Nordic Council of Ministers

Nordic and North European Flatfish Value Chains

Contents

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1 Foreword

This report provides an overview of the Nordic flatfish sector; especially focusing on stock status, catches, values, handling, processing, trade, and markets. The report is the outcome of a collaboration project, The Nordic Flatfish project, that was supported by the Nordic Council of Ministers Working Group on Fisheries (AG fisk). The project had the objectives to study the Nordic flatfish value chains and the significance of Nordic supplies within the North-European flatfish value chains. The project was as well intended to facilitate networking and cooperation between stakeholders in the Nordic flatfish value chains, and potentially contribute to a common strategic planning by suppliers or Nordic authorities and/or cooperation in sales and marketing of flatfish from the Nordic countries.

The project consortium consisted of five industry representatives and five representatives from research institutions. Six of the participating organisations were from the Nordic countries and three were from countries that are important for the Nordic flatfish sector. The project partners and responsible representatives were as follows:

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  - Gunnar Þórðarson
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- **University of Copenhagen – Department of Food and Resource Economics (IFFRO), Denmark**
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  - Erling Larsen
- **Nofima, Norway**
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  - Tønnes "Kaka" Berthelsen

2 Summary

The objective of this report is to provide an overview of the Nordic flatfish sector; especially focusing on the significance of Nordic supplies within the North-European flatfish value chains, stock status, catches, values, handling, processing, trade, and markets. The hope is that the overview can provide Nordic stakeholders with better understanding on the flatfish value chains and potentially facilitate increased cooperation among Nordic Flatfish suppliers and authorities, with the aim to increase value of these resources for the Nordic seafood sector.

The Nordic countries represent 5% of global flatfish supplies and has significant share in total supply of six species, of which there are only two species (Greenland halibut and European plaice) that can be considered to be of any major importance with respect to volume and value. The report focuses therefore on these two species, as well as on sole (European sole and lemon sole) which are important for some fleet sections.

The report shows that there are similarities in the value chains of plaice and sole. The fish are caught largely in the Northern part of Europe and the consumption takes place in Europe, chiefly in the Netherlands, Italy and Germany. The main intermediary actor in the value chains between supply and consumption is the Netherlands; they act as a supplier, importer, processor and exporter as well as being a large consumer of the fish. Greenland halibut has however a completely different value chain to that of plaice and common sole. The fish is caught in the high north Atlantic and the main suppliers are the Nordic countries Greenland (Denmark), Iceland, Faroe Islands and Norway as well as Russia and Canada. The main market is Asia, not Europe.

Due to the limited share of the Nordic countries in total European and global supply of flatfish, the extremely strong position of the Dutch industry within European flatfish value chains, and seemingly modest profit margins throughout these value chains; it is difficult so see how increased Nordic cooperation could contribute to further value creation for the Nordic seafood sector. The exception is that there might be opportunities for a Nordic cooperation between Denmark and Iceland in processing and marketing of plaice, as these countries are a relatively large global suppliers with a 30% share of the supply, and the average prices for whole plaice in Iceland is low compared to mainland Europe.

3 Introduction

The Nordic countries consider themselves important suppliers of various flatfish species to markets in Europe, US and Asia. These species include for example European plaice, American Plaice, dab, witch, lemon sole, common sole, halibut, Greenland halibut, megrim, turbot and many more. These are all valuable and nutritious species; and the final products are highly sought after at demanding markets. The Nordic flatfish industry is however struggling because of seasonal fluctuations, low market share and the fact that the Nordic industry is primarily a raw material supplier and not producing final products. The processing, including filleting and other value adding, is largely done outside of the Nordic countries, for example in the Netherlands, UK, Germany and Poland. This has resulted in a relatively small part of the final product value being paid to the Nordic fishermen.

The objective of this report is to provide an overview of the Nordic flatfish sector; especially focusing on stock status, catches, values, handling, processing, trade, and markets. The report is the outcome of a collaboration project, The Nordic Flatfish project, that was supported by the Nordic Council of Ministers Working Group on Fisheries (AG fisk). The project had the objectives to study the Nordic flatfish value chains and the significance of Nordic supplies within the North-European flatfish value chains. The project was as well intended to facilitate networking and cooperation between stakeholders in the Nordic flatfish value chains, and potentially contribute to a common strategic planning by suppliers or Nordic authorities and/or cooperation in sales and marketing of flatfish from the Nordic countries.

One of the challenges the Nordic flatfish sector is facing is the lack of transparency within the flatfish value chains. Knowledge on supplies, logistics, where processing takes place, what is produced, where the products go and where the value adding takes place are among the issues that could be more transparent. This report attempts to answer these questions, as its focus is on analysing the value chains of the two most important flatfish species supplied by the Nordic seafood sector, that is European Plaice (*Pleuronectes platessa*) and Common Sole (*Solea solea*); their stock status, catches, values, handling, processing, exports, markets and trends on market. Additionally, the report covers the value chain of Greenland halibut (*Reinhardtius hippoglossoides*) which has a very different value chain to the other flatfish species. These three species dominate the European flatfish sector in volume and value and are broken down into three different value chains in this report using publicly available data. Landings in EU28 and the Nordic countries have been relatively stable in recent years, which is why this report primarily focuses on statistical figures for one year, 2018.

4 The significance of Nordic flatfish in global supplies

Nordic fishermen generally consider themselves important suppliers of various flatfish species and are concerned that they are not receiving fair share of the final product value. However, when analysing the global supply of flatfish, it is evident that the Nordic countries' contribution is very limited. Global wild capture flatfish supply is around 2.5 million tonnes (FAO, 2018) of which the Nordic countries represent 5%. The Nordic countries do however supply significant share of global supply of six flatfish species, as shown in Table 1.

Table 1: Nordic and Global flatfish landings in 2018

Species	Denmark	Greenland	Faroe Islands	Finland	Iceland	Norway	Sweden	Global	Nordic supply
Greenland halibut	-	42.353	3.750	-	15.239	17.772	-	133.881	59%
Lemon sole	1.071	-	261	-	1.715	48	9	7.278	43%
Atlantic halibut	183	17	14	-	139	2.713	8	9.222	33%
Witch	1.294	-	1	-	867	277	162	8.115	32%
Dab	1.607	-	11	-	445	28	5	6.804	31%
European plaice	16.916	-	290	-	8.342	718	171	89.563	30%
American plaice	72	-	8	-	35	179	-	7.358	4%
Megrim/ Megr. nei	61	-	-	-	369	36	-	18.297	3%
Common Sole	722	-	-	-	-	5	16	29.817	2%
Other	9.543	-	-	3	275	42	-	2.189.665	0%
SUM	**31.469**	**42.370**	**4.335**	**3**	**27.426**	**21.818**	**371**	**2.500.000**	**5%**

Sources: Adapted from (FAO, 2022), (Fiskeristyrelsen, 2022), (Statistics Greenland, 2022), (Statistics Faroe Islands, 2022), (LUKE, 2022), (Statistics Iceland, 2022), (Statistics Norway, 2022)

Greenland halibut and plaice are by far the most important species on the list for the Nordic countries, and the only Nordic species of significant global importance. The other species are in limited supply and can therefore only be considered as replacement- or niche products. The exception is common sole supplies from Denmark, which despite only amounting to just over 700 tones (2% of global supply) is of significant value for the Danish seafood sector.

Based on the above, it is safe to say that in general the Nordic Seafood sector is not a significant global supplier of flatfish and has therefore limited opportunities to have an impact on markets or prices. Whether Nordic fishermen are receiving fair share of the final product value is another question, which is attempted to be answered in this report.

5 Seafood value chains

There are many different definitions available for value chain, one of which comes from Kaplinsky & Morris (2000), which states that "the value chain describes full range of activities which are required to bring a product or service from conception, through the intermediary phase of production, and delivery to final consumers, and final disposal after use". In a similar way, Kogut (1985) talks about the value-added chain and describes it as "a process by which technology is combined with material and labour inputs, and then processed inputs are assembled, marketed, and distributed. A single firm may consist of only one link in this process; or it may be extensively vertically integrated...". Porter (1980) also put great emphasis on the strategic position of companies in what he calls the value system, which is the embedded value chain from suppliers to buyers.

The way information and knowledge are distributed is essential for efficiency and productivity of a value chain and therefore a very important part of actors' relationship and cooperation. Information from upstream actors on product matters needs to flow down the value chain to the market, and from the market to downstream actors. Information also needs to flow the other way, from the market to the suppliers, for instant specification and information on how to satisfy the customer with unique requirements (Galbraith & Kazanjian, 1986).

Describing and analysing seafood value chains is often quite complicated, as they are generally long and fragmented, sometimes consisting of integrated companies and trade across borders. Flatfish processing is in addition often divided into primary and secondary processing. Figure 1 shows how a typical value chain could look like in theory, and then how it actually operates (Blumberg, Cooper, & Schidler, 2000).

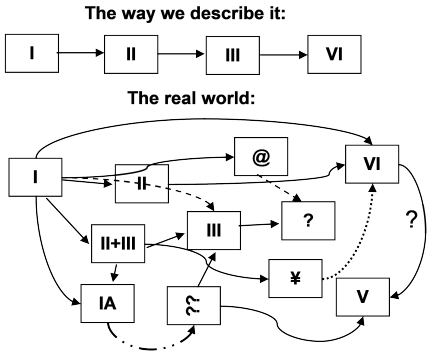


Figure 1: Value chains of seafood are often much more complicated than one might think

Source: (Blumberg, Cooper, & Schidler, 2000)

A simple classification of the value adding in the value chain of seafood can be described as:

- Farmgate price (landing value)
- Primary processing price
- Secondary processing price
- Wholesale price
- Retail price

For most Nordic flatfish species there is a lack of transparency in the value chains, and understanding on where the value adding takes place, and why.

6 The Nordic and North European flatfish value chains

Flatfish is a general term for several marine fish species. In the North-Atlantic, North Sea and other European marine waters, sole and plaice are the most important ones. However, turbot, brill, dab, lemon sole, Greenland halibut, megrim and flounder are also of importance. The value chain(s) of flatfish appear rather simple, with fishing, primary processing, secondary processing, distribution and consumption as the main pillars, as shown in Figure 2.

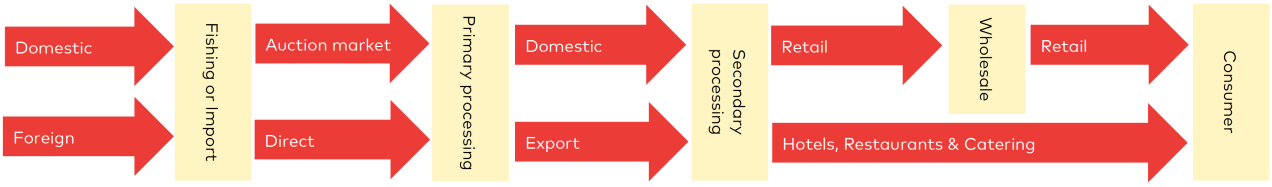


Figure 2: An overview of the flatfish value chain

The value chains are however more complicated than they appear at first, as they span over multiple fleets, countries, products, markets, outlets etc.

Plaice, common sole and Greenland halibut are the most important flatfish species in EU 28, Norway and Iceland; representing 92% of the supply. Plaice and common sole are traditional flatfish species, sold and distributed mainly within the European market, but Greenland halibut is mainly sold frozen and headed to Asia, primarily to China, Taiwan and Hong Kong.

The main fishing nations for flatfish in Northern Europe are the Netherlands, United Kingdom, Denmark, France, Iceland, Norway and Belgium. For Greenland halibut, Greenland, Norway and Iceland are the main fishing nations and exporters. Flatfish aquaculture farming is a relatively small business in Europe, mainly consisting of turbot and sole farming in Southern Europe.

Landings in EU28 and the Nordic countries have been relatively stable in recent years and the flatfish stocks in northern Europe are generally in good condition and quotas have therefore been relatively stable. Total flatfish quotas have been around 430 thousand tonnes, with plaice, common sole and Greenland halibut accounting for 92% of the total flatfish quotas. The quotas (TACs) have however not been fully utilised in recent years, particularly for plaice.

7 The value chains of the three main flatfish species

European plaice, common sole and Greenland halibut dominate both the Nordic and European flatfish sectors in volume and value. This report does therefore focus on these three species. Following is an overview of the value chains of these species, catches, stock status and future outlooks.

7.1 Plaice

Catches of European plaice (*Pleuronectes platessa*) worldwide were 89,563 tonnes in 2018, while catches of American plaice (*Hippoglossoides platessoides*) were 7,358 tonnes (FAO, 2022). All European plaice is caught in Europe, which is also the case for a largest part (77%) of the American plaice. In other words, plaice originates almost solely from Europe.

7.1.1 Supplies and markets

The total catches of European plaice in the Nordic countries were 26,436 tonnes in 2018. Denmark (16,988 tonnes) and Iceland (8,376 tonnes) were the only suppliers of significant importance, with catches in each of the remaining Nordic countries forming less than 1,000 tonnes. The Nordic catches accounted for 30% of total catches of European plaice in 2018.

The main suppliers outside the Nordic area are the Netherlands (26,378 tonnes), United Kingdom (12,372 tonnes), Russia (9,231 tonnes) and Belgium (7,183 tonnes). The European Union, United Kingdom and the Nordic countries therefore accounted for 90% of the global supply of European plaice in 2018.

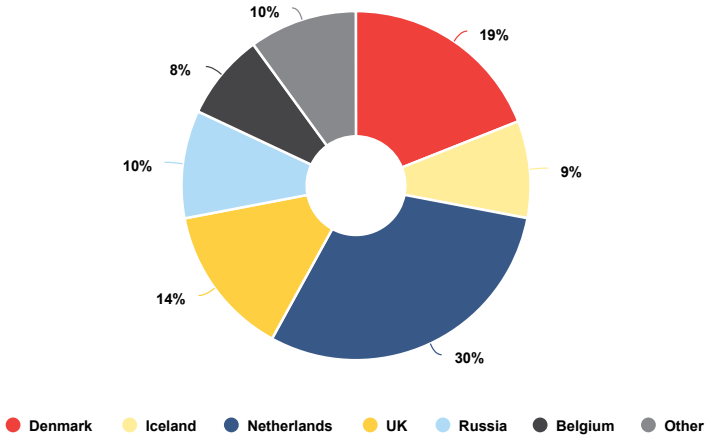


Figure 3: Main suppliers of European plaice in 2018

Source: (FAO, 2022), picture: fauna.is

The main stock is North Sea plaice with 65% of the supply or 57,800 tonnes in 2018. The stock is within safe biological limits and fishing mortality is sustainable (ICES, 2022a). The remaining supply originates from several origins, including catches from a number of small stocks in waters surrounding Britain and in the Baltic Sea, as well as from Icelandic and Russian waters. The spawning-stock biomass for plaice is above the Maximum Sustainable Yield (MSY) the Irish Sea, the Eastern and Western English Channel, the North Sea, Skagerrak, Kattegat, Belt Sea, the Sound, and the Baltic Sea (in the ICES areas 7a, 7d, 7e, 4, 3A and subdivisions 21–32). All areas have seen an increase in the spawning-stock biomass at least since 2015. The exception is the Eastern English Channel, where fishing mortality has decreased in all areas during recent years. However, fishing mortality remains above the mortality corresponding to MSY for Kattegat, the Belt Sea, and the Sound in addition to the Eastern English Channel. Plaice is a Category 1 stock in the North Sea, Skagerrak, Kattegat and Eastern English Channel (ICES areas 4, 3a, subdivisions 21–23, 7a and 7d). In the Western English Channel and in the Baltic Sea (ICES areas 7e and subdivisions 24–32) plaice is a Category 3 stock.

Plaice is mainly caught using bottom and beam trawl; pulse trawling and gillnets are also applied. Dutch fishers use beam trawl, with pulse trawling being common, while fishers in the Nordic and other European countries mainly use bottom trawl. Plaice and sole are often caught simultaneously, implying that it is not fully possible to limit the catch to the target species.

Figure 4: Dutch beam trawler

Picture: Herman IJsseling/Flying Focus

The international trade of European plaice between countries was valued at 204 million EUR in 2018, where Netherlands accounted for 53% of the exports and 33% of the imports, as shown in Figure 5. Italy represented 26% of the imports, of which 89% came from the Netherlands. Iceland, Denmark and Belgium were net exporters, whilst Germany imported twice as much as they exported.

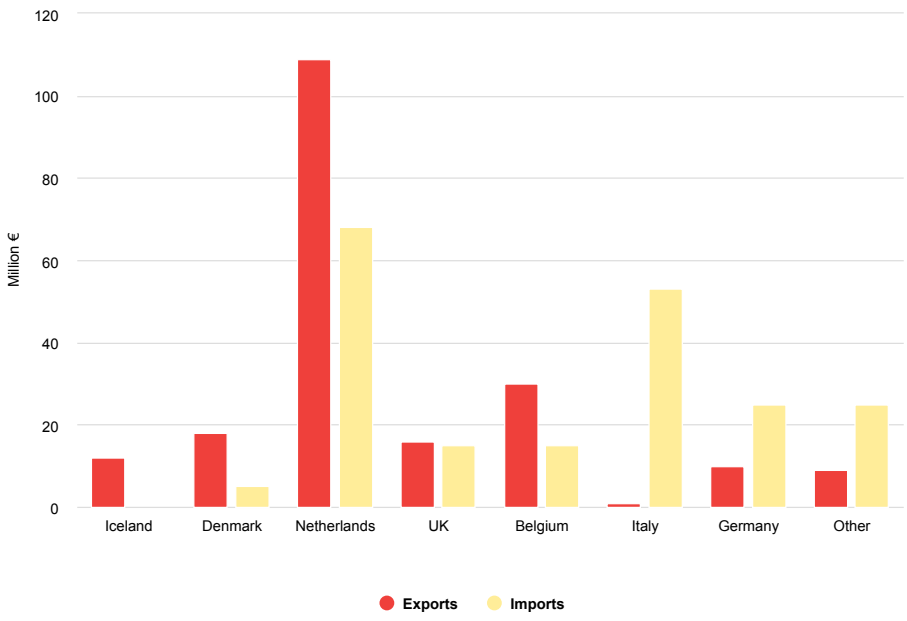


Figure 5: Trade of European place between countries in 2018

Sources: (EuroStat, 2021) (Statistics Iceland, 2021a)

The figure shows the trade flows of European plaice between the main suppliers and buyers (countries) in 2018. What the figure only partly reveals is that plaice is typically traded across borders several times before it reaches the final buyer and consumers. The Netherlands, Belgium, Denmark, UK and Iceland are the main suppliers. The Netherlands is by far the most important country in the value chain, with substantial imports of plaice that is processed and/or used for re-export to the final markets. The main end markets are in Italy, Germany, Belgium and the UK.

In the main supplier countries, plaice is consumed domestically, but besides that, these countries have a substantial export of raw materials. Italy is solely a consumer country. That reveals a value chain with suppliers in Northern Europe, with the Netherlands as the core intermediate player and with Italy, Germany, Belgium and the UK being the main destination and consuming countries.

The trade values shown in Figure 5 do not distinguish between whole and processed fish. This distinction is however indicated in Figure 6, which provides an overview of the European plaice value chain with the three elements: suppliers (fishing), processing and wholesale, and final consumption. The figure shows that the main suppliers of European plaice are the Netherlands, Denmark, UK and Iceland. It also shows that the final markets are in mainly in different parts of Europe.

These value chains only cover some of the route's plaice takes from sea to consumption; several other routes also exit. For example, plaice is consumed domestically in the country of catch. The catches in Figure 6 represent 73% of the global supply of plaice, 44% of the processing and wholesale and 74% of the consumption.

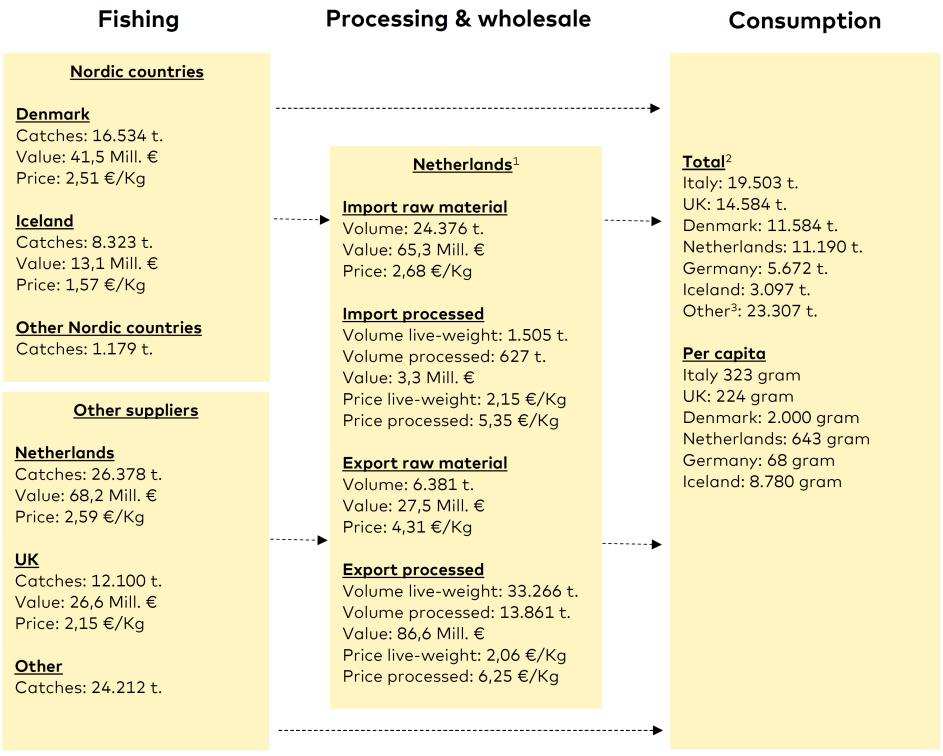


Figure 6. The European value chain for plaice in 2018

Notes:

[1] Plaice import and export cover the following codes in the Harmonized System for raw material: 03022200 Fresh and chilled whole plaice *Pleuronectes platessa* and 03033200 Frozen whole plaice *Pleuronectes platessa*. For processed plaice, the following codes in the Harmonized System are included: 03042071, 03042971 and 03048310 Frozen fillets of plaice *Pleuronectes platessa*.

[2] Consumption nationally is calculated as catches plus import minus export. All quantities are in live weight with fillets converted to live weight using a conversion factor on 2.4.

[3] Consumption in other countries is calculated as total global catches minus consumption in the above-mentioned countries.

Sources: (Danish Directorate of Fisheries, 2021a) (Statistics Iceland, 2021b) (STECF, 2021) (Marine Management Organisation, 2021) (EuroStat, 2021)

The Netherlands is both the largest fishing nation of plaice and the most important processing and wholesale country. The domestic plaice supply of 26,378 tonnes in 2018 was supplemented by imports of 24,376 tonnes of raw material, while a minor amount of plaice fillets of 1,505 tonnes live-weight were also imported. Export of unprocessed plaice was 6,381 tonnes and fillets were 33,266 tonnes live weight. Hence, three-fourth of the deliveries were exported.

Italy was the largest plaice consumer country in 2018 with an estimated total consumption of 19,503 tonnes, mainly consisting of fillets. The UK, Denmark and the Netherlands follow, with 14,855, 11,584 and 11,190 tonnes respectively. Per-capita consumption, however, differ substantially with Iceland being the highest with 8,780 gr., followed by Denmark with 2,000 gr., the Netherlands with 643 gr. and Italy with 323 gr (FAO, 2021a). For unprocessed whole plaice, Germany and Belgium are also important consuming countries.

The plaice value chain was identified using available statistics. However, as trade in breaded plaice and plaice in ready meals is not available separately in the statistics, it was not included in the calculation. Further, as waste in processing is not known, it was not included in the calculation. Plaice fillets were converted into live weight using a conversion factor of 2.4 (42% yield on filleting). This conversion factor is an estimation and may vary from company to company, season, fishing grounds, and size. These data limitations reduce the accuracy of the identified value chains in relation to where the plaice is consumed. For example, if breaded plaice is produced in Denmark and exported, it erroneously counts in the calculation of consumption figures for Denmark. However, the amount is assessed to form a limited share of total trade in plaice, since it is often cheaper for the producer to use other flatfish species in the product where the consumer cannot directly perceive or identify the species.

Landing prices in 2018 were similar in the Netherlands, Denmark, and the UK (2.15–2.59 €/kg.), while being considerably lower in Iceland (1.57 €/kg.). The low landing price in Iceland may partly be due to the distance to the European market, inducing higher transportation costs. The vertical integration of fishing and processing in Iceland is also known to reduce landing prices of several species. For Iceland, export prices are therefore a more reasonable measure for comparison purposes. The export price of whole plaice from Iceland was 2.29 €/kg., close to the corresponding export price e.g., from Denmark of 2.75 €/kg. Hence, while prices are lower in Iceland, the difference is less pronounced than indicated by landing prices.

The raw material import prices of plaice to the Netherlands are on the same level as the landing prices. This is due to several fishers from countries surrounding the North Sea that land directly in Dutch ports.

Export raw material prices of plaice from the Netherlands in 2018 were 4.31 €/kg and for fillets 2.60 €/kg live weight. These prices reflect that two market segments exist. One market segment for high quality large plaice sold whole at a high price and another market segment for fillets of plaice sold largely at the same price as the average landing prices, despite being processed and subject to costs of processing. Such situation can only appear since the highest quality, corresponding to the largest sized plaice, is exported whole to meet demand by fishmongers and at restaurants, while the remaining part of the plaice is sold as frozen fillets in large quantities mainly in supermarkets.

The market segmentation is reflected in the landing prices of large and small plaice in Denmark, as shown for the 2012–2020 period in Figure 7.

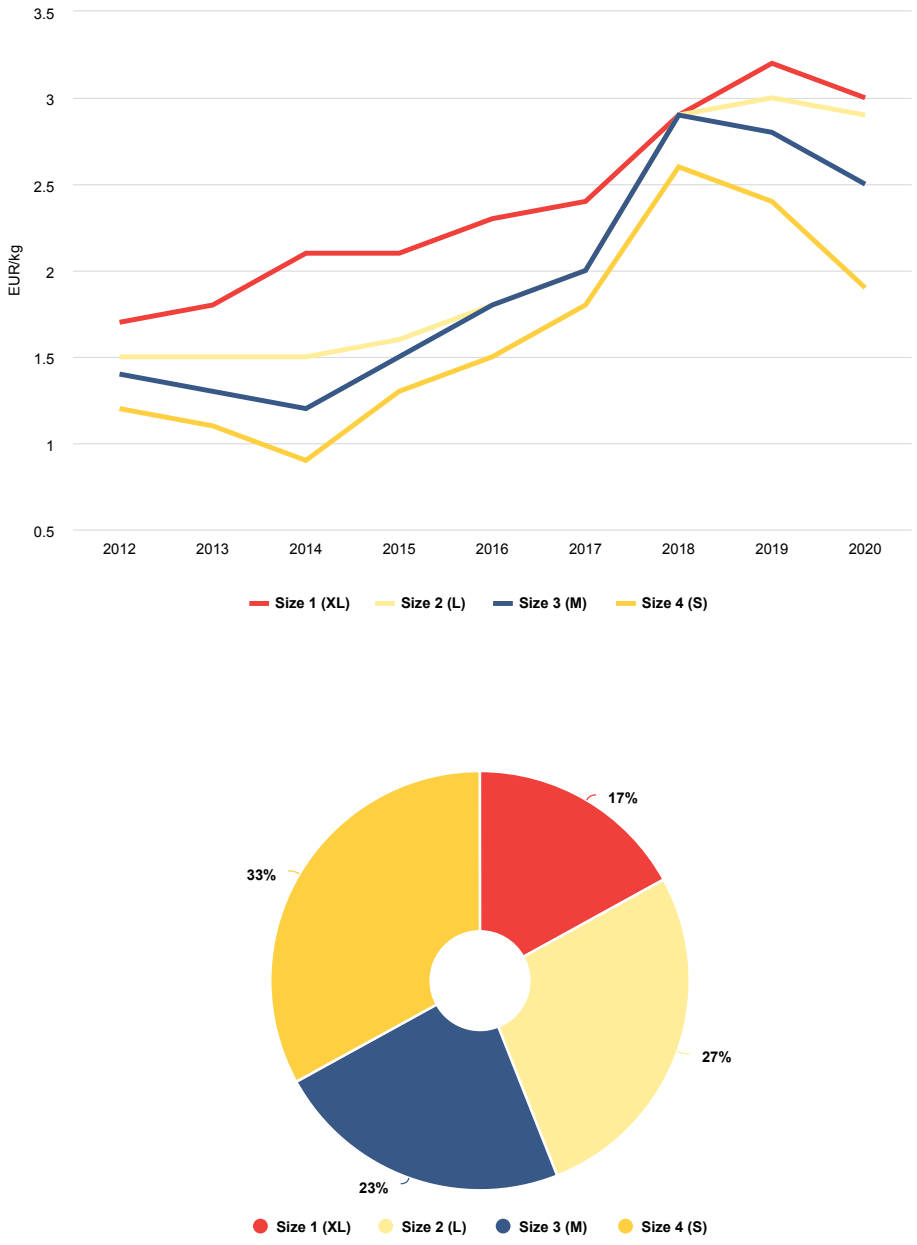


Figure 7. Landing prices of different sizes of plaice in Denmark, 2012–2020, and the proportion of the volume of each size group in total landings

Source: (Danish Directorate of Fisheries, 2021b)

The landing prices increase with the size of the fish, with the price of the largest plaice (size 1) being 2.93 €/kg in 2018 and the price of the smallest fish being 2.62 €/kg. The price of the largest plaice is 12% higher than that of the smallest plaice and 5% higher than the average price. It also appears from Figure 7 that prices of the different sizes follow each other over time, with relatively minor fluctuations. Hence, while the prices of all the different size classes may be formed within the

same market, prices of the larger plaice may partly be formed at its own niche in that market. The largest plaice does, however, only provide 17% of the Danish landings.

The implication is that the Dutch export of whole plaice is mainly large-sized fish, while the Dutch export of fillets of plaice are mainly based on the smaller size classes. The Dutch export price of whole plaice was 4.31 €/kg in 2018, whilst the Danish landing price of size 1 plaice was 2.93 €/kg. The corresponding "margin" for Dutch export of fillets is close to zero, with the Dutch export price on fillets in live weight being the same as the Danish landing price of size 4 plaice. This suggests that the profitability of Dutch wholesale companies trading whole fresh (unprocessed) plaice is substantially higher than of companies processing fillets.

The global supply development of plaice and the Dutch import price of raw material are shown in Figure 8 for the period 2005–2019. The Dutch import raw material price of plaice is selected as most plaice goes through that value chain and partly as the Netherlands is the main direct market for plaice from the Nordic countries.

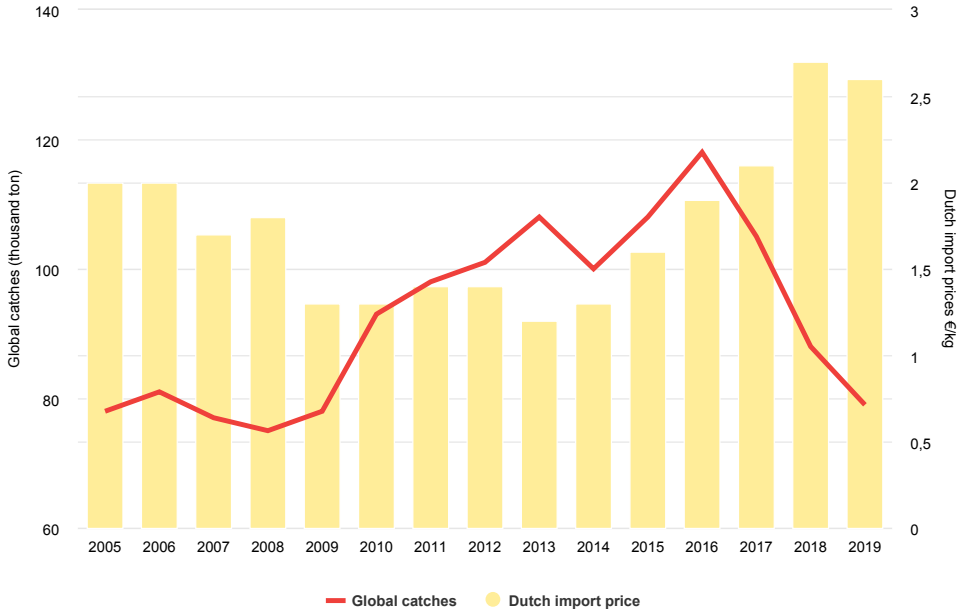


Figure 8: Global supply of plaice and raw material prices for plaice imported to the Netherlands during 2005–2019

Sources: (FAO, 2021a) (EuroStat, 2021)

The figure shows supply and price relationship. When global supply increases, the Dutch raw material import prices of plaice decrease; and vice versa. This indicates market geographical integration of plaice across countries and that prices of plaice are based on international market prices. Prices of plaice are thus driven by own supply and demand.

Research further shows that plaice is a part of the large European market for both fresh and frozen whitefish, including species such as cod, haddock, saithe, hake, Alaska pollock, pangasius and tilapia (Bronnmann & Asche, 2016) (Nielsen, Smit, & Guillen, 2012). This implies that the prices of plaice, besides being driven by global supply and demand, are also driven by supply and demand for whitefish. Since the

European whitefish markets are many times larger than the plaice market, whitefish supply and demand strongly influence the prices of plaice.

The efficiency of the plaice value chain can be assessed by analysing price levels and price transmission. Prices in one of the important value chains for plaice are shown in Figure 9, that of fish departing from Denmark after landing and imported as raw material in the Netherlands to be exported as both whole plaice and fillets. All the Dutch imports and exports are included.

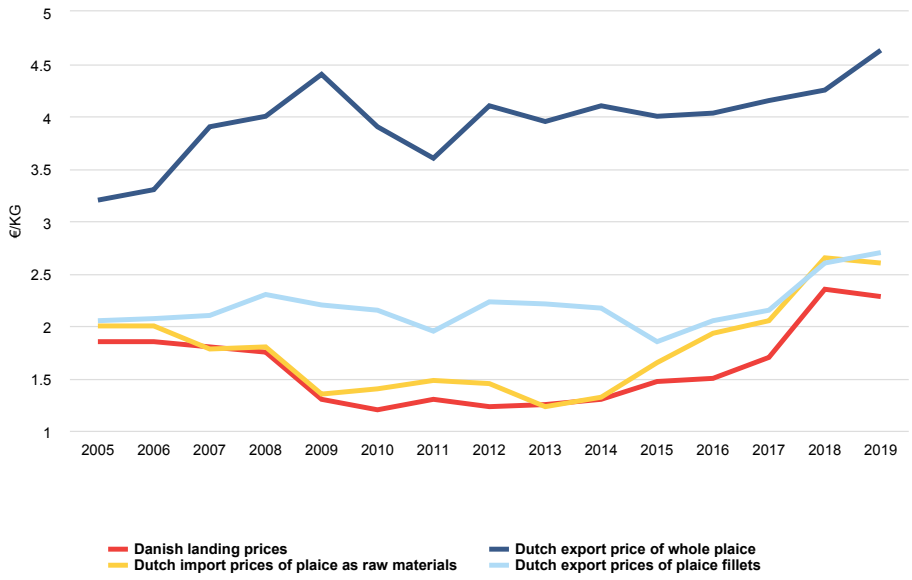


Figure 9: Price transmission in the plaice value chain, 2005–2021

Sources: (Danish Directorate of Fisheries, 2021b) (EuroStat, 2021)

In 2018, the Danish landing prices for plaice were low and Dutch raw material import prices were only fractionally higher. These import prices are largely the same as the Dutch export prices for live weight fillets. Hence, despite that small and cheap plaice may be used as raw material to produce fillets, the operating margin in the export of fillets from the Netherlands appears small.

Low operating margins in fillets of plaice are also observed when Dutch raw material import price is compared with fillet export prices during 2015–2019. However, in the period 2007–2014, the export prices of fillets in live weight were substantially higher than the import price of the raw material. In 2013, these prices were respectively 1.23 €/kg for import of raw material and 2.21 €/kg live weight in export of fillets. Hence, in the 2007–2014 period, operating margins in processing of plaice fillets may have been reasonable, or close to 40%.

The export prices of whole plaice from the Netherlands were, on the other hand, substantially higher than the Dutch import prices of raw materials of plaice over the whole period 2005–2019. Since there is no processing involved, that reflects continuous operating margins at a substantial level. That is also the case even if this

export is based on large sized plaice (size 1) that are more expensive than smaller sizes of plaice. Moreover, while the prices of Dutch exports of whole plaice do not seem to follow the Dutch import prices of raw materials closely, the price transmission in this part of the value chain is not perfect. Hence, Dutch exports of whole plaice appears partly decoupled form the rest of the plaice market, thereby potentially leaving room for high earnings in the wholesale companies that buy large-sized plaice.

For plaice fillets, the operating margins leave neither indication of a mal-functioning value chain nor of an inefficiently functioning value chain. For whole plaice exported from the Netherlands, operating margins appear potentially high among Dutch wholesalers. Whether the reason is, that companies are well run or that the value chain is inefficiently functioning with lack of competition cannot be assessed with the prevailing material.

7.1.2 Quotas and stock status

The main plaice stock for Danish fishers in the North Sea and Skagerrak is, according to ICES (ICES, 2022a) in healthy condition with low fishing pressure and a high stock size. The same accounts for the Baltic Sea plaice stock, while for the Kattegat stock the stock size is high, but fishing pressure is also high. The size of the Icelandic plaice stock is not assessed, but fishing pressure is close to the MSY level. Quotas and quota utilization on plaice in the Nordic countries are shown in Table 2.

Table 2: Plaice quotas and quota utilization in the Nordic countries in 2018

	Stock	ICES area	Quota (ton)	Catches (ton)	Quota utilization
Denmark	North Sea	2A3AX4	23,678	9,67	41%
	Skagerrak	03AN	13,514	4,362	32%
	Kattegat	03AS	1,549	479	31%
	Baltic Sea	3BCD-C	5,406	2,368	44%
Iceland	.	All	7,132	7,828	96%
Norway	.	All	No quotas	718	.
Faroe Islands	.	All	No quotas	265	.
Sweden	.	All	Only bycatch quotas	171	.
Finland	.	.	No quotas	No catch	.
Greenland	.	.	No quotas	No catch	.

Sources: (Danish Directorate of Fisheries, 2021b) (Statistics Iceland, 2021b) (Icelandic Directorate of fisheries, 2022a) (ICES, 2022a) (FAO, 2022)

As the table shows, only 31–44% of the Danish quotas are exploited, apparently leaving substantial room for catch increases. For the other countries fishing plaice in

the North Sea, quotas are not fully used, e.g. 69% in the Netherlands in 2016. The quota utilisation may be low due to several reasons. First, a mismatch may exist between total quotas and fishers' experiences in the field that despite of significant efforts, the fleet does not seem to be able to find the plaice. Since total quotas are set in accordance with ICES advise, the mismatch also prevails between advice and fishers experience. Hence, the fish are possibly not catchable at the level indicated by advises and quotas. Second, it may in some periods not pay off to fish plaice due to high costs and market conditions. That follows from high fuel consumption and fluctuating plaice prices over time due to seasonality, catch composition, size distribution and competition between flatfish and other species, e.g., whitefish. Third, plaice is often caught in multispecies fisheries as by-catch where sole or cod are the main target. When the quota of these species is fully used, fishing of plaice also needs to stop (choke species).

The low quota utilisation indicates that catches can be increased. On the other hand, fishers experience, economics and that plaice is caught in multispecies fisheries limit this growth opportunities. In Denmark, the option of increasing quota utilization of plaice and other flatfish such as turbot and flounder have gradually become more relevant over the last 4–5 years with the cod quotas in the Baltic Sea shrinking to close to zero, since the vessels targeting cod need alternatives.

7.1.3 Future outlook

Brexit could affect the plaice value chain as a shared stock within the North Sea and surrounding areas. The relative stability in The EU – Norths Sea in 2017 can be seen in Figure 10 (NAFC, 2017).

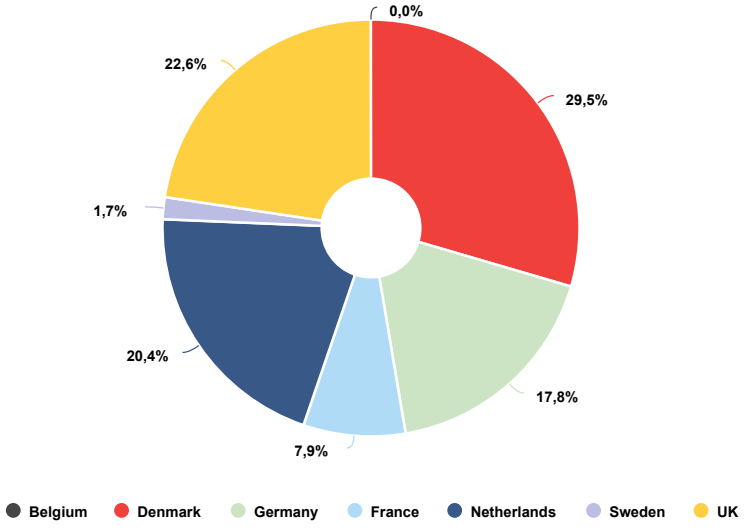


Figure 10: Relative stability in the EU - Norths Sea and surrounding areas

Source: (NAFC, 2017)

The effects of Brexit are likely to expand far beyond just the share of the UK fleet in the total supply of plaice, as some of the most important fishing grounds for plaice are within UK waters. Without a deal between UK and EU, for access to the fishing grounds, some of the EU fleets targeting plaice might be badly hit.

Problems with getting UK supplies to the EU market are also piling up after Brexit, with complication on customs arrangements, export health certificates and other bureaucratic formalities causing delays of delivery of seafood. There are examples of trucks with chilled fresh seafood being delayed by up to 30 hours because of this, which is likely to have impact on supplies in the near future (BBC News, 2021).

As for the future outlook of Nordic supplies of plaice, it seems unlikely that there will be much difference in current trends. Denmark will continue to be a major supplier, potentially increasing their share in total supply if they are able to catch higher portions of their allocated quotas. Iceland is likely to maintain its share, but with less than 10% of the total supply it is unlikely that they will be able to have significant impact on the market. The other Nordic countries have extremely limited catches of European plaice.

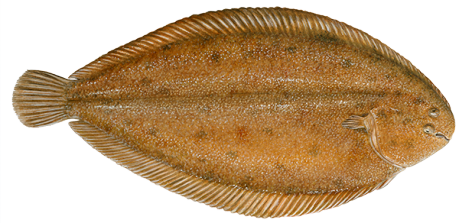
7.2 Sole

The catch of Common sole (*Solea solea*) worldwide was 29,817 tonnes in 2018. Catches of other sole species was in total 202,686 tonnes, with the most important species being yellowfin sole (*Limanda aspera*, 127,332 tonnes), rock sole (*Lepidopsetta bilineata*, 29,142 tonnes), flathead sole (*Hippoglossoides elassodon*, 12,380 tonnes) and lemon sole (*Microstomus kitt*, 7,278 tonnes). The catch of common sole in Europe was 23,150 tonnes, corresponding to 78% of global catches. The only other sole species caught in significant quantities in Europe is lemon sole, which solely originates from Europe (FAO, 2022).

The total catch of common sole in the Nordic countries was 743 tonnes in 2018, which corresponds to almost 2.5% of global catches. Denmark was the only Nordic supplier of importance with 722 tonnes. A total of 3,104 tonnes of lemon sole was also caught in the Nordic countries with Iceland (1,715 tonnes) and Denmark (1,071 tonnes) as the largest suppliers (FAO, 2022). However, as it is difficult to separate lemon sole from other sole species in the trade statistics and as lemon sole is sold in a different market segment than common sole, only the value chains for common sole are analysed in this report. Further, the prices differ substantially between lemon sole and common sole, as average price of lemon sole in Danish landings in 2018 were 5.02 €/kg whilst the average prices for common sole were 11.48 €/kg (Danish Directorate of Fisheries, 2021b) (EuroStat, 2021).

7.2.1 Common sole supplies and markets

The main suppliers of common sole in Europe are the Netherlands (8,622 tonnes), France (5,351 tonnes), Belgium (2,137 tonnes) and Italy (2,025 tonnes), but Morocco and Egypt are also important, respectively with 3,010 tonnes and 2,201 tonnes of catches. A minor aquaculture production of common sole prevails with global harvest of 154 tonnes in 2018. Portugal is the largest producer of farmed common sole. The Netherlands and France accounted for almost half of the global supply in 2018, as shown in Figure 11 (FAO, 2022).



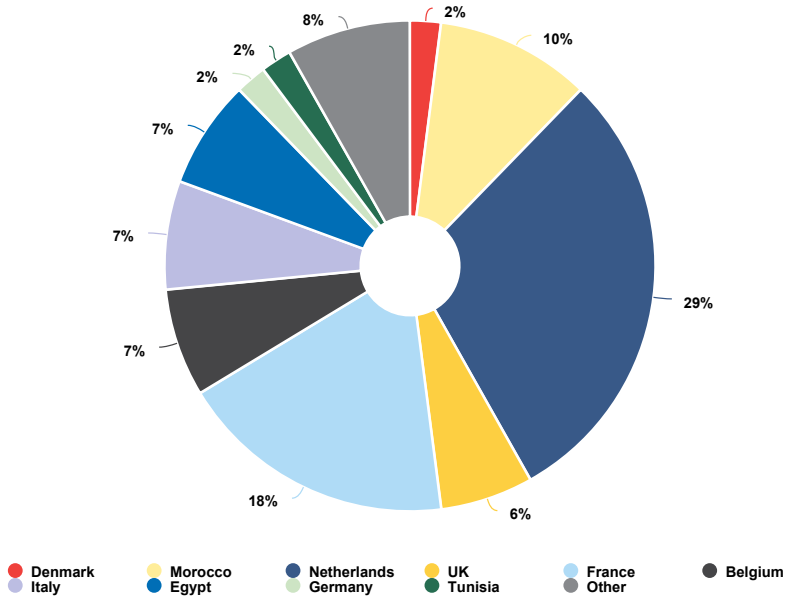


Figure 11: Main suppliers of common sole in 2018

Source: (FAO, 2022), picture: fauna.is

The main stock is the North Sea common sole, from which 11,199 tonnes originated in 2018, corresponding to 38% of the global supply. Other important fishing grounds in Northern Europe are in the Celtic Sea, English Channel, Irish Sea, Skagerrak/ Kattegat, North/Northwest of Ireland and in the Bay of Biscay. The remaining catches originated mainly from the Mediterranean Sea, caught by the countries in the area and from the Central Eastern Atlantic Ocean, among other caught by Moroccan fishers.

Sole is mainly caught using bottom and beam trawl, but gillnets are also used. Dutch fishers use beam trawl, while fishers in the remaining Nordic and European countries mainly use bottom trawl. Sole and plaice are often caught simultaneously, implying that it is not fully possible to limit the catch to the target species.

Trade of common sole between the main countries is shown in Table 3 (EuroStat, 2021).

Table 3: Import and export value of common sole of the main fishing and purchasing countries in 2018 in million euros

	Denmark	Netherlands	France	Belgium	Italy	Spain	Germany	Other	Total
Denmark		3.0	0.4	0.2	1.4	0.8	1.0	0.9	**7.7**
Netherlands	0.4		9.1	18.4	30.5	20.4	10.9	12.9	**102.6**
France	0.0	2.3		1.8	5.8	7.0	0.8	1.9	**19.6**
Belgium	0.2	10.6	1.3		1.0	0.7	0.0	0.9	**14.7**
Italy	0.0	0.0	0.0	0.2		0.4	0.1	0.2	**0.9**
Spain	0.0	0.0	1.2	0.2	2.0		1.0	7.7	**12.1**
Germany	0.0	7.5	0.0	0.1	0.0	0.1		1.0	**8.7**
Other	0.2	10.3	8.7	0.6	1.7	26.9	0.1		**48.5**
Total	**0.8**	**33.7**	**20.7**	**21.5**	**42.4**	**56.3**	**13.9**	**25.5**	**214.8**

Source: (EuroStat, 2021)

The table shows that total imports to Spain in 2018 were worth € 56.3 Million, and that total exports from Spain that same year were worth € 12.1 Million. Moreover, the table shows that € 20.4 Million (36%) of the Spanish imports came from the Netherlands.

Table 3 shows bilateral trade flows of common sole between the main supplier and buyer countries in 2018. The total trade amounted to € 214.8 Million. However, this amount reflects that sole may cross borders several times before reaching the final consumers. The Netherlands, France, Belgium, and Italy are the main suppliers. The Netherlands is the core intermediate connection in the value chain with both a substantial catch and import of sole that is re-exported to the final markets that are mainly in Spain, Italy and France. Sole is also consumed domestically in the Netherlands. This reveals a value chain with both production and consumption located mostly in the Western part of continental Europe.

The data shown in Table 3 does not distinguish between fresh and frozen sole. Figure 12 makes this distinction, as well as providing an overview of the common sole value chain with the three elements: fishing, wholesale, and consumption.

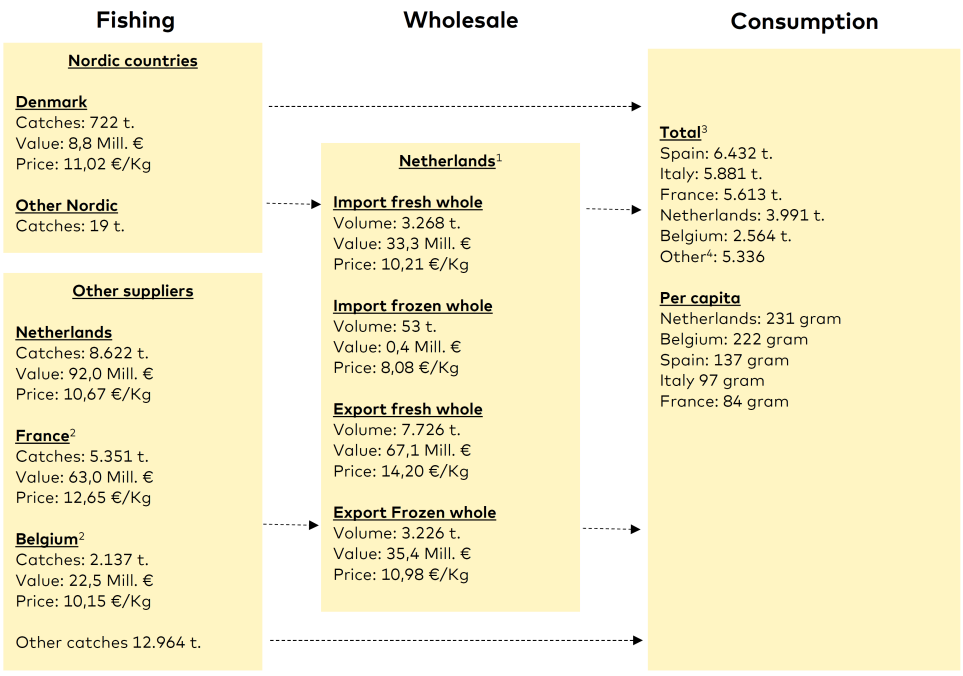


Figure 12: The European value chain for common sole, 2018

Notes:

[1] Import and export of common sole covers the following codes in the Harmonized System for raw material: 03022300 Fresh and chilled whole sole *Solea spp.* and 03033300 Frozen whole sole *Solea spp.*

[2] For France and Belgium, catch quantities are known for 2018. Catch values and prices are only known for 2017 and these are included in the Figure. For comparison over time, the Danish landing price increased 10% from 2017 to 2018. If the markets are internationally integrated, prices develop equally over time.

[3] Consumption nationally is calculated as catches plus import minus export.

[4] Consumption in other countries is calculated as total global catches minus consumption in the above-mentioned countries.

Sources: (Danish Directorate of Fisheries, 2021b) (FAO, 2021b) (STECF, 2021) (EuroStat, 2021)

Figure 12 provides an overview of the value chains for common sole in Europe. These value chains only cover some of the routes for sole from sea to final consumption; several other routes also exist. The fisheries included in the figure cover 57% of global supply, 40% of processing and wholesale, and 82% of consumption.

The Netherlands is both the largest sole fishing nation and the most important wholesale country. The domestic supply of common sole as raw material was 8,622 tonnes in 2018, supplemented by imports of fresh whole sole of 3,268 tonnes. Export of fresh and frozen sole was 4,726 tonnes and 3,226 tonnes, respectively. Hence, two-third of the deliveries was exported.

Spain was in 2018 the largest consumer of sole with an estimated total consumption

on 6,432 tonnes. Largely all this quantity was imported from Netherlands, Morocco and France. Italy (5,881 tonnes), and Belgium (2,564 tonnes) are also large suppliers. Per-capita consumption is largest in the Netherlands and Belgium, respectively with 231 and 222 gr, by far exceeding per capita consumption in Spain (137 gr.), Italy (97 gr.) and France (88 gr). In all the countries, sole is consumed mostly in restaurants.

Landing prices for common sole are similar in the Netherlands, France, Belgium, and Denmark or between 10.15–12.65 €/kg. The highest prices are observed in France and lowest in Belgium. This may reflect close market integration between the different EU countries. Import prices for fresh sole to the Netherlands was 10.21 €/kg, which is on the same level as the landing prices. This is due to fishers from the UK, Belgium and Denmark landing part of their North Sea catches directly in Dutch ports. Dutch companies also own some British vessels.

Export price for fresh sole from the Netherlands in 2018 was 14.20 €/kg and for frozen sole 10.98 €/kg. These prices reflect that two market segments may exist. One market segment is for high quality large sole sold at a high price to restaurant and through fishmongers, and another market segment for frozen (small) sole sold by supermarkets. While detailed statistics is not available, the different prices may indicate that the wholesale companies earn the price premium on being good at sorting the fish and supply the fresh high-price market with large sized sole. This market segmentation is reflected in the landing prices of large and small sole in Denmark from where data are available, as shown for the 2012–2020 period in Figure 13 (Danish Directorate of Fisheries, 2021c).

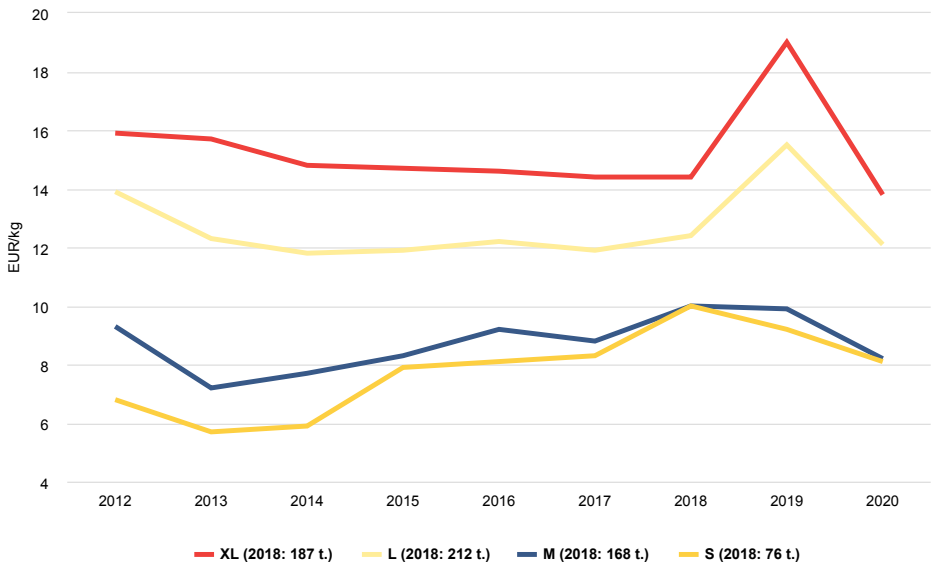


Figure 13: Prices of different sizes of common sole in Denmark between 2012–2020 as euro/kg annual price level

Source: (Danish Directorate of Fisheries, 2021c)

The landing prices increase with the size of sole; the price of the largest fish was 14.42 €/kg in 2018 and the price of the smallest fish was 10.04 €/kg. The price of the largest sole was 43% higher than that of the smallest and 20% higher than the average price. It also appears from Figure 13 that prices of the two largest size-classes follow each other with time, as well as the two smallest size-classes follow each other with time. The large and small size-classes seem, however, not to follow each other with time. Hence, there may be a tendency for large-sized sole being sold fresh in the high-quality high-price market segment by fishmongers and restaurants, while small-sized sole is sold frozen in supermarkets. This is confirmed as the share of the two larger size-classes form62 % of Danish landings, which is close to the share of fresh sole in the total Dutch export of 59% (Danish Directorate of Fisheries, 2021c).

The development in global supply of common sole and in the Dutch import prices of fresh common sole can be seen in Figure 14 for the period 2005–2019 (FAO, 2021c) (EuroStat, 2021).

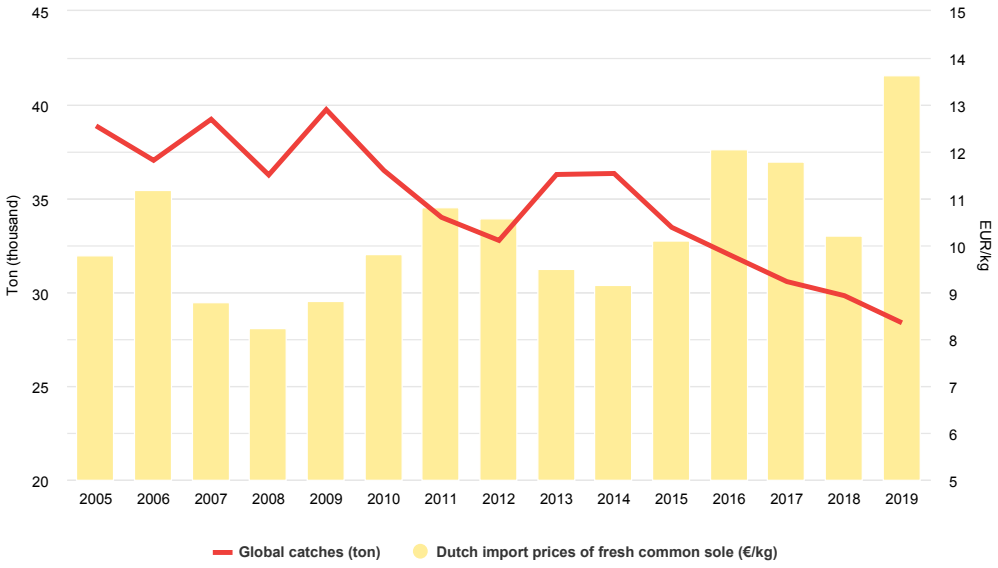


Figure 14: Global supply of common sole and Dutch average import prices of fresh common sole, 2005–2019

Source: (FAO, 2021c) (EuroStat, 2021)

Figure 14 shows that the global supply of common sole varies inversely with the Dutch import prices of fresh sole, as expected. This indicates an international market where prices are formed largely on prices in Netherlands, as sole has few substitutes. Thus, the supply and demand of common sole are the main drivers of prices, not the supply and demand of other species.

The efficiency of the value chain for common sole can be assessed by analysing price levels and price transmission. Figure 15 show prices in the common sole value chain from Danish landings, via import of fresh sole into Netherlands to export of both fresh and frozen sole from the Netherlands (Danish Directorate of Fisheries, 2021c) (EuroStat, 2021).

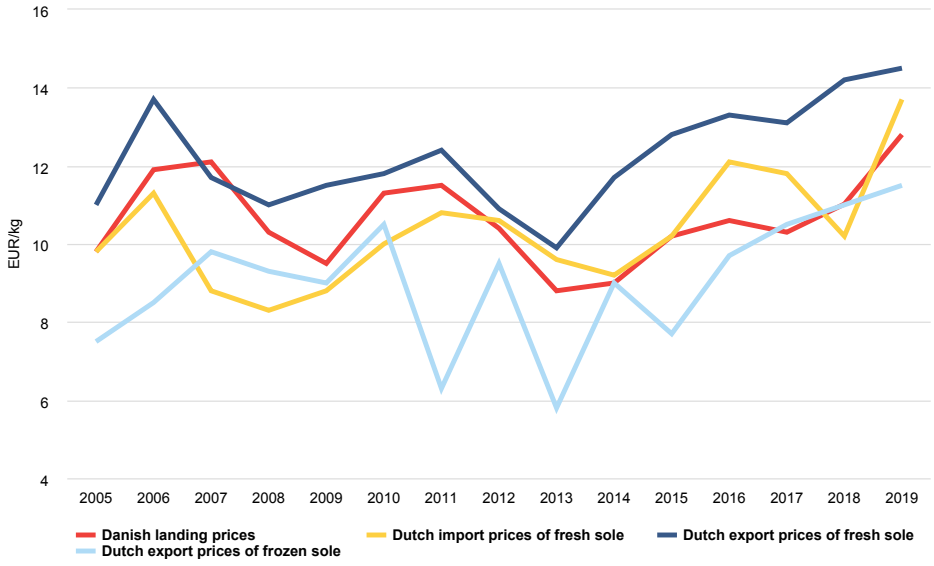


Figure 15: Price transmission in the common sole value chain during 2005–2019[1]

Source: (Danish Directorate of Fisheries, 2021c) (EuroStat, 2021)

During the 2005–2019 period, the Dutch export price of fresh sole (14.20 €/kg in 2018) was highest and above both the Danish landing price (11.02 €/kg) and the Dutch import price for fresh sole (10.21 €/kg). The margins are, however, small. On average during the period, Dutch export prices of fresh sole were 19% higher than that of Dutch import price for fresh sole and 15% higher than that of Danish landing prices. These margins do not consider that large sole is exported as high-priced fresh product and small sole as lower-priced frozen product. However, the prices of the different sizes do not reveal substantially higher margins. Hence, the operating margins in the value chain from catch to export of fresh sole from the Netherlands appear small. Since the prices for Dutch export of frozen sole are low (10.98 €/kg in 2018), the operating margins in the value chain from catch to export of frozen sole from the Netherlands also appear small. The operating margin leaves are neither an indication of mal-functioning value chains, nor of inefficiently functioning value chains for fresh and frozen sole.

7.2.2 Common sole quotas and stock status

The most important common sole stocks for the Nordic and N-European countries are in the North Sea, and in Skagerrak and Kattegat. According to ICES (2021), the North Sea Common sole stock is low, having fluctuated around B_{lim} since 2003. Fishing pressure has been consistently declining since 1999, but fishing mortality is

1. *All prices are in the annual price level*

still slightly over F_{MSY}. ICES are concerned that there is no agreed shared management plan between EU and UK for this stock, and that landings of "below minimum reference size" (BMR) catches under the EU Landing Obligation amounted to only 0.5% of total catches in 2019, whilst discards in 2019 were estimated at 18.3%.

The stock in Skagerrak, Kattegat and the Baltic Sea is strong and growing, with stock size above MSY and a low fishing pressure (ICES, 2021a).

The status of the stocks and fishing mortality in the English Channel, Celtic Sea, Irish sea and Bay of Biscay are showing similar signs, where the stocks are growing and fishing pressure is decreasing (ICES, 2021c).

The status of the stocks observed by ICES and linked total allowable catches (TAC) are however not well reflected in the actual landings, as only about ¾ of the quotas are being utilised each year. The quota utilisation for 2018 is shown in Table 4 for the stocks assessed ICES (ICES, 2021c).

Table 4: Common sole quotas and utilization in 2018 in the areas assessed by ICES

ICES area	TAC	Landings	Quota utilization
North Sea	15.694	11.199	71%
Skagerrak & Kattegat, W-Baltic Sea	448	434	97%
English Channel West	1.202	1.086	90%
English Channel East	3.405	2.312	68%
Celtic Sea South & SW of Ireland	382	283	74%
Bristol Channel, Celtic Sea	920	849	92%
Irish sea	40	36	90%
Bay of Biscay	3.621	3.468	96%
Total	**25.712**	**19.667**	**76%**

Source: (ICES, 2021c).

The reason for the low quota utilization can only be speculated, but economic viability and choke species (lack of quota for bycatch) are likely explanations. The Danish fleet for example has to consider that in some periods it does not pay off to fish for sole in the North Sea due to thigh costs of transition from and to fishing other species, given that the Danish sole quota is relatively small. Hence, if the fishery would be more economically viable, there might possibly be room for increased Danish sole fishing in the North Sea. As shown in Figure 13, the size of the sole is the main price decider and therefore determines the economic viability of the fishery. Fishing grounds with small sole are therefor likely to be less attractive than others.

7.2.3 Lemon sole

The global catches of lemon sole in 2018 amounted to 7,278 tonnes, of which 3,104 tonnes (43%) came from the Nordic countries, mainly Iceland (1.715 tonnes) and Denmark (1,071 tonnes) (FAO, 2022). Despite the big share of the Nordic countries in total catches, the fisheries are of limited importance due to relatively small volumes and dispersed catches. The fisheries consist mainly of relatively minor bycatches in bottom trawl and Danish seine fisheries. There were for example only four vessels that exceeded 100 tonnes of catches in Iceland in 2018 (Icelandic Directorate of Fisheries, 2022b). Figure 16 shows the share of each country in the supply of lemon sole in 2018 (FAO, 2022).

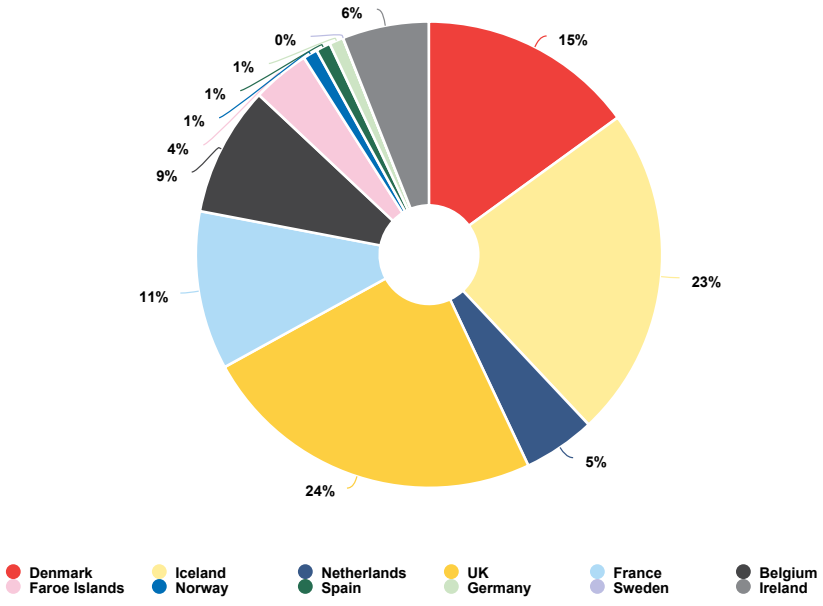


Figure 16: Global catches of lemon sole in 2018 by country
Source: (FAO, 2022), picture: fauna.is

The average prices of lemon sole are significantly lower than of common sole, as for example the Danish landing prices in 2018 were 5.02 €/kg, compared to 11.48 €/kg for common sole (EuroStat, 2021). The limited volumes and inconsistent availability make it also difficult to establish strong markets or achieve price premiums. The stocks are declining and quotas are fully utilised (MFRI, 2022), which suggests that it is likely that supply will remain low in the coming years.

7.2.4 Future outlook

A handful of countries represent the mainstay of the common sole supplies, and the Netherlands are in an extremely strong position when it comes to value chain integration. This is unlikely to change in the near future. With respect to the Nordic countries, it is only Denmark that has any real interest but are only responsible for less than 2.5% of the total supply. The main stocks are in relatively good state, but quotas are however only being partly utilised, which might suggest that an increase in supply should be possible in near future. Some of the most important fishing grounds are however shared with the UK, which might complicate thigs as an agreement for access has not been reached between the EU and UK.

The Nordic countries (Iceland, Denmark and Faroe Islands) represent a significant share of the global supply of lemon sole. The global catch volumes are however limited, and the fisheries are therefore of little importance, and it is likely that the catches will even decrease in the coming years. The outlook for sole from the Nordic countries is therefore rather bleak.

7.3 Greenland halibut

Greenland halibut (*Reinhardtius hippoglossoides*) is caught in cold waters the high north, mainly in the Atlantic Ocean and to a minor extent also in the Pacific Ocean. The global catches of Greenland halibut were 133,881 tonnes in 2018 (FAO, 2022).

7.3.1 Supplies and markets

The catches of Greenland halibut in the Nordic countries were 79,114 tonnes in 2018, corresponding to 59% of global catches. Greenland caught 42,353 tonnes, making them the world's largest supplier, followed by Norway (17,772 tonnes), Iceland (15,239 tonnes) and the Faroe Islands (3,750 tonnes). The remaining Nordic countries do not fish Greenlandic halibut. The main suppliers outside the Nordic countries are Russia (25,206 tonnes) and Canada (11,560 tonnes). Germany (6,391 tonnes), Spain (4,685 tonnes) and Portugal. Figure 17 shows the share of the main supplying nations of Greenland halibut in 2018 (FAO, 2022).

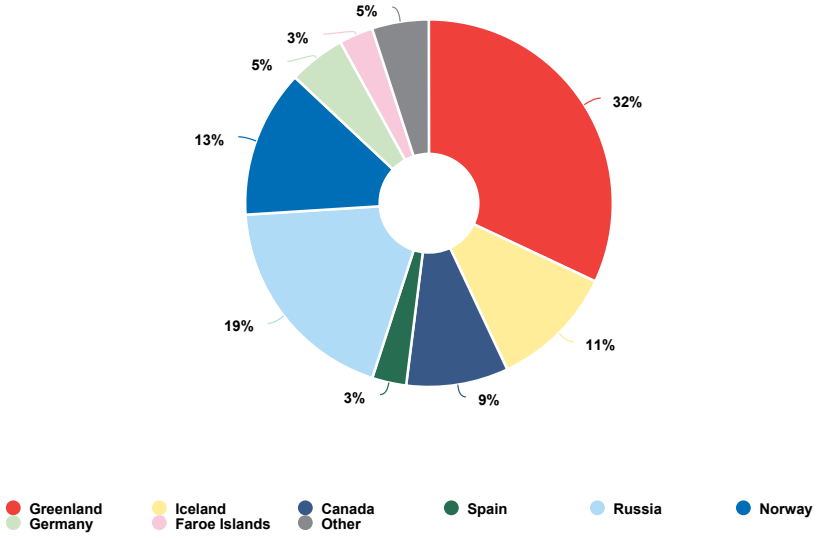


Figure 17: Share of the main supplying countries of Greenland halibut in 2018

Source: (FAO, 2022), picture: fauna.is

Greenland halibut originates mainly from three areas, which are west of Greenland, N-Atlantic and Barents Sea.

- The West of Greenland fishery targets two offshore stocks (the Davis Strait- and the Baffin Bay stocks) and three inshore stocks (the Bay of Disko-, Ummannaq- and Upernavik stocks). Both Greenlandic and Canadian vessels are fishing from the offshore stocks, but the inshore stocks are solely targeted by the Greenlandic coastal fleet.
- The N-Atlantic stock is found in Icelandic and Faroese waters, West of Scotland, North of Azores and East of Greenland, and is mainly targeted by Icelandic, German, Greenlandic and Faroese vessels.
- The Barents Sea stock is mainly targeted by Russian and Norwegian vessels.

The three groups of stocks are almost of the same size, although in 2018 the largest part of the catches originated from West of Greenland.

Greenland halibut is mostly caught using bottom trawl, but in some countries, gillnets and longlines are also applied. Large trawlers fish offshore, and small coastal vessels and dinghies using longlines or gillnets are fishing from the inshore stocks. Until about ten years ago, a substantial share of the Greenlandic catches was provided by fishing through the sea ice, but today this is very limited due to a shorter ice cover.

The main markets for Greenland halibut are in Asia, primarily in China, Taiwan and Hong Kong. A small market section also exists in the EU, with Germany being predominant. More or less all of the Greenlandic and most of the Canadian catches are transported frozen to Denmark for processing and transhipment to final destination. Vietnam and Thailand are also important intermediate Asian destinations, but not the countries of final consumption.

Exports of Greenland halibut from the fishing nations to the final country of destination is shown in Table 5. Since all Greenland halibut from Greenland is exported via Denmark, the two countries are included together. Russia is not included due to lack of available statistics (Statistics Norway, 2021a) (Statistics Iceland, 2021c) (Statistics Faroe Islands, 2021a) (Government of Canada, 2021) (Statistics Denmark, 2021) (EuroStat, 2021).

Table 5: Trade in Greenland halibut through the value chain in 2018 in millions of euros

Import / Export	Denmark	Asia*	EU27**	Other	Total
Norway***	13.6	42.7	18.9	12.9	**88.2**
Iceland4	0.5	43.9	4.9	8.2	**57.5**
Faroe Islands	2.1	7.5	9.2	.	**18.8**
Canada5	22.2	.	0.5	7.9	**30.6**
Greenland via Denmark	.	175.0	22.8	8.2	**206.0**
Total	**38.4**	**269,1**	**56,3**	**37,2**	**401,1**

Note:

* Asia includes China, Taiwan, Hong Kong, Vietnam and Thailand. Since Vietnam and Thailand are included since they serve as a temporary destination of Greenlandic halibut that is afterwards re-exported to China, Taiwan and Hong Kong.

** EU27 includes all the 28 EU countries in 2018 excluding Denmark, since Denmark is mainly an intermediate country for export of Greenlandic halibut to Asia.

*** Norwegian export includes both Greenlandic halibut and Atlantic halibut (Hippoglossus hippoglossus), since the statistics doesn't allow separation. In 2018, the catch of Atlantic halibut was 2,713 tonnes, where catches of Greenlandic halibut were 17,772 tonnes.

Sources: (Statistics Norway, 2021a) (Statistics Iceland, 2021c) (Statistics Faroe Islands, 2021a) (Government of Canada, 2021) (Statistics Denmark, 2021) (EuroStat, 2021)

The table shows 2018 exports from the fishing nations in the North Atlantic Ocean to the main markets in China, Taiwan and Hong Kong. The total export value was € 401 Million. However, this amount reflects that Greenland halibut is often traded across borders more than once before it reaches the final consumers. Greenland via Denmark is by far the largest supplier, followed by Norway, Iceland and Canada. As Denmark is not fishing Greenland halibut, the figure for Denmark represents imports that are processed and/or transhipped to final destination. Greenland is the dominating supplier with two large companies, Royal Greenland and Polar Seafood, that have operations in both Greenland and Denmark. Substantial imports from Canada and Norway to Denmark also exists. Greenland halibut imported to Denmark is almost all re-exported frozen without much processing to the final markets, of which 85% are exported to China, Taiwan and Hong Kong. Asia is also the main market for the supplies from Norway, Iceland and the Faroe Islands. The total value of Asian imports of Greenland halibut in 2018 amounted to € 269.1 Million.

An overview of the global value chain for Greenlandic halibut is shown in Figure 18.

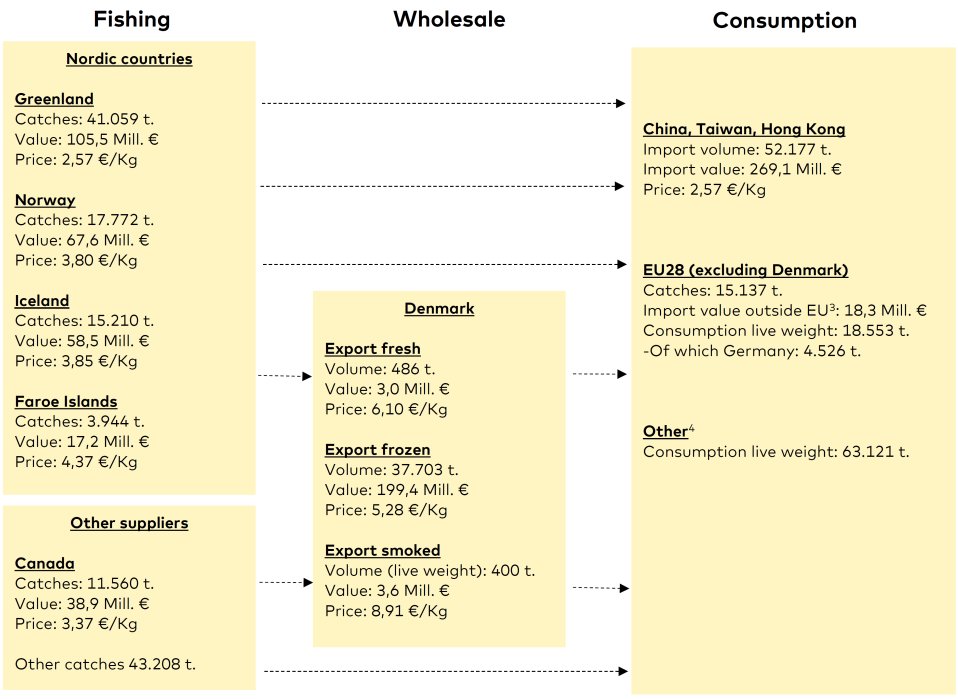


Figure 18: The global value chain for Greenland halibut, 2018[1]

Notes:

1. For the EU, Greenland halibut import, and export cover the following codes in the Harmonized System for raw material: 03022110 Fresh and chilled whole Greenland halibut *Reinhardtius hippoglossoides* and 0303110 Frozen whole Greenland halibut *Reinhardtius hippoglossoides*. For smoked Greenland halibut, the following codes in the Harmonized System are included: 03054910 smoked fillets of Greenland halibut *Reinhardtius hippoglossoides*. For the other countries, the Harmonized System codes that includes Greenland halibut under the same 6-diget codes as for the EU are included.
2. Consumption nationally is calculated as catches plus import minus export. Since export statistics is not available for Russia, possible export from Russia to Asia is not included. All quantities are in live weight with fillets converted to live weight using a conversion factor on 1.97.
3. Tis export value on € 18.3 Million includes only import from outside the EU. When including internal EU trade, the number is € 56.3 Million (see Table 6.3).
4. Consumption in other countries is calculated as total global catches minus consumption in the above-mentioned countries.

Sources: (Statistics Greenland, 2021) (Statistics Iceland, 2021c) (Fisheries and Oceans Canada, 2021)

(Statistics Norway, 2021b) (Statistics Faroe Islands, 2021b)

The value chains shown in Figure 18 only cover several of the routes of Greenland halibut from sea to the final destination; several other routes also exist. The catches shown in the figure represent 68% of global supply, 29% of 53% of the wholesale and consumption.

The imports to the most important markets in China, Taiwan and Hong Kong amounted to 52,177 tonnes in 2018. However, possible export from Russia is not included in these figures, and consumption may therefore be higher.

The consumption in the EU in 2018 amounted to 18,553 tonnes, where the main part of the supply came from EU vessels. The EU market differs from the Asian markets to some point, as fresh and smoked products represent considerable part of the consumption.

The value chains presented in Figure 18 were identified using available statistics. However, as Greenland halibut fillets are sometimes registered together with other types of fish species, they are not included in the calculation. Greenland registered their exports to Denmark of frozen fillets of Greenland halibut in 2018 as 2,405 tonnes, at the value of € 16.3 Million. It is not known but assumed that the fillets are smoked in Denmark or sold directly in Denmark or Germany. Also, the Norwegian export statistics register Greenland halibut together with Atlantic halibut. Both are included in the Norwegian export data, which suggests that Norwegian export data for Greenland halibut might be overestimated. The Norwegian catch of Atlantic halibut in 2018 was 2,713 tonnes, corresponding to 13% of the total catch of the two species. The overestimation is therefore limited. Finally, Russian export is not known, and it is expected that Greenland halibut to a certain extent is exported to China, Taiwan and Hong Kong, as for the remaining fishing nations. Which means that the consumption in Asia presented in Figure 18 is most likely underestimated. The Russian catch was 25,206 tonnes in 2018.

Landing prices are similar in Canada, Norway, Iceland and the Faroe Islands (3.37–4.37 €/kg.), but low in Greenland (2.57 €/kg.). The low landing prices in Greenland can be compared to the export price of frozen fillets from Greenland to Denmark as 4.70 €/kg and on export from Denmark as 5.28 €/kg, as all Greenland halibut is exported via Denmark. A large part of the Greenlandic exports is coming from the two largest seafood companies in Greenland, Royal Greenland and Polar Seafood, and are really just internal transactions within their own group. Both companies have operations in Denmark that process and tranship the catch. While high shipping costs from Greenland to Denmark may be one explanation for the low export prices in Greenland, it is actually more important that the Greenland halibut are landed in small villages in remote areas with limited infrastructure, and it is therefore expensive to compile sufficient volumes, process and get the products onboard cargo vessels.

The export prices from Denmark reveal that minor amounts are exported fresh and smoked, at higher prices than frozen fish (the price of fresh and smoked fish was 6.10 €/kg. and 8.91 €/kg live weight, compared to the price of frozen Greenland halibut of 5.28 €/kg.). The fresh exports are presumed to be of Norwegian origin and the destination is the EU market.

The Greenland halibut global supply and the Danish export prices of frozen Greenland halibut are shown in Figure 19 for the period 2005–2019. The Danish export prices are selected because most Greenlandic halibut goes via Denmark; and frozen is selected as that is by far the most important product category.

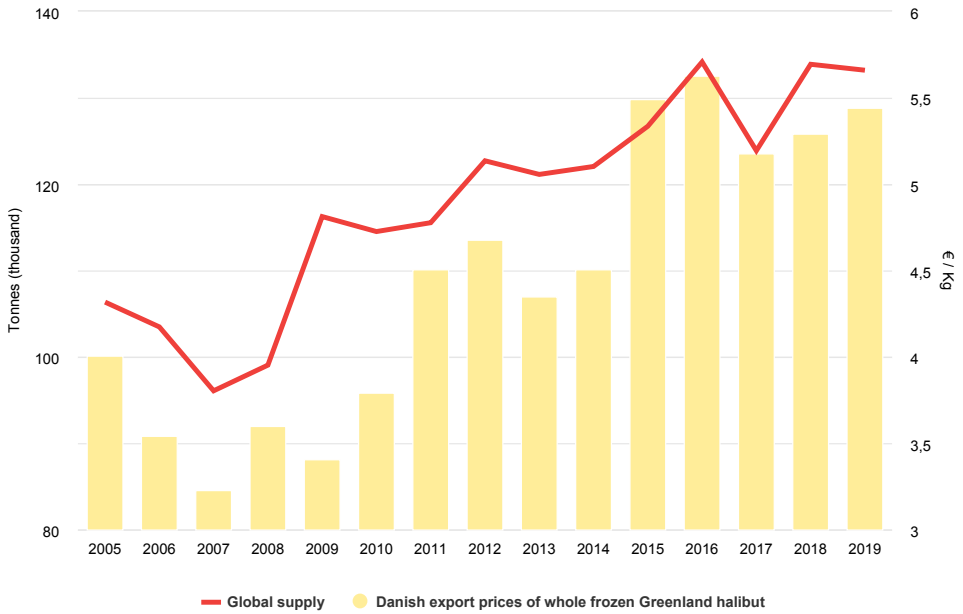


Figure 19: Global supply of Greenland halibut and prices of frozen whole exported Greenland halibut from Denmark during 2005-2019.

Sources: (FAO, 2021c) (Statistics Denmark, 2021)

The figure shows that the Danish export prices increase when global supply increases. Normally, it is expected that prices will drop when supplies increase. The explanation for this may be that Greenland halibut is to a large extent a substitute product for Patagonian toothfish, and the supply and demand for Patagonian toothfish has therefore possibly more effect on the price of Greenland halibut than the supply of Greenland halibut (Nielsen, Ståhl, Nielsen, Ankemah-Yeboah, & Schütt, 2016). Patagonian toothfish is caught in the Antarctic Sea and the Southern Atlantic Ocean and Southern Pacific Ocean. Global supply was relative constant in the 2005–2019 period or between 21,255 tonnes and 25,165 tonnes. Hence, the continued growing demand in China may explain that both prices and quantities of Greenland halibut have increased. The growing demand is explained by an increased purchasing power in China, and marketing efforts from wholesalers from the Nordic countries. The Chinese market for Greenland halibut is an excellent example of a good marketing strategy, as the Chinese market has grown from almost nothing to be the largest global market for Greenland halibut in the last twenty years.

7.3.2 Stock status and quotas

The Greenland halibut stocks are for the most parts in healthy condition and are being harvested sustainably. The offshore stocks in West of Greenland (Davis Strait and Baffin Bay) have been relatively stable since the late 1990's and catches are within scientific advice, there is however considerable uncertainty in the stock assessment with is highlighted by NAFO in its advice (NAFO, 2022). The inshore stocks in West of Greenland (Disco Bay, Ummannaq and Upernavik) were showing signs of overexploitation in 2017–2019 but appear now to have recuperated (NAFO, 2022). These are however considered data limited stocks and uncertainty is

considerable. Scientists have recorded constant trend of reduction in average size over the past decade, which has raised concerns. The Spawning stock biomass of the N-Atlantic stock (East of Greenland, Iceland Faroe Islands and West of Scotland) is above MSY and the fishing pressure is below F_{MSY} (ICES, 2021b). The Barents Sea stock is also strong, but fishing pressure has increased significantly over the past 10 years and has exceeded scientific advice since 2016 (ICES, 2021d). The "overfishing" has not yet had major effect on the stock size.

Quotas and quota utilization on Greenlandic halibut in the Nordic countries are shown in Table 67.

Table 6: Greenland halibut quotas and utilisation in the Nordic countries 2018

Country	Stock	Area	Quota (tons)	Catches (tons)	Quota utilization (%)
Greenland	Davis Strait/Baffin Bay	NAFO 1 W-Greenland	16,182	16,113	100
	Disko Bay	Part of NAFO 1 W-Greenland	9,200	8,399	91
	Ummannaq	Part of NAFO 1 W-Greenland	9,500	8,839	93
	Upernavik	Part of NAFO 1 W-Greenland	9,500	7,549	79
	Mid-Atlantic*	ICES 14 E-Greenland	2,669	2690	100
Iceland**	Mid-Atlantic*	ICES 5A Icelandic waters	13,271	12,044	91
Norway	Barents Sea	ICES I-2 Barents Sea	13,755	***16,284	91
	Mid-Atlantic*	ICES 14 E-Greenland	400		.
	Davis Strait/Baffin Bay	NAFO 1 W-Greenland	900	.	.
Faroe Isl.	Mid-Atlantic*	ICES 5B Faroese waters	No quotas	2,987	.
	Mid-Atlantic*	ICES 14 E-Greenland	325	312	96
	Davis Strait/Baffin Bay	NAFO 1 W- Greenland	110	104	95
	Other	Other	.	347	.
Sweden	.	All	No quotas	8	.
Denmark	.	All	No quotas	2	.
Finland	.	.	No quotas	No catch	.

Note:

* Cover ICES areas 5 (Faroe Islands and Iceland), 6 (West of Scotland), 12 (North of Azores) and 14 (East Greenland). Far the majority of catches appear in the Extended Economic Zones of Iceland and Greenland.

** The Icelandic quotas runs from 1 September to 31 August.

*** Include Norwegian catches in the whole Northeast Atlantic Ocean (ICES area).

Sources: (NAFO, 2022) (Directorate of Fisheries, 2021) (Statistics Iceland, 2021a) (ICES, 2021d) (Statistics Faroe Islands, 2021a) (FAO, 2022)

The quotas are close to fully used in all the fisheries and options of increasing catches are largely non-existent. That does, however, not account for the Icelandic fishery, where the quota utilization rate is only 63%. The low Icelandic quota utilization remains a matter of speculation but may be due to that it in some periods does not pay off economically to fish Greenlandic halibut.

For the offshore fishery in Greenland, fishing opportunities are already used with sustainable fishing and largely full quota utilization. No growth in catches appears possible.

In the inshore fishery in Greenland, quotas have over several years been set higher than NAFO recommendations. This implies that catches over a long period have been higher than recommended, resulting in reduced average sizes in catches. Future catches are therefore somewhat uncertain, and probably more likely to decrease.

8 Discussion

The value chains for plaice and common sole are in many respects similar; both fish are caught largely in the Northern part of Europe and the consumption takes place in Europe, primarily in the Netherlands, Italy and Germany but common sole is also popular in Spain, France and Belgium, and plaice is popular in Denmark and the UK. The main intermediary actor in the value chains between supply and consumption is the Netherlands; they act as a supplier, importer, processor and exporter as well as being a large consumer of the fish.

The supply of plaice is considerably larger than that of common sole; annually approximately 80,000–100,000 tonnes of European plaice are caught compared with about 30.000 tonnes of common sole. However, common sole is more expensive with landing prices of 10.15–12.65 €/kg live weight, compared with landing prices of 2.15–2.59 €/kg for plaice. There is a high value market – a niche market – for large plaice and common sole at fishmongers and restaurants, while small sized fish is sold frozen at lower prices, or in the case of plaice as fillets, in retail. In fact, trading of unprocessed whole plaice appears to be quite profitable, whereas the margin for plaice fillets appears low especially in recent years, considering the cost of processing. The low margin of fillets may be due to reduced global supply of plaice from 2016 onwards, leading to price increases of the raw material to processors and at the same time possible resistance by retailers in reducing their margin or in increasing prices to consumers. In contrast, the operating margin in trading of sole appears small, irrespective of the size of the fish or whether it is in the fresh or frozen state.

For common sole the driver of market prices looks to be its own supply and demand, whereas the supply of other fish species, such as whitefish, affects the market pricing of plaice. In other words, common sole appears to be a relatively high valued niche product with few substitutes, but plaice a more generic product with prices strongly affected by the supply of other competing fish species.

The main plaice stocks appear to be in relatively healthy condition and some of the quotas, e.g. in Denmark and the Netherlands are not fully exploited, so there may be options to increase supply. However, it is possible that increased fishing effort may not be economically viable due to market conditions, size composition of catch and difficulties in finding and catching the fish. Assuming fishing is economical, and the fish can be found and caught, such a fishing effort could lead to a relatively large increase in the global supply. For instance, assuming full utilisation of the Danish quotas their supply would increase annually by about 10,000 tonnes. Similarly, the Dutch only catch about 70% of their quota in the North Sea; full utilisation of the quota could potentially lead to an annual increase of about 10,000 tonnes. An increase of about 20,000 tonnes in the global supply of plaice will, in the short term, reduce the landing prices to fishermen and import and export prices but the effect on prices to consumers will likely be negligible. The price reduction could be close to 10% based on historic price development in the supply of plaice. In the longer term, assuming such an increase will be permanent, the prices to consumers will also

reduce by a similar degree as the landing prices of plaice. There may be options for minor increases in the supply of common sole as the quota of Danish fishers is not fully utilised, assuming fishing is economic viable. Presuming full utilisation of the Danish quotas the increase could be about 340 tonnes which is unlikely to affect the current global supply of common sole to any degree. No changes in landing prices, import and export prices are likely to occur if such increases in catches would occur.

The Nordic countries, Denmark and Iceland, are substantial suppliers of plaice with about 30% of the supply of European plaice but they are a minor supplier of common sole with about 2.5% of the global production. One of the aims of the project was to consider cooperation with the view of upgrading the Nordic value chain e.g. in terms of processing, sales and marketing. Processing of plaice into fillets does not seem to be attractive economically based on the low margin and current landing prices in Denmark, UK and the Netherlands (2.15–2.59 €/kg). However, landing prices of plaice are considerably lower in Iceland than that of Europe or about 1.57 €/kg which can potentially give some room for a margin in filleting assuming high yield into fillets, freezing and economical transport to European markets. The margin would not be high assuming the market prices would be close to that of export prices from the Netherlands or about 2.60 €/kg, but with good coordination in purchasing plaice from Icelandic fishers and economical processing and transport this may be an option. Additionally, some of the Icelandic catch will be large plaice which can be sold at higher prices fresh into the European HoReCa market. The focus in processing should be on size grading the fish, exporting the larger fish fresh and then mechanically filleting the smaller plaice as manual filleting is not an option due to costs. The transport cost in exporting the large plaice fresh as minimally processed or whole, would of course be considerably higher that of frozen fillets but such transport has been carried out successfully from Iceland for fresh cod, haddock and redfish (fillets and portions) to Europe in recent years, so there are already in place routes and expertise. Denmark could be the ideal partner for Iceland, as it is a consuming country as well as being a large supplier and exporter of plaice and with options to increase the catches. Denmark should have connections to potential buyers both within retail and HoReCa and could have the necessary market power to supply to different clientele (fresh/frozen, whole or fillets). For interested parties this may be a logical option; for entrepreneurs with connections to the raw material supply in Iceland and Denmark and links to marketing channels both in retail and HoReCa in the consuming countries (Denmark, Italy, Germany, Netherlands and UK). Still, the supply from Iceland is quite sporadic in the sense that the catch is a by-catch by trawlers and only few fishers are concentrating on catching flatfish species; in fact, the current landings of flatfish in Iceland is by over 300 vessels. Fluctuations in quantity from one month to another should be expected and good coordination will be required to supply the European market. Another concern is that the current relatively small landings of Iceland may not be large enough for justifying an investment in a technical advanced processing, especially considering that a large part of the plaice may be too big for the filleting machines. However, the large size plaice may offer an opportunity for minimal processing and export of fresh whole plaice at relatively higher sales prices (and with a better margin) than that of fillets.

For common sole there is no obvious Nordic common connection as Denmark is the only Nordic supplier and a relatively small one on a global scale (2.5%).

Greenland halibut has a completely different value chain to that of plaice and common sole. First, the fish is caught in the high north Atlantic, not as the other fish species mainly in the North Sea. Second, the main suppliers are mainly the Nordic countries Greenland (Denmark), Iceland, Faroe Islands and Norway as well as Russia and Canada. Third, the main market is Asia with only small quantities being imported into Europe, mostly to Germany. The composition of Greenland halibut is different to that of common sole and plaice; the fish has high fat content which may explain why it has only a niche market in Europe, mostly as a cold smoked product. The catches of Greenland halibut are considerably higher than that of the other species with global catches of about 130,000 tonnes. The traded value of Greenland halibut was about 400 million euros in 2018, almost the same as the combined trading of common sole and plaice for that year. Largely the supply of Greenland halibut is sustainable with minimal options to increase catches. Greenland halibut is a substitute to Patagonian toothfish in Asian markets. The global supply of Patagonian toothfish has been relatively steady during the last few years, but at the same time both supply and prices of Greenland halibut have increased. This suggests that the demand for Greenland halibut and/or the substitute Patagonian toothfish has been increasing so any decrease in the global supply will lead to price increases.

Already good cooperation can be seen within the Nordic countries for Greenland halibut; all the fish caught in Greenland and most of the Canadian fish is exported via Denmark. Some of the fish from Norway and Faroe Islands is also exported via Denmark. In fact, trade via Denmark was about half of the global trade for Greenland halibut in 2018. Denmark is the main exporter of Greenland halibut into Asia and has strong market power. The other Nordic countries that is Norway, Iceland and the Faroe Islands have also set up sales channels to export and market their products directly to Asia; 40–80% of their trade of Greenland halibut is to Asia. It is understandable that the companies – especially the larger ones - supplying Greenland halibut want to have direct links to buyers to improve margin, service, etc. The product for Asia is minimally processed – mainly headed and gutted – before export to the market. There is no apparent lack of transparency seen in the current value chain of Greenland halibut and no obvious means of further common value creation between the various Nordic stakeholders.

9 Conclusion

The objective of this report was to provide an overview of the Nordic flatfish sector; especially focusing on the significance of Nordic supplies within the North-European flatfish value chains, stock status, catches, values, handling, processing, trade, and markets. This overview could then potentially be used to facilitate increased cooperation among Nordic Flatfish suppliers and authorities.

The report shows that there are similarities in the value chains of plaice and common sole. The fish are caught largely in the Northern part of Europe and the consumption takes place in Europe, chiefly in the Netherlands, Italy and Germany. The main intermediary actor in the value chains between supply and consumption is the Netherlands; they act as a supplier, importer, processor and exporter as well as being a large consumer of the fish. Greenland halibut has however a completely different value chain to that of plaice and common sole. The fish is caught in the high north Atlantic and the main suppliers are the Nordic countries Greenland (Denmark), Iceland, Faroe Islands and Norway as well as Russia and Canada. The main market is Asia, not Europe.

There may be some options for a Nordic cooperation between Denmark and Iceland in processing and marketing of plaice, as these countries are a relatively large global supplier with a 30% share of the supply. No such cooperation options were seen for common sole and Greenland halibut.

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