2021:00733 - Open

Report

Employment in the EU Fish Processing Industry based on Norwegian Seafood Export

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2021-06-29

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REPORT NO.	PROJECT NO.	VERSION	DATE
2021:00733	302006379	final	2021-06-29

KEYWORDS:
EU
Seafood processing
Export from Norway
Employment

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CLIENT(S)
FHF – Norwegian Seafood Research Fund

CLIENT'S REF.	NUMBER OF PAGES/APPENDICES:
901703	23 + Appendix

CLASSIFICATION	CLASSIFICATION THIS PAGE	ISBN
Open	Open	ISBN 978-82-14-07636-3

ABSTRACT

Strong interdependency between Norwegian export of raw fish and the resources base to the European fish processing industry

This analysis is an update of an analysis performed in 2014. The main objective has been to analyse how many fish processing jobs in the EU are based on import of unprocessed Norwegian fish. This is important information for several stakeholders, because it shows to what extent unprocessed fish is exported to the EU market, and indirectly will show how many jobs that are related to processing Norwegian fish in the EU. Of the raw fish imports to the fish processing industry in the EU in 2019, 25% is based on Norwegian fish raw materials. Thus, it makes Norway to be the main trading partner of raw fish to the EU.

The imported volumes from Norway to the EU increased from almost 800,000 tonnes in 2004 to over 1.3 million tonnes in 2012, and further to almost 1.6 million tonnes in 2019. This has contributed to the EU's imports of Norwegian seafood increasing its share from 20 % in 2012 to 25 % in 2019. Considering the total resource base in the EU fish processing industry, the Norwegian share of the total resource base (of seafood) is between 17% to 19% in the period 2015 -2018. Of the 118,000 full-time employees (man-years) in the EU fish processing industry in 2018, 21,000 man-years are directly related to imports of Norwegian raw fish. This represents a doubling of the estimated full-time employees from last report based on data from 2012.

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Document History

VERSION	DATE	VERSION DESCRIPTION
1	2021-06-29	Final version

SINTEF

Table of Contents

APPENDIX

Sammendrag
I denne rapporten har vi analysert hvor mange arbeidsplasser i EU innenfor fiskeforedling som baserer seg på norsk fiskeråstoff. Rapporten baserer seg på en metode som ble benyttet i en tilsvarende analyse i 2014, og er i så måte en oppdatering av dette arbeidet. Analysen setter søkelyset på råstoff som sendes direkte til EU, og ikke det som måtte sendes til andre destinasjoner for så å gå inn i EU igjen for videre prosessering.

Tall fra 2019 viser at over 25 % av volum fiskeråstoff til foredlingsindustrien i EU hadde norsk opprinnelse. Norge har hatt en betydelig vekst i sjømatprodukter eksportert til EU på kort tid, fra nærmere 800 000 tonn i 2004 til over 1,3 million tonn i 2012, og videre til nesten 1,6 millioner tonn i 2019. Dette har bidratt til at EUs import av norsk sjømat har økt sin andel fra 20 % i 2012 til 25 % i 2019, noe som gjør Norge til EUs viktigste leverandør. Sett opp mot det totalet ressursgrunnlaget av sjømat til EU, så lå den norske andelen mellom 17-19 % i perioden 2015-2018. Dette er en betydelig vekst fra 2012 da tilsvarende tall ble estimert til 10 %.

Av 118 000 heltidsårsverk innen fiskeforedling i EU i 2018 kan man derfor estimere at tilnærmet 21 000 årsverk var direkte knyttet til import av norske råvarer, sammenlignet med 11-12.000 årsverk i 2012.

Hovedgrunnen til utviklingen som viser at norsk fiskeråstoff blir viktigere og viktigere for EUs foredlingsindustri kan forklares i disse punktene:

- Økt markedsandel for norsk sjømat i den totale importen av sjømat til EU
- Nedgang i EUs egenfangst/selvproduksjon
- De to ovennevnte punktene fører til en betydelig økning i norsk andel i EUs totale ressursbase for humant konsum av sjømat
- Noe av økningen i antall årsverk i EUs prosessering av sjømat kan tilskrives mindre import av sjømat fra Kina noe som fører til mer egenprosessering
- Mellom 75-85% av norsk eksport av sjømat trenger videre prosessering

Legger man i tillegg til at foredlingsindustrien i EU skaper ringvirkninger til annet næringsliv i EU, har man en forventet tilleggseffekt på 20.500 årsverk til øvrig industri i EU. I sum kan man derfor si at norsk fiskeråstoff i 2018 sto for 41.000 årsverk i EU.

1 Preface

The European Union (EU) is the most important market area for Norwegian seafood export. At the same time, Norway is among the most important providers of consistent and sustainable supply of raw materials to the EU seafood industry for value adding processing of products to satisfy consumer demands within local market areas. Based on these facts, The Norwegian Seafood Federation in 2014 took initiative to estimate the effect of employment numbers in the EU fish processing industry due to imports of seafood from Norway. That report was documented in July 2014 (Richardsen and Henriksen; SINTEF Report A26219). Again, initiated and funded by The Norwegian Seafood Research Fund (FHF), the present report aims to present an update based on the latest possible statistical data. The estimate shall include employment based on export of Norwegian farmed salmon, as well as wild-capture species.

2 Methodology

In this report we use a Resource Base model (as shown in Figure 1) to estimate employment effects within the EU.[1] The scope of the work has made no room for primary data investigations going into specific product categories and market areas. Rather more useful for the main objective of this report is to look at the aggregated volumes and values for the EU seafood industry. When knowing the total employment numbers of the EU seafood industry, we can calculate the effect of supply from Norway by calculating the resource base fraction from Norway, using the same fraction (%) of EU's total number of employment, measured as Full Time Equivalent (FTE). Thus, we assume import from Norway is generating approx. the same employment effects as any seafood import to the EU.

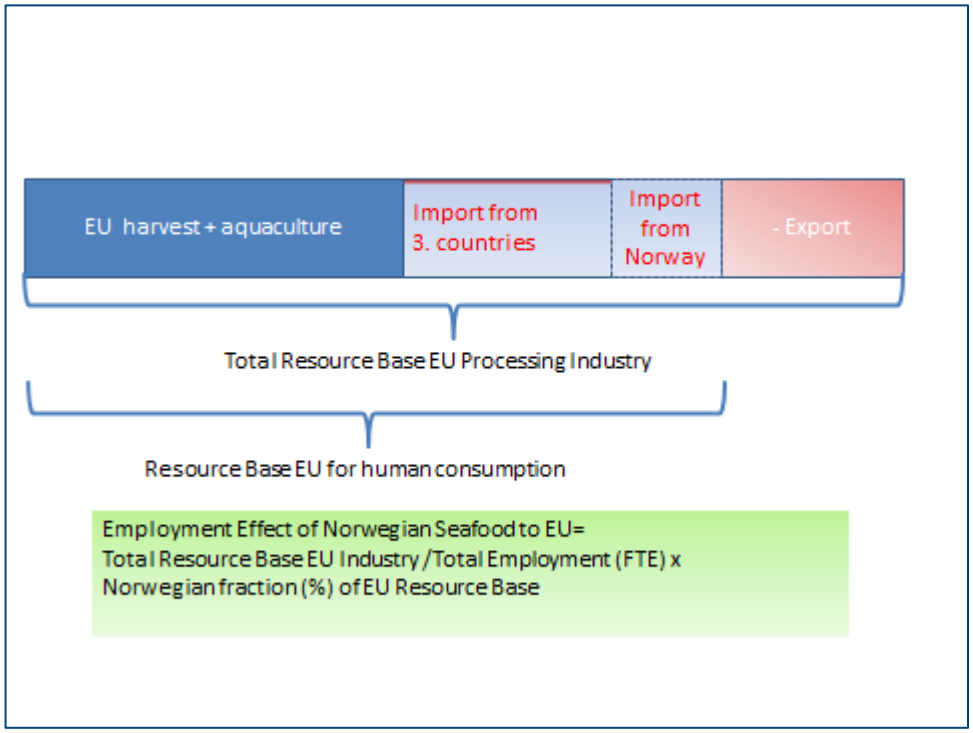

Figure 1: A Resource Base Approach to Evaluate Employment Effects of Norwegian Seafood

[1] The methodology is replicated from the previous report (Richardsen & Henriksen, 2014) investigating the same topic.

In this report, only *direct* export from Norway to any EU member state is accounted for. It could be argued that some volumes of raw material go to non-EU markets for primary processing,[2] ending up in the EU for secondary processing (value adding), thus giving additional economic effects in the EU. However, it would be substantial technical and methodical problems associated with estimating valid data for such global trade in seafood. Therefore, such side-effects of global seafood trade via third countries have not been included here.

2.1 Data sources

The figure below illustrates a typical Value Chain for seafood, including "scope of work" and primary data sources for the calculations to be used.

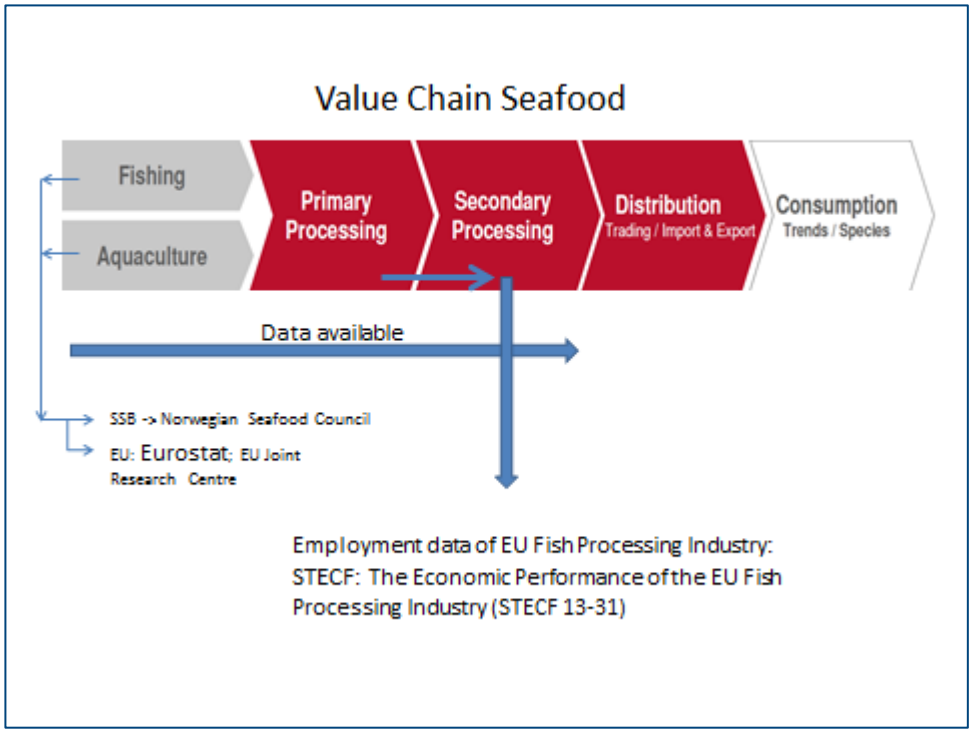

Figure 2: Seafood Value Chain - data sources

Primary sources of trade statistics data for the EU-27 are available through the EUMOFA[3] database, based on elaboration of EUROSTAT data. However, in this report we have based our estimates of the EU resource base on data published by AIPCE (European Fish processors and Traders Association). Their publication *The Finfish Study 2018* (2018) gives a comprehensive and detailed description of production and trade volumes of seafood in the EU market. Data published are based on Eurostat 2017, but converted to whole fish equivalent (WFE), which is "consistent with quota and allocation data and we believe is the fairest means of comparison" (AIPCE, 2019). Further description of the conversion factors used can be found in the AIPCE study.

Data for the economic capacities, including total employment figures for the EU fish processing sector, is based on the latest report from the Scientific, Technical and Economic Committee for Fisheries (STECF). In their report *The EU Fish Processing Sector. Economic Report* (2019), data of employment and economic

[2] It is well known that export of H/G demersal white fish species to China are partly re-exported to EU markets as fillets or blocks for further value adding processing to wholesale and retail. However, identifying "Norwegian raw material" from other North Atlantic suppliers to China, is not easy due to lack of traceability of reprocessed products.
[3] https://www.eumofa.eu/

performance for the EU fish processing industry are investigated. The data relates to enterprises whose main activity is defined according to the Eurostat definition under NACE Code 15.20: 'Processing and preserving of fish and fish products'.[4)] This should cover all the primary and secondary processing units in the EU relevant for this study.

The analysis of the economic performance of the fish processing sector in the EU is based on national statistics and data for the fish processing industry collected under the Data Collection Framework of the EU. The latest report (STECF -19-15) was published by the end of 2019, containing data for the fish processing sector for the years 2008 – 2017.[5] Based on this we use the data for 2017 as a baseline for measuring the employment effect of Norwegian seafood supply to EU. Post 2017-data are not currently available for the economic activities in the processing sector, but development trends can be discussed based on trends in the EU resource base of seafood, i.e., own production and import figures.

3 The EU Seafood Market

The EU is a major consumption market of seafood in the world with 12.5 million MT live weight, representing a value of EUR 59.3 billion in 2018.

In 2019, import and export of fisheries and aquaculture products between the EU and the rest of the world totalled 8.55 million tonnes with a value of EUR 33 billion, making the EU the second largest trader of these products after China. As a net importer, the EU had a deficit of EUR 21 billion in 2019, which was slightly higher than the previous year. In the long run, the deficit grew by 33 % in real terms from 2010 to 2019.

Per capita apparent consumption, estimated at 24.3 kg of live weight of mostly wild caught products, signalled that in 2018 EU citizens consumed, on average, 430 grams less fisheries and aquaculture products than in 2017. Figures presented by EUMOFA show a rather stable consumption level over a long period (2009- 2018), consumption varying around 24 -25 kg per capita (live weight). However, from 2016 there has been a slightly decreasing tendency. Consumption declined for the three most consumed species, namely tuna, salmon, and cod. Seafood consumption varies a lot from one member state to the other. Northern Member States are more focused on processed fish while Southern Member States still favor fresh products and devote a larger part of household expenditures to fish. Central and Eastern European countries are below the EU average but register increase in consumption.

The total value of EU trade flows of fishery and aquaculture products in 2019 was EUR 60.78 billion. In real terms, it was 44 % above the level of 10 years before. During the 2010–2019-decade, trade flow value had increased at a compound annual growth rate of 4 %.

Extra-EU imports account for almost half of all fishery and aquaculture products traded both within the EU and with third countries. The extra-EU exports were on an upward value trend in the decade, growing 58 % in real terms, but they play a far less important role, which makes the EU a net importer. The other half is made up of intra-EU exchanges, mostly exports from northern Member States to other EU countries, and mainly salmon and cod originating from Norway and Iceland.

[4] The NACE Code 15.20 class includes:
Preparation and preservation of fish, crustaceans, and mollusks: freezing, deep-freezing, drying, smoking, salting, immersing in brine, canning, etc.
Production of fish, crustacean, and mollusk products: cooked fish, fish fillets, roes, caviar, caviar substitutes, etc.
Production of prepared fish dishes. Production of fishmeal for animal feed

[5] Updated figures for the EU fish processing sector (to 2018) will be available by the end of 2021. Source: Personal communication to the STECF working group.

Extra-EU imports reached a ten-year high of 6.34 million tonnes[6], almost 460,000 tonnes or 8 % more than in 2010. There was also a peak in value, with imports reaching EUR 27.21 billion, which was a significant 38% increase in real terms compared with ten years before.

Norway and China are the main EU suppliers. Norway has shown significant growth in volumes of seafood products exported to the EU. From close to 800,000 MT in 2004 to over 1.3 mill. tons in 2012, and further to nearly 1.6 million tons in 2019. While Norway in 2013 accounted for some 20% of the extra-EU import of seafood, this was increased further to **25% in 2019**. Hence, from Figure 3 we see that Norway by far is the main supplier of seafood to EU. Both China, USA, Vietnam – other big suppliers – have weakened their 'market share from 2013, while Iceland and Peru have a stable proportion of import volumes to EU[7].

Salmon, the main species imported to the EU, accounted for 15% of total volume of extra-EU imports of fishery and aquaculture products in 2019, and close to one quarter of the total in value terms. In 2019, salmon imports reached a 10-year peak of 966,220 tonnes and EUR 6.28 billion. Imports of salmon mainly consist of fresh whole products originating from Norway, amounting to 753,041 tonnes worth EUR 4.56 billion in 2019, with neighbouring Sweden as the first point of entry. Over the last 10 years, fresh whole salmon imports from Norway grew at a yearly average of 6% in volume and 8% in value (Eumofa, 2020).

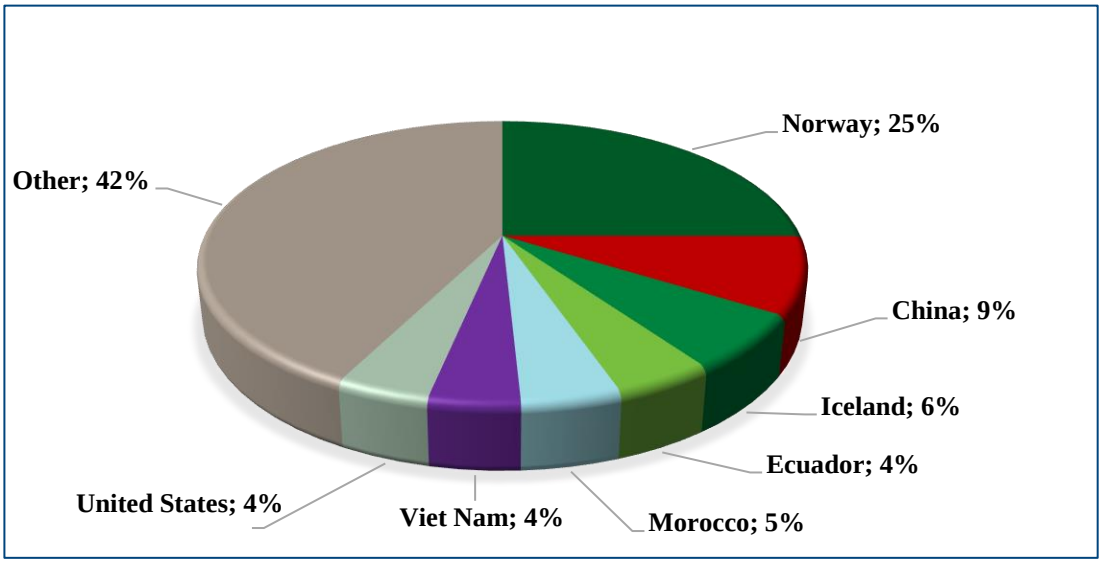

Figure 3: Import from non-member countries – by volume (2019)
Source: EUMOFA based on elaboration of EUROSTAT data

China was for many years a processing hub for 'white fish' (cod, hake, hoki, etc.) However, this situation seems to gradually change. Europe, including Iceland, Faroe Island and Norway is investing in technology that automate operations for filleting, deboning and portioning, which compensate cost disadvantages using manual labour force – as in Southeast Asia. Report from Europe/EU explains the same trend – as cited below:

During the last 10-15 years it has been a relocation of primary processing away from primary catching nations to third countries most especially North Eastern China and a few other smaller hubs. However, this have shown a slowing of this trend and in some species a clear reversal. Our contention that higher quotas alongside the better and more stable availability these have generated has encouraged investment in technologies that address the need for capturing the benefits of yield improvement and portion control that have been the advantage of hand-cutting. By narrowing the cost gap that had originally attracted buyers to

[6] Product weight.
[7] EUMOFA based on elaboration of EUROSTAT data

using more distant locations for processing this brings processing closer to the markets. Additionally this has spurred opportunities for short supply chains to develop again. The advent of more fish and seafood use in the chilled distribution system has enabled stronger and more viable supply routes to be established that are now shifting the processing needs ever closer to the final destination market for products and their consumption. Our data for 2017 suggest this trend is continuing, in whitefish species at least. China's share of EU trade has dropped to 22 % (in whitefish) at whole fish equivalent with most species appearing to have seen reduction – the exceptions being hake and hoki that were never very large anyway. We believe this change is gaining a sustainable momentum. That benefits the EU processing industry economically and provides greater economic contribution from its activities. In turn that will bring benefit to those fisheries and cultivators operating in closer proximity to the EU market[8].

Another point related to (more) reprocessing in Europe has aroused as effect of the corona-pandemic. Sharp increased freight rates in shipping goods between Europe and Asia will further be a competitive advantaged for processing activities within Europe.

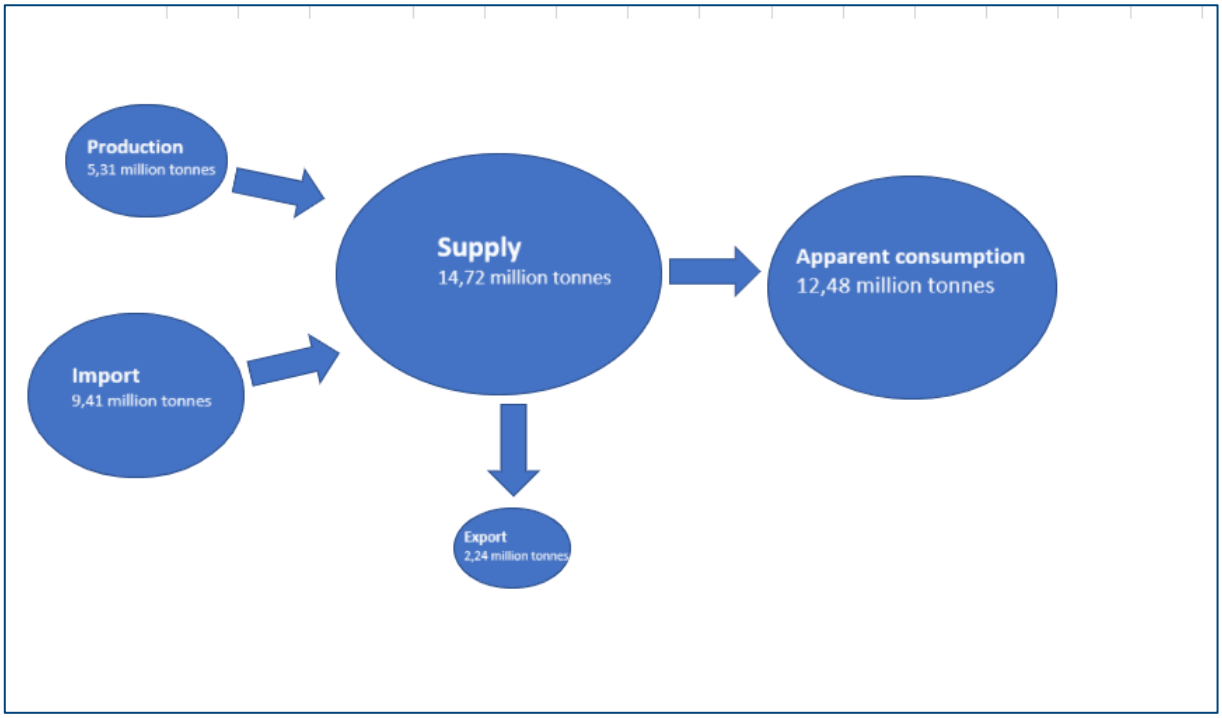

Figure 4: Supply balance EU seafood 2018-figures
All data transformed to live weight
Source: EUMOFA based on elaboration of EUROSTAT data

Figure 4 above gives an example of the proportion between each factor for the total activities within the EU seafood sector. It also illustrates how much dependent the EU market is on imported materials for its processing sector. Since the formation of EU-25/27 in 2006 this dependence as share of the market has hardly varied, remaining within the range of 63 +/- 2 % (AIPCE, 2019). Self-sufficiency of seafood within the EU has been stable over many years, varying between 43- 46 % of total consumption between 2014 - 2018. Consumption per capita is even more stable. Statistics from 2006 – 2018 shows per capita consumption fluctuating around 24 -26 kg (live weight).

[8] Quotation: AIPCE: Finfish study p.17.

Table 1: Self-sufficiency rates of most consumed products in the EU (2018) (Eumofa, 2020)

Main commercial species	Per capita (kg)	Self-sufficiency rate
Tuna	3,05	33 %
Salmon	2,24	15 %
Cod	2,14	8 %
Alaska pollock	1,68	0 %
Shrimps	1,58	13 %
Mussel	1,21	81 %
Herring	1,18	98 %
Hake	1	37 %
Squid	0,66	12 %
Mackerel	0,6	106 %

The EU can maintain a high level of fish and seafood consumption, mainly by sourcing it from other regions of the world through imports. Self-sufficiency, which is the capacity of EU Member States to meet demand from their own production, can be calculated as the ratio of domestic production over domestic consumption. Imports dominate for tuna, salmon, cod, Alaska pollock and shrimps – the top 5 species consumed in the EU and for which EU self-sufficiency averaged only 14 % in 2018.

Almost 62 % of total consumption of both captured and farmed products was covered by 13 species, whose calculated consumption is illustrated in Table 1. It can be noted that two of the top three most consumed species within the EU (salmon and cod) are species where Norway has a dominant role as supplier.

In 2019, extra-EU imports of fishery and aquaculture products reached a 10-year high of 6.34 million tonnes, almost 460,000 tonnes or 8 % more than in 2010. There was also a peak in value, with imports reaching EUR 27.2 billion. This was nearly EUR 659 million or 2 % higher than in 2018, but 38 % higher if compared with 10 years before in real terms.

Even though imports to the EU had a record level in 2019, and shows a slight increasing tendency the latest years, it should be noted that in volume terms the total import of seafood has been surprisingly stable around 5.5 – 6 million tons for a long period of time. This is shown in Figure 5. As an example, back in 2007 the extra-EU import of seafood was 6 million tons. What really is striking is the increase in cost/price of imported goods; +38 % since 2010. This fact indicates a growing global demand for such food items, and consumer willingness to buy the same volume to steadily higher prices.

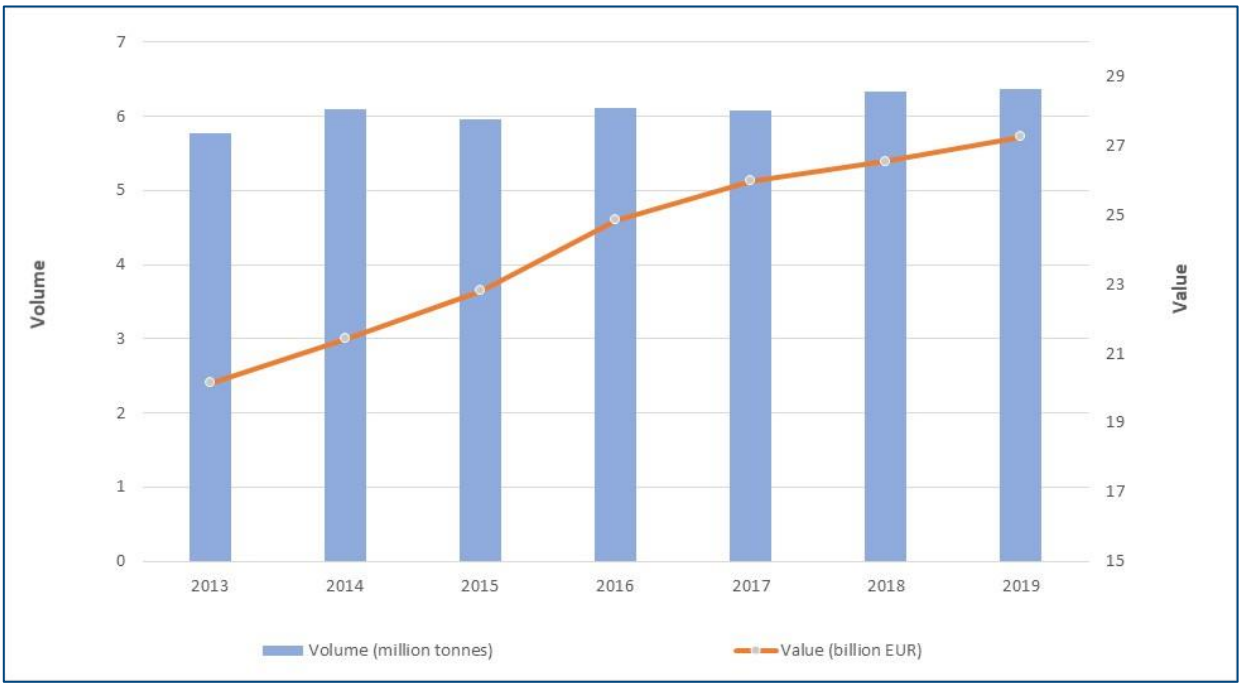

Figure 5 Total EU Import of seafood, 2013 - 2019
Source: EUMOFA based on elaboration of EUROSTAT data

In Figure 6 the import by country in the EU is presented. Of all extra-EU imports of fishery and aquaculture products, one fifth is destined for Spain, which is mainly supplied by Morocco, Ecuador and China, all of which increased their exports from 2018 to 2019. At the same time, we can see major markets for Norwegian products all listing among the top 7 importing countries. This is namely Denmark, Sweden, Netherlands, UK, Germany, France, and Italy. At the same time, most of these countries also have a substantial processing industry based on raw material or semi processed seafood import.

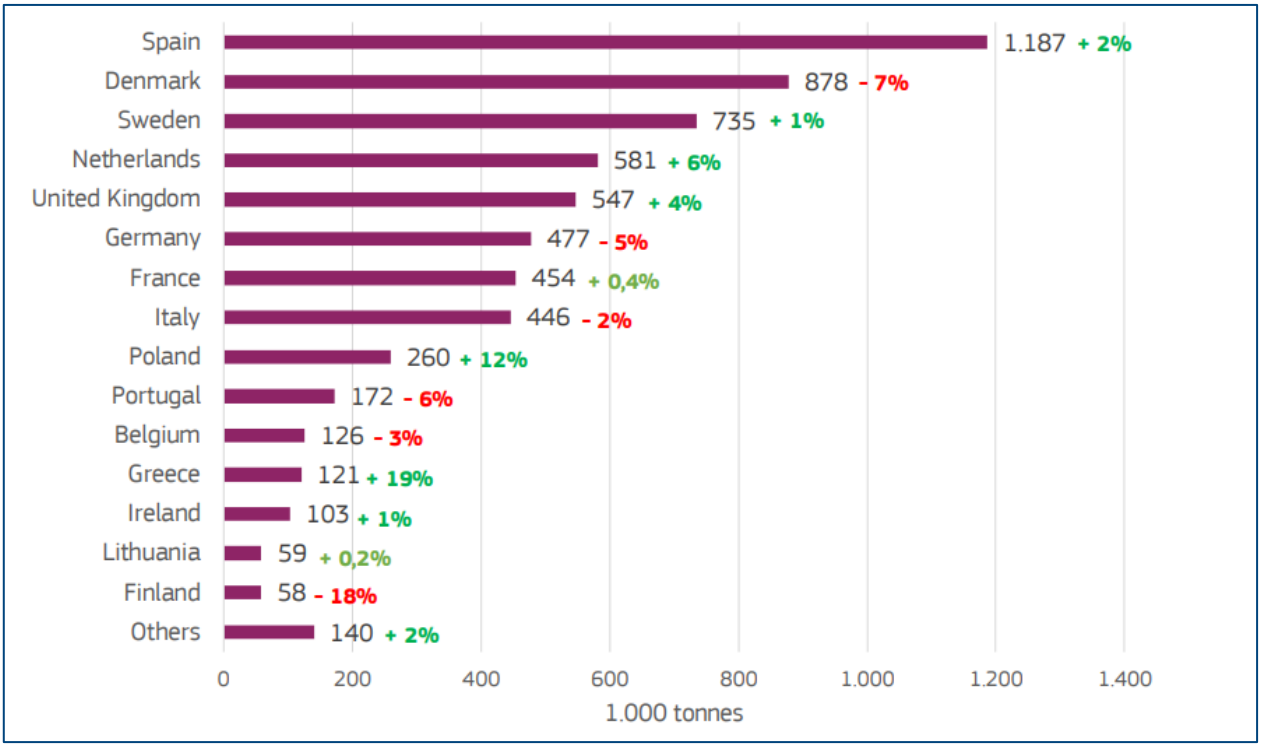

Figure 6: Volume of extra-EU import by member state in 2019 and % variation 2019/20018
Source: EUMOFA elaboration of Eurostat-COMEXT data

One should be aware that intra-EU trade of seafood are substantial. Import figures to one specific country does not mean volumes are consumed there. A typical example is Denmark, with centuries of important role as a trading hub for Norwegian fresh fish to central Europe. Denmark has also had a good economic activity in reprocessing some of the commodity volumes before re-exporting value added seafood products to other EU market areas. Also 'technical' (custom clearance) issues influence widely on import statistic figures. As seen from Figure 6, Sweden rank as the third largest importing nation in 2019. This is largely due to import volumes from Norway which are custom cleared on the Swedish border. However, large proportions of this volumes going straight further to larger consumer areas in other EU countries.

A third point to note is that EU member states in Eastern Europe steadily overtakes the role as processors of (Norwegian) imported chilled or frozen raw material, at the expense of traditional major seafood industries in Denmark, Netherlands, and Germany. Poland as an example, has established a vital value-added industry based on Norwegian salmon – and to some degree also white fish. This change of geographical location of seafood industry is driven mainly by lower cost of labour input necessary, and the availability of labour force. Lack of 'willing' labour force is a major problem in many central European countries, as is also the case in Norway where there have been good economic alternatives in both public sectors as other industries.[9]

4 Norwegian Seafood Export to EU

The European Union has become more and more important as a market for Norwegian seafood the last 10 years. While export to EU-27 came to around 50 % in the period 2010 - 2013, this has increased to the amount of 64 % in 2020 (EU-28) as shown in Table 2. In value terms the growth has been huge, more than doubled from 2010 (30.9 billion NOK) to 2020 where export to EU summed up to more than 69 billion NOK. The increase in value is mainly due to the increase in farmed salmon, but also a strong demand for rather high priced 'white fish' (cod, haddock, etc.). As documented from EU statistics in Chapter 3, import of seafood from Norway accounts for – in value terms - some 26 % of the total import in 2018. In volume terms this import accounts for 25 %. This means there has been a significant increase – from 20 % in 2012 to 25 % in 2019.

Table 2: Norwegian Seafood; Total export and export to EU, 2015 -2020

	Total export	Export to EU 28		% export to EU
	Volume (MT)	Volume (MT)	Value (NOK)	Volume
2015	2 637 403	1 683 508	49 729 585	64 %
2016	2 454 757	1 539 703	61 197 960	63 %
2017	2 631 686	1 572 236	60 863 284	60 %
2018	2 733 254	1 704 149	65 941 850	62 %
2019	2 665 517	1 605 004	68 287 255	60 %
2020*	2 717 764	1 726 507	69 278 561	64 %

Source: Norwegian Seafood Council

*UK included to see the historic development. Without the UK in 2020 the EU export share was 58 % (volume).

Export of salmon to the EU is very important for Norway as most of the EU can be served by fresh fish export (by road), making a "door to door" logistic system benefitting both parties. EU fish processing units can receive fresh raw material for further processing and still have good quality products for the retail markets within EU without extra cost of storing facilities or other quality measures.

[9] A NOFIMA report estimated foreign workforce in Norwegian seafood processing to over 50 % in 2017 (Nofima, 2017).

As a fact, Europe is by far the most important global market for Norwegian seafood. In 2020, export to Europe took close to 70 % of the total – and the EU took the bulk share of this; 64 %. The second most important market area is Asia – i.e., Japan, South Korea, China, Taiwan, and more. Totally some 18 % of volumes went to these markets. North America and Africa each took some 5 % of volumes sent from Norway (see Appendices 1).

Norway is also one of the most important markets for EU-export of seafood. According to figures from EUMOFA (2020), 13 % of the exported volume in 2019 ended up in Norway, the same proportion as in 2015. In 2019, extra-EU exports of fishery and aquaculture products reached a 5-year peak of 2.21 million tonnes and showed a growth of 7 % with respect to 2015.

Some 90% of exports from the EU to Norway were covered by non-food use products, i.e., fish oil and fish meal destined for aquaculture feed production. Total value amounted to EUR 550 million for Norway which summed to approx. 287,000 metric tons. Besides the United States and China which are the two biggest destinations in value terms, Norway was the main country of destination in volume terms. Again, Norway is among the top trading partners in seafood for EU aggregated – as a supplier as well as a market (EUMOFA, p.22).

Table 3: Norwegian export of seafood to EU by product category, 2019

HS4	HS6	%-andel
0302	Fish, fresh/refrigerated	63,8
0303	Fish, frozen (ex. Fillets)	11,3
0304	Fish fillets, fresh/frozen	11,4
0305	Dried, salted, smoked	3,9
0306	Crustaceans (shrimps, etc.)	0,3
0307	Molluscs, shellfish	0,0
0308	Invertebrates (urchins, etc)	0,0
1504	Fish oils	4,0
1604	Fish prepared, caviar subst.	1,2
1605	Crustaceans, shellfish prepared	0,6
2301	Fishmeal for feed	3,3
	Total	100,0

Source: Data based on statistics from Norwegian Seafood Council

The data document the fact that Norway is a 'raw material' provider of seafood to the EU. Table 3 documents the share of product types exported to EU. Roughly some 75 % of export is fresh or frozen head on/head off fish where further processing takes place within EU markets. Another 11 % are semi-processed fillets, which often need some further cutting in retail or catering sector. Salmon fillets to some degrees are prepared to smoked products within the EU. The most obvious explanation for the fact is a) the profile of custom duty between Norway – EU[10], and b) High cost of labour in Norway makes value added production less competitive to most of the EU-countries.

[10] 'Raw material' goods = low custom duty. Value Added Products (VAP) = High custom duty

4.1 The UK

The UK has been – and still are – an important seafood market for Norway. Although salmon is the top species imported, also white fish species like cod and haddock are important for the British consumer, commonly to produce "fish and chips". In the last years, the UK share of EU total imports from Norway has been about 10 % in volume and value, making it a significant market. Table 4 show this timeseries between 2015-2020. However, similar to the majority of seafood products heading to the EU, a large share of the products exported from Norway to the UK market is less prepared, like salmon (95 %), haddock (91 %) and cod (70 %), creating significant ripple effects in the UK industry.

Table 4: Norwegian Seafood; Export to the EU and the UK, 2015 -2020

	EU	UK		% export UK
	Volume (MT)	Volume (MT)	Value (NOK)	Volume
2015	1 683 370	141 389	5 077 726	8 %
2016	1 539 703	146 087	5 656 206	9 %
2017	1 572 236	130 399	5 272 695	8 %
2018	1 704 149	148 002	6 252 362	9 %
2019	1 604 966	158 824	6 416 904	10 %
2020	1 726 683	148 502	6 159 831	9 %

Source: Norwegian Seafood Council

5 Employment and Economic Performance of the EU Processing Industry

Information under this chapter is based on data sampled by fisheries economists from Joint Research Centre (JRC) and specialists under the Scientific, Technical and Economic Committee for Fisheries (STECF). The report, *Economic Report on the EU Fish Processing Sector* is an annual report (from 2010) that provides a comprehensive overview of the latest information available on the structure, social, economic, and competitive performance of the fish processing industry at the member state and EU level (STECF, 2019)[11].

According to Member States DCF data submissions, the total number of enterprises in the European fish processing industry sector in 2017 was around 3,460, of which some 53 % are small enterprises with less than 10 employees and another 32 % with between 11 and 49 employees.

Over the reporting period, i.e., 10 years - the total number of enterprises decreased by 8-10 %. These structural changes are the same as we see in Norway, and supposedly due to increased productivity within the industry. From Table 5 below, we can observe no significant difference in declining number of enterprises between different size groups.

According to the data submitted by the EU member states, the number of workers employed in the European fish processing industry in 2017 was approx. 130,000. As in Norway, seasonal variations in the industry's need for employees makes the number fluctuate over the year, making a minor proportion of the work force 'seasonal workers'. Therefore, some 130.000 employees working in the EU seafood processing industry amount to 118.000 full time equivalents (FTE). Both the number of employees and registered FTE have been surprisingly stable during the recorded period from 2008. There were some declines in employment from

[11] STECF data are not updated to the same degree as EUMOFA data on import, own catch, etc. The latest detailed data from seafood industry is 2017. Updated figures from 2018 will not be available until December 2021 (personal communication to STECF). However, continuous data from 2008 – 2017 gives a fair ground for extrapolation and reasonable conclusion of status for 2019 -2020.

2008 – 2012 but then it has increased again and regains back to its previous level. Thus, the FTE level of employment in the EU seafood processing sector are the same in 2017 as in 2008.

Socio-economic data submitted by the Member States also suggest that most workers employed in the sector are women and that the proportion of male/female employees has been rather constant over time (STECF, 2019). Therefore, as in Norway, the seafood processing industry is a vital factor for employment of women, often in rural areas without too many job alternatives.

Table 5: European fish processing industry sector overview, 2008 - 2017

Variable	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Δ(2016-17)
Structure (number)											
Total enterprises	3,738	3,700	3,725	3,614	3,549	3,757	3,613	3,695	3,630	3,462	-5%
≤10 employees	1,959	1,936	1,987	1,964	1,897	2,105	1,974	2,067	1,938	1,840	-5%
11-49 employees	1,195	1,230	1,207	1,124	1,119	1,133	1,111	1,101	1,142	1,100	-4%
50-249 employees	504	458	454	450	455	442	446	449	471	449	-5%
≥250 employees	81	76	77	76	78	77	82	77	79	73	-8%
Employment (number)											
Total employees	129,429	125,502	125,583	124,873	124,524	125,486	127,449	128,790	132,964	130,664	-2%
FTE	118,502	114,813	116,185	115,843	114,369	114,510	115,922	116,082	120,160	118,110	-2%
Indicators											
Turnover (million €)	27,033.2	24,716.9	27,434.8	27,631.0	28,676.3	28,849.5	29,482.2	30,639.9	31,809.9	32,413.6	2%
FTE per enterprise	31.7	31.0	31.2	32.1	32.2	30.5	32.1	31.4	33.1	34.1	3%
Average wage (thousand €)	23.9	25.6	26.3	27.2	28.6	29.0	29.9	30.2	30.6	30.4	-1%
Unpaid work (%)	0.9	1.8	2.0	0.9	0.9	1.3	1.6	0.9	1.0	1.0	-1%

Source: STECF - 2019 Economic Report on the EU Fish Processing Sector, p. 25

Spain possessed the biggest fish processing industry in terms of number of enterprises and people employed, respectively constituting 15 % and 18 % of the total EU 25 figures. Italy and United Kingdom followed in terms of number of firms (respectively 18 % and 15 % of the total), France and Poland in terms of employment (both 16 % of the total). All these countries are main trading partners of Norwegian seafood export.

Note that average wages for a full-time worker within the EU was EUR 30.4 thousand in 2017. This is substantially lower when compared to Norway. Although it varies much within EU this makes the secondary processing of seafood competitive to similar economic activity in Norway.

Table 6: Economic performance of the EU fish processing industry sector, 2008-2017

Variable	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Economic performance (million €)										
Gross Value Added**	6,627.1	5,411.8	6,193.7	5,692.3	5,875.1	6,406.0	6,853.8	6,083.0	5,729.9	6,783.1
Operating Cash Flow**	3,861.1	2,539.6	3,197.5	2,622.7	2,690.4	3,156.6	3,449.2	2,660.2	2,114.7	3,267.1
Earning before interest and tax**	3,254.6	2,127.7	2,704.5	2,146.8	2,223.7	2,762.3	3,048.8	2,247.3	1,770.6	2,853.3
Net Profit**	2,883.0	1,782.6	2,304.5	1,856.5	1,977.2	2,497.3	2,791.8	2,163.6	1,810.9	2,800.7
Productivity and performance Indicators										
Labour productivity (thousand €)	55.9	47.1	53.3	49.1	51.4	55.9	59.1	52.4	47.7	57.4
Capital productivity (%)	53.6	43.9	43.4	40.1	39.3	42.8	43.8	38.5	36.2	43.2
GVA margin (%)	24.1	21.6	22.1	20.2	20.1	21.5	22.2	19.4	17.3	20.1
EBIT margin (%)	11.9	8.5	9.7	7.6	7.6	9.3	9.9	7.2	5.3	8.4
Net profit margin (%)	10.5	7.1	8.2	6.6	6.8	8.4	9.0	6.9	5.5	8.3
Return on Investment (%)	23.3	14.5	16.1	13.1	13.2	16.7	17.8	13.7	11.5	17.8
Financial position (%)	40.0	43.6	47.2	50.6	51.0	39.9	48.4	50.2	49.0	46.3

Source: STECF (2019); Report 19-15, p.30

Data documenting the economic performance of the industry reveal some interesting information relative to similar industry in Norway. In spite the fact that the EU industry is highly dependent on imported raw material, implying extra cost of sourcing, their overall economic performance has been stable (nominal values) over this recorded period (see Table 6 above). On the other hand – values of Gross Value Added (GVA), EBIT and Net Profit being approximately at the same level in 2017 as in 2008, means a certain decline in real terms. But, when looking at the economic performance indicators like *EBIT margin* [12] and Net Profit Margin, these indicators show significant better results compared to similar figures from the Norwegian industry. If we look at the three last recorded years (2015-2017), Table 6 above gives an average EBIT margin for EU seafood industry of 7 %. Similar for the Norwegian seafood industry[13] is only 1.3 %. Even more striking is the numbers for *Net Profit*: While EU industry had an average Net profit margin of 6.9 % for the last 3 years recorded, Norwegian seafood industry commenced only a mere 0.4 % in average.

6 Employment Effects in the EU Seafood Processing Industry

As stated in Chapter 2 we base our calculation on looking into the average market share of imports to EU. All import figures are recalculated to live weight, which gives more valid considerations when comparing EU's "own catch" and imports of many different product categories to EU. Some being more "value added" than others, influencing the employment effect within the common market substantially.

Knowing the fact that Norway is the most important supplier of raw material and semi processed seafood to the EU, we can say, by using a calculated average market share as basis for employment; the method chosen does not overestimate the effect, rather being modest considering the composition of seafood export from Norway.

In addition, we use data from research made in Norway (Richardsen, R. et al., 2019; Johansen, U. et al., 2020) to calculate the indirect employment effects from the seafood processing sector. That is typical suppliers of processing equipment, logistics, technical and financial services, and a variety of other input factors necessary for the total output from the industry. Subcontractors again have their own suppliers. Which means both 1st degree and 2nd degree of spin-off effects are included in our estimates. SINTEF has for many years calculated such spin-off effects from the fish processing industry in Norway. Assuming the structure of the EU fish

[12] EBIT = Earnings Before Interests and Tax

[13] Economic performance indicators for the Norwegian industry contains data separated for a) "consumer products" and b) meal and oil industry. Indicators presented here are for "seafood industry" exclusive fish meal and oil. See https://nofima.no/prosjekt/driftsundersokelsen-i-fiskeindustrien/

processing industry is not that different in this respect from Norway, we think it will be a 'best estimate' calculation using similar multiples as can be documented from Norwegian empirical data.

6.1 Direct employment effects

To calculate the direct employment effects on the EU fish processing industry of Norwegian export, we use the Norwegian proportion of EU's total resource base for the latest years. From Table 7 (below) we can see that Norway's market share of the total (volume) import is around 24-25 %. This is a significant increase from 2010 -2012 where the market share of EU import was varying between 19-21 %.

Further, based on the '*Total EU resource base for consumption*' 2015 – 2018 including own catch in the EU, we can see that the Norwegian supply accounts for an average of 18 % (17.75) in the period accounted for (Table 7). Norwegian share of total seafood for consumption in the EU has grown even more than the import share. In 2010-2012 approximate 10 % of the total seafood resource base in the EU came from Norway. Now, as we can see – this has increased significantly to 18-19 %. Stable consumption rates in the EU, but lower own catch and more import from third countries – in particular from Norway – explains much of the higher proportion by Norway.

Table 7: Total import to EU specified to product categories and Norwegian share, 2015 -2018

	2015		2016		2017		2018		NOR % of
	Imp tot	Imp NO	Imp tot	Imp NO	Imp tot	Imp NO	Imp tot	Imp NO	
White fish, wild capture (cod, saithe, redfish, haddock, hake, APO, hoki)	2 638 768	348 835	2 758 444	367 345	2 774 737	380 457			14 %
Salmon spp.	1 235 405	992 773	1 217 392	933 785	1 190 279	913 558			77 %
Tuna spp.	1 253 974	-	1 236 138	-	1 344 917	-			0 %
Herring spp.	272 346	199 014	298 485	236 358	297 438	234 441			79 %
Mackerel spp.	121 748	32 955	132 628	23 514	144 825	26 354			18 %
Other	3 467 759	5 627	3 602 913	3 916	3 427 804	3 135			0,1 %
Total import (live weight)*	8 990 000	2 210 886	9 246 000	2 190 885	9 180 000	2 181 123	9 410 000	2 317 000	
Norwegian market share of EU import		25 %		24 %		24 %		25 %	
Total EU, catch + production + import	15 441 000		15 481 000		15 867 000		14 720 000		
Non food	938 000		711 000		1 077 000		1 077 000		
Exports to third countries	2 012 000		1 977 000		2 114 000		2 240 000		
Total EU resource base for consumption	12 491 000		12 793 000		12 676 000		12 480 000		
Norwegian market share of total supply		18 %		17 %		17 %		19 %	

Source: SINTEF calculations based on EUROSTAT – Comext Statistics published by AIPCE 2019.
Note: All volumes recalculated to live weight

From Table 5 we can see that the EU fish processing sector engaged some 130,000 people in total. Converted to full time equivalents (FTE) this means that the EU fish processing sector gave employment for 118,100 FTE in 2017 (STECF, 2019). The number is somewhat higher than 2010 – 2012, but the same size of employment as in 2008. In other words; The size of employment in the seafood processing sector in the EU is rather stable in total, in spite structural changes and internal shift in volumes between member states.

From Table 7 (above) we can see that Norwegian seafood export has increased its share of the seafood market in the EU, and also, its share of the total resource base for processing industry sector. The volume of the total import to the EU was 25 % (2018), while the Norwegian share of the total resource base (of seafood) varied between 17 – 19 % in the period 2015 -2018.

This means that of the total of 118,000 Full Time Equivalent employment (FTE) in the EU in 2018, approximate 21,000 FTE (21,240) was directly related to import of Norwegian raw materials for the industry. This is a substantial increase in 'employment effect' of Norwegian seafood export to EU compared to previous report estimating for the period 2010 -2013 (Richardsen & Henriksen, 2014). That report gave an estimate of 11-12.000 FTE in 2012 – now increased to 21.000 FTE in 2018. This is due to several development characteristics:

- Increased market share of Norwegian seafood of total EU import (19-20% -> 25 %)
- Declining EU own catch/production
- Leads to significant increase in Norwegian share of EU's total resource base of seafood for human consumption
- Some increase of employment in the EU seafood processing sector due to less import of seafood from China, i.e., more value-added processing internal in the EU
- Some 75 -85 % of the Norwegian export needs further processing

6.2 Spin-off employment effects

Additional to direct employment effects, any economic activity also creates spin-off effects to related sectors of the economy. To calculate 'spin-off' (indirect) effects of one economic activity (here: seafood processing) needs detailed macroeconomic data. Such data for the whole economy normally needs thoroughly elaboration and analysis. However, in this report we can calculate the indirect effect of economic activity created by the seafood industry by using available data from Norway, where SINTEF, funded by The Norwegian Seafood Research Fund (FHF), has made a series of reports on spin-off effects from the total activity of the Norwegian seafood industry.[14]

In Table 8 we provide data of the "employment multiples" documented from Norwegian fish processing industry 2004 – 2019 (Richardsen, R. et al., 2019; Johansen, U. et al., 2020). Note that this is the spin-off effect on employment in other related industries based on the economic activities in the fish processing industry. So, these multiplies do not include spin-off effects from fishing activities, aquaculture (farming), etc.

Table 8 Wider impacts to other industries in Norway based on the fishery industry

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average 2004-2019
No. FTE in seafood industry	8575	7900	7750	7850	7800	8150	8000	8250	8575	8800	9025	8875	9050	9300	9300	9700	8556
Spin-off effect in releated industries (FTE)	6016	5737	6167	6530	6180	7528	7335	6929	6868	8153	9228	11474	14104	10589	11163	11350	8460
Spin-off FTE / Seafood industry FTE	0,70	0,73	0,80	0,83	0,79	0,92	0,92	0,84	0,80	0,93	1,02	1,29	1,56	1,14	1,20	1,17	0,98

Table 8 indicates an increasing level of spin-off effect from primary seafood processing to economic effects on other sectors in the Norwegian economy. The increased spin-off effect here can be explained by a steady increase in labor productivity – which again is caused by substantial investments in new technology and machinery for processing of seafood. This makes the employment rate in the primary sector (seafood processing) rather stable, but demand to other suppliers increase, thus implying positive (increased) employment effects to related economic sectors. STECF (2019) observe the same pattern of structural

[14] We assume that spin-off effects (multiplies) measured to other sectors in Norway are not far away from other European countries and as such gives a fair estimate for EU. This presumption can be discussed, and will normally vary to some degree depending on the industrial structure in each country. However, the structure of seafood processing in Europe is quite similar, level of technology being much the same -except for a few Eastern European countries. Thus, as a presumption for EU we believe spin-off effects measured for by a long time-series will give a good estimate.

change within the EU. Therefore, lacking better options, we choose the average of employment multiplies from the same industry sector in Norway for the whole period 2014-2019. This causes a somewhat lower multiply than extracting the latest years, but presumably prevent overestimation of spin-off effects.

If the EU fish processing industry gives similar effects on related industries within EU, we can calculate the indirect employment effect as follows:

Average multiple for the whole period is 0.98.

Spin off employment = Direct employment effect (21,000) x average multiple (0.98) = 20,500 FTE

7 Conclusion

Based on calculations on best available data (2017-2019) we can conclude the employment effect of Norwegian seafood export to EU.

Direct employment effect in the EU fish processing industry:	21,000 FTE
Spin-off effects in related EU economy sectors:	20,500 FTE
Total effect of Norwegian seafood/EU employment	**41,000 FTE**

As a main conclusion, Norwegian seafood, including aquaculture, creates more jobs in the EU than it does in Norway. While Norwegian direct employment in the fish processing industry roughly fluctuates around 10 - 11,000 full time employees, export to the EU creates around **21,000 full time jobs** in the EU industry. Using the same spin-off effect as documented from Norway means Norwegian seafood export gives full time employment for some **41,000 persons** within the EU. This might be seen as a paradox, but has several (economic) explanations:

1. **Cost of labour**
   Fish processing is still rather labor-intensive. Although a steady tendency towards automation of some of the processes involved, processing seafood raw material still need skilled workers. It is well known that the cost of labor in Norway is much higher than the average EU level. For example, the average wage in the EU processing industry was EUR 30.400 in 2017 (STECF, 2019). In Norway the cost for a full-time employee would be around EUR 45- 48,000, social costs included. Some costs disadvantages have been compensated by a steady improvement in labor productivity, but as long as there are no significant barriers of entry for technological innovations, Norway cannot eliminate a higher production cost easily.

   Poland is a good example of the effect of lower cost level leading to competitive advantage in industrial processing. The fish processing industry in Poland is strong and still developing. A major explanation is the fact 'the cost of goods and services' in Poland are 40% lower than EU average, while Norway, on the other hand, are 44% higher than EU average. (Indexed to 144 (EU= 100).[15]

   Poland has become a competitive seafood processing unit for import from Norway and re-export to other EU member states.

2. **Trading tariffs**

[15] Statistics Norway/Statistisk sentralbyrå: Sammenligning av prisnivå i Europa. Statistikk for 2019. https://www.ssb.no/priser-og-prisindekser/konsumpriser/statistikk/sammenlikning-av-prisniva-i-europa
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The nature of trading tariffs between Norway and EU market is such that "the less processed – the less custom duty." Originally, import taxes are used to protect primary producers to foreign (cheaper) competition, but can have a reverse effect on the processing industry established to process value added products for the consumer market when national resources become scarce – as it is with seafood. Anyway, differentiation of import duties can explain why many Norwegian companies – related to processing of farmed salmon – have invested heavily in processing facilities within EU, rather than in Norway. We find several processing units established within vital EU countries, in particular France, Poland, Netherlands, Belgium, and Sweden.

High import tariffs to value-added products adds to the negative side of Norwegian competitive disadvantages compared to EU processing industry.

3. **Marketing issues**
   Market competence is a vital issue for success at the highly competitive consumer level. Investing in such competence is costly, and a barrier of entry for many rather small processing companies in Norway. Production of consumer value added products in Norway then need an "extra" competence on top of economic competitive cost of production compared to "native" processing units.

4. **Quality issues**
   It is well known that natural skin-on products keep quality parameters better than processed, skin-off, pinbone-out products. With fresh fish products, which for many years have been the innovative product category in the EU retail sector, this gives a prolonged shelf life throughout the value chain. Thus, giving processing units "nearest possible the consumer end" a competitive advantage.

Regarding seafood, there is a strong interdependency between Norway and the EU. Norway is the most important country to supply seafood to the consumer markets in Europe. Totally some 1.5 – 1.6 million tons each year accounts for around 25 % of total import to EU-27. At the same time EU is the most important consumer market for seafood from Norway, increasing from 50 – 55 % in 2012/14 to 64 % of total export volumes in 2020. Norway is even one of top two markets for export of marine products from EU, taking 13 % of exported goods, mostly fish oil and fish meal for aquaculture feed production.

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A Appendix 1

Table A1 Export by destination continent – value and volume period - 2015-2019

Measures		Value 1000 NOK						Volume in MT					
		2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Continent	Area	2 157 742	1 589 952	1 755 550	1 711 384	2 200 880	2 226 609	121 566	85 980	112 160	94 141	153 196	139 561
Africa	Africa												
Africa		2 157 742	1 589 952	1 755 550	1 711 384	2 200 880	2 226 609	121 566	85 980	112 160	94 141	153 196	139 561
Asia	Other Asia	3 693 905	4 993 472	5 817 823	6 461 689	8 251 288	7 128 614	175 965	203 707	246 178	205 927	231 972	210 610
	Japan	3 245 001	4 404 779	4 080 443	3 921 640	4 338 948	4 225 837	112 272	119 231	114 433	108 404	95 545	104 873
	Middle East	1 447 013	2 027 410	2 223 820	1 982 207	2 534 065	2 505 095	32 865	33 398	35 628	34 695	41 055	41 296
	South East Asia	4 002 947	5 957 168	6 565 022	5 277 622	6 212 840	5 375 073	110 317	123 126	143 801	128 380	137 479	130 463
Asia		12 388 865	17 382 829	18 687 108	17 643 159	21 337 141	19 234 620	431 418	479 463	540 041	477 406	506 051	487 242
Europe	EU	49 729 585	61 197 960	60 863 284	65 941 850	68 287 255	69 278 561	1 683 508	1 539 703	1 572 236	1 704 149	1 605 004	1 726 507
	Other Europe	558 022	470 875	472 118	606 887	595 697	444 726	77 543	39 714	51 593	108 522	47 388	14 028
	East Euorpe	3 062 593	3 201 056	3 521 582	3 595 656	4 252 878	4 041 149	175 540	156 798	180 569	171 802	167 554	157 165
Europe		53 350 199	64 869 891	64 856 984	70 144 394	73 135 831	73 764 436	1 936 591	1 736 215	1 804 397	1 984 473	1 819 945	1 897 700
North America	Carribean	538 498	564 244	576 895	618 837	649 133	824 777	15 334	16 709	18 456	20 617	21 004	24 121
	Other America	136 403	130 276	166 273	152 453	174 741	137 489	2 907	2 733	3 113	2 697	2 831	2 522
	North America	751 062	674 945	719 904	575 126	719 540	788 870	18 791	14 031	14 741	10 591	12 928	17 323
	USA	3 298 616	4 623 776	5 664 859	6 009 652	6 677 561	6 865 308	59 325	69 747	79 331	81 999	79 593	85 040
North America		4 724 579	5 993 241	7 127 932	7 356 068	8 220 975	8 616 444	96 357	103 220	115 641	115 905	116 355	129 007
Oceania	Oceania	317 506	344 701	357 148	424 609	465 566	351 891	3 718	3 399	2 957	3 891	4 062	3 338
Oceania		317 506	344 701	357 148	424 609	465 566	351 891	3 718	3 399	2 957	3 891	4 062	3 338
South America	South America	1 025 646	848 073	1 166 829	1 030 421	1 120 487	806 339	45 339	44 127	54 036	54 145	62 744	58 012
South America		1 025 646	848 073	1 166 829	1 030 421	1 120 487	806 339	45 339	44 127	54 036	54 145	62 744	58 012
Unknown		512 640	530 072	500 178	652 888	726 712	719 381	2 413	2 353	2 454	3 293	3 164	2 904
Total		74 477 177	91 558 759	94 451 729	98 962 921	107 207 591	105 719 719	2 637 403	2 454 757	2 631 686	2 733 254	2 665 517	2 717 764