The wages paid in each Member State is very different depending on labour productivity and the different aquaculture systems applied in each country. The average wages varied from €2 600 per year to €67 000 per year, in 2016 (Figure 6).

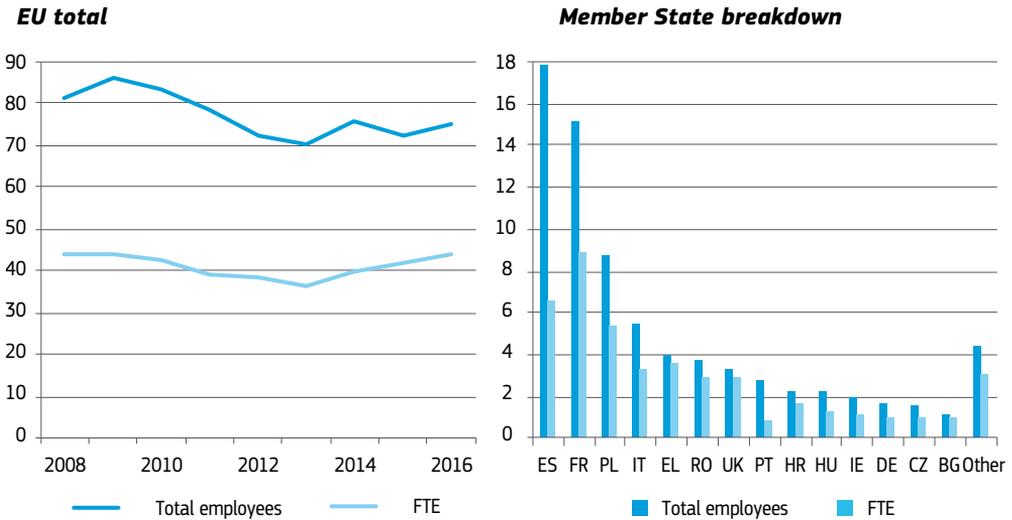
The latest data indicate that the EU aquaculture sector generated a **Gross Value Added** of €2.0 billion in 2016, an increase of 19% from 2015. The **profitability** of the EU aquaculture sector has improved between 2015 and 2016 with reported operating profits (Earnings Before Interest and Taxes or EBIT) of €950 million, which continues an increasing trend already observed in 2014. Indeed, EBIT almost doubled since 2014. These healthy

Figure 4: EU Aquaculture production, 2016



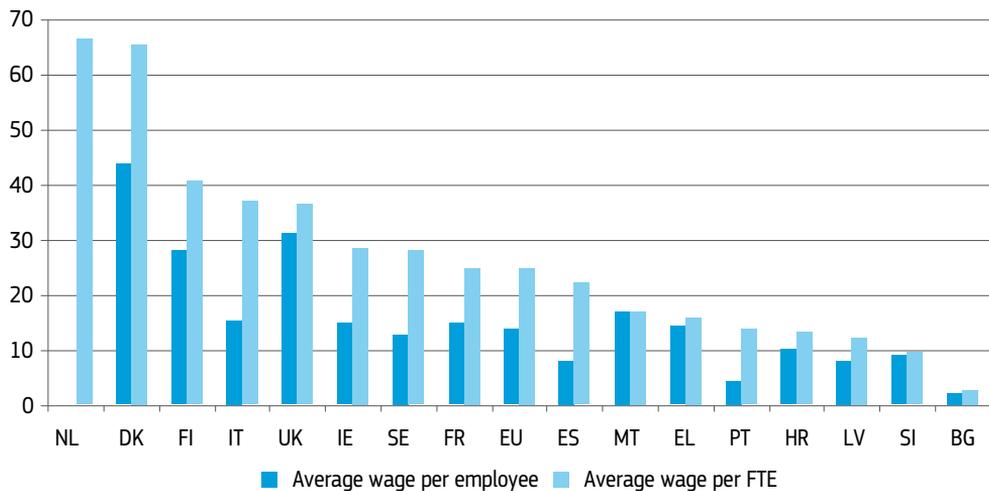
Source: STECF 2018 and FAO.

Figure 5: **Employment in EU Aquaculture**, thousand jobs



Source: STECF 2018.

Figure 6: **Average wage in the EU aquaculture sector**, € thousand per FTE, 2016



Source: STECF 2018.

levels of profitability lead to an average **return on investment (ROI)** of 14.5% in 2016, and an **operating profit margin** of 15.7%.

Labour productivity was estimated in €57.3 thousand per FTE in 2016, a 16% increase with respect to the previous year. However, as for wages, there is a large variation across Member States, ranging from less than €20 thousand per FTE in countries like in Bulgaria and Latvia, to more than

€120 thousand per FTE in the Netherlands and Denmark. Once again, this depends on the type of aquaculture predominant in each Member State. On average, **capital productivity** reached 32% in 2016. A positive Future Expectations Indicator (FEI) in 2016, with a value of 3%, indicates that the industry is investing in itself more than the depreciation of capital, and consequently is showing positive expectations on the future development of the sector.

3. Analysis by segment

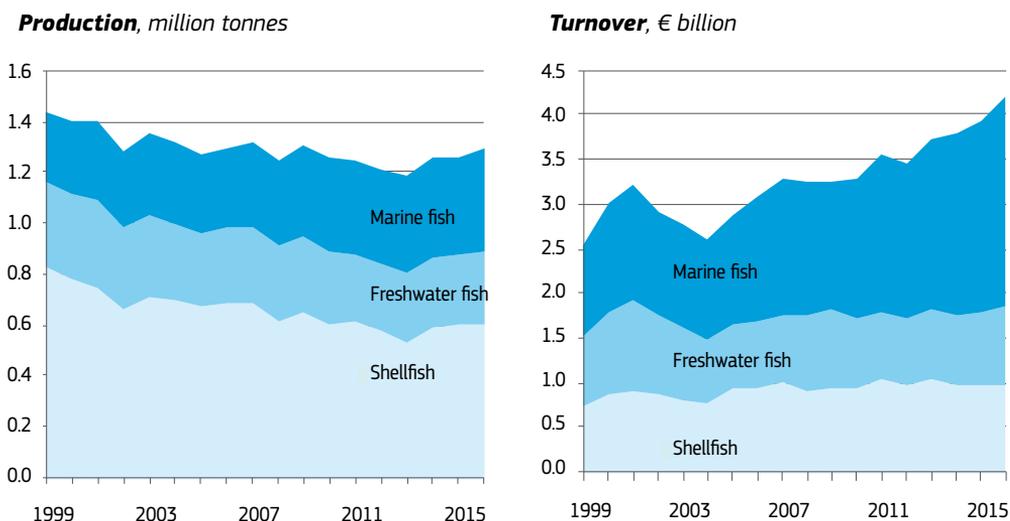
The aquaculture is usually divided into three segments: marine finfish, shellfish and freshwater. Recently, algae and aquatic plants are more and more cultivated, although the production remains still anecdotal compared to the other segments. With an average first sale price of €5.80 per Kg, the marine finfish has a much higher unitary price than shellfish (€1.62 per Kg). This explains that although in terms of weight the shellfish is the largest sector (47% of the total), the marine finfish segment generates the largest share of revenues (55%) with only 31% of the volume. The freshwater fish segment, with a share of 22% in terms of volume and 21% in terms of value, is the smallest segment (Figure 7). For

other economic performance indicators such as GVA and EBIT, the marine finfish segments is also the largest one (45%-55% of the total) followed by the shellfish segment (30%-40%), while the freshwater segment is much smaller (about 12%).

3.1. Main species

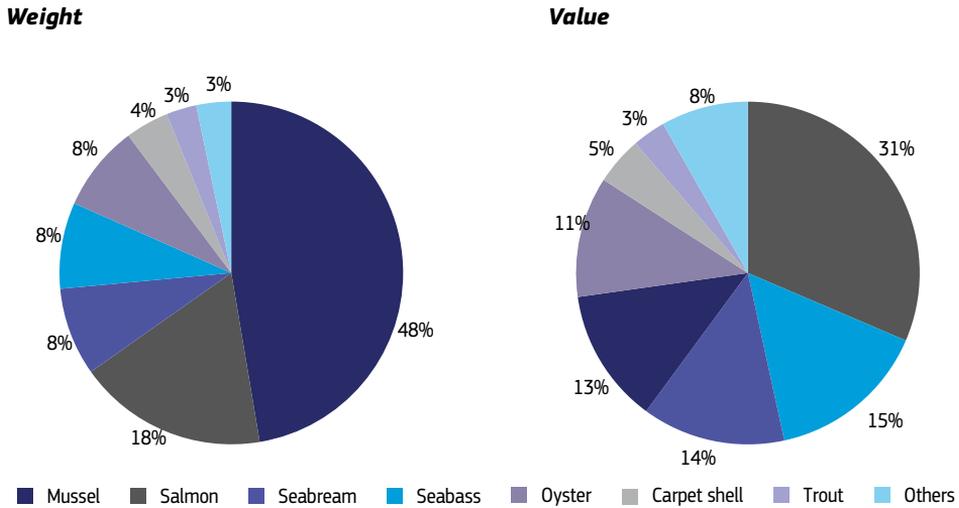
Aquaculture production concentrates mainly in seven species (mussel, salmon, seabream, seabass, oyster, carpet shell and trout), which account for more that 95% of the production in terms of weight and more than 90% in term of value (Figure 8). Moreover, Member States tend to specialises in a few species. Shellfish producers are mainly Spain, France, Portugal and Italy. Atlantic salmon is mostly produced in the United Kingdom. Oyster are mostly produced in France, whereas trout is produced mainly in Denmark, France and Spain.

Figure 7: EU Aquaculture by segment



Note: The production of aquatic plants remains marginal (less than 0.1% of total production).
Source: FAO.

Figure 8: **Main species produced by EU Aquaculture, 2016**



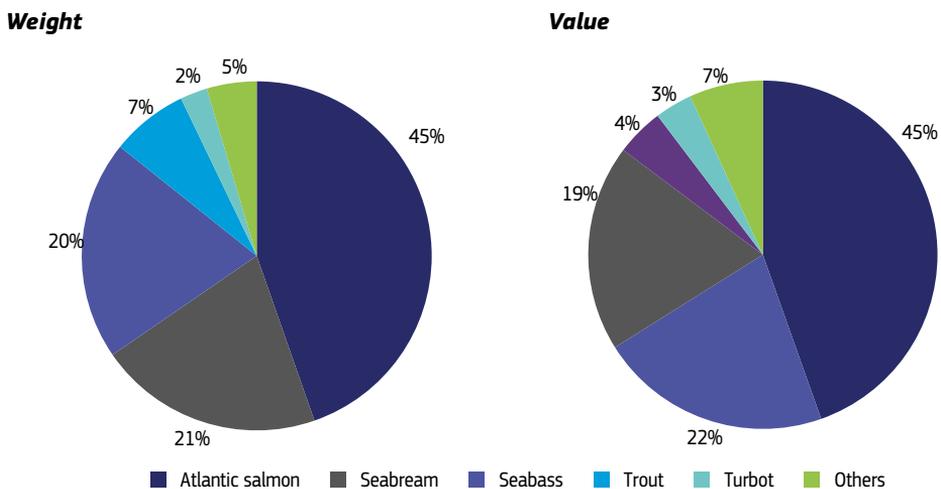
Source: FAO and own elaboration.

3.2. Marine finfish aquaculture

The EU marine finfish aquaculture concentrates in three species: Atlantic salmon, gilthead seabream and European seabass, which jointly represent more than 85% of the production both in terms of volume and value (Figure 9). The EU production of salmon is dominated by the UK, with more than 90% of the total, followed by Ireland. However, the world leading producer is Norway, followed by

Chile. The EU production of seabream and seabass is dominated by Greece (50% of EU production) and Spain (28%), followed by Italy (8%) and Croatia (6%). Some Mediterranean countries like Turkey and Egypt (and to a lesser extent also Tunisia) are significant competitors. The seabass and seabream sector is undergoing a consolidation phase. Bluefin tuna is produced in Malta, Spain and Croatia by fattening in sea cages, while turbot is mainly produced in Spain and Portugal.

Figure 9: **Main finfish marine species produced by EU Aquaculture, 2016**



Source: FAO and own elaboration.

In 2016, EU aquaculture produced 425 thousand tonnes of marine fish worth €2.7 billion, an increase of 19% compared to 2015. Between 2000 and 2016 the production of salmon and trout increased by 23% while the production of seabass and seabream increased by 62%; this resulted in an overall increase of 38% in the marine finfish production during that period.

Fish production in marine aquaculture is capital intensive, given the need of relative large investment on physical equipment and stoking of cages. This explains the relative higher labour

productivity (€78.5 thousand per FTE) and average wages (€30.7 thousand per FTE) than for the overall aquaculture sector; as well as the relative small amount of people employed in this segment (9 600 employees and 8 200 FTEs) (Table 2 and Table 3). This being said, different techniques across countries (also linked to the specific species) help explaining the wide heterogeneity in wages across Member States (e.g. from €4.3 thousand in Slovenia to €55.3 thousand in Denmark). This variability can be explained by differences in labour productivity and the capital and production intensity of the different techniques.

Table 2: **EU finfish marine aquaculture: economic indicators (I)**, 2016

Member State	Firms	Production	Turnover	Employment	FTE	Average wage
	number	Ton thousand	€ million	thousand	thousand	€ thousand
Croatia	27	12.5	99.3	1.0	1.0	16.1
Denmark	5	12.6	62.4	0.2	0.1	55.3
Greece	329	107.1	562.6	3.1	2.7	19.0
Ireland	20	16.7	106.0	0.2	0.2	36.9
Italy	46	11.7	84.6	0.4		
Malta	5	13.6	163.1	0.2	0.2	17.1
Portugal	34	3.8	29.4	0.3	0.2	17.0
Slovenia	1	0.0	0.1	0.0	0.0	4.3
Spain	79	57.0	481.7	2.4	2.0	39.7
United Kingdom	52	163.2	937.2	1.9	1.8	48.3
Total DCF reported	598	398.3	2 526.5	9.6	8.2	30.7
Other Member States		26.3	138.5			
Total EU		424.7	2 665.0			

Source: STECF 2018, FAO and own elaboration.

In 2016, the marine finfish sector generated a GVA of almost €800 million (of which, €255 from salmon and €330 from seabream and seabass), 51% more than in 2015. EBIT significantly improved reaching €446 million (of which, €117 million from salmon and €192 million from seabream and seabass), mainly due to the good economic

performance of the Greek, Spanish and Croatian marine sectors and the production of seabass and seabream turning from incurring in losses into generating a profit. The return on investment reached 13.8% in 2016 and labour productivity increased to €78 500 (Table 3).

Table 3: **EU finfish marine aquaculture: economic indicators (II)**, 2016

Member State	GVA	EBIT	ROI	Labour productivity	Capital productivity
	€ million	€ million	percent	€ thousand	percent
Croatia	35.7	15.4	5.9	36.1	13.6
Denmark	14.6	7.2	16.5	145.6	33.4
Greece	193.8	135.8	12.7	72.4	18.1
Ireland	30.7	24.8	32.5	192.5	40.4
Italy	44.1	28.4	23.1	474.6	35.8
Malta	18.2	13.1	50.1	82.2	69.7
Portugal	43.3	30.1	52.4	176.9	75.3
Slovenia	0.3	0.2	8.3	28.2	11.8
Spain	163.4	72.0	50.1	83.5	29.8
United Kingdom	255.1	119.0	14.6	145.3	31.2
Total EU	799.1	445.9	13.8	78.5	23.4

Source: STECF 2018.

3.3. Shellfish aquaculture

Worldwide seafood demand for bivalves continue to grow. The human health benefits from bivalve consumption, and their eco-friendly image among species coming from aquaculture, have attracted new consumers to this species group. The high demand for bivalves have resulted in a 5-10% price increase in international and domestic trade. Furthermore, according to FAO, demand growth is likely to continue in the coming years. The shellfish sector does not face limiting environmental concerns in terms of nitrogen and phosphorus emission, because shellfish helps to improve water quality by filtering the water for phytoplankton absorbing these nutrients. However, shellfish farmers dread other problems in terms of limitation of suitable production sites, competition for space and spreading of diseases such as the one faced by France for oysters in 2015, or the 2013 red tides in Spain. This sector shows high variability in production over time depending on environment conditions, seeds, prices, livestock purchases, species, and techniques used.

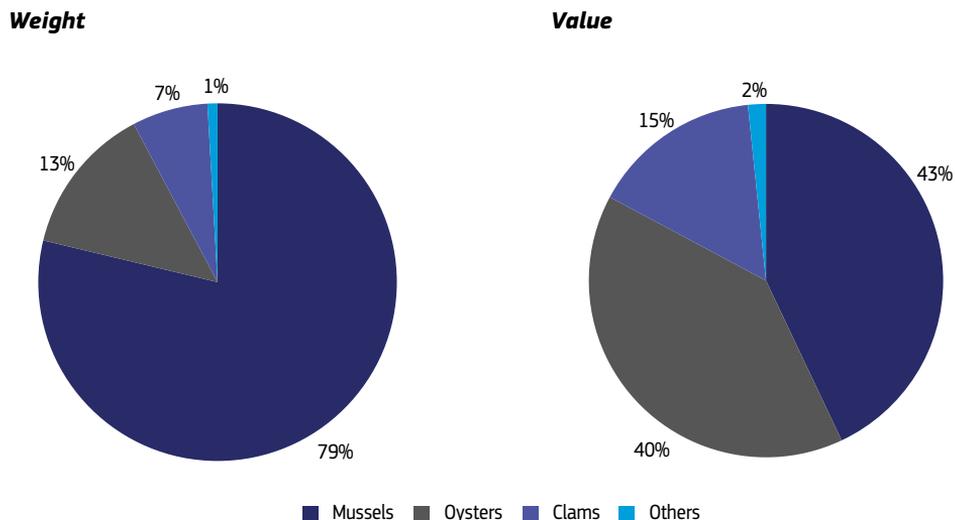
EU shellfish farming facilities focus mainly on mussels, oysters and clams (carpet shell), the production of other species being marginal (Figure 10). **Three main farming techniques** are being used in the **production of mussels** in the EU: rafts, long lines and bottom harvest. They are well differentiated methods of production, with differences in terms of costs, cost structure,

productivity and market prices. The seed mussels are collected from special areas and are then carried to areas where the growth conditions are better for the mussels. The volume of seed mussels varies from year to year. With a time lag of one to two years, the volume of mussels for consumption varies accordingly, generating a fluctuation of income in this sector while employment remains relatively stable. In some areas, like in the Netherlands and Germany, the problem of lacking seed mussels is an obstacle for stable and growing production. Mussel production has negatively been affected by a series of factors including the spread of diseases, algal blooms, lack of mussel seed (spat), predation and low earnings. In some cases, this factors may have been exacerbated by local conditions such as the small size of the mussel aquaculture enterprises and the impacts of climate change.

The production of oysters is mainly on bottom (94% of the EU turnover). The oyster sector due not have any feed cost because the feeding of oyster is exclusively of the nutrients available in the sea.

In the clam segment, important milestones have been reached to mitigate conflicts with other anthropic activities that are located in the same coastal areas. For instance, in Italy, the regions in which clam aquaculture is mainly concentrated, have been obtained exclusive areas of nursery for the reproduction of the seeds, but areas allocated exclusively to aquaculture and to venericulture have not yet been defined.

Figure 10: **Main shellfish species produced by EU Aquaculture, 2016**



Notes: Mussels includes Blue mussel, Mediterranean mussel and other sea mussels; Oysters include Pacific cupped oyster, European flat oyster and other flat and cupped oysters; Clams include Japanese carpet shell, grooved carpet shell, pullet carpet shell and other clams.
Source: FAO and own elaboration.

Sixteen Member States are involved in the EU shellfish sector, being significant in nine of them: France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the UK. There is a certain specialisation with the oysters produced mainly in France (88% of the EU production) followed by Ireland (7%) and the clams mainly in Italy (80% of the EU production), Portugal (11%) and Spain (9%). The production of mussels is more spread across Member States, but still concentrated in Spain (45% of the EU production), Italy (15%), France (12%) and the Netherlands (11%).

Total EU production shellfish aquaculture was estimated in 670 thousand tonnes worth €1,100 million in 2016 (Table 4). The shellfish aquaculture is to a large extent based on small scale family owned enterprises and is, therefore, very atomised. This sector contributes actively to external trade and has a very important social dimension given the high number of persons employed and the supply of animal protein for human consumption. The sector employed 37,800 people in 2016, going down to 16,400 FTEs given the high levels of part-time work. Moreover, a large part of the

employment is not recorded under a formal contract given the fact that many workers are either the firm owners or their family members. That, and the use of different techniques across countries (e.g. more capital intensive techniques are used in Germany and The Netherlands), explains the wide range of average wages across Member States.

With €250 million of EBIT, the EU shellfish sector obtained profits in 2016. Gross Value Added generated in 2016 was €700 million, a 9.4% decrease from 2015. Most Member States producing shellfish reported a positive profitability, with only Slovenia recording losses. The profitability measured in ROI terms was 14.7% in 2016. Since 2013, with the red ties in Galicia and a very low production, the economic situation has improved for Spain and the level of production has been increasing during the last years. Labour productivity for the EU aquaculture shellfish sector was €41.8 thousand per FTE and capital productivity was 43.6%, in 2016. Nevertheless, this figure hides a huge discrepancy between Member States from 11% in Slovenia to 120% in Portugal.

Table 4: **EU shellfish aquaculture: economic indicators (I)**, 2016

Member State	Firms	Production	Turn-over	Employment	FTE	Average wage
	number	Ton thousand	€ million	thousand	thousand	€ thousand
Bulgaria	33	1.6	1.2	0.09	0.09	2.9
Croatia	117	0.7	1.4	0.17	0.10	12.2
Denmark	5	1.7	1.3	0.01	0.01	66.0
France	2 432	191.8	656.5	13.84	7.89	26.0
Germany	10	22.2	25.3	0.13	0.10	40.6
Greece	201	25.7	10.3	0.59	0.57	5.5
Ireland	255	26.4	57.0	1.72	0.83	25.7
Italy	400	95.6	137.8	3.66	1.69	24.7
Netherlands	70	56.5	60.3		0.21	67.0
Portugal	1 362	5.7	42.5	2.36	0.56	12.2
Slovenia	6	0.6	0.7	0.01	0.01	17.2
Spain	2 717	219.8	82.5	14.46	3.85	13.9
Sweden	27	2.3	1.6	0.10	0.02	26.1
United Kingdom	205	16.9	28.3	0.67	0.49	15.9
Total DCF reported	7 840	667.5	1 106.6	37.81	16.41	21.9
Other Member States		0.1	0.3			
Total EU		667.6	1,106.9			

Source: STECF 2018 and FAO.

Table 5: **EU shellfish aquaculture: economic indicators (II)**, 2016

Member State	GVA	EBIT	ROI	Labour productivity	Capital productivity
	€ million	€ million	percent	€ thousand	percent
Bulgaria	1.1	-0.0	-0.3	12.9	17.7
Croatia	1.8	1.0	14.5	17.7	26.9
Denmark	0.8	0.2	9.3	113.1	31.6
France	388.7	118.4	12.4	49.3	40.8
Germany	14.4	8.7	19.4	139.7	32.0
Greece*	10.1	6.9	741.5	17.5	1,080.9
Ireland	39.4	16.6	16.2	47.5	38.5
Italy	90.5	44.4	34.5	53.6	70.3
Netherlands	35.4	18.9	14.0	172.4	26.2
Portugal	39.9	26.0	77.8	71.6	119.6
Slovenia	0.6	-0.3	-5.3	54.5	10.6
Spain	59.8	3.5	4.8	15.5	83.1
Sweden	1.8	0.9	35.5	87.0	70.5
United Kingdom	16.1	4.7	17.4	32.9	60.2
Total EU	700.3	249.8	14.7	41.8	43.6

Notes: For Greece, the table replicates the transmitted data, even if for Roi and Capital productivity they seem to appear as outliers compared with the rest of Member States.
Source: STECF 2018.

3.4. Freshwater aquaculture

The total volume of EU freshwater aquaculture sales was 305 thousand tonnes in 2016, generating a value of €1 billion. The prices per kilogram of fish from freshwater aquaculture tend to be much smaller than from marine aquaculture.

The EU freshwater aquaculture focuses on trout (61% of the EU value) and carp (20%) (Figure 11). The farming of these two species has some distinct economic and employment characteristics. Trout aquaculture production is mostly obtained from more intensive technologies, whereas carp producers use more extensive technologies. Trout production has declined by 22% from 2000 to 2016, while carp production has remained steady, resulting in an overall 18% decline in freshwater production.

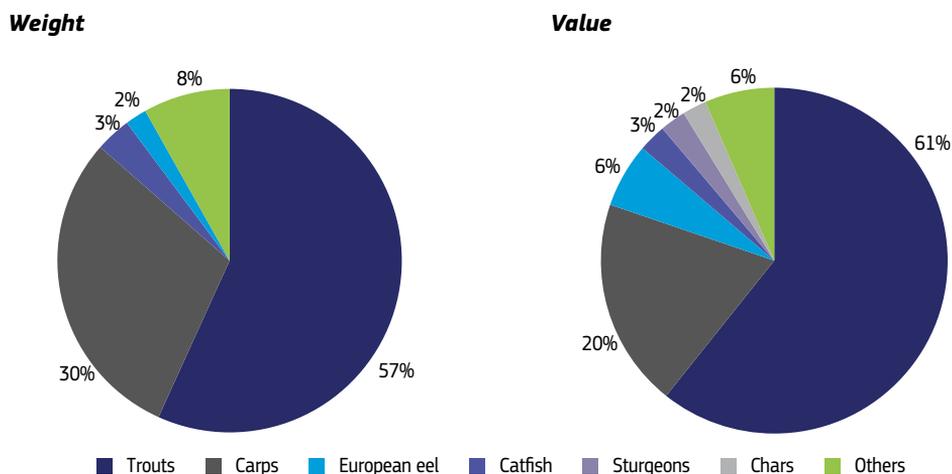
The leading European producers are Italy, Denmark and France. Globally the production of trout is led

by Iran, Turkey, Norway and Chile, which combine 61% of global volume. The combination of an expansion in global production and a stagnation or slight decline in EU production has led to a decrease in the EU share from 39% in 2008 to 26% in 2016. The freshwater trout sector has an important component of part-time work.

The production of carp is led by China with 93% of global volume in 2016. In the EU, the leading producers were Poland, Czech Republic and Hungary. Production is usually oriented to domestic markets, but Poland and Germany are important importers of (live) carp.

Italy remains the largest contributor to the EU freshwater production covering 13% of the volume and 12% of the value. Other major producers are Denmark, France and Spain covering 11%, 9% and 6% of the total EU volume, respectively.

Figure 11: **Main freshwater species produced by EU Aquaculture, 2016**



Notes: Data do not include aquaculture in land-locked EU countries. Trouts include Rainbow trout, Sea trout, Brook trout and other trouts. Carps include Common carp, Silver carp, Bighead carp, Grass carp, Crucian carp and Black carp. Catfish include North African catfish, Wels catfish and Channel catfish. Sturgeons include Danube sturgeon, Siberian sturgeon, Sterlet sturgeon, Starry sturgeon and other sturgeons. Chars include Artic char and other chars. Source: FAO and own elaboration.

Table 6: **EU freshwater aquaculture: economic indicators (I)**, 2016

Member State	Firms	Production	Turn-over	Employment	FTE	Average wage
	number	Ton thousand	€ million	thousand	thousand	€ thousand
Bulgaria	555	7.9	19.8	999.0	884.3	2.5
Croatia	43	4.0	7.9	998.0	559.0	9.2
Denmark	97	33.9	121.3	389.0	259.0	69.7
Finland	173	12.5	69.6	495.0	341.0	40.6
France	268	27.8	108.7	1,233.0	945.0	17.3
Greece	112	2.5	11.0	290.0	231.0	10.6
Ireland	6	0.7	2.0	23.0	18.7	37.0
Italy	146	40.9	122.5	594.4		
Latvia	85	1.5	5.6	250.0	169.0	12.2
Malta	1	0.1	0.9	3.0	3.0	16.8
Portugal	6	0.7	1.9	32.0	28.0	15.4
Spain	183	18.4	62.5	931.8	704.4	21.2
Sweden	109	14.3	58.2	610.0	296.1	28.5
United Kingdom	216	14.4	57.7	740.0	571.0	18.1
Total DCF reported	2 000	179.6	649.7	7 588.2	5 121.6	21.8
Other Member States		125.2	353.5			
Total EU		304.8	1 003.2			

Source: STECF 2018 and FAO.

In 2016, there were more than 2 000 enterprises in the EU freshwater sector. The sector employed around 7,600 people and about 5 thousand FTEs⁹, with an average wage of €22 thousand per FTE. However, the wage varies significantly across Member States, depending on the technique used and the species produced. The highest salaries were reported in Denmark and Finland, where intensive trout aquaculture dominates. The lowest

salaries were paid in Bulgaria and Romania, where extensive carp production dominates (Table 6).

The EU freshwater aquaculture sector generated €220 million in GVA in 2016, which corresponded to a 10% increase from 2015. Measured in terms of EBIT, profitability reached €92 million and 7.6% of ROI. Labour productivity was on average €35,100 per FTE (Table 7).

⁹ Note that data on freshwater aquaculture are compiled on a voluntary basis and, therefore, may be incomplete. Taking into account other sources, the profit in freshwater aquaculture for the overall EU is estimated in €200 million and employment in 20 000 employees and 10 000 FTEs.

Table 7: **EU freshwater aquaculture: economic indicators (II)**, 2016

Member State	GVA	EBIT	ROI	Labour productivity	Capital productivity
	€ million	€ million	percent	€ thousand	percent
Bulgaria	10.4	9.3	26.0	11.8	29.0
Croatia	12.0	6.0	93.3	21.5	188.5
Denmark	29.5	4.7	3.0	114.1	18.6
Finland	12.9	1.3	1.3	56.8	13.4
France	32.4	12.4	15.5	34.3	40.4
Greece	6.1	3.0	20.5	26.4	41.2
Ireland	0.2	-0.4	-7.8	9.6	3.9
Italy	50.4	31.1	17.3	449.8	28.0
Latvia	2.8	0.7	2.8	16.5	10.6
Malta	0.3	0.3	83.0	107.5	105.0
Portugal	0.4	-0.2	-9.2	12.6	17.7
Spain	15.7	-0.2	-0.3	22.3	22.8
Sweden	31.3	20.4	33.1	117.4	50.9
United Kingdom	15.5	3.5	14.6	27.1	64.0
Total EU	219.9	91.9	7.6	35.1	28.7

Source: STECF 2018.

3.5. Algae (aquatic plants) production

The algae aquaculture production is an expanding sector boosted in the recent years by the increase in the demand of algae biomass for a variety of applications (e.g. food, nutraceuticals, cosmetics, biomaterials, bioremediation). However, with

an estimate biomass of about 150 tonnes wet weight in 2016 according to Eurostat figures, its production remains small. Algae aquaculture (seaweeds and microalgae) has been reported in a number of countries including France, Ireland, Denmark, Portugal, Spain, Greece, Bulgaria, The Netherlands, Sweden, Germany and Italy.

4. Multiannual National Strategic Plans for aquaculture

In 2013, the European Commission published the *Communication on Strategic Guidelines for the sustainable development of EU aquaculture*¹⁰, where four priority areas to boost the EU aquaculture sector were identified: (i) reducing administrative burdens, (ii) improving access to space and water, (iii) increasing competitiveness, and (iv) exploiting competitive advantages due to high quality, health and environmental standards.

In 2014-2015, EU countries developed the Multiannual National Strategic Plans for the promotion of sustainable aquaculture, proposing concrete actions to address these strategic priorities and set growth goals in volume and value by 2020. The assessment carried out

by STECF experts considers that more than half of the projected actions are under execution in most MS and that the remaining actions seem to be in good track for being concluded in time. The positive impact of the proposed actions is expected to lead to improvements in the industry performance, which should begin to be noted soon.

They also consider that, although an increase in production is observed between 2013 and 2016, the projected quantities and values reported in the MNSP appear to be too optimistic, or even unrealistic, in many cases. This is mainly due to the fact that the reference year of 2013 marked a minimum in production in several of the largest aquaculture producers in Europe, so that, the increases observed between 2014 - 2016 led to the recovery of the volume of production lost between 2008-2010. (see Figure 1). Despite of the above reserves, the experts consider that the design and implementation of the Multiannual Strategic Plans is a step forward in the lifetime of modern EU aquaculture and a success in coordination of the different stakeholders across countries towards a common goal and strategy.

¹⁰ COM/2013/0229 final.

Annex: Additional tables

Table A1: **Structure of the EU aquaculture industry, 2016**

Member State	Firms	Production	Turnover	Employment	FTE
	number	thousand tonnes	€ million	thousand	thousand
Austria	51	3	22	0.3	0.2
Belgium	1	0	0	0.0	0.0
Bulgaria	588	9	21	1.0	0.9
Croatia	187	17	109	2.2	1.6
Cyprus	16	7	42	0.5	0.5
Czechia	90	21	39	1.5	0.9
Denmark	107	48	185	0.5	0.4
Estonia	10	0	2	0.0	0.0
Finland	173	13	70	0.5	0.3
France	2,700	220	765	15.1	8.8
Germany	293	41	129	1.6	1.0
Greece	328	135	584	4.0	3.5
Hungary	72	16	32	2.1	1.3
Ireland	289	44	168	1.9	1.0
Italy	711	201	557	5.5	3.3
Latvia	85	1	6	0.3	0.2
Lithuania	28	4	12	0.5	0.3
Malta	6	14	164	0.3	0.3
Netherlands	70	56	60	0.2	0.2
Poland	1,242	38	110	8.8	5.3
Portugal	1,402	10	74	2.6	0.8
Romania	430	12	28	3.7	2.9
Slovakia	11	2	5	0.6	0.4
Slovenia	7	1	1	0.0	0.0
Spain	2,990	295	627	17.8	6.5
Sweden	136	17	60	0.5	0.3
United Kingdom	473	195	1,023	3.3	2.8
Total EU	12 496	1 422	4 893	75.5	43.7

Source: STECF 2018.

Table A2: **Economic performance of the EU aquaculture industry, 2016**

Country	GVA	EBIT	ROI	Average wage	Labour productivity	Capital productivity
	€ million	€ million	%	€ thousand	€ thousand	%
Bulgaria	11.5	9.3	22.1	2.6	11.9	27.4
Croatia	49.5	22.4	8.1	13.5	30.0	18.0
Denmark	44.9	12.1	5.9	65.7	122.7	21.9
Finland	19.7	2.5	2.1	40.6	57.8	16.8
France	421.1	130.8	12.7	25.1	47.7	40.8
Greece	209.9	145.8	13.4	16.2	60.3	19.3
Ireland	71.0	40.3	21.1	28.5	69.2	37.2
Italy	185.0	103.8	24.1	37.2	97.7	42.9
Latvia	2.8	0.7	2.8	12.2	16.5	10.6
Malta	18.5	13.3	50.5	17.1	82.6	70.1
Netherlands	35.4	18.9	14.0	67.0	172.4	26.2
Portugal	83.6	55.9	60.2	13.7	100.8	90.0
Slovenia	0.8	-0.1	-1.0	9.5	42.4	11.0
Spain	238.9	74.0	10.8	22.4	36.6	34.7
Sweden	22.2	10.3	16.2	28.4	70.0	34.7
United Kingdom	286.7	127.2	14.6	36.6	101.8	33.0
Total EU	1 701.6	767.4	14.5	24.6	57.3	32.2

Source: STECF 2018.

Acronyms

DCF	Data Collection Framework	MS	Member State
EBIT	Earnings Before Interests and Taxes (or operating profit)	pm	Pro memoria
FTE	Full-Time Equivalent	ROI	Return on investment
GVA	Gross Value Added	SME	Small and Medium-sized Enterprise
MNSP	Multiannual National Strategic Plans	STECF	Scientific Technical and Economic Committee for Fisheries

Country codes

AT	Austria	LV	Latvia
BE	Belgium	LT	Lithuania
BG	Bulgaria	LU	Luxembourg
CZ	Czech Republic	MT	Malta
HR	Croatia	NL	Netherlands
CY	Cyprus	PL	Poland
DK	Denmark	PT	Portugal
EE	Estonia	RO	Romania
FI	Finland	SK	Slovakia
FR	France	SI	Slovenia
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IT	Italy		

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In broad terms, the fishing industry can be divided into harvesting (either from captures in wild-capture fisheries or from fish farms), commercialisation and fish processing sectors. The aquaculture sector has been identified in the EU's Blue Growth Strategy as one of the five sectors that have higher potential for sustainable jobs and growth. In addition to economic development, the aquaculture sector can also boost food security.

The EU has around 12,500 aquaculture enterprises with about 75,000 employees. Production is concentrated in five countries: Spain, France, Italy, the United Kingdom, and Greece, making up about three quarters of all the EU aquaculture production in volume and value. More than 90% of the production concentrates in seven species: mussel, salmon, seabream, seabass, oyster, carpet shell and trout.

In 2016, the EU aquaculture sector produced 1.4 million tonnes of seafood worth almost €5 billion. The EU aquaculture sector generated a GVA of about €2 billion and a profit measured as EBIT of more than €950 million. The aquaculture industry can be divided into three main sub-sectors: marine, shellfish and freshwater. The marine (finfish) sector is the most important economically, generating a turnover of €2.7 billion in 2016, followed by the shellfish sector with €1.1 billion and then the freshwater sector with €1 million.

Between 2010 and 2016, we observed a slight decrease in the production volume, but an increase in the production value and an improvement in the economic performance of the EU aquaculture sector. This trends have been driven by the production of seabass, seabream and salmon (higher valued species with a higher degree of control by the farmer in the production cycle in terms of feeding, medicines, juveniles, broodstock, etc.).