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Deliverable D3.4

Report on evaluation of industry dynamics, opportunities and threats to industry

February 2018

Executive Summary

In this report, evaluation of industry dynamics, opportunities and threats to industry, we are focusing on value chain dynamic for certain industries and species. The framework used is a bit different for caught species (cod and herring) and farmed species (salmonoids, sea bream & bass and pangasius). The industry dynamics is more value chain focused for the caught species, while individual companies are also the focus for the farmed species.

The main results for the caught species revealed very interesting structural difference and functionality of the value chains for cod between Norway, Iceland and Newfoundland. Previous studies have argued that the superior harvesting and marketing strategies of the Icelandic industry may be rooted in factor conditions that are difficult to duplicate and a rigid institutional framework in Norway and partly the social resource structure of the Newfoundland industry, where market conditions have very limited consideration in terms of the structure or management of the industry.

The vertically integrated companies in Iceland is based on the processor owning its own fishing vessels. Unlike the push supply chain system followed by the Norwegian and partly the Newfoundland companies where they must process the fish that they receive, the Icelandic processors place orders to their own fishing vessels based on the customer orders and quota status, thus following a pull supply chain system. The Icelandic processors can send orders to the vessels for how much fish should be caught of each main species wanted, where to catch and land so they have the desired size and quality of raw material needed for fulfilling customer orders. This structural difference is also affecting the product mix that the countries are going for.

It is also very interesting to see the difference in structure and functionality of the value chains between Norway, Iceland, Denmark and Newfoundland for herring. The structure of the industries is different as can be seen in the degree of vertical integration and the limits that government's put on the industries. It is though surprising how homogeneous the industry is between those nations. The nature of pelagic species that is, seasonality and high catch volumes in short periods, makes the products a global commodity for further processing from one season to the next. The main markets are Business to Business (B2B)

The first noticeable difference observed, apart from the structure, is the price settling mechanism. On one hand it is the Norwegian system that builds on minimum price and auction market which is the same that is used to determine the Danish price. In Iceland the price is decided by the Official Bureau of Ex-Vessel Fish Prices. The Norwegian price is in many cases double that of the price in Iceland. The price obviously affects the profitability of the industry as the Norwegian fishing is benefiting from high price but the processing sector is suffering from low profitability. On the other hand, the herring processing sector in Iceland is doing well and the profitability of the fishing is healthy. It can be claimed that the overall profitability is higher in Iceland due to the freedom of strategically positioning yourself in the value chain and being vertical integrated or not, without external limitation as those that can be seen in Norway, Denmark and Newfoundland

Aquaculture is the primary source of salmonid supply globally. The different salmonid species available on the market are substitutable to a considerable extent due to their pink flesh colour and similar properties. However, different dynamics in the broader competitive environment, and in the particular circumstances of national sectors, in which the businesses comprising these industries are

embedded, have determined different developmental trajectories for the very same industries. These dynamics include the changing nature of consumer demand characteristics, production technology, national regulatory regimes, international trade, industry structure, availability of natural resources. Discussed in this chapter are the cases of farmed Atlantic salmon and rainbow trout in major producer countries and the role key external influences have played in shaping different developmental outcomes. The interaction of selected salmonid producer firms with their distinct competitive environments is illustrated through firm-level case studies of strategic positioning.

The output of most salmonid aquaculture, and Atlantic salmon in particular, is highly commoditised i.e. there is little differentiation between farms and competition is based purely on price. These products, mostly head-on gutted fresh fish, serve as raw material for further processing. In that situation, large enterprises which can reduce costs of production through economies of scale and offer the lowest price, have a competitive advantage.

Seabass and seabream are the most important species for the aquaculture of fish in Spain, being one of the most important markets in Europe. The production and the market is highly concentrated and economies of scale may improve the competitiveness of the sector. The integration of production and the stable international trade allows to increase the share of the price value.

The pangasius industry in Viet Nam has grown quickly over the last two decades to become one of the main food exports from the country and a major contributor to the Vietnamese economy. Pangasius products, mainly frozen fillets, are currently exported all over the world, with the largest markets being the EU, the USA, and more recently China. The success in market penetration of pangasius products can be attributed to their mild taste, lack of bones, and most importantly, their low price compared to other, more traditional whitefish products, for which it acts as a low-cost substitute.

The production node in the pangasius's value chain was initially highly fragmented, composed of many small-scale family owned enterprises and middle-scale processor-exporters. However, the industry is undergoing a rapid a rapid consolidation and increasingly being served by large-scale vertically integrated enterprises, encompassing all stages of the value chain. The reasons for that can be found in the improvement in seed production methods, control of fish health and disease problems, feed and nutrition and market requirements.

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Chapter 1: Comparison between cod value chains in Iceland, Norway
and Newfoundland.

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1 Executive summary

It is very interesting to see the difference in structure and functionality of the value chains between Norway, Iceland and Newfoundland. Previous studies have argued that the superior harvesting and marketing strategies of the Icelandic industry may be rooted in factor conditions that are difficult to duplicate and a rigid institutional framework in Norway and partly the social resource structure of the Newfoundland industry, where market conditions have very limited consideration in terms of the structure or management of the industry.

The vertically integrated companies in Iceland where the processor owns its own fishing vessels. Unlike the push supply chain system followed by the Norwegian and partly the Newfoundland companies where they must process the fish that they receive, the Icelandic processors place orders to its fishing vessels based on the customer orders and quota status, thus following a pull supply chain system. The Icelandic processors are able to send orders to the vessels for how much fish of each main species is wanted, where to catch and to land so they have the desired size and quality of raw material needed for fulfilling customer orders.

This structural difference is also affecting the product mix that the countries are going for. Iceland is therefore placing more and more emphasis on fresh fillets and pieces, while the other countries are going for more traditional products, like salted, dried and frozen products. Due to the vertical integration in Iceland, the production plans are developed based on customer orders and then a plan is made for fishing, while in Norway and Newfoundland, the production plan is usually developed after receiving the fish at the processing plant as the information about volumes of species caught and quality is not available beforehand.

2 Global Market review

According to a book by Mark Kurlansky; "Cod - A Biography of the Fish that Changed the World". Cod was the reason Europeans set sail across the Atlantic, and it is the only reason they could. What did the Vikings eat in icy Greenland and on the five expeditions to America recorded in the Icelandic sagas? Cod, dried in the frosty air. What was the staple of the medieval diet? Cod again, sold salted by the Basques. As it turns out, cod has sparked wars, shaped international political discourse, impacted diverse cultures, markets, and the environment.

Cod importance has dwindled, but it is still of major importance to Iceland and Norway and growing importance in Newfoundland and therefore it is important to look at industry and market dynamics, opportunities and threats in the value chain of cod for these countries.

2.1 Main producers

Atlantic cod is only one of many species entering the global supply chain for whitefish, which can be viewed as substitutes. Amongst them, we find Alaska pollock, hake, saithe, Pacific cod, haddock, hoki and Atlantic redfish. Altogether, the global supply of these species in 2015 was about 6,937 million tonnes, according to FAO. The largest species by far is Alaska Pollock, for which the catch in 2015 added up to 3.3 billion tonnes – 48 per cent of the total whitefish supply – for which US and Russia are the largest actors.

Atlantic cod was the second largest species in the global whitefish supply in 2015, responsible for 1,304 million tonnes, or 19 per cent of the total. The main actors in this catch of Atlantic cod in 2015 was Norway, Russia, Iceland and the EU with 11% of the catches as can

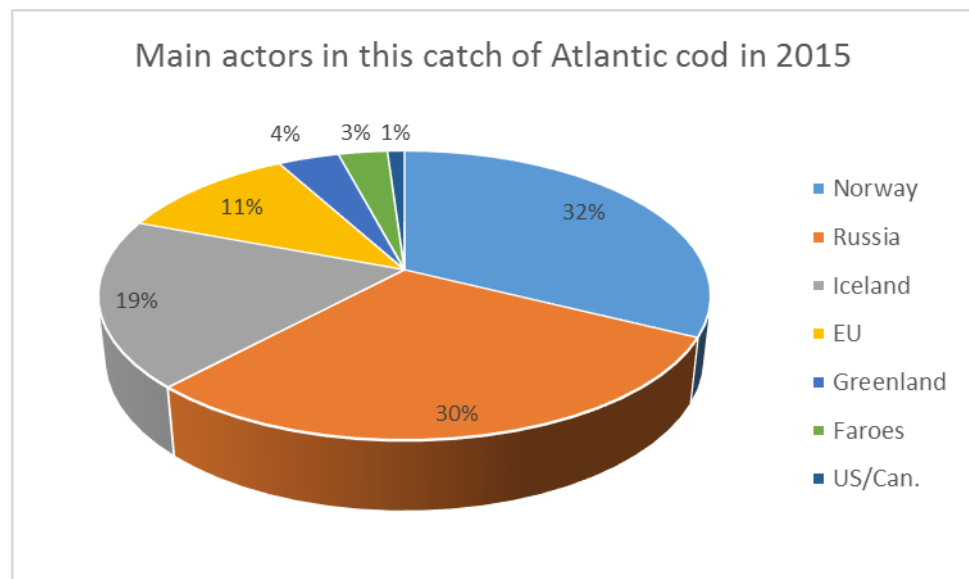


Figure 1. Main actors catching Atlantic cod in 2015 according to FAO

been seen in figure 1. The main actors among the EU countries are Denmark, UK, Germany and Poland. The main suppliers since the turn of the century are shown in **Error! Reference source not found.**

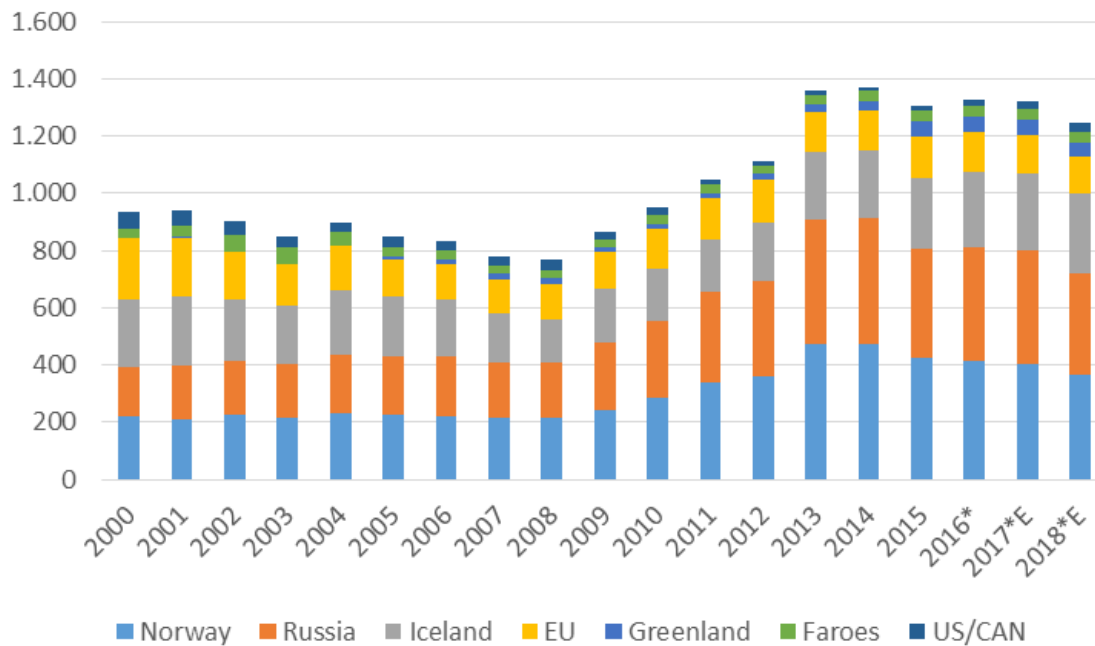


Figure 2. Supply of Atlantic cod from the North Atlantic waters, by country, 1000 tonnes, 2000–2018. Source: FAO and (*) Groundfish Forum

Error! Reference source not found. show a relatively stable distribution of cod catches until the increase in the quotas for Northeast Atlantic cod about 2009, where Norway and Russia increased their share. Moreover, it shows that the catch of US/CAN fell until the end of this period, when it rose again, and that Greenland catches have increased over the period.

As can be seen in **Error! Reference source not found.**, The International Council for the Exploration of the Sea (ICES) has recommended a 20 percent cut in the Barents Sea cod quota for 2018. However, the Joint Russian Federation-Norwegian Fisheries Commission in October 2017 agreed on the 2018 quotas, which include a 13 percent cut in the Barents Sea cod quota to 775.000 tonnes ([FAO](#)).

2.2 Main markets

The EU is by far the largest market for cod products in the world. Cod is processed in different format to fulfil the needs and customs of different markets. There is a big consumption of fresh and frozen product in EU, especially in UK and France. The tradition of drying fish to preserve it dates back to Viking times, but the process of salting fish began in the 15th century, when the Iberian fishermen were sailing to and from Newfoundland. Cod that had been preserved in salt would last the length of the journey. Clipfish/saltfish or bacalao is also popular in Catholic countries, thanks to a tradition that dates back to the middle ages when the pope ordered Catholics to eat fish instead of meat during Lent. Therefore have Iceland and Norway exported bacalao for centuries to Catholics around the world, especially to Spain and Portugal. There are also number of other traditional markets, like Nigeria for dried fish parts and heads. USA was also a big market for cod products, and it has been growing again in recent years, especially for fresh cod.

Cod producers from Norway have been taking putting effort in emerging market like China, where there is great potential but no custom of consuming cod products.

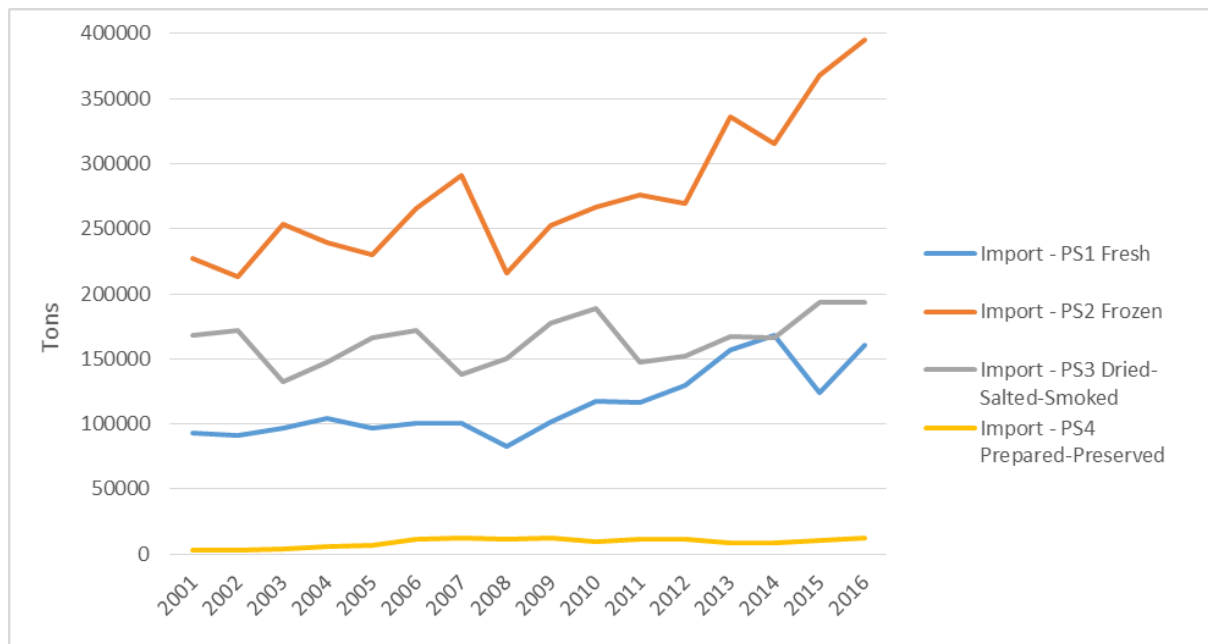


Figure 3. Trade of cod in the EU, Import of cod products in the EU, both extra and intra EU trade. Raw data from EUMOFA.

The total import in the EU was 761 thousand tons in 2016 and the imports in total have been on the rise in recent years. That don't mean that this came all from outside of EU. Part of the imports (42.1%) came from Intra EU trade while the larger part (57.9%) came into the EU from countries outside the EU, like Norway and Iceland. Largest part of the EU export figures of 421 thousand tons are Intra EU trade or 94.1%, therefore there are only around 25 thousand tons of cod exported out of the EU to non EU countries.

Frozen cod is by far the most common preservation form of traded cod in the EU as can be seen in **Error! Reference source not found.** The import of dried, salted and smoked cod products has been relatively stable in recent years but the main growth has been in the import of frozen and fresh cod products. The imports of fresh cod have been on the rise since 2008, but 2015 the volume went down but gained momentum again in 2016. The imports of prepared or preserved products is low but relatively stable between years.

3 Fisheries Management System in Norway, Iceland and Newfoundland

	Norway	Iceland	Newfoundland
General	<p>“The main objective for the industrial and fisheries policy is the highest possible value creation in Norwegian economy, within sustainable limits. The Ministry of Trade, Industry and Fisheries work is to obtain this main objective builds on the following sub-objectives: efficient use of society’s resources, increased innovation and adaptation ability, and companies who succeed in international market. The sub-objectives and prioritised areas to achieve these are just as important for the seafood industry as other activities in Norway. A purposeful superior effort to stimulate to increased innovation and adaptation ability in Norwegian economy is of great importance also for the seafood industry.”</p>	<p>Iceland seafood sector is modern and competitive, based on sustainable harvest and protection of the marine ecosystem. Marine products have historically been the country’s leading export items and the seafood industry remains the backbone of the economy. The fisheries management in Iceland is primarily based on extensive research on the fish stocks and the marine ecosystem and biodiversity, and decisions on allowable catches are made on the basis of scientific advice from the Icelandic Marine Research Institute and catches are monitored and enforced by the Directorate of Fisheries.</p>	<p>Fisheries and Oceans (DFO) is responsible for management of the Canadian fisheries stocks in accordance with the roles and responsibilities outlined in Canada’s Fisheries Act. The major objectives and priorities of the DFO’s fisheries management policies include ensuring environmental sustainability and conservation of the resource, ensuring access based on adjacency or proximity to the resources, consideration of the relative dependence of coastal communities and the dependence of various fleet sectors, as well as factors such as economic efficiency and fleet mobility. Inclusion of stakeholders in the decision-making process is regarded as a key priority for fisheries management in Canada (Fisheries Management Decisions, 2017; Sustainable Fisheries Framework, 2017).</p>
Quota system: Individually	<p>* Rule of thumb: Off-shore vessels governed by licenses, and coastal vessels by annual participation rights</p>	<p>The ownership of quotas involves the right to catch the fish but does not entail ownership of the fish stock. Thus, it is claimed that the quota does not mean the</p>	<p>Generally, DFO allocates quotas for each stock/species (or group of species) in accordance with a specific fishing season and within a specified fisheries</p>

<p>Transferable Access.</p>	<p>(off-shore conventional vessels excepted).</p> <ul style="list-style-type: none"> * In order to get a fishing quota you have to buy a vessel (a pre-requisite is loosened up in later years, where one nowadays can get hold of structured quotas, without factual vessel transactions). Transferability has increased, but still with great imperfections compared with an ITQ-regime. * Quota distribution to vessel groups (coastal vs. off-shore, and different size classes within the coastal vessel group) based on allocation formulas agreed within the Norwegian Fishermen Association, upon historical rights. Still with some autonomy for the authorities to allocate certain shares of quotas to special schemes (youth, recruitment, R&D, etc.) before allocation to vessels. * Regional distribution safeguarded by fleet composition, and limited transferability between regions for some licenses/participation rights. <ul style="list-style-type: none"> • Quota year is the same as the almanac year. 	<p>ownership of the fish but rather the right to catch the fish.</p> <ul style="list-style-type: none"> * Since 2001 small boats have been allocated TAC (Total allowable catches) and all effort based system abolished until 2009 when coastal fisheries was introduced. As can be seen in figure the share of small boats of the TAC was 14.2% in 1992 and is 22.3% in 2016. It peaked in 2001 when it was 24.1% of the TAC in cod. Part of this increase can be explained with changes in classification of small boats as in 2013 when small boat definition went from 15 gross registered tonnes (GRT) to 30 GRT. * The emphasis of the fisheries management system since 2001 has been to simplify the system and bring all into the quota system of ITQ and TAC system. Against this, open access fishing was introduced in 2009 when new system was introduced for small boat called coastal fishing (isl. strandveiði). * By the 1990 Act the fishing year was set from 1. September to 31. August in the following year but previously it had been based on the calendar year. This was an effort to channel fishing of the groundfish stocks away from the summer months, when quality suffers 	<p>management division. The key regions or fisheries management divisions for cod quota or allocation in NL are:</p> <ul style="list-style-type: none"> i. 3K (including 2J3KL) ii. 3Ps iii. 4R (including 4R3Pn) <p>Information included in a fisheries decision may include:</p> <ul style="list-style-type: none"> * opening and closing dates for the season, * total allowable catches (TAC), * and management plans (Fisheries Management Plans, 2017) with certain fisheries managed through multi-year Integrated Fisheries Management Plans (Integrated Fisheries Management Plans, 2017). <p>In Newfoundland, Atlantic cod are managed through a series of strategies. Pending the NAFO region, the cod fishery can be a set quota, a weekly allowance or allocation, or may be an experimental fishery. Based on principles of adjacency and the numbers of vessels /harvesters participating in the fishery, the coastal fleet</p>
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		more quickly and many regular factory workers are on vacation.	(<65 feet) has a strong position within the NL fisheries sector.
Entry barriers into the system:	<p>The activity demand in the Participation Act states that in order to own a fishing vessel one have to be an active fisher.</p> <ul style="list-style-type: none"> * Many exceptions have been granted. Firstly, on the same footing as active fishers are administrative fishing vessel owners – caretaking the daily operation of vessels from land. * Also, as the filleting industry in the north of Norway was built up and prioritised as whole year employers, many filleting firms were granted cod trawl licenses, which today are held by two big processing concerns (Lerøy and Nergård, * To become a registered fisher, you have to live in Norway and work on a registered Norwegian fishing vessel * To get a vessel registered as a fishing vessels, demands have to be met regarding size class and operating areas. Like in other western society fisheries, the closure of the commons have increased the capital intensity, and labour is to a large degree substituted by capital intensive production equipment. <p>Foreigners can buy vessels below 15 meters in Norway and control no more</p>	<p>All professional fishing in Iceland has to have licences for fishing.</p> <ul style="list-style-type: none"> * Capital intensive due to high price of quota * Entry for foreign investments very limited (or closed). * Economics of size <p>Costal fisheries</p> <ul style="list-style-type: none"> * In 2016 total 9790 thousand tones are allocated for coastal fishing one open access base from May to August. <ul style="list-style-type: none"> • Open access • Low profitability (returning loss for all years of operation) * Coastal fishing is limited to small boats with maximum two handlines per person and maximum two person on the boat. The maximum 650 kg catch per day and fishing is limited to four days a week. <ul style="list-style-type: none"> • There are also limits of TAC for each area for the small boats. 	<ul style="list-style-type: none"> * No new licences being issued by DFO * Entry into fishery is based on acquisition of existing licences * Requires a professional fish harvester certification <ul style="list-style-type: none"> • Significant investment in terms of education and training and at-sea experience * Cost of entry into the fishery is prohibitive due to the high cost of capital investment (vessels, gear, etc.) and the cost of licences <ul style="list-style-type: none"> • Uncertainty over future allocation/quotas and if there will be return on investment

	<p>than 40 per cent for boats above 15 metres.</p> <p>Processing industry - no nationality limitations exists</p>		
Exit barriers from the industry	<p>Exit barriers are fewer</p> <p>Vessel owners are unable to recover the full vessel value as they exit the industry.</p> <ul style="list-style-type: none"> * However, the increase in quota prices over the years should cover for such discrepancies. * Limited transferability between regions in some vessel groups. 	<ul style="list-style-type: none"> * Low exit barriers quota easily sold and market open * No tax limitation for selling the fishing rights and ITQ. * Unlimited transferability between regions 	<ul style="list-style-type: none"> * Low exit barriers licenses are easily sold; open market for licence * No regulations governing the sales <ul style="list-style-type: none"> • Exit not linked to potential resource re-allocation for new entrants; i.e. portion of share or allocation is not reinvested back into the fishery • No financial reinvestment (e.g. no tax or fee) required to be paid by harvester upon sale of licence and exit from the system
Quota ownership and quota prices	<p>There is in Norway a consolidation limit for cod for both conventional off-shore vessels (auto-liners) and cod trawlers, but not for coastal vessels.</p> <ul style="list-style-type: none"> * Firms owning conventional off-shore vessels cannot, directly or indirectly, own vessels that control more than 15 per cent of the group quota for any of the species included. * For cod trawler, firms cannot control more vessels exceeding more than the number that controls 12 quota factors. With today's quota ceiling (maximum 	<p>Limitation on consolidation of quota ownership – max 12% ownership of TAC for each species.</p> <ul style="list-style-type: none"> * Quota is bound to fishing vessel but companies with number of vessels can transfer quota between vessels. * 15% of TAC can be transferred between years by companies * 5% can be overfished in the fishing year and will then be withdrawn from the companies next year TAC 	<p>Transferability of quota/weekly allocation</p> <ul style="list-style-type: none"> * Limit on combining (maximum set at 2:1 or 3:1) shares or allocation for inshore fleet * Transfer of shares/allocation between vessels is permanent (inshore fleet); * Larger offshore vessels can transfer quota between vessels annually- it is not permanent * Opportunity to buddy-up is limited or restricted based on region and season

	<p>four quota factors per vessel), it means 3 full structured vessels and about 13 per cent of the group quota for cod trawlers.</p> <p>* However, there are specific rules for ship owners that also own processing facilities, which is the reason that the two before mentioned cod trawler ship owners have more vessels than the limit of the Act.</p> <p>Quotas can be transferred among vessels in a vessel owning company, but only upon authorities' approval.</p> <p>Also, other eases of transferability exist (renting quotas, ship wrecking, replacement permit – in awaiting of new vessel, and others)</p> <p>A quota flexibility between years is also possible, but within the cod fishery, this is only possible on group level – not for individual vessels.</p> <p>An overfishing of the vessel groups' cod quota one year will be claimed against next year's quota, and vice versa if the full quota is not taken.</p> <p>For the vessel groups with a limited number of vessels, this individual vessel quota flexibility between years will be</p>	<p>TAC cannot be transferred between systems, example from the hook system to the general TAC system</p> <p>* There is regional restriction to fishing in the coastal fisheries</p> <ul style="list-style-type: none"> • The fishing ground is split into 4 areas 	
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	<p>effectuated over the turn of the year from 2017 to 2018.</p> <p>Coastal vessels will have to wait longer until this can be effectuated, since so many extraordinary schemes exists for these vessels</p> <p>Quotas within Norwegian fisheries are transferable, but there exists no central brokerage system where quota prices are noted.</p>		
Possibilities to upgrade in the system	<p>Upgrading is possible, but is capital intensive.</p> <p>Opposite to the fishing industry, no license is needed to erect processing capacity. Upstream vertical integration (towards the fishing fleet) is prohibited, while downstream (from fleet to processing) allowed.</p> <p>Less cod in onboard processed in the off-shore over time, but more is sold as frozen HG.</p>	<p>Limitation to move between systems</p> <ul style="list-style-type: none"> * hook system is looked in there but can be transferred inside that system * Small boats can enter the costal fisheries even if they are operating in other systems. * only requirement's is during that time they only operate in costal fisheries. 	<ul style="list-style-type: none"> * Limited opportunity for vertical integration based on PIICAF and allocation of first 115,000 tonnes to inshore sector * Upgrading is based on number of licences purchased
Management measurements	<p>Landing obligations are not a subject in Norwegian fisheries, since it is mandatory to land all caught fish.</p> <p>Delivery obligations have nevertheless been put on about half the cod trawlers in</p>	<p>Landing obligation</p> <ul style="list-style-type: none"> * None, except in coastal fisheries the fish has to be landed before 16:00 and in harbours in the fishing zone 	<p>Landing obligation</p> <ul style="list-style-type: none"> * must land all catch unless a species exemption is received from DFO <p>Minimum processing requirement</p> <ul style="list-style-type: none"> * cannot process at sea

	<p>order to see to it that fish is landed where it was supposed to, in the cases where processing firms were granted cod trawler licenses but where ownership to trawlers have been dissolve during the years.</p> <p>No limits exists to how much a vessel can land on a daily basis.</p> <ul style="list-style-type: none"> * safety limits to how much cargo a vessel can hold, and * also a general rule that “a vessel should not carry more than it can take care of in a reasonable manner”, * but no limits exist as to what is the limit for daily catches in order to enable a best possible raw material quality. 	<p>Delivery obligations are not in place in Iceland and no processing requirements</p> <p>Fishing days – regulations /number of days</p> <ul style="list-style-type: none"> * Coastal fisheries have limitation (4 days pr. week/4 months) * Gear restriction in the hook system <p>Quantity</p> <ul style="list-style-type: none"> * In the coastal fisheries system <ul style="list-style-type: none"> • Max 650 kg pr. day/14 hours pr day • TAC for each area <p>Closures</p> <ul style="list-style-type: none"> * Marine Institute has licences to introduce closures fishing areas if for example share of small fish is too high according to landing or historical landing data <p>Discard ban</p> <ul style="list-style-type: none"> * There are measurement’s in place to avoid discard <ul style="list-style-type: none"> • Limited withdraw on unwanted catch form TAC • Up to 5% of fish that is damage can be landed as VS fish special weighted and not withdraw from TAC 	<p>Fishing season</p> <ul style="list-style-type: none"> * determined annually; reportedly based on ease of access to the fishery and not linked to market conditions <p>Gear restriction</p> <ul style="list-style-type: none"> * in place (e.g. fixed versus mobile gear)
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4 Market approach

The aim of this section is to demonstrate what the different value chains are returning to the markets in product mix, value and share of export. This is approach to demonstrate how responsive/dynamic the value chain is to serve the markets with products and value. It has to be keep in mind that there is great different in quantity of raw material that goes in each different value chain. Norway's total cod catch in 2015 was 422 thousand tons, Iceland caught 244 thousand tons and Newfoundland caught just over 12 thousand tons.

4.1 Differences in exports

It is interesting to look at the nature of the export from each of the value chains; that is whole fish, fillets, salted products and dried fish.

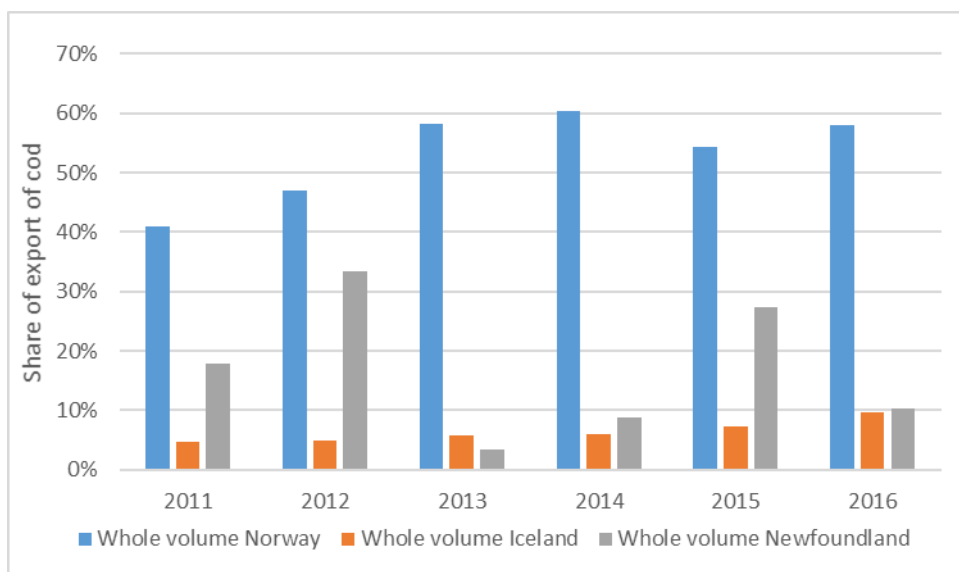


Figure 4. Export of whole unprocessed fish from Norway and Iceland as share of total exports.

- Export of whole fish from Norway has rather been increasing in the recent years. Part of that could be the increase in catch in Norway or from around 215.000 thousand tons in 2008 to 422 thousand tons in 2015. This export is both frozen H/G (headed and gutted) and fresh.
- Norwegian have focused a lot the last year of marketing their H/G fresh fish as Skrei where they select the best fish for export under the brand name Skrei and receive premium for that export.
- Export from Iceland has been increasing slightly and is mainly fresh with head on and is up to 9.7% in 2016 from 4.1% in 2011.
- Newfoundland export of whole fish fluctuates a lot between years; somewhat determined by the fluctuating TAC and weekly allocation/permissible catch rates.

Another way to look at the processing stage of the value chain is to look at the share of fillets in the export from those countries. In figure 3, all fillets export is summarized. This takes into account whole fillets, fillets portions and fillets from different processing; fresh, frozen and dried.

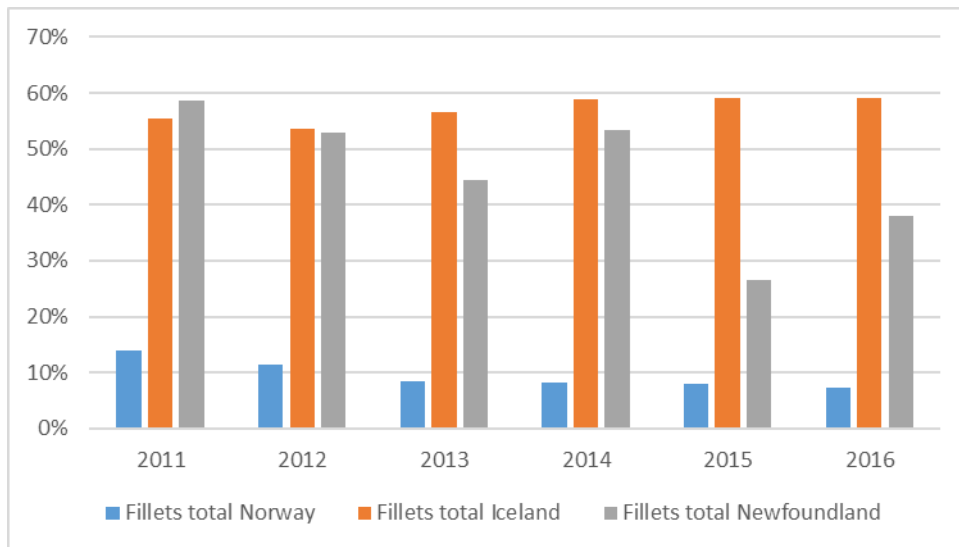


Figure 5. Total share of volume of fillets in export from Norway, Iceland and Newfoundland.

- Fillets production is very limited in Norway and accounts for less than 10% of the export in 2016 and the share has been decreasing. The fillets production is mainly frozen in Norway
- Iceland Fillet production is stable from around 55% to almost 60% of the total export. The 12.1 % of the export are fresh fillets or fillet parts, 21% is frozen and 10.3% are salted both frozen lightly salted and as salted fillets.
- Newfoundland export of fillets fluctuates between years.

The most valuable fillets production is the fresh fillets or fillet portions. In Figure 6 the fresh fish fillet export is expressed with export value per kg of fillets exported

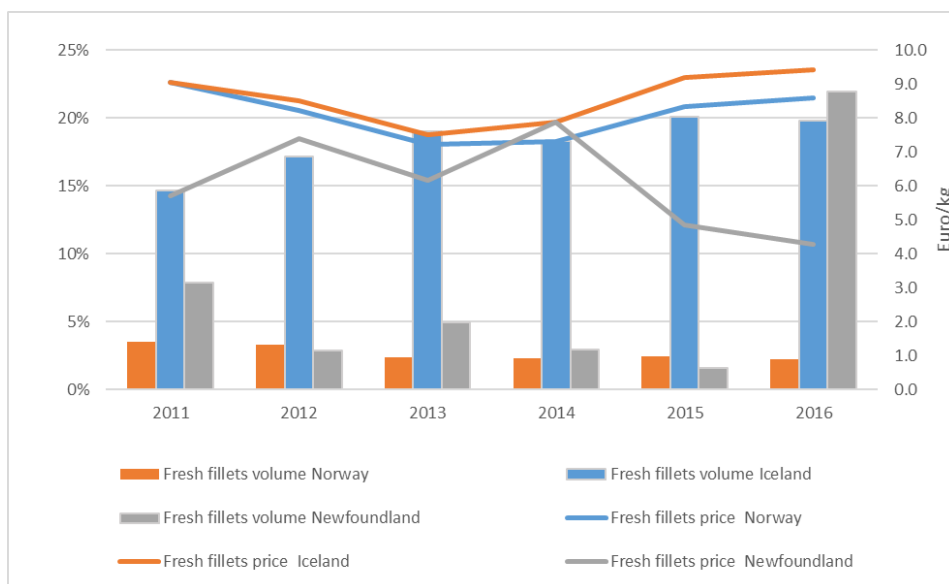


Figure 6. Share of export for fresh fillets by volume and average export price.

- The volume of fresh fillets as a share of the total export in Norway has been decreasing in share although the real quantity has not been reduced as the share as quantity of landed cod has increased considerable in this period. It is interesting that the price per kg of exported fillets are lower than for Icelandic fillets, which could suggest more export of whole fillets instead of fillet portions (loin cut) export from Iceland or lower price in the market.

- The export of fresh fillets has been increasing its share in Iceland as well as price per kg which can mainly be traced to higher degree of portioning in Iceland today due to water jet cutting in the processing part of the value chain.
- The share of fresh fillets in Newfoundland was decreasing from 2011 when it was 10.1% to 2015 when it was 1.5%. Then in 2016 it was up to 22% of the total export. Price of the export is in most cases (except 2014) much lower than fresh fillets from Norway and Iceland.

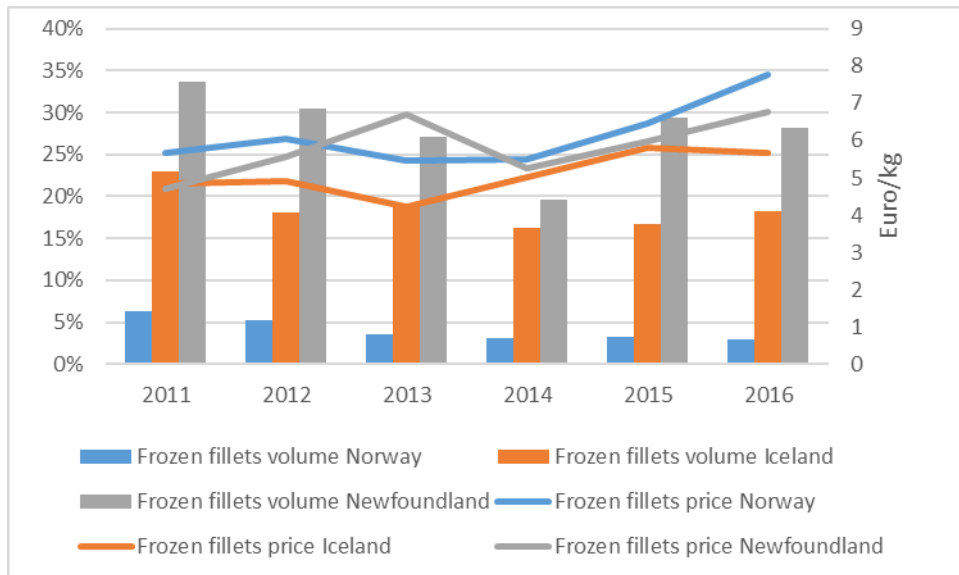


Figure 7. Share of export for frozen fillets by volume and average export price.

- The share of the Norwegian frozen fillets export is decreasing or from around 6% in 2011 to 2.9% in 2016. What is interesting is that the Norwegian receive higher price per kg of fillet than Iceland. One reason for this could be the focus of fresh fillet portions (loin cut) in Iceland leaving the tail and belly flap behind less valuable part of the fillet.
- Newfoundland have just under 30% of their export in frozen fillet and the price is in between Iceland and Norway except for 2013 when they receive the highest price of the three nations.

The traditional markets of cod from all the three countries is the salted fish markets mainly in the Mediterranean countries.

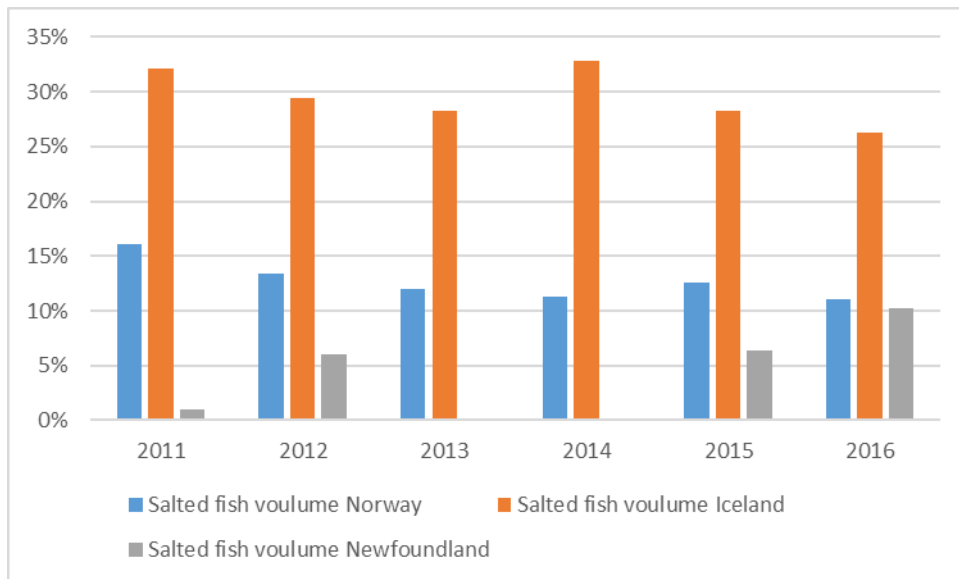


Figure 8. Total share of volume of salted fish in export from Norway, Iceland and Newfoundland

- Salt fish export from Iceland is divided between fillets and split fish. The share of export of split fish has been decreasing and the share of fillets increasing.
- The Norwegian export is mainly spited fish or clipfish dried salted that is counted as dried fish.
- The NL export consists of cod fillets dried and salted in brine (with/without smoking) and wet salted

The export of dried fish is also important for Norway and Iceland but not for the Newfoundland cod. The total share of salted and/or dried fish for NL has decreased over time. Between the years 2005-2010, NL salt fish exports ranged from 8-37% of total exports. This decreased from 2011-2016 where exports varied from 0% to 8.5%

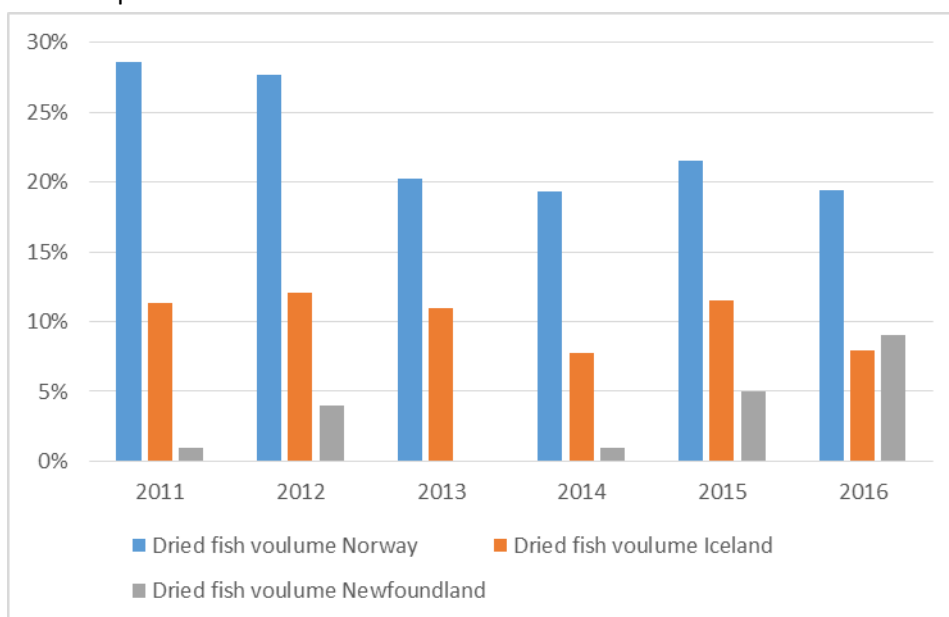


Figure 9. Total share of volume of dried fish in export from Norway and Iceland

- The export of dried fish from Iceland is mostly dried head and frames.

- The Norwegian export is stock fish. The main markets is Italy, which Norwegian have overtaken almost completely.

To summarise the marketing and production part together, it is interesting to look at how much value each of the value chains are returning for per kilo of cod. From Figure 10 it can be seen that from 2010, Iceland has in most cases been returning highest value per kg of cod.

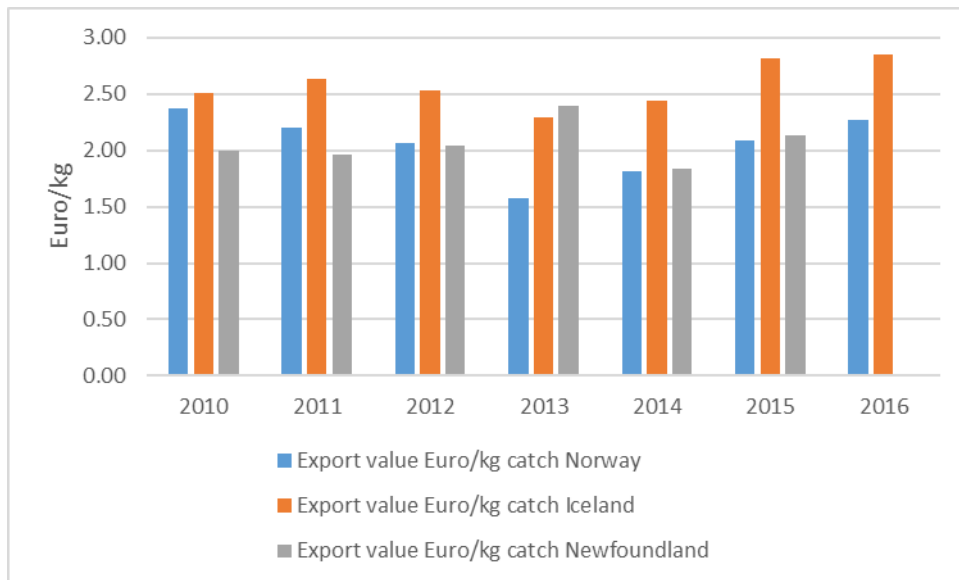


Figure 10 Total value of export per kg of cod landed

- This method of calculating value creation does not take into account stock in the beginning of the year or at the end of the year. So that could affect the numbers especially in Newfoundland that focuses on frozen products.

4.2 Summary of main influencing factors regarding market approach

Factor	Iceland	Norway	Newfoundland
Degree of processing	Medium/fillets	Low/raw material for processing abroad	medium/fillets frozen
Strategy	Focus on: <ul style="list-style-type: none"> • Fresh fillets • portions 	Raw material exporters. Focus on: <ul style="list-style-type: none"> • Whole • Dried • Salting 	Focus on <ul style="list-style-type: none"> • Frozen products • Fillets • Fillet portions
Marketing	Limited mainly based on individual companies	Medium, based on central focus of Norges rafisklag and individual companies. Producers and fisherman pays fee for	Limited or based on individual companies

		marketing of Norwegian seafood	
Risk in marketing	Rather high. Depend on rather few countries. 94% of the export goes to 10 countries	Medium. Emphasis on marketing and selling to many countries. 86% of exports go the 10 countries	High, Depend on few countries

5 Processing

5.1 Profitability and performance

Looking at the profitability of the processing sector as a whole as net profit as a share of revenue it is clear that the Norwegian industry is behind the Icelandic processing sector regarding these criteria. The trend line for profit for the processing sector is but much steeper in for the Icelandic sector than for the Norwegian one. The Norwegian processing sector has been suffering from low profitability in recent years. Information about profitability is not available from Newfoundland.

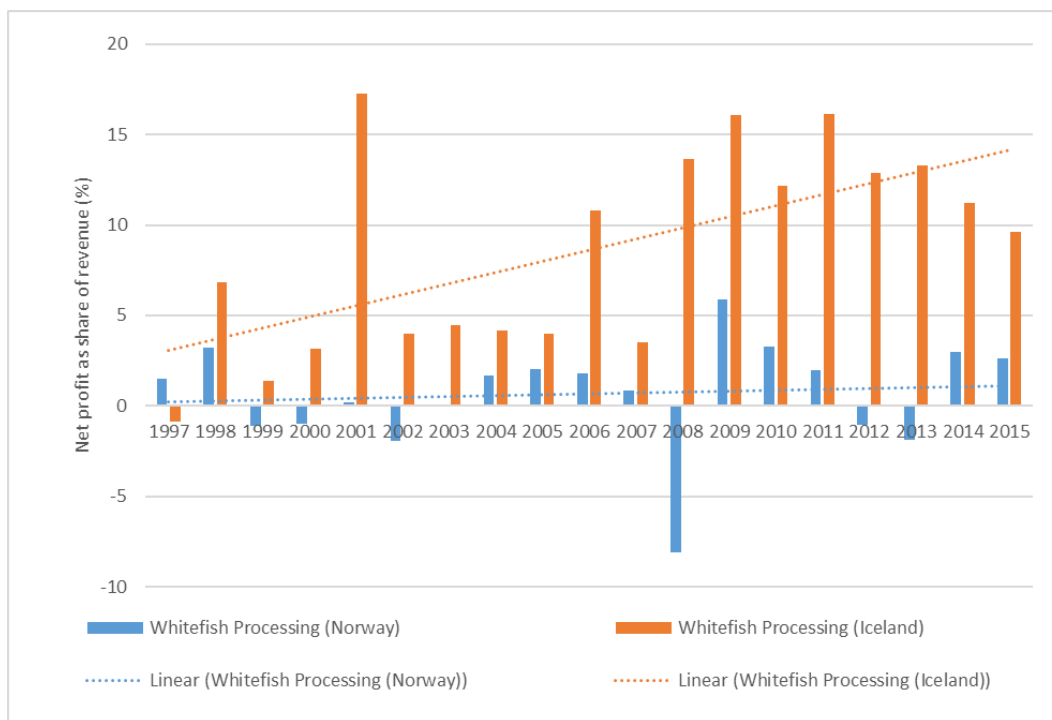


Figure 11. Net profit as share of revenue (Profitability) for the processing sectors in Norway and Iceland 1997-2015.

It is interesting to look at the difference in performance for the salting and drying sectors between Iceland and Norway.

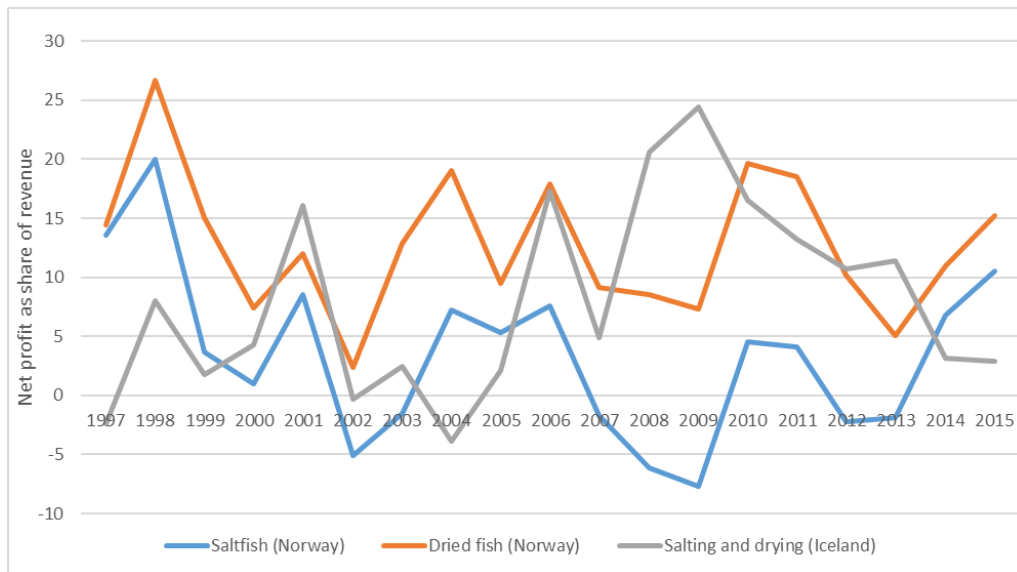


Figure 12 Net profit as share of revenue in salting and drying processing sectors in Norway and Iceland 1997-2015

Main issues:

- The best profit in Norway is in dried stockfish and clipfish, that is dried salted fish. Salting and drying in Iceland is mainly salt fish. Light salted and even light salted and frozen. Profitability is much higher than in salted production in Norway, where production is mainly traditionally salted fish.
- Stockfish production in Norway is returning healthy EBIT for most year. The stockfish production is aimed for high end niche markets in Italy and lower value markets in Nigeria.
- Drying of whole fish is very limited, the main product of the drying sector in Iceland are heads and bone frames.

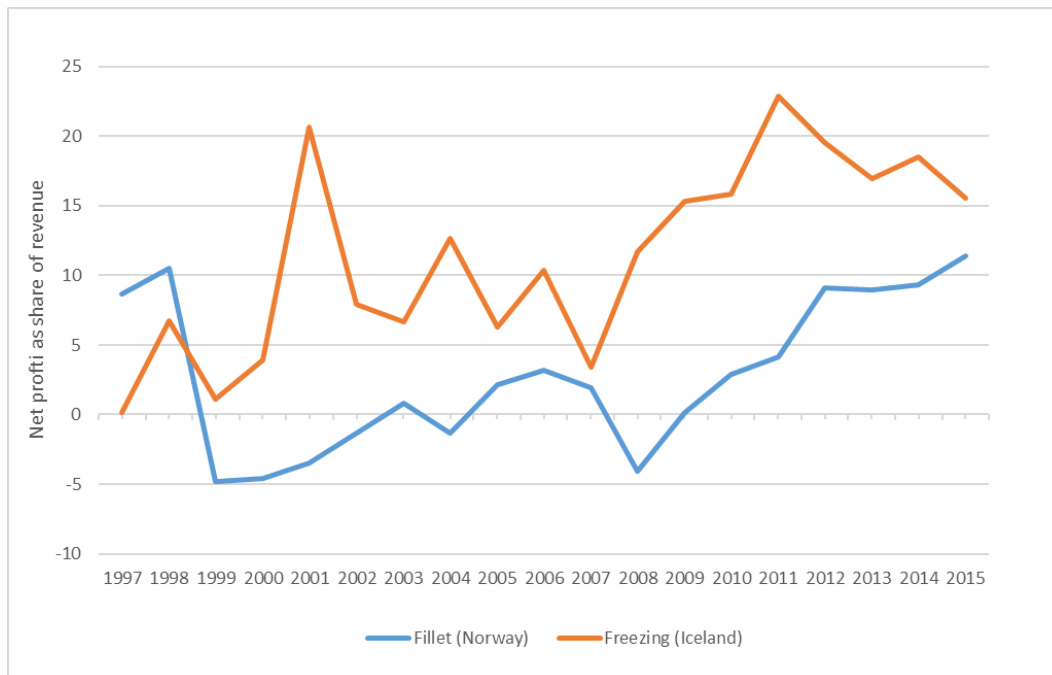


Figure 13. Net profit as share of revenue in filleting processing in Norway and frozen production in Iceland 1997-2015

- Comparing export and profitability on fillets production it is possible to compare the frozen production in Iceland with the filleting production in Norway. The frozen products from Iceland are mainly fillets or fillets portions. It is obvious that there is great difference in profitability although the profitability in Norway has been improving since 2008.

One of the influencing factor on the performance of the processing industry is the flow of fish to the processing part. It is interesting to see the distribution of catches for Norway and Iceland as is done in Figure 14, where the flow is shown as monthly share of total catches for the year vs. export price of fresh fillets for these countries in 2014.

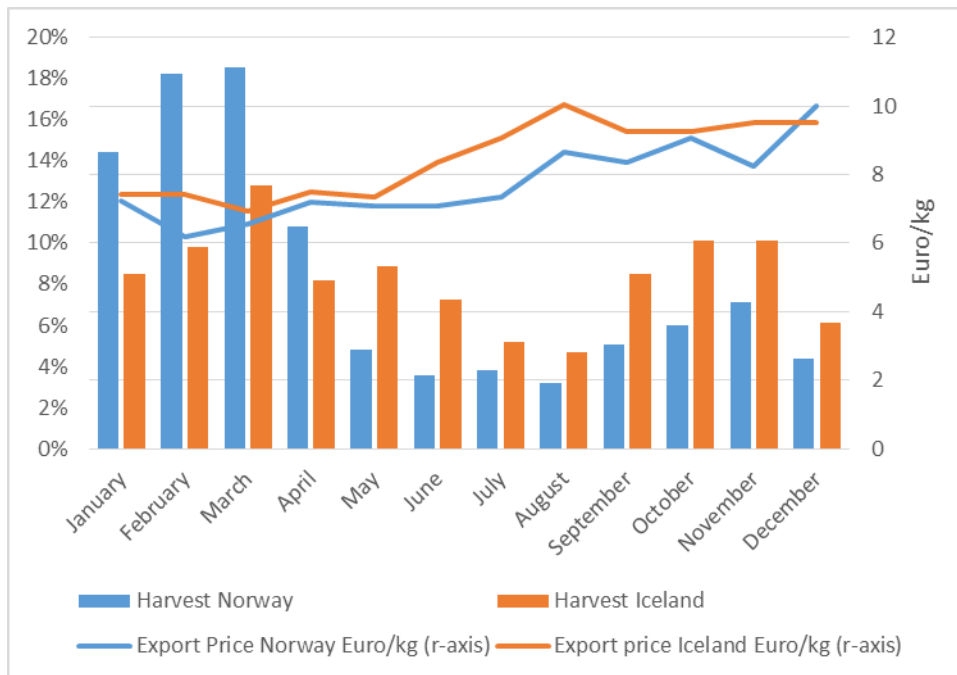


Figure 14. Monthly catches of cod as share of total catches for 2014 and export price in Euro per kg for fresh fillets.

- Norway has around 62.1% of the total catch landed in the first four months of the year while in Iceland the 39.2% of the total catch is caught during that period.
- During the first four months the price is lower than in the rest of the year and Iceland receives higher prices every month, except in December.

5.2 By-products

Product export statistic from the countries are not comparable making it difficult to estimate the utilisation of the cod. However, the availability and the critical mass needed for creative usage of by-products is always facilitated by the size of processing facilities and level of automation.

5.3 Summary of main influencing factors regarding processing

Factor	Iceland	Norway	Newfoundland
Profitability	high	low	Undetermined
Degree of processing	Medium/fillets	Low/	Medium/fillets frozen

Flow of raw material	Stable controlled by the processing marketing needs	Seasonal controlled by the catch and seasons	Seasonal controlled by catch limits (weekly limits may vary within the same season) and fisherman's willingness to sell to processing companies
Structure of the industry	Vertical integrations	Ban or limits to vertical integrations	Limited vertical integration; Regulations in place to limit increase in vertical integration
Vertical integrations	High	low	low
Flow of raw material	Stable controlled by the processing marketing needs	Seasonal controlled by the catch and seasons	

6 Price settling mechanism

One of the factors determine the dynamic in the value chain is the first gate price that the industry is capable of paying for the raw material and the form of selling. It is also interesting to study how effective the price settling mechanism is in rewarding for attributes of the raw material, like quality and fishing gear used. In Figure 15 development of the first gate price is expressed as weighted average price.

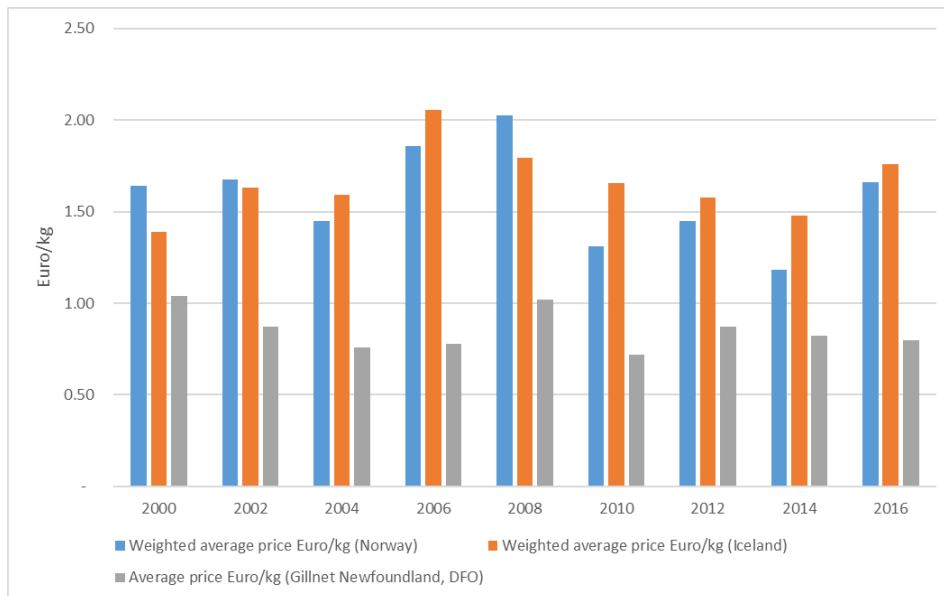


Figure 15. First sale price as weighted average price for cod in Norway and Iceland 2000 -2016.

Iceland has three ways of exchanging fish:

- Auction markets sells around 16% of the total landed cod,
- The VICs are responsible for around 70% of the landed catch and process most of the catches in own processing facilities. The price to the VIC's is connected to the auction price in Iceland.
- Contracts between individual boat owners and producers is responsible for 14% of the first sales.

In Norway there are two main form of trade of fish from fisherman to producers:

- Fresh fish is traded upon direct agreements between seller and buyer, but with minimise price settling according to Act of the Fish Sales organizations (Fiskesalgslagsloven), which gives sales organizations owned by the fishers monopoly in the first hand trade of fish. In the case of cod, two of those organization are responsible for nearly 99 % of all cod landed by Norwegian fishers (in 2016). The sales organizations are responsible for setting minimum prices for fish which is in most cases the price in the transaction.
- Frozen fish is sold on auction or by own acquisition, where the vessel owner upon landing himself takes care the sale of fish. In general, frozen cod either goes to clipfish production or is exported unprocessed abroad, while fresh cod to a greater degree is processed where it is landed.

In Newfoundland first hand price is negated before the start of the respective fishing season.

- This is done by The Fish, Food and Allied Workers Union (FFAW) and the processing companies convene as a price settling panel to negotiate the first gate prices paid to harvesters.
- The grade or quality of the product constitutes the price received with cod graded as either Grade A, B, C, or reject. The negotiated price is considered the minimum price and it is often augmented by the processing companies.

6.1 Price according to fishing gear

It is important to understand if the price settling mechanism is rewarding fisherman for attribute that could affect the value creation in later stages in the value chain. These attributes are for example quality, timing, size of fish, fishing gear and temperature of the fish. It is impossible to evaluate all those factors, but it is possible to evaluate the ability of the price settling mechanism to pay different price according to fishing gear.

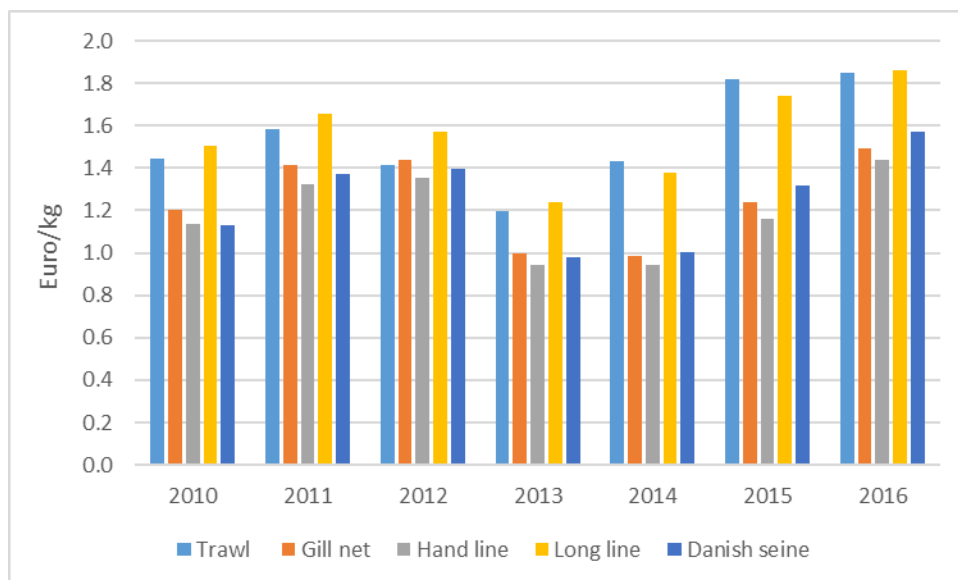


Figure 16. Norway, price according to fishing gear Euros/kg 2010 to 2016

It is clear that the price is different in Norway after according to the fishing gear.

- Longline and trawl receive the highest price but it is interesting that hand line usually gets the lowest price which is in contrast with the general believe that hook and line fish have the best quality.
- The price difference is quite high or up to 0.58 euro in 2015 between the highest and the lowest. Which means that the lowest price is 33% lower than the highest.

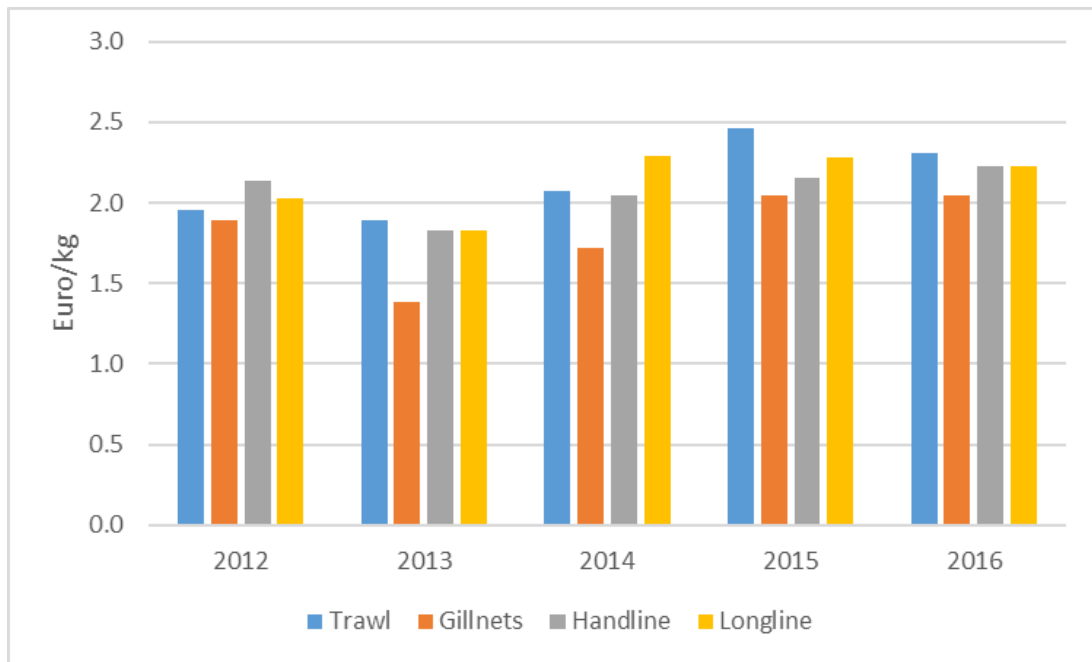


Figure 17. Iceland, price according to fishing gear Euros/kg 2012 to 2016

Price varies according to fishing gear in Iceland.

- The same trends can be detected as in Norway that the longline and trawl receive usually the highest price. Gillnets receive the lowest price but hand line receive the highest price in 2012, although the share of the total landed cod is rather low.
- The price difference between the highest and lowest price range between 0.25 to 0.51 euros per kilo and is biggest in 2013 when the difference is 27%.
- It is interesting to see the difference in price between hand line in Norway and Iceland that raises questions about quality and how active the price settling mechanism is in identifying and rewarding for quality.

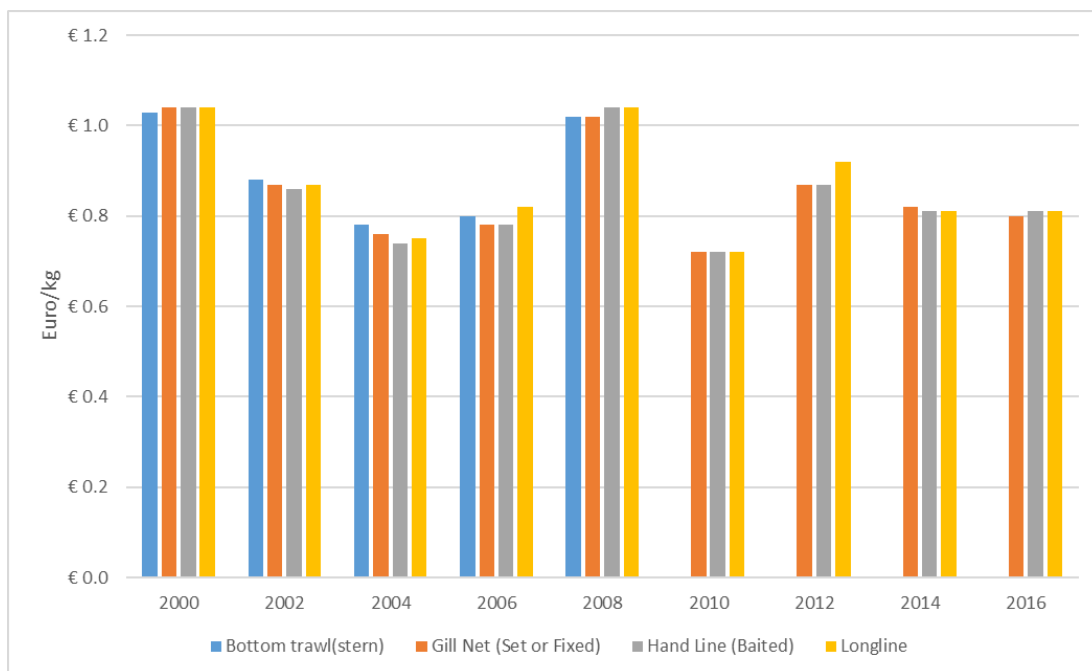


Figure 18 Newfoundland, price according to fishing gear Euros/kg 2000 to 2016

In Newfoundland there is no difference according to fishing gear indicating there is no efficiency in the price settling mechanism to identify quality and pay incentives for that. There are recent examples where processing companies are engaged in collaborative relationships with harvesters and are paying higher premiums to those using fishing gear that produce a premium product.

6.2 Summary of main influencing factors on value chain dynamic

Factor	Iceland	Norway	Newfoundland
Price settling	Auction markets Price settling committee but the auction price is used as benchmark for other prices calculations in vertically integrated companies (VIC).	Minimize price decided by sales organizations owned by the fishers for fresh fish Frozen fish is put up to auction	Minimize price negotiated in the beginning of the season
Market activities	Active	Limited	None
Transparency in price settling	High Transparency in price formation – online auctions. Equal access to auctions. Price to harvester has increased.	Low	Low
Dynamic of the price settling mechanism	They play important role in returning marketing signal to the harvesting sector making price formation transparent and market based Provided necessary quality incentives Facilitate the utilization of by-products	The price settling mechanism has been effective in avoiding “noise” or sharp changes on fish price to fishermen. Less part goes through auction markets of the offshore fish.	None or limited.
Different price according to fishing gear	Active	Active	Limited
Quality	Not possible to evaluate	Not possible to evaluate	Not possible to evaluate
Role of Auction markets regarding	The auction markets have support	Limited	Limited

<ul style="list-style-type: none"> Specialisation 	<p>specialisation in processing. transforming heterogenous raw material into standardised lots for processing (spices, size, quality)</p>		
<p>Role of Auction markets regarding flow of raw material</p>	<p>They provide a stable flow of raw material to many small processors, creating a lower entry barrier for entrepreneurs in fish processing. Helps maintaining competition in the processing. Foreign companies are on the market. Even out short run catch variations. Pressed for new product mix. Create channel for by-catch species and undersized fish. Creates critical mass in small species/economic of scale Supported more efficient logistic</p>	<p>Seasonal flow of material.</p>	<p>Auction markets non-existent. Seasonal flow of material.</p>

7 Fishing

7.1 Fishing gear

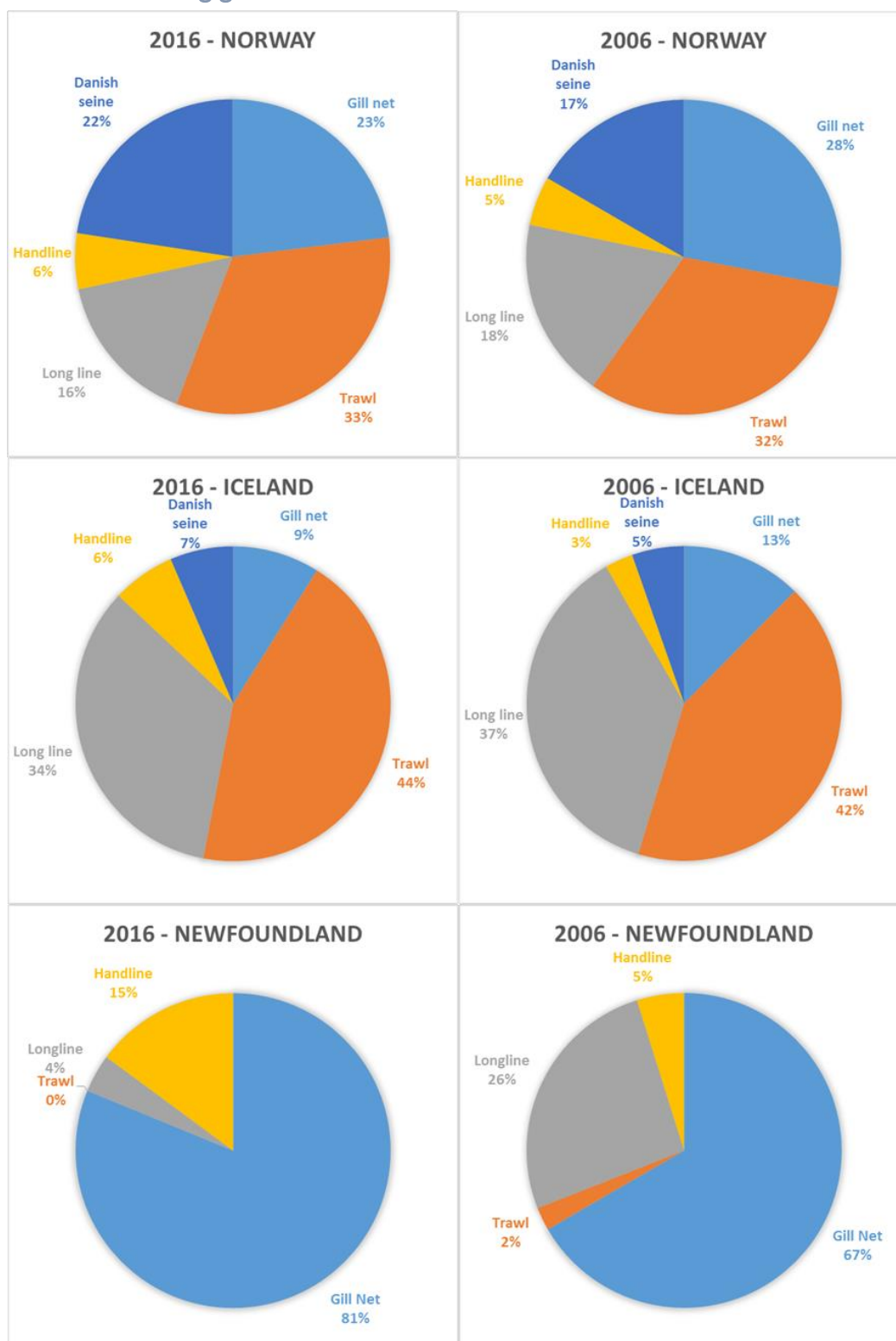


Figure 19. Newfoundland, Icelandic and Norwegian cod catch by fishing gear as share of total catch for the years 2016 and 2006.

Use of gillnets in Newfoundland had been dominated fishing gear accounting for around 80% of the total catch in 2016. In 1998 use of gillnet was around 62% and longline was around 28% but since then use of longline has been decreasing and in 2016 it counts for 3.9%. Use of hand line has been increasing or from 6.4% in 1998 to 14.9% in 2016. The reasons are:

- No active auction markets
- Very limited price difference between fishing gear
- Very limited marketing effect in the relationships between producers and fisherman's.
- The use of gillnets and lack of markets connection suggest that most fisherman focus on minimising the cost of fishing and low cost strategy.

Trawl is the most important fishing gear in Iceland with around 43% of the total catch in 2016. The main change in development of fishing gear is that the share of gillnets has steadily been decreasing from around 33% in 1982 to 13% in 2006 down to 8.8% in 2016. Longline has been increasing its share or from 11% in 1982 to 37% in 2006 and is around 33.5% in 2016. Use of hand line has increased mainly due to the introduction of coastal fishing in 2008. The share of hand line is around 6% and has double from 2006 when it was around 3% which is similar as in 1982. The reasons are:

- The auction market in Iceland is active
- Price varies between fishing gear is creating incentives for better quality
- The strategy is in most cases on quality and maximising the revenue

In Norway, trawl is the most important fishing gear and accounts for 33% in 2016 which is increase of 1% since 2006. The use of gillnets has been going down from 2006 when the share was 28% to 23% in 2016. The biggest increase is in use of Danish seine has been increasing from 17% in 2006 to 22% in 2016. The reasons are.

- Clear difference in price between fishing gear
 - Suggesting quality incentives in the relationship between producers and fisherman
- Seasonal fishing and use of gillnet and Danish seine suggest that the focus in fishing is mainly on minimizing cost of fishing

7.2 Performance and profitability

Profitability in fishing in Norway and Iceland have been rather low during the past. In figure 20 all the demersal vessel from small boats to processing trawlers are expressed. This is net profit of the operation as share of revenue (EBIT = Earnings Before Interest & Tax).

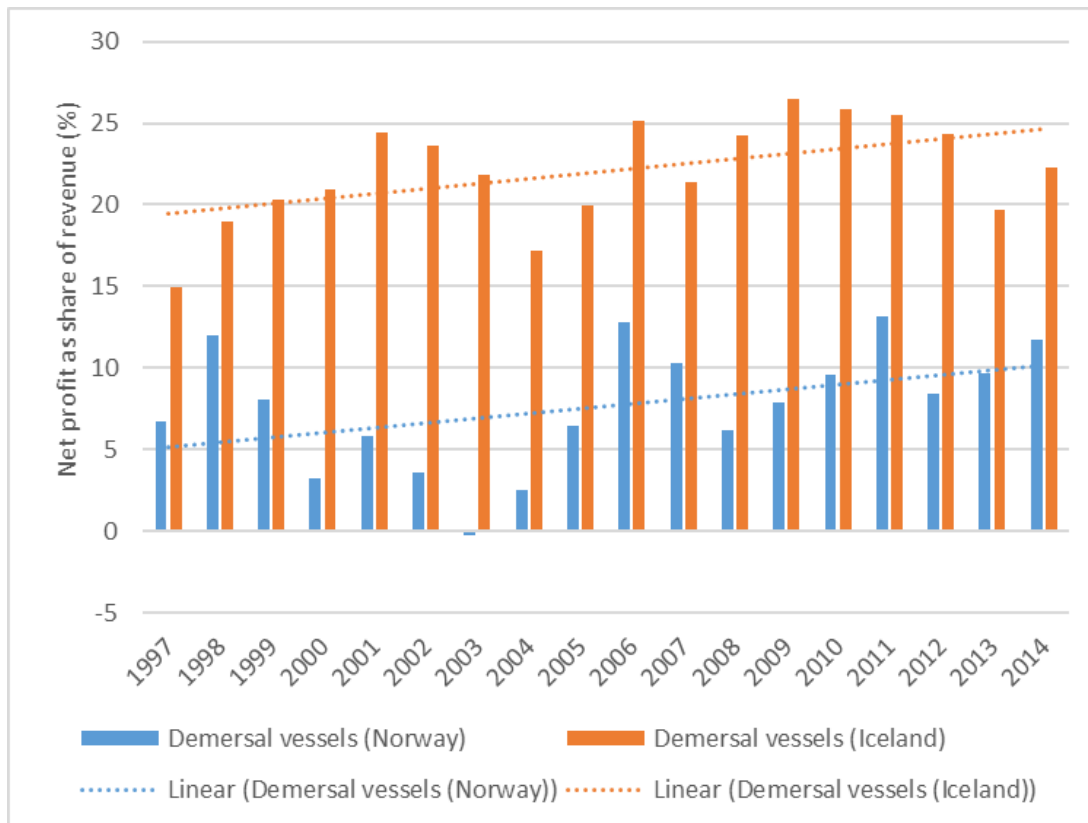


Figure 20. Profitability for the demersal fishing sector, based on EBIT as share of revenue.

- The profitability in Norway and Iceland varies a lot but the profitability in Iceland is considerable higher than in Norway. The EBIT in Norwegian demersal fisheries has been rather low or in most cases below 10% with few exceptions.
- There is difference in the fleet groups as in Norway cod trawler are returning highest profitability in the last years and the coastal fleet or smaller vessels are less profitable. The same trend is in Iceland as small boat fleet is returning lower profitability than fresh fish trawler and bigger vessels.

7.3 Performance

Fishing per vessel have increase a lot last years both in Iceland and Norway while it has rather decreased in Newfoundland.

- Trawler in Norway is fishing 43.8% more in 2016 than 2008
- Coastal boat 15-21 m Norway are fishing 145.7% more in 2016 than 2008
- Trawler in Iceland is fishing 36,0% more in 2016 than 2008
 - From 1998 the increase is 136%
- Medium vessel is fishing 24.1% more in 2016 than 2008.
 - From 1998 the increase is 367 %
- The change in Newfoundland depend on the size class.
 - Average vessel is fishing 3.0% less in 2016 than 2008.
 - Looking further back the or from 1998 this development has been the same except for the class size 45 to 54 feet

Size class	1998/2016	2008/2016
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1 - 34 Feet	19.0%	-11.1% (2015)
35 - 44 Feet	-45.2%	-28.9%
45 - 54 Feet	170.8%	112.8%
55 - 64 Feet	-78.6%	-92.7%
Average	-3.8%	-3.0%

- In general catch per vessel have been decreasing in Newfoundland unlike both Norway and Iceland.
 - The only group that had increase in Newfoundland was the 45 to 54 feet group with considerable increase of 112.8% since 2008.
- The increase in catch from 2008 to 2016 has been more in Norway than Iceland that could be connected to increase in quota in Norway in 2014. Other explanation is that the consolidation in the Icelandic fleet took place before 2008 or between the years of 1996 until 2006.

Factor	Iceland	Norway	Newfoundland
Fisheries management system	ITQ system pushed for consolidation increased efficiency more catches pr. boat fewer boats catching more fish fresh fish trawlers have been the most profitable reduction on processing trawlers Costal fisheries struggling financially	Quota system have supported increased efficiency and catch per vessel has increased. Profitability has been increasing	Restriction and limited catch per vessel Catch level have been decreasing Lack of flexibility and transferability
Profitability	Medium/high	Low/medium	Undetermined
Productivity	Productivity has increased because of more automation, both in fishing and processing of seafood. More catches pr. boat	Productivity has increased because of more automation, both in fishing and processing of seafood. More catches pr. boat	Limitation of catch per week and lack of transferability of licences limits the productivity

Processing	<p>Fish is more processed in Iceland instead of exporting HG (headed and gutted) fish for further processing abroad.</p> <p>Changes from processing on sea to processing on land, where utilization is better (better filleting</p>	<p>Emphasis on minimum processing that is H/G frozen at sea or export of Skei H/G fresh fish. Fillet production has been decreasing</p>	<p>Emphasis on frozen fillet production.</p>
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8 Consolidation in the sector

One way of expressing consolidation in the seafood sector in different countries is to calculate HHI or Herfindahl, Hirschman index which for the seafood sector can be calculated by summing up the squared quota shares of the firms in question. The index value is found by the sum of the squared market shares of all firms (N): and can be expressed as a normalized figure ($0 \leq \text{HHI} \leq 1$), or taking numbers between 5 and 10,000, for whether market shares are expressed in percentages or rates.

For a company with 100 per cent market share the value will be 10,000 (or corresponding 1), while for a market with 10 firms and 10 per cent market share each the value will be 1,000 or 0.1.

8.1 Iceland

Concentration ratios are calculated by simply adding together the quota shares of a pre-determined number of firms. A five firm concentration ratio will thus show the combined quota share of the five largest firms, but will not consider how the quota is shared within this group of firms.

The HHI values obtained in the Icelandic study indicated that the market for quota shares is competitive. This is hardly surprising, given that there are quota ceilings in place for both fleet segments. However, although relatively small, the HHI values have increased over the period under study; by two thirds for the larger vessels and more than three times for the hook-and-line boats.

Some further consolidation has occurred since the fishing year 2014/2015 with individual boats or trawlers with quota or just quota being bought by VICs, however, the HHI is probably still far less than 1000, indicating low market concentration.

8.2 Norway

The Norwegian whitefish sector is a heterogeneous branch consisting of very different units in all links of the value chain – from small independent coastal vessels, fishing and delivering fresh whitefish (mainly cod), to smaller or larger seafood processors in rural areas, to large (concentrated or diversified) concerns of firms with a fleet of integrated (freezing) trawlers. Our choice of case study firms show intendedly only sparse examples of businesses found in this sector, since there is practically no “typical” firm in this industry. They are however, examples of firms that we find in this sector.

For the sellers of cod/whitefish in the first hand market in the Norwegian seafood value chain (fisheries) it is obvious that the first hand market of fish is the relevant market. However, the products sold on in this market are not necessarily homogeneous, and therefore substitutes to such a degree that they all should be weighed together.

The largest company has a 15 per cent market share in 2010, while 17 per cent in 2015. Increased concentration was seen in this market from 2010 to 2015, but still at modest level. Hence, the first hand market for frozen fish should also be deemed “un-concentrated” when following the rule of thumb, where the “cut-off” to becoming moderately concentrated, was 0.15.

8.3 Newfoundland

HHI index was not calculated for Newfoundland due to low concentration in the cod fishing in Newfoundland. The NL cod fishery is a relatively homogenous industry with the majority of landings (~95%) coming from predominately small, independently owned and operated vessels <45 feet

(13.7m) in length. Comparatively, there are much fewer larger companies with fully integrated systems in operation. There are approximately 73 primary and 2 secondary processing facilities, the majority of which compete for available cod catches. The current fisheries management structure in NL, in particular the allocations of quota or weekly catch limits, caps the number of licenses an enterprise can acquire. Similarly, the fleet separation policy is also having an impact on the level of concentration, the competitiveness and consolidation by harvesters and processing companies.

8.4 Summary of main influencing factors regarding concentration

- According to HHI index calculated for Iceland and Norway there is no real danger of too high consolidation in the value chains. The HHI index was not calculated for Newfoundland fisheries due lack of data and it was obvious that the degree of consolidation is very low.
- It is though question if calculating the HHI index is the right way of measure the danger of too much consolidation in the fishing sector as it is mainly meant for calculating market domination rather than consolidation in the fishing sector.
- Too calculate and identify consolidation and the danger of lack of competition in the fishing sector it would be necessary to study the different subgroups in the fishing sector, that is quota classes or size groups in those different countries.

Factor	Iceland	Norway	Newfoundland
Restriction on consolidation	<p>Quota celling</p> <p>For vessels operating under the regular quota system, the combined share in all fisheries may not exceed 12% in cod equivalents,</p> <p>The corresponding maximum for hook-and-line boats is 5%.</p>	<p>Limits to quota consolidation both in offshore vessels 15% and cod trawler,12 quota factors accounting for around 13% of the share. For coastal vessels there are not quota limits.</p>	<p>Limits of stacking of licences, maximise three licences</p>
HHI index	Low consolidation	Low consolidation	Not calculated but very low consolidation

9 Overall economic performance and competitiveness of the fisheries value chain

Value chain dynamics depends heavily on the governmental form of the value chain and the relationship within the value chain and the governance form. Gereffi claims that in many chains are characteristic of dominant party/parties who determine overall character of the chain. In the same way the lead firm(s) becomes then responsible for upgrading activities within individual links and coordinating interaction between links in the value chain. Hence, the role of governance in the value chain is important and Gereffi (Gereffi, 1994) makes distinction between two types of governance in value chain, first where buyers is undertaken coordination in the value chain (buyer driven commodity chains) and those which producers play key role of coordination (producer-driven commodity chains). In fisheries that builds on natural resource, it is interesting to analyse the different forces in the value chains and how activities are impacting the results of the value chain.

9.1 Iceland

9.1.1 *Governmental form of the value chain*

Links between fishery and producer's

- One of the most important changes of the domestic value chain dynamic was the establishment of the auction markets.
- Before that the most common form of the governmental of the domestic part of the value chain was either **hierarchy** through VIC or **relational** through landing agreements between individual boat owners and producers.
- In some cases, there are **market** relationships where individual boat owner based their relationship with the producers on just the highest available price.
- By the establishment of the auction markets more and more of the individual boat owners moved their business to the auction markets increasing the emphasis of the **market form**.
- Then after the implementing the ITQ system more of the TAC moved to the VIC as can be seen that only around 15% of cod is sold through the auction markets and around 70% through the VICs.
 - There are mainly two form of governmental structure in the domestic part of the value chain of cod that is **markets** based on supply and demand of the auction markets and **hierarchy** relationship through vertical integrated companies. Other form as relational can still be identified but in limited cases.

Producers export links

- During the period before 1994 when the limited export licences were still active the governmental structure of the value chain of cod from fishing to markets was **Captive form** as the sale organisation in key position in the value chain where producers had duty of handing in all their product for selling through the SMOs.
- The export part of the value chain has as changed a lot for the last 30 years. The bigger VIC have in many cases established their own marketing division or even their own marketing companies abroad depending on **hierarchy form** of governance.
- In most cases Icelandic companies are selling to middleman abroad as distributors or wholesalers, although some are selling directly to retail chain as in the fresh fish markets. In

most cases companies have contract with buyers that that could be regarded as **relational** from of governance.

Dependency

- The dependency in the value chain varies a lot depending degree of long term contracts in their business instead of ad hoc sale. In interview with managers in the Icelandic fish industry it is clear that more and more of the TAC is sold before it is caught. This indicates long term relationship and relational governance form in the export part of the value chain term relationship

Power structure/balance

- It is in the nature of quota system that the quota holder has the power in the value chain. Hence it is in the hands of the quota holders when where and how the fish is caught and then for others to try to make the most out of the raw material that is brought onshore. Due to high degree of VICs (70%) in the value chain in Iceland, the negative effects of this power is not real. Auction markets are as well important for power balance as they send markets signal to the independent fisherman about quality, fishing gear and even timing. The power balance between links in the value chain are in good balance in the Icelandic value chain

9.1.2 Drive force in the value chain

The drive force in the value chain have changed a lot the last 30 years from having:

- harvesting/production driven value chain to becoming more and more marketing driven value chain. The main reasons for this changes can be trace to:
 - Introduction of auction markets in 1987
 - Introduction of the ITQ system in 1991
 - Abolishment of strict and limited export licences opening up for more marketing connection of producers.
- The drive force for changes in the dynamic of the value chain of Icelandic cod are
 - FMS (ITQ) system that allows companies to maximize their returns and plan according to market condition
 - Direct marketing connection and understanding of market situation
 - Coordination in the value chain mainly done through the hierarchy in the VIC
 - Auction markets support coordination and specialisation in production
 - Power balance. In quota system it is clear that the formal power lies with the quota holder or the individual that has the TAC. Due to the fact that around 70% of the TAC is hold by the VIC companies so it is clear that they are the most powerful players in the value chain. Due to limits to the consolidation that is 12% in the demersal species there are limits to how individual company can dominate the industry.
 - Vertical integration support power balance in the value chain

9.2 Norway

9.2.1 Governmental Form

- In modern times (after WWII), up until the new seafood export legislation in the 1990'ies, all branches in the cod sector was subject to the trade conditions dictated by the sectoral export commissions. These commissions was leading actors in the centralised export, where they lead negotiations and entered into common agreements for most all important seafood

products. They were, like in Iceland at that time, a **captive lead firm** that explicitly coordinated the export, and by that had great influence on the business environment.

- After the new Export Act in 1992, these export commissions were dissolved, and new liberal rules granted practically anyone paying an export fee could to start export of seafood. With this many processors above a certain size (or even just processors that have found it opportunistic) have started their own export. There are of course cooperation between exporters, processors and both, where some quantities/products/species are sold by standalone exporters, while some have caretaker in-house, but in general the structure and governance form in the marketing sector is atomistic. Some large exporters exist within some products, and also some major processing firms dominate the export of other products, but in general a *market to modular* form of this trade is the usual. This is our impression of the chain as a whole, and we cannot see a **big development towards one governmental form or the other throughout the latest 10 to 20 years**.
- The power between purchasers and suppliers is balanced in the way that terms of trade is governed by the price, even though relations play a role together with trust and esteem/reputation.

Power balance/structure

- The consolidation in the fleet might have had an effect on the **power balance**, and some would maintain that the fishing industry have **increased their power on expense of the processing industry**.
- Others again, would maintain that the processing industry, by ways of consolidation in this link of the chain, have ascertained **increased power over the fishing/selling side of the transaction**.
- However, the heterogeneity of the fishing sector makes it impossible to conclude unanimously on this matter. In some areas for some vessel groups consolidation might have increased the fishing side's power towards the processing sector, whereas in other areas the opposite might be the case. The power balance might also depend on the aggregated demand and supply situation, and as such depend on the cod quota available for the industry.

9.2.2 Drive force in the value chain

- The development of the Norwegian seafood industry has over time followed a trend of liberalization, where the emphasis has changed from protection and subsidies (pre-1990'ies) to international competitiveness and environmental and economic sustainability. It is not easy to set a clear division in time where this policy change occurs, but over time the emphasis has gone in that direction.
- From early 1970'ies as a process where resources and resource allocations becomes the main theme in the fisheries policy, while negotiations on subsidies and its distributions becomes secondary.
- In the mid-1990'ies, Norway has left a period with free conduct on the ocean and regulated market behaviour, to one with regulated conduct on sea and free competition in the market. Earlier (pre-1990'ies), the seafood export was organised in trade unions, dependent on product (dried fish, salt fish, fresh fish, frozen fish and clipfish) whereas a deregulation of the

seafood export act in early 1990'ies open up for anyone – satisfying a set of objective criteria, to export seafood.

- In the first hand market, the abolishment of subsidies involved that the price wedge between supply and demand was removed, enabling price movements in the market to be directly transferred to fishers.
- **Sales organisations' right to set minimum prices still meant a share of market power on behalf of fishers**, but also here the **development towards a dynamic minimum price** – dependent on objective and observable factors on the market place – **have reduced the shielding of fishermen from market signals**.
- The reduction of both fishing vessels and purchasers along the coast, has consolidated and professionalised the industry on both sides of the transaction in the first hand market.

9.3 Newfoundland

9.3.1 Governmental Form

- In Newfoundland it is possible to separate the fishing industry into two sectors. First is the offshore sector that is vertical integrated in fishing, processing and marketing and then inshore fleet, which is based up on individual boat owners where vertical integration is banned.
- Today TAC in cod is only allocated to the inshore sector (TAC will need to exceed 115.000 thousand tons before it is reallocated to the offshore sector).
- The links between boat owner and producers is based on negotiated price between FFAW (The Fish, Food and Allied Workers Union) and associations of producers. There are no auction markets and more or less the negotiated price is used in the transaction.
- The relationship is in some way **captive** due to lack of active markets in the relationship but in some cases it could be regarded **relational** where boat owner and producers have some contract about landing of cod and other species.
- Stakeholders seems to play more active role in governing the value chain and its structure than in other countries as allocation of quota and limits on transferability seems to depend on the stakeholders as FFAW.

Power balance/structure

- Due to the structure of the fisheries management system that is individual vessel do not have TAC (have to follow the weekly limits of catch) and very limited possibility of transferring fishing licenses (stacking up) the power in the value chain lies in the hands of the stakeholders that decides on the system.
- The stakeholders are the policymakers that is the politicians and the parliament that decide on the system. Secondly it is the FFAW that plays big role in influencing the system and deciding of how it is conducted.
- FFAW and negotiated agreements are having significant influence on the free markets; the agreements preventing markets relationship and market influence in the value chain.

9.3.2 Drive force in the value chain

- Due to low quota in Newfoundland and more important species as lobster and crab, cod have been looked up as filling and not major species in fishing. With foreseeable increase in quota this can become problematic.

- The fishing of cod in gillnet during August points out that the drive force is minimising the cost of fishing rather than anything else.
- Longer season and strict rules about transferring quota (stacking up) points out that the fishing is looked at as a social aspect rather than building up economic sustainable business.
- The influence of stakeholders seems to affect the economical sustainability of the industry.

9.4 Summary of main influencing factors regarding concentration

- The structure and the governance of the value chain, Vertical integration is creating more value per kg of raw material and returning higher profit
 - The profitability is higher than in other system
 - The market responsive is better
 - The flow and stability is better
- In value chain where vertical integration is banned or limited the strategy of fishing is more or less to minimise the cost of fishing.
 - Seasonal fishing
 - Use of gillnets is common
- The auction markets in Iceland has created new source of dynamic in the value chain that is specialisation in production
 - Companies selling of species and sizes that do not fit their production mix
- Iceland has freedom on decide on its structure that is vertical integration or not
- Norway has limits on vertical integration in the coastal fishing
- Newfoundland ban vertical integration in inshore fleet.
- Source of competitiveness of the value chains

Factor	Iceland	Norway	Newfoundland
Structure of the industry	Vertical integrations Hierarchy Market through auction markets	Limits to vertical integrations Individual boat owner and producers	Ban on vertical integration's in the inshore fleet. Offshore fleet has no cod quota
Vertical integrations	High	Low	Low/none in inshore fleet
Flow of raw material	Stable controlled by the processing marketing needs	Seasonal controlled by the catch and seasons	Seasonal controlled by catch limits and fisherman's effort
Governance	Mainly through hierarchy of VICs or use of auction markets	The role of minimum price affect the dynamic in the value chain	Significant stakeholder involvement such as FFAW

	Market relationship, based on auction markets		
Coordination	High in the VICs and based on buyers need in some sense. In the auction markets coordination is limited.	Low in coastal fleet In the offshore fleet it could be high due to vertical integration	Very low in inshore fleet; some in the offshore sector and cooperatives
Dependency	High in the hierarchy low in the market based	High in the hierarchy low in the market based	Low but minimum processing requirements can create dependency between fishing and production
Power structure/balance	Twofold Hierarchy with high dependency by sectors and power balance Markets based on power of quota holders. Low dependency	Twofold Hierarchy with high dependency by sectors and power balance Markets based on power of quota holders. Low dependency	Unbalanced power lies in the hands of stakeholders mainly FFAW
Drive force	Buyer driven value chain based on coordination of fishing and production through VICs and auction markets	Harvesting (product) driven value chain. Based on minimising cost strategy of fisherman's	Harvesting (product) driven value chain, Stakeholders driven (FFAW) Based on minimising cost strategy of fisherman
Lead firm	VICs	Owner of the off shore fleet.	None/FFAW on behalf of small boat owners

Specialisation	<p>Rather high</p> <p>ITQ in in fishing</p> <p>Auction markets for processing, spices, sizes etc.</p>	Rather low or limited	Very low seasonal industry
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10 Strategic Position Briefing - Norway

Norway's main advantage within the cod sector is the proximity to a productive Barents Sea and a cod stock in good shape. A disadvantage market wise is the seasonality in landings, following the spawning and feeding pattern of the cod. This is also a cost effective advantage, since great volumes can be caught close to the coast as the cod find its way to the spawning grounds of Lofoten. Within the fishing industry, structuring combined with large quotas (at a reasonable first hand price) has increased the profitability in the last decade.

For the processing industry, the high Norwegian labour cost is a disadvantage. Moreover, sectors emphasising a continuous production throughout the year to meet pull market demands, meet great barriers in the seasonal supply of cod. Conventional production (saltfish, clipfish and stockfish) are used to and have adapted to these supply variabilities. Clipfish is also the sector that to the greatest degree have adapted to the relatively new raw material source of frozen cod, which have insulated them from the seasonal supply. The interest from investors stemming from aquaculture can revive the supply chain by ways of competence, financial muscles and the utilization of already established markets, logistics and marketing channels.

	Description- 2018	Share cod quota	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Open vessel group	2000 vessels <11m, max. vessel quota 15-24t (length dep.) guaranteed 11-18t	6.8 %	Low	Pressure due to high uptake and stop. Opportunities in other fisheries than cod, and quota purchase.	Lower cod quotas. Regional differences in availability and landing opportunities. New safety regulations will increase capital demands.	Direct agreement with buyers, little influence on price.	Open fishery with entry under profitable circumstances
Coastal vessels under 11m	1200 vessels, with vessel quota of 25-50t	14.1 %	Relatively low. Higher quota prices up to 350kEUR	Differentiation through quality, opportunities in other fisheries (king crab, haddock) and co-fishing	Uncertainty regarding future fisheries management system, (structuring and vessel length limits). Structural development in landing sites.	Direct agreements with buyers. Often close ties with local purchaser.	Maximize first hand value, often with low cost focus (seasonality).
Coastal vessels, 11m and above	560 vessels, with structuring, vessel quotas of 50-166t	37.1 %	High - capital intensive, due quota price	Better handling. Sale contracts with producers. Many generalists with rights in pelagic sector also.	Uncertainty regarding fisheries management system, potential introduction of resource rent tax, affecting profitability.	Direct agreements, high mobility and in greater (volume) demand.	Maximize first hand value, low cost focus (seasonality). On board freezing incr.
Off shore vessels (auto-line and trawl)	26 conventional vessels (autoline), vessel quota >274t 36 cod trawlers, vessel quota >1,096t	8 % 30.8 %	Very high	On board processing potential exploited by few. High quality on hook catch, with price premium. Tendencies towards own sale. Structuring potential exploited.	Currency and quota fluctuations. Uncertainty regarding future management options and resource rent tax.	Auction sale of frozen fish, tendency towards contracts and own takeover of catch	Maximize value from catch. Full capacity utilisation with later years' quotas.
White fish processing firms	Companies with processing facilities, some with vessel ownership, some with export licence. Great heterogeneity.	0	Low to medium, dependent of capital intensity of production.	Choice of product mix. Increasingly capital intensive processing have led to big fresh fish export under high quotas and seasonality. Falling quotas can counter this dev.	Favourable but unstable currency fluctuations. Seasonality in supply. Much fish surpass traditional supply channels, to an increasing degree. Thawing have reduced comp. power of fresh. High Norw. salary level.	Tough competition up- and downstream the value chain, but close ties and trust	Small margins and low profitability on average. Liquidity challenges in production of conventional prod.
Export and marketing companies	Many exporters of varying size, markets and product portfolio. In-house, stand alone and preferred traders.	0	Low	Small degree of own brands in international seafood trade, especially with raw material and semi-finished products. Supported by the generic marketing of seafood from the Norw. Seafood council.	Currency fluctuation. Lack of branding. Seasonal landings complicates continuous supply of fresh fish.	Demanding retail chains and spot markets. Price signals most important but also relational customer ties.	Monitor markets needs and preferences and share market signals to producers. Multiple and regional sourcing eases supply continuity

11 Strategic Positioning Briefing - ICELAND

In general the main strength of the Icelandic system is the distribution of catches around the whole year, strengthened by the start of the quota year on 1. September each year. The industry is putting more emphasis on production of fresh fish instead of frozen or salted product with huge investment in new fresh fish trawlers. The processing companies have also been investing in new equipment, especially regarding water cutting and super-chilling. With super-chilling and good control of temperature in containers, more emphasis has been put in transportation on sea rather than by plane. This is related to cost but also to carbon footprint. There is also more emphasis on markets in N-America and the industry is closely monitoring developments in Asia.

VICs are extremely strong as they control more than 2/3 of the cod quota and therefore limited amount is going through the auction markets.

	Description	Share of cod fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Independent small boat owners in costal fisheries	<30 tons, number of fishing days limitation.	3.2%	Low	Better handling, buy quota.	Unstable currency, uncertainty of number of fishing days resulting in poor profitability.	Almost all goes through auction markets.	Lack of dynamic
Independent small boat owners with quota	<30 tons, TAC	19.4%	High - capital intensive quota price	Can participate in costal fisheries without using their TAC. Better handling. Sale contracts with producers.	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability.	Auction market around 70%. Rest sold by contract relationships.	Maximize first sale price.
Independent big boat owners	>30 tons with TAC	7.6%	High - capital intensive quota price	Better handling. Sale contracts with producers.	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability. Reduction in number of independent big boat owners.	Mixture of auction market and contract relationship.	Maximize first sale price.
Individual producer	Supplies fish by contracts and from auction markets. Medium and small size producers with often low degree of automatization, mainly focusing on fresh niece markets.	0	Medium - depends on markets needs and level of automatization required.	Market relationships, product mix, long time source and sales contracts,	Unstable currency, Access to supply do to quota system and high degree of VICs. Lack of branding,	Sourcing form auction market and by contracts with boat owners and other producers.	Maximize value from bycatches and serving niece markets
Vertical integrated company in fishing, production and marketing (VICs)	Companies with own boats, processing facilities and marketing office. High degree of atomisation in processing and fishing. Producing fresh, frozen and salted products.	70.8%	Very high - quota price, capital intensive fishing and production.	Branding, product mix, market relationships, usage of by-products, increase quota share up to limit.	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability. Reduction in number of independent big boat owners. Refresh fish. Lack of branding.	Internal sourcing and auction market when there is shortage of own catches.	Coordination of fishing and processing according to market needs, current sales and quota limitations.
Export and marketing companies with	One big sales company and number of small companies selling fish products from VICs and smaller producers by long term contracts	0	Low - depends of market and supply relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Mixture contract relationship ad hoc trade	Monitor markets needs and preferences and share market signals to producers. Risk reduction

no own production	and adhoc trade. Sourcing fish from Iceland and other countries.						through network of suppliers.
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12 Strategic Positioning Briefing – NEWFOUNDLAND AND LABRADOR

In general, the main strengths of the Newfoundland and Labrador system is the proximity of the resource to the landing sites and the proximity to the North American markets. The industry is putting more emphasis on the quality of the product and efforts are being made to expand into the fresh fillet markets. Labour costs when compared to European costs are cheaper however the industry is currently very labour dependent as most of processing sector is still manually driven with limited automation. The export market to the US continues to remain strong as the market has shifted to higher value product forms. The resource (harvestable biomass) has remained stable and is expected to grow over the coming years. In recent years, government has been providing financial support for technology enhancement initiatives within the harvesting and processing sectors.

From an economic or value chain perspective the NL cod fishery (and Canadian fisheries in general) is a social resource where market conditions have limited consideration in terms of the structure or management of the industry.

Compared to the European market the challenges for the NL market are based on economies of scale as the NL biomass or landed volume is a fraction of that produced by Iceland, Norway and Russia. Some of the challenges with the fishery include the number of vessels and harvesters competing for the limited resource. The current industry structure limits the transferability of quota between vessels thus impacting the self-rationalization within the industry. The current fishery has a seasonality that is not linked to market demand or prices. The fishery does however have the potential to extend its current season so that it operates longer throughout the year and efforts are being made to move in this direction.

Strict regulation on enterprise combining and owner operator fleet separation has influenced vertical integration within the industry. The lack of exit barriers has resulted in licenses being sold at extremely high value which is negatively impacting new entrants into the industry as the costs are prohibitive.

Demographics are challenging both the harvesting and processing sectors as the average age of participants is >50 years+ and recruitment of people <30 years has been declining. To combat pending labour losses, the fishery (harvesting/processing) will have to move towards more automated systems. For the limited harvestable resource, the number of landing ports (>400) and potentially processing facilities adds a level of complexity to the logistics component of the value chain. Many processing facilities have aging and outdated equipment based on current markets.

	Description	Share of cod fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Independent small boat owners in inshore/coastal fisheries	<65 feet (or 19.8 metre), fishery can be based on a weekly allocation or quota based (e.g. certain NAFO regions such as 3Ps); number of fishing days/season determined by union and government	75+%	High cost for vessels and licences; no new licence being issued must buy existing licences	Can improve on board handling/holding technology; can buy additional licences (2:1 or 3:1).	Weekly catch allocation is variable and overall stock/quota is uncertain; Negotiated price; fishing season not necessarily linked to market	Most goes to independent processing companies; portion of catch is processed and sold directly (micro-vertical integration model)	Maximize first sale price
Independent boat owners (inshore/mid-shore range)	65 feet (19.8 m) – 90 feet (27.4m); fishery can be based on a weekly allocation or quota based (e.g. certain NAFO regions such as 3Ps); number of fishing days/season determined by union and government	20+%	High cost for vessels and licences; no new licence being issued must buy existing licences	Can improve on board handling/holding technology; can buy additional licences (2:1 or 3:1).	Weekly catch allocation is variable and overall stock/quota is uncertain; Negotiated price; fishing season not necessarily linked to market	Most goes to independent processing companies	Maximize first sale price.
Vertical integrated company in fishing, production and marketing (VICs)	Companies with own boats, processing facilities and marketing office. Medium degree of automation processing and fishing. Producing a variety of products frozen, portions, block, fresh	~1%	Very high - quota price, capital intensive fishing and production.	Improved technology in processing facilities and vessels; building relationships with smaller vessels for secure product	Unstable currency, Uncertainty regarding access to quota; regulations preventing growth of vertically integrated sector	Internal sourcing	Coordination of fishing and processing according to market needs, current sales and quota limitations.
Export and marketing companies with no own production	One big sales company and number of small companies selling fish products from VICs and smaller producers by long term contracts and adhoc trade. Sourcing fish from Iceland and other countries.	0	Low - depends of market and supply relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Variable, based on relationships and access to resources	Variable, constrained by the seasonality and availability of product; Monitor markets needs and preferences and share market signals to producers

13 Summary of Strategic Positioning

It is very interesting to see the huge difference in structure and functionality of the value chains between Norway, Iceland and Newfoundland. Previous studies have argued that the superior harvesting and marketing strategies of the Icelandic industry may be rooted in factor conditions that are difficult to duplicate and a rigid institutional framework in Norway and partly the social resource structure of the Newfoundland industry, where market conditions have very limited consideration in terms of the structure or management of the industry. Both in Norway and Newfoundland, this structure or rigid framework is hampering the industry to organise the value chain, to be more market competitive by methods like vertical integration.

The vertically integrated companies in Iceland where the processor owns its own fishing vessels. Unlike the push supply chain system followed by the Norwegian and partly the Newfoundland companies where they must process the fish that they receive, the Icelandic processors places orders to its fishing vessels based on the customer orders and quota status, thus following a pull supply chain system. The Icelandic processors are able to sends orders to the vessels for how much fish of each main species is wanted, where to catch and to land so they have the desired size and quality of raw material needed for fulfilling customer orders.

This structural difference is also affecting the product mix that the countries are going for. Iceland is therefore placing more and more emphasis on fresh fillets and pieces, while the other countries are going for more traditional products, like salted, dried and frozen products. Due to the vertical integration in Iceland, the production plans are developed based on customer orders and then a plan is made for fishing, while in Norway and Newfoundland, the production plans is usually developed after receiving the fish at the processing plant as the information about volumes of species caught and quality is not available beforehand.

However, the socioeconomic effects of VICs in Iceland and aforementioned consolidation where not addressed in this report.

Chapter 2: Comparison between herring value chains in Iceland, Norway, Denmark and Newfoundland

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1 Executive summary

It is very interesting to see the difference in structure and functionality of the value chains between Norway, Iceland, Denmark and Newfoundland. The structure of the industries is different as seen in the degree of vertical integration and the limits that government's put on the industries. It is though surprising how homogeneous the industry is between those nations. The nature of pelagic species that is, seasonality and high catch volumes in short periods, makes the product global commodity for further processing from one season to the next. The main markets are Business to Business (B2B)

The first noticeable difference observed, apart from the structure, is the price settling mechanism. On one hand it is the Norwegian system that builds on minimum price and auction market which is the same that is used to determine the Danish price. In Iceland the price is decided by the Official Bureau of Ex-Vessel Fish Prices. The Norwegian price is in many cases double that of the price in Iceland. The price obviously affects the profitability of the industry as the Norwegian fishing is benefiting from high price but the processing sector is suffering from low profitability. On the other hand, the processing sector in Iceland is doing well as well as the profitability of the fishing is healthy. It can be claimed that the overall profitability is higher in Iceland due to the freedom of strategically positioning yourself in the value chain and being vertical integrated or not, without external limitation as those that can be seen in Norway, Denmark and Newfoundland. There are certain signs that the price settling mechanism in Iceland could be more efficient like, paying for quality of the raw material. Herring is caught almost completely in pelagic trawl compared with purse seining of virtually all the catch in Norway, that is believed to return better quality than the trawl.

The vertically integrated system where one company owns its own fishing vessels and production has the opportunity to control the flow of the raw material to its production like in Iceland. Instead, in Norway and Denmark this coordination has to be done through auction markets and informal coordination between the owner of fishing vessels and producers. Due to the short fishing season this seems to have less influence on the value chain e.g. compared with cod where the push system is clearly returning less value creation and profitability.

In such seasonal value chain as seen in the herring fishing it is difficult to enter the industry due to high capital cost and the competitiveness builds on economics of scale. The competitiveness of the value chains also depends heavily on other pelagic species as capelin, mackerel and blue whiting in most of the countries. All this makes upgrading in the value chain difficult. Opportunities to upgrade the value chains in the case of Norway and Iceland are in increasing the production stage of the herring at least part of it into consumer's value added products instead of B2B commodity. Evidence from Newfoundland and partly Denmark show that more value can be created by focusing more on consumer's markets. Tariffs, distances from consumer markets and limited seasons can limit this option. The option to increase the processing stage has as well to be economically sustainable in competition with countries with lower salary cost and better access to the main markets as for example Poland and other former eastern European countries have, being part of EU.

2 National comparison

2.1 Introduction

2.1.1 Global market review - herring

Herring has been an important food for humans since ancient times; 5,000-7,000-year-old herring bones from the stone age have been found in Denmark, both indicating catching and consumption of the fish (Albala, 2011).

Herring played an important role in the economic development of Iceland during the last century. Herring revenues built up whole villages, ensured renewal of the fishing fleet and allowed thousands of young Icelanders to educate themselves. (Sigurdsson *et al.*, 2007). Herring still plays a large role in the economy of Iceland with about 4-12% of the total value in fish export (Statistics Iceland, 2018). In Canada, the herring fishery has supported major commercial fisheries on both its Pacific and Atlantic coasts. The development of an almost unlimited world market for herring meal and oil, plus major advances in fishing technology led to overfishing both stocks during the 1950 through to the early 1970's. Since then, both fisheries have been strictly regulated and the herring fishery is still contributing to the Canadian economy (valued at ~€28 million in 2015).

The Atlantic herring is one of the most important pelagic fish species in the world with historic catches ranging from about 4 million tons (1965) to about 880 thousand tons (1979). The catches in 2014 were about 1.631 tons (FAO, 2017). Other (true) herrings are the pacific herring, found in the north Pacific and the Araucanian herring found off the cost of Chile. These latter herrings will not be covered in this report.

According to the FAO (2016), fishery production varies greatly among species with the ten most productive species accounting for ~27% of the world's marine capture fishery production in 2013. Some stocks are regarded as overfished, while most are considered fully fished without potential for further increase in production. The Atlantic herring stocks on both the northeast and the northwest Atlantic are considered fully fished.

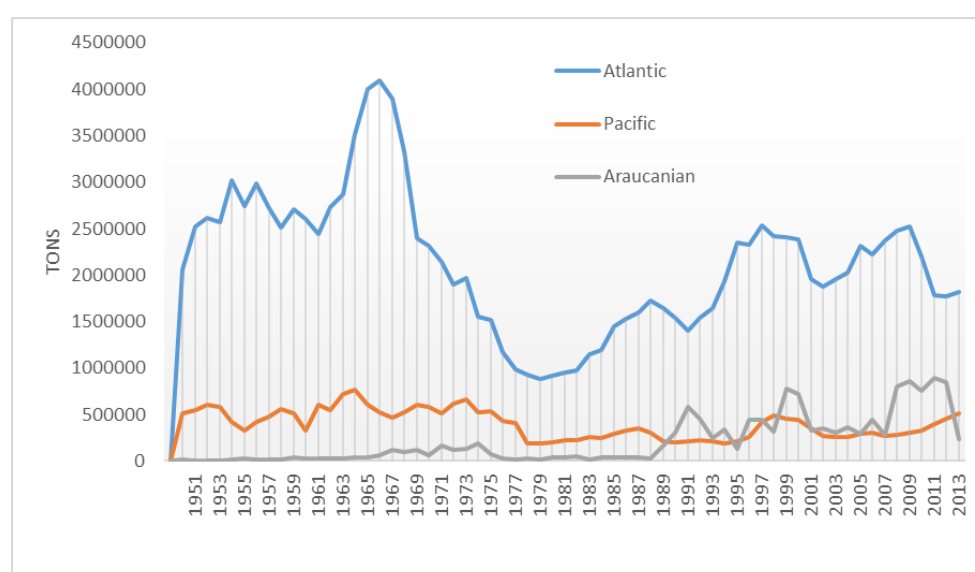


Figure 1. Catches of herring from 1950-2014 (FAO, 2017).

2.1.1.1 Main producers

The main producers of Atlantic herring have traditionally been Norway, Iceland, Russia (previously the Soviet Union) and Canada with on average 60% of the herring catch during the last 20 years (1994-2014) (FAO, 2017). The main herring producer within EU are Denmark, Finland, UK, The Netherlands, Germany, France, Poland and Ireland with about 650 thousand tons on average during the period 2012-2014 (FAO, 2017).

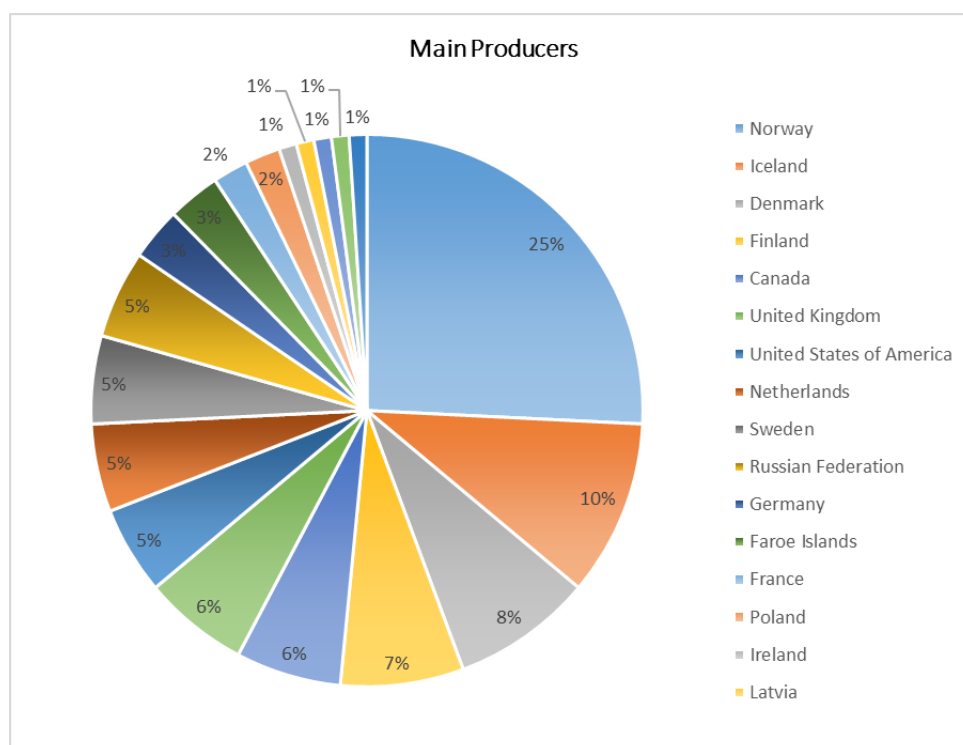


Figure 2. Main producers of herring (FAO, 2017).

2.1.1.2 Main markets

The great majority of landings across countries was destined for human consumption and this share has been growing over time. Still parts of the Atlantic herring catch e.g. the Baltic herring is mainly used for feed production (Anon, 2018).

The main food markets for herring have traditionally been Eastern Europe and Russia. Herring has been stable food in these regions both as a good source of relatively cheap fish and as a protein source. In former times much of the herring was salted in the countries catching the herring before export. However, after the collapse of the Soviet Union at the end of 1991 the market for the primary goods has switched largely from salted herring in barrels to frozen herring (whole, headless and gutted, butterfly fillets and single fillets, with or without skin). The frozen herring is both eaten as is, but a large part of the import is used for further processing e.g. for salting and marinating (salting or vinegar curing), smoking or canning. The market in Russia has recently become less important due to political reasons and the frozen herring has been exported mainly to other markets in Eastern Europe.

There are traditional markets in Scandinavia (Sweden, Finland, Denmark and Norway) and in Germany for herring and a (small) part of the Atlantic herring catch is salted (mainly in Norway but also in Denmark, Sweden and Iceland). A large part of the Atlantic herring catch in Newfoundland is also salted for markets in USA. The herring is salted or vinegar cured using traditional recipes into large plastic barrels which serve as the raw material for the final marinated products in glass, plastic or metal containers.

There is also a market for herring in various European countries e.g. for matjes in Holland and smoked in France and UK (as kippers) and some other European countries.

Herring rest materials (bone, head, and intestines) and the part of the catch not intended for processing is used for meal and oil processing. The main market for these products is Norway as feed for farmed salmon.

2.1.2 Value chains flow

In Figure 3a, a visualization of the European herring value chain is given, showing the different stages, and with arrows suggesting the most important flows through the chain. This is by no means a complete rendering of the many value chains for herring, but it illustrates some important features. The most important is probably that herring finds various ways from catch to consumption.

Likewise, Figure 3b, provides a visualization of the Canadian (predominantly NL) value chain, illustrating some of the important relationships or channels within the value chain.

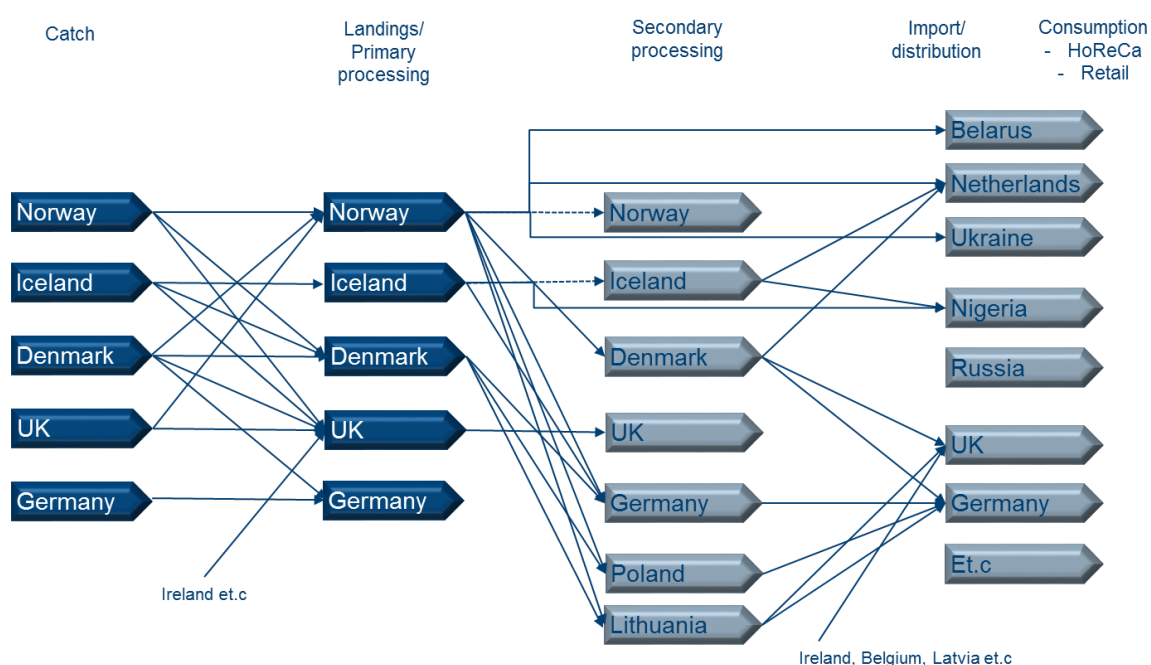


Figure 3a. The European value chain for herring

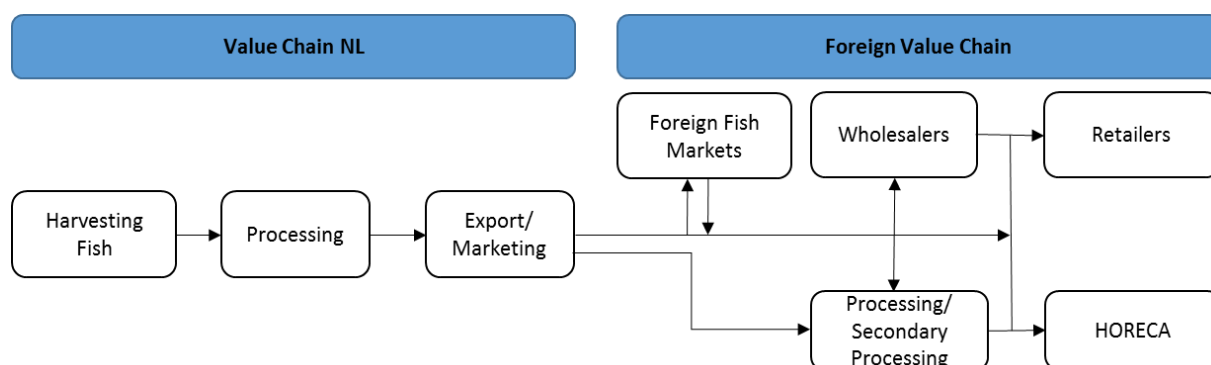


Figure 3b. The Canadian/NL value chain for herring

As can be seen in Figure 3a much of the caught herring is landed in another country. Iceland is the exception as all the herring caught is landed in the country. In Canada (Figure 3b) herring is landed in and typically processed, at least at the primary level.

2.2 Fisheries Management System

	Norway	Iceland	Denmark	Newfoundland
General	Fisheries restrictions in 1971, fisheries ban from 1972. Cooperation between Norway, Iceland and Russia. Licences for purse seiners introduced in 1973	Quota system was first introduced in Iceland on herring fisheries in 1975 and for most all other species in 1983.		Herring fishery in NL is managed through TAC and sharing arrangements; in the maritime region (e.g. 4WX) the fishery is management through an Integrated Fisheries Management Plans; which sets quota allocations, fishing seasons and areas; no new licenses are available for either fixed gear or purse seine; harvesters may only hold a license for one gear type; fixed gear licenses are permitted to fish in their Fishing area or port of residence; mobile gear fishers can fish in specified Fishing Areas/zones.
Quota system: Individually Transferable Access	850 base tonnes limit	ITQ implemented in 1991 20% quota ceiling for companies	Changed in 2003 from ratio allocation to ITQ	Seasonal quotas vary by fishing zone or region; recipient of a license must have a homeport based in, or be resident of the fishing area of the license

				Regulations governing enterprise/license combining- up to two individual quotas; buddy-up provisions are authorized for the herring fishery (Area 14)
Entry barriers into the system:	<p>Capital intensive</p> <ul style="list-style-type: none"> - High price of quota (compared with value of products) -High investment cost in vessels and technology to chill the fish-on-board <p>Economics of scale and scope</p> <ul style="list-style-type: none"> - Multispecies access is necessary (capelin, blue whiting, mackerel) - Short seasons <p>Requires high catch capacity and financial strength to leave the vessel idle for 6-8 months a year</p>	<p>Capital intensive</p> <ul style="list-style-type: none"> - High price of quota (compared with value of products) -High investment cost in vessels and technology to chill the fish-on-board and process the fish <p>Economics of scale and scope</p> <ul style="list-style-type: none"> - Multispecies access is necessary (capelin, blue whiting, mackerel) - Reduces seasonal fluctuations and optimises the use of capital <p>Strict laws govern ownership of vessels holding quota (and processing). Must be Icelandic or controlled by Icelanders – foreigners can</p>	<p>Capital intensive</p> <p>Has to be active fisherman that hold quota „slipper skippers“</p> <p>A status as fisherman with one year as commercial fisherman and 60% of income from fisheries</p> <p>Very high price of the vessels and especially the quotas</p> <p>Limitation of quota concentration</p> <p>Requirement of at least 2/3-ownership of active fishers with a-status.</p>	<p>Requires a professional fish harvester certification</p> <p>Significant investment in terms of education and training and at-sea experience</p> <p>Cost of entry into the fishery is prohibitive due to the high cost of capital investment (vessels, gear, etc.) and the cost of licences</p> <p>Uncertainty over future allocation/quotas and if there will be return on investment</p>

		<p>only own 25% in fishing or fish processing companies</p> <p>All professional fishing in Iceland requires a licence</p> <p>Seasonality of the fishing</p> <p>Small boat access</p> <ul style="list-style-type: none"> - Competitive fishing - Migration creating uncertainty in fishing - Instability in issuing quotas (political) 		
Exit barriers from the industry	Quotas and vessels easily sold	<p>Quotas easily sold and markets available – in Iceland</p> <ul style="list-style-type: none"> - Consolidation is set at 20% for herring which can affect exit <p>Vessels and equipment can be sold on the open market</p>		<p>Low exit barriers licenses are easily sold; open market for licence</p> <p>No regulations governing the sales</p> <p>Exit not linked to potential resource re-allocation for new entrants; i.e. portion of share or allocation is not reinvested back into the fishery</p> <p>No financial reinvestment (e.g.no tax or fee) required to be paid by harvester upon sale of licence and exit from the system</p>

Transferability of quota/regional regulations	No regional restrictions on transferability	Quota ownership <ul style="list-style-type: none"> - Limitation on consolidation of quota ownership – max 20% ownership of TAC for herring - Quota is bound to fishing vessel but companies with number of vessels can transfer quota between vessels - 15% of TAC can be transferred from one year to the next by companies - 5% can be overfished in the fishing year and will then be subtracted from next year TAC 	The regulation of limitation of concentration has been changed over the years with the present interpretation for the pelagics of a limit of 10% of all pelagic quota, and 2% of the total pelagic quota if the vessel also owns demersal quota	Limit on combining (2:1) shares or allocation Transfer of shares/allocation between vessels is permanent Opportunity to buddy-up is limited to NAFO division 4R trap gear
Possibilities to upgrade in the system		There is no restriction on upgrade or move from species but due to the specialisation of pelagic fishing and processing the vessels/processing are simply too specialized to easily allow a move from		Limited opportunity for vertical integration based on PIIFCAF; Upgrading is limited to 2 purchased licensed; no new licenses are issued for the fishery

		<p>pelagic to other species e.g. demersal. This also applies for the processing or freezer trawlers</p> <p>Small boats there are limits, except when going into the coastal or quota system</p>		
Management measurements	<p>Most of the herring quota is caught by large purse seiners. This is a group of vessels that historically has seen a strong reduction. In later years, though, the number of large purse seiners has stabilised just below 80 vessels.</p> <p>Quota for herring may not be sold without a vessel, but there is still room for expanding the quota for most vessels (only two vessels are at the new limit of 850 base-tonnes (increased from 650 tonnes)).</p>	<p>Landing obligation</p> <ul style="list-style-type: none"> - None <p>Min processing requirements</p> <ul style="list-style-type: none"> - None <p>Fishing days – regulations /number of days</p> <ul style="list-style-type: none"> - None <p>Quantity</p> <ul style="list-style-type: none"> - None <p>Closures</p> <ul style="list-style-type: none"> - Marine Institute has licences to introduce closures for fishing areas if for example share of small fish is too high according to 		<p>Landing obligation- must land all catch unless a species exemption is received from DFO</p> <p>Minimum processing requirement; cannot process at sea</p> <p>Fishing season is determined annually;</p> <p>Gear restriction in place (e.g. fixed versus mobile gear)</p>

		<p>landing or historical landing data</p> <p>Discard ban</p> <ul style="list-style-type: none"> - Herring discards were banned in 1977 (with 5 other species) - In 1996 a ban on all discards of fish; all species - There are measurement's in place to avoid discard - Limited withdrawal on unwanted catch from TAC - Up to 0,5% of herring can be landed as VS fish (project fund for fisheries), must be weighted and is not subtracted from TAC. 20% goes to the vessel and 80% to the fund - Damaged fish is kept separate and weighted not subtracted from quota - By-catch should be recorded, but is mainly cod and lumpfish 		
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2.3 Markets- and production development

The aim of this section is to demonstrate what the different value chains are providing to markets in product mix, value and share of export as well as the overall value creation within individual countries. This approach demonstrates how responsive/dynamic the value chain is in serving the markets with products and value. It has to be kept in mind however that there is great difference in quantity of raw material within the different value chains. Norway's total catch in 2015 was 422 thousand tons, Iceland received 244 thousand tons, Denmark about 140 thousand tons and Newfoundland was just over 12 thousand tons.

2.3.1 Differences in exports/productions

2.3.1.1 Products

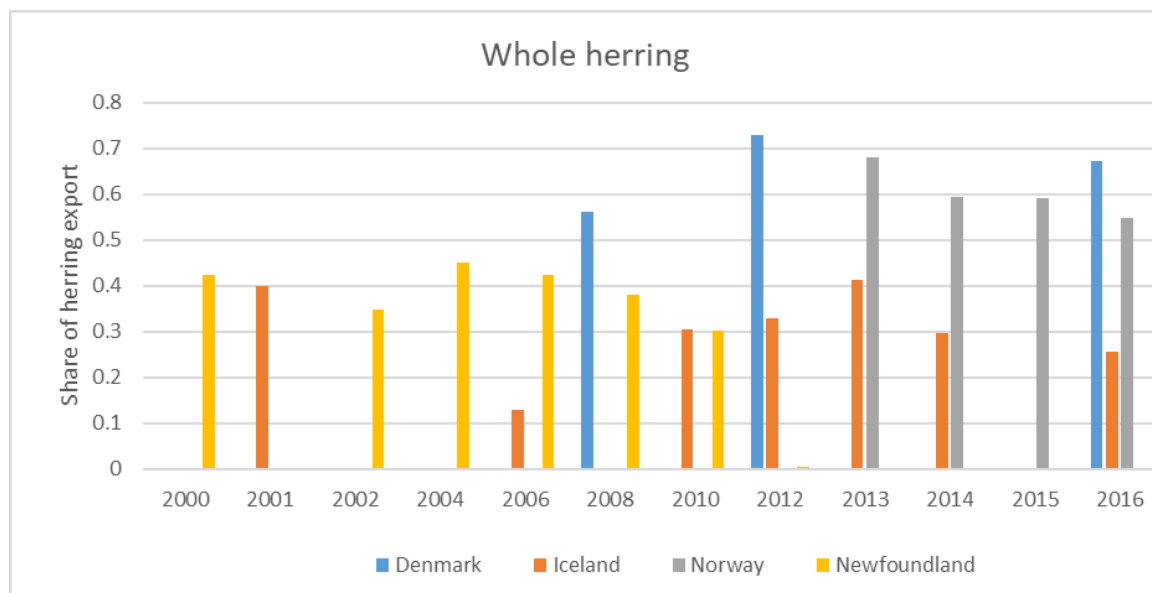


Figure 4. Export of whole herring (frozen and fresh) from Denmark, Iceland, Norway and Newfoundland as share of total export volume (fish meal and oil excluded).

- Whole herring is a large part of the herring export for all the countries except for Canada. The whole herring is exported mainly as frozen but both Norway and Denmark export as well fresh herring.
- NL market decreasing from 42% in 2000 to 0% in 2016

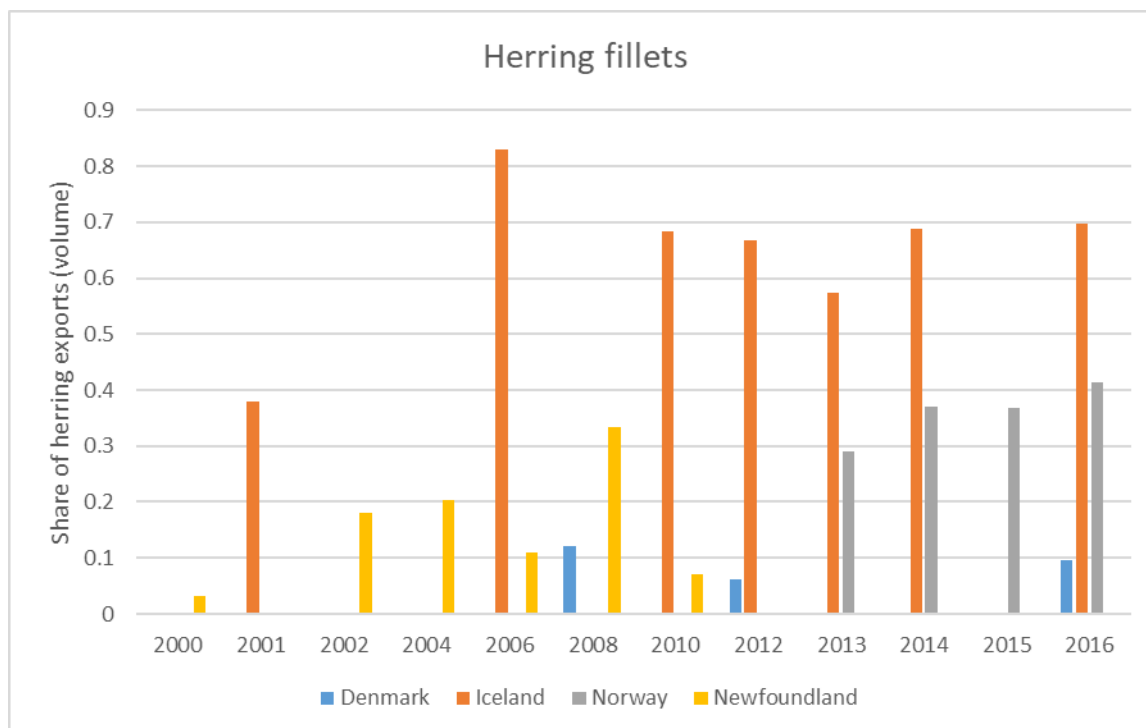


Figure 5. Export of herring fillets (single and butterfly, frozen at sea and on land) from Denmark, Iceland, Norway and Newfoundland as share of total export volume (fish meal and oil excluded).

- Herring fillets, both single and butterfly fillets frozen at sea or on land, are the most important export category in Iceland indicating the growing importance placed on processing
- Fillets are also of growing importance in Norway, reflecting on the investment made in both Iceland and Norway on investment in processing and automatization of the process. Both countries focus on processing the fish into fillets and using the rest raw materials (offal, bones and heads) for fish meal and oil.
- All the large pelagic processors in Iceland have included in their integrated operation a fish meal plant(s). Figure 6 shows the value of herring fish meal and oil during the last few years for Iceland as share of total herring products export value.
- Fillets are not a large item of the exports from Denmark
- NL market decreasing from 33% in 2008 to 0% in 2016

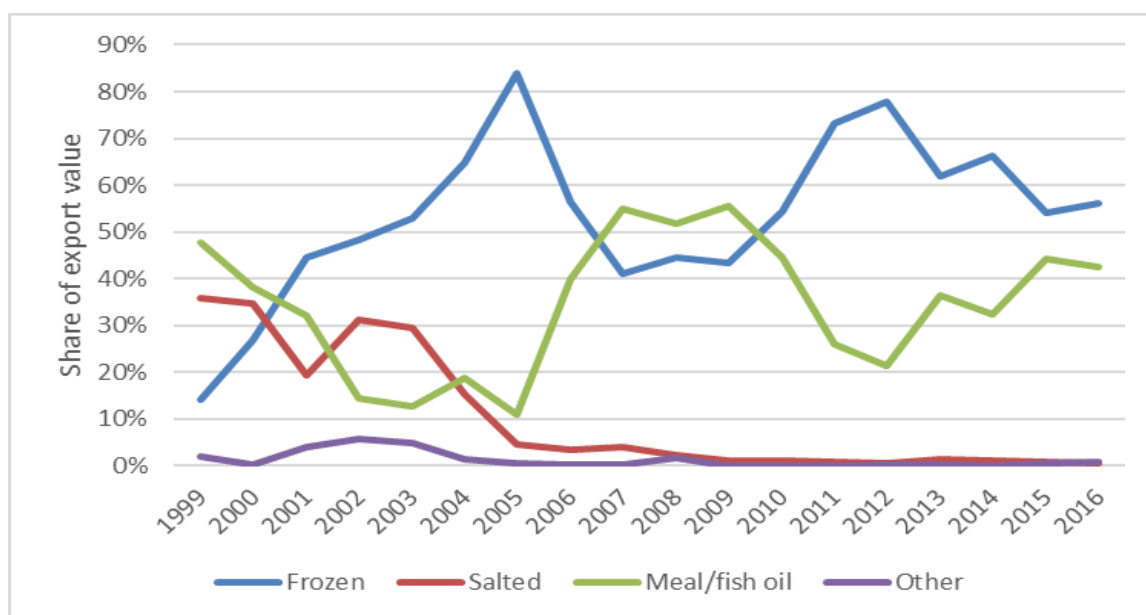


Figure 6. Value of herring product exports from Iceland during the period 1999-2016 as share of total export (fish meal and oil included).

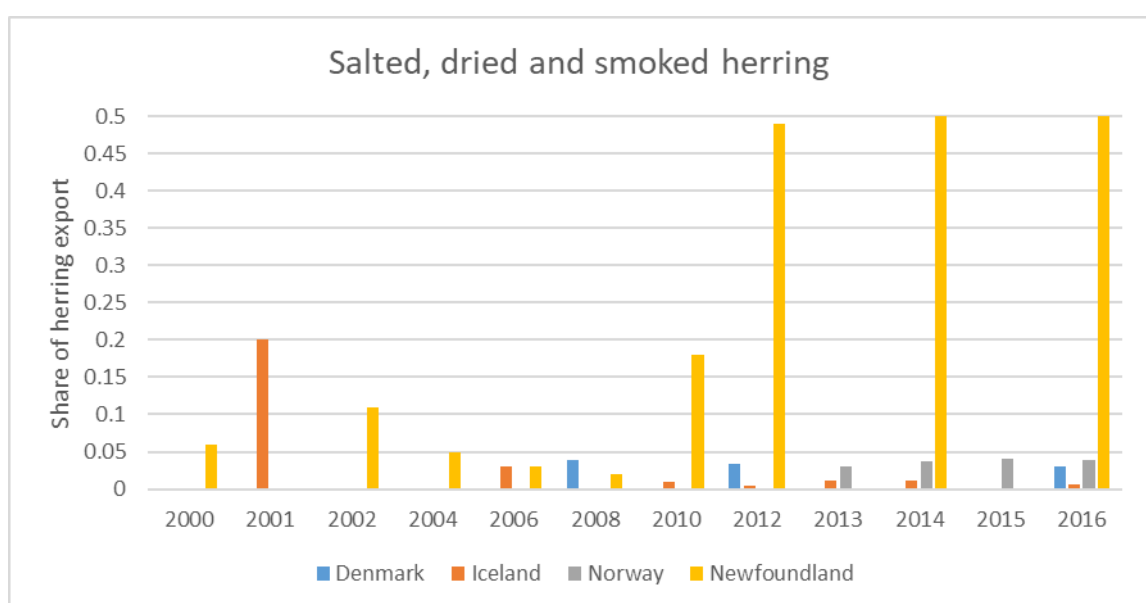


Figure 7. Export of salted, dried and smoked herring products from Denmark, Iceland, Norway and Newfoundland as share of total export volume (fish meal and oil excluded). The figures for Norway include both salted and preserved products.

- Salted and vinegar cured products are important as raw materials for the Scandinavian herring market as well as for the German market.
- Denmark and Norway produce for this market and approximately 3-4% of the herring products are export as salted
- Iceland has virtually stopped salted – 1% or less of the herring is exported as salted
- This is a growing market for NL,- increased from 6% in 2000 to 50% in 2016

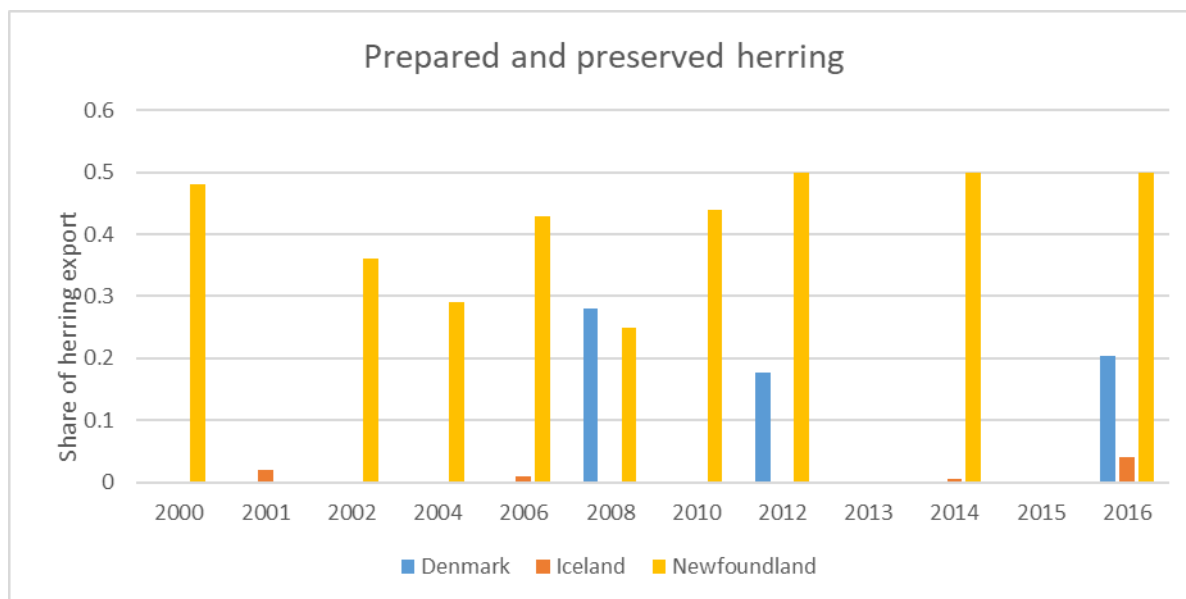


Figure 8. Export of prepared and preserved herring products from Denmark, Iceland and Newfoundland as share of total export volume (fish meal and oil excluded).

- Denmark and NL both focus on this market. Denmark exports between 15-25% of the herring as value added products to EU28 countries. Denmark does not have to pay tariffs for the products being a member of EU whereas both Iceland and Norway must pay 10% tariff on prepared and preserved herring products to EU as EEA countries.
- Due to tariffs there is virtually no production of consumer herring goods for export in Iceland and Norway. There is some bulk production in Norway of herring products (in brine or vinegar cured) which form the main ingredient in the consumer goods (mainly jars) which are produced in EU (mostly Sweden) to avoid import taxes
- Newfoundland export a large part of their herring products (>40%) to the US as preserved and prepared goods. No import tariffs are on the products.

2.3.1.2 Customers

Both Norway and Iceland are outside EU and must pay tariffs on value added products and even on some salted herring raw materials into EU. The main markets, though, are eastern European countries, with a long history of eating herring.

Table 1. Main buyers of Icelandic herring products (as share of herring export volume and value, excluding meal and oil)

Country	Volume			Value		
	2010	2014	2016	2010	2014	2016
Poland	33%	9%	30%	36%	9%	32%
Ukraine	5%	2%	18%	5%	2%	20%
Belarus	0%	2%	15%	0%	2%	16%
Lithuania	28%	15%	14%	25%	14%	15%
Russia	22%	64%	9%	20%	62%	9%
Holland	0%	2%	0%	0%	3%	0%
EU28	65%	30%	52%	67%	31%	57%
EEA	65%	30%	52%	68%	31%	57%

- Main markets for the products are in Eastern Europe
- The focus is on commodities or raw material (fillets or whole fish) that can be used to produce the final consumer goods. Virtually nothing is produced of the prepared or preserved ready to eat products.
- There is considerable variability of main buyers (as countries) between years; it depends on market conditions and prices to whom the products are sold. Often uncertain market conditions e.g. closure of the Russian market recently, but also lack of loyalty between buyers and supplier
- EU purchases between 30-65% of the products (mainly Poland)

Table 2. Main buyers of Norwegian herring products (as share of herring export volume, excluding meal and oil)

Country	2013	2014	2015
Denmark	10%	15%	18%
Germany	10%	14%	15%
Lithuania	15%	16%	15%
Ukraine	12%	15%	15%
Poland	7%	9%	12%
Netherlands	6%	8%	11%
Egypt	4%	1%	7%
Belarus	2%	6%	6%
Russia	32%	17%	0%
EU28	43%	53%	61%
EEA	43%	53%	61%

- Main markets are in Eastern Europe
- The focus is on commodities or raw material (fillets or whole fish) that can be used to produce the final consumer goods. Virtually nothing is produced of the prepared or preserved ready to eat products.
- EU purchases between 43-61% of the products (mainly Denmark, Germany and Lithuania)
- More stability in customer base than seen for Iceland – possibly due to more loyalty between buyers and supplier. Easier logistic routes to markets also help

Table 3. Main buyers of Danish herring products (as share of herring export volume and value, excluding meal and oil)

Country	Volume			Value		
	2008	2012	2016	2008	2012	2016
Germany	61%	61%	59%	49%	55%	51%
Poland	16%	6%	10%	24%	13%	16%
Holland	8%	7%	8%	13%	11%	12%
Norway	2%	6%	5%	2%	5%	4%
UK	2%	13%	5%	1%	8%	3%
Sweden	6%	3%	4%	3%	3%	3%
EU28	97%	94%	90%	97%	94%	91%
EEA	100%	100%	95%	99%	99%	95%

- EU is the main market for the products purchasing 90-97% of the products. The access to the common market is a key (no tariffs) as well as short logistic routes.
- High stability in customer base indicating loyalty between supplier and buyer. Germany is by far the biggest market not only for the commodities but also taking the largest share of the value-added products

Table 4. Top buyers (based on value) each year for Newfoundland herring products (as share of herring export value, excluding meal and oil)

Countries	2011	2012	2013	2014	2015	2016
United States	83%	53%	82%	53%	64%	64%
Poland	2%			16%	15%	15%
Lithuania				5%	2%	
Côte d'Ivoire					3%	
Germany					6%	
Ukraine						6%
Japan	2%	13%	2%			3%
South Africa				4%		2%
China	3%					
Nigeria	3%	13%	3%			
Georgia		5%	3%			
Russian Federation		6%		18%		
Egypt			3%			

- USA purchases almost 80% of the products. Easy access routes favour products from Canada
- Most of the remainder of the products are exported to East Europe.

2.3.1.3 Value creation

The below figure shows the value creation within each country based on the total export value for all the herring food products. As it was difficult to obtain accurate information on the total quantity and value of herring meal and oil produced within each country, feed products (meal and oil) are excluded in this comparison and the focus is on exported goods for food purposes.

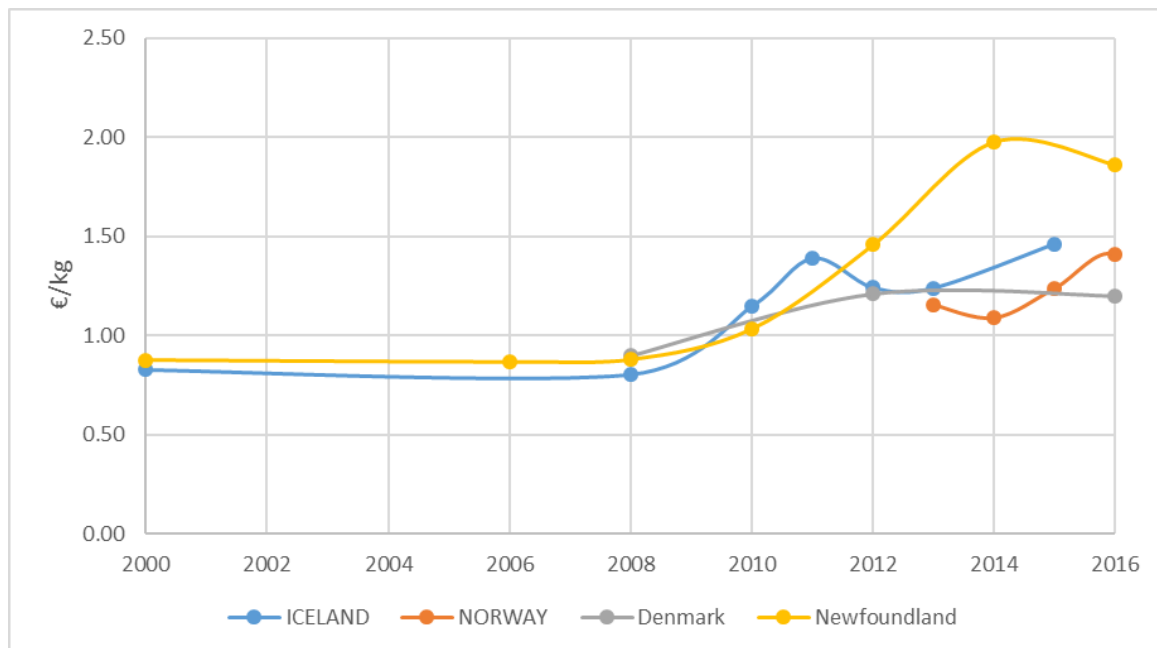


Figure 9. Value creation in euro/kg of export value of herring products from Iceland, Norway, Denmark and Newfoundland

- Value creation has increased with time mainly due to price increases of herring products as herring quotas have been in steep decline from 2009 until 2017.
- Similar value creation is observed in all the countries
- The value creation within Newfoundland seems to be increasing in the last few years, possibly because of their focus on final consumer goods

2.3.2 Processing

2.3.2.1 Profitability and performance

Profitability figures for the processing sector are just available for Norway and Iceland. The figure for Norway is for the pelagic processing mainly herring and mackerel. The only separation in Iceland is the meal production of pelagic species as whole. The production of frozen herring is included in the profitability figure for the whole freezing sector, both demersal and pelagic. Hence, the profitability comparison is limited. Below is comparison of profitability in the processing industry in Iceland and Norway based on EBIT (Earnings Before Interest and Taxes) as share of revenue.

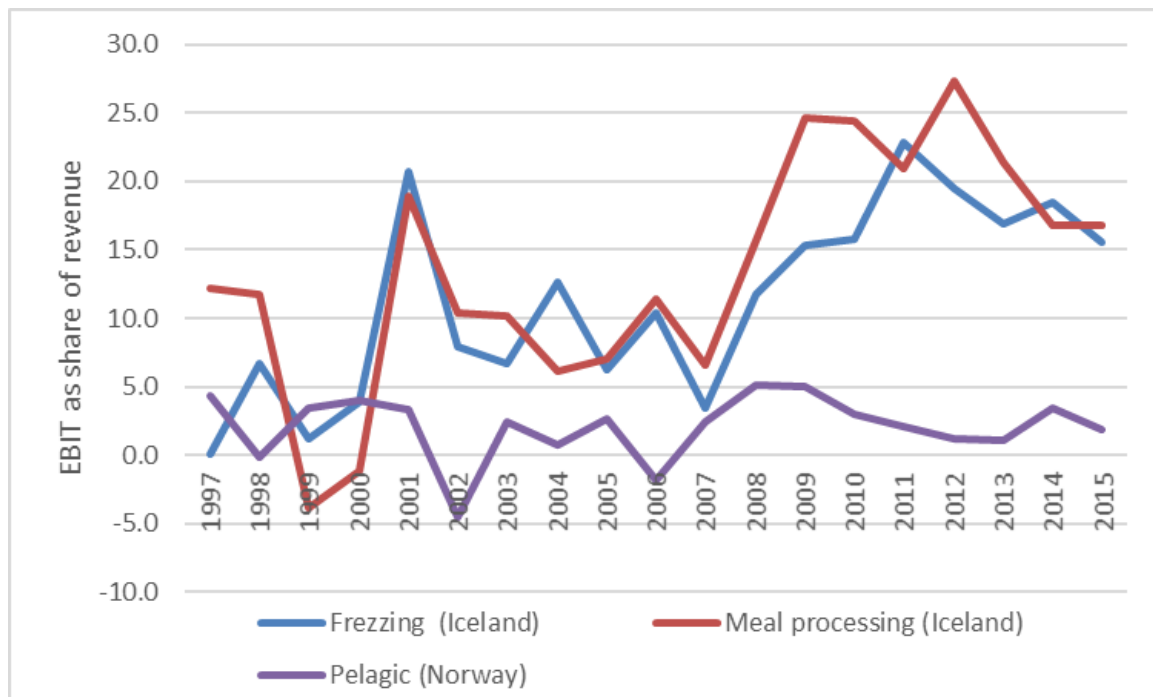


Figure 10. EBIT as share of revenue in Iceland and Norway 1997 to 2015

- The profitability in processing is higher in Iceland than Norway in most cases.
- The profitability as EBIT in Norwegian processing is very low or below 5% in most years while the EBIT in Iceland has been over 15% from about 2008.
- Profitability for meal and oil production yield an EBIT of around 10 % in Norway. This industry bases its production on capelin, blue whiting and rest raw material from herring. The amount of whole herring used for meal and oil is negligible.

2.3.3 Summary of main influencing factors regarding markets- and production development

Factor	Iceland	Norway	Denmark	Newfoundland
Strategy	Vertical integrated companies focusing on value creation and control of raw material flow (inside the seasons)	Auction markets limits vertical integration. Strong focus on large-scale efficient production.	Auction markets limits vertical integration. Strong focus on large-scale efficient production.	Small degree of vertical integration; recent year increasing focus on secondary processing and higher valued product forms instead of bait or zoo feed
Marketing	Main countries that buy herring from Iceland vary a lot between years.	Stable markets. Mostly intermediate products for further	Mixture of B2B raw material commodity and consumers packing	Stable markets as US is largest buyer; marketing done directly by processing companies/retailers;

	Indicating spot markets and always going for highest price?	processing in market countries		main countries relatively consistent over time
Risk in marketing	Medium and in many cases, could be improved	Relatively short catch seasons, with sales over a longer period, makes the industry vulnerable for exchange-rate risk	Relatively well distributed by selecting numbers of buyers to spread the risk	Relatively short season; annual quotas decisions unpredictable; focused primarily on existing markets
Degree of processing	<p>High degree of automation</p> <ul style="list-style-type: none"> - Capital intensive - Consolidation of processing <p>Fillets and butterflied fillets has been increasing and is currently around 50%.</p>	<p>High degree of automation</p> <ul style="list-style-type: none"> - Capital intensive - Consolidation of processing <p>Fillets and butterflied fillets have been relatively stable at around 40 % for the last five years.</p>	<p>The production seems to in two main sections that is Whole unprocessed herring and the end markets with prepared or preserved products.</p> <p>The biggest share or around 70% of the volume is whole frozen. - - Fillets counts for around 9% of the volume</p> <p>- Around 20% of the volume goes to prepared or preserved markets (around 40% of the value)</p>	<p>Low level of automation; Value of the product is increasing as Canadian quotas decrease</p> <p>Fish are processed more in Canada instead of exporting fish for further processing abroad</p> <p>Minimum processing requirement makes processing on sea impossible</p>
Flow of raw material	Fishing and processing done in harmony by VICs based on	Raw material flow governed through first-hand auction.	Through the auction markets and some degree	Depending on size of boats and fishing grounds. Off shore

	<ul style="list-style-type: none"> - Quota status - Coordination of landings with processing capacity within each season 	Vessels may have to travel 2 days extra to reach the highest bidder	of coordination with buyers	<p>vessels are not as bound to location</p> <p>Landing obligation and minimum processing requirements make location of production important to be close to landing stations</p>
Structure of the industry	<p>Almost completely vertical integrated industry. Small share of catch done by independent small boats</p> <p>Limited competition within the pelagic (herring) sector due to consolidation</p> <ul style="list-style-type: none"> - Raises questions about how this affects product mix and development? 	<p>No vertical integration.</p> <p>High capacity in processing and strong competition between processors.</p>	<p>No vertical integration.</p> <p>High capacity in processing and strong competition between processors.</p>	<p>The industry is split into two main sector inshore fleet and offshore fleet.</p> <p>Approximately 50-60% of landed volume and value is by the inshore fleet <19.8m</p>
Location	<p>Economics of scale and scope</p> <ul style="list-style-type: none"> - Need to have one location highly focussed on processing of fillets, freezing and meal production 	<p>Economics of scale and scope</p> <ul style="list-style-type: none"> - An advantage to have one location with both freezing and meal and oil production 	<p>Economics of scale and scope</p> <ul style="list-style-type: none"> - An advantage to have one location with both freezing and meal and oil production 	Inshore fleet has limits of fishing ground depending on boat size

Employment	<p>Seasonality and fluctuation in catches between years affects required employees</p> <p>- emphasis on automation</p>	<p>Highly seasonal production</p> <p>Highly automated production with fewer employees</p> <p>Mainly seasonal, foreign labour</p>	Highly seasonal fishing	<p>Rather low degree of automation production</p> <p>For the majority of labour force in the NL fishery the industry is regarded as highly seasonal and is augmented by secondary income. Labour for the harvesting vessels and processing facilities are required for short periods of time with individuals either relying on employment assistance programs or having to find alternative employment when the fishing season is closed</p>
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2.4 Price settling mechanism

- Price of herring in Iceland is decided by the Official Bureau of Ex-Vessel Fish Prices (Verðlagstofu Skiptaverðs).
 - The price is decided monthly, where the set-price is changed according to changes in the market price, sometimes with a considerable delay.
 - This price is not used in any transactions other than calculating the vessel crews' wages (based on a share system).
 - Historically the price was determined by the market price for fish oil and meal.
 - As the importance of herring to human consumptions has grown, this has changed and the Bureau of Ex Vessel Fish Price now also decides the price for whole herring for freezing.
 - The quantity behind the price is however very limited so the price for fish meal and oil is still the price that is used by the industry
- Norwegian herring is sold through the Norwegian pelagic auction, Europe's largest pelagic fish auction, with an annual turnover of approximately 1.5 million tonnes at a value of almost NOK 9 billion (€ 966 million).
 - The auction is an electronic auction without physical inspections of products and is based on the first-price sealed-bid method
 - There is a minimum price in the auction, set at 80 % of the average for all sales of the species for the last two weeks
 - The first-hand sale of fish in Norway is legally protected through the raw fish act and organized through sales organizations with exclusive rights for co-ordinating the first-hand sale of fish
 - The Norwegian pelagic auction was established in the 1970s and is owned and operated by Norges Sildesalgslag (NSS), the current sales organization for pelagic fishermen in Norway.
 - There are some firms owning both fleet and processing capacity in the herring sector, but the auction limits any real vertical integration
 - There are two main prices in Norway for consumption, and for meal and oil as shown in Figure 11. The quantity in meal and oil is very limited so the consumption price will be used in the comparison.

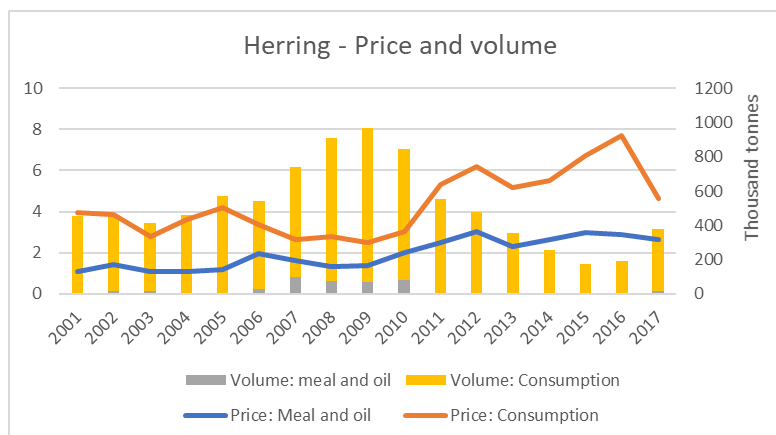


Figure 11. Herring price and volume in Norway 2001 to 2017

- Danish herring is also offered at the auction of “Norges Sildesalgslag.” The Norwegian processors as well as Danish processors buy directly via this auction.
 - Around 90% of the herring goes through the auction of “Norges Sildesalgslag.”
 - The rest or 10% is sold through the Danish fish auctions (Ministry of Environment and Food.
 - In many cases there are some agreement or coordination between the vessel and a processor about deliverance of a certain amount at a certain time.
 - Even when coordination takes place, the current price at the auction of Norges Sildesalgslag is the basis for negotiations about possible bonus for deliverance.
 - The market is not fully reflecting the highest quality of herring. In general, the quality of purse seine caught herring is higher than trawl caught herring, as the quality of herring caught by trawl depends of trawl time, and there are pressure risks.
- In Newfoundland first hand price is negotiated annually between the harvesters and the processors with an average price per kilogram determined in advance of the season; the negotiated price is subjected to change throughout the season. Unlike other fisheries, the FFAW (the union representing the harvesters and processors) are not actively engaged in the price negotiations for herring.

Price development in the comparisons countries is expressed in Fig 12. Price was just available from Canada from 2006 to 2008 and from 2014 to 2017.



Figure 12. Price development in Norway, Iceland and Denmark 2001 to 2017; Canada 2006-2008 and 2014-2017.

- There is a huge difference between the price paid in Iceland and the consumption price in Norway and Denmark.
- The price in Canada is always the lowest (for the comparison years).
 - Price varies between region in Canada and the herring receive the lowest price of the region in Newfoundland.
- There is not much evidence of the role of the auction markets to pay for quality, or according to the fishing gear as all herring in Norway is caught in purse seine
 - According to unconfirmed personal communication the auction market is not fully reflecting the highest quality of herring.

2.4.1 Summary of main influencing factors regarding the price settling mechanism

Factor	Iceland	Norway	Denmark	Newfoundland
Price settling	Price settling committee deciding price. Less than 1% goes through auction markets	Auction market	Auction market	Negotiated annually and subject to change within a season
Market activities	Limited	High	High	Limited
Transparency in price settling	Limited	High (Auction market)	Auction market	Limited
Dynamic of the price settling mechanism	Limited	High	High	Low
Different price according to fishing gear	None	Yes (but almost everything is caught by purse seine)	?	Undetermined
Quality	Good, and has improved with time due to higher RSW-capacity of vessels	Very good, minimal variation. Quality has increased with time by better catch handling and higher RSW-capacity	Good, and have improved with time by higher RSW-capacity	Dependent on the quality of the flesh and the fat content; seasonal variance
Timing	Strong seasonal variation	Strong seasonal variation	Strong seasonal variation	Strong seasonal variation

2.5 Fishing

2.5.1 Fishing gear

- Norwegian catch all the herring in purse seine that is believed to deliver better quality of raw material than the pelagic trawl.
- Icelandic pelagic vessel are increasingly using pelagic trawl in catching the herring as can be seen from below figure where the trawl used for 90% of the catch during the last 3 years.
- The NL/Canadian herring fishery are using a combination of fixed and mobile gear (purse seine) to capture herring; regulations governing the use of each gear type and the region where they can be used.

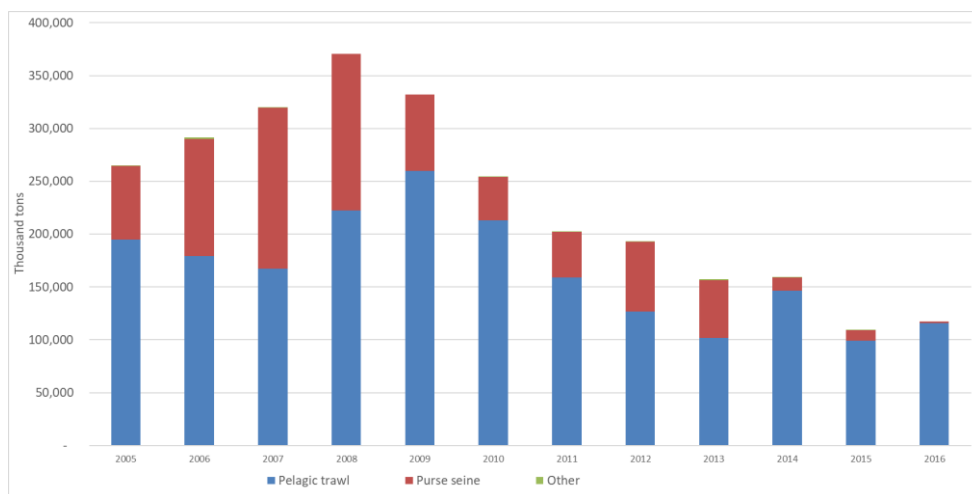


Figure 13. Use of purse seine and pelagic trawl in Fishing herring in Iceland 2005 to 2016

- The biggest change in the fishing of herring is the improved cooling system in the vessel by the introduction of fresh chilled (RSW) on board the vessel.
 - In Iceland this changed the industry in the sense that more of the herring is processed on land instead of frozen at sea as can be seen in Figure 14.

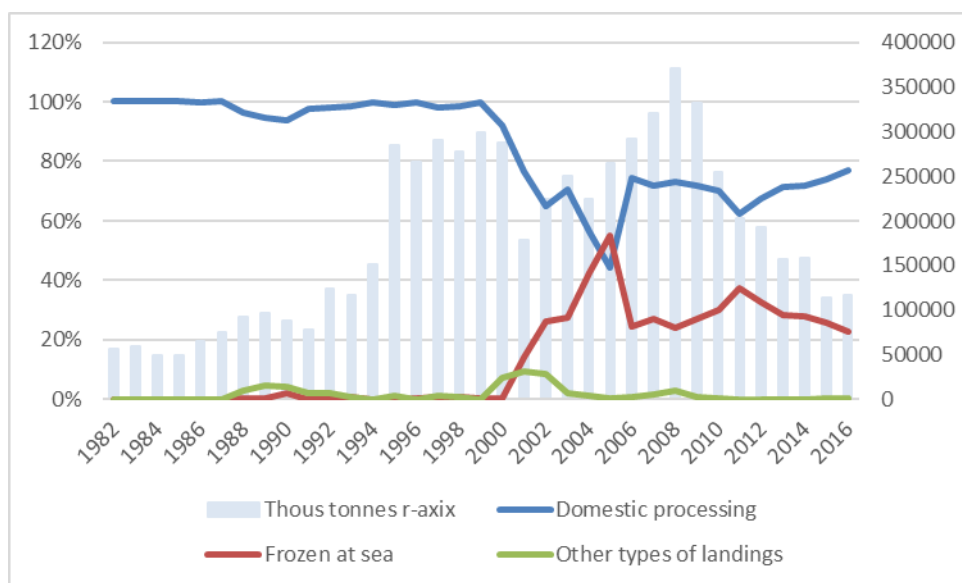


Figure 14. Herring landings 1982 to 2016 – frozen at sea or domestic processing

2.5.2 Performance and profitability

In Figure 15 the profit before interest rates and tax (EBIT) is shown for pelagic fishing in Iceland and two vessel groups from Norway, deep sea and costal fishing of pelagic species

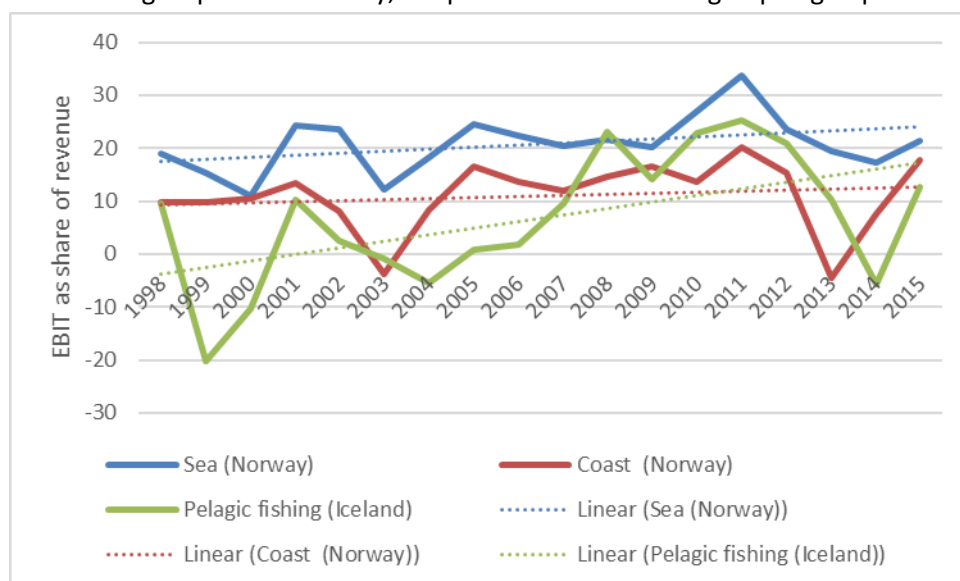


Figure 15. EBIT as share of revenue for pelagic fishing in Norway and Iceland 1998 to 2015.

- The profit is similar between the fishing methods but slightly higher in Norway. The trend line show that the profit has been increasing faster in Iceland in recent years than Norway.
- The highest profit is in deep sea fishing in Norway, which varies between 10 to 20% of revenue.
- There is no available information about profitability in the industry in Newfoundland.
- In Denmark information about profitability is at company level and not comparable with the sectoral analysis in Iceland and Norway

2.5.3 Summary of main influencing factors regarding fishing

Factor	Iceland	Norway	Denmark	Newfoundland
Profitability	Medium	High	?	?
Productivity	Productivity has increased because of more automation , both in fishing and especially on-land processing of seafood	Productivity has increased because of more automation , both in fishing and especially on-land processing of seafood	Productivity has increased because of more automation , both in fishing and especially on-land processing of seafood	Rather low degree of automation production For the majority of labour force in the NL fishery the industry is regarded as highly seasonal and is augmented by secondary income.

Processing	<p>Changes from processing on sea to processing on land, where utilization is better (better filleting yield) and promotes better use of by-products creating more value from each fish.</p> <p>Cooling</p> <p>- Longer fishing trips – you can catch good fish further out at sea; seasonality</p>	<p>Increased share to human consumption (reached 100 % around 2000)</p> <p>Share of processing now stable at around 40 %</p>	<p>Mixture of whole export for further processing abroad or as prepared and preserved that is more in consumer packing.</p>	<p>All landed processed</p> <p>Majority of Atlantic herring is exported</p> <p>Small volume is sold or used within Canada as bait or for fishmeal.</p> <p>Food exports are typically in the form of primary or secondary processed products (e.g. whole fresh/chilled/frozen, frozen fillets, smoked, salted or in brine [not dried or smoked], prepared or preserved whole or in pieces). Some of these products (e.g. first stage marinades) are further processed in the United States and then re-imported back into Canada</p>
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2.6 Consolidation

One way of expressing consolidation in the seafood sector in different countries is to calculate HHI or Herfindahl, Hirschman index which for the seafood sector can be calculated by summing up the squared quota shares of the firms in question. The index value is found by the sum of the squared market shares of all firms (N): and can be expressed as a normalized figure ($0 \leq \text{HHI} \leq 1$), or taking numbers between 5 and 10,000, for whether market shares are expressed in percentages or rates.

For a company with 100 per cent market share the value will be 10,000 (or corresponding 1), while for a market with 10 firms and 10 per cent market share each the value will be 1,000 or 0.1.

- An H below 0.01 (or 100) indicates a highly competitive industry.
- An H below 0.15 (or 1,500) indicates a concentrated industry.
- An H above an H between 0.15 to 0.25 (or 1,500 to 2,500) indicates moderate concentration.
- 0.25 (above 2,500) indicates high concentration.

Other way to express this consolidation is to calculate the concentration ratio for the biggest companies. For Iceland this is done for the biggest (CR1), the five biggest (CR5) and the ten biggest (CR10).

2.6.1 Iceland

Table 5. Concentration calculation for Iceland the years 2000 and 2017

	2000			2017			
	Herring	Capelin	Blue whiting	Herring	Capelin	Blue whiting	Mackerel
Number of vessels	36	41	19	14	12	15	67
Concentration ratios							
CR1	9.2%	9.6%	21.7%	19.3%	19.7%	18.6%	14.0%
CR4	28.9%	32.6%	56.7%	62.3%	58.3%	60.7%	47.5%
CR5	34.1%	38.3%	63.7%	70.1%	68.6%	69.0%	56.9%
CR10	54.1%	55.2%	92.6%	97.3%	97.2%	96.5%	89.1%
HHI	0.0421	0.0459	0.1205	0.1232	0.1190	0.1221	0.0902

Data for the calculation is from the Directorate of Fisheries in Iceland. Calculations based on catches by all vessels reporting pelagic catches in 2000 and 2017. Concentration calculated by vessel operators; if an operator has many vessels catches of them all are combined.

- It is clear that consolidation has been taking place in Iceland looking at the CR index and biggest company CR1 is close to the quota ceiling of 20%
- The CR10 points toward great consolidation where the 10 biggest have well over 95 % share of most pelagic species.
- The HHI index express that the industry has moved from being a competitive industry to being an almost totally concentrated industry in 2017.

2.6.1 Norway

Concentration in the pelagic fisheries is very low, with 78 large purse seiner taking part in the fisheries, and with no quota owner owning more than 2 % of the quota.

Concentration in processing is much higher, as shown below. There was a decrease in concentration from the mid 90ies till around 2005, where more companies established processing plants for pelagic species.

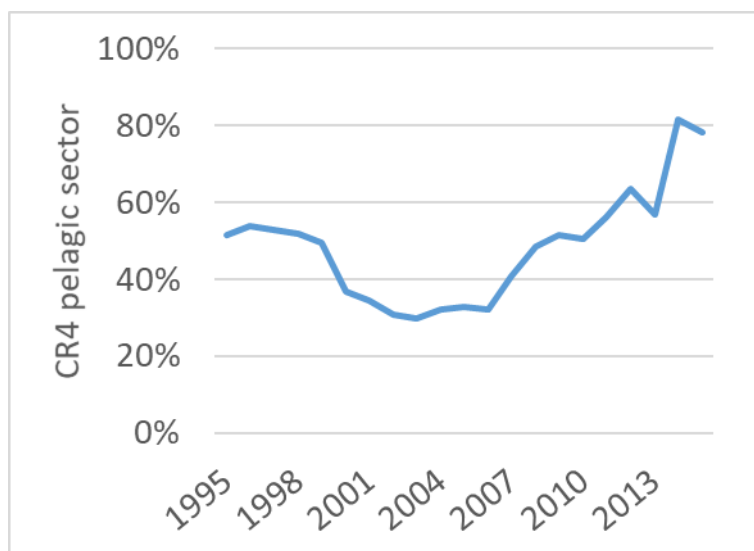


Figure 16. Concentration in the Norwegian pelagic industry.

The steepest increases in concentration was seen from 2006 to 2008, with the merger that shaped Norway Pelagic, with 16 processing facilities included. The last steep increase is the result of the merger into Pelagia, also resulting in a strong concentration of herring for both human consumption and oil and meal.

There is a certain tendency of an increased importance of this sector to the economy, as demonstrated in Fig 17 below. The increased contribution to the economy coincides with an increased concentration (without any causal relation).

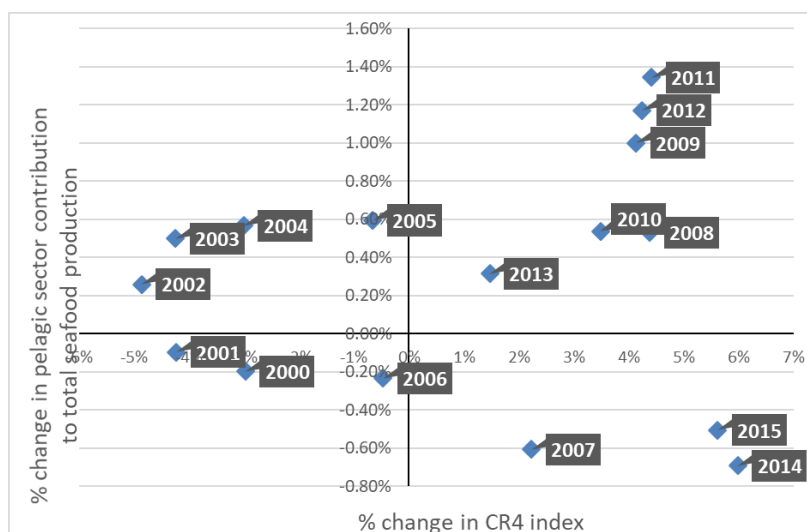


Figure 17. Change in concentration and importance of the sector.

The pelagic industry does not seem to be occupying a larger share of the seafood sector.

2.6.2 Denmark

Table 1 Atlanto-Scandic herring – Danish ITQ quotas. No vessels, no of vessels with different owners/owner company* and HHI index.

	2008	2016
Danish TAC (tons)	44.535	20.919
No vessels with quota (ITQ)	23	13
No individual owners*	22	12
HHI-index	0,065	0,113

*The specific ownership is not clear. The quotas are allocated to vessels, which can have different owner structure. Reduction only if same company owns two vessels.

- The concentration rate for Danish Atlanto Scandic herring fisheries has increased – almost doubled. But it is still below a HHI-index of 0,15 and is therefore regarded as un-concentrated.

Table 2. North Sea herring– Danish ITQ quotas. No vessels, no of vessels with different owners/owner company* and HHI index.

	2008	2016
Danish TAC (tons)	31.243	98.830
No vessels with quota (ITQ)	8	7
No individual owners*	7	7
HHI-index	0,146	0,182

*The specific ownership is not clear. The quotas are allocated to vessels, which can have different owner structure. Reduction only if same company owns two vessels.

- The concentration of the Danish fisheries of North Sea herring has increased. It had the top level to be characterised as an un-concentrated market in 2008, but will be regarded as moderately concentrated by 2017.
- A strong consolidation has taken place in the primary processing of herring over the last 10-15 years. Unfortunately, there is no data available on volumes of purchasing of herring by the Danish fish processors to document this process in HHI-terms. At present (2017) we have assessments from industry informants and managers that the documented structure of high concentration of primary processor in the herring with two large processors and a few minor processors probably would give a score at the HHI-index around 0,40, which document a high concentration of production in the Danish processing. As will be argued later, this is not problematic from a competition point of view, as the regional (Norway, Germany) competition is high.

2.6.3 Newfoundland

The current fisheries management structure in NL, caps the number of licenses an enterprise can acquire. Similarly, the fleet separation policy is also having an impact on the level of concentration, the competitiveness and consolidation by harvesters and processing companies. It is clear that there is no danger that consolidation is high in Newfoundland and therefore the HHI index was not calculated for Newfoundland

2.6.4 Summary of main influencing factors regarding concentration

- According to CR4 it is clear that Norway had more concentration sector than Iceland in the year 2000 where the Norwegian pelagic sector had CR4 49,1% while the Icelandic herring sector 28,9%.
- In 2017 the CR4 is up to 62,3% in herring for Iceland while it is 67,6% in the pelagic sector in Norway. The difference is getting smaller and it is clear that concentration within the sector in Iceland has been increasing fast
- Although concentration has been increasing a lot in all the countries it is argued that this is not problematic from a competition point of view, as the pelagic products are mainly B2B commodity and the global/Nordic competition is high as well as regional.

Factor	Iceland	Norway	Denmark	Newfoundland
Restriction on consolidation	20% quota celling. The largest company is almost up to that limit.	Very low consolidation in the fishing fleet (largest vessel owner at 2 %) Increasing concentration in processing and exports		Limits of stacking of licences
HHI index	0,1232		Quota 0,113 Fishing 0,182	Not calculated but very low consolidation
CR4	28.9% (2000) 62.3% (2017)	49.1% (2000) 67.6% (2015)		

2.7 Overall economic performance and competitiveness of the fisheries value chain

Value chain dynamics depend heavily on the governmental form of the value chain and the relationship within the value chain and the governance form. Gereffi (Gereffi, 1994) claims that many chains are characterised by a dominant party/parties who determines the overall character of the chain. In the same way the lead firm(s) becomes then responsible for upgrading activities within individual links and coordinating interaction between links in the value chain. Hence, the role of governance in the value chain is important and Gereffi (1994) makes a distinction between two types of governance in value chain. In the first buyers undertake coordination in the value chain (buyer driven commodity chains) and the second are those in which producers play the key role of coordination (producer-driven commodity chains). In fisheries that builds on using natural resource it is interesting to analyse the different drive forces in the value chains and the ways of coordinating activities in the value and how this is impacting the results of the value chain.

2.7.1 Iceland

2.7.1.1 Governmental form of the value chain

- The herring sector was until 1991 based on many individual boat owners that had the licences to catch herring. During that time the governmental form was based on individual contracts and where the herring was caught.
- The period during 1991 to 2000 a lot of consolidation occurred as other pelagic boats, mainly capelin boats were allowed to buy herring quota.
 - In 2016 the real number of companies that hold herring quota is only 11.
 - One of them is not vertically integrated and operates only one pelagic vessel.
 - Value chain is governed through high power asymmetry as hierarchy.
- The export part of the value chain has as well changed a lot during the last 30 years.
 - The dependency in the value chain varies a lot depending degree of long term contract in their business instead of ad hoc sale.
 - Frequent changes in export from Iceland suggest market relationship based on price. Closing of markets in Russia affect this in the last years.
- The degree of coordination in the value chain of herring is not as great as the supplies can be stored for a long time as well being global b2b commodities.
- The vertical integration has maintained a certain power balance in the industry preventing the fishing sector from becoming too powerful.

2.7.1.2 Drive force in the value chain

- It is clear that the VICs companies holding majority of the quota are the leading firm in the value chain of herring in Iceland.
- The driving force is economics of scale in fishing and production
- Synchronising fishing and production through the VICs.
- Consolidation brings in the danger of lack of internal competition in the value chain.
 - More or less all companies are focusing on the same strategy of automation in production and focus on frozen fillets and butterflied herring.
 - Only one company focuses on salted herring
- Market price

2.7.2 Norway

2.7.2.1 Governmental Form

The value chain for pelagic fish from Norway

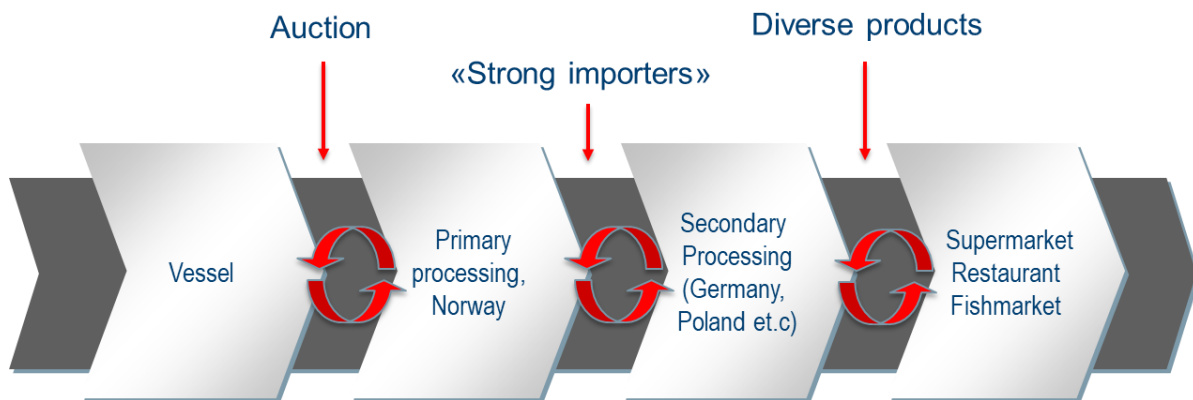


Figure 18. The value chain for Norwegian herring, with three intermediate markets

Herring from Norway is sold in three intermediate markets, with quite different characteristics:

1. The Auction Market. **Market relationship** mainly based on price on the auction
 - a. Many sellers (more than hundred), but one sales point
 - b. Around 25 buyers, huge landing and processing capacity
 - c. First-price, sealed-bid auction
 - d. Strong seasonal peaks
 - e. Quality is variable and hard to control, but generally good
 - f. Efficient auction and high capacity in processing: leads to high profitability in the fleet, low profitability in processing
2. Export of whole frozen or fillets. **Relational** form of governance, but still strong competition.
 - a. Few buyers in each market, fish resold to many small producers in some markets
 - b. Contract or spot sales
3. Relations are important, necessary for obtaining a sale, but not sufficient to gain a contract. Relations are not unique relations. All buyers will have relations with several exporters, leaving price to determine the contract.
4. Processed products. **Relational** form of governance.
 - a. Supermarket chains: Strong buyers in consolidated retail markets
 - b. Huge diversity of products

2.7.2.2 Driving force in the value chain

- Main traits/implications:
 - a. Efficient auction leads to highest possible sustainable (sustainable price: the price that brings down profitability to just above zero in processing) prices: high profitability in the fleet, low in processing
 - b. Very efficient primary processing in Norway, highly automated, with large quantities produced at high, even and predictable quality
 - c. This is an industry not very well suited to differentiated products, as production is based on scale and standardisation, therefore unlikely to move into highly diversified and small-scale retail markets

- The power in the value chain seems to be at both extremes in the value chain. The fleet has a very strong position, as it holds a raw material in high demand, and has an auction system able to command the highest possible price for the herring.
 - On the other extreme, supermarket chains act as very strong buyers from processing firms, leaving processors and traders in the value chain in a weak intermediate position.
- In Norway we have seen several mergers in an attempt to weaken the competitive pressure, and thus to gain a higher margin, only to find that other producers strengthen their position in the wake of the dominant firm.
- With almost all of the herring sales going through the first-hand auction, the degree of vertical coordination is very low, even though some boat-owners are major stakeholders in processing firms.

2.7.3 Denmark

2.7.3.1 Governmental Form

- Herring industry has been consolidated over the last 15 years.
 - Implementation of ITQ in 2003.
 - Processing followed some year later but has reached a high level of concentration today, which the assessed HHI-index around 0,4 illustrates.
- In general, the relation between the fleet and the primary processors has been characterized by a market relation,
 - with some degree of negotiation and coordination.
- Today the relation is formally market based – the vessels sell and land where the price and income is best
 - there is some coordination between the vessel and the processor.
 - the relation thus can be characterized as modular, or in some cases even relational, in the cases of strong coordination between the processor and one or a few vessels.
- Regarding the processing and export market, the consolidation the last 15 and especially 10 years has influenced the governance structure as well.
- Earlier, the Danish herring-processing sector was characterised by a relative few high number of primary processors.
 - The relation was highly competitive at a market basis, while also personal relations and personal knowledge of quality were of importance.
- The relation between primary and secondary processor apparently has characteristics from a modular or even relational coordination. Still the relation is highly competitive and market based.
- Apparently, every link in the value chain are aware the risk of being dependent of a supplier or customer.
 - limit input or sales of products to 20-25 % for each customer.
 - customers have a range of suppliers and can maintain the price competition between these.
 - This is also a market based limit for consolidation in the Danish industry.

2.7.3.2 Driving force in the value chain

- Driving force is economics of scale in fishing and production
- Market price in the relationship of fishing and production
 - Certain level of synchronising fishing and production through relationship between the two sectors.

- Towards less emphasis on prepared and preserved products towards lower processing stage as whole herring
 - Lack of competition?
 - Too much consolidation?
 - Lack of synchronisation of fishing and production?

2.7.4 Newfoundland

2.7.4.1 Governmental Form

- In Newfoundland it is possible to separate the fishing industry into two sectors. First is the offshore sector that is vertical integrated in fishing, processing and marketing and then inshore fleet, which is based up on individual boat owners where vertical integration is banned.
- The boat owners and producers negotiate a price at the beginning of the season which is subjected to change; unlike other fisheries the price is not negotiated by the FFAW (The Fish, Food and Allied Workers Union) and associations of producers. There are no auction markets and more or less the negotiated price is used in the transaction.
- The relationship is in some way **captive** due to lack of active markets in the relationship but in some cases, it could be regarded **relational** where boat owner and producers have some contract about landing of cod and other species.

Power balance/structure

- Due to the structure of the fisheries management system that is individual vessel has a TAC but has limited possibility of transferring fishing licenses (stacking up) the power in the value chain lies in the hands of the stakeholders that decides on the system.
- The stakeholders are the policymakers that is the politicians and the parliament that decide on the system.
- Due to low quota in Newfoundland and more important species as lobster and crab, cod have been looked up as filling and not major species in fishing. With foreseeable increase in quota this can become problematic.

2.7.5 Summary of main influencing factors regarding concentration

Factor	Iceland	Norway	Denmark	Newfoundland
Structure of the industry	Vertical integrated rather large companies	Two sectors: inshore smaller boats, but majority larger companies but not vertically integrated		Two sectors Inshore with ban on vertical integration Offshore sector which is more or less vertical integrated
Vertical integrations	High	None	None	Low
Flow of raw material	Through VICs	Auction markets	Auction markets and	

			some –degree of coordination	
Governance	Hierarchy	Market based	Marketed based	Captive or relationship in inshore sector Hierarchy in the off-shore sector
Coordination	High in the VICs and based on buyers need in some sense	Market based	Market based and some direct coordination	Low in inshore fleet; some in the offshore sector
Dependency	High in the hierarchy	Low	Low	Low but minimum processing requirements can create dependency between fishing and production
Power structure/balance	Hierarchy with high dependency by sectors and power balance	The auction system leaves the fishing fleet with most of the profitability in the industry		
Driving force	Product and seasonal driven value chain based on coordination of fishing and production through VICs	Scale and productivity increase		Harvesting (product) driven value chain, Based on minimising cost strategy of fisherman
Lead firm	VICs	Pelagia in processing, no identifiable		None

		lead firms in fishing		
Core competitiveness	Economic of scale and synchronising of activities through the VICs	Economics of scale	Economic of scale	
Specialisation	<p>Rather high</p> <p>Vessels mainly in pelagic species</p> <p>Producers have special pelagic processing facilities</p>	<p>Large purse seiners are specialised in pelagic species (but less specialisation within the pelagic species, all vessels catch herring and mackerel, some also catch capelin, blue whiting etc.)</p>		Very low seasonal industry

2.8 Strategic Position Briefing

- The pelagic/herring industry in Norway, Iceland and Denmark build their competitive strength on economics of scale both in fishing and processing.
 - consolidation and automatization of their production.
 - the production is mainly B2B commodities for further processing abroad
 - Danish herring has though bigger part of their production in prepared and preserved packing due to access to the common market (without tariffs)
- The Canadian industry focus more on prepared herring and is more labour intensive maybe due to limited quantity.
- Due to the economics of scale it is not easy to enter the industry
- In all countries herring fishing is seasonal so competitiveness of the industry is based on other pelagic species and quantity.
- Upgrading in the value chain can be difficult and will in the case of Norway and Iceland be based on increasing the production stage of the herring, at least part of it, in more consumer's product instead of B2B commodities.
 - Tariffs in the main markets like EU can in many cases be difficult barriers to overcome. This could be an advantage for Denmark being part of EU and is making countries like Poland and other EU countries more competitive and attractive for further processing.

2.8.1 Iceland

	Description	Share of herring fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Independent small boat owners	<30 tons, number of fishing days limitation and TAC	0.2-.4%	Low	Limited	Low valued fish; profitability low or non-existent due to low volume. Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability	Part in direct sales and part through auction markets.	Lack of dynamic
Independent big boat owners	>30 tons with TAC	12% of Icelandic herring	High - capital intensive quota price	Sell to highest bidding land processing	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability. Reduction in number of independent big boat owners.	Mixture of auction market and contract relationship.	Maximize first sale price.
Individual producer ORA, Egilssíl, Marhólmur	Supplies fish by contracts and from auction markets. Medium and small size producers with often low degree of automatization, mainly focusing on niece markets.	0	Medium - depends on markets needs and level of automatization required.	Market relationships, product mix, long time source and sales contracts,	Unstable currency, Access to supply do to quota system and high degree of VICs. Lack of branding,	Sourcing form auction market and by contracts with boat owners and other producers.	Maximize value from bycatches and serving niece markets

Vertical integrated company in fishing, production and marketing (VICs)	Companies with own boats, processing facilities and marketing office. High degree of atomisation in processing and fishing. Producing fresh, frozen and salted products.	86,4% of Icelandic herring	Very high - quota price, capital intensive fishing and production.	Branding, product mix, market relationships, usage of by-products, increase quota share up to limit.	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability. Reduction in number of independent big boat owners. Refresh fish. Lack of branding.	Internal sourcing and auction market when there is shortage of own catches.	Coordination of fishing and processing according to market needs, current sales and quota limitations.
Export and marketing companies with no own production	One big sales company and number of small companies selling fish products from VICs and smaller producers by long term contracts and ad-hoc trade. Sourcing fish from Iceland and other countries.	0	Low - depends of market and supply relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Mixture contract relationship ad hoc trade	Monitor markets needs and preferences and share market signals to producers. Risk reduction through network of suppliers.

2.8.2 Norway

	Description	Share of Herring fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Coastal seiners 11 – 21m	Close to shore, small-scale fisheries, often off-season	9 %	Medium - capital intensive quota price	Better handling, buy quota.	Quota reduction, price reduction	Almost all goes through auction markets.	Lack of dynamic
Coastal seiners > 21m	Seasonal fisheries of herring and mackerel (and demersal fisheries in other seasons)	18 %	Medium - capital intensive quota price	Better handling. Sale contracts with producers.	Quota reduction, price reduction	Auction markets	Maximize first sale price.
Purse seiners	Large, modern fleet, RSW and good handling > both high efficiency and high quality. Catching in short seasons for herring (and in particular mackerel)	55 %	High - capital intensive quota price	Sale contracts with producers. Buy quota.	Quota reduction, price reduction	Auction market	Maximize first sale price.
Large company in production and marketing	Companies with processing facilities and sales office. High degree of automation in processing. Producing frozen whole and filleted products.		Low/medium/high. Low investment for small/medium-scale simple operations (existing, idle plants), high investment for large, automated factory	Branding, more processed products, market relationships, usage of by-products.	Unstable currency	Auction towards the fleet, highly competitive markets for products,	hard to increase value creation.

Small company in production and marketing, specialising in semi-processed products	Companies with processing facilities and sales office. High degree of automation in primary processing, smaller scale secondary processing. Producing frozen whole and filleted products, as well as marinated smaller pieces.		Medium - depends of market relationships	Branding, market relationship, long time contracts		Auction towards the fleet, highly competitive markets for products	
Export and marketing companies with no own production	Sales company selling fish products from VICs and smaller producers by long term contracts and adhoc trade. Sourcing fish from Iceland and other countries.	0	Low, requires capital to finance ownership of a few hundred tons. Based on market knowledge and relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Relationships are a pre-requisite, but not sufficient, actual trade based on spot price	Monitor markets needs and preferences and share market signals to producers. Risk reduction through network of suppliers.

- Independent Small boats owners
 - Small boat owners operate a bit differently than the larger purse seiners. They mostly fish close to the coast, often inshore, and through a larger portion of the year than the larger fleet
 - They often sell outside of the auction, to smaller firms, and often to much higher prices than in the high season
 - The larger coastal fleet has much of the same pattern as the purse seiners. A share of their catch is sold on contract, sometimes at a lower price than purse seiners. The lower price might stem from both the inability to travel long distances with the herring and the fact that some struggle to achieve the high quality delivered by the most modern purse seiners
- Independent big boat owners

- All boat owners might be characterised as independent. The sector is dominated by a large and homogeneous fleet of purse seiners (78 boats), where a few boat owners own 2-3 boats, but where no firm catch more than 2 % of the catch value.
- Individual producer
 - Most major processors have a very high degree of automation
 - A few producers producing more processed products, but still only semi-processed, have a slightly higher proportion of manual operations
- Vertical integrated company in fishing, production and marketing.
 - With almost all of the herring sales going through the first-hand auction, the degree of vertical coordination is very low, even though some boat-owners are major stakeholders in processing firms.
 - Even though some of the boat owners also have ownership in processing companies, all of the fish is sold on auction, leaving very little room for vertical coordination.

2.8.3 Denmark

- **Independent Small boats owners**
 - The nature of the herring/pelagic stocks and the industrial processing are that the catches is best done by large modern vessels which can catch large schools and store them under high quality conditions. Therefore I don't see any upgrading strategies for the small or minor boat owners. Catches of herring here is more like bycatch or for limited local markets, which seems to be quite limited.
 - There are no forceable "alternative" markets or distribution for herring, which could be upgrading strategy for small vessels.
- **Independent big boat owners**
 - The fleet seems to be close to the limit of consolidation, also given the recent political debate of "quota-kings". The dominant process has been construction of larger vessels with top-class handling equipment for deliverance of top quality. This process of modernisation will probably continue, as long as the economy in the sector is as profitable as at present.
- **Individual producer**
 - The consolidation process has increased the automation among the primary processors. The turnover is up to 580.000 €/employee. A driver for the consolidation has been the necessity of volume in the processing industry, following the still larger pelagic vessels. It turned out to be impossible/expensive not to be able to take a full load from a vessel. Therefore, the minor primary processors could choose to increase capacity with the larger vessels or sell to the larger processors with sufficient capacity to take and handle full loads.
 - The dominant upgrading process for the producers has been consolidation in larger entities and higher value adding of the product for secondary processing.
 - There seems to be barriers for upgrading to be secondary producer of consumer products. This will lead to a double position with direct competition against the customers.
- **Vertical integrated company in fishing and production**
 - Vertical integration of primary processing and the fleet was given up 6-7 years ago. The situation was opportune for getting a good price for vessels and especially quota, which was invested in consolidation in the processing industry. An argument used today is that maybe the dis-integration allowed the company to focus better.
 - Clearly integration would secure the supply of resources, but the company also in the period of integration bought from other vessels. It can be considered if the dis-integrated situation with informal relations to a larger group of vessels/suppliers allow the company to plan to a higher degree than by being fully integrated.
- **Vertical integrated company in fishing, production and marketing.**
 - No such companies have been identified in the sector

2.8.4 Newfoundland

- In general, the main strengths of the Newfoundland and Labrador system is the proximity of the resource to the landing sites and the proximity to the North American markets.
 - The industry is putting more emphasis on the quality of the product and efforts are being made to expand into the fresh fillet markets. Labour costs when compared to European costs are cheaper however the industry is currently very labour dependent as most of processing sector is manually driven with limited automation.
 - The export market to the US continues to remain strong as the market has shifted to higher value product forms. The resource (harvestable biomass) has remained.
- From an economic or value chain perspective, the NL fishing industry is a social resource where market conditions have limited consideration in terms of the structure or management of the industry.
- Compared to the European market the challenges for the NL market are based on economies of scale as the NL biomass or landed volume is a fraction of that produced by Norway and Iceland. The current industry structure limits the transferability of quota between vessels thus impacting the self-rationalization within the industry. The current fishery has a seasonality that is not linked to market demand or prices.
- Strict regulation on enterprise combining and owner operator fleet separation has influenced vertical integration within the industry. The lack of exit barriers has resulted in licenses being sold at extremely high value which is negatively impacting new entrants into the industry as the costs are prohibitive.
- Demographics are challenging both the harvesting and processing sectors as the average age of participants is >50 years+ and recruitment of people <30 years has been declining. To combat pending labour losses, the fishery (harvesting/processing) will have to move towards more automated systems. For the limited harvestable resource, the number of landing ports (>400) and potentially processing facilities adds a level of complexity to the logistics component of the value chain. Many processing facilities have aging and outdated equipment based on current markets.

2.9 Summary of strategic positioning

It is very interesting to see the difference in structure and functionality of the value chains between Norway, Iceland, Denmark and Newfoundland. The structure of the industries is different as seen in the degree of vertical integration and the limits that government's put on the industries. It is though surprising how homogeneous the industry is between those nations. The nature of pelagic species that is, seasonality and high catch volumes in short periods, makes the product global commodity for further processing from one season to the next. The main markets are Business to Business (B2B)

The first noticeable difference observed, apart from the structure, is the price settling mechanism. On one hand it is the Norwegian system that builds on minimum price and auction market which is the same that is used to determine the Danish price. In Iceland the price is decided by the Official Bureau of Ex-Vessel Fish Prices. The Norwegian price is in many cases double that of the price in Iceland. The price obviously affects the profitability of the industry as the Norwegian fishing is benefiting from high price but the processing sector is suffering from low profitability. On the other hand, the processing sector in Iceland is doing well as well as the profitability of the fishing is healthy. It can be claimed that the overall profitability is higher in Iceland due to the freedom of strategically positioning yourself in the value chain and being vertical integrated or not, without external limitation as those that can be seen in Norway, Denmark and Newfoundland. There are

certain signs that the price settling mechanism in Iceland could be more efficient like, paying for quality of the raw material. Herring is caught almost completely in pelagic trawl compared with purse seining of virtually all the catch in Norway, that is believed to return better quality than the trawl.

The vertically integrated system where one company owns its own fishing vessels and production has the opportunity to control the flow of the raw material to its production like in Iceland. Instead, in Norway and Denmark this coordination has to be done through auction markets and informal coordination between the owner of fishing vessels and producers. Due to the short fishing season this seems to have less influence on the value chain e.g. compared with cod where the push system is clearly returning less value creation and profitability.

In such seasonal value chain as seen in the herring fishing it is difficult to enter the industry due to high capital cost and the competitiveness builds on economics of scale. The competitiveness of the value chains also depends heavily on other pelagic species as capelin, mackerel and blue whiting in most of the countries. All this makes upgrading in the value chain difficult. Opportunities to upgrade the value chains in the case of Norway and Iceland are in increasing the production stage of the herring at least part of it into consumers value added products instead of B2B commodity. Evidence from Newfoundland and partly Denmark show that more value can be created by focusing more on consumer's markets. Tariffs, distances from consumer markets and limited seasons can limit this option. The option to increase the processing stage has as well to be economically sustainable in competition with countries with lower salary cost and better access to the main markets as for example Poland and other former eastern European countries have, being part of EU.

Chapter 3: Salmonids

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1 Summary

Aquaculture is the primary source of salmonid supply globally. The different salmonid species available on the market are substitutable to a considerable extent due to their pink flesh colour and similar properties. However, different dynamics in the broader competitive environment, and in the particular circumstances of national sectors, in which the businesses comprising these industries are embedded, have determined different developmental trajectories for the very same industries. These dynamics include the changing nature of consumer demand characteristics, production technology, national regulatory regimes, international trade, industry structure, availability of natural resources. Discussed in this chapter are the cases of farmed Atlantic salmon and rainbow trout in major producer countries and the role key external influences have played in shaping different developmental outcomes. The interaction of selected salmonid producer firms with their distinct competitive environments is illustrated through firm-level case studies of strategic positioning.

The output of most salmonid aquaculture, and Atlantic salmon in particular, is highly commoditised i.e. there is little differentiation between farms and competition is based purely on price. These products, mostly head-on gutted fresh fish, serve as raw material for further processing. In that situation, large enterprises which can reduce costs of production economies of scale and offer the lowest price, would have competitive advantage.

Several of the cases focus on the struggle of smaller-scale companies for market and the competitive strategies they employ to enhance their strategic position in an industry lead by large-scale multinational vertically integrated enterprises. The case of a small-scale independent family-owned salmon farmer in the UK – Wester Ross Salmon - underlines the importance of differentiation from commodities in order to survive in the long run. It has managed to achieve that through branding around unique attributes such as small-scale, rural, natural, hand-reared and by strongly emphasis on Scottish origin. Further, the selection of suitable distribution channels, in line with the resources and capabilities of the firm has helped strengthen the company's strategic position and avoid cut-throat competition with larger rivals. It has shifted its customer base from low-end retail stores to high-end boutique retailers and restaurants, where it enjoys higher bargaining power.

The case for strategic differentiation is further illustrated by a small Atlantic salmon producer in France – Saumon de France. The French salmon market is the largest in the EU and almost completely supplied by imports from Norway, Scotland and Chile, where the farms are able to achieve much lower costs of production. Competition on price with commodities from these countries would be unsustainable in the long term, and the company differentiates itself through marketing messages around high quality, freshness, local origin and heath attributes. It also vertically integrated and processes its fish into high value smoked products. Similar to the UK salmon case, it chooses to distribute to high-end restaurants and boutique shops where consumers value its unique features and are ready to pay a premium.

The Norwegian salmon case illustrates a considerably larger independent company than the two previously discussed. Nevertheless, it is still considered a medium scale enterprise in comparison to the main players in Norway. With its volume of output, this producer can for the most part operates in the commodity market, where prices are based on spot markets. The firm does not claim any unique advantages compared to the rest of the industry. Products are of uniform quality and

appearance, leaving the firm's "way of doing business" as the only differentiator. Honesty, accountability, reliability, and a straightforward way of doing business, is the main sources of competitive advantage for the firm. Owners are aware that buyers value the origin and independent nature of their company, but are not explicitly branding around it. A primary focus of the company's long-term competitive strategy, however, is its vertically integrated structure incorporating farming and limited amount of value-added processing, which stands in contrast with the vast majority of the industry which only supplies raw material for further processing close to the market in importing countries. The firm realises that moving further down the value chain, producing more value-added products, requires the build-up of both a larger and a more advanced marketing competence, combined with a sales force closer knit to or located in the market countries. They are considering this as a long-term development, in adaption to an increasing consumer demand for value added products.

Differentiation as a strategy is not only pertinent to the smallest companies in an industry but can also be applied to entire national sectors. Broad differentiation is also the strategy followed by one of the largest Atlantic salmon producers in the world – Bakkafrost – which however operates in one of the smallest salmon aquaculture sectors – the Faroe Islands. Utilizing its unique geographical position and growing fish to a larger size, the company differentiates from the commodity market, on the basis of Faroese origin, quality, and size of fish, and is thus able to supply a niche market with considerably higher prices achieved. By being by far the largest company in the sector it also influences the position of the entire national sector on the global market, namely as a source of boutique products. The company's highly integrated value chain from fish meal and oil to value added products allow it to exert strict control over all activities to its best advantage, for example maintaining stable profitability even when prices fluctuate, through its ability to shift sales between whole fish and value-added products.

Although seen as a substitute to salmon, the overall competitive position of rainbow trout has not been nearly as successful in Europe as that of Atlantic salmon. The traditional 'portion-size' trout market is in long-term decline across Europe. This can be attributed to changing consumer preferences away from whole fish. The consumer today has access to a large variety of seafood products and chooses those which provide the most utility. Increasingly, these are the value-added products which save time and effort in preparation and cooking, and better complement a modern lifestyle. One of the primary reasons why small-size fish lose popularity is, thus, the limited amount of value that can be added to a plate-size fish. This is further complicated by the fragmented value chain that plate-size trout producers comprise and the limited ability of such enterprises to process fish into value added products.

The case of Aqualande (a vertically integrated trout farming cooperative in France) illustrates how an increase in scale and improved coordination along the value chain can improve the competitive position of an enterprise, even within an overall declining industry. The cooperative, which represents the leading trout farming operation in France, grows the majority of its trout to around 3 kg, which is considerably larger than portion-size. This allows larger fillets to be extracted which are more suitable for further value addition, predominantly into sliced smoked fillets. The larger resources available in the cooperative can be directed to processing, marketing and innovative activity. The company has developed several popular brands under which it produces various products of premium quality. It holds around 70% of the French smoked trout market. The majority

of products are distributed through the retail network. The success of the products has increased the demand for otherwise declining trout. The company's profit margin is considerably higher than the average for the portion-size trout industry. The success of this business has had a positive impact on the entire sector.

The rainbow trout case from the UK paints a similar picture. The business model of the currently leading trout producer in the country – Dawnfresh – underlines the idea that much more value can be derived from a large size fish by undergoing different levels of processing, ultimately resulting in an overall more competitive product of higher demand. Starting out as a seafood processor the company enters the trout industry through an acquisition of a bankrupt trout farmers' cooperative. The strategy of the company borrows significantly from the much more successful nowadays salmon industry. The fish are grown in marine cages to large sizes of more than 4 kg, the majority of which then serve as raw material for value addition within its own processing factories, into mostly chilled products, closely resembling those based on salmon. As such, it gains access to a much larger and well-established market, but also enters a competitive environment in which its rivals become the much larger companies in the consolidated and integrated UK salmon sector. Unlike Aqualande most of its products, however do not carry the company's brand, but the retailers' own brands instead and thus rely on the retailer for most of the marketing effort. Although the company strives to be a premium-product supplier, the general consumer's perception of trout in the UK is that of inferior quality compared to salmon, thus potentially putting the product at a disadvantage within the salmon segment, with prices tending to be slightly lower than those of comparable salmon products. Considerably more marketing effort is needed to uplift the image of trout to set it as a premium product to salmon. Potential attributes include the fish's better gustatory properties. Competing on the same basis as salmon, the company suffers from its smaller scale and much lower bargaining power than retailers.

One of the Danish rainbow trout cases – Aquapri has followed an approach similar to that of Dawnfresh in growing fish to a large size in marine cages, however, instead of focusing on the flesh of the fish, it has chosen to supply the niche market of trout eggs for human consumption. The company regard sale of small trout as unattractive due to low prices, with competition on cost reduction, while Aquapri has chosen to focus on Therefore, they focus on large trout roe where quality and marketing are the key determinants of success. The roe gives a more stable profitability, while the market for fish flesh follows the (apparently) more fluctuating salmon prices. Within the relatively more stable market for roe and caviar, prices mainly depend on product quality, which is within the area of control for Aquapri. The flesh of the trout is also sold, as filets or whole, but this product is highly dependent of the market for (especially) Norwegian salmon and thereby hard to control for the company.

In the case of the second Danish rainbow trout case – Danforel - who grow portion-size trout, the focus of value creation is on smoking whole filets and supplying the mass-market of retails and wholesalers, which is possible due to the large scale of the enterprise and thus its considerable bargaining power in this segment. Much like present-day Aqualande, Danforel was originally organized as a co-operative. However, it went bankrupt in the 1970s the co-operative concept eroded. After several re-organization and different owners, the present owner took over Danforel in 1998. During the crisis 2008 several of the supplying independent aquaculture producers went bankrupt and were acquired by Danforel. This movement of acquisition of bankrupt enterprises was

seen also in the case of Dawnfresh and illuminates a strategy to improving competitiveness through consolidation in a stagnating low-profit sectors such as the portion-size trout industry. The current strategic position of the company also benefits from its vertical integration.

While most of the companies examined so far are vertically integrated enterprises, which is increasingly becoming a necessity in a quickly maturing salmonid sector, the case of ESCo reveals the competitive position of a company involved in a single activity in the salmonid value chain – processing – and the challenges associated with that. Compared to its suppliers – the large salmon farms in Scotland, and its buyers – major multiple retail chains in the UK, ESCo is a small enterprise with limited bargaining power which can at times result in unfavourable price terms from both sides and erosion of profitability. This vulnerable position, however, is ameliorated by the fact that the company is currently part of a large multi-national corporation which can support it in times of difficulties.

2 Introduction

This section discusses the most important dynamics affecting the competitiveness of major salmonid aquaculture national sectors. It focuses primarily on Atlantic salmon (*Salmo salar*) and Rainbow trout (*Oncorhynchus mykiss*) which are the main species of the salmonid family, mass-produced in aquaculture, Figure . Rainbow trout has long presence in the history of European commercial aquaculture – it is one of the first species whose reproduction cycle was entirely replicated under farm condition. Salmon aquaculture was mastered only later, because of the more complex biological cycle spanning both marine and freshwater environments. Moreover, due to their pink flesh⁴ and similar texture, rainbow trout and Atlantic salmon are commonly considered substitutes by consumers (Asche et al., 2005; Virtanen et al., 2014), particularly so when it comes to large-size sea water grown trout. Nevertheless, the performance of the rainbow trout aquaculture sector at the European level has not been nearly as impressive as that of Atlantic salmon. While salmon aquaculture has shown phenomenal growth rate since its emergence in the 1980s and is currently regarded as the most advanced form of large scale aquaculture, and represents a globally traded commodity (Asche et al., 2013), rainbow trout aquaculture has quickly reached a plateau and is currently in decline across all EU countries,

⁴ The colour of flesh is dependent on the addition of pigments to the fish feed. Portion-size rainbow trout is also available in white-flesh form, particularly on the Eastern European market, parts of Germany and Italy. As such, it competes with other white-flesh species, such as those supplied from capture fisheries, rather than with other salmonids (Nielsen et al., 2007).

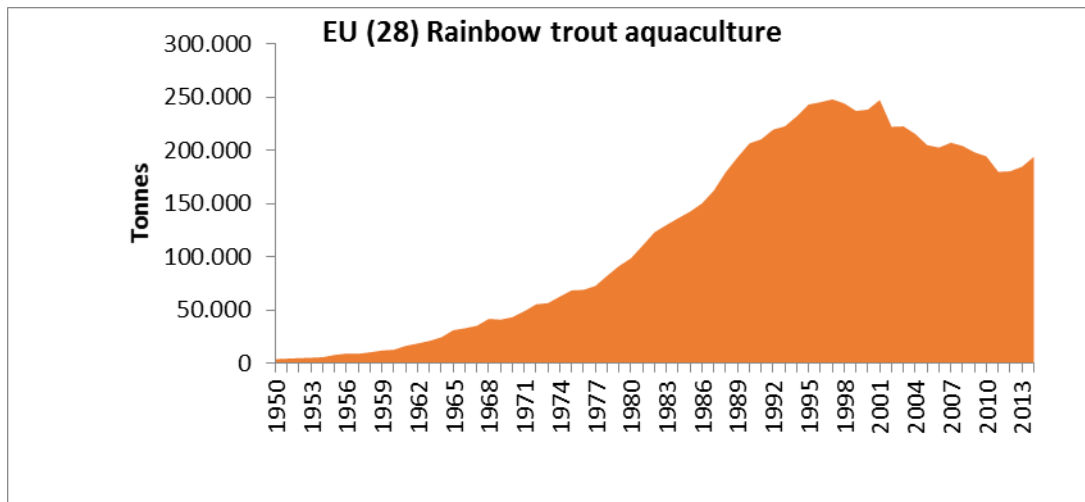


Figure 2.

In contrast, its production in Turkey has „exploded“ over the last decade and the country now serves as a major supplier of rainbow trout for the EU as well as a main competitor for domestic producers (Lasner et al., 2017).

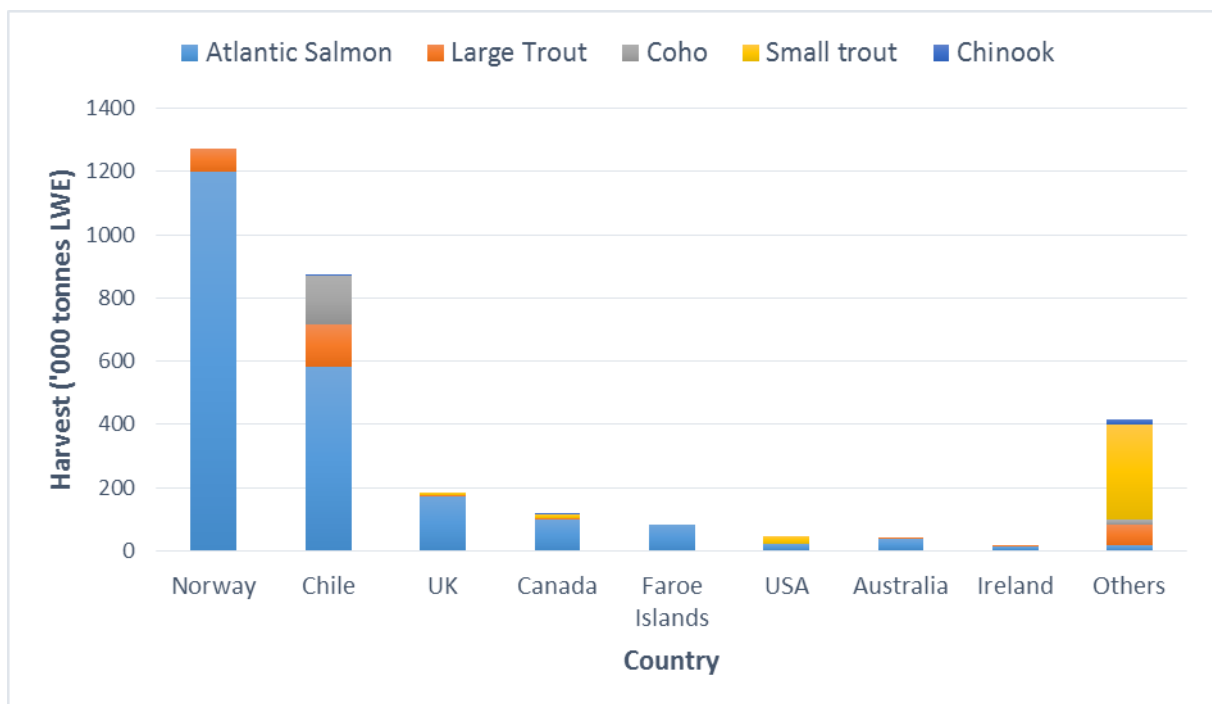


Figure 1. Total harvest weight of farmed salmonids in 2014 (000's tonnes LWE - Source: Kontali Analyse AS)

The following sections will uncover the mechanisms behind these contrasting developments of seemingly substitute products, by examining the key determinants of competitiveness on the global and national industry level. Firm-level case studies of trout and salmon aquaculture enterprises in major producing countries illustrate different competitive strategies specific to the context in which the firms operate.

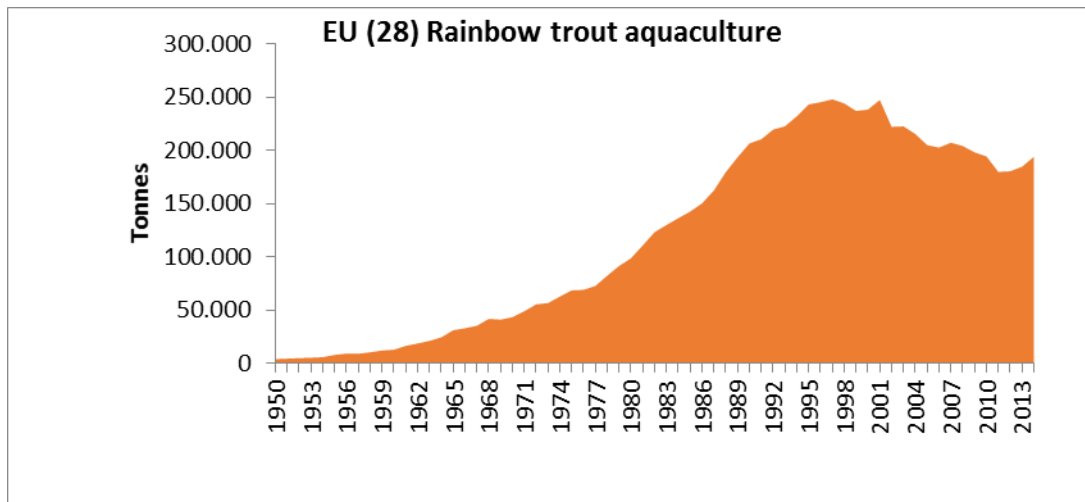


Figure 2.

Figure 2. Production of rainbow trout in the EU. Source: FAOSTAT

3 Key influencing factors

3.1 Consumer preferences

Generally, the drivers for fish and seafood consumption in developed countries, where incomes are high and basic dietary needs have long been more than satisfied, are mainly the need for dietary diversity and convenience and increasing health awareness (Birch et al., 2012; Carlucci et al., 2015) as well as increasing availability of products, marketing campaigns and declining prices.

Due to factors such as time pressure, there is a strong rise in the demand for products that are ready to eat or require little preparation before serving (Brunner et al., 2010). And while whole fish has been widely considered inconvenient because of the time and skills required for preparation (Olsen et al., 2007), the current wide availability and expanding market of convenience seafood products acts as a driver for a shift away from whole fish.

However, in addition to increased availability of convenience products and improved presentation, promotional campaigns can stimulate consumption, too. Branding requires sufficient differentiation of products from competing products and is difficult when the products are fresh or have few added ingredients and low level of processing. Protection of patents and recipes is also difficult for this category of products. Differentiation at the consumer level can be also achieved through various labelling schemes (including sustainability certification), which is only possible when products are packaged, and the increasing number of processed and packaged seafood as well as growing sales from retailers rather than traditional fish monger shops, provides a good opportunity for that. Products that are advertised most heavily are typically the most shelf-stable products e.g. frozen, smoked, canned. Importantly, branding however, is not likely to occur to a significant extent in an industry dominated by small scale companies, because of limited internal resources available for promotion directed at consumers. Large companies on the other hand, have advantage in brand promotion, because of better resources and higher product volumes, which are sufficiently visible to be recognised by consumers (Tveterås, 2007). For example, in Europe Youngs has focused on final

consumers and has invested considerably in branding. A successful promotional campaign necessitates a consequent establishment of a reliable supply able to cater for the expected increased demand. Availability of fresh products is more difficult to be guaranteed, particularly in terms of fisheries. However, the transition of the salmon industry, for example, from numerous small-scale farms to several large-scale vertically integrated multinational enterprises, has enhanced the opportunities for branding and better control over the production process, logistics and requirements of retailers.

While the decline of whole fish is a clear trend, the dominance of other forms of processing exhibit regional variations. As noted by Carlucci et al (2015), over-processing and transformation can also result in reduced preference for fish products and in southern European countries such as Greece and Portugal, traditions in the consumption of fresh fish still play an important role as determinants for the preference of products (C. et al., 2013; I.S. et al., 2004). In fact, FAO (2008) mentions a trend of increasing importance of fresh fish in developed countries due to the favourable consumer attitude for this form of fish over highly processed forms. This is further reinforced by improvements in packaging, reduced air-freight priced, and more efficient and reliable transport, have helped overcome some of the long-standing barriers to international trade with fresh fish such as perishability and limited shelf-life (Asche et al., 2015).

More stringent demands for assurance concerning safety is another high-profile issue that has emerged in recent years and shaping consumption patterns. Consumers, largely mediated through retailers, are increasingly requesting product attributes that depend on the production process such as not being hazardous to their health, safeguarding the environment and addressing various other ethical and social concerns (FAO, 2008). As a result a variety of safety certifications have been developed which have become requirements by supermarket chains. European retailers for example increasingly expect supplies to comply with quality standards such as BRC and IFS, as well as traceability (CBI, 2014).

In addition, seafood buyers are increasingly concerned about the sustainability and risk of depletion of marine stocks (FAO, 2008). While the range of fish and seafood products labelled as sustainably sourced is expanding and the demand for sustainable seafood products is rising, there is debate whether this is due to genuine consumer demand or it is due to pressure by lobby groups and a strategy of retailers to gain market share (Gutierrez and Thornton, 2014). Gulbrandsen (2006) and Bush et al (2013) argue that most markets for eco-labelled forestry and fisheries products have been created as a result of pressure by environmental groups on consumer-facing corporations, who are requesting various certification schemes as a form of reputation management, rather than resulting from consumer demand. In any case, consumers have as a result an increasing abundance and diversity of certified seafood product to choose from, which can serve as a stimulus for driving seafood production into a more sustainable course. Similarly, sustainable seafood guides such as Monterey Bay Aquarium's Seafood Watch and MCS Good fish guide are acting as steering mechanism for a more sustainable choice of seafood. However, the availability of too much information from different sources, with sometimes conflicting advice can lead to consumer confusion and even negatively impact consumption (Oken et al., 2012; Roheim, 2009).

Another key factor influencing consumption decisions is awareness of health and well-being (Carlucci et al., 2015). The populations of many industrialized countries are becoming older, richer,

more educated and more health conscious leading to an increased demand for food that promotes health and well-being (FAO, 2008). And, while fish is often cited as having a variety of health promoting properties (such as being rich in essential fatty acids) which are believed to be able to drive increased fish consumption (Mitchell, 2011), risks of eating fish linked to contamination with carcinogens has also been communicated to the public (Sidhu, 2003). As a result there is a general confusion over the right choice of seafood (Oken et al., 2012), the individual choice whether to consume fish or not being eventually dependent on the type and accuracy of information consumers are exposed to (Burger and Gochfeld, 2009).

3.2 International trade

Expansion of seafood markets had been aided significantly by the international trade in the sector. The increase in the global supply of seafood over the last few decades, combined with technological innovations, has facilitated the international orientation of the seafood industry. In particular, improved transportation and logistics leading to lower costs have allowed international trade to grow (Asche et al., 2015). Furthermore, progress in storage and preservation has continued, allowing a wider range of seafood products to be traded. For example, freezing technology has improved to such an extent in recent years that many product forms can be frozen twice, allowing products to be processed in locations with competitive advantages in processing fish rather than in locations close to where the fish is caught/farmed.

The extent to which an industry is exposed to global forces depends on the level of international trade with the inputs and outputs of the industry. In the case of salmon, production has become highly commoditised, with farming concentrated in only a few countries and exports covering almost all continents, Figure 3. This makes the sector highly dependent on global demand trends and supply trends in competing producer countries. For example, as one of the largest global markets, with negligible domestic production, demand in the USA has a major influence on global prices.

Global trade 2016:
 Farmed Atlantic salmon - world wide (In tonnes hog)
 Source: Kontali Analyse AS

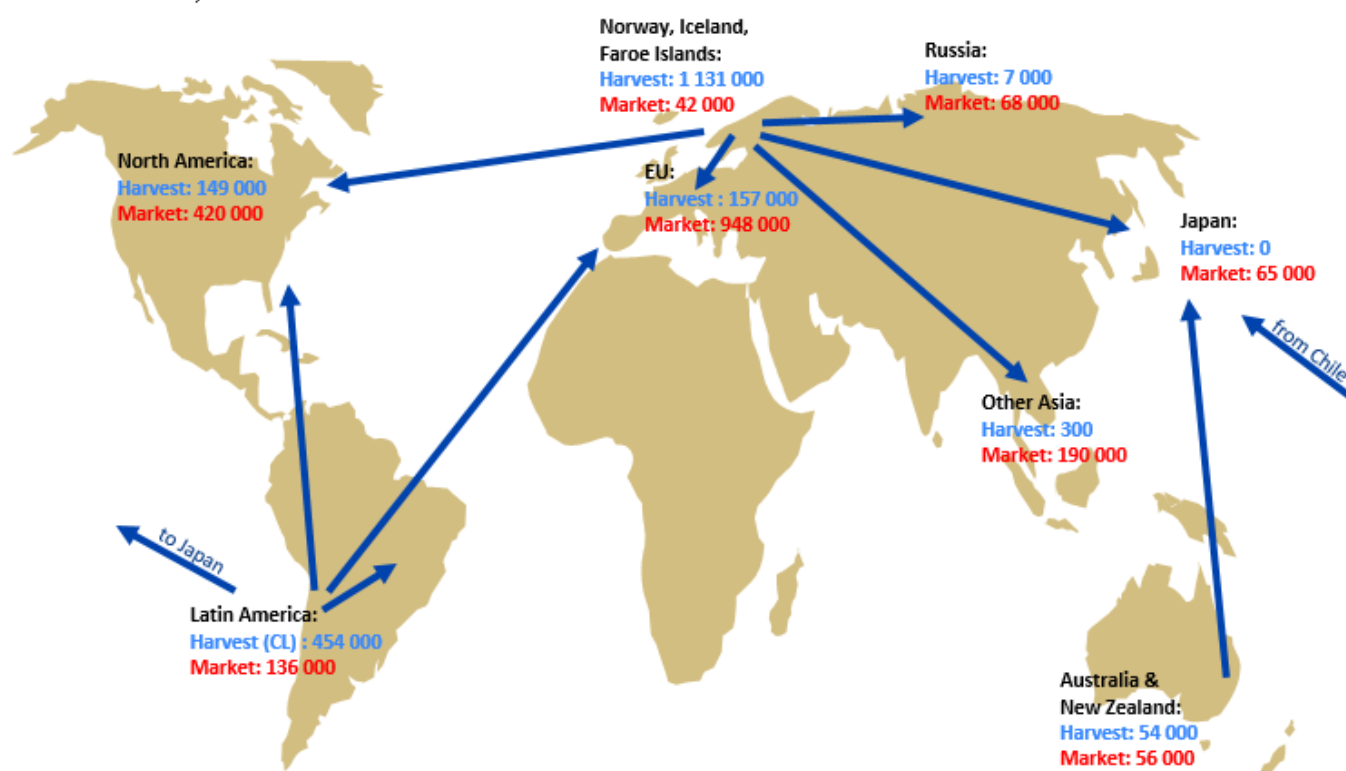


Figure 3. Global trade in farmed salmonids (tonnes WFE Atlantic salmon, large trout, coho and chinook) in 2016

The European production of rainbow trout has decreased the last ten years (EUMOFA monthly report 5/2014 p 10 and FEAP Production Report 2016 covering European fish farming from 2007-2015⁵). The increased production of large rainbow trout do not compensate for the decreased production of small portion-sized rainbow trout. The production has stagnated the two last reported years 2014 and 2015, with continued decrease of portion-sized trout and increased production of large trout (FEAP).

Despite of decreasing production, the European market for trout is mainly covered by EU internal production. The import from Turkey though increase (doubled) over a few years until 2014, where an anti-dumping process against Turkish producers lead to imposition of provisional countervailing duty on import of certain rainbow trout products from Turkey (OJEU 6.11.2014 L319/1).

The EU country with the largest import of rainbow trout is Germany, both from other EU countries (22.737 tons in 2013) and from third countries (7.275 tons in 2013), reflecting decreasing trout production and aquaculture production in general (FEAP 2016). The main import country for EU is Turkey, which in 2013 sold 17.284 tons rainbow trout to EU – 70 % of total EU import of trout (EUMOFA 5/2014)⁶.

⁵ <http://www.feap.info/Default.asp?SHORTCUT=582>

⁶ The main trout import product to EU is frozen where Turkey is the main supplier. Fresh products were 25 % which Norway was the main supplier.

3.3 Industry structure

The production of salmonid fishes requires specific environmental conditions, such as temperature and availability of water resources, which limits the global production to only a few countries. The two largest producing nations; Norway and Chile together accounted for 80% (2,142,500t) of global supply in 2014 (Figure). In a distant third-place, the UK (Scotland) accounted for 7.1% of global supply. The same figure also shows the dominance of Atlantic salmon in the salmonid market segment; accounting for 73% of a total global salmonid production of 3,047,000t in 2014. The closest substitutes; large trout and coho accounted for only 14.8% of supply in the same year.

Stricter environmental regulation and associated licensing has contributed to relatively stable supply conditions in most producing regions over the last decade; a trend further enabled by on-going industry consolidation and maturation. Chile is the major exception to this trend, over the last decade, having experienced wide supply fluctuations due to disease outbreaks amplified by natural disasters.

Moreover, the Atlantic salmon farming industry is highly consolidated. Initially composed of mostly small-scale family-owned enterprises, it is currently concentrated in the hands of several large multinational publicly traded companies (Asche et al., 2013). The factors which affect the evolution of industry structure include formal regulation (through for example, laws limiting the amount or resources a company can control), the level of commoditisation in the industry's outputs, and the structure of the industries upstream and downstream. Figure represents the rate with which consolidation has occurred over the last couple of decades and the number of companies currently accounting for 80% of the national output. A different way of expressing market structure is the concentration ratio – the share of the top n-number of companies in the output of a given industry. Figure shows the concentration ratio for the four largest companies in major producing countries. Both figures show an overall positive trend in consolidation for the first half of the period, followed by stabilisation, and in cases such as Chile and Canada slight decline.

Number of players (spec. by country) producing 80 % of total (oceanfarmed salmon and trout)

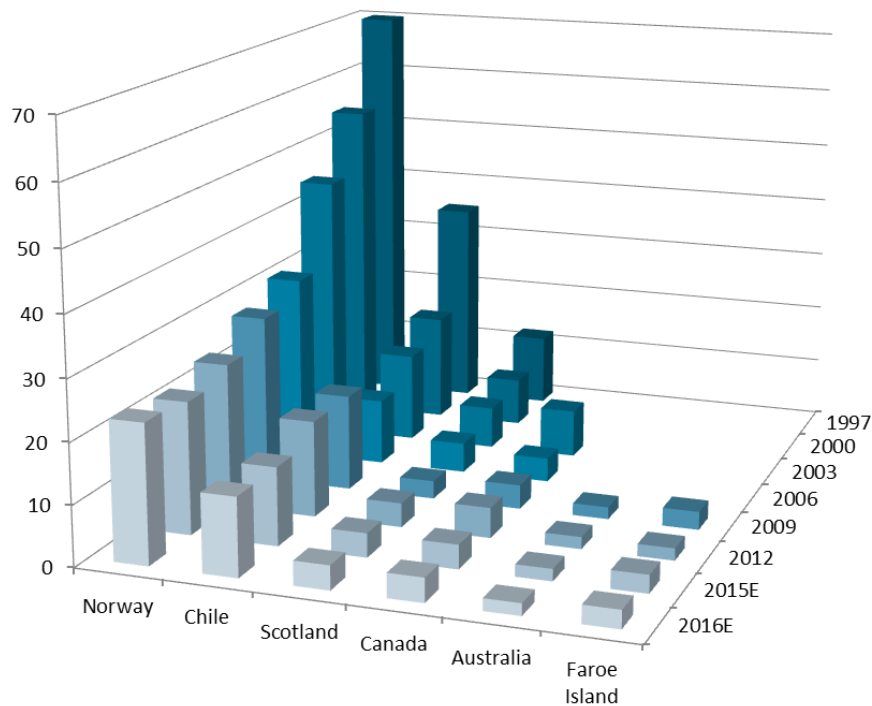


Figure 4. Number of salmonid farming companies by country. Source: Source: Kontali Analyse AS

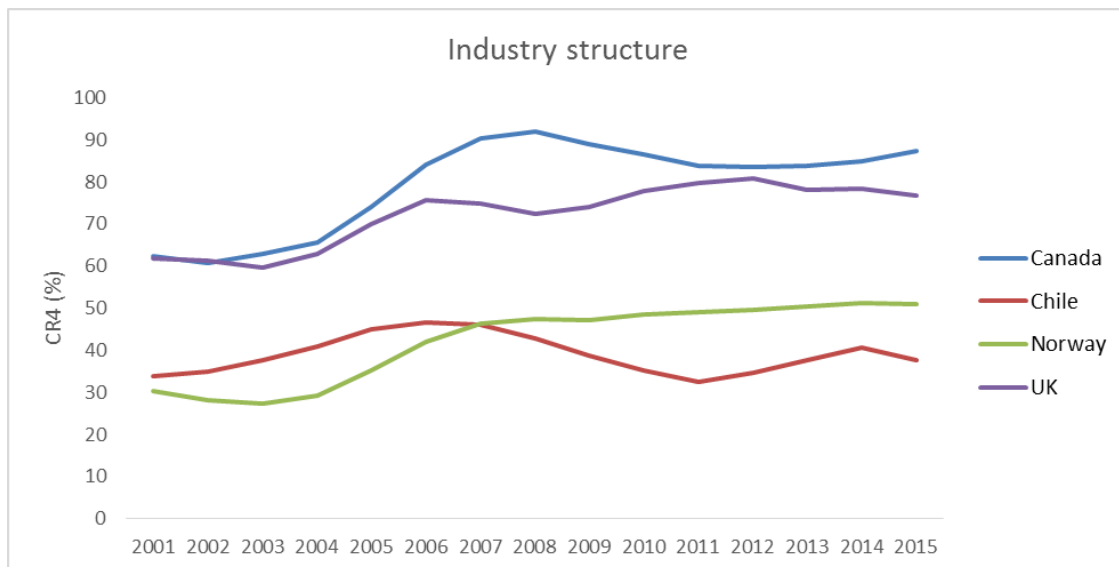


Figure 5. Consolidation trends in salmonid producing countries. Concentration ratio (CR4) represents the share of the production (volume) of the four largest companies in a country in the total production (volume) of the country. Values are 3 year rolling averages. Data source: Kontali Analyse AS

The structure of the industry plays a critical role in determining the overall profitability potential in the industry as it affects the barrier to entry, the rivalry within the sector and the bargaining power of members against buyers and suppliers (Porter, 1980). The strategic position of companies within the industry, influenced to a great extent by its resources and competencies, is the other major determinant of competitiveness (Rumelt, 1991). For example, following recurrent bust and boom

cycles, these factors have contributed to an extended period of profitability for many companies; particularly those able to exploit scale-economies in better-regulated jurisdictions.

3.3.1 Norway

Salmon aquaculture in Norway started through pioneers in the late 50s and '60s with small-scale farmers obtaining smolts from research stations and experimenting with different tank designs. In the late 60s simple sea cage designs became relatively reliable at the same time as costs could be lowered. This technology spread along the coast rapidly, and regulations from the authorities were introduced in 1973. This included a licensing regime with small-scale, owner-operated firms and geographical limitation where farming was an element in the rural development policy. One person could only have one license and the activity could only take place in a defined municipality. Salmon was sold through a producer organisation, Fish Farmers Sales Organisation. After an overproduction occurrence in 1990, the PO went bankrupt along with a large share of the farmers. As a result, the ownership restrictions were lifted and this started a consolidation process that is still ongoing and has resulted in some large producers, but still relatively many smaller scale operators.

Currently, government regulations regarding the ownership of licences are still the main reason behind the more fragmented production sector in Norway compared to other countries e.g. Scotland and Faroe. Since 2015 the rules stipulate that no one company in the industry can control more than 50% of the total biomass in any of the regions of the Directorate of Fisheries. Before 2015 an industry player had to apply for approval from the Government if they got control of more than 15% and approval was based on the special circumstances of the company e.g. regarding economic impact (Marine Harvest, 2017). Since lifting the restrictions on ownership, the number of firms have fallen from around 700 (when one firm could have one license) to around 150 firms now. The 10 largest companies contribute about 70% of output.

As seen in figure 5, the output of the industry has grown rapidly over time with brief slowdowns and reductions. In the early phase, rising productivity was the major cause of growth – production costs fell rapidly as production was scaled up. In the later period, costs have levelled off and since 2005 risen more than 60 % in real terms. During this period, demand growth has been the major explanation for growth. Variations have been due to market conditions, disease issues and regulatory issues. Lately, several companies have been restricted by the maximum allowed biomass level in addition to particularly problems with salmon lice.

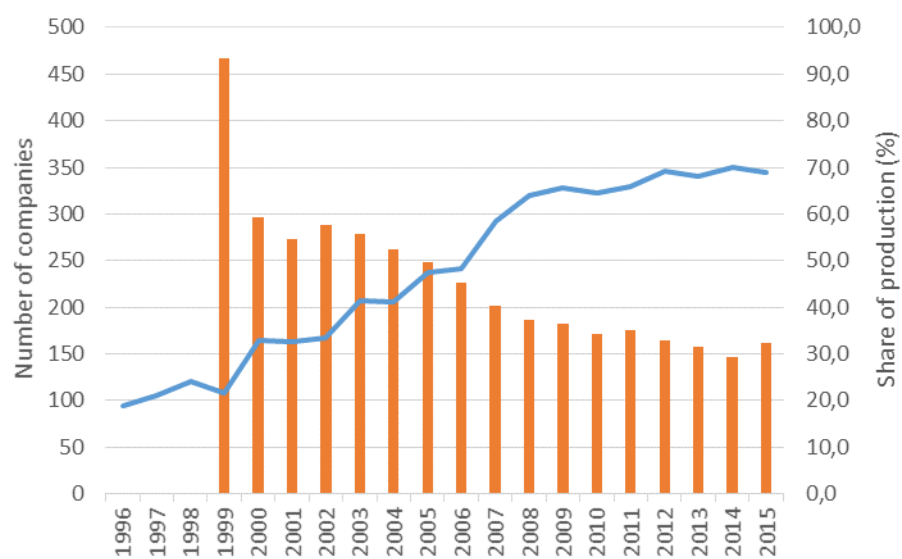


Figure 6. Number of salmon farming companies in Norway and 10 largest companies share of total production. Source: Directorate of Fisheries

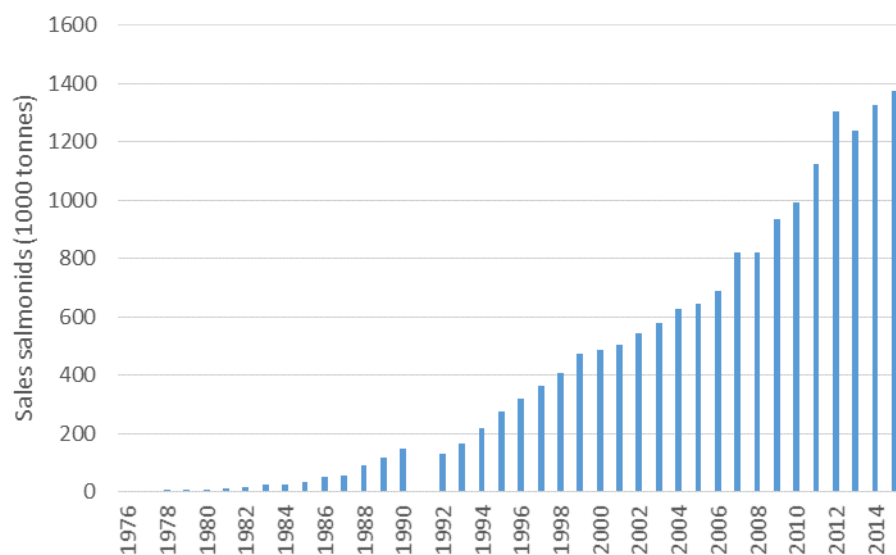


Figure 7. Sales of salmon and rainbow trout. Source: Statistics Norway

Currently the salmon aquaculture production sector consists of around 150 companies, some being subsidiaries of the same mother company. As shown in

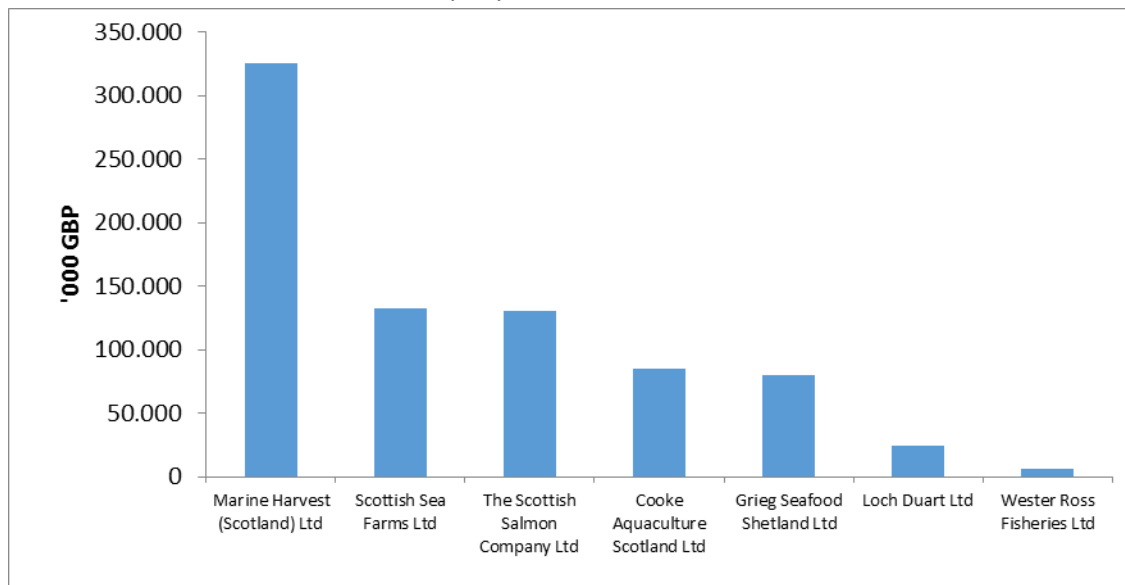


Figure , there is considerable variation in company size. There is one standing out as very large, two at about half this size and a number of companies with decreasing harvest quantity. There is a number of companies not shown with smaller production. Calculation of the Herfindahl-Hirschmann Index (HHI) for this sector shows that the industry is considered moderately consolidated (0,11), leaving out the companies not shown in

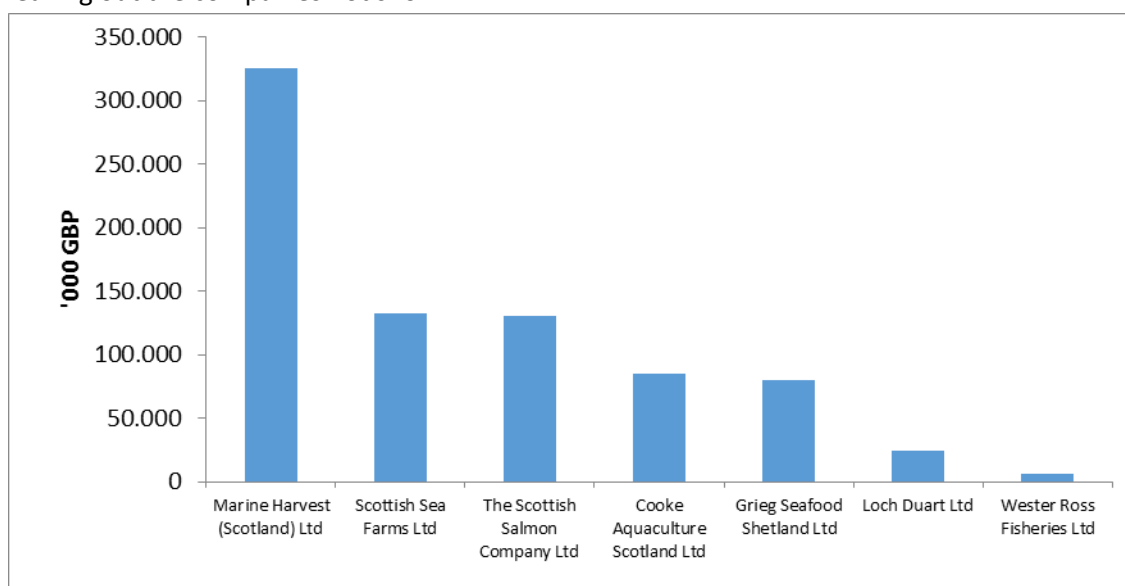


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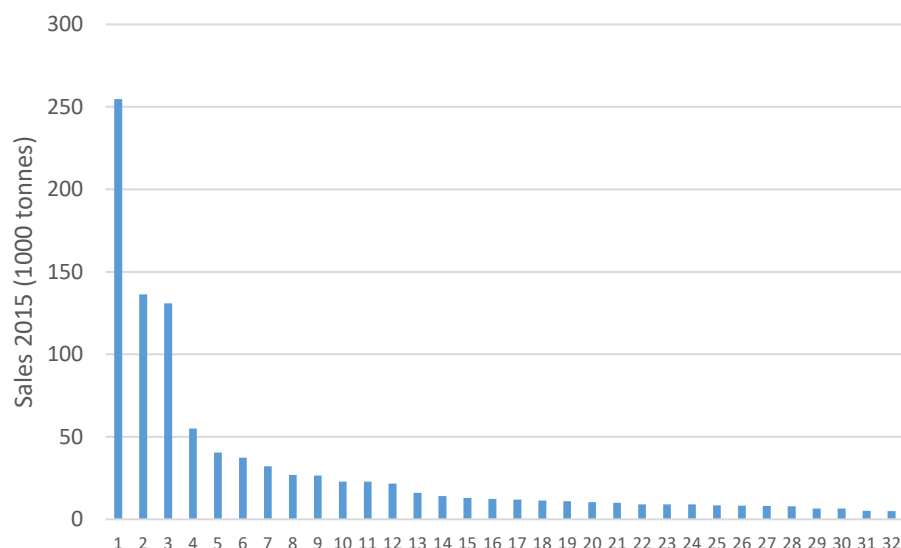


Figure 8. 2015 salmon harvest from 32 largest companies. Source: Kontali

3.3.2 United Kingdom

In 2016, salmon farming contributed 94.8% of revenue generated by aquaculture industries within the UK (trout contributing 3.1% and shellfish 2.1%: IBIS 2016).

Rainbow trout farming for the table the UK emerged as an industry earlier than the salmon aquaculture, in the 1950's. The main production system used from the beginning has been earthen ponds and raceways. There have been attempts in both the UK and Norway to grow rainbow trout in marine net pens, however, these were quickly replaced by Atlantic salmon when the technology for transferring smolts was established, due to the higher market price for salmon. This was followed by rapid growth of Atlantic salmon farming in Scotland in the late 1970s and early '80s. Trout farming quickly plateaued however, and since then has been in a long-term decline,

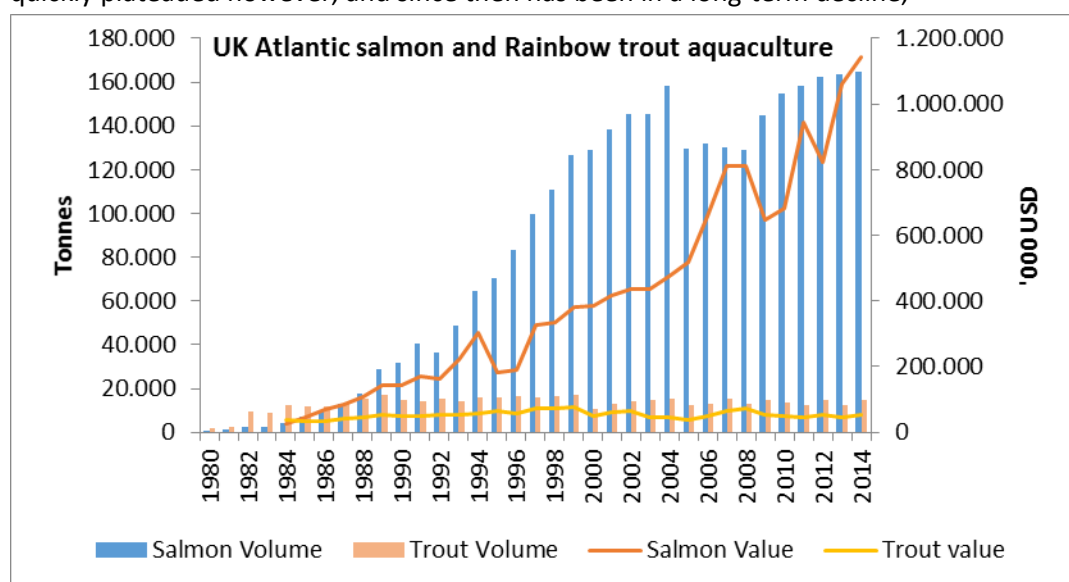


Figure 9. This contrasted with the growth in salmon farming in Scotland, and the very rapid growth of aquaculture throughout the world (Seafish, 2016).

The production of Atlantic salmon in the UK has shown an overall positive trend, although interrupted by several “bust” cycles due to problems with overproduction and profitability. Over the last decade prices have been buoyed by supply bottlenecks (discussed below) and rising demand from a growing global middle-class receptive to the positive health and aspirational attributes of salmon consumption.

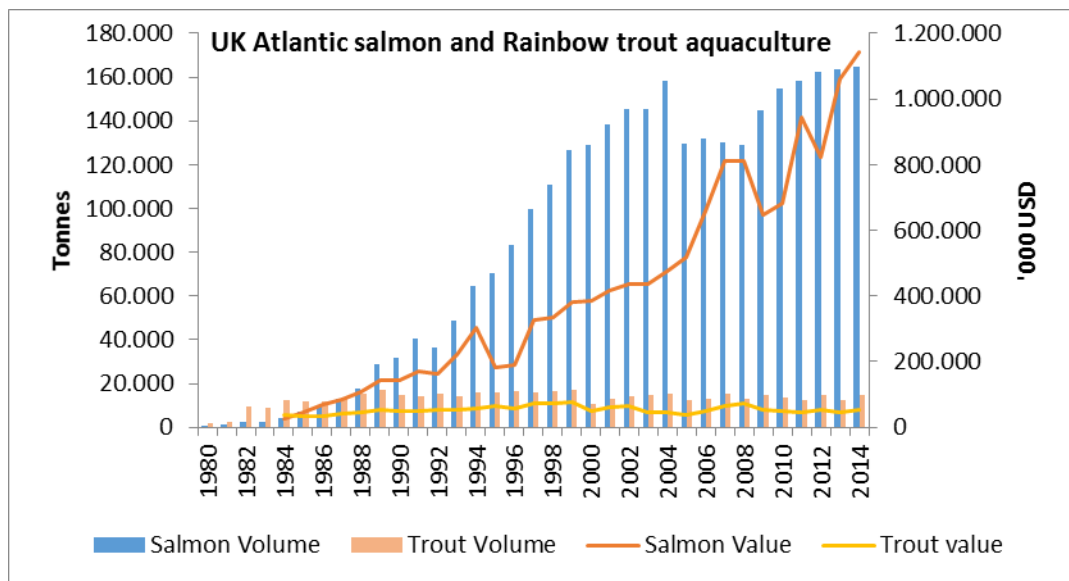


Figure 9. Volume and value of farmed Scottish salmon (Source: Marine Scotland, Scottish Fish Farms Annual production Surveys 1981-2015)

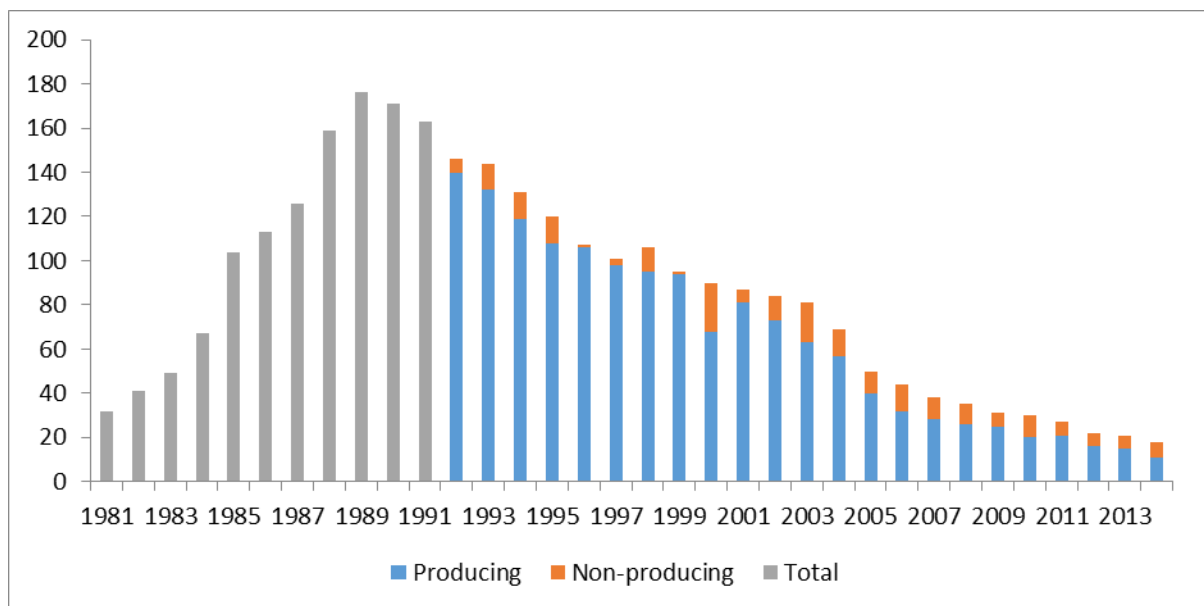


Figure 10 illustrates the number of companies in operation in the salmon farming industry in Scotland. A strong decline in the number of enterprises can be observed since the late 80s, at the background of growing production trend. In the UK, only 7 companies operate currently, four of which are

foreign owned subsidiaries of large MNEs. Only two independent locally owned companies have survived to date: Wester Ross Fisheries and Loch Duart, which are also the two smallest companies in the sector in terms of turnover, holding 0.8% and 3.1% of the Scottish turnover respectively,

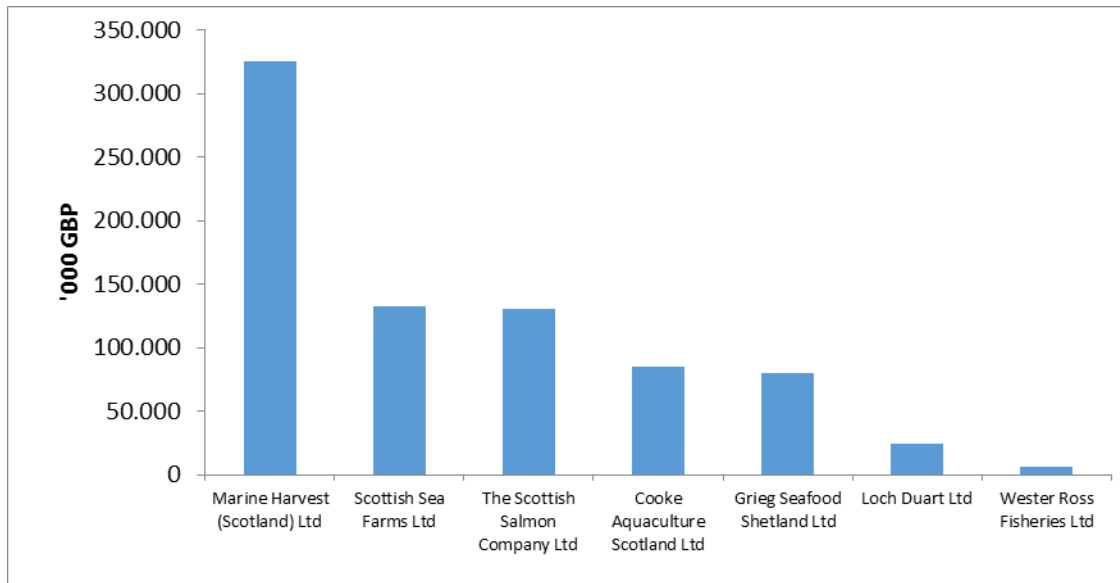


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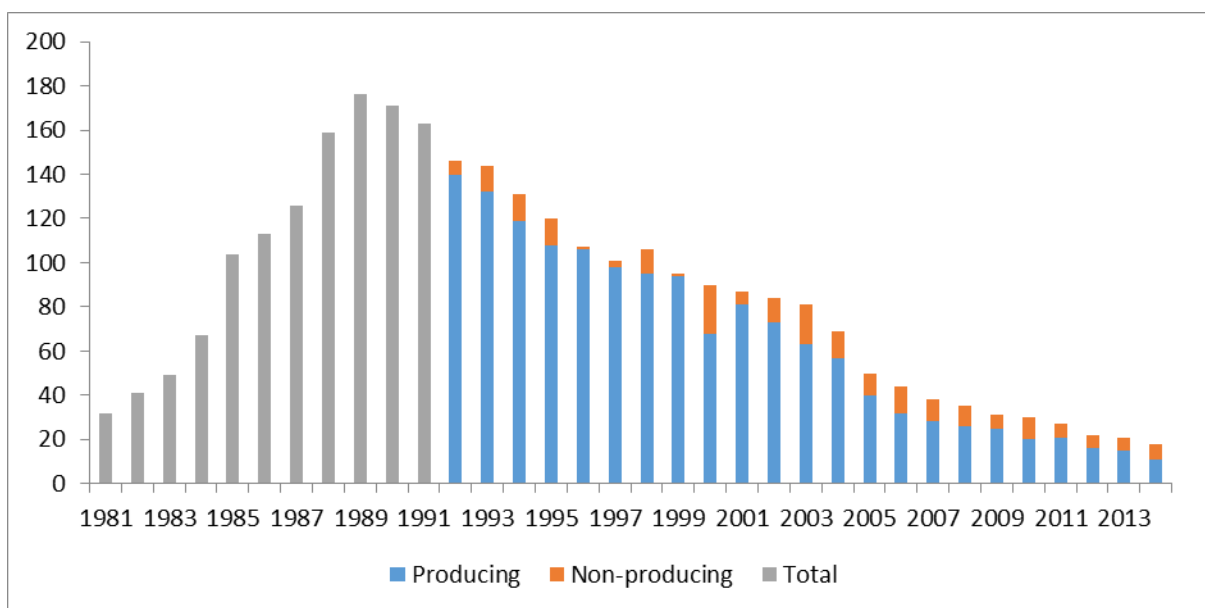


Figure 10. Number of salmon farming companies in the Scotland. Source: Marine Scotland

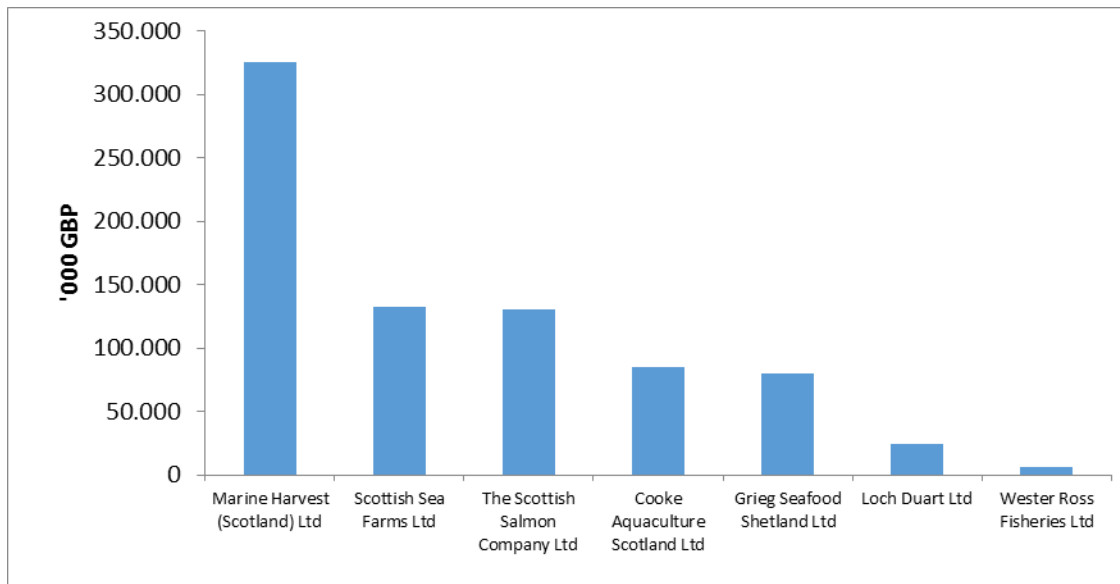


Figure 11. Turnover of salmon producing companies in Scotland for 2014. Source: FAME

The trout business in the UK has followed a similar trend, although not to the same extent. It is still a fragmented industry with more than 300 companies across the country, many of which in the restocking and recreational business, however. The table trout business is more concentrated and controlled by several production and processing companies.

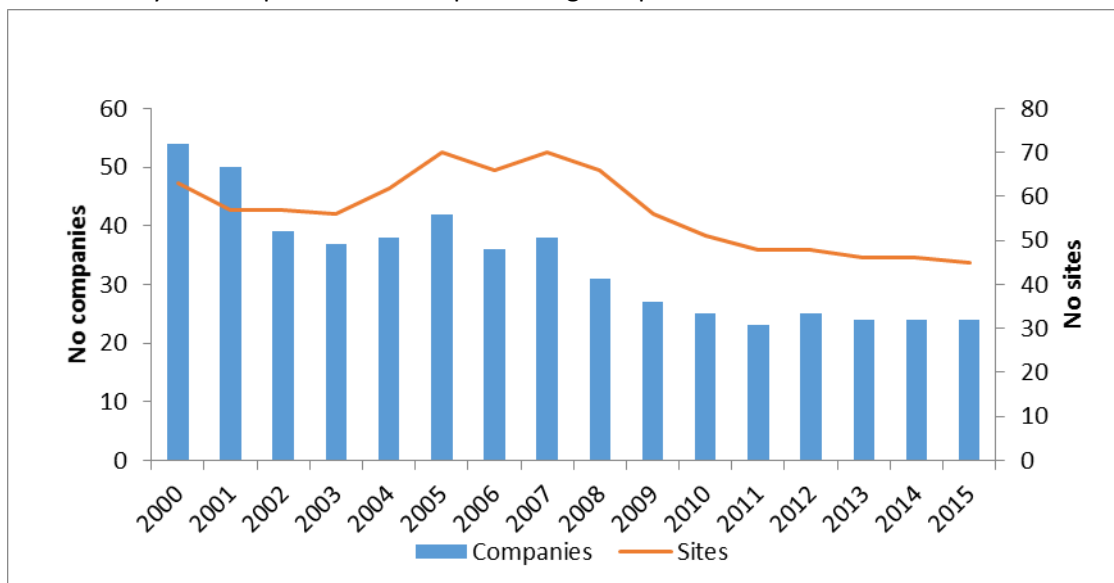


Figure illustrates the trend in Scotland. Over 75% of production ends up in major supermarkets (Seafish, 2016).

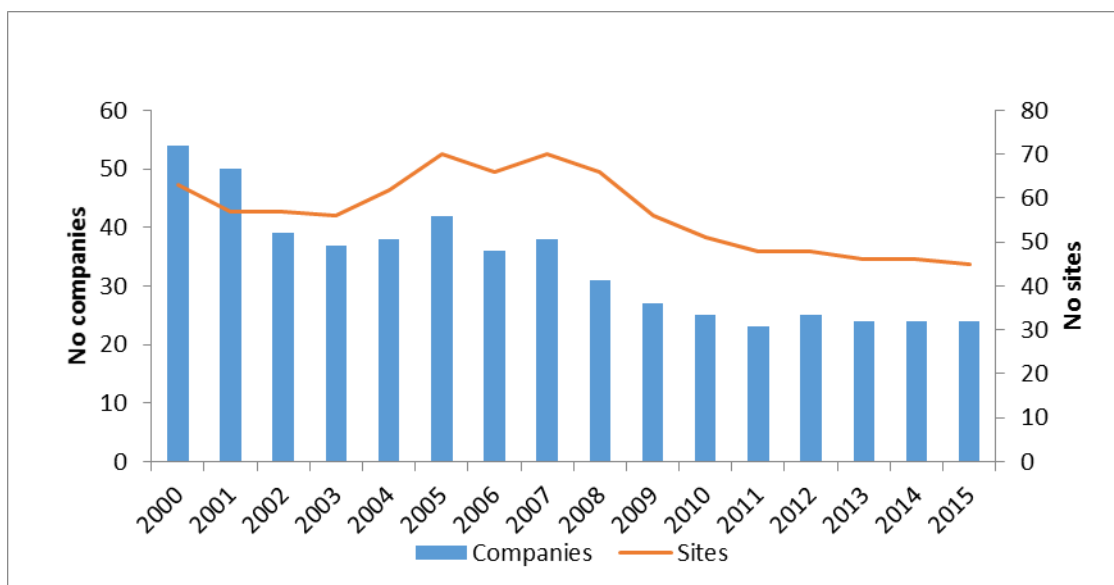


Figure 12. Number of trout farming companies in Scotland. Source: Marine Scotland

The primary reasons for the poorer performance in the rainbow trout industry in the UK can be found in the limitations imposed by the production system. The availability of freshwater and the regulations around its abstraction and release of nutrients in the outflow usually limit the capacity of the production site to small volumes of annual harvest. The largest land-based trout company in the UK produces around 1000 tonnes of fish annually. This is smaller compared to the average marine salmon production site nowadays. Due to the technology itself and regulation, marine sites are much larger which allows achieving economies of scale and consolidation of ownership. This sets the basis for a fragmented industry. The fragmented small-scale ownership in the land-based trout sector also serves as a limitation for investment and upgrading of the systems to improve productivity, since family-owned businesses are usually constrained in terms of financial resources and are risk-averse.

The land-based production system also imposes limits on the size of trout – growing fish to larger sizes is less practical due to the constraints on water resource use. Therefore, fish are harvested at the size of around 300 g and typically sold whole chilled.

Continuing downward pressure on market price is the main risk, with margins having been squeezed to a minimum in the table trade. Few wholesalers remain, and supermarkets have near monopolistic power and very demanding product requirements. There also appears to be a lack of interest by large retailers in trout product promotion and innovation.

Adaptation to a changing market requires increased innovation and marketing effort. Potential for improving the performance in the UK rainbow trout industry lies in the development of value-added products such as the increasingly popular smoked trout products, as well as in restructuring the industry (Seafish, 2016).

3.3.3 Denmark

Denmark was in 30s – 40s the metropole for breeding of trout in Europe. This was built on good production conditions and organization of a cooperative company owned by the farmers; Dansk ørredeksport (Danish trout export). The living and iced trout was exported by train to Germany for

further export. The Danish farmers were very competitive by producing high quality. In the 40s the farmers created a co-operative owned company name Danforel - a supplier driven company which slaughtered, cleaned and processed the trout. The cooperation eroded in the 70s, when several farmers started own export of fresh trout. The transportation had moved from train to trucks, which was easier to handle at an individual basis.

Front 1980ties the political pressure on the land-based industry focussed on the environmental impact. The answer was public support to industry development of different models of recirculated technology, implemented on a limited number of model farms. In the last 10 years this has been developed in direction of roofed ponds, and a few examples of fully recirculated plants in house.

In the following years the number of farms decreased partly because of increasing environmental requirements, and in 2005 so called “model farms” were developed, based on a high degree of re-circulation of water. The sea-based sector is relative new and still small in Denmark. As seen in table 1, in 2014 there were almost 150 farms in the traditional aquaculture farms using stream water. 32 so-called “model farms” and 21 sea-based farms, which in 2016 were owned by 4 companies only.

The reduction of number of farms and consolidation in the traditional sector of portion sized trout has the last years mainly been driven by low market prices in 2009 (following the international crisis), which lead to rationalisation. A new price reduction in 2012 (in average 13 % for all trout products) lead to bankruptcy among almost all farms in the traditional sector – according to interviews because all banks wanted refinancing of the capital, which was impossible for most farms. After liquidation of the old capital and refinancing, the numbers of farms were reduced, while the production level have been relative stable (and lately slightly increasing). This is due to technological development with a higher degree of recirculation and partly coverage of the open ponds in the land-based segment (interviews). The number of sea-based farms has been stable, while the production has slightly increased (Dansk aquakultur).

The main company in portion sized production is Danforel, which is mainly producer of smoked trout fillets. During the process of bankruptcies in 2009-2012 Danforel felt forced to take over production at the farms of the main supplier, which has led to take over in total 9 farms (of which 2 are rented) in the company Danaqua.

The sea-based production mainly takes place in four large companies, which holds land based as well as sea based farms, but all produce large sized trout; Musholm A/S (67 % owned from Japan), and three other companies: Aquapri Holding A/S, Snaptun Holding A/S, Hjarnø Havbrug Holding A/S (all owned by Danish private persons).

The production of trout were 2014 41.200 tons. The decrease in number of aquaculture farms is mainly due to a significant decline in the number of traditional land-based farms (Table 3). In this process, the number of employees has decreased from 700 full- and part-time employees in 2004 to only 421 in 2013.

Table 3 Number of aquaculture farms in Denmark. Source: Statistics Denmark. AKREGN

	2009	2010	2011	2012	2013	2014	2015
Land based: Traditional	189	177	162	157	157	145	138
Land based: Model farms	25	32	30	29	33	32	33

Sea based	20	17	17	17	18	21	20
Eel farms	9	8	8	8	7	5	5
Mussel	21	17	11	11	11	11	12
Other	8	6	6	7	8	7	10
	272	257	234	229	234	221	218

When the production volumes are addressed the level has maintained stable, while a change from the traditional aquaculture to recirculation and sea-based production is obvious as the production per firm is much higher in the recirculated and sea based farms, as seen in Table 4.

Table 4. Production of aquaculture in Denmark, tons of all species

	2009	2010	2011	2012	2013	2014	2015
Land based: Traditional	23.101	17.098	15.545	17.867	17.568	17.230	17.124
Land based: Model farms	8.211	11.728	12.020	10.092	14.030	13.222	15.949
Sea based	11.316	10.908	11.428	14.024	15.064	14.329	15.591
Eel farms	1.376	1.629	1.194	1.382	971	802	1.158
Mussel	2.534	1.325	1.031	1.076	851	1.566	1.758
Other	495	370	206	410	679	973	1.728
	47.033	43.058	41.424	44.851	49.163	48.122	53.308

Table 5. Number of employees at aquaculture plants in Denmark, Full-time and part-time employees and total involved.

Year	2004	2009	2010	2011	2012	2013	2014	2015
Full time	620	427	381	373	375	380	381	427
Part time*	80	71	64	57	50	41	124	115
<i>No employees, total</i>	700	498	445	430	425	421	505	642

*The working hour for parttime is between 30 and 90 % - there is no data for equalise to full time employees

Source: Ministry of Food, from Statistics Denmark, the register-based employment statistics (RAS) and 2014 and 2015: NaturErhvervstyrelsens Akvakulturregister.
(<http://lbst.dk/fiskeri/fiskeristatistik/akvakulturstatistik/#c51343>)

No exact data for number of employees per company is available. In the account statistics, the registered companies are though obliged to register number of employees within groups. Based on registrations October 2017, a proxy for consolidation, based on number of employees can be made (table 4). Note that number of companies and number of employees seems reasonable based on the data from Table 4 and

Table 5.

Table 6. Number of companies after size (employees group registration) and assessed total number of employees in the size group. Source: Bisnote – company accounts

no of employees (groups)	no companies	total no of employees*
75	1	75
35	1	35
10-19	5	75
5-9	18	126
3-4	36	126

2-1	22	33
0	7	0
no employees registered	123	0
total registered companies	213	470
only owner		130

*Number of employees: Number of companies * average number in the size group

If concentration in the aquaculture sector is based on the number of employees as a proxy for market share, the four largest companies employ 140 persons, which is 30 % of the total number of employees (not including the farms driven by the owner alone). The 8 largest companies employ 192 or 41 % of all employees in the sector, Table 7.

Table 7. The company concentration (CR4 and CR8) based on number of employees.

Consolidation type	number of employees	Share of total employees (not owners)
CR 4	140	30 %
CR 8	192	41 %

Source: Bisnote – company accounts

The governance form in the value chain differs between the land- and sea-based farms. In the land-based production of portion sized trout two larger companies is fully integrated with own land-based production of small trout, processing and export. Both supply their own production with supply from the independent producers. According to interviews the companies have certain independent aquaculture farms as suppliers. Seen from the independent producers they can sell to the national producers (a few not-integrated processors) or sell living trout for direct export mainly for Germany. According to interviews, the general relation is market based with price competition, where the independent producers sell to highest bidding company. This gets the best short-term income, and a way to avoid dependency of a single processor/customer. A few years ago, one of the integrated companies tried to establish a captive (or maybe relational) relation to some producers which accepted lower payment for supply for a joint project of product development. According to interview this never materialised and seems to have increased the distrust in the value chain, which might hinder value chain coordinated product development.

The sea-based producers are fully integrated in a hierarchically structure, generally with own hatcheries, land-based breeding and sea based final production of large trout for various eggs and flesh products. As far informed the sea-based companies are fully self-supplying through their part of the value chain.

The main part of the land-based, portion size trout production is exported to Europe mainly Germany. The competition has been strong in the 2010-ties especially from Turkish producers. Therefore, the Danish industry (the producer association – Danish aquaculture) took lead in a process of initiating EU to enter an anti-dumping investigation leading to countervailing duty against a number of Turkish producers of portion sized trout.

The sea-based industry, producing large trout 3-4 kilo is more globalised, as a central product, roe, is sold world-wide, with Japan a central market. The flesh is mainly sold at the European market.

3.3.4 France

The French aquaculture industry is a lasting and strongly established sector, one of the first to develop among the EU countries, having a meaningful impact both on the economy and regional development. Although there was a clear downward trend in aquaculture production in France, as it can be seen in Figure 13, France still manages to keep a position in the top largest European aquaculture producers, alongside Spain and United Kingdom.

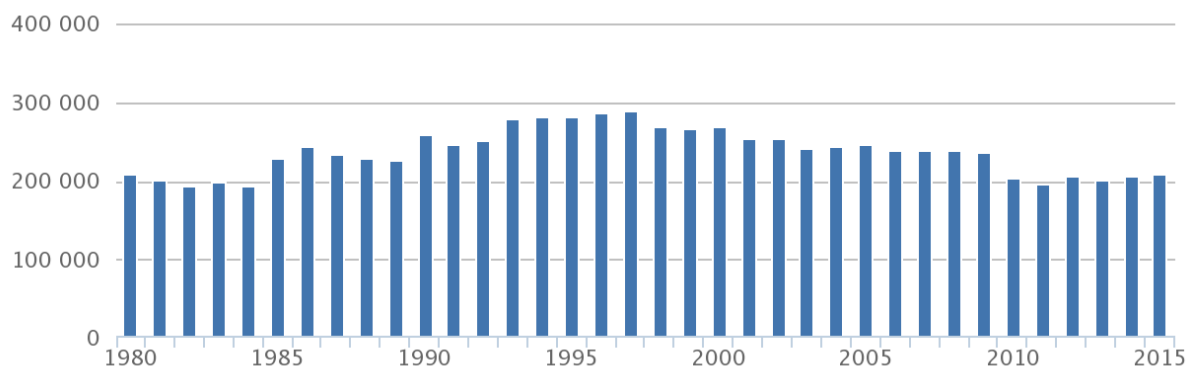


Figure 13. Total aquaculture production for the French Republic (in tonnes). Source: FAO FishStat

Marine production is dominated by molluscs; mainly oyster with ~76,000 tonnes and mussels with ~75,000 tonnes generating a gross income of more than €500 million. Freshwater production is concentrated on trout and salmon with ~35,000 tonnes, as seen in Figure , produced by 500 farms, most of which produce less than 200 tonnes/year each. This illustrated the highly fragmented nature of this sector.

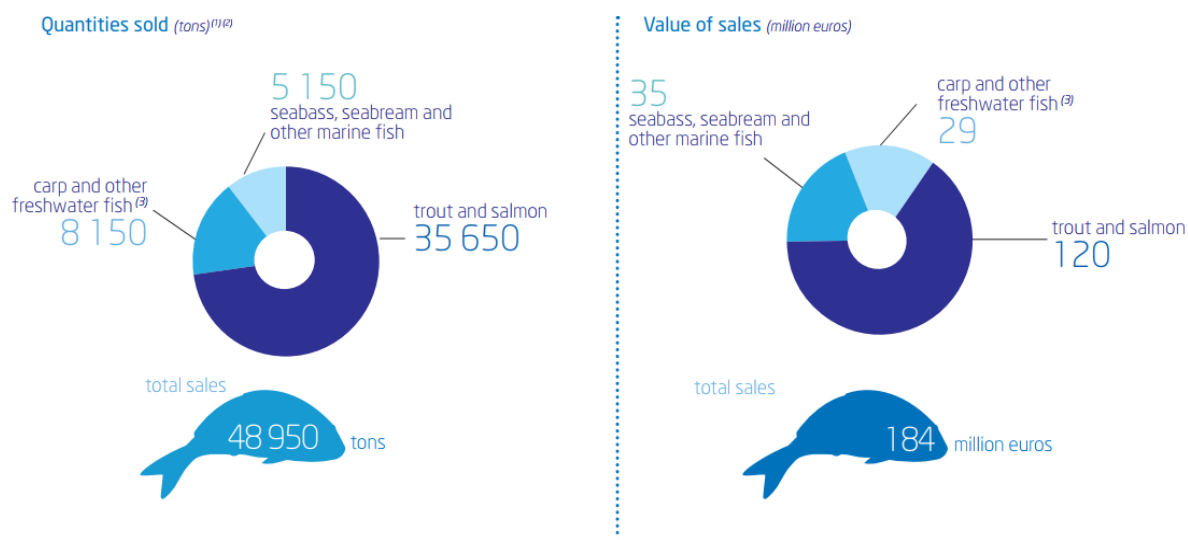


Figure 14. Fish farming in France for 2014; (1) live weight equivalent; (2) total sales; (3) including farmed crustaceans

The main target of the French aquaculture sector is the traditional domestic consumption (France consumes the bulk of its bivalve production), having in addition a dynamic sector of high quality production of species such as seabass exported to USA or shrimp exported to Japan. Due to the

precise control of criteria such as taste, use of treatments, reliability of supply and quality standards, these high-quality products impose high prices.

The aquaculture industry does not have a meaningful contribution to food security in general and the contribution to the total food production in France is relatively minor. However, it contributes significantly towards stable employment, most notably in winter, in the coastal regions and cities. Data from 2015 shows over 16,000 jobs for fishing vessels personnel (as seen in Figure 4), over 7400 fishmonger jobs, approximately 6000 positions in fish trading firms and over 100 positions in seafood processing firms.

Trout farming is mainly located in Aquitaine and Bretagne (47 percent of the total production), other locations being in Nord Pas de Calais, Normandie, Rhône-Alpes and Midi-Pyrénées. Marine fish like seabass and seabream are placed close to the North Sea (utilising heated water from a nuclear power plant), along the Atlantic coast and in the Mediterranean (Côte d'Azur and Corsica). The Atlantic coast is also the place to find turbot farms, while salmon farming is found mainly in the regions of Normandie and Bretagne. Shrimp farming is a dynamic sector which requires more education and technical support to develop, and it is only done on the island of New Caledonia.

To keep the industry in steady development and meet the growing food requirements, a heavy accent is put on the study of innovative technologies for better knowledge and management of resources like: identification and targeting, selectivity, etc. The targeted key issues are energy saving, adaptability, ergonomics and safety in particular, which will allow fishermen to be even more competitive to meet the growing demand for sea products.

3.4 Regulatory framework

3.4.1 Norway

Further expansion of production capacity in Atlantic salmon using the dominant existing technology (i.e. marine net-cages) is constrained by national regulation.

In Norway aquaculture operations require a license from the authorities. For salmon, the number of licenses is generally fixed, but occasionally new licenses are issued for various political reasons. In 2016 the number of licenses for the marine aquaculture of salmon and trout was fixed to 990 (Marine Harvest, 2017). In addition, each license is limited in terms of the maximum allowed biomass. Producers have been offered an increase in the size of their licenses (of 5 % and 1,5 % respectively) for a fee, which some have accepted. Licenses are in general geographically restricted to relatively large zones.

Second, to establish an aquaculture site requires permission from several institutions. In sea-area plans, local municipalities decide on the use of their available sea areas through lengthy processes where limited areas are set aside for farming. These area plans are renewed at differing intervals. Sites require permission from harbour and transport, emissions, food and water resources authorities in addition to the specific aquaculture authorities.

Maximum Allowed Biomass (MAB) for individual sites is determined based on the environmental concerns. As a consequence, MAB for various sites is not uniform and can reach up to 5,400 tons depending on site characteristics and its geographic location but generally are between 2,340 and 4,680 tons. The average annual harvest per license is currently 1200 tonnes GWE, however, larger players typically have better flexibility to maximise output per license than their smaller counterparts (Marine Harvest, 2017).

The handling time for applications for new or modifications to sites varies strongly. Expansion of existing facilities is the most efficient route in terms of cost and time, whilst brand new sites will take longer. Licenses and sites are issued in indefinite time.

Government regulations regarding the ownership of licences are the main reason behind the more fragmented production sector in Norway. Since 2015 the rules stipulate that no one company in the industry can control more than 50% of the total biomass in any of the regions of the Directorate of Fisheries. Before 2015 an industry player had to apply for approval from the Government if they got control of more than 15% and approval was based on the special circumstances of the company e.g. regarding economic impact (Marine Harvest, 2017).

In Norway, there is a minor one-off cost for handling of applications. There are no specific rent taxation except standard business taxation. In later years, the authorities have employed different payment schemes for new licenses issued and expansion of MAB. New licenses have been issued at both fixed cost and by auction and MAB has been allocated at fixed prices.

In Norway, sea lice remain one of the most important cost issues. A number of control strategies and measures are being employed to keep lice levels down. There are official restrictions on lice levels at an average of 0.5 adult female *L. salmonis* per fish. During spring period the limit is as low as 0,1 adult lice to protect wild smolts.

Both non-chemical and chemical measures are employed. Among the former we find wrasse species and lump-suckers is widely used, “high”-temperature baths, fresh water baths, pressurised water flushing, and laser are also being used. Skirts around the cages are installed to prevent lice from entering cages. “Snorkel” cages where the fish are hindered to utilize the top 10 meters of the cage with only a small-diameter snorkel allowing the fish to go the surface to draw air. Chemical treatments with standard chemicals are still used, both by baths and through feed, although the efficiency of such methods is declining due to resistance development.

3.4.2 Institutions

There are formal institutions which aim to support the industry development such as primarily three business organisations (Seafood Norway, Norwegian Seafood Businesses Organisation and NHO) and the Fisheries and Aquaculture Research Fund along with several government-owned research institutions.

The aquaculture firms are generally voluntary members of a business organisation, the majority being members of Seafood Norway. These coordinate industry-wide initiatives and public communication and play a central role in representing the industry on political, regulatory, media and technical issues in Norway.

All seafood firms pay an export value tax to the Fisheries and Aquaculture Research Fund. This defines research areas, allocates funds, controls projects and carry out dissemination activities for various projects in relation to the identified research areas.

3.4.3 *United Kingdom*

In the UK the development of new sites, is very difficult to achieve. Within a company, production capacity growth can be achieved through organic growth or through M&As i.e. acquiring already existing new sites from other companies. Although the organic option is a considerably cheaper, it is very challenging, especially when it comes to new sites. Recent growth of the Scottish salmon companies has been mostly through M&A, however this does not create new production capacity. There is no special law in the UK with regards to the biomass a company can control, as is the case in Norway, however, competition authorities can in cases where they resume that competition is undermined.

It has been identified that a main constraint to the sustainable growth of the Scottish salmon industry are biological constraints in the form of sea lice infections (Scotland Food and Drink, 2016). However, other obstacles high importance also includes issues around consenting for aquaculture sites and application for planning policy.

It is perceived by the industry that the process of establishing a new aquaculture operation is slow, incoherent and unpredictable, because of duplication, overlaps and between different regulatory bodies, causing delays, expense and uncertainty of outcome (Scotland Food and Drink, 2016).

A number of institutions are responsible for the aquaculture policy in Scotland. Fragmented legislation and lack of integration have been pointed out as limitations to aquaculture development (Marine Scotland, 2014). There is also a strong perception in Scotland, that the Scottish salmon farming industry is the most tightly regulated aquaculture industry in the world (Hedley and Huntington, 2009). The same authors report that the industry is “scrutinised by 10 different statutory bodies and subject to more than 60 pieces of legislation, 43 European directives, 3 European regulations and 12 European Commission decisions”.

There is a perceived lack of available sites for the expansion of aquaculture in Scotland (Marine Scotland, 2009). However, as Hofherr et al. (2015) note, limitations to growth may be better explained by the competition for space which takes place at the local level with more established coastal economic activities or strong pressure from stakeholders with negative perception about aquaculture (Ertör and Ortega-Cerdà, 2015).

The difficulty to integrate a viable aquaculture economy with environmental policy due to the environmental impact of aquaculture in Europe is a core barrier to the development of the sector (Nielsen and Motova, 2014).

To establish an aquaculture operation in Scotland the following statutory bodies need to be involved: consent from Marine Scotland, the Crown Estate, the Scottish Environmental Protection Agency (SEPA) and the local planning authorities must be obtained including a consultation with Scottish Natural heritage (SNH). Operating an aquaculture farm involves The Fish Health Inspectorate

(Marine Scotland), SEPA, the Health and Safety Executive, the Food Standards Agency (FSA) and the local authorities (Marine Scotland, 2014).

The Crown Estate is responsible for granting a seabed and the foreshore under the *Crown Estate Act 1961*.

Modifications to existing farms or planning permissions for new ones must be obtained from the relevant local planning authority under the *Town and Country Planning (Scotland) Act 1997* (amended by the Planning etc. (Scotland) Act 2006).

Aquaculture activities which are expected to cause pollution or have potentially significant adverse impact on the environment also require authorisation from SEPA under the *Water Environment (Controlled Activities) (Scotland) Regulation 2011 which regulates effluent discharges and disposals of pesticides into the water environment*. Aquaculture farms must also be registered under the Aquatic Animal Health (Scotland) Regulations 2009 (amended 2011).

The supply and possession of veterinary medicines is regulated through the veterinary medicines Regulations 2011 (amended 2012) and incorporated a multitude of EU regulations.

With regards to feed, its composition, distribution and use are addressed at both UK and EU levels. The principal regulation is the Animal Feed (Scotland) Regulation 2010 which implements EU Directive 767/2009.

The Aquaculture and Fisheries Act 2007 covered a number of legislative areas relating to aquaculture operations including controlling parasites on fish and shellfish farms, treatment of disease, prevention and escapees. The act was amended in 2013 to include a legal requirement for cooperation between farms within a management area in fish health management, movement of fish, harvesting and fallowing.

As part of the consenting procedure, Environmental Impact Assessment may be required if there are concerns that the operation could cause significant pollution. The Environmental Impact Assessment (Scotland) Regulations 1999 implement the requirements of EC Directive 85/337/EEC (as amended) on EIAs. The National Scenic Areas (Scotland) Regulations 2008 requires an EIA if the proposed development is likely to have significant impact on a sensitive area, including a national scenic area.

EIAs can be costly (around \$50,000 for a full EIA⁷) and can slow down the process of consenting. There are also concern that the threshold for EIA applications has been set too strictly, as in practice, virtually all new farm applications are subject to EIA (Skaski, 2010); furthermore, there is concern over the negative approach to EIA assessments, in particular because of the disproportionate use of precautionary principle (Hedley and Huntington, 2009).

As such, the Scottish aquaculture industry can be seen to be at a disadvantage compared to competing countries, because of the high level of environmental monitoring and reporting requirements (Poseidon Aquatic Resources Management Ltd, 2008).

The high standards set in the EU regulation – particularly the Water Framework Directive, the Marine Strategy Framework Directive and the regulations concerning the use of alien species in

⁷ <http://www.intrafish.com/aquaculture/558590/real-environmental-and-ethical-costs>

aquaculture can be costly but can also serve as a competitive advantage if the attention of the consumer is drawn to quality and can contribute to local acceptability of aquaculture (EC, 2013a).

This high level of regulation is believed to be at least partly responsible for the positive image of Scottish salmon by international consumers and the premium of around 10% due to Scottish provenance (EC, 2013b).

In contrast, the Chilean salmon industry seems to have been scrutinised over its high use of antibiotics which has been reflected in the rejection of major retail chain in the US to stock Chilean salmon, and favouring products originating from Europe, exemplifying a case of a loss of competitive advantage as a result of lax regulation (IntraFish Media, 2016).

A major barrier to development of new sites in Scotland can also be the lack of approval from the local communities and other stakeholders. Lobby groups exist who are strongly against the development of aquaculture on the grounds of alleged negative impacts on wild populations of salmon and trout, visual pollution and private interests.

In an extensive analysis of the contribution of aquaculture to the Economies of England, Wales and Northern Ireland, Seafish (2016) reports that regulation has come up as a major problem and the frustration of aquaculture producers was seen as exceptional.

In particular, frustration with permitting/consenting/licensing and animal disease testing and monitoring have been pointed out. Three main aspects of the regulatory problem were pointed out: cost, delay and uncertainty (operational and investment).

As Seafish (2016) puts it: “It is also the case that the regulators have no desire to constrain development, but the costs have increased substantially over the last two decades, and there is a widespread feeling that delays are excessive, some sampling regimes are not fit for purpose, and that conservation interests are considered absolute, while development interests and innovation are considered expendable.”

“One of the key objectives of effective marine planning is to facilitate sustainable development in best locations, from the point of view of the developers themselves, and other stakeholders. This has not happened, and the whole tenor of most marine planning is conservative and precautionary - development in coastal areas is generally something to be concerned about rather than something to be encouraged.”

3.4.4 Denmark

The main regulative issue that constrain development of the aquaculture farming in Denmark is the environmental regulations for controlling or reducing emissions, especially of nitrogen and phosphorus. Some regulation is specifically for the land and sea-based farms respectively, while both types of aquaculture farms need an environmental license according to the Act on Law on environmental protection⁸ and a license from the Ministry of Environment and Food, the Danish Veterinary and Food Administration to start production. The last focus on measures to avoid

⁸ <https://www.retsinformation.dk/Forms/r0710.aspx?id=184047#idbc2c0790-261f-4fe0-bd0a-831fcff2ec7f>, Act of law of environmental protection”, implementing a range of EU regulation, including the European Parliament and the Council directive 2011/92/EU of Dec. 13 2011.

diseases and to spread these to the wild nature, controlling wastewater from farms and slaughtering plants. The first is general environmental protection for the aquaculture regulating measures to protect surface water and in general to the framework for a special “environmental license” for companies with a high risk of impacting the environment.

The land-based farms are further regulated by the “Act on environmental approval and simultaneous processing of freshwater fish farms”⁹. According to this farms with use of less than 100 t feed/year are regulated on input, while larger farms (or minor which apply for it) are regulated on emissions (output). The farms are regulated on use of water (if streams are used), and of emissions of ammonium-nitrogen, total nitrogen, total phosphor and organic BI5. For the minor farms, feed input is indicator for the emission, while the larger farms are supposed to document emission directly. Licenses and control is dealt with at local level – in the municipalities. In some areas local administration has been felt as a barrier for licenses to changes or continued production (pers. Interview Jens Grøn, Nov 2016).

The sea-based farms are also regulated by the “Act on establishment and operation of sea-based aquaculture”¹⁰, which is taken care of by the Danish Agrofisk Agency. The sea-based farms are restricted by quotas on emission of nitrogen and phosphor. According to the implementation of the Water Framework directive. At present a political discussion regarding possible “space” for further emissions of nitrogen can open for further development of sea-based aquaculture in the Baltic and especially the Kattegat. The proposed laws will change the “law on environmental protection”, by opening for compensating measures, e.g. mushroom farming which absorb some of the emissions from the new farms.

The aquaculture sector within EU are regulated under directives at EU level and national specific regulations also. At the national level various authorities are included in the regulation of licensing, regulation of space etc. Still the complex and fragmented regulation seems to be a general condition.

3.4.5 France

In France aquaculture is not regulated as a whole. Two main sets of legislation separate the French aquaculture into inland and marine. The Environmental Code regulates inland aquaculture and inland fisheries, while marine fisheries legislation (for example [Law No.97-1051 on Maritime Fisheries and Mariculture](#)) supervises marine aquaculture.

The Ministry of Agriculture, Food, Fisheries and Rurality is the main authority in charge of fisheries and aquaculture. The Aquaculture Division (Sous-Direction de l’Aquaculture – SDA) functions within the Department of Marine Fisheries and Aquaculture (Direction des Pêches Maritimes et de l’Aquaculture – DPMA) of the Ministry. On matters regarding marine fisheries and aquaculture, the Ministry may cooperate with the Department of Maritime Affairs and People of the Sea of the Ministry of Infrastructure, Transport, Land Use, Tourism and the Sea. Three other Ministries are also important decision makers, namely those for Research and Higher Education, Industry and Finance.

⁹ <https://www.retsinformation.dk/Forms/R0710.aspx?id=185470#idbd19d34b-21ee-4dd2-a4a3-5ff8d2ed1d3d>

¹⁰ <https://www.retsinformation.dk/Forms/R0710.aspx?id=185364>

In order to be allowed to establish aquaculture facilities over private land, the granting of an authorization is required, whereas for the use of State-owned waterbodies, a concession is necessary. Authorizations and permits are denied to farming activities that threaten the fish population of the surrounding waters.

In case of an authorization, the Prefect must either reject the application or require an Environmental Impact Study or an Environmental Impact Notice to be delivered within maximum two years. After receiving the study, the Prefect must start a public enquiry. Once approved, timely completion of works must be communicated to the Prefect, who must order an inspection to be carried out within the following month. The farm may only start operating upon notification of the inspection report. An authorization can be valid for a maximum of thirty years and may be renewed, amended, transferred and revoked.

The concession procedure is similar to that of an authorization. However, in this case, the Director of the Financial Service is involved in the process, in order to establish the fees for the granting of the fishing right, and those for the occupation of State-owned land and for the use of water. Additionally, the terms of the concession must be approved by the applicant, and the building process may start only after the payment of the first fees instalment. Like an authorization, a concession can be granted for a maximum of thirty years and may be renewed, amended, suspended and revoked.

In the last few years, France is being targeted by several rulings of the European Court of Justice, which have to do with the implementation of the EU legislation on water pollution. In order to solve this issue, France is now examining a Draft Water Law in Parliament.

The drainage of wastewater into marine waters or inland water bodies is regulated by the authorization/declaration system described in the Environmental Code. Aquaculture drainage is not particularly regulated; however, a set of fines are established for the discharge of substances that may endanger the conservation or reproduction of marine life.

Regulations concerning animal diseases are issued by the Minister of Agriculture in coordination with the Minister of Finance, while the National Veterinary Commission provides advisory support. The regulation of chemicals and veterinary drugs use, is mainly regulated at Community level, by several directives and regulations, and particularly by Council Regulation (EEC) No. 2377/1990 which lays down a Community Procedure for the Establishment of Maximum Residue Limits (MRLs) of Veterinary Medicinal Products in Foodstuffs of Animal Origin. This Regulation specifies the list of drugs with a determined final or temporary MRL and the list of drugs that do not require an MRL. The introduction of a new veterinary drug in the MRL list, implies the pharmaceutical companies to file an application with the Commission, providing the relevant documentation to allow the Committee on Veterinary Medicinal Products to assess the marketing of the concerned product. Afterwards, the actual use of the approved drugs is subject to national regulations.

4 Value-add calculator for salmon

4.1 Introduction

The value that can be obtained from a given harvested biomass of salmon depends on the way in which the raw materials are processed and utilised and the value that each of those products has in

the global marketplace. However, there is also a cost in transport and processing associated with each option, so complex cost-benefit analysis is required to determine the optimum mix of products, which can probably change depending on current product prices and perhaps the size or other qualitative characteristics of the raw material (salmon supplied from fish farms).

Salmon processing has typically focused on the production of fillets and associated products (including steaks) which comprise the main value of the whole fish. Fillets may be sold fresh, or further processed e.g. for smoked salmon, or have value added in other ways such as marinades and inclusion in ready meals. However, these products represent no more than 60% of the whole harvested fish, leaving a further 40% of harvested biomass for potential utilisation in other ways. This is happening, and markets exist for a wide range of secondary products. These options and opportunities were explored by Stevens et al (2018) with the main by-products from salmon processing shown in the figure below.

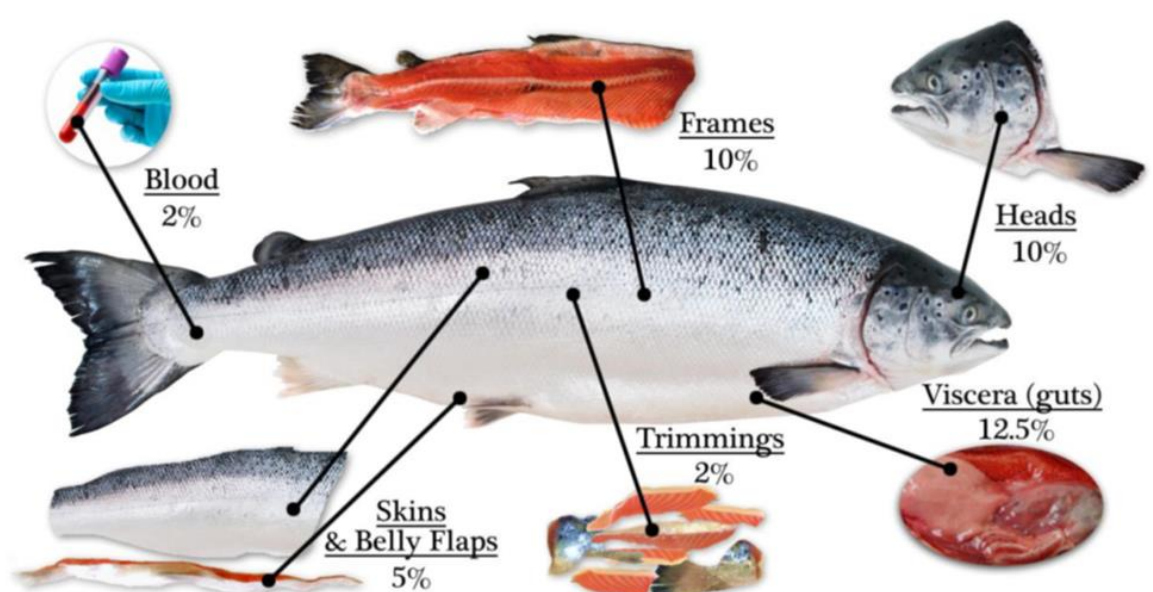


Figure 15: Atlantic salmon by-products (Stevens et al 2018)

These by-products contain many useful bio-compounds which can be utilised directly as ingredients or further refined for a wide range of uses as shown in the following table.

Table 6: Potential salmon by-product utilisation

By-Product	Valuable components	Current uses
Heads	proteins, peptides, lipids, collagen, gelatine, minerals including calcium, flavour	food, fish meal, fish oil, food grade hydrolysates, animal grade hydrolysates, pet food, nutraceuticals, cosmetics

Frames (bones, flesh, fins)	proteins, peptides, lipids, collagen, gelatine, minerals including calcium, flavour	food, fish meal, fish oil, food grade hydrolysates, animal grade hydrolysates, pet food, nutraceuticals, cosmetics
Trimming	proteins, peptides, lipids	food, fish meal, fish oil, food grade hydrolysates, animal grade hydrolysates, pet food
Viscera	proteins, peptides, lipids, enzymes such as lipases	food grade hydrolysates, animal grade hydrolysates, fish meal, fish oil, fuel, fertilisers
Skin (with belly flap)	collagen, gelatine, lipids, proteins, peptides, minerals, flavour	fish meal, fish oil, cosmetics, food, fish meal, nutraceuticals, cosmetics, leather, fuel, fertilisers
Blood	proteins, peptides, lipids, thrombin & fibrin	fuel, fertiliser, therapeutants
Mortalities	proteins, peptides, lipids, collagen, gelatine, calcium and other minerals, flavour	animal feed (fur animals), zoo animal feed, fuel, fertilisers

Source: (Stevens et al 2018) (for further details see Arason et al (2009) and Ghaly et al (2013))

Salmon processing is commonly conducted in two stages, usually at different facilities (primary and secondary processing) as illustrated in the following diagram.

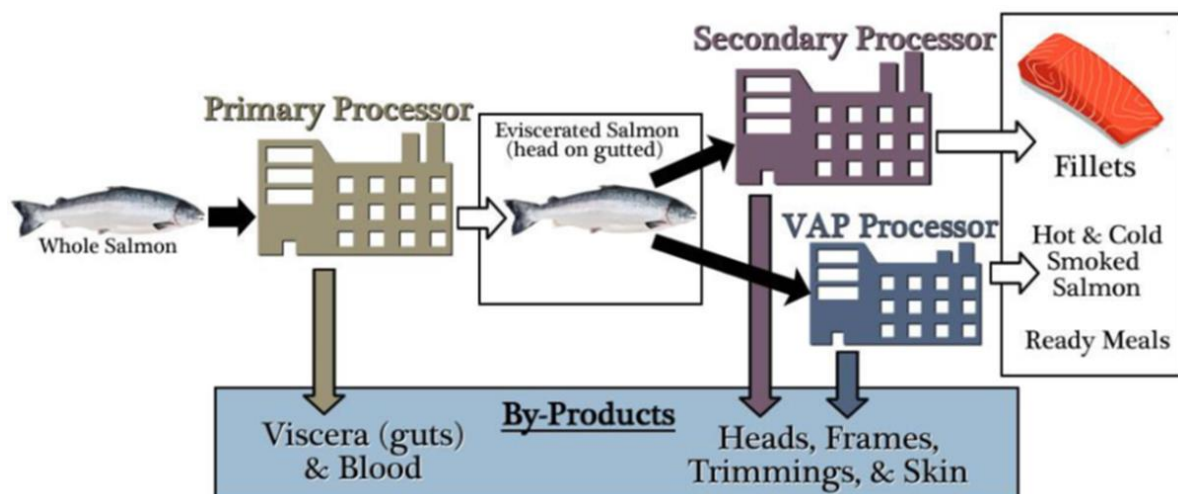


Figure 16: Processing chain for salmon (Sevens et al 2018)

Stevens et al (2018) investigated the processing and product utilisation for Atlantic salmon in Scotland in 2015 and found approximately 75% is currently utilised for animal feed (including 22% for pet food), 15% is used in food for human consumption (mostly heads and trimmings) around 10%

is used for fuel and fertilizer. The value of the by-products varies significantly depending on destination and further processing required, although the value for non-human food products are generally below €100 per tonne and for some products the cost of transport exceeds product value and disposal may be a more economic option.

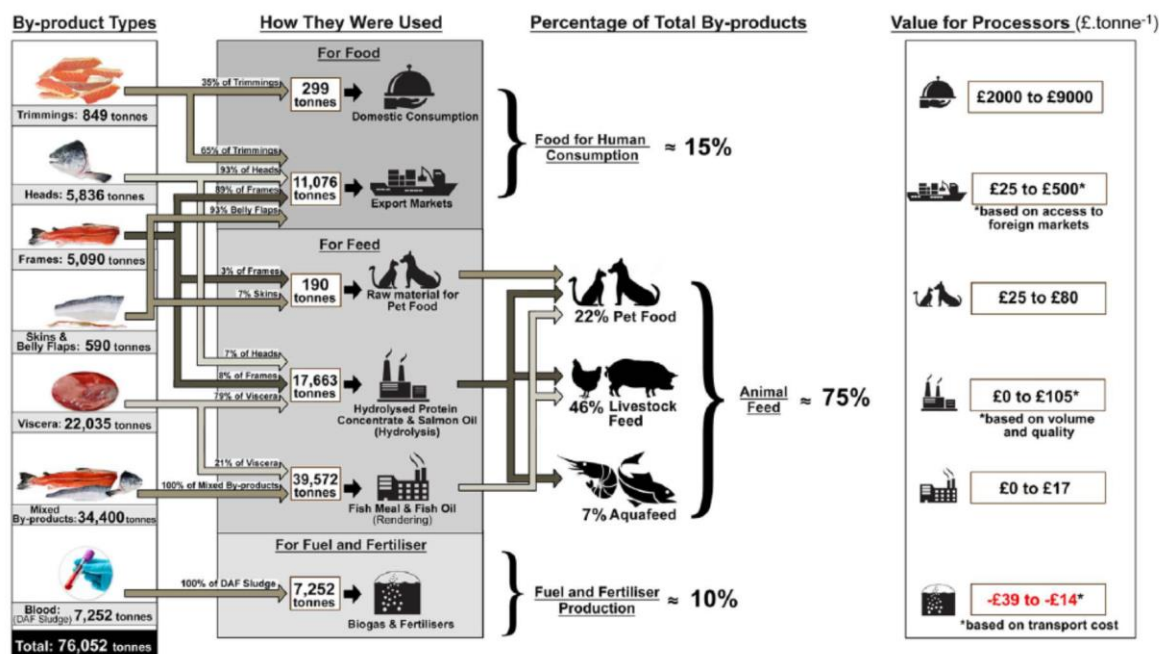


Figure 17: Utilisation of salmon by-products in Scotland in 2015

The value-add calculator described here was designed to help salmon processors find the optimum combination of products based on their own costs, processing yields and market assessments.

4.2 Building the calculator

The value-add calculator for salmon is a spreadsheet-based tool to help processors evaluate their options and find combinations which maximise financial yield from the raw material. It is anticipated this could be developed into a more sophisticated tool within the Prime DSS.

The first step is to develop a list of potential products and by products from the whole salmon raw material and allocate product codes.

Product code	Description	
1.1	Whole fillet	3.1 Salmon skin
1.2	Steaks	3.2 Salmon scales
1.3	Portioned fillet	3.3 Belly flesh
1.4	Sliced/cubed fillet	3.4 Oil from belly flesh
2.1	whole trimmings	5.1 Whole salmon frames
2.2	minced trimmings	5.2 Salmon bones
2.3	Processed product from trimmings	5.3 Salmon tails
		5.4 Meal from salmon frames

Figure 18: Example definition of salmon products and associated coding

It may also be necessary both for defining production cost and sale price to develop coding for the product state and packaging.

Product code	Packaging codes:	State codes:
1.1 Whole fillet	NO No packaging	FR Fresh
1.2 Steaks	BU Bulk pack	FZ Frozen
1.3 Portioned fillet	TR Tray (no MAP)	CH Chilled
1.4 Sliced/cubed fillet	MA MAP packaging	SC Smoked/cured
	VA Vacuum packaging	AM Ambient
	SK Skin packaging	
	CA Canned	
	BA Bag	
	ME Ready-cook meal	

Figure 19: Example state and packaging codes

The basic yield model can then be developed. In the following example, 50 tonnes of salmon are harvested and primary processed to give 42.75 tonnes of gutted salmon and 7.25 tonnes of by-product (viscera and blood). The gutted salmon are then sent to secondary processing which yields 29.25 tonnes of fillets and a further 13.5 tonnes of by-product.

Harvested weight (t)	50	
Size category	5	
Primary processing	tonnes	Category Code
Viscera (t)	6.25	6
Blood (t)	1	7
Gutted salmon (t)	42.75	0
Secondary processing		
Fillet	29.25	1
Trimming	1.00	2
Skins/belly flaps	2.50	3
Head	5.00	4
Frames	5.00	5

Figure 20: Basic yield definitions from primary and secondary processing

Allowance is also made above for different size grades, as the percentage yields from a 3 kg salmon may not be the same as from a 6 kg salmon (See Acharya 2011 for further details). Data for rainbow trout is available in de Souza et al (2015) and for cod in Bechtel (2003).

A worksheet can then be used to define the yields from each product category (using sub-categories where necessary each assigned a percentage of the master category). Each product is then assigned a potential sales value. The sales values are multiplied by the product amounts and the overall income calculated from the initial input of raw material. The average value per kg can also be calculated to provide an easy comparison when input quantities change (current model using placeholder values).

Product selection and value

	Prim. Code	Prod. Code	Pack. Code	State. Code	% of Prim.	t	Value (€/kg)	Value (€)
Whole fillets	1	1.1	BU	FR	0	0.00	6.00	0.00
Steaks	1	1.2	MA	FR	0	0.00	5.00	0.00
Portion fillet	1	1.3	VA	CH	100	29.25	7.00	204,750.00
Smoked	1	1.4	VA	SC	0	0.00	12.00	0.00
Bulk trimmings	2	2.1	BU	FZ	100	1.00	2.00	2,000.00
Minced trimmings	2	2.2	BU	CH	0	0.00	2.00	0.00
Smoked trimmings	2	2.3	VA	SC	0	0.00	5.00	0.00
Salmon skin	3	3.1	BU	CH	20	0.50	0.80	400.00
Salmon scales	3	3.2	BU	CH	10	0.25	0.10	25.00
Belly flesh	3	3.3	BU	CH	60	1.50	0.50	750.00
Oil from belly flesh	3	3.4	BU	CH	10	0.25	1.00	250.00
Heads (export)	4	4.1	BU	FZ	100	5.00	0.25	1,250.00
Heads (for fishmeal)	4	4.1	BU	CH	0	0.00	0.09	0.00
Frames (for fishmeal)	5	5.1	BU	CJ	100	5.00	0.09	450.00
Viscera (for fishmeal)	6	6.1	BU	CH	50	3.13	0.09	281.25
Viscera (for protein concentrate)	6	6.1	BU	CH	50	3.13	0.10	312.50
Blood (disposal cost)	7	7.1	BU	AM	100	1.00	0.00	0.00
TOTAL								€ 210,468.75
Unit								€/kg 4.21

Figure 21: Example worksheet allocating product utilisation and values

For cost-benefit analysis it is necessary to include processing and potentially transport costs. These costs can be quite factory specific and are not generally available from public domain sources. Hence examples here just use placeholder numbers that companies could overwrite with their own data. The first step is to define overall baseline primary and secondary processing costs (that cannot be disaggregated by product).

	(€/t)	€
Raw material (prod. cost)	3500	175,000
Primary processing cost	200	10,000
Secondary processing cost	500	21,375
TOTAL	4,200	206,375

Figure 22: Defining overall primary and secondary processing costs

Where additional costs can be identified for specific products these can be added to the worksheet and a gross margin calculation used to summarise and compare different options.

Product selection and value	Prim. Code	Prod. Code	Pack. Code	State. Code	% of Prim.	t	Value (€/kg)	Value (€)	Additional cost/t	Additional cost total	Gross Margin	%
Whole fillets	1	1.1	BU	FR	0	0.00	5.00	0.00		0		
Portion fillet	1	1.3	VA	CH	75	21.94	6.00	0		0		
Smoked	1	1.4	VA	SC	25	7.31	12.00	87,750.00	1000	7312.5		
Bulk trimmings	2	2.1	BU	FZ	25	0.25	2.00	500.00		0		
Smoked trimmings	2	2.1	VA	SC	75	0.75	5.00	3,750.00		0		
Skins & belly flaps	3	3	BU	CH	100	2.50	0.20	500.00		0		
Heads (export)	4	4.1	BU	FZ	100	5.00	0.25	1,250.00	199	995		
Heads (for fishmeal)	4	4.1	BU	CH	0	0.00	0.09	0.00		0		
Frames (for fishmeal)	5	5.1	BU	CJ	100	5.00	0.09	450.00		0		
Viscera (for fishmeal)	6	6.1	BU	CH	50	3.13	0.09	281.25		0		
Viscera (for protein concentrate)	6	6.1	BU	CH	50	3.13	0.10	312.50	50	156.25		
Blood (disposal cost)	7	7.1	BU	AM	100	1.00	0.00	-50.00	50	50		
TOTAL							226,368.7			11,480.		
Unit							€ 4.53	5		214,889	00	5.07%

Figure 23: Adding cost information to derive gross margin calculations for product mix options

4.3 Potential outcomes from value optimisation

Stevens et al (2018) considered scenarios for increasing the value of by-products from salmon processing and suggested that by using this type of value optimisation, it might be possible to increase Scottish salmon farm production value by 800% by directing each by-product to its most high value market.

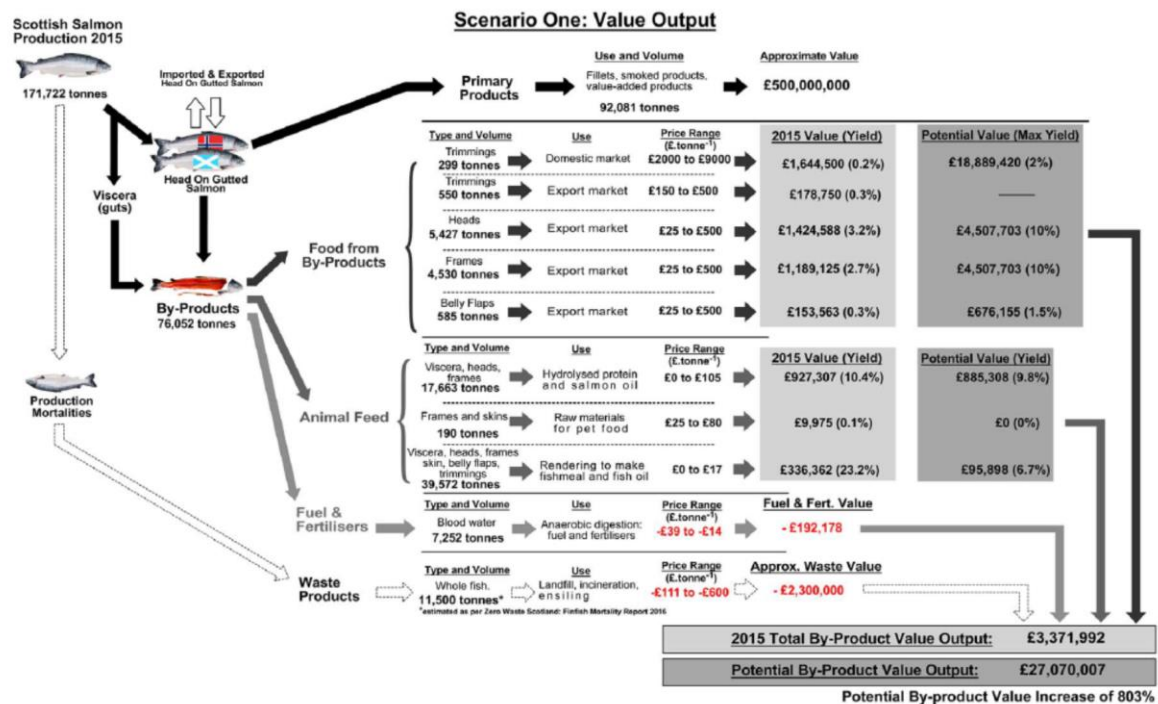


Figure 24: Potential to increase by-product value (Stevens et al 2018)

Providing accurate data on costs and market prices are available, the worksheet approach presented above could provide a company specific output along these lines.



Aquaculture Value Chain
Evaluation of industry dynamics,
opportunities and threats to industry

[Chapter 4: Sea bass and sea bream](#)

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Summary of findings

- Seabass and seabream are the most important species for the aquaculture of fish in Spain, being one of the most important markets in Europe.
- The production and the market is highly concentrated and economies of scale may improve the competitiveness of the sector
- The integration of production and the stable international trade allows to increase the share of the price value.

1 Sectoral Analysis of global aquaculture market of Seabream and Seabass in Spain

At worldwide level, the combined production of gilthead seabream (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*) increased during the period 2008-2012, from 37% and 31% of the total volume and 37% and 28% of the total value in 2012, respectively. Egypt and Tunisia have more than tripled their production volume since 2008, while the volume of Spanish and Italian production it remained stable during the same period. Greece and Turkey are the world leaders in the production with 45% and 19% of the volume and 47% and 16% of the produced value for seabream and 43% and 28% of the volume and 40% and 28% of the value produced for seabass (FAO, 2014).

The aquaculture is an important source of aquatic products for Europe, representing 106 million of tones in 2015. However, the importance of aquaculture is not homogeneous around Europe. Spain is the member state with the highest production volume with almost 290 million of tones in 2015 (22.3% of the total), followed by UK and France (both with 15.9%). Nevertheless, this ranking is different in value terms, being UK is the first one with 878.4 mill. of EUR (24.5% of the total value), followed by France with 653.6 mill of EUR (18.2%) and Greece with 411 mill of EUR (11.4%). Spain, before Italy, is the fourth in this ranking of value with 407.2 mill. of EUR (11.4%) (FAO, 2017).

In the case of Spain, it is not surprising that seafood culture is well established in Spain since ancient times and that this country ranks among the first ones in the world seafood consumer list (42.9 kg/person/year¹¹). The first evidences of domestication of aquatic species in Spain come from the Ancient Rome. The high appreciation of seafood by the upper Roman class enhanced its production, and remains of Roman fish and shellfish rearing facilities are scattered along the Spanish coast (OESA, 2015). In the Middle Age, monasteries and abbeys developed for the first time aquaculture facilities in Europe for rearing trout and carps, mainly devoted to conservation of fish resources, investigation and education. In Spain, the first trout (*Salmo trutta*) farm was settled down in the Monasterio de Piedra in 1870 supported by the Spanish Government to counterbalance the deterioration of aquatic ecosystems.

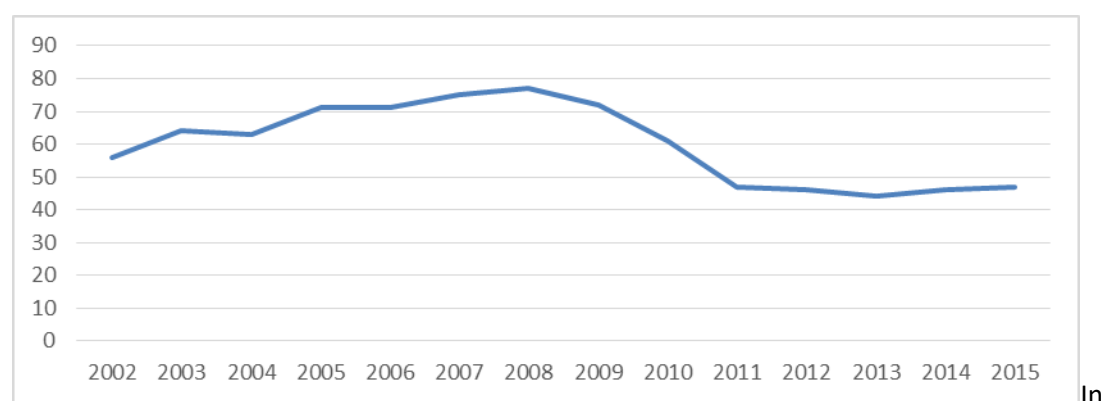
Nowadays, Spain is the main European producer of Mediterranean mussel (*Mytilus galloprovincialis*) and turbot (*Scophthalmus maximus*) with more than 225 hundreds of tons for mussel and 7,4 tons of turbot in 2015. In addition, other fish species such as rainbow trout (*Oncorhynchus mykiss*), sea bass (*Dicentrarchus labrax*) and sea bream (*Sparus aurata*) lead the Spanish cultured fish production, and other, like Senegalese sole (*Solea senegalensis*) and meagre (*Argyrosomus regius*), are emerging as sound candidates for the near future. Additionally, thousand tons of other mollusc species (e.g. clams, cockles, scallops, oysters) are produced in Spain (APROMAR, 2015). These figures represents an employment of 6,813 full-time equivalent units (FTE) in 2015, distributed among 10,090 people (mainly related to the mussels' production) (MAPAMA statistics, 2015).

Spain has a very rich hydrographic system covering most of its geography. This fact influence on the production systems for both, marine, intertidal and inland aquaculture but also the number of establishments, 5,129 facilities with production, in 2015. This figure can be disaggregated in 3,665 rafts for mussel, 1,153 areas for clams and other molluscs, 187 for inland plants (mainly for trout), 38

¹¹ <http://faostat.fao.org/>

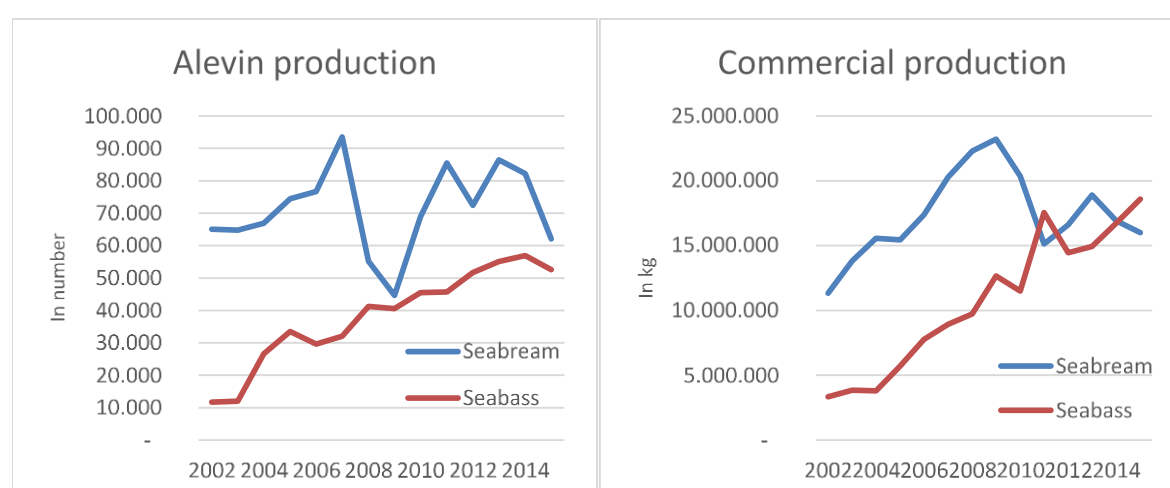
for facilities which use sea water (mainly turbot) and 47 for marine facilities (mainly seabass and seabream, Figure).

Figure 1. Evolution of the number of authorized establishments for seabream and seabass in Spain



aggregated terms, the seabass and seabream production have been increasing year by year. In this sense, the case of the seabass shows a constant growth of the commercial production (an average 11%) but also the production of juveniles. On the other hand, the seabream production grows until 2009, when decrease steeply until 2011, almost a 40% (Figure).

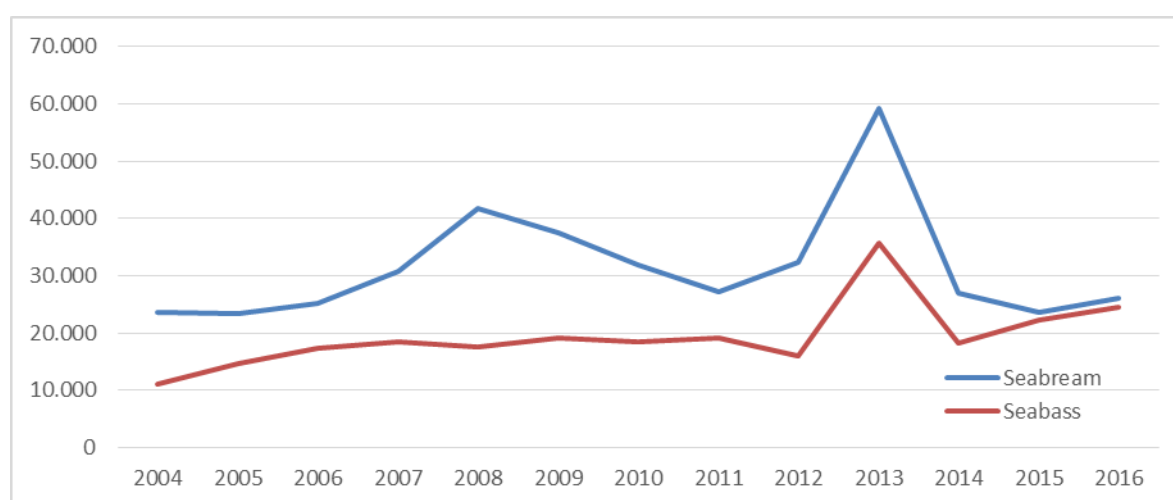
Figure 2. Juvenile and commercial production of Seabream and Seabass (2002-2015)



The production of seabream and seabass responds to the strategic behaviour of the involved firms but not to domestic market demand, which is still uncovered by the national production. The Spanish Firms Association of Aquaculture (APROMAR) estimates the 37% of the seabream and the 59% in the case of seabass that is consumed in Spain comes from the domestic production (APROMAR, 2017).

The consumption for both species increases slightly (average of 6% and 8.5% respectively) but at different rate than the production. The consumptions suffer a boom and bust cycle with increases from 2004 to 2008 and from 2011 to 2013 with the contrary effect along the time series analysed. Recently, the seabass consumptions seems to growth in a high rate than the seabream but both are growing up to levels of 2006 (Figure).

Figure 3. Spanish household consumption



The international production and trade remarks the relevance of Mediterranean Sea, as the major region for producing seabass and seabream. The main market for both is Italy, where is annually consumed 60,000 tons and 40,000 tons respectively. The other relevant markets are Spain, Turkey and Greece (APROMAR, 2017).

1.1 Authorization System

The authorization system for any aquaculture activity in Spain is managed according to the national legislation (Law Nº23/1984 of Marine Cultivation). It allows for commercial farming of aquatic species only to those Spanish citizens and organizations which have been registered as business enterprises. The concession or authorization confers the right to set up an aquaculture activity in a specific area and may concern either a single species or a group of species. The authorization/concession system to set up aquaculture facilities follow this general process:

- Aquaculture concessions are granted by the Ministry of Agriculture, Fisheries, Food and Environment and confer the right to use and benefit from State property. The applicant has to request the authorization enclosing the following documents:
 - An application for the concession of the occupation of the public marine-terrestrial zone addressed to the Ministry of the Environment.
 - Legal identification of the applicant (person or company).
 - The project of the civil works endorsed by a certified technician.
 - A financial feasibility study and a scheme for the execution of the operation endorsed by a certified technician.
 - Proof of payment of duties
 - The environmental impact assessment and the sanitary requirements, as applicable.
- The Administration will establish the opening of a period of 30 days for public information. Simultaneously, an official information period headed for the reports by the competent bodies of defense, navigation, tourism, municipal, environment and sanitary authorities. A deadline period of one month is established. After which date, if no response has been obtained, a favorable outcome will be assumed.
- If the results are favorable, the Regional Government will request the mandatory report of the Demarcation of Costs, which must be finished in two months. This report includes the statement on the viability of the occupation, as well as the conditions under which it is granted.

- The petitioner is informed of the conditions to be met. In case you agree, the file is processed directly to the General Directorate of Costs.
- Once the concession is granted, the resolution of the authorization shall be published in the Official Journal of the Regional Government.
- The duration of the authorization is generally 10 years, extendable once up to a maximum total period of 30 or 50 years.

As part of the European Union, Spain had to harmonize corporate legislation with the Directive 2013/34/EU. This effort was done in order to (i) ensure the transparency and comparability of financial statements, (ii) achieve efficient operation of EU capital markets, (iii) close the legal vacuums in the somewhat scant regulations for the accounting Directives and their similarly low level of implementation and (iv) clarify the diversity of legislation.

The Regulation Nº 1606/2002 of the European Council and the European Parliament devised the path for the accounting reform process in Spain. In fact, this Regulation mandated to apply the International Accounting Standards (IASs) undertaken from 2005. In response, Spain adapted their Generally Accepted Accounting Principles (GAAP) in the most suitable way based on the Spanish accounting precedents.

However, the most authorizations are only for provisional or experimental purposes. The long administrative process and the lack of planning and management of suitable areas for aquaculture limits the development of this activity. Furthermore, the current restrictions protect and limit the production of seabream and seabass creating entry barriers that encourage the concentration of firms.

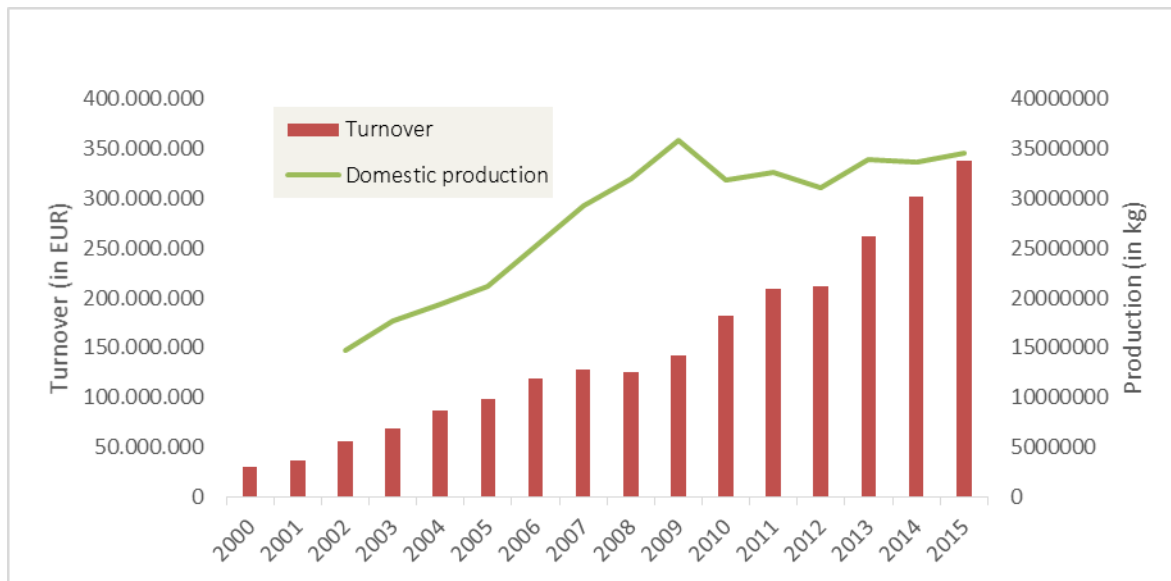
2. Industry dynamics (lifecycle stage)

In Spain, the dynamic of the seabass and seabream industry is marked by a process of concentration of firms, highlighting this fact when Cooque Acuaculture enters in the Spanish market in 2011. Other key aspects that influence the industry dynamic come from the International Trade, in particular the Turkish and Greek relevance in the Spanish market.

The production seabream and seabass is developed in 6 regions of Spain; 5 in the Mediterranean Sea (Andalusia, Balears Islands, Catalonia, Valencia Community and Murcia) and 1 in the Atlantic Ocean (Canary Islands). There are no any formal entrance barriers already set at national or regional level, however, the reluctance to approve new establishments limit the production drastically. Therefore, with a cuasi-fixed number of establishments, the consolidation (i.e. concentration of firms) was the “natural” consequence in terms of economic rationality.

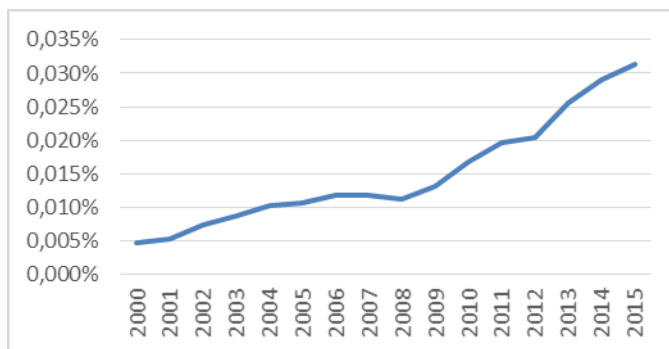
Although, there is not a public register of the owners of the aquaculture establishment for analysing the concentration trend, the concentration index can be estimated through the current ownership register (public available since August 2017). If we assume the same owner of the aquaculture farms and then, we analyse the shareholder evolution. We find out that in 2000 there were 47 different firms with an aquaculture license for seabream and seabass, but only 26 in 2015. This consolidation has direct effect on the economic performance (Figure). The growth rate for turnover is 8% for the period 2000 to 2015. In the entire period, the growth achieve positive values with the exception of 2008 that decrease a 0.87%.

Figure 4. Evolution of turnover and domestic production (2000-2015)



These economic positive results place the aquaculture sector of seabream and seabass as a growth lifecycle of the industry dynamic. In particular, the combination of an increase of the sectorial contribution to the national Gross Domestic Product (GDP) (see Figure), the turnover with a constant domestic production (Figure) allow to generalise current sector position of a growth based on quality.

Figure 5. Contribution of seabream/seabass sector to the Spanish GDP (2000-2015)



2.1 The Herfindahl-Hirschman Index (HHI) of the Seabream and Seabass sector in Spain.

The longitudinal trends of the consolidation dynamic of seabass and seabream sector is calculated through the Herfindahl-Hirschman Index (HHI). This index is an indicative of the movement of the sector through the aforementioned lifecycle. In particular, the HHI is a measure of the size of firms relative to their sector and indication of the level of consolidation and associated competition among them (commonly used as market concentration measure in anti-trust cases). It is measured using the following formula:

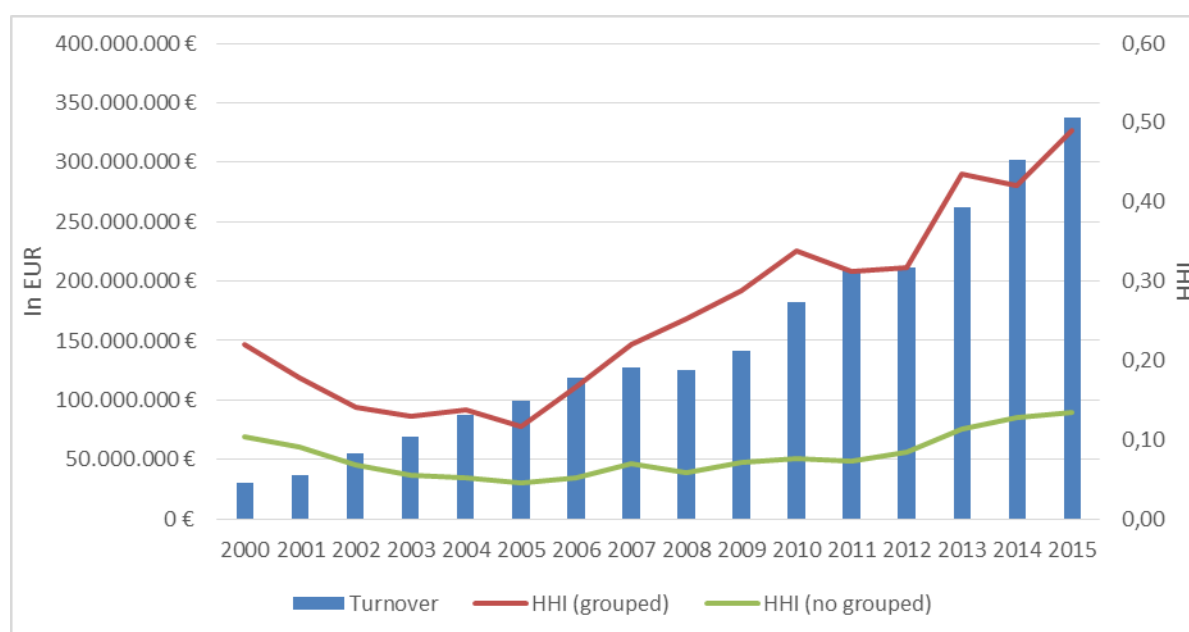
$$HHI = \sum_{i=1}^N S_i^2$$

Where S_i is the market share (expressed as fractions) of a company i and N is the number of companies. It is sometimes limited to the 50 largest companies in an industry i.e. in the case of highly fragmented sectors. The index is a 0 to 1 range, where 1 indicates a monopoly situation. According to U.S. merger

guidelines, a HHI below 0.15 is an unconcentrated market, a HHI between 0.15 and 0.25 is moderately concentrated and a HHI larger than 0.25 indicates a high concentration.

In the case of Spain, the analyses of the HHI can be developed by analysing the number of companies obtaining an average HHI for 2000 to 2015 of 0.08 with an standard deviation of 0.03 (see no grouped HHI in Figure). However, if we analyse the shareholders of the firms, the consolidation trend can be measured by the HHI. Particularly, the results highlight a constant concentration since 2005 achieving a HHI of 0.48 in 2015 (Figure). Therefore, this aggregation of firms according to their shareholders structure allows to define the Spanish sector as a “highly concentrated” instead of an “unconcentrated industry”.

Figure 6. Herfindahl-Hirschman Index (HHI) for seabream and seabass sector in Spain (2000-2015)



This situation is the result of a consolidation trend that starts in 2007 when NIORDSEAS, a filial firm of the Andromena Group, sells different productive assets to CULMAREX. Then CULMAREX takes the lead in production terms and purchase other relevant firms year by year in order to group the production. Finally, in 2011 Marine Farms AS, the owner of CULMAREX, sells the company to Cooke Aquaculture inc., confirming the consolidation process. In 2015, the sectoral consolidation is finished, confirming the concentration of the production in CULMAREX with around 77% of the total (Table 8).

Table 8. Ranking of seabream and seabass firms by turnover in 2015.

Company Rank	Company Name	Turnover (in EUR)	
1 st	CULTIVOS MARINOS EXPERIMENTALES, S.A.	234.298.799	69,34%
2 nd	ANDROMENA IBERICA ACUICULTURA SL	25.161.607	7,45%
3 rd	YAIZATUN, S.A.	13.051.203	3,86%
4 th	CULTIVOS MARINOS DE GUARDAMAR DEL SEGURA, S.L.	7.917.079	2,34%

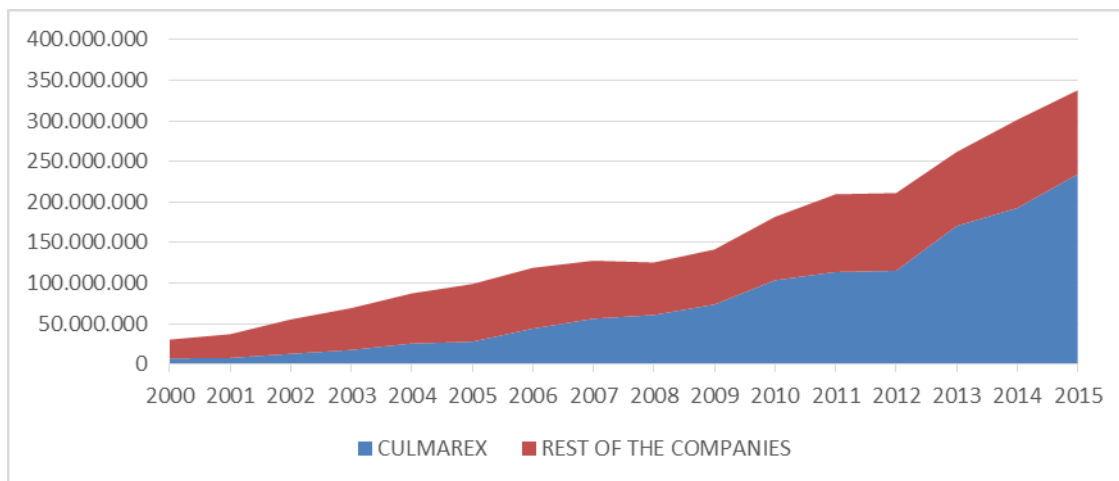
5 th	PESQUERÍAS ISLAMAYOR, S.A.	6.942.218	2,05%
6 th	ACUIPALMA, S.L.	6.807.789	2,01%
7 th	PESQUERIAS LUBIMAR SL	5.941.246	1,76%
8 th	SERVICIOS ATUNEROS DEL MEDITERRÁNEO, S.L.	5.930.715	1,76%

2.2 Value Chain Governmental form

Due to the concentration degree of seabass and seabream aquaculture, the degree of power asymmetry is low. This fact is reinforced with the limitation to increase the production capacity due to the authorisation system. Therefore, the main producers are integrated firms in a position between the captive and relational according to their size. The great relevance and the bargaining power of the distributors (e.g. Mercadona, Carrefour) avoid a completely integrated firm along the value chain in Spain. According to Gereffi 2005, the complexity of transactions and the ability to codify them is high. In contrast, the capabilities in the supply-base is low, highlighting the captive governance form of the value chain.

A few number of small-size producers (mainly from Andalusia – Central South Spain), produce for supplying restaurants and hotels (embedded in the same group of firms). In these cases, they are completely integrated in the value chain in a hierarchy form (Gereffi, 2005). As is shown in the HHI analysis, there is a clear leading company, CULMAREX. The concentration process reinforce their position and their positive economic performance (Figure).

Figure 7. Economic performance of CULMAREX in comparison to the rest of companies.

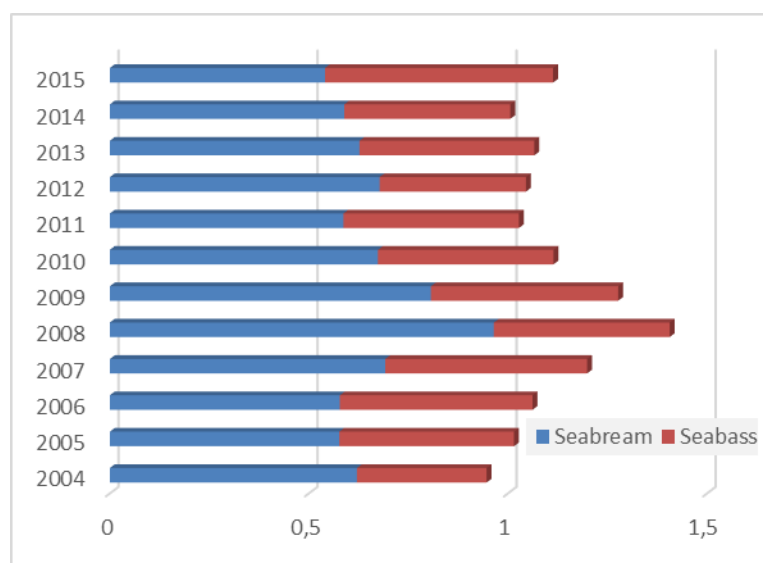


2.3 Opportunities/Threats

The domestic market of seabream and seabass remains constant since 2011 (

Figure). Possibly, external factors influence on the seafood consumption which is in slight decline in the recent years.

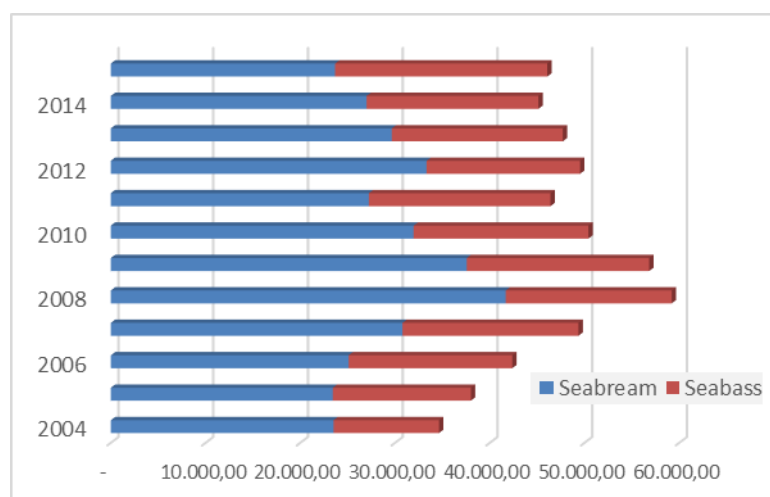
Figure 8. Average consumption per capita (gr per capita) of seabream and seabass in Spain (2004-2015)



If we analyse the household consumption of these species, their representativeness is not relevant regarding the total consumption of seafood in Spain. Particularly, they represent 1.35 kg per capita (5.11%) of total, 26.4 kg per capita in 2014. The seabass and seabream consumption per capita represents around 0.61 kg and 0.41 kg respectively.

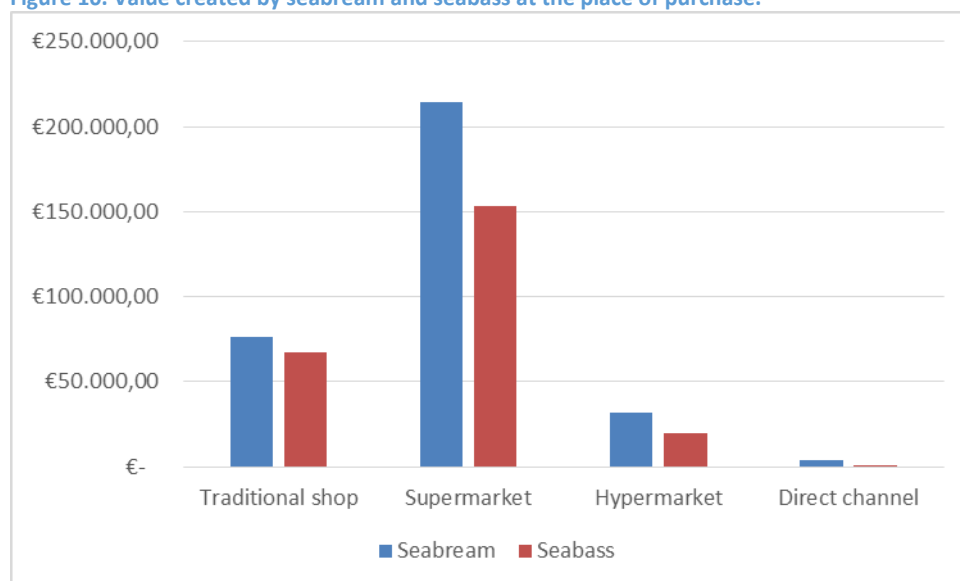
However, the overall consumption in volume is still a remarkable in comparison with other European countries. In 2015, the consumption of both species achieve more than 46.000 tons (23.672,74 for seabream and 22.394,80 for seabass). This relevance is maintained in the series analysed 2004-2015 (Figure).

Figure 9. Consumption of seabream and seabass at household (in '000 kg)



In terms of the frequency of the purchase place, the seabass and seabream are close to the national average. Likewise the most of seafood products, the supermarkets and traditional stores concentrates around the 90% the value (Figure) with a short penetration on direct channel (e.g. online sales) or retailing (e.g. hypermarket) (MAPAMA 2015).

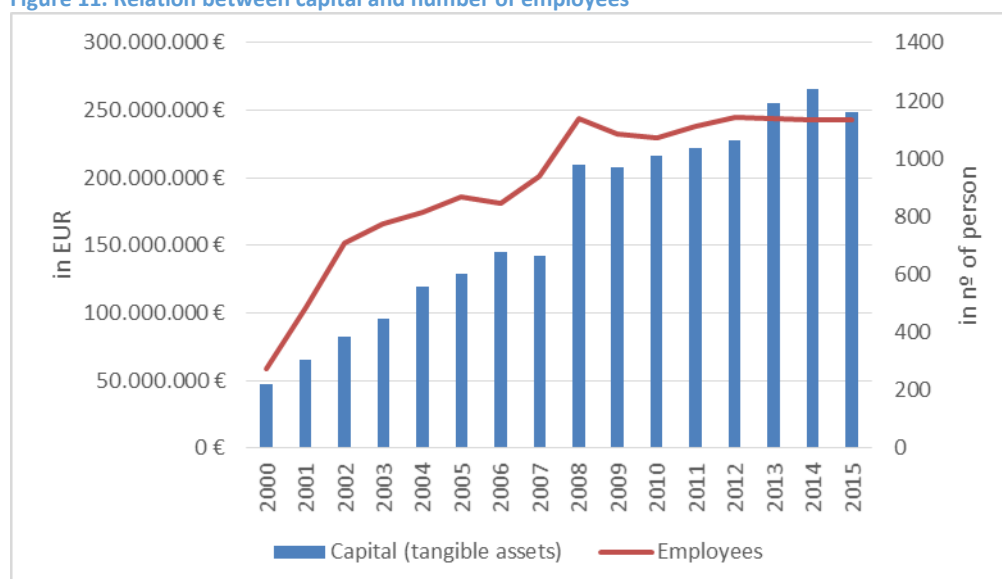
Figure 10. Value created by seabream and seabass at the place of purchase.



3. The Spanish value-chain structure

In Spain, the productive process of seabream and later of seabass starts in Andalusia in ancient coastal structures (esteros) where was effortless the inundation (Arias, 1980 y 1990). This fact limits the production to the natural conditions (i.e. tides), and offshore hatcheries were developed for improving the production system and reduce the fixed costs (García-García, 2001a; García-García et al., 2001b). However, the reproductive and pre-growth phases are still carried out in land facilities. The technical evolution from a nature-driven and hand-made production to a capital intensity is evident when we analyse the constant increase of capital (tangible assets), moving from 47 million in 2000 towards almost 250 million in 2015 with an average growth of 5,51%. In Figure 11 is represented the evolution of the number of employees and capital, with an average for the period of 176 million per employee.

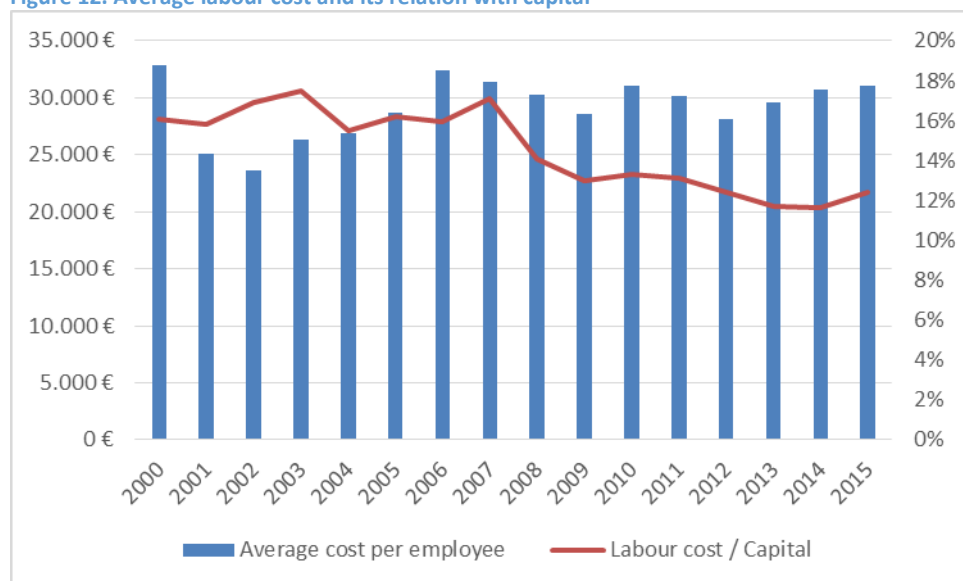
Figure 11. Relation between capital and number of employees



When we analyse the costs linked to the employees, there are not great variations. The average cost per employee is 29.177 €, however, the share of costs related to labour decrease around 2% in the

last 8 years (from 2007 to 2015). This fact reflects a slight increase of productivity in the production of seabream and seabass, but there is still room for further developments Karagiannis et al., 2000 and Benito, 2015.

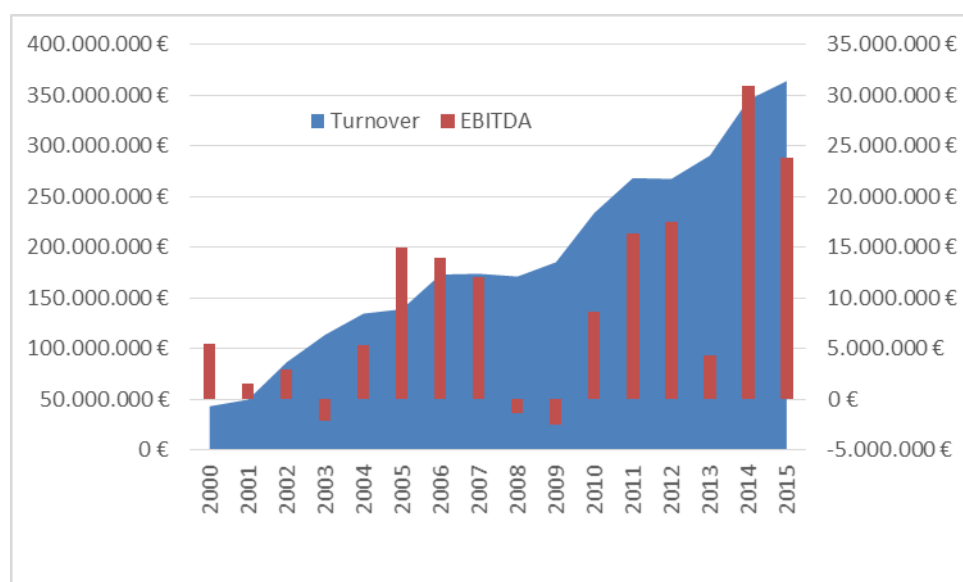
Figure 12. Average labour cost and its relation with capital



3.1 Financial Performance and productivity

The economic performance and its relation with profitability is represented in the Figure. Clearly, the economic performance of this sector has been increasing year by year, including positive results for the most periods. It is remarkably the positive trends achieved in the last 6 years in spite of the financial crisis.

Figure 13. Evolution of Turnover and EBITDA (2000-2015)



The size of the companies, in terms of capital, has been increasing at the same time that their number decrease. Therefore, the analytical index (as HHI) or quantitative ratios from companies accounts (as EBITDA) demonstrate the good economic performance in the sector of aquaculture of Seabream and

Seabass in Spain, finding out the entry barriers and a concentration process as the main factors for positive results.

3.2 Micro-economic competition factors

The key factors effecting firm-level decision-making regarding their production are summarized in Table 9 (Benito, 2015). Economies of scale can be traced mainly in the purchase of juveniles and in labour costs, achieving around more than 10% of decrease.

Table 9. Cost distribution of different productive strategies of seabream and seabass in hatcheries (in EURO).

in EURO	Production (tn/year)	Low (≈1000 tn.)		Medium (≈2000 tn.)		High (≈3000 tn.)	
	<i>Weight of the product (in gr)</i>	450	900	450	900	450	900
	Labour	511,500	535,500	732,500	756,500	927,500	971,500
	Juveniles	1,071,895	535,947	2,143,792	1,071,896	3,215,686	1,607,843
	Feed	1,449,570	1,532,006	2,766,097	3,064,013	4,061,091	4,596,019
	Exploiting costs	553,649	481,565	1,028,080	893,554	1,486,767	1,305,782
	Insurance	94,376	85,418	183,397	161,067	220,738	224,072
	Amortization	251,042	262,944	315,668	324,846	393,005	420,603
	TOTAL	3,932,032	3,433,380	7,169,534	6,271,876	10,304,787	9,125,819
	Production cost €/Tn	3.93	3.43	3.58	3.14	3.43	3.04

Additionally, the economies of scale are also relevant on the investment costs (Table 10). In comparison with the previous cost distribution, it is more drastic the reduction linked to the scale. This fact is related to the fixed costs related to the investments and the possibility to allocate theses costs among more products.

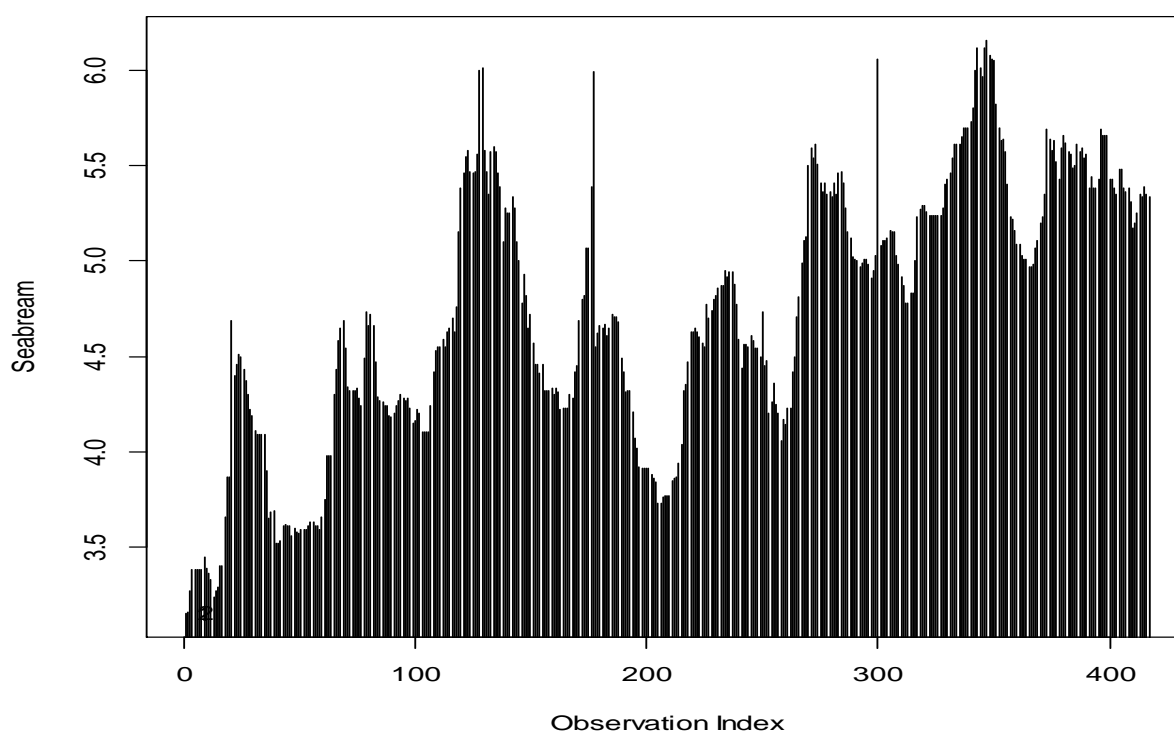
Table 10. Investment required for different production strategies of seabream and seabass in hatcheries (in EURO).

in EURO	Production (tn/year)	Low (≈1000 tn.)		Medium (≈2000 tn.)		High (≈3000 tn.)	
	<i>Weight of the product (in gr)</i>	450	900	450	900	450	900
	Building	589.170	589.170	645.282	645.282	705.000	705.000
	Ship vessel	915.810	915.810	1.403.435	1.403.435	1.851.735	1.930.385
	Machinery	329.005	329.005	454.605	454.605	563.405	607.805
	Facilities	1.654.080	1.778.791	2.041.939	2.127.730	2.562.461	2.911.400
	Subtotal	3.448.065	3.612.776	4.535.361	4.621.152	5.682.601	6.154.590
	Other	172.403	180.638	226.768	231.058	284.130	307.730
	TOTAL	3.620.468	3.793.414	4.762.129	4.852.210	5.966.731	6.462.320
	Investment €/Tn	3,62	3,79	2,38	2,43	1,99	2,15

3.3 How effective is the system to respond to attributes?

The price is the essential basis of commercial transactions, reflecting the balancing position between the supply and demand within a market conditions. It can be used to measure the ability to response and picture the previous facts, concentration and economies of scale. Apart of the clear seasonality for the seabream prices (high prices in summer and low in winter), the trend is clearly positive in the series from 2009 to 2016 (Figure). This fact is reinforced in the last 3 years, achieving an average price of EUR 5.44. This is far from the average price of EUR 3.73 achieved in 2009.

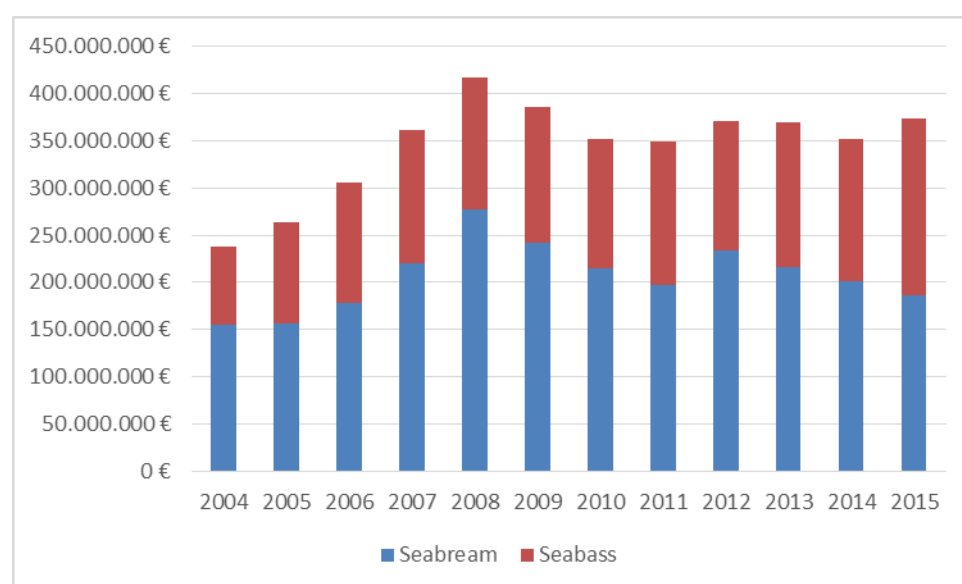
Figure 14. Seabream producer weekly price (2009-2016)



3.4 Value creation and utilisation

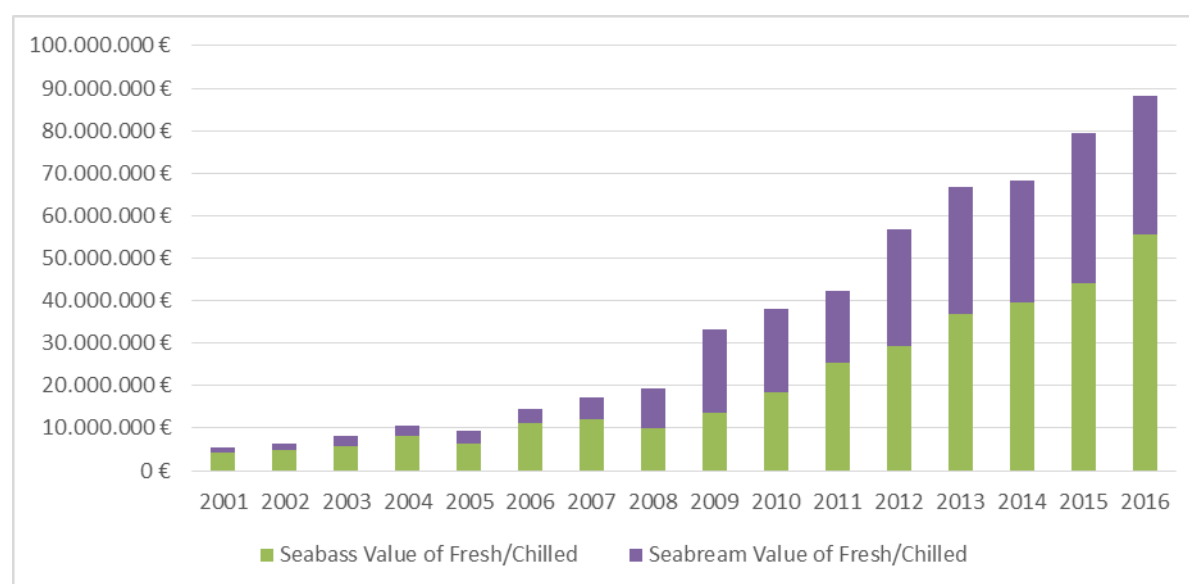
The preferred presentation of both species by the Spanish market is fresh and they are usually eat at home. In particular, the 85% of the total is sell by the Spanish households (APROMAR 2017), achieving a value around 375 million of euros (Figure).

Figure 15. Household expenditures in seabream and seabass (2004-2015)



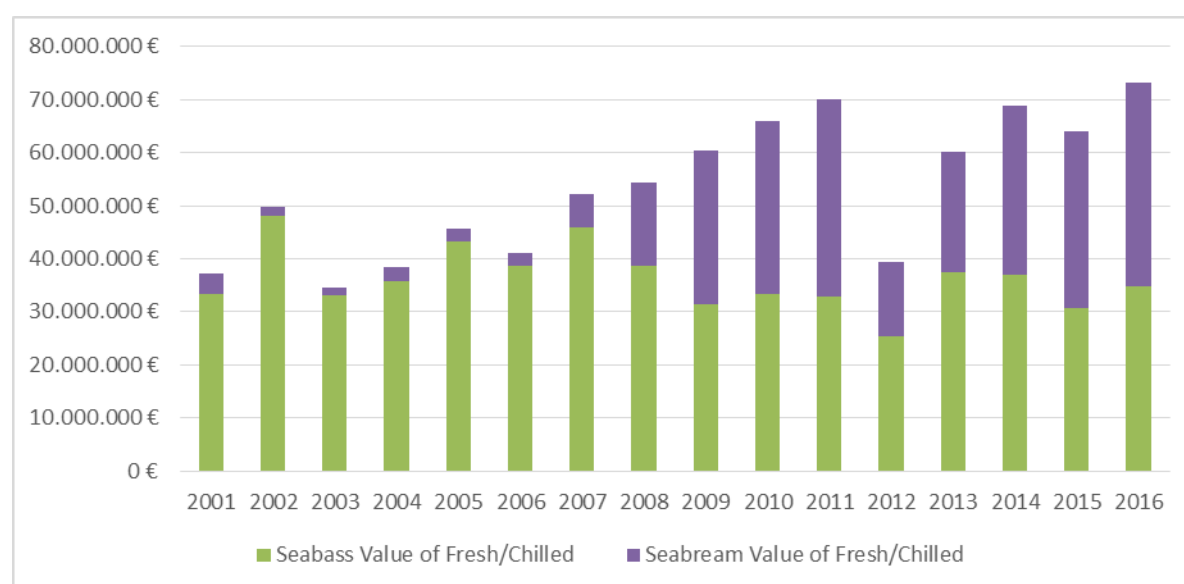
To maintain this demand, the International trade (mainly from Greece and Turkey) is required. In addition, we can see in the following graphs (Figure and Figure) a constant supply of both species for this International market but also a demand to fill in the domestic household consumption. For imports and exports is remarkable the increase of seabass since 2008.

Figure 16. Value of exports of seabream and seabass (2001-2016)



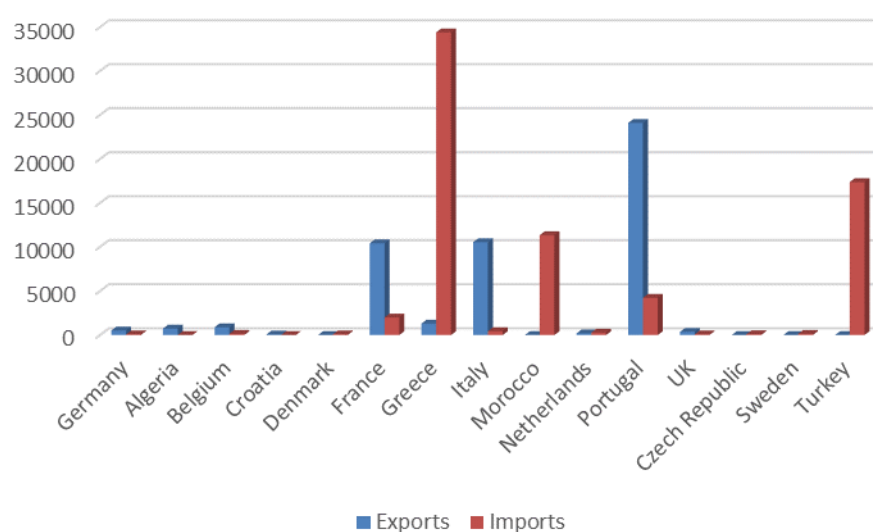
The average volume in the trade balance of seabream the las 4 years is negative. The increase of exports are not covering the market needs and the imports are continuously growing up since 2010, mainly due to Greece and Turkey activity. Probably, the limitations to the Spanish production explains this fact, however further research is needed.

Figure 17. Value of imports of seabream and seabass (2001-2016)



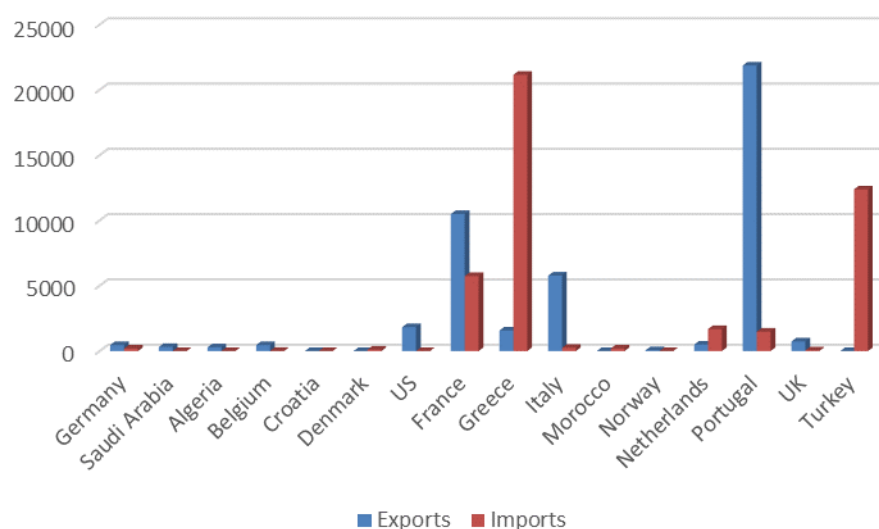
In 2014, the main countries from which Spain imported seabream products were Greece, Turkey and Morocco (Figure). There is also importation from Portugal but the trade balance is clearly positive due to the great level of exportation. Possibly, Spanish enterprises operate in both sides of the borders. Other relevant exporting countries are Italy and France.

Figure 18. Main import/export countries of seabream in 2014.



The balance of imports is similar to the seabream, where Greece and Turkey grouped the highest volume (Figure). However, the number of importations from France is more remarkable than in the seabream case. The same fact occurs with exports, where Portugal occupies the first place, far from France and Italy. It is remarkable the presence of US whose main volume of exports is in form of fresh or chilled products. This could be related to the presence of Cooke Aquaculture Inc. behind the managing board of CULMAREX (the leader company).

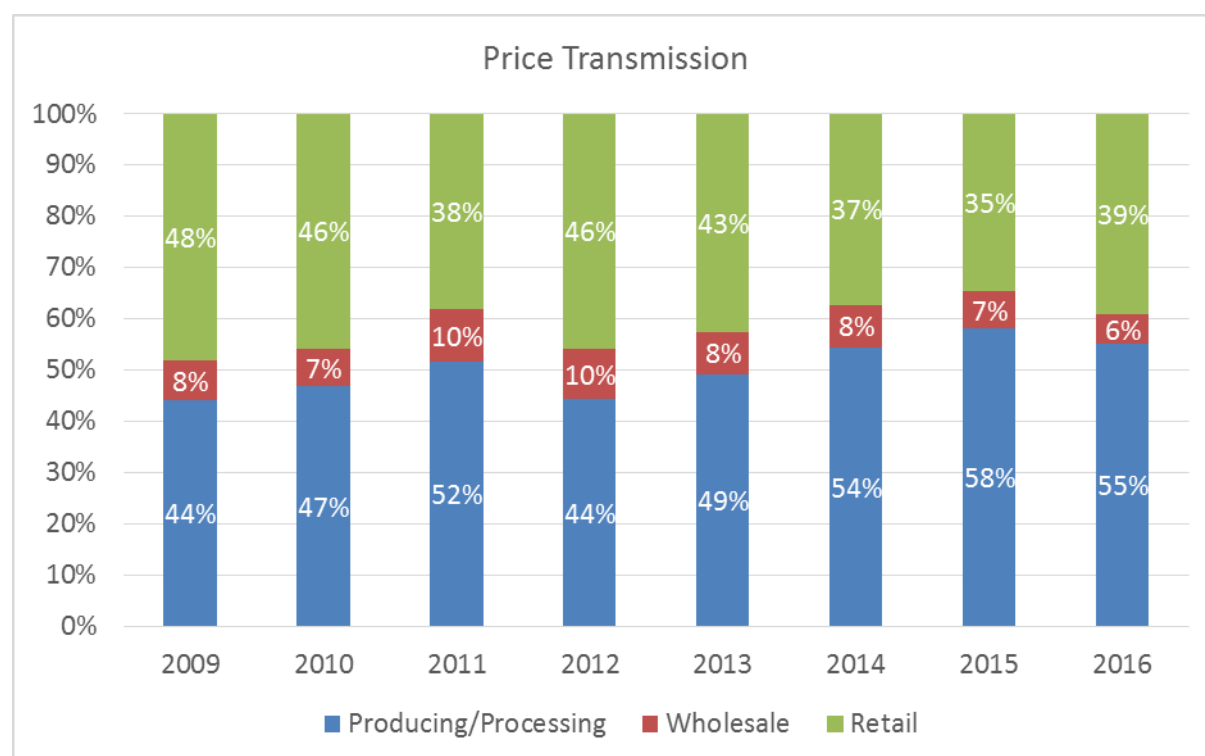
Figure 19. Main import/export countries of seabream in 2014.



4. Price transmission

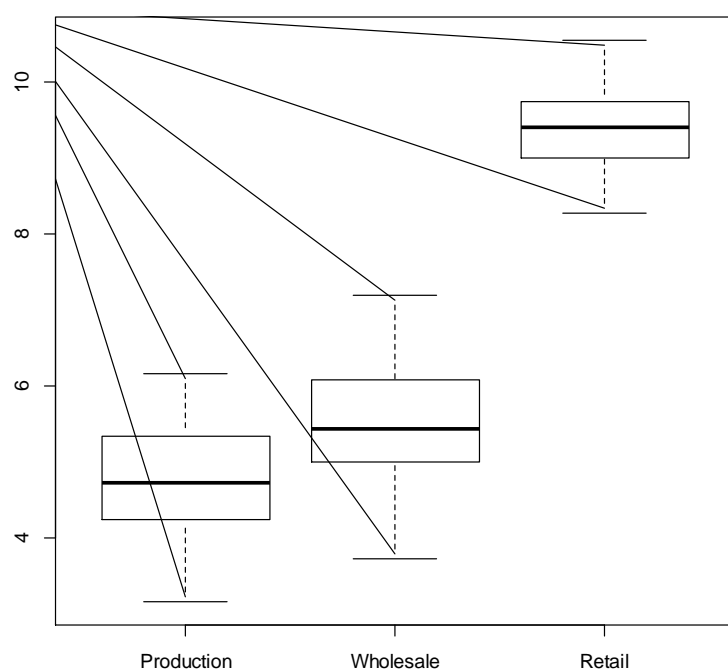
The price transmission analysis remarks the fact that the producer chain is gaining power of bargaining. This is reflected in the price, growing up 11% from 2009 to 2016 (Figure). In addition, it is remarkable the low relevance of wholesale market for seabream.

Figure 20. Price transmission along the value chain of seabream (2009-2016)



Despite the seasonality of prices, the producer and wholesale chains have a wider range of variations than the retail chain (Figure), confirming the strong connection between the production and wholesale chains.

Figure 21. Prices at different value chains stages of seabream (2009-2016)



The short and medium term confirms this trend with means in the margin variation of 0.22% and 0.45% respectively when moving from the producer chain to the wholesale (Table 11). In contrast, only +/- 0.01% in the case of margin variations in retail prices for both periods of time. This fact is reinforced by analysing the standard deviation and the minimum/maximum prices achieved at short and medium term.

Table 11. Descriptive statistic of the margin variation of seabream prices along the value chain at short and medium term.

	Medium term (2009-2016)		Short term 2014-2016	
	Chain 1 => Chain 2	Chain 2 => Chain 3	Chain 1 => Chain 2	Chain 2 => Chain 3
Mean	0,22%	-0,01%	0,45%	0,01%
Standard deviation	15%	2%	19%	2%
Min	-102%	-10%	-102%	-6%
Max	115%	16%	115%	6%

Data limitations

The seabass is not included in the national prices statistics panels. Only relevant data for the retail prices is provided by the different sources consulted.

The reduced number of processing plants of seabream and seabass does not allow to disaggregate the information collected.

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Chapter 5: Pangasius

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1 Summary

The pangasius industry in Viet Nam has grown quickly over the last two decades to become one of the main food exports from the country and a major contributor to the Vietnamese economy. Pangasius products, mainly frozen fillets, are currently exported all over the world, with the largest markets being the EU, the USA, and more recently China. The success in market penetration of pangasius products can be attributed to their mild taste, lack of bones, and most importantly their low price compared to other, more traditional whitefish products, for which it acts as a low-cost substitute.

The production node in the pangasius's value chain was initially highly fragmented, composed of many small-scale family owned enterprises and middle-scale processor-exporters. However, the industry is undergoing a rapid consolidation and increasingly being served by large-scale vertically integrated enterprises, encompassing all stages of the value chain. The reasons for that can be found in the improvement in seed production methods, control of fish health and disease problems, feed and nutrition and market requirements.

The hormone induced spawning have allowed Pangasius aquaculture to develop rapidly and for the fish to become a globally important product. Areas such as hybridization, genetic selection for positive production traits and increased introduction to suitable culture environments. Pellets (round or cylindrical) that are used to replace homemade feed to feed fingerling fish and juveniles in first two months have been a vital contribution to the pangasius production boom. Since 2008 there has been an increasing trend towards the use of commercial pellets that contain rice bran, maize and fishmeal. Although commercial pellets are more expensive, they result in better feed conversion ratios and water quality, and are designed to float to avoid any build-up of food in cages or at the bottom of ponds.

Common disease problems in pangasius farming include protozoan infestations on the skin or gills and bacterial infections from handling or environmental stress. As a fish with no scales, Pangasius is also highly susceptible to the protozoan parasite *ichthyophthirius multifiliis*. However, good aquaculture practices have been implemented and become key to limiting the spread of disease. Examples of such practices are to register farms so they can be monitored or controlled by local authorities, locate the farm in accordance with established local and national legal frameworks, incorporate wastewater treatment ponds and properly measure water parameters such as pH, oxygen and temperature to provide a sufficient water supply in quantity and quality, have a certificate of fingerling quality (important for disease traceability) and purchase high quality industrial feed. The last but not least important reason for pangasius development is in the strict requirements by developed country buyers in terms of traceability, food safety and environmental performance, which favour large, vertically integrated companies, who can exert strict control over all stages of production, thus ensuring traceability and adherence to a number of sustainability and food safety standards demanded by importers in developing countries.

A main challenge in those markets has been the reputation of pangasius products, often undermined by negative and sometimes erroneous media reporting on the conditions of production and food

safety, thus stimulating buyers (mainly large retail chains) to outsource their reputational management through third party certifications schemes, to the cost of the producer while demanding low prices. In addition, the transition of Viet Nam to middle income country has led to growing wages and thus production costs, eroding the price advantage of pangasius and putting more pressure on producers to increase scale to improve profitability.

The increasing scale and scope of operations and the introduction modern processing technology, have also allowed producers to improve significantly the quality and consistency of pangasius products. Many companies have also sought value-added product development as a strategy to capturing more value along the supply chain. New markets have been actively developed by exporters with China becoming a major export destination, including value added products. Ultimately, sustaining growth in the industry would require productivity growth through mechanisation and innovation.

2 Introduction

The tropical aquatic species Pangasius possess a range of potential advantages over other whitefish species such as reproductive capacity, resistance to low dissolved oxygen and high production yields. In addition, the fish's relatively low cost of farming and processing, mild flavour and delicate texture have allowed consumption to rise across the world and become a low-cost substitute whitefish. Vietnam is well known as the biggest pangasius supplier with a contribution to 80% of the total world production (FAO, 2012). Pangasius is one of few aquacultured species have production of over 1 million tons per year, the 2017 production is 1.25 million tonnes (VASEP, 2018). Over 90% of the fish is destined for exports to over 100 countries. The increasing demand of seafood consumption in the world, pangasius has huge market potential for its development.

Pangasius is now one of Vietnam's most important export crops by volume and value, primarily due to the combination of high perceived user value (a substitute of traditional whitefish) and low price. The export value in 2017 is 1.8 billion dollars, pangasius is the second rank species for Vietnam seafood export. The US and Europe are both important markets, which the market shares in total account for over 50% of pangasius export value, although not supporting further growth. The future performance of the pangasius industry is determined by a variety of interlinked factors influencing the competitiveness of exports, originating in the wider business environment, as well as pertaining to the nature of the industry itself and the strategic positions of the companies comprising this value chain. The following analysis examines the most important dynamics, operating at different levels in the value chain affecting the competitive position of pangasius. These are illustrated by four detailed case studies of successful pangasius companies.

3 External competition factors

3.1 Macro-economic context

Starting in the late 1980s Viet Nam's economy has grown at a very rapid pace to transform the country into the middle-income state that it is today. One of the main reasons for the phenomenal growth has been its success in foreign trade where the high competitiveness of Vietnamese products on the export market, including pangasius, has been driven by competitive price. Cost-leadership has been possible due to the abundance of resources and low input costs in Vietnam. High year round temperatures allow fast growth and thus a short production cycle of this native fish species. In

addition, the FAO describes pangasius as a nutritionally low input species, meaning it can be produced efficiently with little animal protein, fishmeal and fish oil, which account for a large proportion of feed costs and which are becoming increasingly expensive. Thus, the low input diet of Pangasius is an advantage in terms of both reduced feed costs and environmental impact. The abundance of freshwater resources in the Mekong Delta, make production of a big scale using traditional earthen pond systems, possible. The low regulatory barriers have allowed the industry to grow very quickly. Importantly, the domestic value chain has been reliant on abundant cheap labour, characterised however, by low labour productivity (output per worker).

However, as the country's average wage rate continues to grow, while labour productivity remains the same, the competitive advantage based on price becomes increasingly eroded, resulting in a slower economic growth. This phenomenon has been termed the middle-income trap (Kharas and Gill). A country in the middle-income trap will have lost their competitive edge in the exportation of manufactured goods but are unable to keep up with economically more developed economies in the high-value-added market. Future economic growth can thus be achieved only through productivity growth such as resulting from consolidating agricultural landholdings (which are still too fragmented and small in Viet Nam) and introduction of mechanisation and innovation. Another issue is the diversifying product category, focusing on high-value added and ready-to eat product, and branding the aquaculture to overcome the market barriers.

3.2 Exchange rate

Competitive advantage based on price is strongly influenced by exchange rates. Since import/export transactions are usually completed in USD, exchange rate fluctuations in the in the local currency of the importing market can affect the competitiveness of pangasius exports in both directions. When the local currency loses against the dollar, the consequences for Vietnamese exporters are negative. Depreciation of the euro against the dollar would mean that EU buyers would need to pay relatively more. In such cases, exporters have had to offer 10-15% lower prices in order to remain competitive (Nguyen, Chuong and Curtis, 2016). Thus, exchange rate fluctuation can negatively affect the profits and revenue of producers. Export volumes have been observed to fluctuate with exchange rate. For example, in 2015 when the pangasius export price reached its highest of \$2.48 export levels levelled off and declined in the EU market (Nguyen, Chuong and Curtis, 2016).

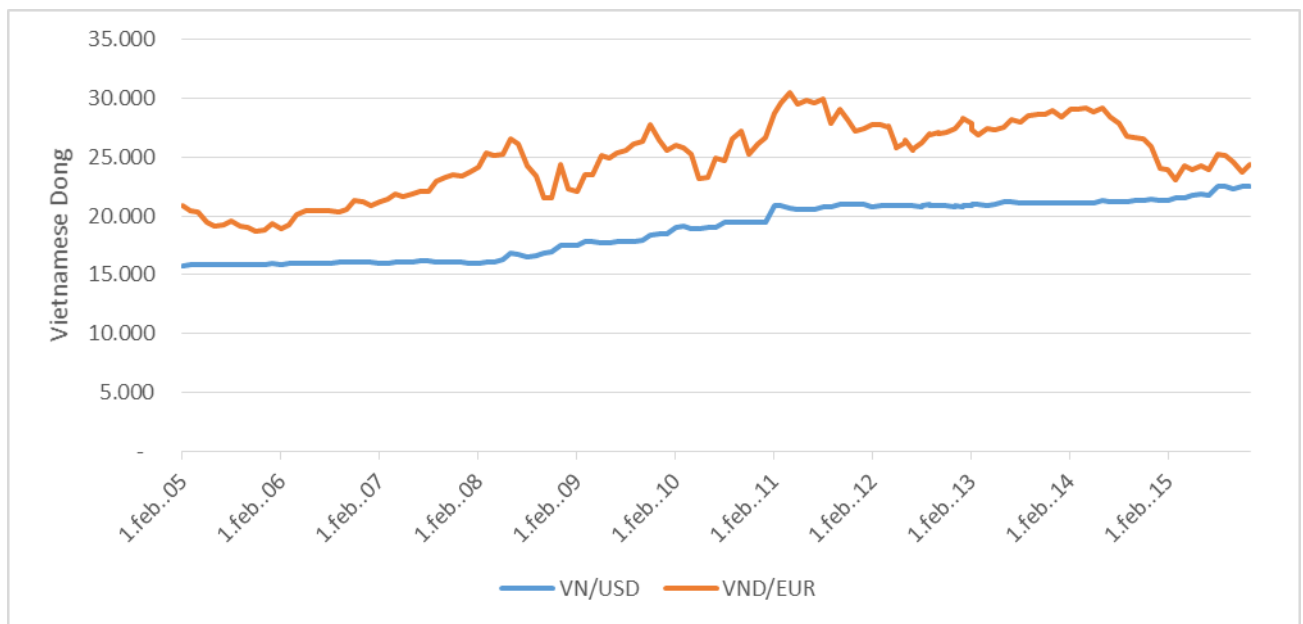


Figure 1. . Exchange rate of VND for 1 USD and 1 EUR in first date of months in 2005-2015

3.3 Price Signalling and Reputation

The success of pangasius on the EU and USA export markets has attracted a lot of media attention, most of which negative. Prominent NGO's and EU MP's have expressed often ungrounded criticism of pangasius on the basis of its environmental, social and safety credentials (Little et al., 2012). According to the same authors the motivation for this can be linked to industry interests over white fish supply which has been likened to a "war".

While quality has improved over time, there is still confusion among consumers regarding food safety and environmental impacts associated with production. Moreover, consumers in those markets are not familiar with pangasius compared to other white fish species, because they have a strong tradition with wild-caught white fish such as haddock and cod, pollock, flatfish. The result has been declining imports in the EU and the US and a shift of exports towards emerging markets.

Pangasius been on and off the WWF's red list of species to avoid over the last decade. In 2017, the pangasius market in EU was strongly affected by the decision of the French retail giant Carrefour to suspend sales of Vietnamese pangasius in all its stores in Belgium, France, and Spain under the suspicion that pangasius farming was polluting the Mekong Delta. This happened despite the fact that a large proportion of Vietnamese pangasius has been certified sustainable by independent third-party certification schemes such as ASC, BAP and GlobalGAP¹².

A main source of confusion and basis for negative reporting have been import rejections by the Rapid Alert System for food and feed (RASFF) which provides notification of food safety risks before they reach European consumers. Pangasius products have been on the top of product lists that have been refused in the EU market (Nguyen, Chuong and Curtis, 2016). Pangasius recorded 56 RASFF notifications in its worst year in 2005. The frequency of notifications reduced after but peaked in

¹² <http://www.intrafish.com/news/1212717/asc-facts-dont-support-carrefours-pangasius-decision>

2009 and 2010 at 24 and 28 per year, respectively. These later notifications were due to microbial contamination (Little et al., 2012).

However, as regards safety of pangasius, (Murk, Rietjens, & Bush, 2016), after analysing contaminant levels encountered in pangasius, collected from the EU Rapid Alert System for Food and Feed (RASFF) database, report that the toxicological risk assessments do not support any of the toxicological risks suggested in the media. They conclude that such mass-mediated risk create confusion, with economic consequences for both seafood exporting countries like Vietnam and for seafood importing regions such as Europe.

The image problem has not been helped by issues related to tempering pangasius with phosphates and increasing water content through tumbling and soaking. Although these techniques are allowed, they are often unwanted by consumers. According to studies of (Anh et al, 2010; De Silva et al., 2010 and Cenci, 2004), the water quality of the Mekong, which remains largely unindustrialized, is clean compared to that of most European rivers . Studies of waste-water released by production and processing of pangasius plants found the limited contribution to overall nutrient loadings at less than 1% of the total suspended solids (TSS), nitrogen and phosphorus in the Mekong Delta. When all factors are considered, the overall environmental burden of pangasius is relatively minor compared to that of numerous other systems of food production.

However persistent negative claims about pangasius' safety and environmental issues in the E.U. markets have damaged the fish's image and destroyed the industry's reputation. The image problems act as a barrier to growth in exports, as well as a product upgrading associated with a price premium. Vietnam's pangasius exports were worth USD 1.78 billion (EUR 1.43 billion) in 2017, an increase of 4.3 percent from 2016. However, the export value to the U.S. and E.U. fell 11 percent and 22.3 percent, respectively (Seafoodsource, 2018). Some seafood experts have collectively created a new term for the campaigns surrounding pangasius, calling them the "whitefish wars, which is driving the Vietnamese pangasius away from EU and US markets. China and Latin America has emerged as the strongest market for Vietnamese pangasius.

3.4 Trade barriers

In addition to reputational problems, other trade barriers in the form of import tariffs also exist and apply to pangasius imports. A tariff is a tax on imports intended to generate income and to maintain a level of protection against high import volumes that might threaten national businesses. In general, high tariffs are placed on processed and finished goods, whereas lower tariffs are placed on goods considered to be raw materials that are essential for local industries. Import duties calculated on the basis of the tariff and the value of the goods (Seafish, 2017).

Vietnamese pangasius is continuing the tariff barriers in US markets since 2000 when the "Whitefish are began". In that year, about 90 percent of the catfish imported by the U.S. was from Vietnam. Recently, in September 2017, the U.S. Department of Commerce decided to preliminarily raise the anti-dumping duty on Vietnamese frozen pangasius fillets to USD 2.39 (EUR 1.95) per kilogram under its 13th administrative review of the antidumping duty, tripling the previous rate. In addition, since 2 August, 2017, the Food Safety and Inspection Service, an arm of the U.S. Department of Agriculture, has inspected every single catfish shipment entering the U.S. As a result, total U.S. frozen catfish imports declined by 18 percent during the first half of 2017 (Seafoodsource, 2018).

At this time Vietnam falls under the General System of Preferences (GSP) system introduced by the EU Council regulation R0978/12 (01/01/2015). The tariff applying to different pangasius products imported into the EU are given in However, as the status of all the countries is being reviewed, it may be that in the future they are confronted with higher tariffs. An example of the consequences of higher import tariffs is the Thai shrimp industry, which lost its preferential status for the EU market in the year 2000. As a result, exports to the EU dropped dramatically while exports to the US increased rapidly. Only after the Tsunami in 2004, when Thailand regained its preferential status, did shrimp exports to the EU recover slightly (Duijn et al., 2012).

Table 12. Import tariff applying to pangasius goods imported into the EU (as of Feb 2018). Source: UK GOV

Commodity code	Name	Tariff regime	Tariff
0302720000	Fresh or chilled catfish	Tariff preference	4.5%
0303240000	Frozen catfish	Tariff preference	4.5%
0304320010	Fresh, chilled fillets catfish	Tariff preference	5.5%
0304620000	Frozen fillets catfish	Tariff preference	5.5%
1604199190	Fillets, raw, merely coated with batter or breadcrumbs, whether or not pre-fried in oil, frozen	Tariff preference	4.0%
1604209090	Other prepared or preserved fish	Tariff preference	10.5%

3.5 Market integration

Pangasius in the European retail market (mainly in the form of frozen fillets) is part of the market of frozen whitefish and thus competes with other, more traditional for that market, frozen whitefish products, such as those based on cod, Alaska pollock, saithe, haddock (Bronnmann, Ankamah-Yeboah, & Nielsen, 2016) various flatfishes and hake and tilapia in Southern Europe.

It is valued as a generic white fish fillet which can be cooked in a number of ways, for the lack of bones, its mild flavour and primarily for its competitive price (Carson, 2013).

The lack of sufficient differentiation from other whitefish commodities (being closely integrated into the whitefish market) means that producers in Vietnam are exposed to and influenced by external factors such as fisheries quotas and the supply of wild-fish products (Bronnmann et al., 2016).

3.6 Regulatory

In an effort to improve the conditions under which pangasius is farmed and processed, and the image of the entire industry, in 2014 the Vietnamese government issued a decree outlining a number of specific requirements for producers, processors and exporters. Two notable requirements for producers were that “The breeds, feeds, veterinary medicine, bio-products, microorganisms and chemicals used must be consistent with the law,” and “By December 31, 2015, every commercial Pangasius farm must obtain the Certificate of Good Aquaculture Practice according to VietGap or an international certificate that is consistent with Vietnam’s law.” The Deputy Chair of Vietnam’s Association of Seafood Exporters recently stated that roughly 50% of farmers have attained compliance with certification requirements (Nguyen, Chuong and Curtis,

2016). Pangasius processors are obligated to comply with the demands of the decree and with a number of requirements. These requirements include tracing the origins of processed Pangasius products, and applying a quality control system. Technical regulations and standards for food safety and hygiene during manufacture and sale of aquaculture products must be followed. Producers and processors must obtain a certificate of food-safety facility issued by a competent authority and ensure the announced quality of Pangasius products, carry out inspections and take responsibility for the announced quality, and label goods in accordance with the law Lutz, 2016)¹³.

3.7 Governance

The Viet Nam's Fisheries Development Strategy plan to 2020 has the ambitious goals of establishing the seafood sector as a global leader in seafood exports through a growth rate of 8-10% annually in the contribution of the seafood industry to agro-forestry-fisheries sectors' GDP, reaching 35% by 2020. The goal is to be achieved by efforts along the value chain including growing the sectors' total output mostly through aquaculture while protecting fisheries resources. The increase in aquaculture is to be achieved through diversification into tilapia and marine fish production in order to become less dependent on the production of shrimp and pangasius. In the short term, however, government programmes support these two species as they are considered the key export products. Also, clams, oysters and mussels are seen by the government as an important growth sector and therefore the government provides incentives to entrepreneurs in this subsector (Duijn, Beukers, & Pijl, 2012).

3.8 Assistance

The Vietnamese seafood sector also receives a considerable amount of bilateral assistance from European countries, such as Denmark and the Netherlands, for example focusing primarily on the aquaculture subsectors and exports. The most important target species are pangasius and shrimp. In the context of the Aquaculture Stewardship Council (ASC), there is a lot of interest from NGOs such as WWF, IUCN, Oxfam and IDH, particularly for pangasius. For pangasius, IDH focuses mostly on providing financial and organisational support to exporters and large-scale producers to help them certify pangasius production in order to obtain the ASC label (Duijn et al., 2012).

3.9 Access to capital

Interest rates in the producing country affect competitiveness. Many producers in Vietnam rely on loans to run their operations and finance new investments. When faced with high interest rates and strict lending policies by local lending institutions farmers are unable to take them. Thus, requirements for additional investments for compliance with a standard, for example, may become unaffordable for many. In 2011 and 2012 many producers were forced to cease operations due to high interest rates and thus inability to purchase inputs for the new cycle (Nguyen, Chuong and Curtis, 2016).

Access to capital also occurs through foreign direct investment. A significant proportion of the investment since 1988 has been made by regional investors including Singapore, Korea, Taiwan, Japan, Hong Kong through companies such as Hung Viong and Agifish (Nguyen and Jolly, 2017).

¹³ Lutz, G. C. (2016). Vietnam Pangasius Industry still Facing Difficult Times; Aquaculture Magazine; February March 2016.

4 Sectoral competitive environment

4.1 Sector structure

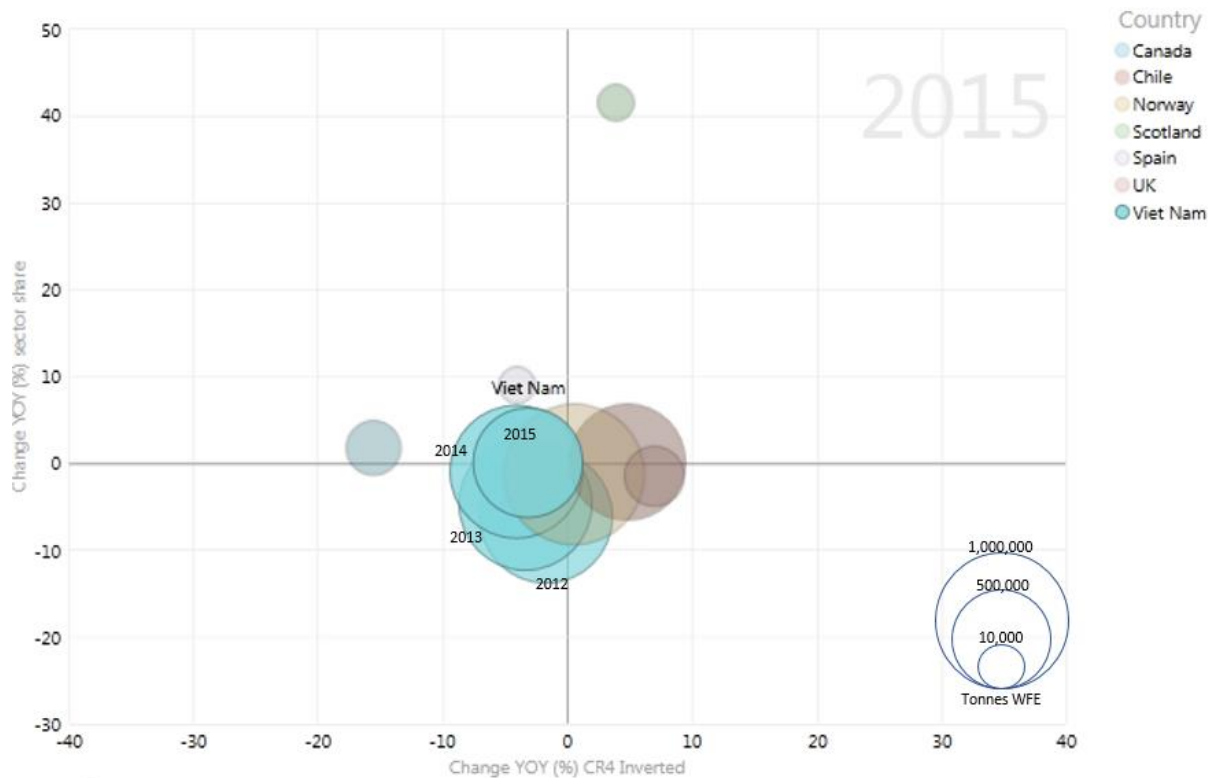


Figure 2. Sectoral dynamics. The x-axis presents year-on-year change in the inverted concentration ratio (CR4) for the Vietnamese pangasius export industry. CR4 calculated based on export value (USD million) of the top 4 largest exporters, 3 year rolling average. The y-axis shows year on year change in the share of the national sector output in the total global output for the species (3 year rolling average). Data sources: company reports, VASEP, FAOSTAT

The pangasius farming stage of the value chain is fragmented, composed of a large number of small-scale enterprises, due to low barriers to entry. According to MARD in 2004, there are more than 15,000 households who raise pangasius (Khoi, 2010). During the last several years however, the development in the pangasius sector has resulted in more large-scale producers and the disappearance of many small-scale producers. The concentration trend is illustrated in Figure, which shows that share of the four largest companies in the total pangasius export value of the country, has grown from 25.5 to 34.3% for the period 2011-2015.

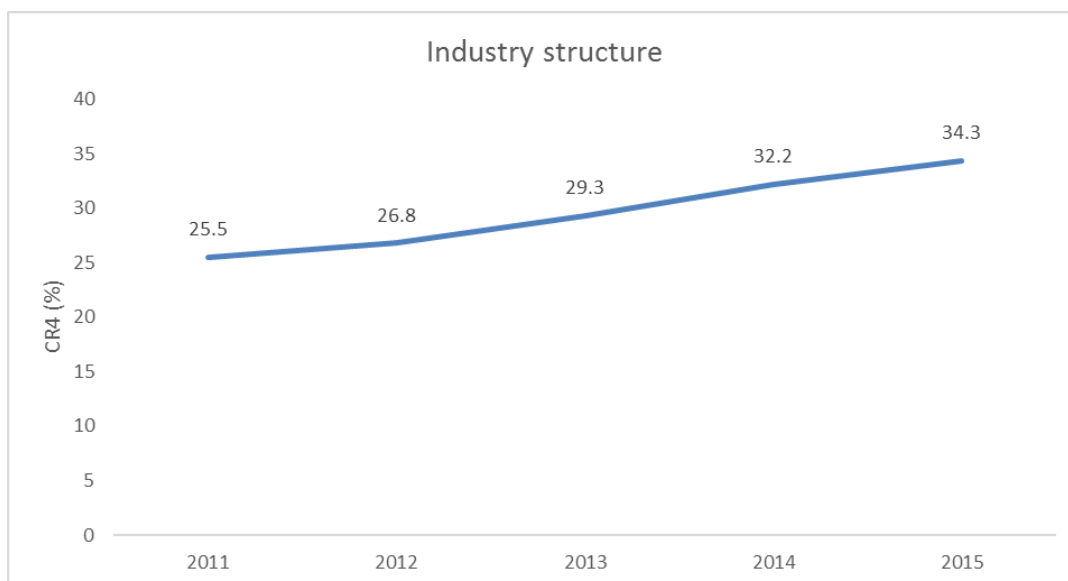


Figure 3. Concentration ratio (CR4) in the Vietnamese pangasius export industry. Based on export value (USD million) of the top 4 largest exporters. Data sources: company reports, VASEP.

Although the number of commercial large-scale pangasius farms is increasing the vast majority of pangasius farms are still smaller than one hectare. This especially is the case in provinces that have a long-standing fish farming tradition such as An Giang where more than 70% of pangasius production originates from small-scale producers (CBI, 2012). Provinces located more downstream in the Mekong River Delta, where pangasius farming only arose when it became clear that it had a great export potential, have more large-scale commercial farms. These are often directly owned and managed by export companies.

According to the Vietnamese Association of Seafood Exporters and Processors (VASEP) there are 534 seafood processing establishments in the country that are licensed by the National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQAD) and which therefore have permission to export. For exports to the EU and US additional NAFIQAD licenses are required. By the end of 2011, 393 companies were licensed to export to the EU. The total volume of processed fish products in 2010 was more than 1,500,000 tonnes. Vietnam has more than 400 freezing factories with a daily capacity of 7,500 tonnes (Duijn et al., 2012). Most of the large-scale commercial farms are owned and operated by export companies while most of the small-scale are operated by individual households.

In Vietnam many companies are traditionally owned by the state or joint-stock companies. Only recently has the number of private companies risen.

Table 13 provides an overview of the types of companies that were licensed for seafood exports in 2009.

Table 13. Type of seafood processing company and geographical distribution in VN in 2009. Source: Duijn et al. (2012)

Type of company	Red River Delta	North Central and Central Coastal	Southern Delta	Mekong River Delta	Total
State-owned	6	33	30	22	91
Joint stock	9	30	47	73	159
Private	3	71	114	104	292
Joint venture	4	0	4	1	9
100% foreign capital	4	0	4	1	9
Total	26	134	199	201	560

The North Central and Central Coastal area, the Southern Delta and the Mekong River Delta are the three most important regions for seafood processing plants. The companies in the Red River Delta and the North Central and Central Coastal Area mainly source captured products and Pacific White shrimp which is a rapidly developing subsector in these regions. The Southern Delta region, of which Ho Chi Minh City is the capital, follows the Mekong Delta as the most important region, and a strategic one, as it is easy to source from both the central and southern regions. Furthermore, high quality workers and highly educated staff are easy to find here. Moreover, Ho Chi Minh City has an increasingly important export harbour from which products can be directly shipped to most export markets. In the Mekong River Delta, the number of processing establishments has increased rapidly since the cultured production of Black Tiger shrimp and Pangasius increased rapidly. At present it is the most important source of raw material for the Vietnamese seafood sector (Duijn et al., 2012).

4.2 Productivity

The productivity of pangasius farms is very high. Earthen ponds accounted for 99% of total production in the Mekong Delta in 2011, with stocking density of 20-40 fingerling/m² resulting in a harvest of 20-40 kg/m² (SEAT). Depending on the price that exporters pay from the product, farmers harvest their ponds ideally after 6 months when they can harvest fishes of 700 grams which is the preferred size by exporters. If the price is low, farmers can decide to grow their fishes to 1 kg with the hope that prices will improve. If a farmer harvest after 6 months he or she can harvest approximately 1.8 times per year. This yields approximately 250 tons of pangasius per harvest from a 1 ha pond. In November 2011 the farm gate price of pangasius is approximately between 25,500 – 27,000 VND or USD 1.2-1.3 / kg (CBI, 2012).

4.3 Standards

The increased focus on sustainability and food safety results in higher quality standards with respect to production and hygiene. The high level of EU food safety standards compared to the level of standards in markets such as the US, Japan and especially alternative markets such as South Korea or

the Middle East, may constitute a barrier for exporters for whom the costs of compliance are too high. If, for whatever reason, the local supply chain in shrimp producing countries cannot meet these requirements or is not able to pass the tests that need to be carried out, this may constitute a reason to export to other countries instead. In recent years it has happened that as a result of rejection by the EU (and also US and Japanese) health authorities, on the basis of the presence of antibiotics, for example, exporters shifted their focus to other markets where health standards are less stringent than in the EU. This ultimately results in different supply chains for specific end markets that each have own levels of quality. Contrary to other barriers, such as import tariffs, this barrier may be eliminated in the countries where shrimp are produced, as institutions can be strengthened and producers can be trained for compliance with EU standards. Traceability is an issue in aquaculture production, as it is used as a means to be able to trace the origins of unsafe seafood.

4.4 Buyer relations

The majority of pangasius products in developed country markets are distributed through retailers who have high bargaining power and can dictate the terms of trade. The image problems associated with pangasius and pressure from lobby groups, have stimulated buyers to outsource their reputational management through third party certifications schemes. These have pushed producers to adopt horizontal and vertical integration strategies in order to respond to the requirements for scale and control over the value chain (traceability) and quality. This pressure has led to a restructuring of the sector into a much more integrated one, while smaller producers have been excluded and pushed to abandon the activity or supply domestic markets.

The large-scale commercial farms are therefore quickly moving towards more sustainable production and certification of the pangasius farms. For household farms that lack the required investment capital, this process is going slower, or leads to exclusion from the value chain. However, the Vietnamese government and NGOs are helping farmers to organize themselves and to develop infrastructure through which small-scale farmers can also proceed towards certification (CBI, 2012).

4.5 Key success factors

The success in the pangasius export industry in the EU and US markets is influenced by the structure of the company, in favour of structures which provide the highest level of control over the value chain, i.e. highly vertically integrated companies. The highly demanding US and EU markets are serviced increasingly by large vertically integrated companies which are able to provide full traceability from for their products and adherence to a number of sustainability and food safety standards demanded by importers. These companies are aiming complete self-sufficiency in the provision of raw materials for processing as this is seen as a major area or risk for processor. Reliability on purchasing of raw material from small-scale processors shows a diminishing trend in the export business, because of trust issues and lower level of control over the upstream value chain. Non-vertically integrated companies are less likely to be able to meet the strict requirements imposed by developed country buyers and thus may seek other less demanding export markets.

4.6 Strategic directions

The biggest companies are set up as corporations which are involved not only in pangasius business but in other food related areas. Vinh Hoan, for example, while having its core expertise in pangasius has diversified in wider food industry in order to reduce risk, through grain business, general seafood

processing business and by-product processing into high-value inputs for cosmetics such as collagen and gelatine. These businesses are at different stages of growth and can serve as a 'buffer' at times of hardship in the pangasius business. However, all businesses are related and thus benefit from the management expertise of HQ in the food industry. On the other hand, Hung Vuong Corp has diversified into unrelated areas such as real estate, and experiences problems allegedly due to the vastly different nature of business activity in its portfolio.

Recognising the limitations of the "traditional" export markets (EU, North America), larger companies (see case studies) have been actively developing new markets such as in Asia, Middle East, Russia and Latin America, as well as domestic consumption, while maintaining position in the "traditional" export markets. Smaller companies such as An Phu Seafoods, are also looking for growth at in emerging markets. Competition in existing markets for them is more likely to be based on superior quality rather than price as they do not benefit from economies of scale and the cost savings of big companies. However, competition is difficult even based on quality as large companies are also moving fast along that trajectory and but are more able to provide competitive prices. Small company advantages thus lie in established good relationships with buyer and good reputation as a brand and trading partner.

4.7 Vertical integration

The analysis of case studies shows that in order to compete effectively on the pangasius market, a company has to be vertically integrated. The fully integrated production system allows the company to ensure quality products, environment management and reducing costs that generate competitive advantage. Such a move eliminates the necessity for dealing with a large number of small-scale suppliers and the quality and consistency risks associated with that, as well as capture more value from upstream or downstream activities (Ulrich and Tran, 2010). Currently only a small share of the production destined for export is marketed through middlemen or traders. FAO estimated that more than 84% of the small-scale farmers sell their product directly to processing companies while this is the case for 100% of the farms that are larger than 0.5 hectares (CBI, 2012).

Such strategy however is more suitable for large scale processors who have the resources needed for investment in a farming function. The typical starting point for vertical integration is the processor stage, which then acquires a farming operation. The larger processing plants are also those who have been able to upgrade their equipment and technology to benefit from a more efficient process and comply with standard requirements (Trifkovic, 2014). Such firms have been the first to obtain ASC certification for their farming units. An exception seems to be Hung Ca Co. which started out as a farm and integrated into processing and backward into feed. Before integrating vertically, however, the company had already become a leader in farming and a main supplier for the domestic market

While striving to achieve complete self-sufficiency in raw material production, processing plants who still source a proportion of their inputs from other farmers have tried to reduce risk and dealing with supply continuity through establishing stronger relationships with farming enterprises. In this arrangement, processors supply a proportion of the inputs needed for farming, information and technology to farming enterprises under the farmers' obligation to sell the fish to them. A marketing contract stipulating the quantities and price linked to this is also possible (Cuyvers and Bin, 2008; Trifkovic, 2013).

4.8 Quality upgrading

Companies servicing the developed country markets need to ensure high product quality. Both large and small companies upgrade their products and processes to ensure high quality, safe and consistent products. However, differentiation is especially important for smaller companies who do not have the economies of scale to compete of price with large enterprises. This is illustrated by the case of An Phu who has built a reputation for premium products.

In response to the reputational treats, many exporting companies have focused of broad differentiation based on quality. This type of differentiation allows them to access the demanding developed country markets. To improve the quality of their products they have engaged in product, process and functional upgrading. Due to the mass-scale certification VietGAP, more or less the entire sector has upgraded is production methods resulting in an overall safer and better quality product. Since many companies have followed this strategy, the basis for differentiation on quality has been eroded and has become a basic requirement for access into the EU market. Similarly, certification is also not a point of differentiation but simply a “license to operate” demanded by the buyers. However, as regards other markets, especially emerging ones, there is a marked difference in quality, compared to EU and US markets.

Accordingly, Vietnam has expanded its presence in Asian markets, like China, India, Japan and Thailand, who imported last year more catfish than in the past. Also, FAO reported that Latin America has emerged as the strongest market for Vietnamese pangasius. In the first half of 2017, countries from this region imported 15 percent more frozen pangasius compared with the first half of 2016, reaching a total of 75,000 MT of whole frozen and frozen fillets. Brazil overtook Mexico as the biggest buyer of pangasius with a 22% increase in imports. The average import prices rise with 39% in whole frozen and with 7% in frozen fillets.

4.9 Value added products

Another source of differentiation, in which many companies are becoming engaged is value-added products. Such products are becoming increasingly popular in China and other emerging markets. While the proportion of the total sales derived from value-added products is still small, it is believed that this is a source of future value growth and reduction of the competition based on price.

However, even on the EU market, rather than try and compete at the bottom end where business is cut throat and margins are slim with prices at about \$2.60-2.70 per kg CIF for skinless IQF pangasius fillets, forward looking companies are starting to introduce value-added pangasius products. The two most common lines are pangasius fillets marinated with flavours such as lemon grass, lemon pepper and coriander, and breaded fillets. Both products are proving popular in supermarkets in Belgium, the Netherlands, Germany, Croatia and the UK, and there are reports that sales will be expanded to other countries. Prices paid to Vietnamese exporters for marinated pangasius fillets are about \$5 per kg. Moreover, the tariffs for breaded fillets seems to be lower than those for unprocessed ones, see Table 12.

Reference,

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5 Strategic positioning case studies

5.1 Case study summary

Table 3 shows a synthesis of the case studies discussed in sections 5.2-5.5 below.

Table 14. Comparison of case studies

	Vinh Hoan Corp.	Hung Vuong Corp.	Hung Ca Corp.	An Phu Seafood Corp.
Type of company	Joint Stock Company	Joint Stock Company	LTD	CORP
Established	1997	2003	2006	2007
Number of employees (2016)	7,000	16,000	4000	Around 1,500 employees (Tam Tru 2015) However, there are 53 employees working at 2 An Phu's farms in Ben Tre (ASC 2017a)
Turnover (2016)	VND 7,369,982 (€261 million)	€ 691.34 million	USD 54 Million USD	37 (Export value 2015)
Scale	Large	Large	Large	Small-Medium
Profit margin (2016) %	7.76%	0.32%	NA	
Share in VN Pangasius (2016) %	15%	7.0% (3 rd)	3% in 2016 Top 4 Pangasius/Basa/Tra Fish supplier in Vietnam.	
Operations	International	International	International	International
Ownership	Publicly joint stock company	Publics	Private	Private
Value chain activities	Farming, Processing, Exporting, Feed manufacturing	Fish fingerlings production, Feed production, Aquaculture, Processing and export, cold storage	Farming, Processing and Exporting Pangasius Products	Packing or Repacking, Processing - Preservation, Processing - Primary processing, Processing - Secondary processing, Storage, Trading Fish

				(Buying/Selling) of Pangasius Products (ASC 2017b)
Standards		HACCP standard as well as Global GAP, BRC, IFS, GMP, ISO 9001: 2008, ISO 22000: 2005, HALAL, ISO/IEC 17025: 2005, ASC, BAP and VietGAP	HACCP, BRC, HALAL, ISO 22000, IFS, GLOBAL GAP, ASC	GlobalGAP, BAP, ISO 22000:2005, BRC 2005, ASC
Products	Frozen pangasius, value-added pangasius, collagen and gelatin	Frozen, fresh fish and add-valued products from pangasius fish.	Pangasius Fish Fillet, Pangasius Whole Fish, Value Added Products, Block, loin and portion pangasius	Pangasius Fish Fillet, Pangasius Whole Fish, Value Added Products, Block, loin and portion pangasius
Buyers	Importers from U.S., EU, Australia, Canada, China, Hongkong	Importers from EU, Middle East, the U.S., Australia, Russia, Mexico (Rusian Fish Company; E Guillem, S.L.; Mascato)	America, North US, South US, EU, Africa (Morocco, Algeria, Nigeria), Asia, Middle East, Russia	West Europe; East Europe; Canada; Australia; Asia; South America; Middle East; Africa, Egypt...
Markets	The U.S., the EU, Australia, Canada, China, Hongkong	EU, Middle East, the U.S., Australia, Russia, Mexico	America, North US, South US, EU, Africa (Morocco, Algeria, Nigeria), Asia, Middle East, Russia	West Europe; East Europe; Canada; Australia; Asia; South America; Middle East; Africa, Egypt...
Competitive strategy	High quality product, renowned brand name, and expanding direct distribution channels, and exploring new markets	Merger & Acquisition, closed process production, multi-sector investments	Reduce the cost production and ensure best quality	Reduce the cost production and ensure best quality
Corporate strategy	Expansion into related activities to core business field	Unrelated to core business field		

Appendix 1 - Cod country reports from Iceland, Norway and
Newfoundland



Fisheries Value Chain
Evaluation of industry dynamics, opportunities
and threats to industry

Icelandic COD

Prepared by

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February 2018

HHI index - Iceland

In the industrial organisation literature, various measures have been utilised for the analysis of market structure (Bikkar and Haaf, 2002), some of which have also been employed to study consolidation in the fishing industries. These include the application of simple concentration ratios (CR) (Pálsson and Helgason, 1995; Runolfsson, 1997; Runolfsson and Arnason, 2001; Stewart and Callaghan, 2011) as well as the Herfindahl-Hirschman Index (HHI) to measure market concentration (Connor, 2011; Stewart and Callaghan, 2011; Abayomi and Yandle, 2012; Gulf of Mexico Fishery Management Council, 2013; Haynie, 2014).

Concentration ratios are calculated by simply adding together the quota shares of a pre-determined number of firms. A five firm concentration ratio will thus show the combined quota share of the five largest firms, but will not consider how the quota is shared within this group of firms. This drawback can though be overcome by calculating several concentration ratios of different sizes. In this study, calculations are done on the quota share of the largest firm, and the 5, 10 and 25 largest firm in each fleet-segment at the beginning of each fishing year (September 1st – August 31st).

HHI (Herfindahl, 1950; Hirschman, 1945) is calculated by summing up the squared quota shares of the firms in question. This index is defined as

$$H = \sum_{i=1}^N s_i^2 \quad (1)$$

where s_i represents the combined quota share of firm i in all fisheries and N is the number of firms included. HHI looks therefore more closely at the distribution of quota and the relative size of each harvester. HHI may be presented in shares, in which case the index will take a value between 0 and 1, or as percentages in which case the index ranges from 0 to 10,000. In the case of a complete monopoly, HHI takes a value of 1 (10,000), whereas a value below 0.1 (1,000) indicates low concentration. According to horizontal mergers guidelines issued by the European Commission (EC), a HHI below 1,000 does not constitute grounds for competition concerns (EC, 2004).

21.1 Iceland

Since 1990, management of the Icelandic fisheries has been based on the Fisheries Management Act and its subsequent amendments. The management system distinguishes between two kinds of quota in each fishery: quota shares and harvest rights. The former are sometimes called “permanent quotas” and the latter “annual catch entitlements” or “catch shares”. Quota shares quantify the holder’s entitlement to a percentage of each year’s total allowable catch (TAC) in each fishery. A vessel may, for instance, hold a 1% share in the cod fishery. Once the TAC has been set, the harvesting quota for the fishery in question is simply calculated as the product of the vessel’s quota share and TAC.

Currently, there are two different types of general fishing permits, general fishing permit with a catch quota and a general fishing permit with a hook-and-line quota. In what follows the former are called regular quotas and the latter hook-and-line quotas. Hook-and-line quotas may only be utilised by boats smaller than 30 gross registered tonnes (GRT) that only use hand-line or longline. Both quota shares and harvest rights are transferable between vessels within each size category. Transfers from regular quota vessels to hook-and-line vessels are allowed but quotas may not be transferred from boats holding hook-and-line quotas to vessels holding regular quotas.

Agnarsson et al. (2016) analyse concentration in the Icelandic fisheries using both CR and HHI. The study is based on data supplied by the Icelandic Directory of Fisheries (DoF), a government agency charged with the task of monitoring fisheries and the daily administration of the fisheries management system. The data covers the period 1990-2014, which corresponds to the time the comprehensive ITQ-system has been in operation, and includes quotas of the following species: cod, haddock, saithe, redfish, golden redfish, ling, blue ling, tusk, wolffish, monkfish, greater silver smelt, Greenland halibut, plaice, witch, lemon sole, dab, herring, lobster, inshore and offshore shrimp, Norway redfish and demersal deep-sea redfish. Quotas for some of these species were though not issued in all years. For the period 1990-2001 information is only available on quota holdings of the 25 largest harvesting companies, but for the period after that data can be found on quota holdings of all harvesting companies, both those operating vessels with regular quotas and those operating hook-and-line boats. All the quota-data refer to the harvesting rights assigned to each vessel at the beginning of each fishing year and are denominated in cod equivalents. These are defined in the Fisheries Management Act as the unit value of each species relative to the unit value of cod, the most important fishery. The cod equivalents are calculated for each fishing year on the basis of the average unit value of the landings of each species during the previous May-April period. For vessels operating under the regular quota system, the combined share in all fisheries may not exceed 12% in cod equivalents, but the corresponding maximum for hook-and-line boats is 5%.

Both measures employed indicate that considerable quota consolidation has occurred in the Icelandic fisheries. The share of the largest firm holding regular quotas increased from 4.3% at the beginning of the fishing year 2001/2002 to 10.7% at the beginning of the fishing year 2014/2015, while the share of the 25 largest firms increased from 39% to 74% over the same period. The largest boat holding hook-and-line quotas held a 2.0% share in 2001/2002, but by 2014/2015 this share had almost trebled to 5.8%. The quota shares of the 25 largest firms increased from 23% to almost 57% over the same period.

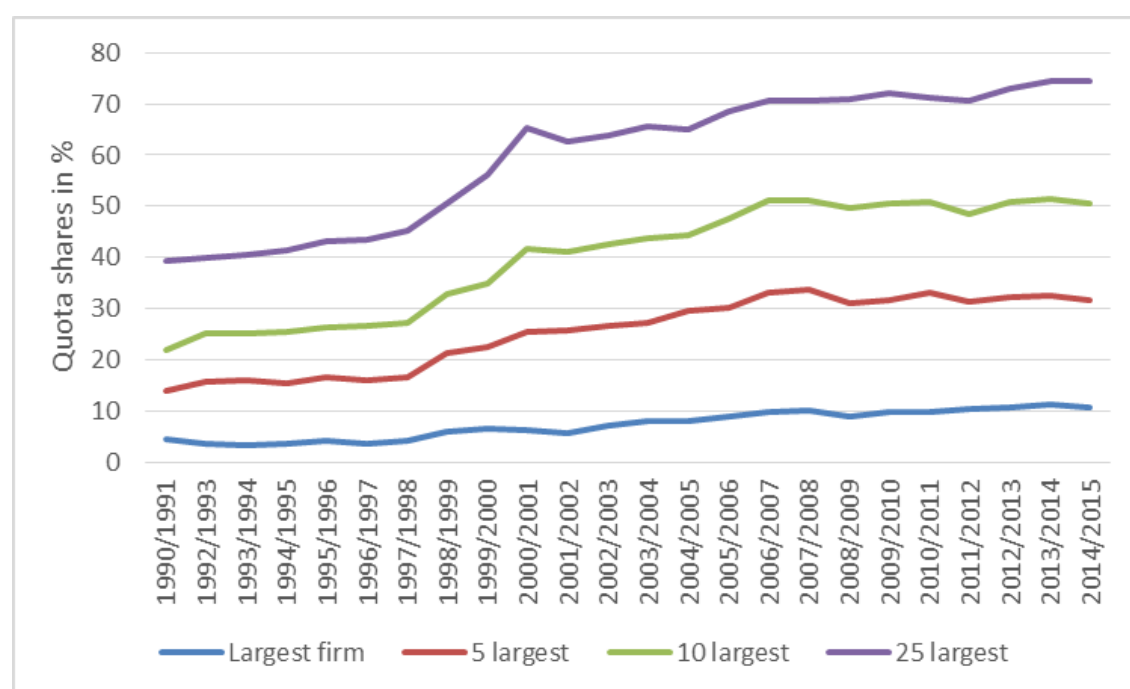


Figure 1. Quota consolidation among harvesting companies operating vessels with regular quotas from 1990/1991 to the fishing year 2014/2015. Source: Directorate of Fisheries.

The same trend can be seen in the quota consolidation among harvesting companies operating vessels with hook-and-line quotas.

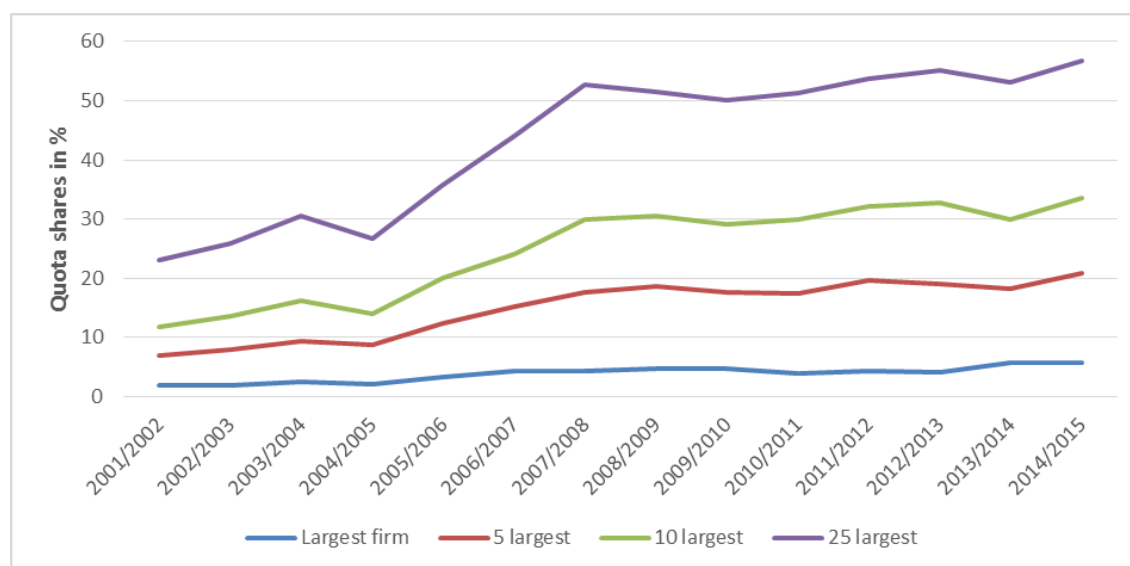


Figure 2. Quota consolidation among harvesting companies operating vessels with hook-and-line quotas from the fishing year 2001/2002 to 2014/2015. Source: Directorate of Fisheries.

Estimates of market concentration using the HHI are presented in Table 15. For harvesting companies holding regular quotas, the index takes values ranging from 265 observed in the fishing year 2001/2002 to 452 observed in the fishing year 2013/2014. The results for firms operating vessels with hook-and-line quotas are also quite low. The HHI value is 45 in the fishing year 2001/2002 but 183 in the fishing year 2014/2015.

As discussed above, HHI values of less than 1000 indicate low market concentration. The HHI values obtained here are much lower, and thus indicate that the market for quota shares is competitive. This is hardly surprising, given that there are quota ceilings in place for both fleet segments. However, although relatively small, the HHI values have increased over the period under study; by two thirds for the larger vessels and more than three times for the hook-and-line boats.

Some further consolidation has occurred since the fishing year 2014/2015 with individual boats or trawlers with quota or just quota being bought by VICs, however, the HHI is probably still far less than 1000, indicating low market concentration.

Table 15. Market concentration in the Icelandic fisheries the fishing years 2001/2002 – 2014/2015 as measured by the Herfindahl-Hirschman Index. Source: Directorate of Fisheries.

Fishing year	Regular license	Hook-and-line license
2001/2002	256	45
2002/2003	264	51
2003/2004	288	64
2004/2005	305	49
2005/2006	349	79
2006/2007	357	111
2007/2008	407	151
2008/2009	375	153
2009/2010	396	145
2010/2011	442	149
2011/2012	424	164
2012/2013	445	167
2013/2014	452	162
2014/2015	432	183

Fisheries management system - Iceland

General description

The quota system was introduced in 1983 in Iceland, with quotas on important species, either in the form of quantities or limitations regarding the number of days that ships could fish each year. Before 1983 a quota system had been introduced in the herring fisheries in 1975 and in 1980 this was extended to the fishing of capelin.

Main reasons:

- declining fish stocks
- collapse of the herring stock
- foreseeable collapse of the capelin stock unless preventive measures were adopted

The same can be said about the demersal species before 1983 when the stocks had been declining due to over-fishing.

Hannesson (1994) has pointed out that the ownership of quotas involves the right to catch the fish but does not entail ownership of the fish stock. Thus, it is claimed that the quota does not mean the ownership of the fish but rather the right to catch the fish.

In Figure the catch of cod is presented for the main quota groups for Iceland from 1982 to 2016.

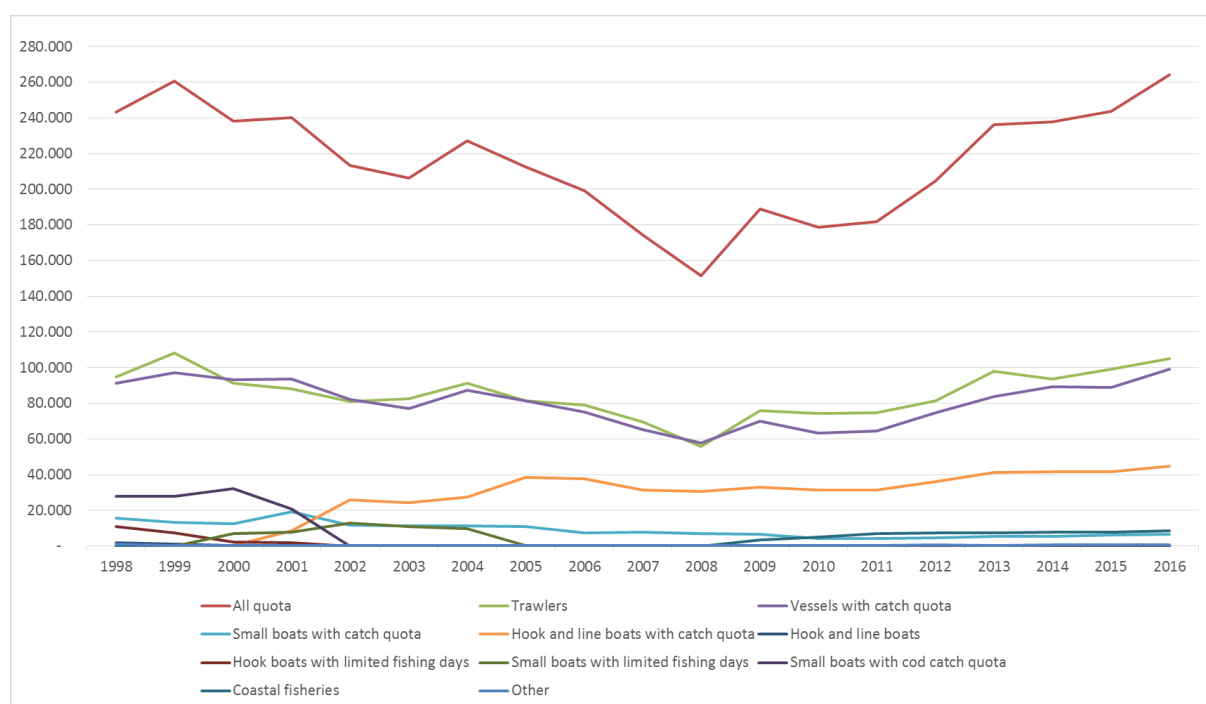


Figure 3. Catch of cod by quota class in tons in Icelandic waters, 1998-2016

Since 2001 small boats has been allocated TAC (Total allowable catches) and all effort based system abolished until 2009 when coastal fisheries was introduced. As can be seen in figure the share of small boats of the TAC was 14.2% in 1992 and is 22.3% in 2016. It peaked in 2001 when it was 24.1% of the TAC in cod. Part of this increase can be explained with changes in classification of small boats as in 2013 when small boat definition went from 15 gross registered tonnes (GRT) to 30 GRT.

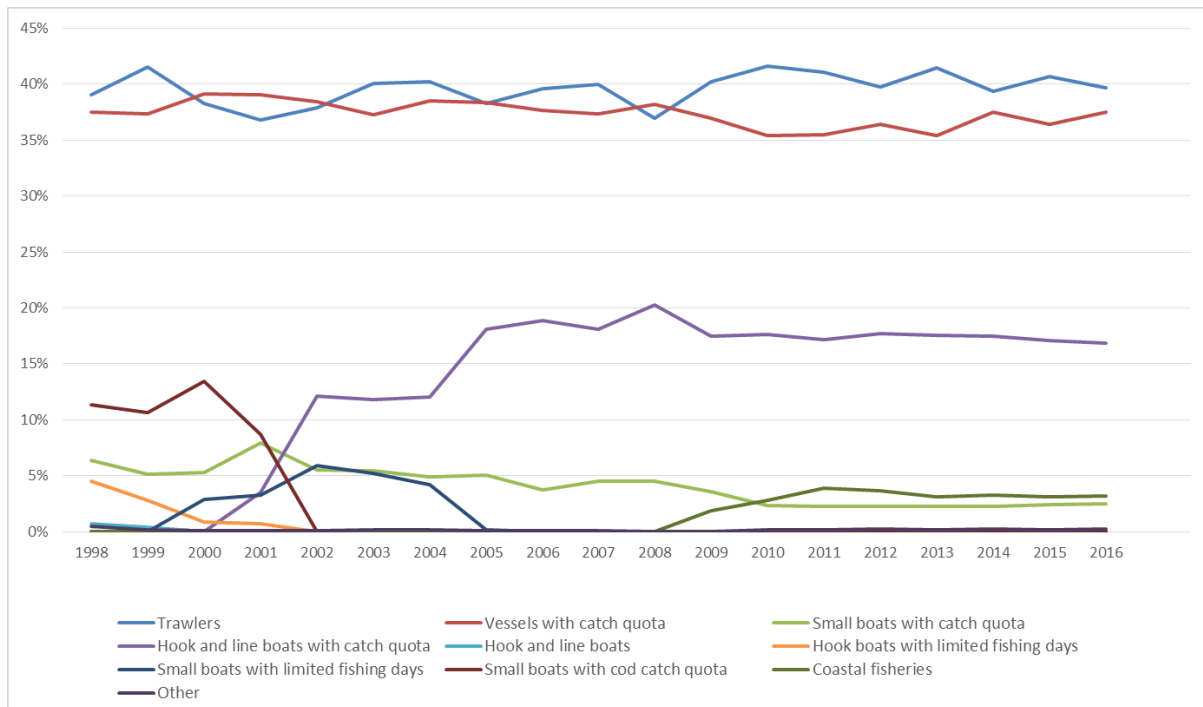


Figure 4. Share of cod catches according to boat types from 1998-2016

The emphasis of the fisheries management system since 2001 has been to simplify the system and bring all into the quota system of ITQ and TAC system. Against this, open access fishing was introduced in 2009 when new system was introduced for small boat called costal fishing (isl. strandveiði). In 2016 total 9790 thousand tones are allocated for coastal fishing one open access base from May to August. Coastal fishing is limited to small boats with maximum two handlines per person and maximum two person on the boat. The maximum 650 kg catch per day and fishing is limited to four days a week. The catch of cod during the four months fishing period in 2016 was 9315 thousand tons of cod. There are also limits of TAC for each area for the small boats.

By the 1990 Act the fishing year was set from 1. September to 31. August in the following year but previously it had been based on the calendar year. This was an effort to channel fishing of the groundfish stocks away from the summer months, when quality suffers more quickly and many regular factory workers are on vacation.

13.1 Main influences of management on value chain dynamics

The main influences were covered in deliverable 3.1, but here are some main characteristics of the Icelandic system.

Entry barriers into the system:

- All professional fishing in Iceland has to have licences for fishing.
- Capital intensive due to high price of quota
- Entry for foreign investments very limited (or closed).
- Economics of size
- Costal fisheries
 - Open access
 - Low profitability (returning loss for all years of operation)

Exit barriers from the industry

- Low exit barriers quota easily sold and market open
- No tax limitation for selling the fishing rights and ITQ.

Possibilities to upgrade in the system

- Limitation to move between system
 - hook system is looked in there but can be transferred inside that system
- Small boats can enter the costal fisheries even if they are operating in other systems.
 - only requirement's is during that time they only operate in costal fisheries.

Transferability of quota/regional regulations

- Quota ownership
 - Limitation on consolidation of quota ownership – max 12% ownership of TAC for each species.
 - Quota is bound to fishing vessel but companies with number of vessels can transfer quota between vessels.
 - 15% of TAC can be transferred between years by companies
 - 5% can be overfished in the fishing year and will then be withdraw from the companies next year TAC
- TAC cannot be transferred between systems, example from the hook system to the general TAC system
- There is regional restriction to fishing in the coastal fisheries
 - The fishing ground is split into 4 areas

Management measurements

- Landing obligation
 - None, except in coastal fisheries the fish has to be landed before 16:00 and in harbours in the fishing zone
- Min processing requirements
 - None
- Fishing days – regulations /number of days
 - Coastal fisheries have limitation (4 days pr. week/4 months)
 - Gear restriction in the hook system
- Quantity
 - In the coastal fisheries system
 - Max 650 kg pr. day/14 hours pr day
 - TAC for each area
- Closures
 - Marine Institute has licences to introduce closures fishing areas if for example share of small fish is too high according to landing or historical landing data
- Discard ban
 - There are measurement's in place to avoid discard
 - Limited withdraw on unwanted catch form TAC

- Up to 5% of fish that is damage can be landed as VS fish special weighted and not withdraw from TAC

HB Grandi

HB Grandi has a long history but it came out of many merges of companies through the history. The oldest company in this history is Haraldur Böðvarsson hf (HB) was established in Akranes in 1906. Other companies that stood behind HB Grandi is for example Bæjarútgerð Reykjavíkur (BÚR) established in 1947 and Ísbjörninn in Reykjavík established in 1944. In 1985 Bæjarútgerð Reykjavíkur and Ísbjörninn merged and formed Grandi hf. In 1990 Grandi and Hraðfrystistöð Reykjavíkur were also merged. All of those companies were located in Reykjavík. Then in 2004 Grandi merge with HB froming HB Grandi and therefore the operation of HB Grandi were now in two places, Reykjavík and Akranes. In 2005 Tangi hf in east Iceland merge with HB Grandi moving the operation to three places in Iceland. The company has gone through around 20 major merger or acquisition through its history. Behind the seven ground fish trawler through the merge of the companies around 20 trawlers are standing behind the seven trawler that are operating today.

Since the establishment of Grandi and later HB Grandi it has been one of the largest fishing companies in Iceland. In the last decade HB Grandi is the biggest quota holder in Iceland with **10.3% of Cod equivalents** of quota in 2016.

HB Grandi has integrated operations in fishing, processing and marketing in order to promote efficient production and ensure an unrestricted pathway from catch to markets. It is easy to trace the route of the product from delivery all the way back to the sea. The key to the company's success lies in its excellent staff, both at sea and on land, who are committed to delivering quality products to buyers and consumers.

QUOTATIONS FROM THE INTERVIEWS

Interlocutor about the cost of operating in the FMS.

..., okay, it's better to have higher dept and have an equal quota. We always bought quota when it was reduced, again and again. I think there are 4 or 5 systems that were in place in the small boat system and the same people just sold and went over to the free (costal) system"

Interlocutor asked about the political stability and the influence on the FMS

"There has been political usability in recent years and we have had to go through five (parliamentary) bills regarding FMS... and then we go out and try to find our way for the company. The company has been waiting and thus withholding their hands for years (without investments). And we can say that, as we really have, we

would rather have naturally built just the new freezer trawler, new processing facilities and new pelagic facilities sooner. Because there was a need for those investments. So we first went for the pelagic and then we're investing in ground fish processing now and I suppose we're going to invest in a freezer trawler because there is an urgent for that"

Interlocutor asked about the competitive status of the FMS in Iceland and the.

"I met Norwegian during the day. He was telling me that there was one ship that had been bought and sold there, or there was someone buying a trawler with three allocations. And he said regarding the allocation, that one was permanent but the other two were only short-term, only for 25 years. If we knew for 25 years how big share of herring we could catch, we would call it permanent"

Industry structure and employment

What characterizes the Icelandic seafood sector is a rather high degree of vertical integration between fishing and production. Around 80% of the cod goes through vertically integrated companies (VICs) that control fishing, processing and operate their own marketing division or even sales offices abroad. Figure shows an overview of the structure of the Icelandic cod value chain. Brief information about the linkages in the value chain is presented below for fresh and frozen fish.

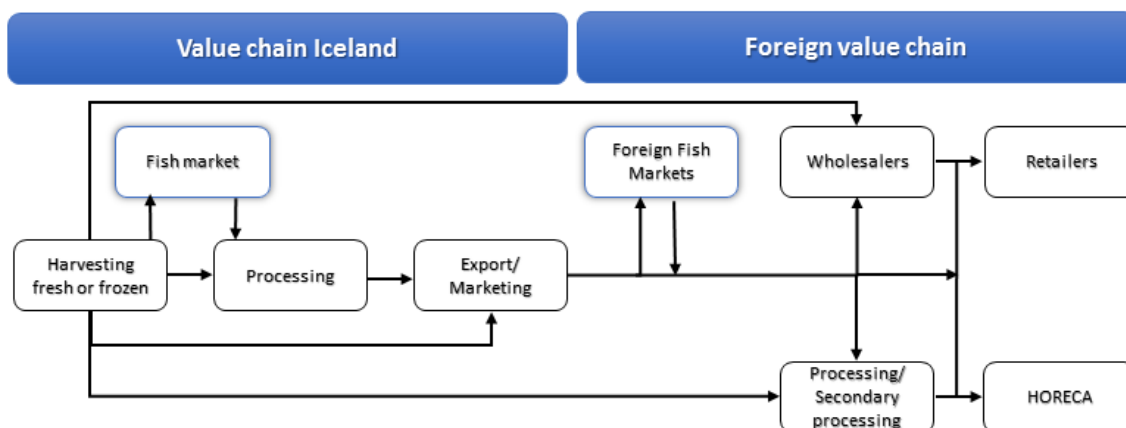


Figure 5. Icelandic cod overall value chain structure.

In Iceland the exchange of wet/fresh/frozen fish is dominated by these modes of exchange and goes into processing and markets via for main channels:

- Auction sales (fish markets) to processors
- Fish sourced from own vessels (vertically integrated fisheries companies, VICs) to land based processing and to direct export in unprocessed form (fillets)
- Direct sales contracts between fishing vessels and processors
- Processed at sea and usually sold direct to HORECA sector

The salted product is usually processed in Iceland and sold to wholesalers in Spain and Portugal who distribute the products to the retailers and HORECA sector.

In the frozen fish the fish is usually sold direct to foreign wholesalers that distribute the product to the HORECA sector. Part of it goes also into secondary processing abroad where the fish is sold as chilled or used in ready meals.

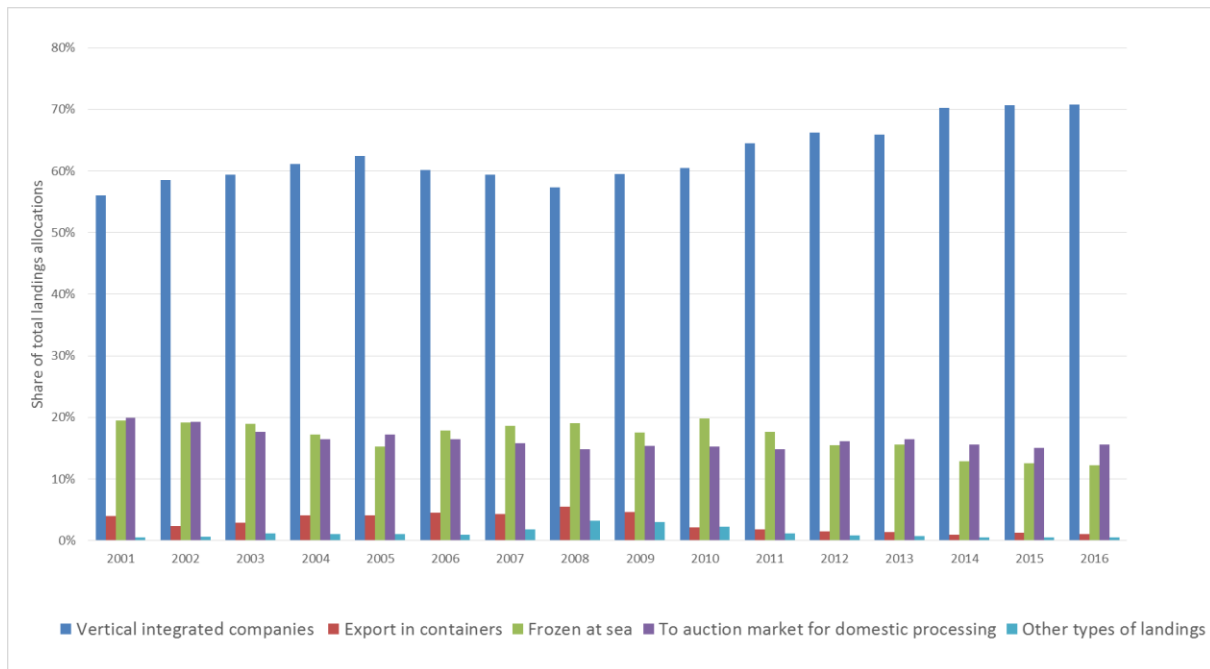


Figure 6. Allocation of cod landings by different sale methods (Statistics Iceland).

It is interesting that 1994 the domestic processing through vertical integrated companies accounts for 50.3% of the total landing. During the same time the auction markets accounts for 22.4% and frozen at sea 21.9%. Frozen at sea reached its peak in 1995 where 23.5% of the cod was allocated to that processing since then the frozen at sea has been declining and was in 2016 around 12.2% and is still declining. The auction markets for cod peaked in 1997 when 25% of the cod went through the markets. Recently the auction markets have been getting around 15% of the cod through their gates per year. This indicates that around 85% of the cod goes through vertical integrated companies (VICs). Estimating how much of the cod goes through VIC is a bit difficult as the VIC sell some of the cod that does not fit into their production on the auction markets. It is estimated here that they buy back equal amount as well that the companies operating frozen at sea are regarded VIC. There is a clear sign that the VIC companies have acquired more of the cod quota through the ITQ system since introduction of ITQ.

Export of whole fresh fish was what individual boat owners did to receive higher prices for their fish as no auction market was operating in Iceland until 1987 and the price was decided by a price settling committee. During that time, the price decided by the price settling committee was regarded low by the independent boat owners.

In 2016 it is estimated that 6,600 people worked directly in fishing and fish processing, which is a decrease of 100 from the year before as can be seen in Figure . The number of jobs in the seafood industry accounted for 3.5% of total jobs in the Icelandic economy in 2016. The seafood sector remains one of the pillars of the Icelandic economy, responsible for a fair share of GDP (8.4%) which is far higher than the percentage of total jobs in the industry.

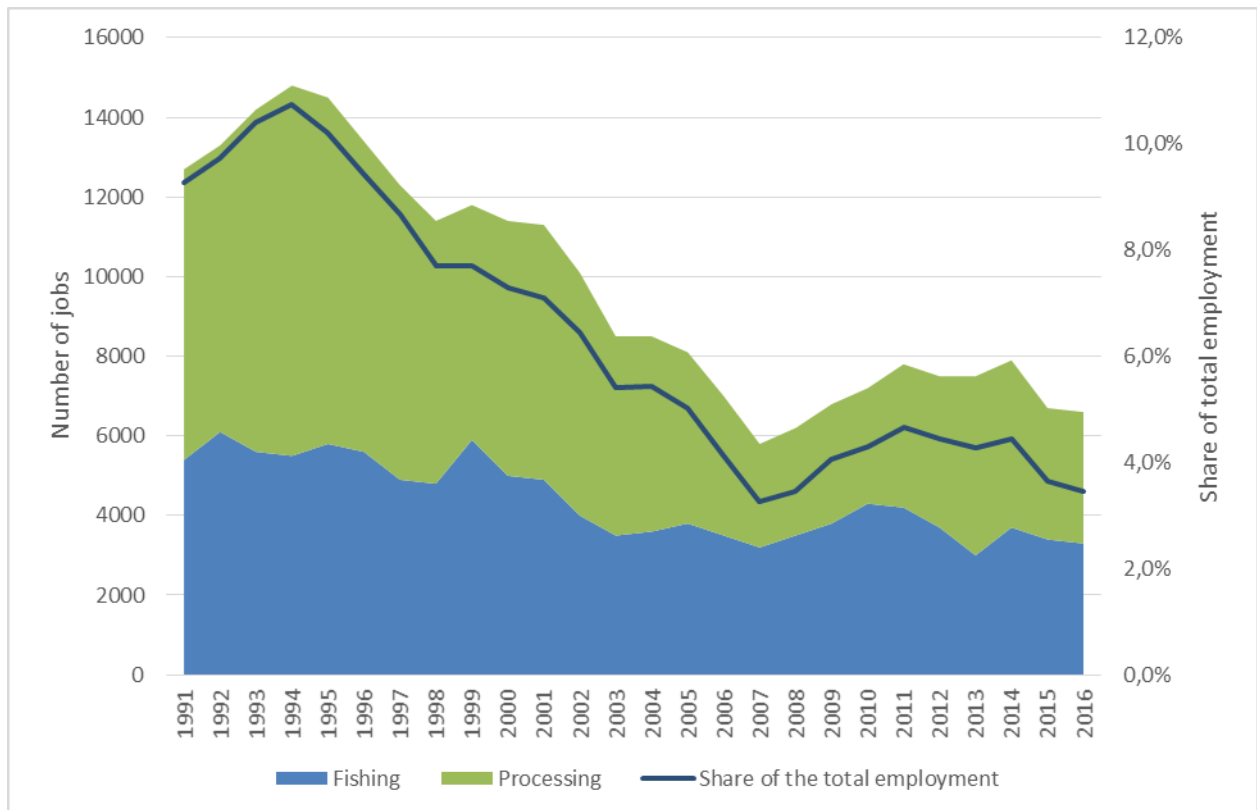


Figure 7. Number of jobs in fishing and processing 1991 to 2016.

According to data from Islandsbanki, each employee produced product for 48 million Icelandic krona (382 000 €) and has that number been on the rise for several years, due to automation in processing and partly because of better technology in the fishing sector. Productivity in the seafood industry has increased in recent years:

- Productivity has increased because of more automation, both in fishing and processing of seafood.
- Fish is more processed in Iceland instead of exporting HG (headed and gutted) fish for further processing abroad
- Changes from processing on sea to processing on land, where utilization is better (better filleting yield) and promotes better use of by-products creating more value from each fish.

Fishing

Structure of the fleet (Demersal fish stocks).

The Icelandic motor fishing fleet has traditionally been split into 3 groups; trawlers, decked boats, and undecked boats. The decked boat category is by far the most diverse as it ranges from small boats (smaller than many undecked boats) to large purse-seiners and multipurpose vessels. However, the separation of decked boats and trawlers is not very clear since many decked boats can also operate trawls. Many of the decked boats are also structurally similar to stern trawlers, and some of the old side trawlers were converted to purse-seiners, which put them into the decked boat class. This classification is in fact a kind of an anachronism from the times when trawlers were much larger than all the other boats. This started to change around 1960 when large purse-seiners began operating.

In **Error! Reference source not found.**fig 8 the number of licenced vessel is express according to the quota system they are participating in. From this figure it can be seen that the total number of vessel has gone down from 1620 in 2001 to 632 in 2016. The number of trawlers went up to 113 in 1990 and has gone down to 43 in 2016. The number of small boats have fluctuated according to changes in the fisheries management system.

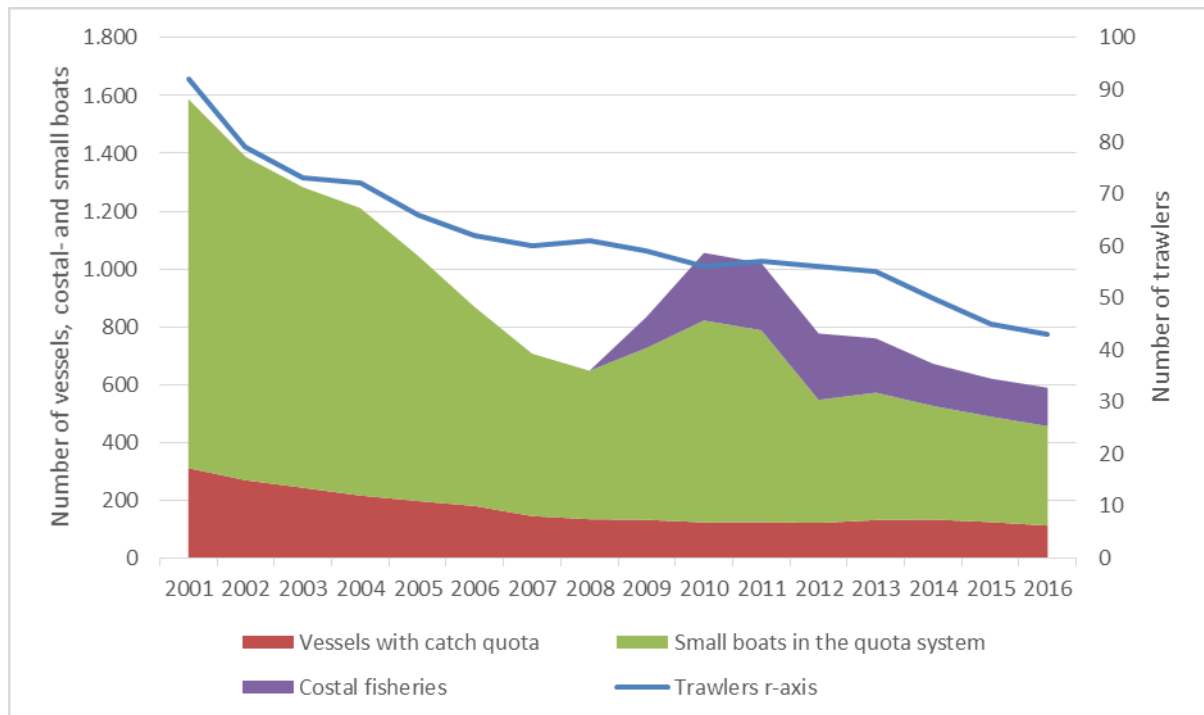


Figure 8. Structure of the Icelandic fishing fleet according to quota classes.

In 2009 new management system was put in place for small boats coastal fishing. One of the aims of the system was to open the fisheries up for newcomers. This is open access fishing for four months and is open for all small boats with fishing licence. Small boats can participate in the system but cannot operate in boat system simultaneously. The development of participants in the system is present in Figure which show that the number of newcomers or boat only operating in the costal fishing peaked in 2010 with 234 boats but has reduces to 133 in 2016. This shows that increasingly coastal fishing is done by small boats owner that are as well operating in other quota system as well.

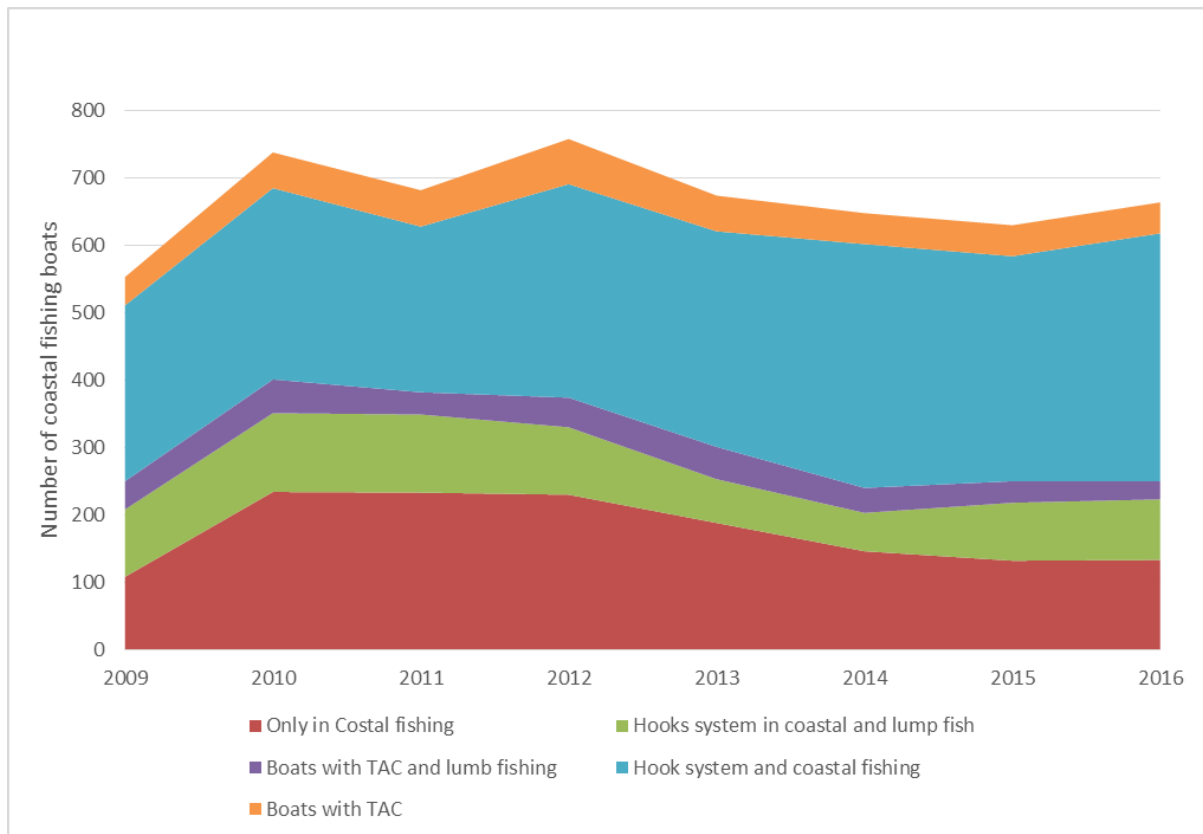


Figure 9. Coastal fishing 2009 - 2016

One of the interesting development in Icelandic fisheries in recent years there has been a major change in the Icelandic fleet where the freeze trawlers have been sold or changed back into to fresh fish trawlers. Around 2000, the number of freeze trawlers with processing facilities was 35, but currently there are only 13 left, and still declining. These major changes are due to number of reasons but currently there is better economic viability for fresh product than frozen one.

- Usually fresh fish processed on-land if seeking higher prices.
- The utilization of the fish is higher, with better utilization of by-products.
- The increased quota from the Barents Sea has let to price reduction in frozen cod and also resulting in a sale of number of these old processing trawlers to Russia.
 - Russia has put more emphasis of filleting production on their trawler in recent years.
- The salary on the freeze trawlers are high and therefore a major factor in these changes in the Icelandic fleet.
- With introduction of extra fish levy in 2012 which is put on every fished kg by the government, different levy for every specie. This levy has somehow been higher for the species usually fished and processed by the freezer trawlers than the fresh fish trawlers, facilitating partly these changes.

13.1.1 Fishing gear

The Icelandic fishing fleet is technologically advanced and uses a variety of fishing techniques and gears. The range of fishing gears include handline, longline, gillnet, bottom trawl and Danish seine for groundfish and flatfish.

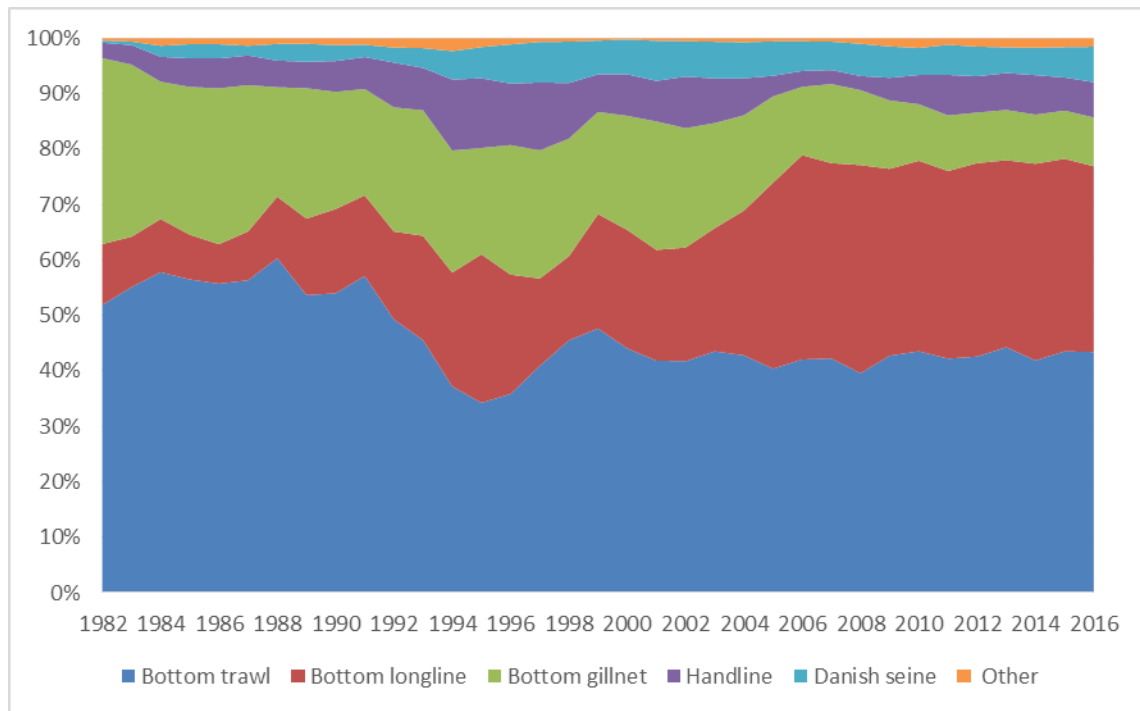


Figure 10. The total catch of Cod by Icelandic boats by major fishing gear since 1982. (Source: Statistics Iceland)

- The fishing gear that catches the highest volume is the bottom trawl with 40%-50% of the volume of the total catch.
- The second most common catch is from longlines.
- It is interesting to the decline in gillnet fishing or from around 45% of the total cod catch in 1982 down to 8.8% in 2016.
 - This hold in hands with the increased use of longline or from being around 10% in the 1982 to become over 30% in 2016.

Consolidation

As reported in previous chapter, the establishment of the quota system has resulted in consolidation in the sector. In Iceland there is tap on consolidations in the ground fish one company may not hold more than 12% of cod equals and 20 % in the pelagic spices. Limits may though vary inside individual species.

There is steep growth in consolidation from 1991 to around 2005 when the both the biggest quota holder as well as the 5 and 10 biggest quota holders have established their share of the TAC. The 25 biggest and the 50 biggest have though increased its share from 2005. This indicates that consolidation is still happening in the medium and smaller companies in the fishing sector.

This is not a complete picture since ownership of different companies by same owner is somehow not applicable to those rules or can by bypassed with little effort, therefore there has been a trend towards more consolidation than the graph and numbers in previous chapter indicates.

Financial Performance and productivity

Economic outcome of quota systems has in most cases been very positive, but the system is highly controversial. As can be seen from Figure the turnaround in the fishing is around 1998 as in general the fishing sector started to return net profit. All until 2005/06 freezing trawlers were the most profitable but since then and more after 2014 fresh fish boats and trawlers are becoming more profitable. This holds in hands with other development as on export of fresh fillets portions and more emphasis on line and hook caught fish.

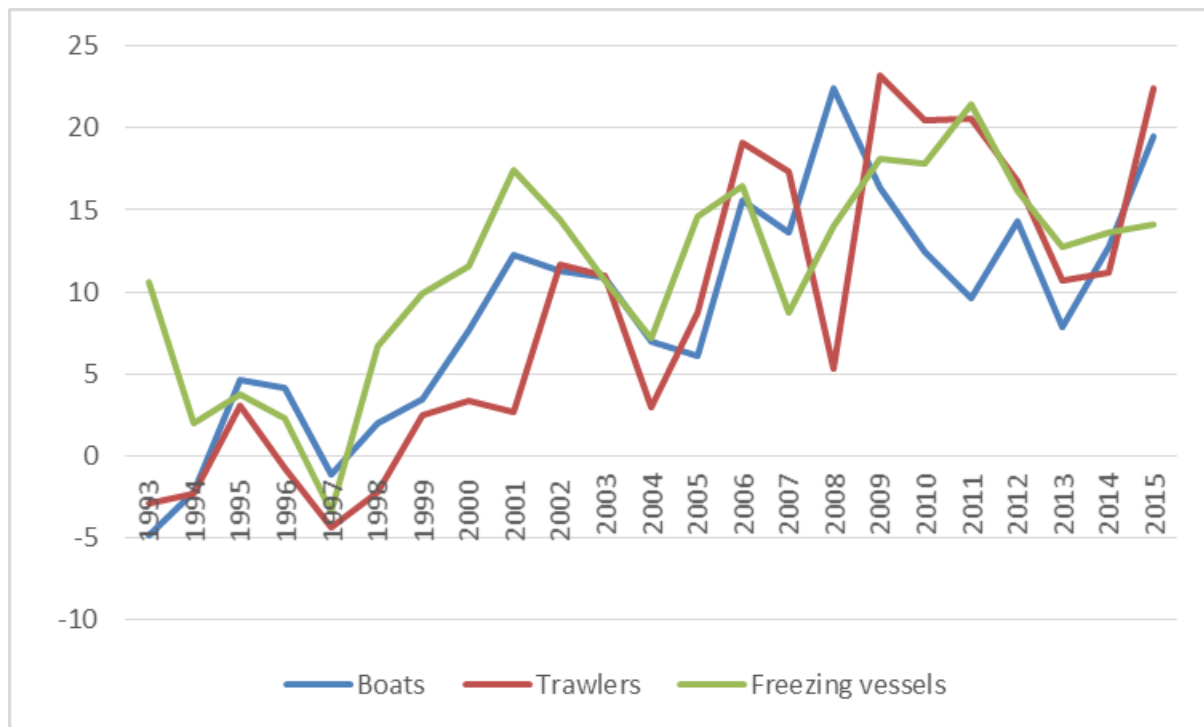


Figure 11. Net profit of revenue (%) in fishing and fish processing, using annuity approach (imputed cost of capital) and 6% rate of return 1993-2015.

Economic outcome of quota systems has in most cases been very positive, but the socioeconomic developments in connection with these changes will not be addressed in this report. The introduction of the coastal system was one way of making the system less controversial by open it up for newcomers. In studying the profitability between boat sizes in demersal fishing of fresh fish since the coastal system was introduced reveals that the difference in profitability is great.

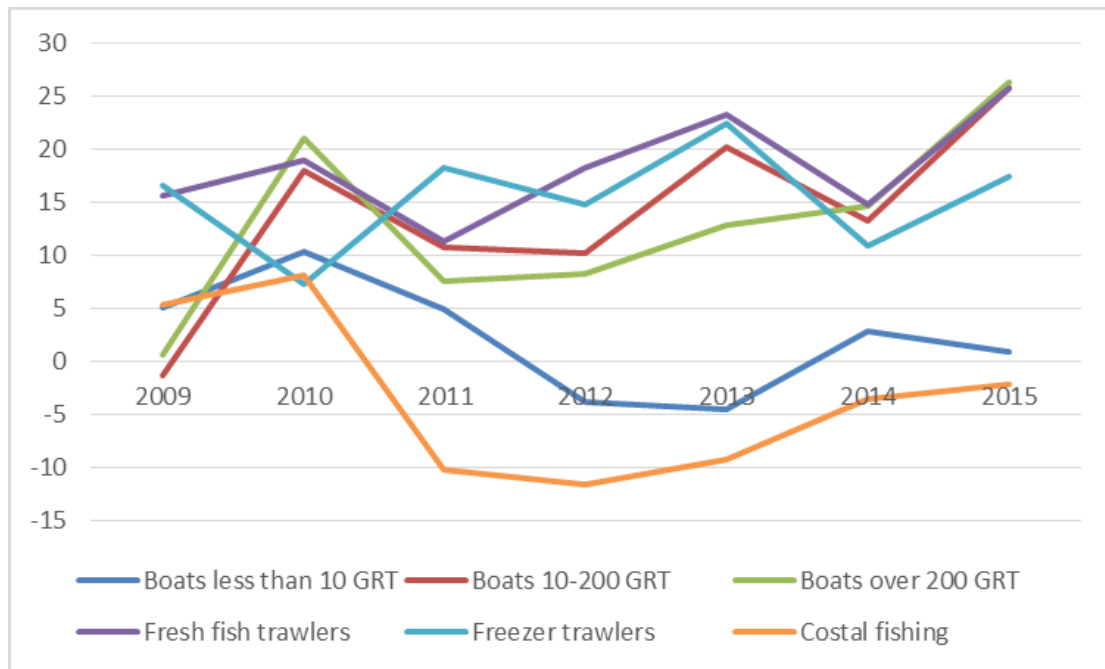


Figure 12. Net profit as % of revenue 2009 – 2014. Source: Statistic Iceland

- The fresh fish trawlers have been the most profitable while the boats under 10 GRT have been least profitable and since 2011 they have returned losses all the years while other group sizes have returned profit up to 20% of the total revenue.
- The greatest loss is although by the coastal fishing fleet as it goes down to 11.6% of the revenue in 2011.
- The coastal fishing has not been successful concerning the financial performance.

The quota system and the ITQ have returned high degree of consolidation as was discussed in chapter 2. This has affected the productivity of the vessels as can have been seen in Figure expressing the average catch per year for each vessel from 2003 to 2016.

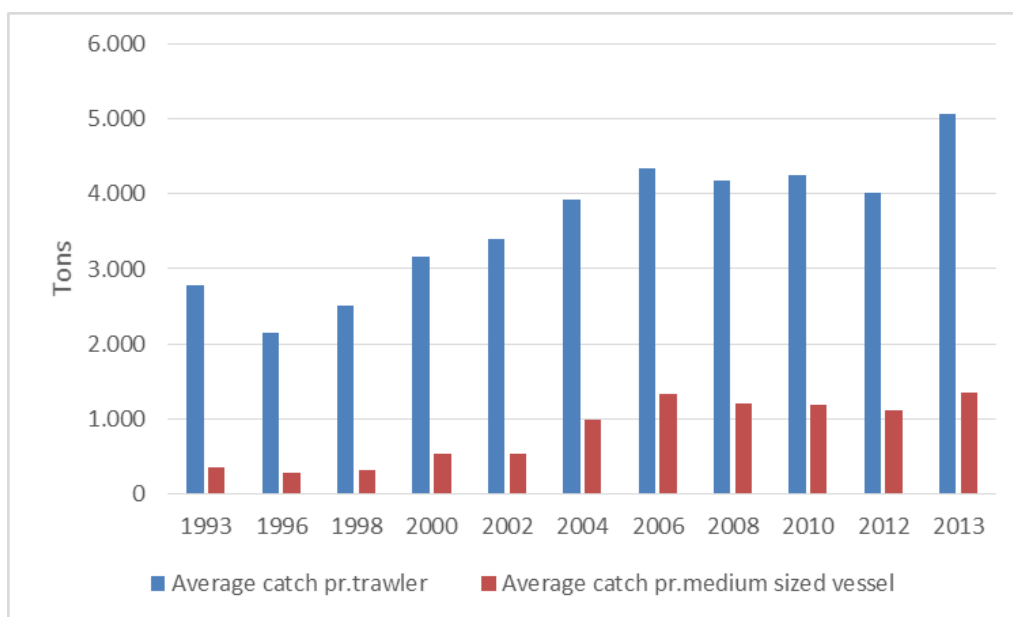


Figure 13. Average catches for trawlers and medium sized vessels in tones.

Catch for average trawler has doubled during this period while it has tripled for medium size vessels.

Fishing fees

Fishing fees have been used by the Icelandic government, to collect some resource rent of the fishing industry. Whether that share is fair, or whether it is sufficient or equitable is highly debatable and subject to intense political and public debate.

This fee is now a considerable cost item to the industry, dragging down its profitability. It is worth noting that the fishing component of the industry has been able to increase profits despite the implementation of the fishing fees. The fee was increased considerably in 2012 as can be seen in Figure to assist the government to cope with the aftermath of the economic crash in 2008. The fishing fee peaked in 2012 and 2013 but has been going slightly down in recent years, and will be revaluated by the government in 2018.

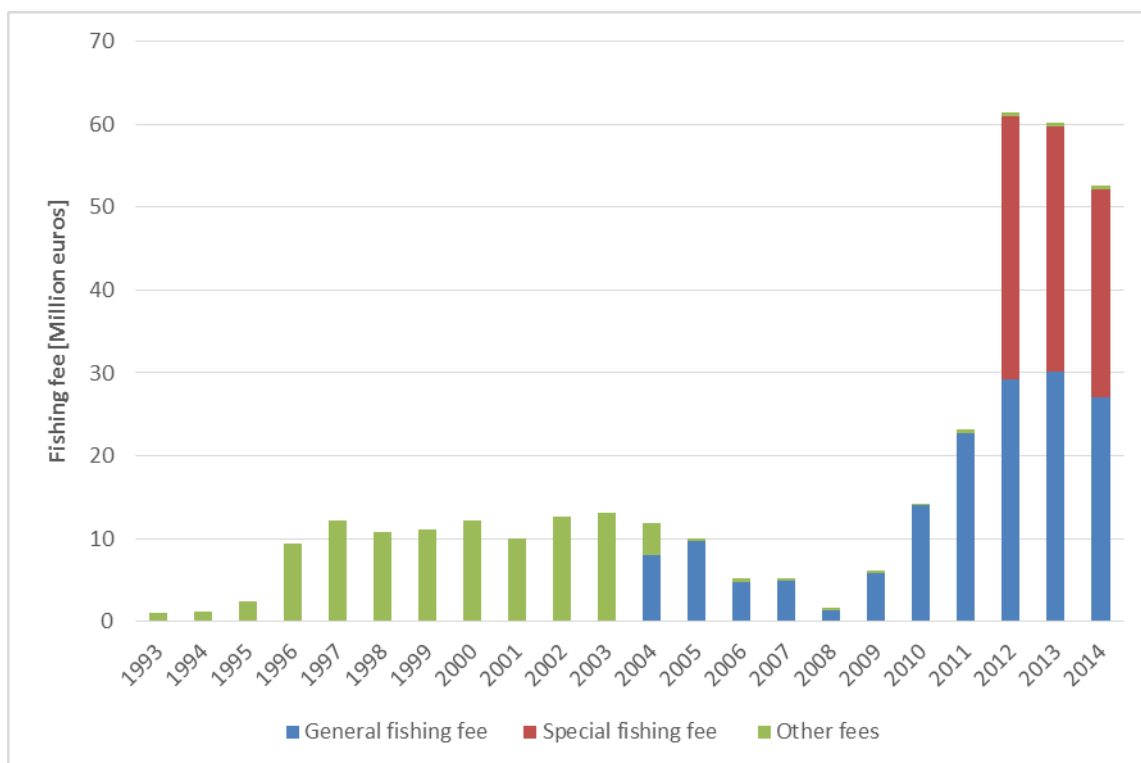


Figure 14. Fishing fee paid by the industry to the government

It is likely that fishing fees will be lowered further since the profitability of the industry is lower now because of stronger Icelandic currency and new government has indicated that the fees will be lowered for small and medium sized companies.

Main influencing factor for value chain dynamic

- ITQ system pushed for consolidation
 - increased efficiency
 - more catches pr. boat
 - fewer boats catching more fish
 - fresh fish trawlers have been the most profitable

- reduction on processing trawlers
- Coastal fisheries struggling financially
- Productivity has increased because of more automation, both in fishing and processing of seafood.
 - More catches pr. boat
- Fish is more processed in Iceland instead of exporting HG (headed and gutted) fish for further processing abroad
- Changes from processing on sea to processing on land, where utilization is better (better filleting yield) and promotes better use of by-products creating more value from each fish.
 - Cooling/development in iceless boats
 - Shorter fishing trips
- Fishing and processing done in harmony by VICs based on
 - Quota status
 - Fish sold/market signals
 - Transportation orders (especially on cargo planes)

QUOTATIONS FROM THE INTERVIEWS

Interlocutor asked about the development in processing and export:

“there is a fierce competition from foreign producers. It's just technique now, I say that this technic (water-jet cutting) that is coming now, is the reason for that we are not still talking about containers (exporting unprocessed fish in containers). Do you remember when the trawler where focusing on exporting whole fish in containers, they just don't do it today”

Interlocutor asked about the changes in fishing

“... Fishing trip that was before 7-10 days, is maybe 4-5 days today...I remember when I was here at XX..., that's the ships were doing 25- 27 fishing trips a year, now we're doing 60. So we processing fresher fish. And of course, the shelf life of fish from when it is killed and until it's eaten. But if we can receive the fish 3, 4, or 5 days earlier than before, then it's only prolonging the shelf life at the other end.”

Interlocutor about competitive status and comparison with Norway

“...if we look at how we are utilising the cod quota, naturally, we're using it much, much better. We used to use the quota similar as they (Norwegians) when we had our gillnet season here. Then the boats covered the fishing grounds with gillnets, January, February, March and 70 - 80% of the cod caught then. They are still in

this system. They are catching 70% of the cod at this time and then prices decrease in all markets and they are completely aware of that having graphs themselves showing that (laughs), this is no secret, this is known by everyone. So, this is obvious to all. When this happens, we slow down and keep on doing so, trying to reduce cod fishing at this time, when they are fishing and then come in when the price goes back and they reduce their supply. This may be the biggest difference in how we use our resources, we are trying, and we can organise our fishing according to when the market wants it, to get the highest price. They went a little bit there, they started updating their freezing trawlers a few years ago, they all really went all for H/G (Headed gutted whole frozen). They were aiming for processing in China. ... Now they are reevaluating this strategy. So now they have started to build filleting trawlers and are getting a new one now for example. So they're trying to collect their armour and focus more on filleting on-board their trawlers"

13.1.2 Price settling mechanism, first gate price

The auction markets were a great enabler of the structural changes in the Icelandic fish industry. From the establishment of the first auction market 1987 the official price regulation on wet fish was partially uplifted which greatly affected the price of fish to fisherman.

The turnover in volume increased rapidly from 22 thousand tonnes at the beginning up to the maximum of 115 thousand tonnes in 1996. For the last 5 years or so the quantity on the fish auction markets are around 100 thousand tonnes or equally to one fifth of the total demersal catch. The emergence of fish markets in Iceland has had a profound impact on availability of fish for the non-vertically integrated fish processors. Fish markets have also strengthened the market power of the fishermen as market based price formation has resulted in higher prices for them (Einarsson, 2003).

Market Price vs. Price in Direct Sales

The price settling mechanism for cod in Iceland today is mainly three fold:

- Auction markets where price is determined on market principle of supply and demand.
- Secondly is the price for VIC that is used for calculating the salary for the fisherman's.
- Thirdly is the price for frozen at sea fish that price is decided as a share of the value of the product according to salary contract.

From the beginning of the fish markets in Iceland there has been a significant price difference between the fish market prices and the price of fish through direct sales (internal sales) as can be seen in the Figure. This should not come as a surprise as the price formation is fundamentally different between these two allocations. On one hand is basically an internal pricing, regulated by the semi-official Bureau of Ex-Vessel Fish Prices, where the set-price is changed according to changes in the market price, sometimes with a considerable delay. This price is not used in any transactions other than calculating the vessel crews' wages (based on a share system). It is set to assume that important cost factors are not included such as direct or indirect costs of quota (leasing or buying). Other cost factors like handling, grading, logistics and other services are included in the fish market price but not in the

direct sales price. It is also set to assume that buyers on the fish markets are ready to pay higher price for fish in the right quantity and quality according to their stringiest demand. To what extent these different set-ups can explain the price difference (around one-third) is hard to say but in general it is evident that it is not straight forward to compare these prices as they are decided in a fundamentally different way.

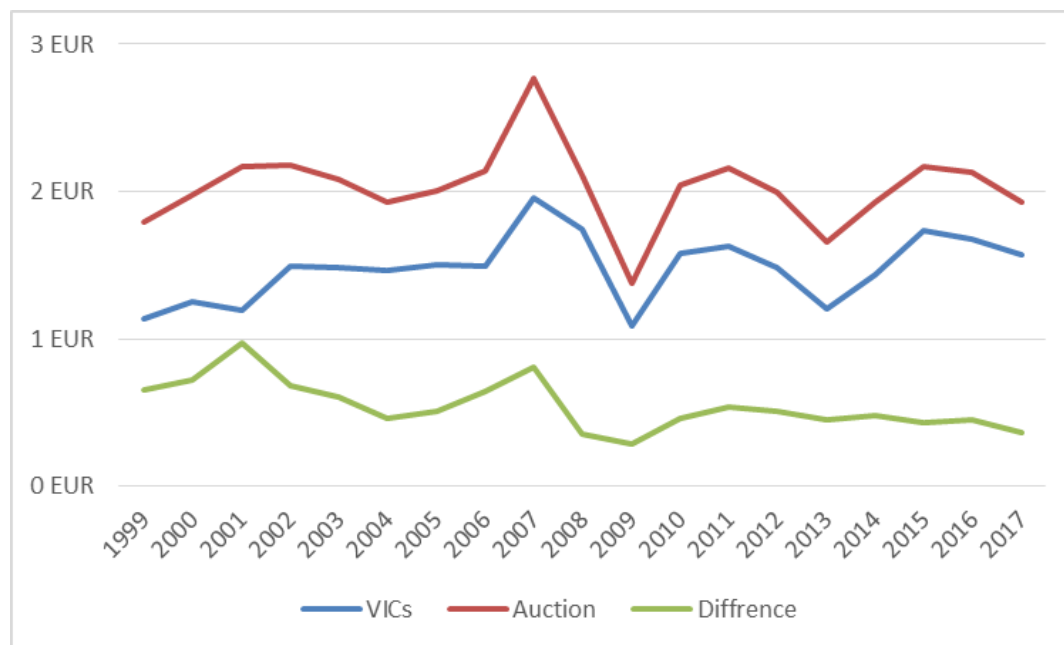


Figure 15. Auction fish market price vs. direct sales of VICs companies in Euros for gutted cod (Source; Bureau of Ex-Vessel Fish Prices).

In the newest salary agreement between fisherman union and company's owner in Iceland (SFS Fisheries Iceland) made in 2017 after around 10 weeks strike, resulted in stronger connection between VIC price and the auction price. This is calculated in that manner that the average weighted price for the VIC for the previous 12 months shall be as a proportion of the average weighted price in auction markets. For gutted cod the objective for this price calculation is that price to VIC should not be lower than 95.4% of the auction price minus 5% sale cost and for un-gutted 94.4% minus 5% sale cost.

Price according to fishing gear

In studying the effects of the fish markets it is interesting look at whether the auction markets award or punish fishing gear in the pricing. In studying price according to fishing gear it is necessary to look at individual sizes classes as in general gillnet fish is bigger than for example line fish. That means the catch combination is deferent between fishing gear and gillnet fish would get in many cases highest price on the auction markets. On other hand, when different size categorise are studied, cod from gillnets receives the lowest price in almost all cases. InFigure weighted average price for cod 3.5 to 5.0 per year from 2012 to 2017 (until May 2017) is presented. Form the figure it can been seen that gillnet get always lowest price while highest price is rewarded to longline, hand line and trawl. The size 3.5 to 5.0 kg is the most suitable for fresh fillets production where the colour of the fish is one of the most awarded attributes. In that regard it is interesting to see how high price trawl get but some of mangers in fishing sector claims that they get up to 3% higher yield form cod from trawl than form longline.

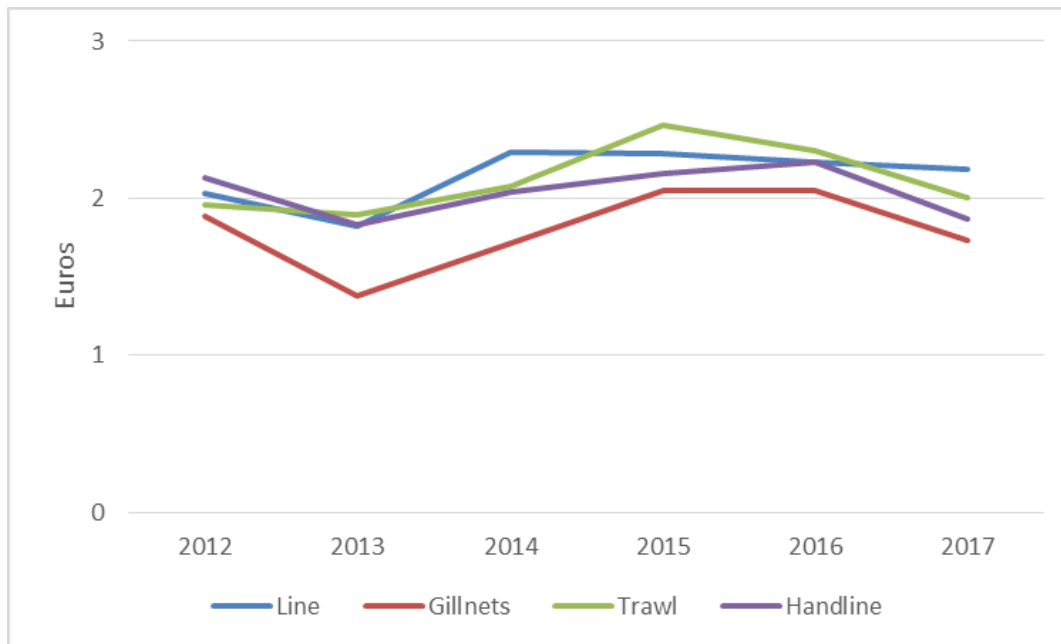


Figure 16. Weighted average price of gutted cod 3,5 - 5,0 kg in Euros.

Traditionally gillnet fish is more suitable for salt fish production and where bigger fish is more attractive. It is therefore interesting to compare prices for cod plus 8 kg as is done in fig 17.

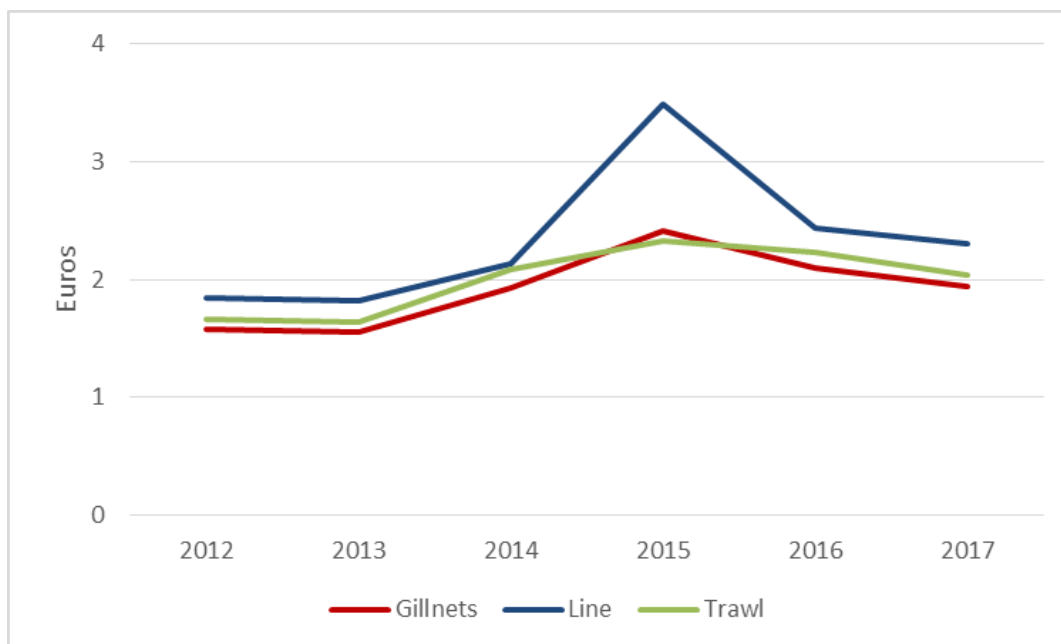


Figure 17. Weighted average price of gutted cod 8+ EURO/kg

The same pattern appears although longline fish get always highest price. This does not take into account different supply of fish to the auction markets or timing, but gives a good indication that auction markets do pay for different attributes of the fish.

Main influencing factor for value chain dynamic

The auction markets are crucial in the value chain of cod in sending marketing signal to the fisherman and guaranty certain transparency in the price formation. Below are some of the importance of the action markets in the value chain of cod.

- With the formation of the fish markets in 1987, resulting in market driven approach. The auction price is used as benchmark for other prices calculations in vertically integrated companies (VIC).
- They provide a stable flow of raw material to many small processors, creating a lower entry barrier for entrepreneurs in fish processing.
 - helps maintaining competition in the processing
 - foreign companies are on the market
- They provide larger companies with opportunities to even out short run catch variations, for example in species and size.
- Transparency in price formation – online auctions
 - Equal access to auctions
 - Price to harvester has increased
- Pressed for new product mix (fresh fish markets)
- They serve as a channel for by-catch species and undersized fish, allowing small quantities from many suppliers to be bought by few specialized processors.
 - Creates critical mass in small species/economic of scale
 - increasing the value of the catch and production
- They play important role in returning marketing signal to the harvesting sector
 - making price formation transparent and market based
 - Provided necessary quality incentives
 - Facilitate the utilization of by-products
- Supported more efficient logistic
 - Raw material
 - Tubs
 - More economic transport
 - All of this has contributed to the progression of **specialisation**, which again is the backbone of the present production strategy of Icelandic fish processing companies allowing them to be more **flexible** and **adaptable** to different business models and situations.

QUOTATIONS FROM THE INTERVIEWS

Interlocutor asked about the supplying fish on auction markets

“...we sell all the under size fish,... probably over the years, 20% of our fishing has been sold on the market, sometimes less, sometimes more. ...we're aiming to supply (from the auction markets) 3 to 4 thousand tons of cod on yearly bases, like all companies in Iceland (are also dependent on fish from the auction market). And that's why the price is so very high, that is because the marginal

income is huge and that it's why everyone is in this (fighting for the auction market fish)”

Processing (all marine fish processing plants)

Fish processing companies

The consolidation within the fisheries sector did not only affect the size of the fleet and concentration of the quota ownership, but also had the same effect on the processing sector. The most illustrious way is to look at the development of the official processing licences. In the first half of '90s there were slightly over 400 licences active but in 2014 the total number of processing plants had gone down too little over 200. The largest decrease in processing licences is in freezing at sea (FAS) trawler, they were 36 in late 1990s but only 14 in 2014.

In the last 25 years, most pronounced is the:

- Decline in the number of salt fish processing plants, a decrease of nearly three-fourth
- Number of freezing plant went down by 60%
- Growing number of producers of fresh fish products by one and half

But the share numbers of processors do not reflect entirely this development as it stands out that relatively larger part of small processing plants have been laid up than the medium/large processing companies. In other words, not only the total number of plants have gone down but the remaining plants are larger than 25 years ago. This reflects the trend of consolidation within the processing sector, fewer and larger plants, in noticeable way.

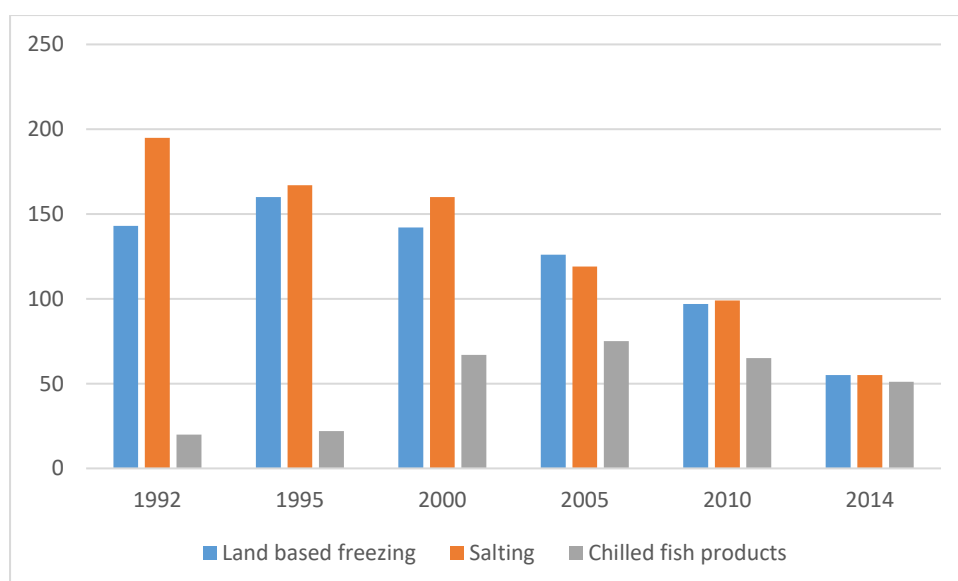


Figure 18. The Number of processing companies (Statics Iceland and Mast).

Technological innovation in processing equipment, the widespread use of ICT based solutions and automation has given rise to a highly significant increase in efficiency and productivity in the processing sector. This development has been aided by the general strategy of product specialisation and focused differentiation in the processing activities. Larger processing units and specialisation have made way for economy of scale and in many instances for economy of scope. Most of the large processors (most of them are vertically integrated) produce a broad scope of products in fresh fish,

frozen products and in salted products to meet the varying needs of different customer groups in different countries. Only larger processors are able to service these markets needs in terms of scope of products, flexibility and supply reliability. Huge steps have been taken in the technologic development in equipment and in the design of processing plants. Only companies with a large quota or other access to wet fish (through the fish markets) can undertake and invest in high-tech plants as the capital cost of such investment is high. These companies have the abilities in term of revenues and profitability to invest in high-tech equipment as automated flow-lines and digitalised processing systems to increase efficiency and productivity.

Product development/product mix

Traditionally nearly all demersal wet fish was allocated to freezing, salting or iced whole for export. This changed with the emergence of freezing trawlers in the 1980s. Since mid-1990s, around one-third of wet ground fish has been frozen at sea but land based freezing fell from 45% in 1990 to about 35% on average in 2010-13 and down to 12.5% of cod allocated for frozen at sea. These changes in processing of demersal fish in Iceland occur in the allocation to salting that was increased temporally to 25% in 1996-2000 but has fallen to below 20% in the recent years. Another significant change since mid-1990s has been the rapid increase in allocation to chilled or fresh products to near one-fifth in 2014 up from a very low level in the 1990s. Processing of fresh products has increased in accordance to decreasing production of frozen and salted products. Fresh products are now the most important export category of processed demersal in Iceland or 36.8% in value in 2016 as can be seen in Figure. This reflects the high value added level of fresh fish that 25.8% of wet-fish is processed fresh but generates 36.8% in export value.

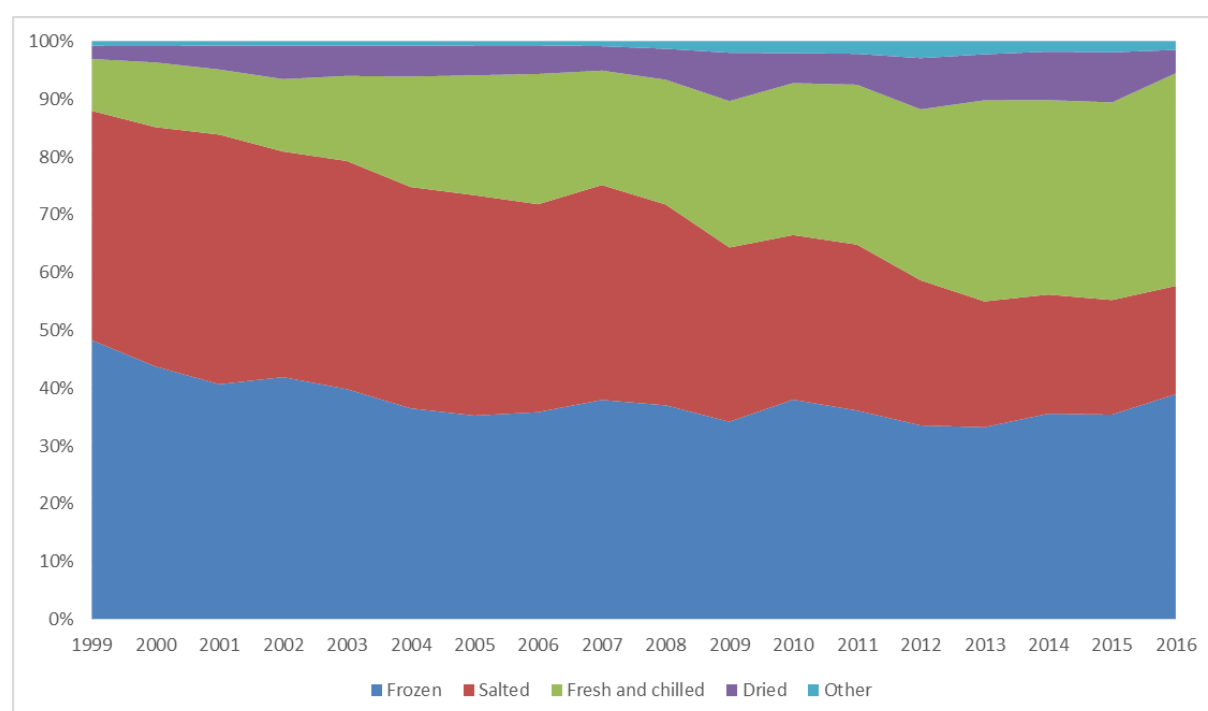


Figure 19. Export of cod 1999 – 2016 in different format.

Although fish processing has been shifting towards the area around the international airport, there are signs that more fresh fish products are exported by sea freight. This development can be seen in Figure 20. In 2013 and 2014 around 45% of the production of fillets and loins was exported by sea

freight. This development can be traced to technical development in packaging as well as improvements in cooling and handling. This has increased the shelf life of the products, making it possible to use sea freight for fresh products instead of only air freight.

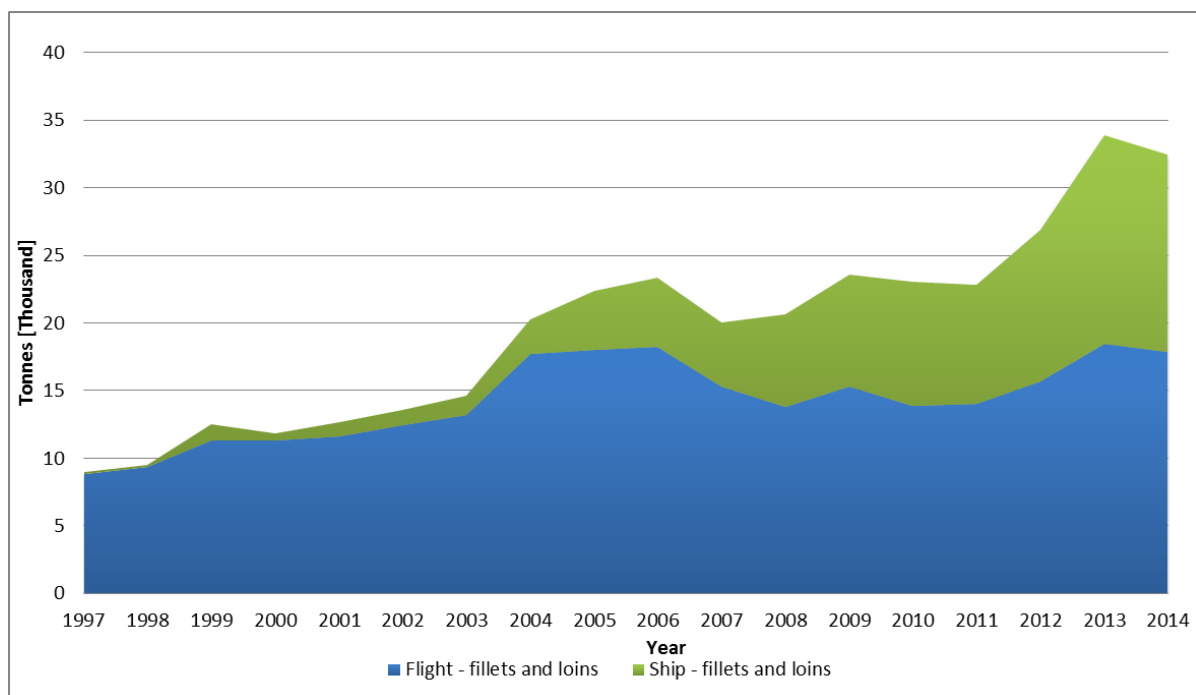


Figure 20. Development of fresh cod product transport from Iceland.

The sea freight is collected in selected harbours around the country once a week and sent directly to the UK and the European mainland. This gives fish processing plants in more remote areas such as the Westfjords and the eastern part of Iceland opportunities to export fresh fish products from their own town or village instead of trucking all their products to the international airport in the south west Iceland.

Financial performance and productivity

The productivity in processing has been increasing steadily since early 1990s, first slowly and gradually but after 2000 large improvement in productivity took place. The productivity has nearly doubled since early 2000 and from early 1990s the increase is 130%. This coincides with the introduction of new flow lines in processing of frozen and fresh fish products, increased automation and use of IT technology. It is also to assume that the general level of skill and increased stability in the workforce, as well as improved methods in operation management, all have had a positive impact on the productivity.

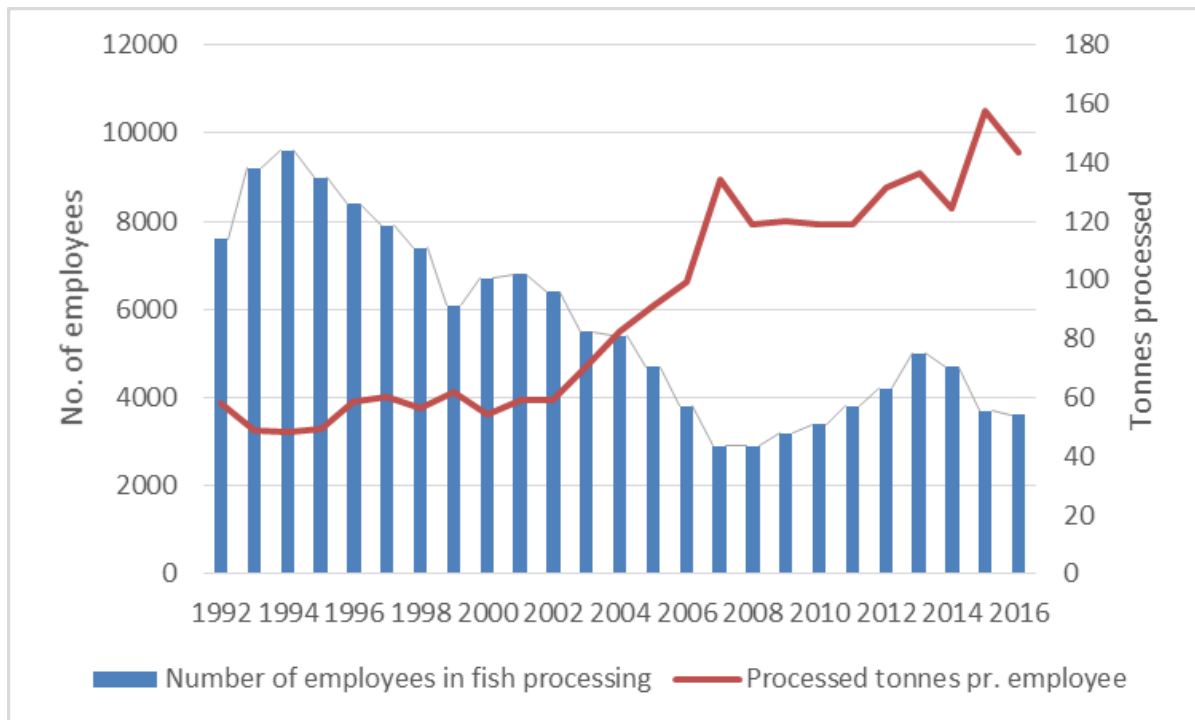


Figure 21. Number of employees in processing and productivity pr. employee 1992 - 2016

The degree of automation is increasing fast in processing with introductions of fourth generation of flow lines and water jet cutting machine. Trimming of the fillets are now minimal and is limited to cutting out defects that are on the fillets and remove ring worm if found in the fillet. The pin bone is removed in the water cutter as well as belly flap and portioning of the fillets. This opens up opportunities for much more advances and complicated product mix as well as more accurate cut and sizes. In addition to the robots in the water cutters they have been implemented increasingly in packing and storing of the products. Hence, throughput per man hour have increased from being around 12 kg/hour in traditional filleting production before the flow lines to become around 80 to 100 kg/hour in the most advanced production today. This development has not stopped and there are signs that this throughput will increase in coming future. On the other hand, this means that fish processing in Iceland is capital intensive.

Fig 22 shows the profitability of processing sector from 1993 to 2015. During this period the average profit of the processing has been 7.5% of total revenues. Processing has been profitable since 2000 with some exception like salt fish processing that returned loss in 2002 and 2004. The figure indicates as well, that the profitability of the industry has been improving until 2011 when profit started to decrease. Every year since 2001 the profit of the fishing industry as a whole has been above 5% of revenues, but between 1993 and 2000 the profitability of the industry was never above 5%. The best years were 2008 for the processing sector when profit was 20.2%. The reasons for the increased profitability of the industry are mainly twofold, increased productivity and higher prices due to the weakening of the Icelandic currency.

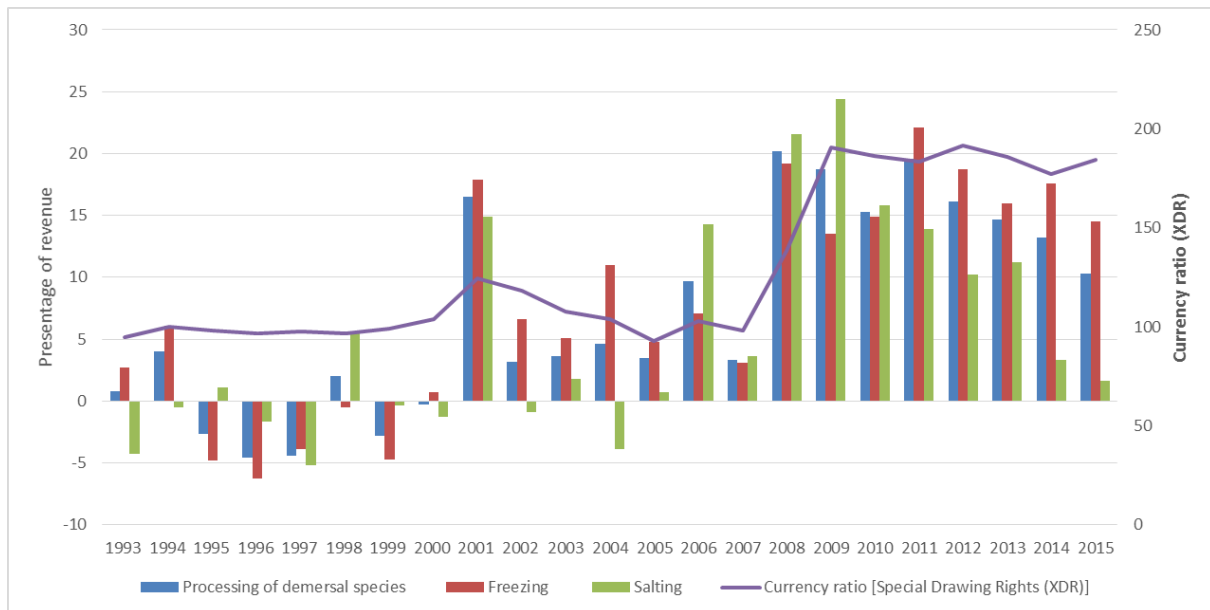


Figure 22. Net profit in revenue in fish processing after imputed cost of capital and currency development.

It is interesting to see the development of net profit in processing in 2001, but that is related to sharp currency changes of the Icelandic krona. It is impossible to study profitability of export industry as fish processing in Iceland without looking at the role of the currency exchange rate of the Icelandic krona IKR against currency on the main markets. In the figure above shows the role of currency fluctuations and how it is highly influencing the profitability of companies in the processing sector. It is clear that the currency crash of the Icelandic krona in 2008 highly affected the profitability in 2008.

Main influencing factor for value chain dynamic

- Synchronising of the value chain activities through
 - Vertical integration
 - Fishing is manage according to marketing needs in VIC
- Access to fish through auction markets
 - Creating critical mass (special in smaller spices)
- Drive forces in the value chain move from push from harvesting to pull from market/production
- High degree of automation
 - capital intensive
 - consolidation of processing plants
- Transportation infrastructure to markets
 - More options in shipping chilled containers from Iceland to the mainland and UK.
 - Cargo transport of fresh fish by planes
- Developments in:
 - Packaging (Polystyrene boxes)
 - Super chilling (below 0°C)

Examples of changes in the structure of the fish industry

As an example of the changes in Icelandic cod processing and the structure of the industry two examples will be given here of the development in last years. The first example is from Vísir hf. In Grindavík that merge operation from four places in Iceland in one place in Grindavík. This discussion is taken from news cover in Kvotinn.is from 28th of March 2014 with statement from the company.

“All processing moved to Grindavík”

“Vísir hf. in Grindavík plans to transfer all its fish processing to Grindavík. The company has for many years been operating fish processing in Þingeyri, Húsavík and Djúpavogur. Then the company's line boats will be reduced by one. The company is aiming to support another business structure in the communities that they are leaving. This is stated in a notice published on the Vísir website today. Signed by, Pétur Hafsteinn Pálsson, Managing Director of the company, writes. The notification is below.

Changes have been made to markets abroad for Icelandic fish. Product prices have fallen by 20%, and fresh demands are being made for fresh fish, production flexibility, and delivery of orders. To meet these changes, Vísir hf. now a new organization that aims to maintain an unchanged number of employees while improving the company's margin, which fell by 50% between 2012 and 2013. There are about 200 people employed in fish processing and 100 on the company's vessels.

The purpose of the above ideas is to strengthen the company, make it more competitive and ensure that employees of Vísir and their families can trust the company for a long run as a safe and reliable workplace. The above-mentioned plans will be prepared in consultation with representatives of staff and relevant trade unions. Vísir's management hopes that most of the employees will retain their work, either in a modified form in the same place or in the same work at a new location. In order to be able to do that, they will make every effort of integrity and full force.

<https://kvotinn.is/oll-fiskvinnsla-visis-flutt-til-grindavikur/> visit 09.01.18

The second example is taken from HB Grandi that moved their processing from Akranes to Reykjavík in 2017. This quotation is taken from the webpage of HB Grandi from 5th of March 2017.

“Land processing of groundfish”

Following the discussion of the last few days regarding changes to HB Grandi's operations in Akranes, we would like to submit the following. In recent years, the company's trawlers have landed their catch in Reykjavík. A significant part of the catch has been transported to Akranes for processing and then back or bypassing Reykjavík for export. It is estimated that this year, 8,000 tonnes of cod has been driven through Reykjavík to Akranes for processing and then 4,000 tonnes back to Reykjavík for export, about 500 tonnes to Keflavik Airport for export and 3,500 tonnes to Reykjavík for drying.

These transfers have been and are inefficient. However, the profitability of groundfish processing have been able to bear those costs in recent years, so there has not been enough reason to change this arrangement. Now, we feel that this activity needs to be subsidised, if it remains unchanged. HB Grandi has the capacity to work all the catch in Reykjavík and by moving the plant there, the company hopes to achieve sufficient streamlining to justify continuing with ground fish processing during the same time as the strengthening of the Icelandic krona is challenging the profitability of the company.”

<https://hbgrandi.is/frettir/frett/2017/04/05/Landvinnsla-botnfisks/> visit 09.01.18

Value creation and utilisation (based on live weight)

Rationalisation steps have been taken such as in better utilisation of by-products and offal mainly trimmings (in the filleting process), heads, roes and liver. That part of whole fish into processing is a significant proportion of landed volume and was until recently categorised as waste and used in meal and oil reduction or used in low grade products. This has changed and most available by-products and offal is used in processing of value added products. In the last four years the amount of by-products and offal account for 6% of landed volume of cod, up from 2% in the first half of the 2000s. The export value of such products such as canned cod liver, cod liver oil, frozen and salted cod roes and dried fish accounts for 15% of the total export value of cod products. The value added production of this material, which otherwise had little or no value, has contributed significantly to the higher yield from input and higher average product margin in the recent years.

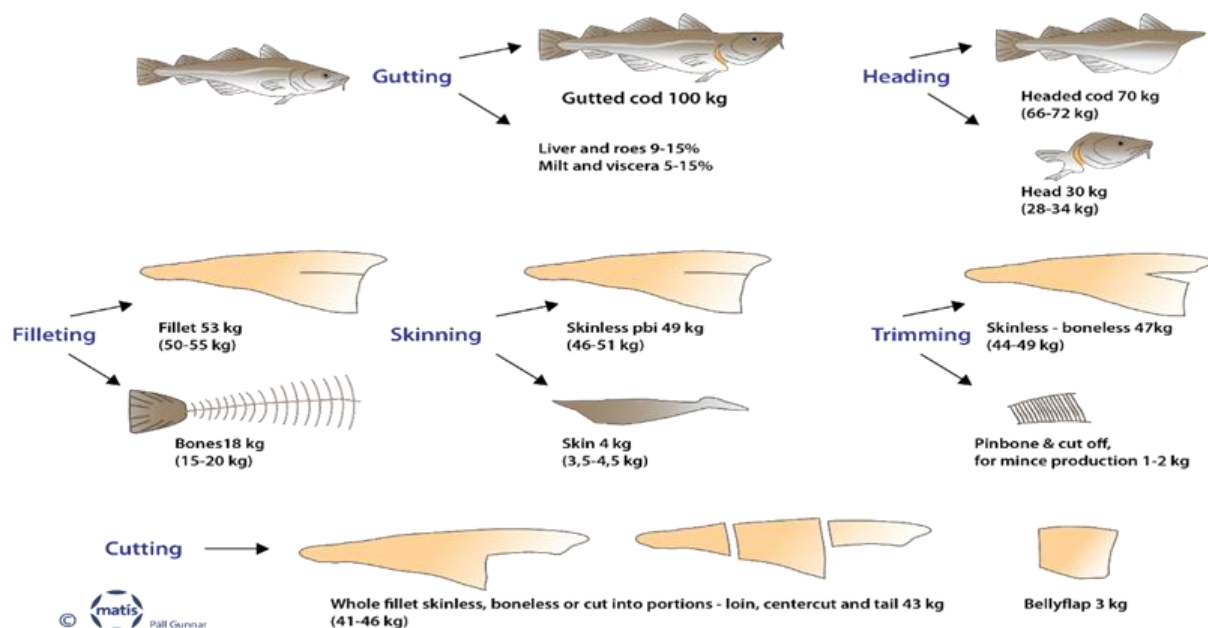


Figure 23. Example of possible utilisation of cod with estimation of yield for each product.

It is difficult to look at development in value creation and utilisation from export figures from Statistics Iceland, because of changes to custom numbers through the years and lack of stability in documentation quality and consistency, supplied by the companies. Calculated utilisation from these export figures when we calculate the different product groups to wet weight and amount of cod cached, gives us an utilisation figure close to between 75-80% yields. That is relatively high but there is still room for improvements as can be seen in fig 24.

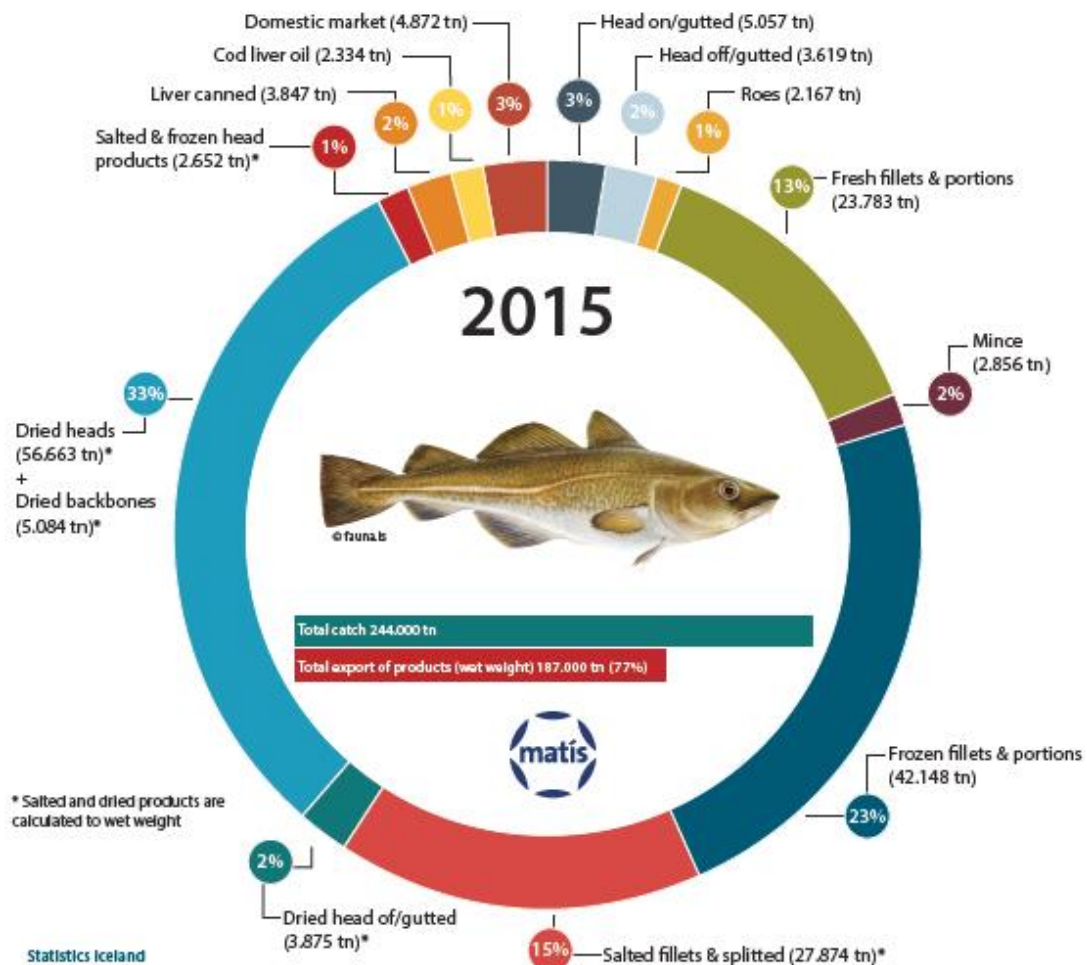


Figure 24. Division of cod catches in Iceland into different product categories calculated to wet weight for 2015 and volume in tons. Figures are collected by Statistic Iceland from export reports supplied by the industry.

It is interesting in the picture above the volume of dry heads and backbones and how that is the largest category then the products are calculated back to wet weight. Also if we put together the fresh fillets, the frozen ones and the salted ones, we have a percentage of 51%. So the fillets production is still responsible for majority of product volume.

There has been little product development of cod products for the retail sector in recent years in Iceland, products that reach the end consumer through the retail sector. There are many reasons for this stagnation, the industry has settled for production of raw material where the value addition takes place in countries closer to the end market. There was a development of individually frozen portions and cutting around 1990, however since that development, the local currency has been unstable and therefore the companies have struggled to develop long time contracts with the retail sector. Also the development of fresh production and transportation has resulted in more emphasis on the spot market with rapid cash flow and shorter contracts. However, these developments have led to shorter fishing trips, better raw material and developments in transportation as covered in previous chapters.

However, there has been innovative development of utilization of Rest Raw Materials (RRM) in Iceland from cod production, where the development has been slightly different from Norway. Silage production has for example not caught on in Iceland and the focus has been more towards

production of more valuable products for human consumption and bio technical products. Other RRM that are not readily applicable for added value production or are not utilized now are commonly frozen for mink feed. In essence it can be then be claimed that everything that is landed is utilized, there are however materials that are not landed, these are particularly viscera from fresh fish vessels and parts of the heads and frames from the processing vessels. This is though changing now, as vessels are being fitted with equipment that allows for collection and storage of these RRM and therefore further utilization is expected of RRM. Regulations have also been changed, so that factory vessels are now obligated to land part of the cod heads.

Smaller fishmeal plants have also been set-up around harbours in Iceland and they receive RRM from the aquaculture industry and from larger fish processing plants. This development may indicate that fishmeal production from RRM may increase in near future. Silage production is another interesting alternative that could work well with fishmeal production.

The Icelandic seafood sector has also been utilizing other parts of the cod and making from them valuable products which are not accounted for, because either the statistics are not readily available or the volumes are insignificant, but the value is. Examples of innovative products that are in production now for human consumption and for other utilization are listed here below:

- leather made from fish skins
- pharmaceuticals and cosmetics made from bioactive compounds extracted from different parts of the cod
- collagen made from fish skin
- supplements and protein made from different by-products
- mineral supplements made from fish bones
- enzyme extracted from viscera
- skin and tissue repair patches made from fish skin
- extracts from RRM made into powder or bouillon (i.e. for making soups and sauces)
- silage made from viscera used for animal feed or as fertiliser, swim bladder and milt

Main influencing factor for utilization

- Development in:
 - Handling
 - More on-land processing
 - More critical mass of by-products
 - Better machinery
 - Better filleting utilization than on boats
 - Better size grading
 - Auction markets
 - Collection of liver/roe
 - TAC went down
 - Facilitating further utilization
 - Culture
 - Innovation between industry, institutions and universities
 - Development of strong companies in the fish machinery sector
 - Formation of the Seafood cluster

- Funds availability
- Discard ban – everything onshore

Kerecis

Kerecis is one of the innovative companies in Iceland that are making use of fish skin.

“Kerascis was established in 2009 as a research project based in Isafjordur, Iceland. The company started commercial operations in 2013. The company is headquartered in Isafjordur and manufactures its products there. The company also has offices in Reykjavik and, Iceland, and in Arlington, Virginia, near Washington, D.C.

Kerecis Omega3 is intact fish skin rich in naturally occurring Omega3 polyunsaturated fatty acids. When grafted onto damaged human tissue such as a burn or a diabetic wound, the material recruits the body’s own cells and is ultimately converted into living tissue.

Compared to mammalian-based skin substitutes, Kerecis Omega3 offers improved economics and clinical performance, as well as reduced disease transfer risk and no cultural constraints on usage.

Other tissue-transplant products are based on tissues of human and porcine origin. These are not ideal substitutes because heavy processing is needed to eliminate the risk of disease transmission. This harsh, anti-viral treatment removes most of the material’s natural components, making it dissimilar to human skin.

Key technical advantages

- No cultural or religious barriers to clinician/patient acceptance
- Easier to use, with larger, thicker sheets (no need for multi-layer grafts)
- Non allergenic and bio-compatible
- No known risk of disease transfer
- Enhanced cell proliferation and vascularization
- Improved infection control
- Adjustable rate of absorption into the surrounding tissue”



Kerecis™ Omega3 fish skin

<http://www.kerecis.com/why-kerecis/> visit 04.01.2018

QUOTATIONS FROM THE INTERVIEWS

Interlocutor asked about the value creation and R&D

“..., the fillets are just portioned as the customers wants it. We first take of the tail,...and rest of the fillet goes through the trimming lines.... Then the value added that is added here is the loin that have been defined much broader than before (stretches much further down the fillet).

“The loin portion is sold fresh and we IQ freeze part of the fillet. We are packing it in bags, according the customers needs. Then we cut the belly flaps into stripes and salt them for Spanish market. The fish tongues are all collected and the cod heads are dried.”

Another interlocutor claimed

“... we have increased this fresh fish processing... we are talking about 10 - 12 days of shelf life (after processing). So today we are exporting more than 70% of fresh cod loin in containers, in cargo ships, that are taking 3 - 4 days to European markets instead of one day by air. And that's one euro per kilo cheaper to transport the products by ship (that by cargo planes), that is affecting our profitability.

Marketing sector

Structure of the marketing sector

The decreased fish stock after the 90's meant that producers often had difficulties in increasing their value creation by just increasing fishing as they often did before. This increasingly put pressure on the MSOs to create the type of relationship where producers have the opportunity to get access to information and knowledge in the network that can support further value creation in their own companies.

The role and power of the producers' organisation dwindled gradually in the later years of the 1990s' due to the abolishment of export licensing and the establishment of new large fisheries companies. Soon after that the largest vertically integrated fisheries company (Samherji) started exporting their products as well as a number of new marketing and exporting companies sprang up when larger independent producers (i.e. producers sourcing wet fish from fish markets or through direct supplying contracts with vessel owners) did the same. Gradually after 2000, the large integrated fisheries companies took over most of their exporting and marketing activities and so did a number of seafood producing companies of frozen and chilled products (Klemensson & Knútsson, 2006).

Export

- 10 biggest export markets for Icelandic Cod accounts for around 93% of the total export of cod products.
- In 2016 the total export of the Icelandic seafood industry is around about 232 billion Icelandic krónur (ISK), roughly equal to 1.78 billion Euros.
- The export of Cod products is around 751 million euro or 43.2% of the total value of the export of seafood products from Iceland.

In Table 16, share of cod in total export of seafood is expressed. From the table it can be seen that the importance of cod of the total export has been increasing or from 36.7% of the total value in 2014 to 43.2% in 2016. The same is in the volume but the increased quota in cod plays big role in this.

Table 16. Share of cod in total export of seafood is expressed

	2016	2015	2014
PRICE	43.2%	38.0%	36.7%
VOLUME	23.4%	19.3%	18.0%

The most important export countries for cod product before 1999 were US markets for frozen products. After the EEA agreement in 1994 the importance of EU markets has increased.

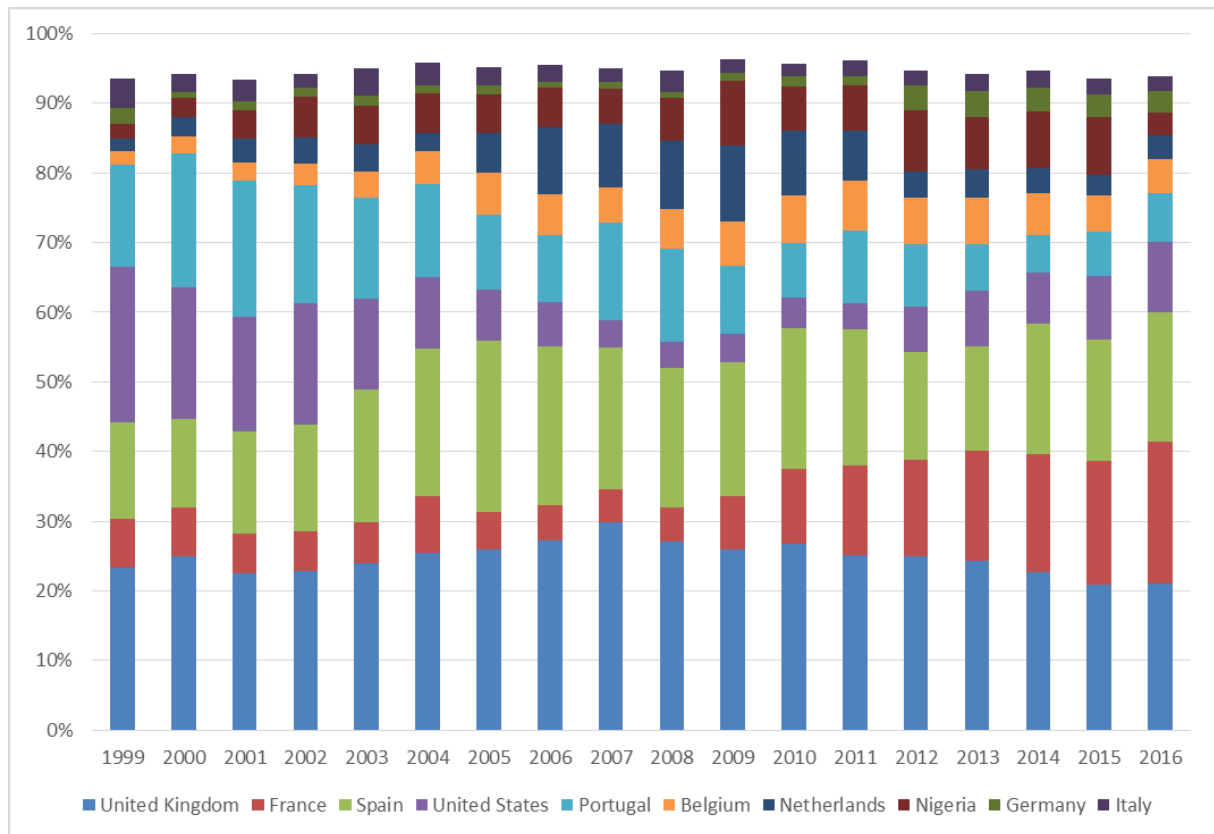


Figure 25. Export value by 10 major countries. (Source: Statistics Iceland)

As can be seen from the figure above that the most important country for cod export is UK with around 22.3% of the total values in 2016. The UK market is still dominated by frozen product or around 64% of the total value of the market is frozen. France is the second most important market for cod in 2016. The France market is dominated by fresh fillets portion as 82.9% of the value comes from fresh fillet but in 1999 fresh product accounted for 2.7% of the value. The US market has been growing in importance since 2011, mainly due to increase in export of fresh fillets to the east coast.

Nigerian market is increasingly important for Cod products mainly by-products as dried heads and bones of cod, although that market is now struggling because of low oil prices and unstable infrastructure. Spain has been important market for salted cod product. In 1999 salted products accounted for around 80% of the value of the export. In 2016 frozen products has taken over with just over 50% of the export value. This is mainly due to more emphasis of lightly salted frozen products that are ready to cook instead of the salted product that needs to be desalted before consumption.

Main influencing factor for marketing sector

- Capability to respond to market development buyers requirements
 - Vertical integration/Auction markets
 - Iceland limits supply of fresh cod when Norway takes over the market in Feb-April.
 - Then grab the market back in end of April and supply the market until Feb next year.
- Limited efforts in:
 - Market development for end users
 - Image creation for Icelandic products

- Packaging of consumer products
- Business to business orientated rather than Business to Consumer driven
 - Limited efforts in reaching the end consumers

Domestic use or consumption

The consumption and export section of the value chain includes the only the export part of the value chain. The local consumption in Iceland is small percentage of the total cod caught. In 2013 were 3.800 tons consumed in Iceland of cod which is only a small part of the 225.000 tons caught that year. This is the official number but it is likely that the consumption is much higher of cod that does not come through documented channels. Most of the cod is sold through special fish monger shops, but big chunks are sold through the HORECA sector. Cod was not frequently sold through regular stores in Iceland, but that is changing nowadays.

Price transmission

Studying the price transmission in the value chain for Icelandic cod is not a straight forward task. There are number of reasons for that and a literary study reveals that not may have addressed this issue for Icelandic fish and estimated price transmission of cod products through the value chain to the EU market, although Eumofa did a price structure study on the supply chain for fresh cod in UK in 2012.

It is also well worth to notice that products price and margins are constantly on the move, not only on yearly basis but probably almost between batches. Volumes are also a big factor, while Norwegians send their product to the market during their short fishing season and make up demand, Icelanders manage to reduce their effort during that period, but move in when the Norwegians are finished in April and take over the fresh fish market again and supply steadily until this cycle repeat itself again the year after.

The UK market is with the French market are the most important markets for fresh cod for the Icelandic sector. Therefore it is interesting to look at price transmission of fresh cod fillet through the value chain. As, previously explained in this report, most of the cod is caught, processed and sold business to business by vertically integrated companies (VICs). These companies most often have their own marketing department selling their fish, but few rely on external sales companies that take commission for their services, often around 3%, but dependant on services supplied. There are also some smaller companies, often with processing facilities that source their fish from the fish markets or have fixed contract with boats/ships and sell their fish fresh to the UK market. These companies are often situated in short distance from Keflavik airport.

According to a desk study on the prices of cod at the three largest retail chains in UK, the price is around 16 pounds pr. kg (18.3€) of packed skinless and boneless fillet pieces. Usually 2 pieces in each package, weighing 250-280 gams. The CIF average price for fresh, whole gutted cod in Iceland was 2.1 €/kg while fillets cost is CIF around 6.7 €/kg do to processing cost and yields but average yield from whole gutted cod (with head on) to fillets with skin is around 50%. Fresh fillets pieces without skin and bones are priced around 10.1 €/kg. There is a big price difference between transport methods from Iceland to the UK market, where the plane cost is almost three times more than transport by ship.

So the FOB price of the cod pieces are now between 11 and 12 €/kg in UK. Transport, packaging and labelling in UK adds around 10% to this cost but this is often done by the retailer himself. The retail sector then adds around 5 €/kg for their services. Some might find this a bit high, but this is a highly perishable product with only few days of shelf life and needs refrigeration during transport and instore.

As stated before, this is only an estimation, from current export prices given by the companies to the current final price in the stores.

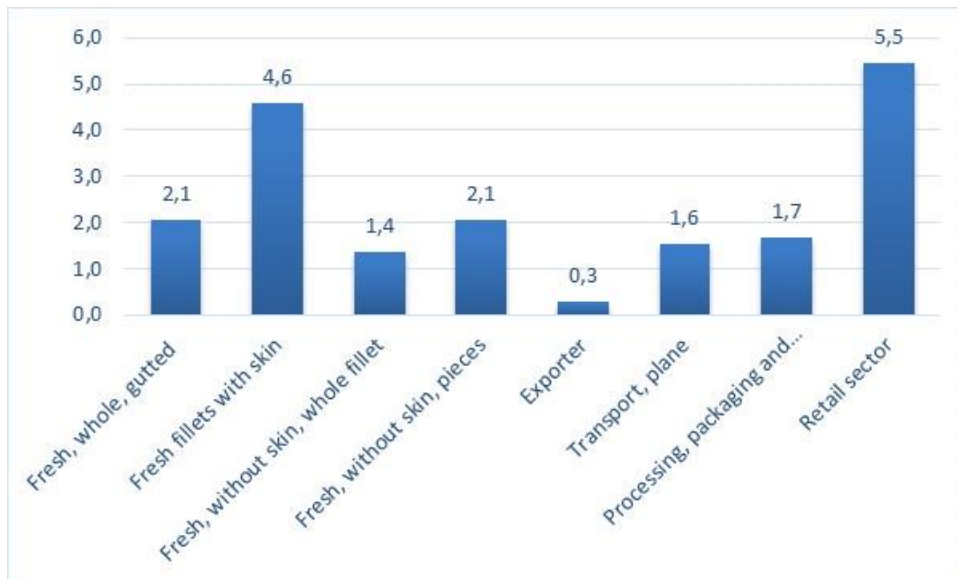


Figure 26. Price transmission for fresh cod fillet pieces from Iceland, transported by plane to UK, refers to the market situation and the price conditions in January 2018.

QUOTATIONS FROM THE INTERVIEWS

Interlocutor talking about the price transparency and markets

“... I can take you to Spain. ... Their customer in shop buys for dinner 20 euros and these 20 euros he took out of their wallet is our livelihood. For all of us (in Iceland). The first 20 euros is to the shopkeepers. And then something to the distributor, and so some to the transportation company and when these euros come in to Iceland, they probably are around 10. And these 10 euros are what we need to share between all of us here. When they come to us, maybe we (as VIC company) get 6, 7, 8 something like that. Then we just take the fisherman share (they have share system) and the fish processing employee part that are on hourly salary system, we are always arguing about our share of these 20 euros. ... Every single second we work, someone in the world needs to decide to eat fish from Iceland and from us. Four per second.”

Another interlocutor claimed when he was asked about the image of Iceland

“Yes, yes. It helps. And that close relationship (between the company and its buyers) I think too. I think we have a little benefit in there. If something is happening today, we know exactly just know exactly, the caterer knows from what ship it come from and all about it. And it's possible to read when it was produced and we can see who was on duty (on board the boat) and what it was like just by one click..., compared to before when it went through the sales

organization, we're being notified maybe half a year later if someone was unhappy or complaining about our product and we did not know anything."

The same interlocutor about the changes in marketing for the last 10 to 20 years

"Yes, it's primarily this, when began to sell ourselves. We were selling through the sales organization like others. And we established our own marketing department. It employed one or two, we had two employees in this work for 10 years. But we have 15 people today. And, yes, well, we are selling products for about 100 million a day. So there's something we are doing right."

Same interlocutor asked about the important of those changes?

"Yes, like just what I was mentioning earlier about how quickly we can respond to the market. I think that it is the most prominent example. It's just, there's something different and much shorter response time"-

Same interlocutor asked about the changes?

"Yes, like just what I was mentioning about how quickly we can respond to the market. I think that is the most prominent example. It's just, there's something different and much shorter -

Overall economic performance and competitiveness of the fisheries value chain

Value Chain dynamics

Value chain dynamics depends heavily on the governmental form of the value chain and the relationship within the value chain. Before 1994 the value chain was governed by the sale and marketing organisation owned by the producers. Those sales and marketing organisations had monopoly of export of salted fish to Mediterranean countries and duopoly of export of frozen fish products to USA. The mono and duopoly was abolished in 1994.

Vertical integration in the fishery industry in Iceland has a long history, which goes back to early 20th century. The largest fishery companies at that time were vertically integrated with large number of trawlers, in-house processing (salt fish, herring processing and meal/oil reduction) and integrated distribution channels and export activities to the main markets in Europe. In-house distribution activities ended in the 1930s and in 1940s when co-operative sales organisations with export monopoly took over (Union of Icelandic Fish Producers, Icelandic Freezing Plants and Samband of Iceland). But, the large fishery companies kept on to be partially integrated with the harvesting part and the processing part in own hands. This type of organisation was kept unchanged up into the early 1990s when the quasi-monopoly of the sales co-operatives was discontinued. Consequently, more and more of the larger companies then took the distribution and export activities in their own hands.

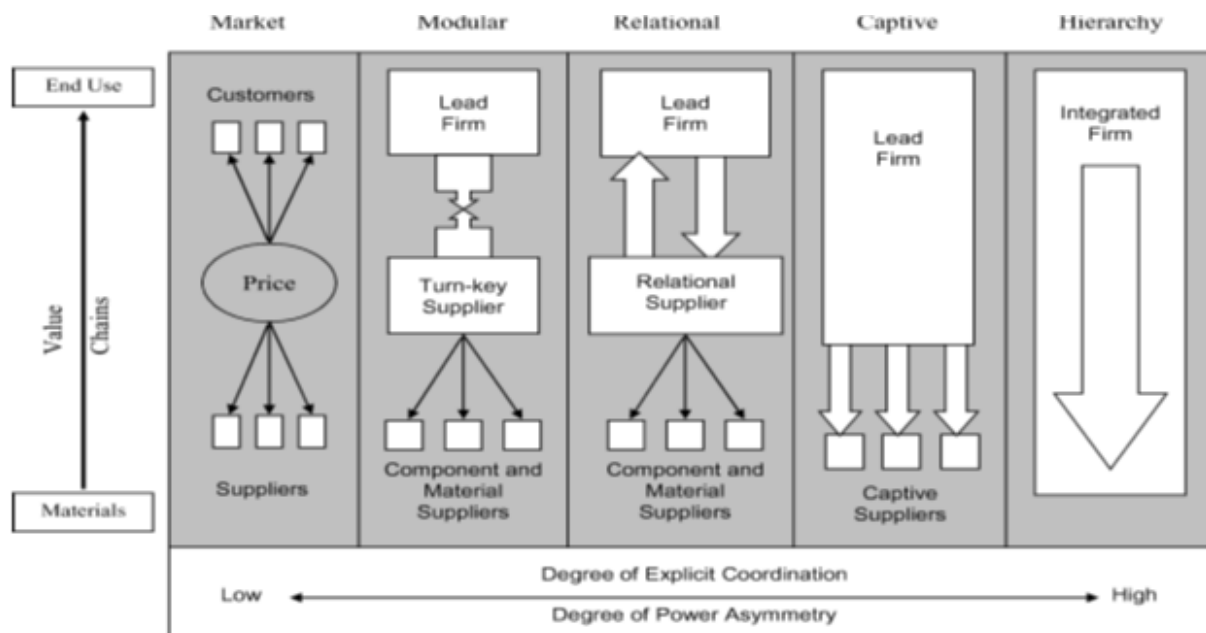
Due to the vertical integration in most Icelandic whitefish chains, the information exchange between the fishing vessels and the processors is seamless. All the catch information as well as the additional information about the trip, haul, fishing gear, etc. is available to the processors. There is no quality information available from the fishing vessels but the haul time, haul size, sea temperature or time from catch till bleeding, could be used as an indicator of quality but this usually is not done today. Most of the big vertically integrated companies have a fleet management system in place to determine delivery times for different vessels and improve supply chain efficiency by reducing wait times.

Icelandic processors in a vertically integrated company places orders to its fishing vessels based on the customer orders and quota status, thus following a pull supply chain system. The processor sends orders to the vessels for how much fish of each main species is wanted, where to catch and when (and sometimes where) to land so they have the desired size and quality of raw material needed for fulfilling customer orders. This is unlike the push supply chain system followed by the Norwegian companies where they must process the fish that they receive.

Governmental form

During the period before 1994 when the limited export licences were still active and the operation of the sale organisation still ongoing, producers had to deliver all their products to the sale and marketing organisation (SMOs) for selling. During that time the governmental structure of the value chain of cod from fishing to markets was Captive form as the sale organisation in key position in the value chain where producers had duty of handing in all their product for selling through the SMOs. This created situation where the SMOs control all flow of information from the market to the producers. After the abolishment of the export licences the sale organisation change the ownership form of the organisation from being co-ops to limited liability companies. Hence, the duty of the producers to

hand over all their products was abolished and most of the producers sold their share in the new companies.



One of the most important changes of the domestic value chain dynamic was the establishment of the auction markets. Before that the most common form of the governmental of the domestic part of the value chain was either hierarchy through VIC or relational through landing agreements between individual boat owners and producers. In some cases, individual boat owner based their relationship with the producers just price creating come kind of market relationship. By the establishment of the auction markets more and more of the individual boat owners moved their business to the auction markets increasing the emphasis of the market form. Then after the implementing the ITQ system more of the TAC moved to the VIC as can be seen that only around 15% of cod is sold through the auction markets. Hence, there are mainly two form of governmental structure in the domestic part of the value chain of cod that is markets based on supply and demand of the auction markets and hierarchy relationship through vertical integrated companies. Other form as relational can still be identified but in limited cases.

The export part of the value chain has as well changes a lot the last 30 years. The bigger VIC have in many cases established their own marketing division or even their own marketing companies abroad. In most cases Icelandic companies are selling to middleman abroad as distributors or wholesalers although some are selling directly to retail chain as in the fresh fish markets. In most cases companies have contract with buyers that that could be regarded as relational form of governance. The dependency in the value chain varies a lot depending degree of long term contract in their business instead of ad hoc sale. In interview with managers in the Icelandic fish industry it is clear that more and more of the TAC is sold before it is caught. This indicates long term relationship and relational governance form in the export part of the value chain term relationship

Drive force in the value chain

The drive force in the value chain have changed a lot the last 30 years from having harvesting/production driven value chain to becoming more and more marketing driven value chain.

The main reasons for this changes can be trace to the introduction of auction markets in 1987 the introduction of the ITQ system in 1991 and the abolishment of strict and limited export licences opening up for more marketing connection of producers.

The fisheries management system has great impact on the relationship in the value chain as companies know in the beginning of the fishing year what their TAC will be and can plan according to that. Limitation or restriction regarding timing of fishing is not the case except in the costal fishing so companies can plan their fishing, production and marketing in order to maximize the output from value chain and in most cases according to market situation. This change from harvesting driven to marketing driven value chain took place between 1990 and 2000 and is more obvious with increased emphasis of production fresh fillet portion that demands full coordination and the value chain. Before 1991 it is clear that the value chain was harvesting drive and decision on fishing was done more according to when it was easiest to catch the fish form example during the spawning season in gillnets.

The drive force for changes in the dynamic of the value chain of Icelandic cod are

- FMS (ITQ) system that allows companies to maximize their returns and plan according to market condition
- Direct marketing connection and understanding of market situation
- Coordination in the value chain mainly done through the hierarchy in the VIC
- Auction markets support coordination and specialisation in production
- Power balance. In quota system it is clear that the formal power lies with the quota holder or the individual that has the TAC. Due to the fact that around 70% of the TAC is hold by the VIC companies so it is clear that they are the most powerful players in the value chain. Due to limits to the consolidation that is 12% in the demersal spices there are limits to how individual company can dominate the industry.
 - Vertical integration support power balance in the value chain
- Leading companies in the value chain? It is difficult to identify leading companies in the value chain of cod.

QUOTATIONS FROM THE INTERVIEWS

Interlocutor asked about the direct relationship with customers

“Yes you can say more today to them (in the market) today we’re catching what we have already sold. We have turned this around. Before we started the old days on the catching the fish, and then we were relying on god and luck that we could possible sell the product. But today we are much more in touch, direct contact with the customers and say: What do you want? And after that we start fishing. So this has turned around a lot.”

There is this integration of fishing and processing. And we find it on the markets, very strong at the beginning of the year when, the Norwegians come into the markets with their seasonal fishing and the price start falling and it's the same year after year, It's just always, in January, February, March, the price is falling when the Norwegians come in with all the time mass. They are a little driven by fishing (harvesting driven value chain). And there is much more of individual boat owners (in Norway) that looks at the fishing as seasonal fishing. They're just focusing on finish fishing and then they're going to do something else. Whether they do nothing, or something else. So they are catching most of their cod in the first four, five months”.

Data limitations - Iceland

The value chain in Iceland is well documented, both regarding fisheries and processing. The export data are not as good since there seem to be little surveillance with data quality at that end and the customs numbers are not adjusted to the industry today. Therefore is far too much of the export going into a group call “other fish products”, making it difficult for observers to estimate what is included in that group.

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Fisheries Value Chain
Evaluation of industry dynamics, opportunities
and threats to industry

Norway – COD

Prepared by
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January 2018

List of Acronyms - Norway

NFD	Ministry of Industry, Trade and Fisheries (Nærings- og fiskeridepartementet)
FDIR	Norwegian Directorate of Fisheries (Fiskeridirektoratet)
NSC	Norwegian Seafood Council (Sjømatrådet)
EU	European Union
HOG	Head on, gutted
HG	Headed, gutted
TAC	Total Allowable Catch

Dictionary - Norway

Fish Landing Station- means any site where fish or marine plants are offloaded for the purpose of marketing (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Live Weight – The weight of the fish in the condition it is as taken out of the water

Total Allowable Catch (TAC) -, are catch limits (expressed in tonnes or numbers) that are set for most commercial fish stocks.

Primary Processing- means the processing of fish as part of its preparation for market by applying any one or more of the following processes to it: washing, cleaning, icing, skinning, shucking, filleting, portioning, pickling, cooking, salting, curing, drying, freezing or canning. A primary process fish or seafood product is on that has been washed, cleaned, iced, skinned shucked, filleted, portioned, pickled, cooked, salted, cured, dried, frozen and/or canned. (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Conversion References

Units of Measure

UNIT	POUNDS (lb)	KILOGRAMS (kg)
Metric tonnes (mt)	2204 pounds	1000

Foreign Exchange Conversions for Period 1999-2016

Year	CDN:EURO	EURO:CDN	ISK:EURO	EURO:ISK	NOK:EURO	EURO:NOK
1999	0.63	1.58			8,310	0,120
2000	0.73	1.37			8,111	0,123
2001	0.72	1.39			8,049	0,124
2002	0.68	1.48			7,507	0,133
2003	0.63	1.58			8,004	0,125
2004	0.62	1.62			8,372	0,119
2005	0.66	1.50			8,007	0,125
2006	0.70	1.42			8,051	0,124
2007	0.68	1.47			8,015	0,125
2008	0.64	1.56			8,219	0,122
2009	0.63	1.59			8,729	0,115
2010	0.73	1.36			8,007	0,125
2011	0.73	1.38			7,793	0,128
2012	0.78	1.28			7,474	0,134
2013	0.73	1.37			7,809	0,128
2014	0.68	1.47			8,353	0,120
2015	0.71	1.42			8,953	0,112
2016	0.68	1.47			9,290	0,108
2017	0.69	1.45			9,303	0,107

Main markets - Norway

For Norwegian cod products, the main markets are shown in the figure below, with respect to export value. As can be seen, Portugal (clipfish) dominate the bars with roughly $\frac{1}{4}$ to $\frac{1}{3}$ of the export value. Denmark is the second largest export market, but is in many cases not the final destination for the fresh and frozen fish going there. Other important export countries are UK (fresh), Italy (dried), China (frozen), France (fresh), Brazil (clipfish) and Spain (salted).

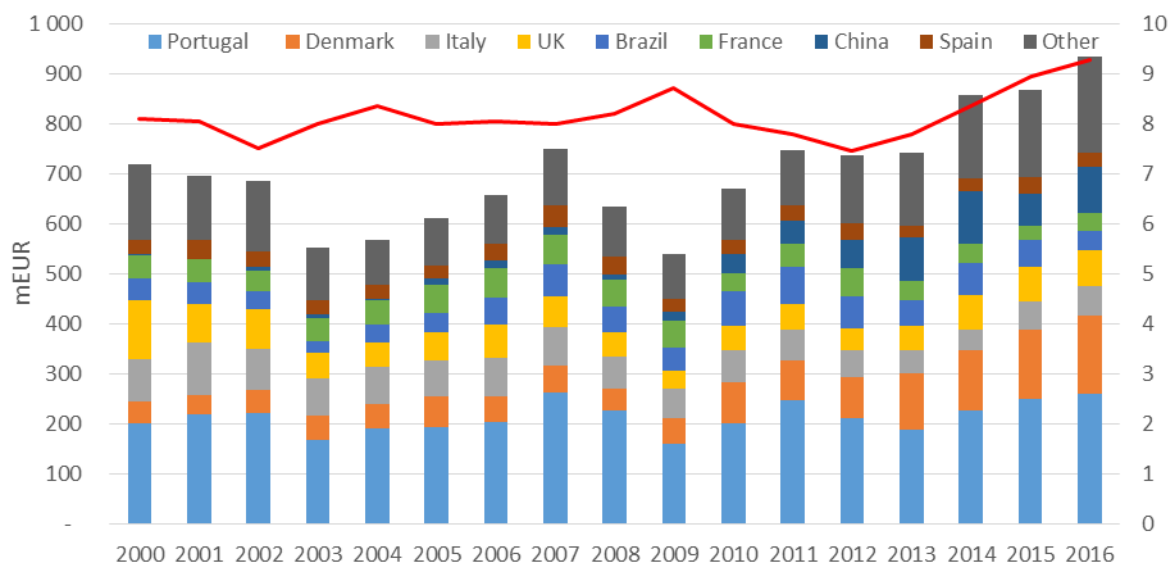


Figure 1 Norwegian cod export, main import countries, 2000–2016, in million Euros, and exchange rate NOK/EUR (red line). Source: Norwegian Seafood Council

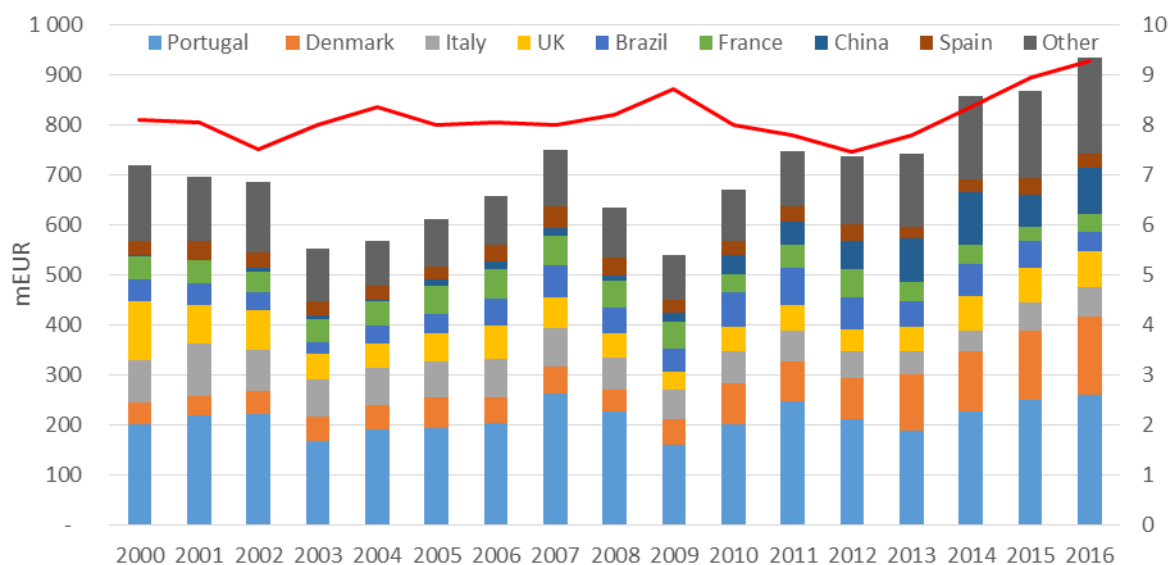


Figure show that over time, China and Denmark have taken larger proportions of Norwegian cod export, mainly whole fresh and frozen cod, respectively, in accordance with increased quotas for Northeast Atlantic (NEA) cod. The graph also illustrates the development in the NOK/Euro exchange rate, which of course have great influence on the export value and industry profitability, since about half the export is traded in this currency (Nyrud & Bendiksen, 2015).

Below, the export volumes (product weight) is illustrated for the most important markets.

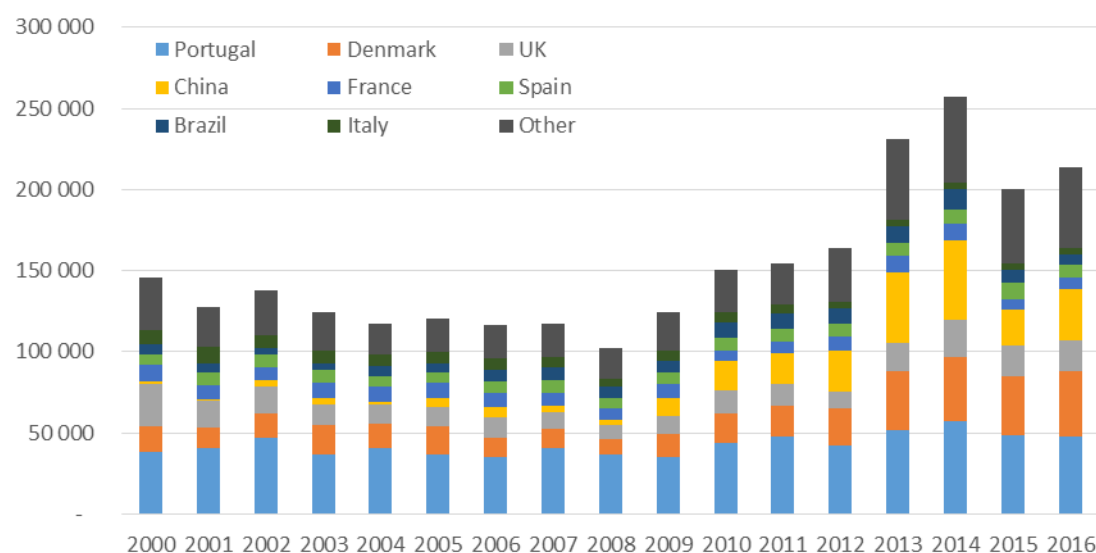


Figure 2 Export volumes (tonnes), product weight, to most important markets/nations, 2000–2016. Source: NSC

Again, we see how Denmark and China, receiving whole cod (fresh and frozen, respectively) developed as most important nations after the cod quota increases after 2009. Moreover, when comparing with

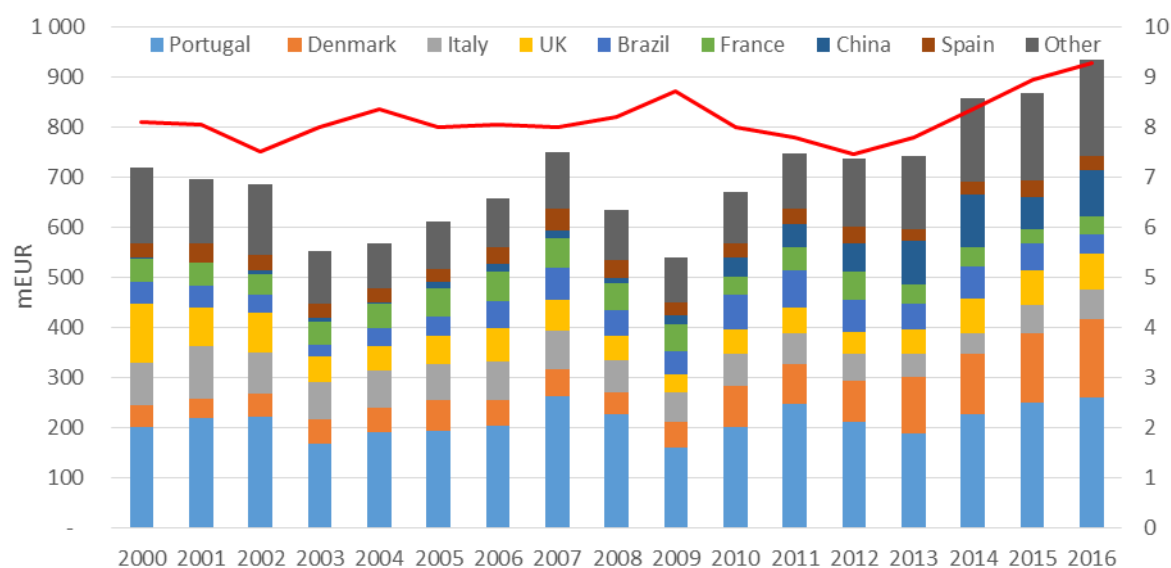


Figure we see that the top eight keep their places on the list but changes position (deemed by the total export/export value in the period 2000–2016). The price effects (in Euros) also become obvious since the value does not vary in the same magnitude (or direction) as the volume.

Concentration – HHI Index - Norway

The Norwegian whitefish sector is a heterogeneous branch consisting of very different units in all links of the value chain – from small independent coastal vessels, fishing and delivering fresh whitefish (mainly cod), to smaller or larger seafood processors in rural areas, to large (concentrated or diversified) concerns of firms with a fleet of integrated (freezing) trawlers. Our choice of case study firms show intendedly only sparse examples of businesses found in this sector, since there is practically no “typical” firm in this industry. They are however, examples of firms that we find in this sector.

One particular feature of an industry, which within the Structure-Conduct-Performance paradigm (Ferguson, 1988) is believed to have causal relationship with firm performance, is the structure of the market. The characteristics of the markets and industries in an economy defines the structure in this paradigm, and describes the environment in which firms operate in a market. A particular important dimension is the market concentration, i.e. the number and size distribution of buyers and sellers. This will be treated below. Other features is the degree of differentiation (product homogeneity), entry and exit conditions and the degree of integration.

Herfindahl-Hirschman Index (HHI)

The HHI-index is one that measures concentration in a market, i.e. to what degree a market is dominated by one or several firms. However, it is a “...pure number with virtually no real-world content; therefore it has been hard to interpret” (Schepherd, 1999: 74). It incorporates the market share of all firms as opposed to concentration ratios depending on the 10 or four largest firms. The index value is found by the sum of the squared market shares of all firms (N):

$$HHI = \sum_{i=1}^N s_i^2$$

and can be expressed as a normalized figure ($0 \leq HHI \leq 1$), or taking numbers between 5 and 10,000, for whether market shares are expressed in percentages or rates.

For a company with 100 per cent market share the value will be 10,000 (or corresponding 1), while for a market with 10 firms and 10 per cent market share each the value will be 1,000 or 0.1. The table below show US antitrust authorities consider industries deemed by the HHI:

HHI	
< 0.15	Unconcentrated
0.15–0.25	Moderate concentration
> 0.25	High concentration

When measuring the concentration in a market, a relevant question becomes: “What is the market, for which firms’ market shares should be evaluated?” Hence; against which other firms should its market share be weighed?

Sellers of cod/whitefish in the first hand market

For the first link in the Norwegian seafood value chain (fisheries) it is obvious that the first hand market of fish is the relevant market. However, the products sold on in this market are not necessarily homogeneous, and therefore substitutes to such a degree that they all should be weighed together. The differences between a frozen herring, or even shrimp, and a fresh cod is huge when it comes to applicability in different seafood production processes, moreover; how it meets different demands of different consumers. Hence, when measuring concentration for the industry in which “Hermes” is a member, measurement should be done in the first hand market, and for whitefish or cod. Cod, since it is the most important species (together with saithe and haddock) and since it is for this species the main quotas are given.

The vessel group of trawlers is however at odds with the main suppliers of fish, in that it delivers most of its catch frozen at sea, not fresh, like most coastal vessels. This is a feature the trawlers share with the conventional off shore fleet – a vessel group operating with long-line (auto-line) in

Norwegian and international waters. These vessels' landings constitute a quite different first hand market than those supplying fresh fish, since fish is auctioned to (usually substantially) higher prices to a global market than what is usual in direct agreements between coastal vessels and fish buyers in harbours. However, the conventional off shore vessels often acquires a price premium for their fish over trawlers', often explained by the extraordinary quality supplied by long line (versus trawl).

Below the number of vessels in the trawler vessel group is depicted for the period 1990-2016, together with all registered fishing vessels (that in theory at least, all can fish cod).

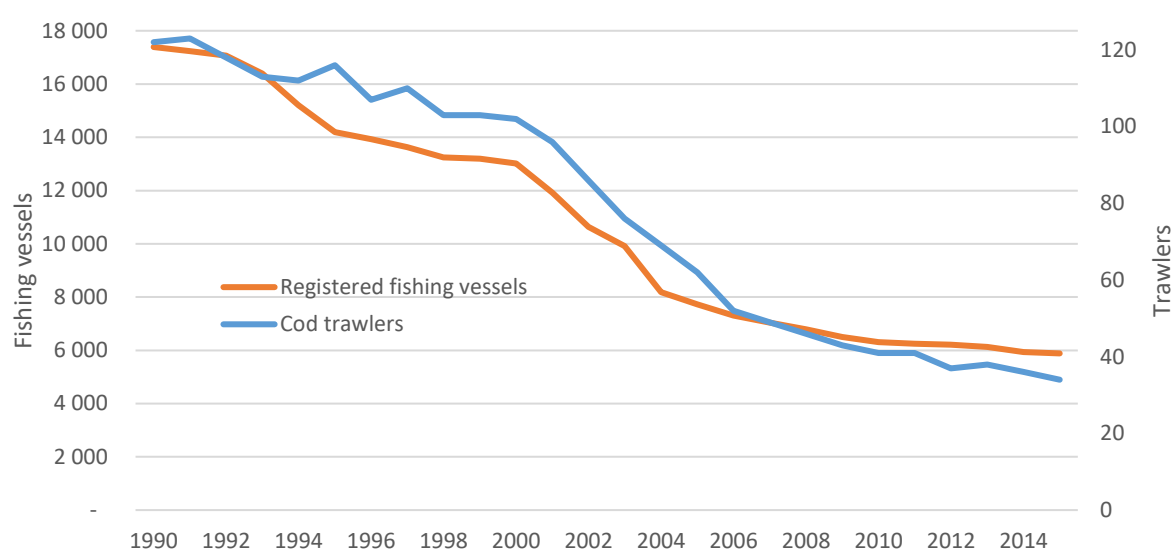


Figure 3 Registered fishing vessels and licensed cod trawlers in Norway in the period 1990–2015. Source: Norwegian Directorate of Fisheries

The figure show that the development in number of trawlers follow the same trend as the development in number of registered Norwegian fishing vessels – which can serve as a proxy to the number able to fish commercially for cod. The reduction in these vessel groups in the period has been 74 and 68 percent respectively for trawlers and registered fishing vessels.

Using the number of fishing vessels as a proxy to concentration show that there has been an immense development the latest 25 years. However, even though 34 individual trawlers can constitute a substantial number of market actors (suppliers), there are companies owning several trawlers which makes the real number of market participants much smaller. In 2015, two vertically integrated firms owned 10 and five trawlers respectively, while two trawler owners controlled two and three vessels each. All in all the number of market actors becomes halved, with only 18 in stead of 34.

In the table below we show the development in the first hand market for cod and whitefish, for frozen and fresh fish, when it comes to number of vessels and total value (nominal) in the period since the turn of the millennium (five year intervals). We only include vessels fishing with landings of cod or whitefish for more than NOK 10,000 nominally each of the year (hence cod landing value in the range of € 1,250 annually). This corresponds to a total cod landing per vessel between 740 and 1,160 kg in the period). The rest of the cod landings constitute less than 0.1 per cent of the total each of the years.

Table 17 The first hand market for cod and whitefish (cod, saithe and haddock) in the years 2000, 2005, 2010 and 2015. Number of vessels landing cod or whitefish for more than 10 kNOK and total first hand value (m€) – all cod and only frozen.

		2000			2005			2010			2015		
		#	Value	HHI	#	Value	HHI	#	Value	HHI	#	Value	HHI
All	Cod	5,852	364	0.00	4,864	377	0.00	3,905	374	0.00	3,685	522	0.01
	Whitefish	6,561	523	0.00	5,180	582	0.00	4,263	707	0.01	4,005	783	0.01
Frozen	Cod	188	122	0.01	109	127	0.01	93	158	0.02	101	265	0.02
	Whitefish	194	177	0.01	111	250	0.01	97	382	0.02	104	438	0.02

Table 17 reveal several aspects with the first hand market of cod and whitefish in the period 2000-15. First of all, if we stick to the most important species; cod, the first hand value increased considerably from 2010 to 2015. However, at the same time landings rose from 283,000 tons to 421,000 tons. We also see that the total number of vessels (landing cod for more than NOK 10k) is reduced by 37 %. This is less than the reduction in total number of vessels (from Figure), which was 55 % for the period 2000-2015. In fact, the number of vessels landing cod for more than NOK 10k has increased from 2013 – the year the first hand price for cod set a new all time low. However, in the number of vessels, we find both leisure time vessels as well as large trawlers with sales beyond m€ 10 mill.

When contemplating the landings of frozen fish one should bear in mind the following development in the period: Traditionally, frozen fish has been supplied by cod trawlers and conventional off shore vessels only. However, also coastal fleets' fishing for whitefish – where the vessel length limit (28 m) was replaced by a 300 m³ cargo capacity limit in 2008 (later increased to 500 m³) – has led to some larger vessels also undertaking onboard freezing of fish. Moreover, which can be seen from Table 17, the reduction in number of vessels in the two vessel groups have been huge. As mentioned, the number of cod trawlers has gone down with 2/3 in the period – from 102 to 34. The number of off-shore conventional vessel (autoliners) was 98 in 2000, whereas in 2015 only 26 remained.

The Hirschman-Herfindahl Index, measured for each of the “groups” and for each of the four years, is meant as an illustration of the concentration in the “cod/whitefish fishing industry”. As seen from Table 17, the concentration in the industry is very modest, and can be characterized as atomism or as a highly competitive industry. Behind this calculation, however, lies the assumption that each vessel can be seen as one freestanding unit in this industry. That is at very simplifying assumption since we know that many companies own more than one vessel over the whole timespan of measurements (as mentioned above). Moreover, with an increasing trend of “more-than-one-vessel”-companies, and fewer and fewer vessels in total, this tendency of concentration will increase over time. For instance among the smaller vessels (under 11 meters) expectations regarding possibilities for merging of quotas on one vessel (structuring), together with a co-fishing scheme, have led many to buy extra vessels (with quota) for positioning reasons. The data access, however, and the number of units in total in this industry, makes it an impossible task to check correctly to real ownership issue to all these vessels over all the years. The reason is that it is a dynamic industry where in some vessel groups up to 20 per cent of the annual permits to fish/licenses changes owner

during the year. Nevertheless, the HHI-values above point to the fact that concentration should not be a concern in the first hand market for cod and whitefish in Norway.

In order to check for the development in concentration we address the group of vessels delivering frozen **cod** in two of the years; 2010 and 2015. The largest vessel owning company had 12 trawlers of which 10 landed frozen cod in 2010, and 10 trawlers in 2015. Within the group of conventional off-shore vessels (autoliners) we find 36 in 2010 and 26 in 2015. We find in total eight companies owning two or more vessels landing frozen fish (auto liners included). The largest company has a 15 per cent market share in 2010, while 17 per cent in 2015. From Table 18 we see an increased concentration in this market from 2010 to 2015, but still at modest level. Hence, the first hand market for frozen fish should also be deemed “unconcentrated” when following the rule of thumb from above, where the “cut-off” to becoming moderately concentrated, was 0.15.

Table 18 Herfindahl-Hirschman index for vessels landing cod and frozen cod, 2010 and 2015.

	Frozen cod			All cod		
	HHI – index	CR4	CR8	HHI – index	CR4	CR8
2010	0.048	36 %	49 %	0.016	20 %	25 %
2015	0.065	42 %	55 %	0.022	24 %	28

Buyers of cod in the first hand market

The other side of the first hand market is the buyers. For cod, one could say that the market is two parted; one market for onboard frozen cod, sold on auction or on contract, and one for the fresh cod, most often landed directly to the buyer on direct agreement between seller and buyer. The two vertically integrated processors in Norway owning cod trawlers, sources only limited volumes of fresh and frozen cod from own vessels. Their strategy is more in the range of purchasing their raw materials from the coastal fleet, and the reasons are multiple. Frozen fillets have become a narrow margin product, in fierce global competition with other whitefish species. Hence, the industry prefers fresh products (of better quality than from trawl). At the same time, the frozen cod from trawlers achieves better prices on the global market, than what they have to pay for the fresh from the coastal fleet. And freezing fish on board can constitute significant cost savings when fishing grounds are far off home harbors.

Development over time

The development of the Norwegian seafood industry has over time followed a trend of liberalization, where the emphasis has changed from protection and subsidies (pre-1990'ies) to international competitiveness and environmental and economic sustainability. It is not easy to set a clear division in time where this policy change occur, but over time the emphasis has gone in that direction. Hallenstvedt (1995) describes the transition (from early 1970'ies) as a process where resources and resource allocations becomes the main theme in the fisheries policy, while negotiations on subsidies and it's distributions becomes secondary. Also, he claims, in the mid-1990'ies, Norway has left a period with free conduct on the ocean and regulated market behaviour, to one with regulated conduct on sea and free competition in the market. Earlier (pre-1990'ies), the seafood export was organised in trade unions, dependent on product (dried fish, salt fish, fresh fish, frozen fish and

clipfish) whereas a deregulation of the seafood export act in early 1990'ies open up for anyone – satisfying a set of objective criteria, to export seafood.

In the first hand market, the abolishment of subsidies involved that the price wedge between supply and demand was removed, enabling price movements in the market to be directly transferred to fishers. Sales organisations' right to set minimum prices still meant a share of market power on behalf of fishers, but also here the development towards a dynamic minimum price – dependent on objective and observable factors on the market place – have reduced the shielding of fishermen from market signals. Moreover, the reduction of both fishing vessels and purchasers along the coast, has consolidated and professionalised the industry on both sides of the transaction in the first hand market.

The consolidation in the fleet might have had an effect on the power balance, and some would maintain that the fishing industry have increased their power on expense of the processing industry. Others again, would maintain that the processing industry, by ways of consolidation in this link of the chain, have ascertained increased power over the fishing/selling side of the transaction. However, the heterogeneity of the fishing sector makes it impossible to conclude unanimously on this matter. In some areas for some vessel groups consolidation might have increased the fishing side's power towards the processing sector, whereas in other areas the opposite might be the case. The power balance might also depend on the aggregated demand and supply situation, and as such depend on the cod quota available for the industry.

Fisheries Management System - Norway

The Norwegian fisheries management system rests on the principle of *sustainable marine resource management*, and rests on the following principles: sustainable harvesting, multi-species approach, adequate regulations and an efficient control and enforcement scheme (Williams & Hammer, 2000).

The development the latest 20 years can be described by the emphasis in the goals for the industry, as set by the Government in White Papers to the Parliament. In 1997, the following is put forward (in Stortingsmelding no. 51 (1997-98)): *“The fisheries policy shall contribute to establishing a sound basis for an economically viable development of the fisheries industry. A sustainable management of the living marine resources is pre-conditional. Through market orientation and increased value creation, the fisheries sector shall contribute to good employment and living opportunities in the coastal communities.”* Nineteen years later different goals for the fisheries policy are put forward, and co-ordinated with the goals for all Norwegian industry (then again, the old Ministry of Fisheries is merged into the Ministry of Trade, Industry and Fisheries – in Stortingsmelding no. 10 (2015-2016): *“The main objective for the industrial and fisheries policy is the highest possible value creation in Norwegian economy, within sustainable limits. The Ministry’s work to obtain this main objective builds on the following sub-objectives: efficient use of society’s resources, increased innovation and adaptation ability, and companies who succeed in international market. The sub-objectives and prioritised areas to achieve these are just as important for the seafood industry as other activities in Norway. A purposeful superior effort to stimulate to increased innovation and adaptation ability in Norwegian economy is of great importance also for the seafood industry.”*

As underlined elsewhere (Iversen *et al.*, 2016), the old three-partition of the fisheries policy goals, has in latter years involved a priority of economic and environmental sustainability, which can be interpreted as if less emphasis is put on the latter; social sustainability (expressed by the industry’s role as employer in [remote] coastal areas). Hence, in the marshalling of the fisheries industry, greater emphasis have been placed on economic development (under the prerequisite of sustainable resource exploitation) while the means for prioritising social development have vaporised as subsidies are phased and disappeared.

General Description

Below, in headwords, a general description of the national system is provided. For a more detailed description, please see chapter 1 in Isaksen (2017):

- Fisheries is an important industry in many coastal communities, especially in the north of Norway.
 - Seafood (aquaculture incl.) is the third most important export article.
 - Share of GDP and employment however, does not add up to 1 per cent.
 - Vast reduction in number of vessels and fishers (-60% since 1990), processing facilities and employees over time.
- Only fishers allowed owning fishing vessels.
 - In practice (upstream) vertical integration prohibited. In the cod sector, historically important exceptions from this (cod trawlers) and an increasing tendency lately where fishers have integrated downstream (buying/erecting processing capabilities).

- Sales Organisation, controlled by fishers, have a legislative monopoly right for all first hand sales of fish.
 - Right to set minimum prices for fish.
 - Attends to some managerial tasks (control and monitoring).
- Most fish stocks shared with other nations, and quotas set upon ICES recommendations and negotiation. NEA cod stock shared with Russia. Own “quota-stock” of coastal cod.
- Quota system: Individually Transferable Access.
 - Rule of thumb: Off-shore vessels governed by licenses, and coastal vessels by annual participation rights (off-shore conventional vessels excepted). In practice, little
 - In order to get a fishing quota you have to buy a vessel (a pre-requisite is loosened up in later years, where one nowadays can get hold of structured quotas, without factual vessel transactions). Transferability has increased, but still with great imperfections compared with an ITQ-regime.
 - Quota distribution to vessel groups (coastal vs. off-shore, and different size classes within the coastal vessel group) based on allocation formulas agreed within the Norwegian Fishermen Association, upon historical rights. Still with some autonomy for the authorities to allocate certain shares of quotas to special schemes (youth, recruitment, R&D, etc.) before allocation to vessels.
 - Regional distribution safeguarded by fleet composition, and limited transferability between regions for some licenses/participation rights.

Main Influences of Management on Value Chain Dynamics

The activity demand in the Participation Act states that in order to own a fishing vessel one has to be an active fisher. Many exceptions have been granted. Firstly, on the same footing as active fishers are administrative fishing vessel owners – caretaking the daily operation of vessels from land. Also, as the filleting industry in the north of Norway was built up and prioritised as whole year employers, many filleting firms were granted cod trawl licenses, which today are held by two big processing concerns (Lerøy and Nergård, owning 8 and 5 cod trawlers respectively in 2015). This constitutes, of course, a considerable entry barrier.

To become a registered fisher, you need to be over 15 years, live in Norway and work on a registered Norwegian fishing vessel. The latter condition can be excepted as mentioned above. To be registered as a full-time fisher, gross income from fishing should exceed NOK 100,000 (EUR 10,760 in 2016), and cannot take work elsewhere than in fishing for more than 2/3 of a man-year, and earn more than NOK 300,000 in other businesses. Gross income from fishing must exceed the double of gross income from other industries/self-employment. To be a registered part time fisher, the income cut-off is NOK 50,000 and the person cannot earn more than NOK 400,000 in other employments.

Moreover, in order to get a vessel registered as a fishing vessel, demands have to be met – mainly dependent of its size class and which ocean areas it will be operating in. Of these; certificates of the operating crew (incl. safety training), ice-classing, AIS- and tracking options, stability and radio communications certificates, and so forth. These are demands set both by the FDIR and the Norwegian Maritime Authority, but also by other ministerial agencies. Some also involves a fee on annual basis, like the registry of fishing vessels.

One critique often raised against the coastal fleet's fishing for cod is that no limits exist to how much a vessel can land on a daily basis. There is of course safety limits to how much cargo a vessel can hold, and also a general rule that "a vessel should not carry more than it can take care of in a reasonable manner", but no limits exist as to what is the limit for daily catches in order to enable a best possible raw material quality.

The examples of exit barriers are fewer, but one can be that vessel owners are unable to recover the full vessel value as they exit the industry. However, the increase in quota prices over the years should cover for such discrepancies. Moreover, the limited transferability between regions in some vessel groups (especially when fishers from "south" of Norway purchase vessels from the north) can constitute an exit barrier. In some instances, fishers have moved from north to south for a period of more than a year, just in order to be able to sell their vessel to the larger and better paying market for vessels (and quotas) in the south. By that, the buyer of quota are not subject to quota reduction.

Landing obligations are not a subject in Norwegian fisheries, since it is mandatory to land all caught fish. Delivery obligations have nevertheless been put on about half the cod trawlers in order to see to it that fish is landed where it was supposed to, in the cases where processing firms were granted cod trawler licenses but where ownership to trawlers have been dissolve during the years. All in all, delivery obligations are attached to about half the cod trawlers total quota, or about 17 per cent of the Norwegian cod quota. Nevertheless, these do not function very good and liberalisation over time has made the delivery obligation to an offering obligation. Trawlers have to offer (some of) the fish to the firm(s)/regions to which they have an obligation, for which the receiver of the offer has to say yes or no at a closer specified price. Some of the fish subject to these offering obligation also have minimum processing requirements. However, few processing firms favoured by such offering obligations take advantage of these "benefits". Hence, the processing obligation have little effect on the industry as such, even though some firms uphold that it constitutes a bottle neck for their choice of production.

Like in other western society fisheries, the closure of the commons have increased the capital intensity, and labour is to a large degree substituted by capital intensive production equipment. This is easily seen if we consider the industry almost 70 years ago. In 1950, 86,000 fishers found their livelihood from the sea, in about 33,000 vessels. Today there are 10,685 fishers (2017) and a total of 5,947 vessels (2016).

To some degree foreigners can buy vessels in Norway. However, this only apply to fishing vessels below 15 metres, and the owner must be resident in Norway. For vessels above 15 metres, foreigners can control no more than 40 per cent. For the processing industry, however, no such nationality limitations exists. In fact, we find many Eastern European and Icelandic citizens in the vessel registry and the fisher census – more than 10 % in some municipalities in Finnmark. The reason might be the open group in the conventional fishery for demersal species and king crab, where the participation have increased the latest years due to increased fishing opportunities. With falling cod quotas the coming years this is expected to change.

Quota ownership and quota prices

There is in Norway a consolidation limit for cod for both conventional off-shore vessels (auto-liners) and cod trawlers, but not for coastal vessels. Firms owning conventional off-shore vessels cannot, directly or indirectly, own vessels that control more than 15 per cent of the group quota for any of

the species included. For cod trawler, firms cannot control more vessels exceeding more than the number that controls 12 quota factors. With today's quota ceiling (maximum four quota factors per vessel), it means 3 full structured vessels and about 13 per cent of the group quota for cod trawlers. However, there are specific rules for ship owners that also own processing facilities, which is the reason that the two before mentioned cod trawler ship owners have more vessels than the limit of the Act.

Quotas can be transferred among vessels in a vessel owning company, but only upon authorities' approval. Also, other eases of transferability exist (renting quotas, ship wrecking, replacement permit – in awaiting of new vessel, and others) which vessel owners can utilise, but not nearly as liberal as under the Icelandic system. A quota flexibility between years is also possible, but within the cod fishery, this is only possible on group level – not for individual vessels. An overfishing of the vessel groups' cod quota one year will be claimed against next year's quota, and vice versa if the full quota is not taken. For the vessel groups with a limited number of vessels (off shore conventional and cod trawlers), this individual vessel quota flexibility between years will be effectuated over the turn of the year from 2017 to 2018. Coastal vessels will have to wait longer until this can be effectuated or this part of the fleet, since so many extraordinary schemes exists for these vessels (fresh fish scheme, quota bonus for catch based aquaculture, overregulation, and others).

Quotas within Norwegian fisheries are transferable, but there exists no central brokerage system where quota prices are noted. These transactions are for the most an issue between buyer and seller, and is seldom revealed to the public. Some anecdotal empiric notations can be found, from ship brokers, media articles and, in some cases, the tax authorities. The latest price notations for cod quotas stem from Iversen et al. (2016) and is given for different vessel groups in the Table below, based on estimates stemming from 2014.

Table 19 Price estimates for cod quotas for different vessel groups in 2014. Source: Iversen et al. (2016)

	Price per quota factor (k EUR)	Number of quota factors	Share of Norw. cod quota	Value of quotas (mill EUR)	Value per kg cod (EUR/kg)
Cod trawl	11,971	87.9	28-33 %	1,053	5.69
Conventional off-shore vessel	3,591	92.2	12.8 %	335	
Coastal < 11 m	59.8	2,528	27.7 %	156	2.05
Coastal 11-15 m	107.7	2,417	20.7 %	263	4.38
Coastal 15-21 m	119.7	2,463	21.4 %	299	4.87
Coastal > 21 m	131.7	1,648	14.3 %	216	5.57

Unfortunately, per kilogram price for the off shore conventional vessels are difficult to compute since their fishing possibilities are to a large degree directed towards other species than cod (haddock and saithe) but also towards not quota allocated species (tusk, ling, monkfish, etc.).

As mentioned, the price references stems from limited empirical evidence, and in some cases only interviews with ship brokers. On a general basis, quota prices in the coastal fleet have increased tremendously since 2014, even for the smallest vessels where quota structuring (gathering more than one quota on a vessel) is not allowed. In 2016, a quota factor in the smallest vessel group was transferred for about 81.6 k EUR, while today (Dec. 2017) such quotas are advertised sold for about

155.4 k EUR. Hence, since 2014 the quota price per quota factor in the smallest vessel group, has almost tripled.

Other issues

Norway have since 1987 practiced a discard ban, where it is illegal to discard fish when first caught.

Also, there are areas along our coast that are protected against use of active gears (trawl, Danish seine), and also areas closed for some type of gears or vessel sizes. For instance, vessels with bottom trawl are prohibited from operating closer than 12 nautical mile from the coastline/baseline (in general, but with some exceptions). Moreover, vessels above 15 meters are not allowed to fish within the fjord lines, a measure taken to protect the coastal cod at the beginning of this century.

These, and other measures to limit the effort within fisheries, are given in an own regulation – the regulation on the exercise of fishing in the sea.

Hermes as & Aksel Hansen as

- Both cod companies have followed a strategy where quota acquisitions have been central
- For Hermes capacity utilisation have been important. Aksel Hansen as, on the other side, have purchased quotas – and vessels – in order to secure raw material flow. On Aksel Hansen's side, regulations forbid upstream vertical integration, so ownership to vessels have been secured by other arrangements than directly through the mother firm.
- The cod trawler "Hermes" is not allowed to fish on the same coast near fishing grounds as the coastal fleet.

Industry Structure and Employment

Unlike the Icelandic seafood sector, the Norwegian industry is very little vertically integrated especially towards the supply source – the fishing fleet. The modest level of integration is due to the authorities wish to keep the links in the value chain separated, and historically based on the low bargaining power of fishers towards fish purchasers in the inter-war years and earlier. The few examples we find today are white fish companies that in over the 1960'ies through 1980'ies were granted exceptions from the activity demand in the legislation (stating that only fishermen could own fishing vessels) and were granted licenses to cod trawlers. In later year, a new 'wave' of integration has come up, as fishers have erected processing facilities – so called downstream integration – in about 10 occasions hitherto. The rule of thumb, however, is that most fish (and cod) is sold between independent and autonomous agents in the first hand market.

In the figure below, a coarse sketch of the Norwegian seafood sector is illustrated.

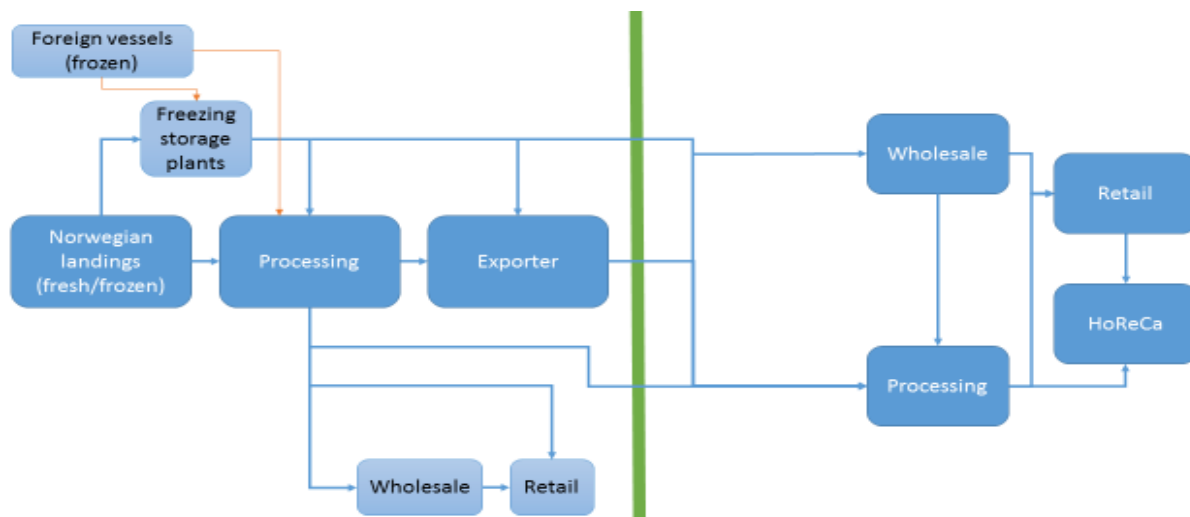


Figure 4. Coarse structure of the Norwegian cod value chain

Norwegian cod catches are in general landed fresh from coastal vessels (up to 55 meters!) or frozen from cod trawlers or conventional off-shore vessels, in a ratio of about 40 % frozen and 60 % fresh. This ratio has been relative stable since 2010 (with exception of 2013; 45 %), but has increased from about 30 % in the years 2000–2008. Moreover, while fresh cod is sold on direct agreements, between buyers and sellers, most frozen cod is landed on freezing storage plants, from which it is either auctioned to the highest bidder, or transited on contract to business partners of the selling firm.

Annually, in the period 2000–2016, a quantity in the range of 75,000 (2005) to 143,000 tonnes was landed from foreign vessels in Norway. The main flag state for these landings is Russia, responsible for 90 %, but we also find vessels from Greenland, UK, Iceland, Spain and other nations landing cod in Norway. This is cod caught by trawlers in the Barents Sea and international waters, landed frozen and in transit to other destinations. In the start of the period, some quantities from foreign vessels (mainly Russian) found its way to Norwegian processors. In later years, most of these quantities is sold on contract out of Norway.

Among the 10 largest buyers of cod in 2015 we find four fish trading firms (no processing activity). These firms purchase frozen cod only and are responsible 21 % of all cod (foreign vessels included) and 42 % of all frozen cod sales. The six remaining on the top 10 list purchase an overweight of fresh cod (three of them only fresh cod) for processing. They purchase almost the same volume cod as the four traders (21 % of all cod), and a bit more than one third of the fresh fish. The aforementioned vertical integrated concerns are among the firms, and purchase fresh (and frozen) fish from many different locations.

In total, we find about 180 whitefish processing companies in Norway in 2014, firms attending to fillets, dried fish, salted fish, clipfish, fresh fish packing and other processing. Twenty years ago, the number was about 300. In addition, about 20 firms also attend to other species (pelagic, salmon, etc.). Hence, when including these firms the number of whitefish processors is 200 in 2014, and was 370 in 1995 (Nyrud & Bendiksen, 2017).

Employees

Giving the correct numbers of employees in the seafood industry is not straightforward. For that purpose our statistics does not contain the fine-graining needed. To calculate this for cod alone becomes even more complicated, since most all vessels, processing plants and even exporters/marketers attend to more species than cod alone. Nevertheless, cod is the most important species in our wild fish industry, and is by far the largest employer of all our species – at sea as well as on land.

Below, the figure illustrates the number of registered fishers (full time occupation only) as well as the number of employees in the fish processing industry – the latter estimated in Nyrud & Bendiksen (2017) based on figures from Statistics Norway.

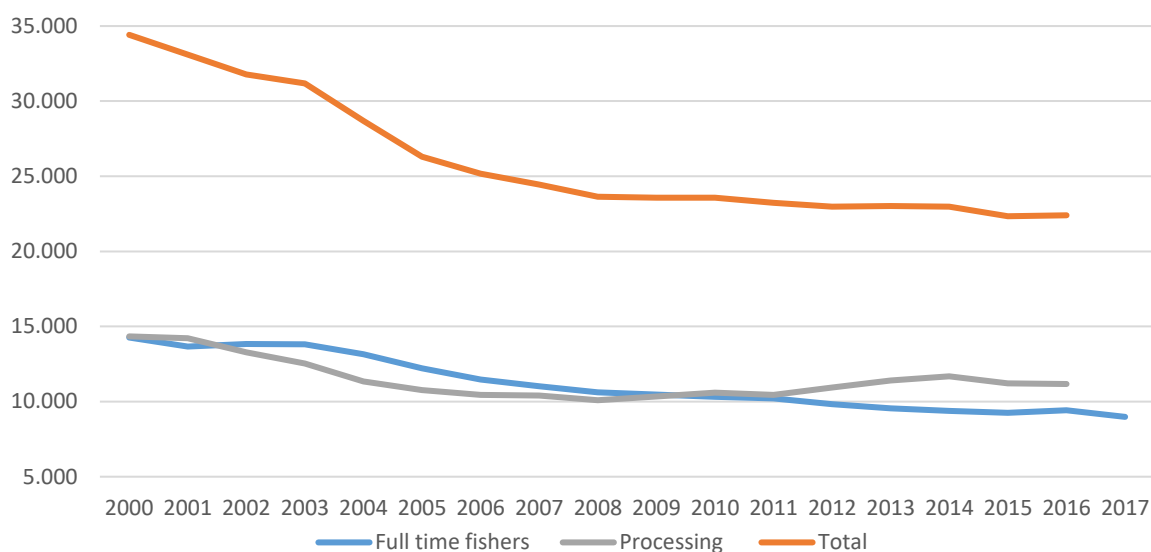


Figure 5 Number of full time fishers and employees in the fish processing industry, 2000–2017

We have chosen to hold outside the part time-fishermen, who in numbers have fallen from 5,800 to 1,700 in the period. Moreover, the number fish processing industry employees includes both number of residents non-residents and stems from a labour force survey conducted each year in November. It also includes employees working in fish processing based on aquaculture (salmon) and of course other species like pelagic.

As seen in fig 5, number of full-time fishers falls in more or less the whole period, from 14,000 to 9,000. Number of fish processing sector employees falls to 10,000 persons until 2008, increases slightly thereafter and stabilises at about 11,000 persons in the latter years. The increase in number of employees in the processing sector coincides with the increased quotas for cod. However, the increased production and profitability in the aquaculture sector is probably more (or just as) responsible for the increase as the cod sector. The employment in the whitefish sector of the processing industry is in Iversen et al. (2016) estimated to about 3,550 man-years in 2014, and with an increase from 2,800 in 2010.

Total employment in the seafood sector (aquaculture included) is about 25,000 persons in 2016. This constitute about 1 % of the total Norwegian workforce.

The cod fishery and its ripple effects (fish processing, export, wholesale and trade with goods and services supporting the industry) is important for many local communities, especially in the north of Norway, but also in the north-western region (Sunnmøre, Ålesund). Despite the fact that fish and fish products are third largest currency earning export article, the industry's value creation constitute only a very small part of the GDP (which can be expected from a primary industry in a developed western society). Value creation in the primary industries fisheries and aquaculture alone was bNOK 45 (bEUR 4.8) in 2016, where aquaculture is responsible for the lion's share. All in all the value creation from fisheries, aquaculture and seafood processing adds up to roughly bNOK 55 (bEUR 6). As the share of the GDP this turns out to be roughly 2 %. Looking to the cod sector alone, which is an important part of the seafood sector, a guesstimate would be about 0.5 % of the national GDP.

Fishing

Structure of the Fleet (Demersal Fish Stocks)

The Norwegian vessels fishing cod are the following groups: Cod trawlers, conventional off-shore vessels (autoliners) and coastal vessels. The latter consists of a closed group with quota rights, and an open group, in which all fishers who fulfil the requirements for fishing can participate. The cod quota is allocated to these groups in the manner shown below. However, this is under the assumption that the Norwegian cod quota is above 330,000 tons. The "trawl ladder" is a buffering allocation rule where larger allocation goes to the coastal vessel if the cod quota available is smaller. If the quota is lower than 130,000 tons, conventional vessels get 72 % of the quota. If the quota exceeds 330,000 tons conventional vessels are allocated 67 % of the cod quota.

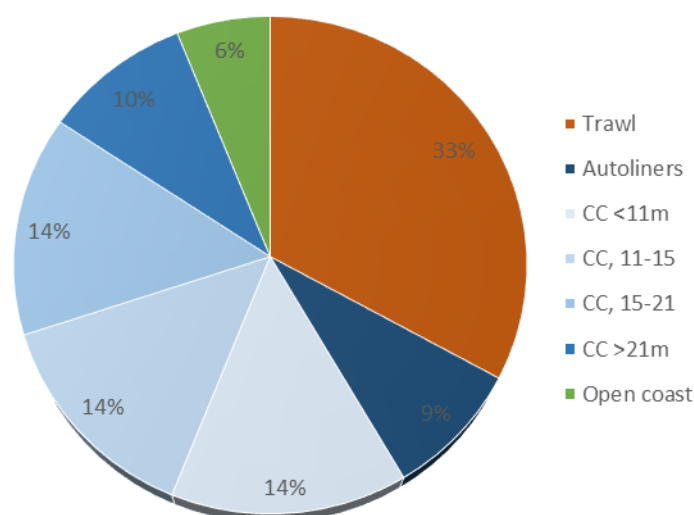


Figure 6 Allocation of the Norwegian cod quota on vessel groups when above 330,000 tons (CC = closed coastal group)

Fig 6 show the allocation on vessel groups. This allocation rule is the result of the unanimity in the negotiations between vessel group representatives in the Norwegian Fishermen's Association, which have been adopted by the authorities. The trawl ladder allocation rule was negotiated in 1989 and stems back to the cod crisis of that time.

Over the years, different structural schemes have been employed and, also, different length group limits in the coastal group. The development in number of vessels in the vessel groups is shown in the figures below, for the period after 2001.

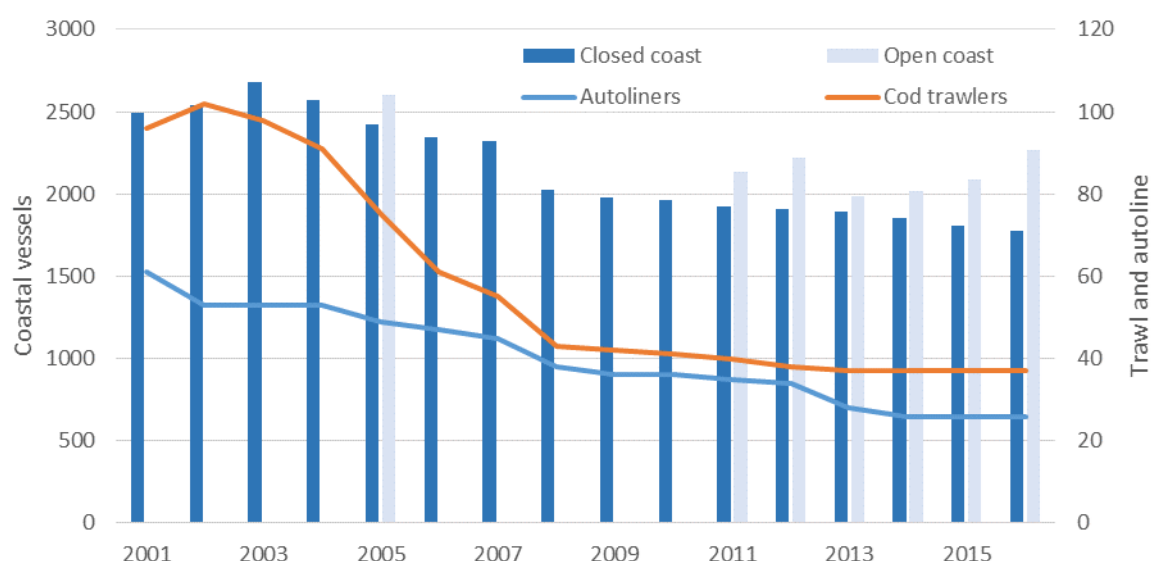


Figure 7 Number of vessel in the main vessel groups fishing for cod. Missing numbers for the open coastal group in single years, due to missing values. For the open group figures are based on vessels participating/landing cod

For all vessel groups except the open coastal vessel, we see a huge reduction in numbers over the years. The reduction in numbers from 2001 to 2016 have been in the range of 60 % for the off-shore vessels (trawlers and autoliners), while in the range of 30 % for the closed coastal group, and 15 % for the open coastal vessels since 2005. The latter also show an increase in later year. This is due to the increase in cod quota, the coastal quota (for Saami-areas; especially for this group) and the quota increase for king crab.

However, with the vast heterogeneity in the closed coastal group, it is worth illustrating the development for the different size classes. Some major changes should be mentioned: Structuring (gathering more than one quota for each vessel) was prohibited until 2004, and then introduced for vessels (with a quota length) above 15 meters. After a structure break in 2005/2006, structuring was introduced for all vessels above 11 metres (quota length) in 2007. At the same time the limit for the smallest vessel group was prolonged from 10 to 11 meters. Until 2008 the largest vessels' size limit was 28 meter. Then it was changed to 300 m3 cargo capacity, and in 2010 to 500. Today we find vessels up to 55 meters in the closed coastal group above 21 meters, whereas the smallest vessel group (under 11 meters) still haven't access to structural measures. The figure therefore has a starting point in 2007, when structural measures for vessels under 15 meters and the new size limit for the smallest vessels were introduced.

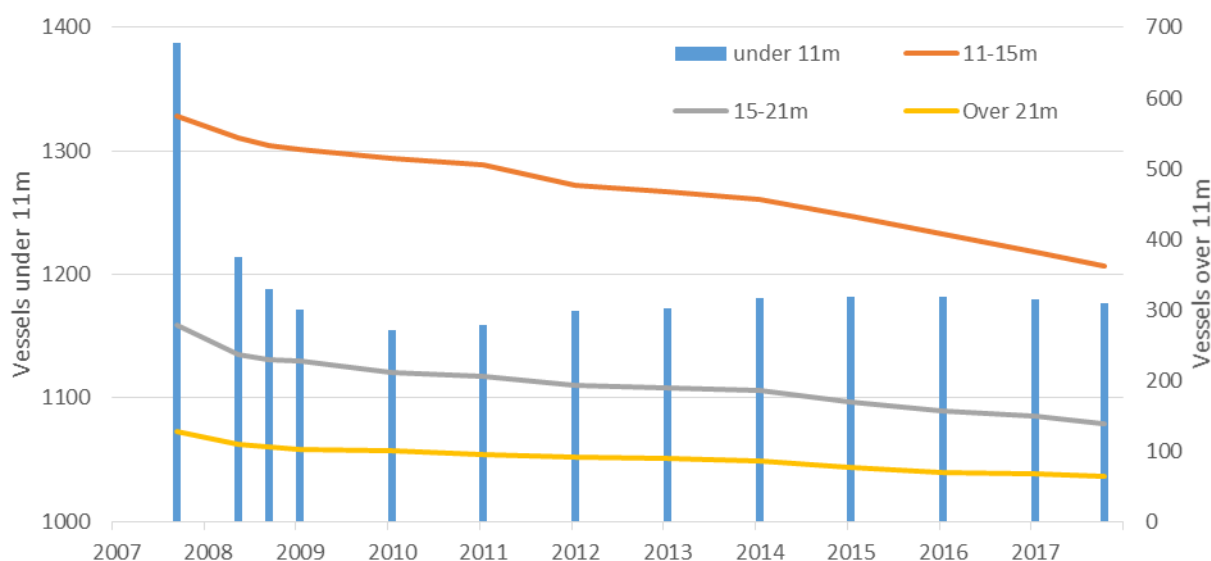


Figure 8 Development in number of vessels in the closed coastal group after quota length size, 2007-2017. Source: FDir

From fig 8 we see that the smaller vessel groups are the more numerous. Their smallest vessel's share of the closed coastal group have increased from 57 to 67 per cent in the period. The smallest one is also the one with most stable development after 2009. Even though these vessels were unable to structure, a decommissioning scheme existed until 2010, which lead to a great reduction from 2007-2010. After 2010 we see an increase in number of vessels due to assigned recruitment quotas.

While the number of small vessels (under 11m) are reduced by 15 %, only half of the vessels in the two biggest length groups are left in 2017. This is of course due to their longer period of structuring, but also that the quota ceiling (the maximum number of quota factors that can be gathered on one vessel) is higher than in the group of vessels with a quota length between 11 and 15 metres. The reduction of vessels in the latter size group (11-15 meters) has been 37 % in the period. Hence

Unlike the development in Iceland, in Norwegian fisheries fresh fish trawlers are almost out of the fleet in 2016. Also, a reduction in the number of on board processing trawlers have taken place at the same time. Both types have been substituted with freezer trawler or combined fresh/frozen trawlers. In 2016, in the largest and northernmost sales organization (Norges råfisklag) only two trawlers delivered fresh fish only and two filleted fish, while 11 landed some fresh fish but mostly frozen, out of 38 trawlers in all. In 2002, 15 years ago, there were in total 86 trawlers, of which 30 were fresh fish trawlers, five combined fresh and frozen, 16 on board processing trawlers and 35 were pure frozen trawlers. As a result only 11 % (15,000 tons) of the cod from trawlers was landed fresh in 2016. In 2002 the share was much higher with about 40 %.

Fishing Gear

In Norway, the quota allocated to trawlers is taken with trawl exactly. In the coastal fleet, gear flexibility prevails, but trawl cannot be used. Over time, the tendency is an increased use of Danish seine in the cod fishery, on the cost of gill net especially. The development in gear use in the cod fishery for the years 2005-2016 is illustrated below. One should, however, be aware of the quota fluctuations between years, were the total catch in 2013 was 471,000 tons, while 215,000 tons in 2008.

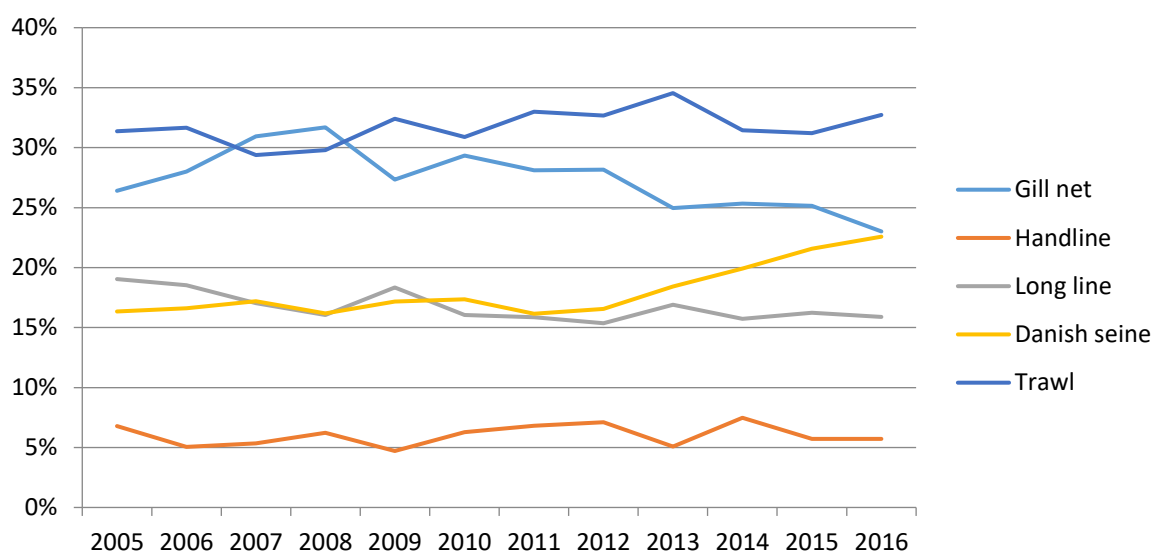


Figure 9. Norwegian cod catch by fishing gear as share of total catch, 2005–2016. (Source: FDIR)

As can be seen, the trawler's share is close to the percentage set by the trawl ladder. In 2013, the coastal fleet were unable to take all their quota, which was reallocated to the trawlers at the end of the year. The gear composition is relatively stable, but Danish seine has taken considerable shares from gill net in the period, and we see that the trend for long line (autoline included) is downward sloping – but at a slow rate.

Consolidation

As mentioned under section 0 there are regulations under Norwegian law on the legal concentration/ consolidation level in different vessel groups. More specifically, for cod trawlers, this is given in “Regulation on special permissions to conduct some fisheries” (of 13. Oct. 2006, No. 1157), and considers applies to cod trawl, shrimp trawl, purse seine, saithe seine as well as whaling and sealing. Firms owning cod trawlers cannot control vessels that have more than 12 quota factors for either cod, haddock or saithe. That implies three fully structured vessels, with a ceiling of four quota factors. An exception is made for firms who own both fish processing plants and trawlers. Then a firm can have up to seven quota factor for each plant that it has landing obligations to. Havfisk, the largest trawl company in Norway, had 29.7 quota factors for cod (11 % of the Norwegian cod quota, and about 1/3 of the cod trawl quota) on their nine vessels (2016), due to such joint ownership. Also Nergård, the second largest trawl company, are subject to such exception. They had five vessels with 13.1 quota factors for cod in 2016 – about 15 % of all cod trawl quotas. In addition, a third firm (Holmøy; without processing plants) controls close to 12 quota factors for cod on their four vessels (2017), so all together these three concerns control about 62 % of the total cod trawl quotas (all together 87.93 quota factors) which means about 20 per cent of the total cod quota.

For the off-shore conventional vessel, who holds a participation right – not a license/special permission like cod trawlers – the consolidation limit is given in the annual regulation regarding the access to fish in the coastal vessel fishery, latest for 2017 (§9 in Regulation of 6. Dec. 2016, No. 1455). There, it is stated that a firm controlling conventional off shore vessels cannot have quota right in cod, haddock or saithe that exceeds 15 % of the group quota. Hence, concerns owning these kind of vessels cannot exceed an ownership share to more than 1.4 % of the total cod quota.

For the closed coastal group, consisting of roughly 1,750 vessels of differing length, there is no established rule for limiting consolidation.

Financial Performance and Productivity

The Norwegian seafood industry have historically struggled with low profitability. That was also the back cloth for the heavy subsidies in the 1970'ies and 1980'ies. However, in recent years many groups in the fishing industry demonstrate high profitability. Below, we illustrate how profitability in the main demersal vessel groups have developed over the years. Results are collected from the “Profitability study for the fishing fleet”, which have been carried out on an annual basis by the Directorate of Fisheries since the 1960'ies. There is, however, a discrepancy between the groups in the study and that of the regulative framework. For instance, the cod trawlers group also consist of a few saithe and shrimp trawlers, as well as trawlers for other demersal species. The coastal groups differ in that it is the vessels’ longest length, not the quota sits, that is decisive for which group they enter in the survey.

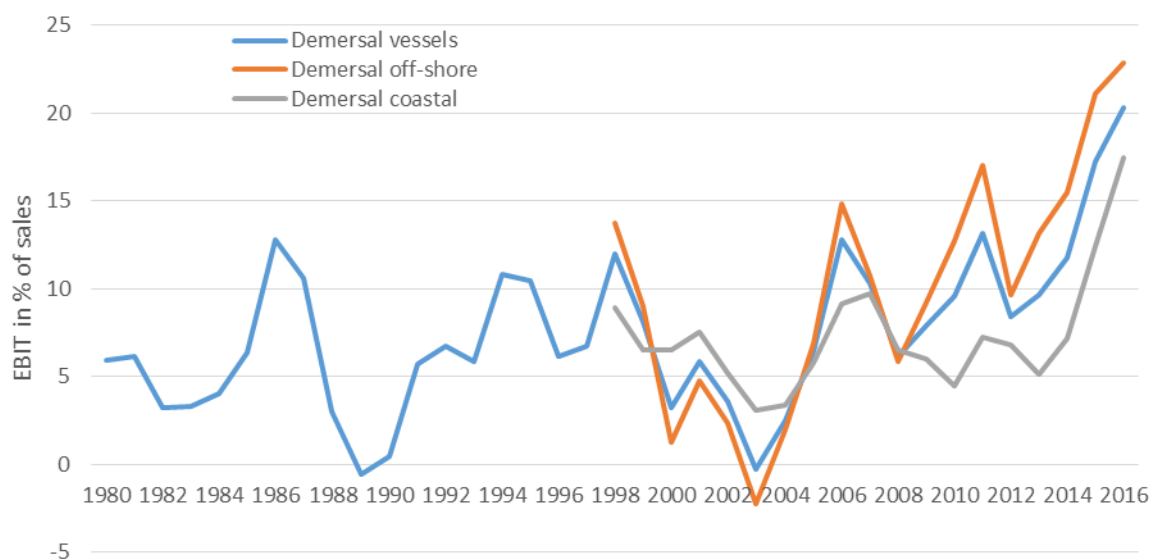


Figure 10 Profitability (EBIT in % of sales) in the demersal fishing fleet, off-shore and coastal vessels, 1980-2016. Source: FDIR

Until the early 2000, profitability was in general low and varying, whereas from then the trend have been increasing – even though still varying. We also see that ...

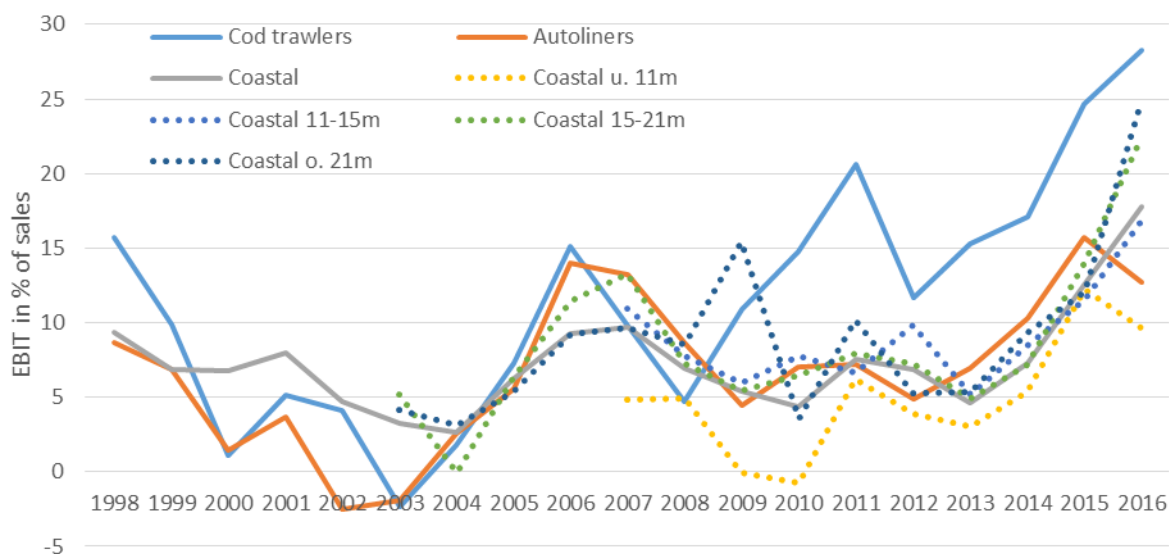


Figure 11 Profitability (EBIT in per cent of sales) in the demersal fleet (autoliners, cod trawlers and different vessel size groups in the coastal fleet), 1998-2016. Source: FDIR

From fig 11 we see the same pattern as in the previous one. The striking trend is the increase in profitability since 2008-2012 until 2016. This is especially so for the cod trawlers, but also for the other demersal vessel groups. For all vessel groups the profitability has increased steadily since 2013 – when cod quotas increased by 1/3 and first hand prices dropped by 20 % – with the exception of the smallest coastal vessels (under 11 meters) and autoliners who had a fall from 2015 to 2016.

As mentioned before, the number of vessels in all groups is reduces as structuring and the purchase of quotas have increased. In the figure below, we have shown the average catch per vessel in the different demersal vessel groups in the period 2008-2016. These groups are defined by income and actual size from the profitability survey, not necessarily in the quota classes (quota size) that are defined within the management system. Volumes also cover catch of crustaceans and pelagic species.

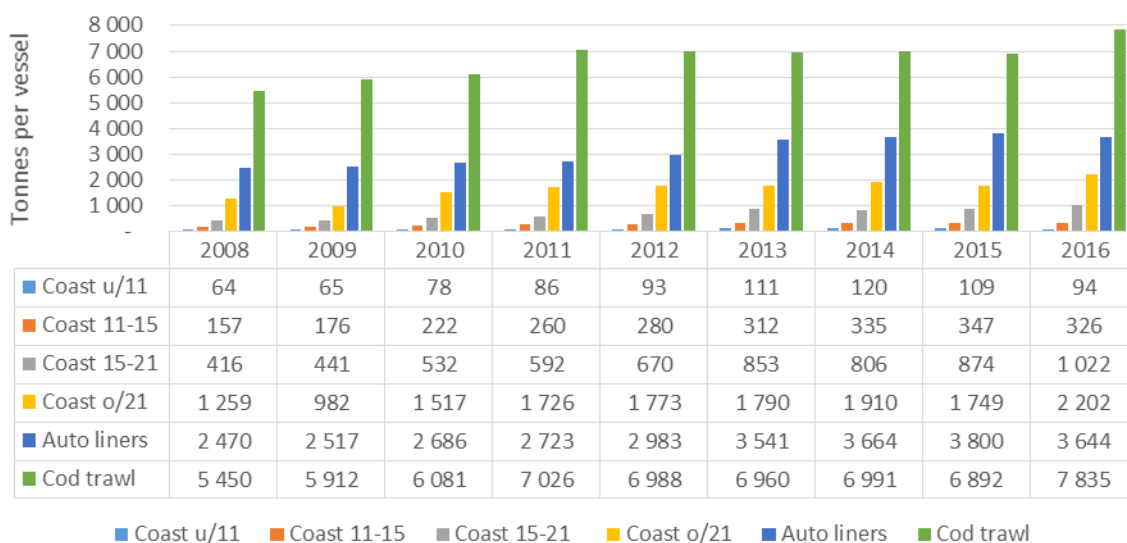


Figure 12 Average catch per vessel in vessel groups (tonnes), 2008-2016. Source: FDIR

The figure show that the catch of the smallest vessel groups is almost negligible compared with the larger. Over this period, however, we find the largest increase per vessel in the three largest coastal

groups (up to 150 %). Structuring has not been allowed for the smallest vessel in the period. However, their catch increase (almost 50 %) is at the same level as cod trawlers and auto liners, in which groups the lion's share of structuring was conceded in the preceding period (2000-2007). If we go a bit further back in time, in the year 2000 cod trawlers had an average catch per vessel of about 1,900 tonnes, while each auto liner landed about 1,300 tonnes of fish. The average catch is of course dependent on the stock increase in the period, and the catch of other species than cod, since these groups all target multiple species.

Fishing fees

Fees on the first hand sales of fish has over time been collected to finance the market place, social security for fishermen, or other concerns. However, there have been no attempts from the authorities to collect the resource rent created in the fishing industry in Norway. Such a tax on the resource rent been discussed politically many times, but the main will of the Parliament has been that the resource rent in the fisheries should fall to the coastal communities in which fisheries takes place. This can potentially change in the near future, as the expert committee that looked into the Norwegian quota system (NOU 2016:16) discussed and suggested a resource rent tax, which will probably be treated by the Parliament this year or the next.

Of other fees on the first hand sales of fish the product fee is the most prominent and has been for the latest 30 years. The product fee is a duty on first-hand sale of fish paid by the fishers/vessels in settlement of certain Social Security arrangements¹⁴. Typically, the fee has varied between 2.1 to 4.2 per cent of the total ex-vessel value of fish in the period after 1977. Correspondingly, the "cost" of the industry – or the income of the state – will vary correspondingly. For 2016 the product fee was 2.7 per cent of the first hand sales until July, and 2.5 per cent in the second half of the year. With a total catch value of roughly 2 billion EUR, the revenue of the state was roughly mEUR 52.5 from this fee. Which again was utilised for social security arrangements for fishers.

Other fees are the levied on the first hand sales of fish is:

- a) The sales organisation fee: For Norges Råfisklag (the northernmost sales organisation where most of the cod sales takes place) the rate is 1.2/0.9/0.4 per cent for fresh, on board frozen and on board produced fish respectively.
- b) The marine research fee was introduced in 2014 to cover some of the costs of gathering necessary knowledge for the fisheries management. In 2016 this fee was 1.35 % of gross catch value.

Earlier, from 2003 to 2008, the fleet was also levied a structural fee, to participate in financing the restructuring of the industry (or rather: commissioning of the smaller fleet). The fee varied from 0.05 % to 0.35 % and a total of mill EUR 14 was collected from the fishing industry in the period.

In addition, a seafood export fee – financing the generic marketing of Norwegian seafood – and a R&D fee – financing research and development in the fisheries industry - is levied on the export of

¹⁴ Traditionally, the fee has been utilised to finance the differences between medium and high rates of National Insurance contributions, occupational injuries insurance, unemployment benefits, and collective supplementary insurance for sickness benefits.

fish. Fishers contribute of course also to these fees, dependent on the supply and demand relations in the value chain, even though the payment of the fee takes place in another link of the chain.

Main Influencing Factor for Value Chain Dynamic

The value chain dynamics are under influence of a long range of factors, stemming from markets, nature, general macroeconomic and industrial policies, together with the more narrow fishery policy – and of course how industry actors react to these changes. Some of these are listed in short below.

- **Nature:** Climate change may have the ability to change ecosystems in the sub-Arctic in a considerable manner. For cod, we have seen an increased geographical distribution in a north-eastern direction in later years. However, these movements of the stock is believed to be limited by the cold waters of the Kara Sea and the deep waters of the Arctic Ocean, and a warmer Barents Sea will probably enable and support a larger stock biomass of cod and other demersal species. In addition, the “centre of gravity” (i.e. the areas holding the highest concentration of fish) in the North East Atlantic cod stock distribution is not expected to change, which will contribute to uphold today's catch distributions (Eide, 2017). As a consequence of global warming, consumers might act in favour of environmental friendly seafood products when doing their purchasing, giving rise to price premiums on products with low carbon footprints (for example by branding and certification) and with less damage on environments and eco systems (Troell *et al.*, 2017).
- **Markets:** Cod is an appreciated product and commodity in international seafood trade, but also meet many white fish substitutes in hake, Pollock, saithe, tilapia and others, in the end markets. Norwegian export of cod had undergone large changes over years. Central in the cod export is conventional products like salt and clip fish (salted and dried) and dried fish, with Portugal and Italy as their respective main markets. Previously, in the 1970'ies, frozen fillets of cod constituted roughly 40-50 % of Norwegian cod exports (Finstad *et al.*, 2012) fresh and frozen fillets of cod constitute merely 10 % of total cod export. The trend in later years has been that an ever larger share of the export is whole (on board) frozen or fresh fish, which is sold to consumers or processed elsewhere. In 2017 these constitute 40 % of Norwegian cod export value. The greatest product (in value) is clipfish (27 %), before the mentioned whole frozen (21 %) and fresh cod (19 %). Then comes salted fish and fillets (each 11 %) and dried fish (6 %). A reason for this development is of course the globalisation of markets, integration of regional trade blocks, free trade agreements, tariffs and non-tariff barriers to trade, WTO and other agreements. Also, consumer trends emphasising ready-to-eat meals and convenience, and the increasing purchasing power of large national and international retail chains, has and can in the future constitute an increasing threat to traditional Norwegian cod products aiming to meet traditional recipes for clipfish and stockfish in Portugal and Italy respectively. For the seafood industry, the Norwegian Seafood Council – responsible for a generic marketing effort world wide, is quite important.
- **Macroeconomic development and industrial policy:** The seafood industry is of course closely connected to the general business environment and as such dependent on the general economic policy. Fiscal or monetary policy that affect employment, currency rates, inflation are all other important features for the business undertaken in a society. As an example, favourable currency fluctuations in the period 2012–2015 – as the Norwegian krone depreciated towards central currencies (€, \$ & ¥) – were responsible for the whole export value increase in the white fish sector (Nyrud *et al.*, 2016). Moreover, tax, labour market, communication and regional policies also have bearings for a decentralised industry like the Norwegian seafood industry. Moreover, one often

stated driver of the export of raw material from Norway (not only for seafood) is said to be the productivity increase of the Norwegian labour force and the high costs for labour. In a recent report from the Technical Calculation Committee for the collective wage bargaining, relative industrial salaries were in 2016 roughly 32% higher in Norway than among our trade partners. However, in 2013, salaries were 57 per cent higher in Norway, so also here the currency development has had an effect. Compared to countries like Poland, Spain, Great Britain, France and Denmark, Norwegian salaries were in 2016 in the range of 474 %, 103 %, 74 %, 27 % and 7 % higher. While the salary cost per hour worked in Norway was € 43.8, the corresponding cost for Poland was € 7.6, and for Spain € 21.4.

- **Fisheries policy:** The goals for the fisheries policy have been relatively stable over years, with emphasis on *sustainable harvesting, a sound economic development and some emphasis on settlement and employment in rural districts*. For the moment a conservative government is running the offices, which many will maintain has underlined a liberalisation and increased emphasis on economic development on the expense of the more regional and social goals pursued earlier. Nevertheless, during the whole period under scrutiny here, the industry have undergone vast changes: From being a thoroughly subsidised industry prior to the early 1990'ies to be a highly competitive internationally oriented industry with high degree of technological development – especially the fishing industry. Also, this is a development undergone under different governments. Lately, two Official Norwegian Reports – where expert committees have given their recommendations – have both pointed to a further liberalisation of the industry. The first had the focus on the fish processing industry, however not without pointing to the fishing industry, which is of course it's main supplier (NOU 2014:16). In the second, NOU 2016:26, the quota system was under scrutiny. The latter is still in progress in the meaning that the Government still has not presented their treatment of it in an own white paper (Stortingsmelding) for the parliament. The suggestions in both these have the potential of changing the structure and function of the seafood industry considerably in a more stringent direction of a fisheries management system more ITQ-oriented than that of today. However, many of the suggestions in the Seafood processing industry white paper (Meld St nr 10 (2015-2016)) never passed the Parliament, and it's still left to see the destiny of the Committee's work on the "future oriented quota system".

In short, the main drivers for value chain dynamics in the Norwegian seafood business comes from all sides of the system; nature and markets (for inputs as well as output) and the changes in macroeconomic factors and regulatory constraints. Some of these work and affect the value chain over long or medium term (climate and stock changes, and to some degree regulatory changes), while others work in a shorter term, causing abrupt changes to the value system (like export constraints).

Price Settling Mechanism – First Gate Price

In Norway the first hand sales of fish (and crustaceans) are governed by the Act of the Fish Sales organizations (Fiskesalgslagsloven), which gives sales organizations owned by the fishers monopoly in the first hand trade of fish. The first hand trade of fish is governed by six sales organisations; one nationwide for pelagic species, and five regional for other species. In the case of cod, the northernmost sales organizations (Norges Råfisklag – covering the area from north in Møre & Romsdal to Finnmark) is responsible for roughly 85 %. When including SUROFI (the second northernmost sales organization), these two are responsible for nearly 99 % of all cod landed by

Norwegian fishers (in 2016). Hence the three smaller sales organizations have limited significance in the trade in cod. The sales organizations are responsible for setting minimum prices for fish.

As accounted for earlier, the rule of thumb in the first hand cod trade is that the coastal fleet lands fresh fish while the off-shore fleet lands frozen. Fresh fish is traded upon direct agreements between seller and buyer, while frozen fish is sold on auction or by own acquisition, where the vessel owner upon landing himself caretakes the sale of fish. This latter form of transactions has to some degree increased in later years, for which some argues it can reduce the efficiency of auctions. In general, frozen cod either goes to clipfish production or is exported unprocessed abroad, while fresh cod to a greater degree is processed where it is landed.

Within the district of Norges Råfisklag, the sale of cod in 2016 reached a total of m€ 585.3, of which m€ 219.3 stemmed from frozen cod, and m€ 364.9 was from fresh cod transactions. A total of 354,920 tons was sold from Norwegian vessels, of which 32 % was frozen. The average price for frozen cod was 40 eurocents above that for fresh cod. The transactions with frozen cod, were partly on auction (29 %), own acquisition for further sale (15 %) and on contracts (56 %). Most all of the fresh cod is sold on direct agreements with purchasers. On average, frozen cod is paid a price premium of about € 0.2–0.6 over fresh cod in later years.

In the figure beneath, average prices for cod is shown for frozen and fresh cod in the period 2000–2016.

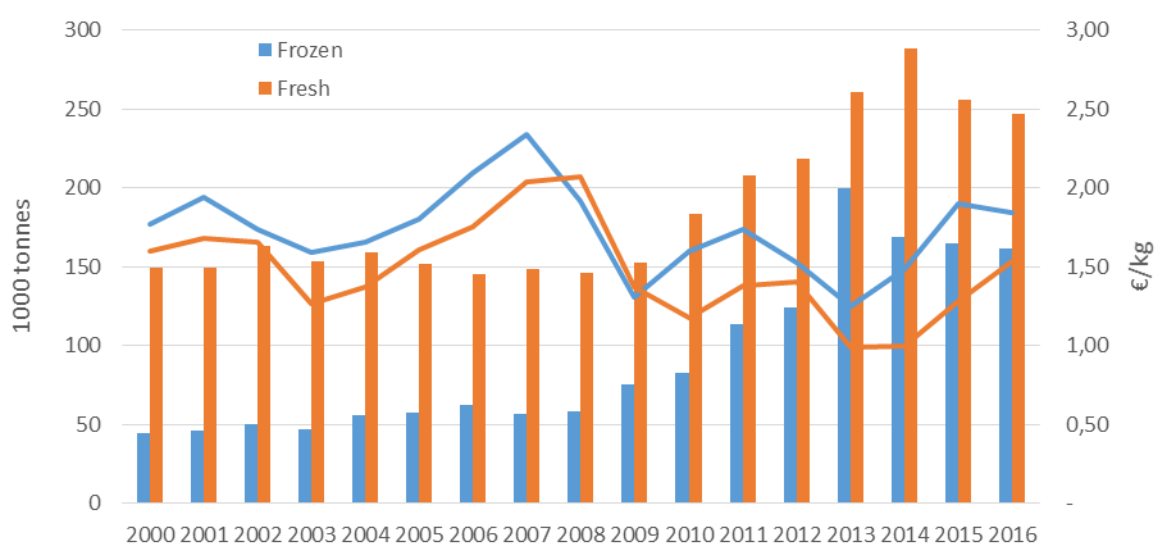


Figure 13 Volume and average prices for cod, fresh and frozen, 2000–2016. Source: FDIR

Fig 13 shows the development in volume and prices for fresh and frozen cod respectively. We see that the frozen landings share of total landings have increased from about a quarter in the period 2000–2005, 1/3 from 2006–2012 and to roughly 40 % after 2013. Moreover we see that the price premium for frozen cod fluctuates between € 0.1–0.6 in the period, with exception of the years of the financial crisis in 2008/2009.

Price According to Fishing Gear

Different gears command different prices. Below we show the (average) price for cod from different gear types in the period 2010–2016. It should be noted that cod from trawl is mainly landed frozen, hence directed to at different (auction) market than the fresh cod landed on direct contracts.

Moreover, larger vessels with greater batch sizes of landings can obtain greater prices than small vessels landing limited quantities of fish in limited areas with limited number of buyers. Moreover, in the category of long lining, off-shore autoliners is included, which also land their fish to frozen auctions. Coastal long- and auto-liners land their fish fresh. In later years also larger coastal vessels utilizing Danish seine freeze their cod on board to some degree.

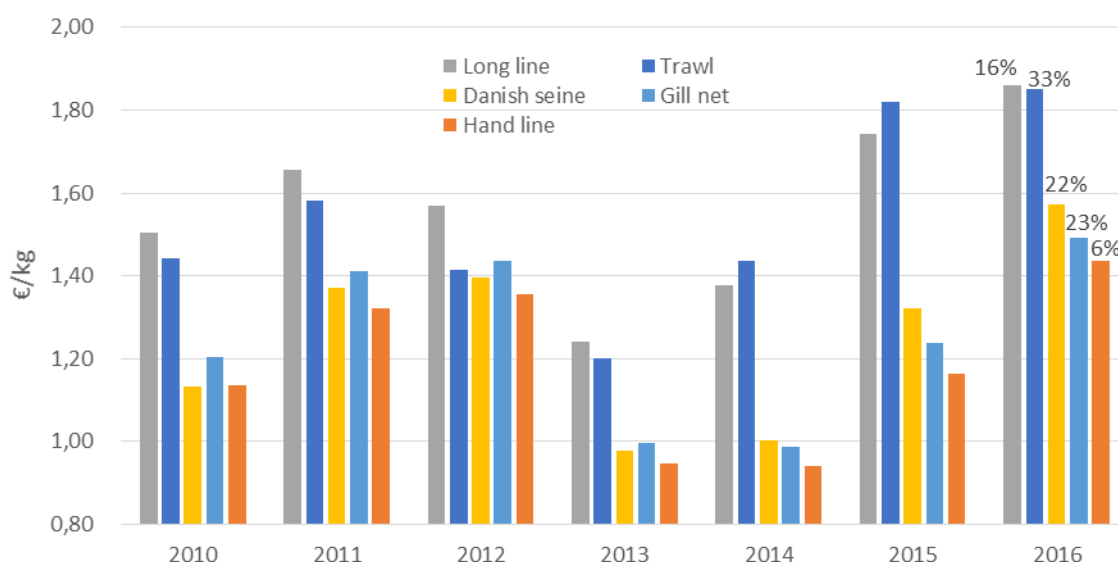


Figure 14 Average prices for cod from different gears, € per kg, 2010–2016. Percentages over 2016-stacks relate to share of total landings from each gear. Source: FDIR

Fig 14 show the average cod prices for the different gears, and the percentages for 2016 show the different gears share of total cod landings. As mentioned, the gears landing frozen cod commands the greatest prices. Cod from longline also achieves a price premium due to it's quality. For Danish seine volume is often an issue, as this is a gear mostly used by larger vessel with great action radius. For gill net, quality is often an issue, but the size of the fish is usually bigger and can generate a premium in some processing segments (salt and clipfish). Hand line is only used on the smallest vessels, which despite a potential great quality is paid the least, probably because their limited volume and low market power (short action radius).

Even though the main statistic (FDIR) only operate with long line, and no distinction between long-line and autoline, we can find price notation from Norges Råfisklag showing the differences. There, the price difference between fresh and frozen cod caught by longline or autoline is 36 and 50 eurocents respectively, per kg live weight.

Main Influencing Factor for Value Chain Dynamic

For the first gate cod market the dynamic minimum price establishment have had major impact on reducing much of the “noise” in this market regarding the disagreement between fishers and processors regarding the right level. However, most of the noise have been in connection with large price fluctuations and in the cod season, for example during the financial crises (2009) and in 2013 as the quota increased by 1/3. Hitherto, after the introduction of the dynamic minimum price, no such “shocks” have occurred, and it remains to see what the reaction will be. The herring first hand market, with its own dynamic minimum price, did not stand the test as prices fell considerable in 2017.

Another trend is the development in the larger coastal fleet where many vessels have installed equipment for on board freezing, a conservation method not yet fully exploited by these vessels. Danish seine has in 2017 for the first time become a more important gear (regarding volume) than gill nets in the coastal fishery, and the structuring have continued (at reduced speed though) which makes fewer vessels gain larger quotas (and hence, greater landing volumes). In the auction market trend has been that greater shares of frozen fish landings are channelled out of auctions and sales are caretaken by vessel owners, which sell to customers directly (not over auction). This is particularly so for on board processed cod (fillets), and is highly so for foreign landings (mainly Russian) in Norway.

Processing (all marine fish processing plants)

Fish Processing Companies

Consolidation is not confined to the fishing industry it has also taken place in the processing sector. In fig 15 the number of fish processing companies in the whitefish processing sector is displayed.

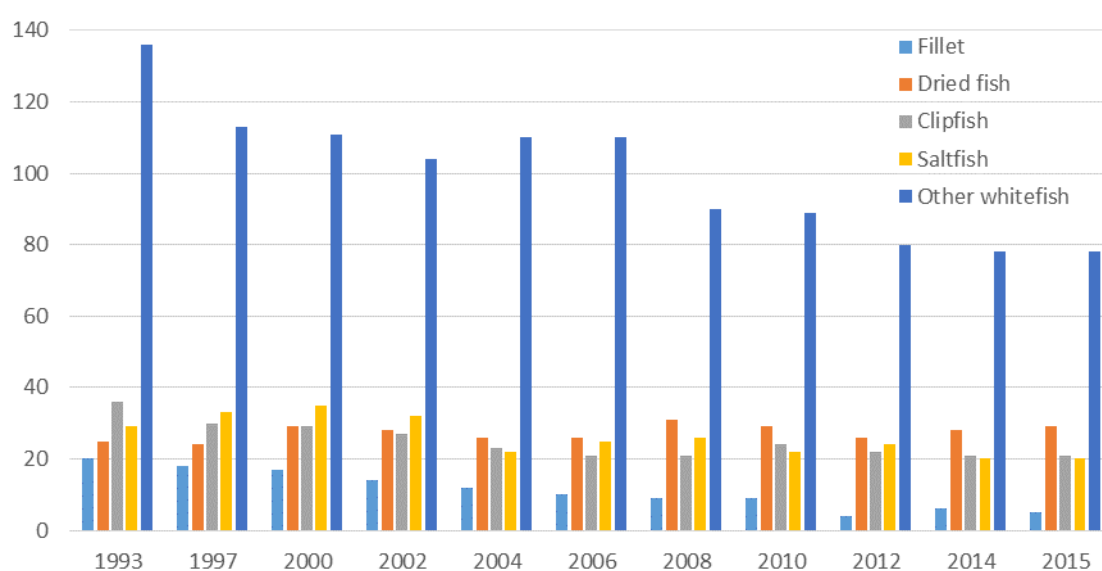


Figure 15 Number of establishments (not firms) in Norwegian seafood processing industry, by production category, 1993–2015. Source: Nofima

From 1995 to 2014 the number of firms in the processing industry was reduced from 222 to 139, a reduction of 37 %. The greatest reduction has come among the larger firms conducting filleting and freezing of whitefish (-70 %), but also among the smaller firms caretaking a number of different processing operations (other whitefish; - 54 %).

Estimations show that in 2014, the whitefish industry employed about 3,555 persons – roughly 500 more than in 2009. In 1995, the corresponding figure was about 8,300 (Nyrud & Bendiksen, 2017). Hence, despite an increase in employment later years (following the increased quotas), there have been a 60 % decline in employment the last 20 years. When comparing the number of establishments and employees up against landed volumes, the productivity of employees and scale of firms have increased considerably. In 1995 the Norwegian landings of whitefish (cod, saithe and haddock) was 10 % lower than in 2014. In 1995, however, the landings of especially Russian whitefish to the Norwegian processing industry was considerable, a raw material source which now

is absent. In 1995, such landings constituted an addition of 25 % to the Norwegian landings available for the processing industry.

Product Development

As mentioned, a central trend in Norwegian fisheries has been that ever more cod is landed as frozen whole fish, with about 40 % of all cod in later years, at the expense of both fresh and on board processed (filleted) fish. Also, with the quota increases in 2009 and 2013, the increased allocation of volumes to the coastal fleet, landing fresh fish, an increasing portion of the cod export has been fresh whole fish.

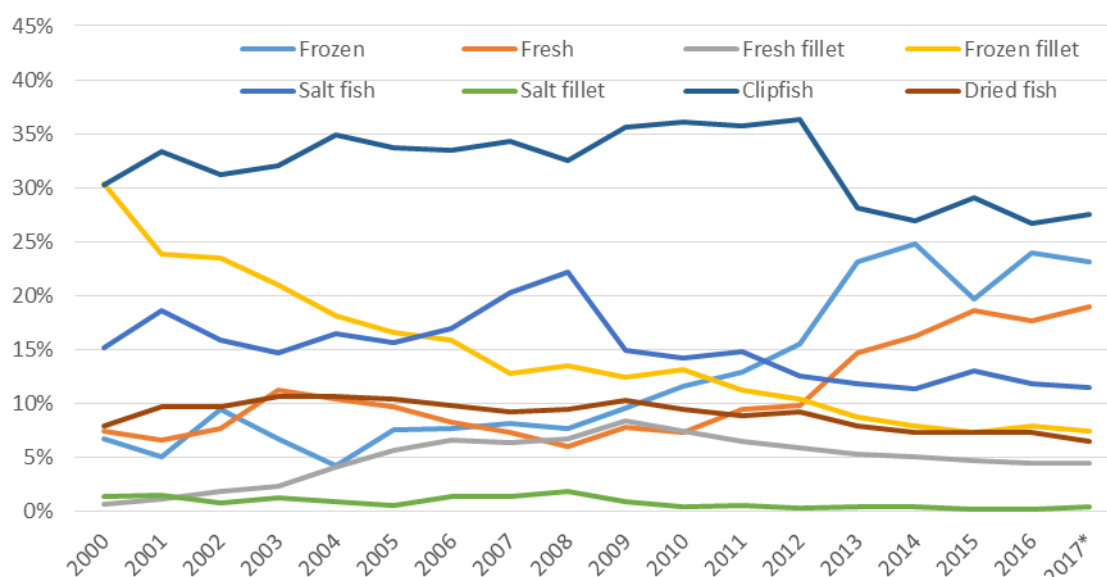


Figure 16 Norwegian export of cod products as share of total export value (in Euro), 2000–2017 (preliminary figures for 2017). Source: Norwegian Seafood Council

Fig 16 shows the reduction of frozen fillets over time, partially compensated in the early 2000's by fresh fillets export. Moreover, the changes in 2009 (especially for salt fish) and 2013 are obvious. The latter "shock" gave the rise to a much higher export of fresh and frozen whole cod. For the other products changes have not been that big.

Financial Performance

Productivity has increased in the Norwegian cod sector over time, also in the seafood processing industry. Though, it is not obvious, since despite the increased input is shared by fewer processors and caretaken by fewer employees, the trend has been an increased export of raw material, un- and semi-processed fish. But to a high degree, costly labour processes are today replaced by capital intensive technology and automation. An example can be found in the landing sites for the coastal, where fishers only years ago had to gut and behead their fish upon landing it (depending of course on the catch volume) – a process that could take hours depending on the catch. Today, high tech gutting lines manned by 4-6 persons, is installed and used almost everywhere by the fish processing companies, a time rationalizing process for both parties. Such technological innovations can be found almost in every processing branch – perhaps to the highest degree within clipfish production. Also within filleting, high tech automation and water jet machinery has turned pessimism to optimism. An important driver for this development have been the high wage costs in Norwegian

industry, which is a great competitive drawback. Hence, labour productivity must be high in order to compete in international markets. As a consequence, there have been examples of Norwegian processing firms moving their value adding activities abroad – to Poland, China or other countries – where labour costs are much lower.

The Norwegian seafood processing industry have for a long time been struggling with low profitability, squeezed as it is between a strong profit generating fishing industry upstream, and a demanding international market with fierce competition in the other end. In neither ends the degree of market power that can be exercised is limited, and margins are limited in most markets. Nyrud & Bendiksen (2017) point to the fact that the weighted average of the net result (EBIT) in the white fish processing sector for the period 1993–2014 was only 0.7 %. Moreover, the share of firms in the white fish industry having a positive net result in 2013 and 2014 was 51 % and 73 %, respectively. However, some niche producers and markets can give rise to comfortable profits in some years, as the figure below shows. There, average profitability for different sectors in the whitefish processing industry is shown. Behind lays, of course, a heterogeneous sample of firms where some exercise significantly better results and others again, worse.

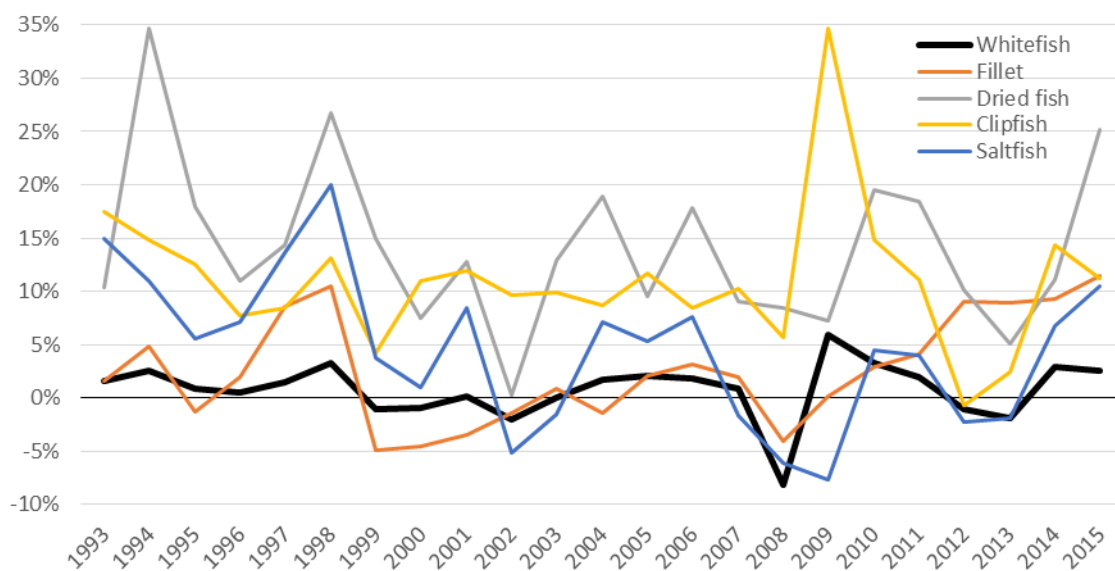


Figure 17 Net profit (gross margin in per cent of sales) in Norwegian whitefish processing sectors, 1999–2015. Source: Nofima

Fig 17 show how the profitability in the whitefish processing sector in general, as well as in different segments, have developed over the last 22 years. As seen, the clipfish and dried fish segments have peaks in single years showing very high profitability (1994, 1998, 2009 and 2015). The bold line, however, show that the whitefish processing industry in general has very modest profitability. Some years even negative on average (2008), while the peak (all time high) is merely 5.9 %. These “extreme” results in 2008 and 2009 was to a large degree due to several large single establishment’s accountants paper-losses and gains on forward exchange contracts these two years. We also see that both the filleting and saltfish firms has varied around “break even” in the years after 2000.

To illustrate better the development in later years for the most important sectors, the profitability development for the fillet, dried fish, clipfish and saltfish sectors are displayed below, for the period 2010–2014.

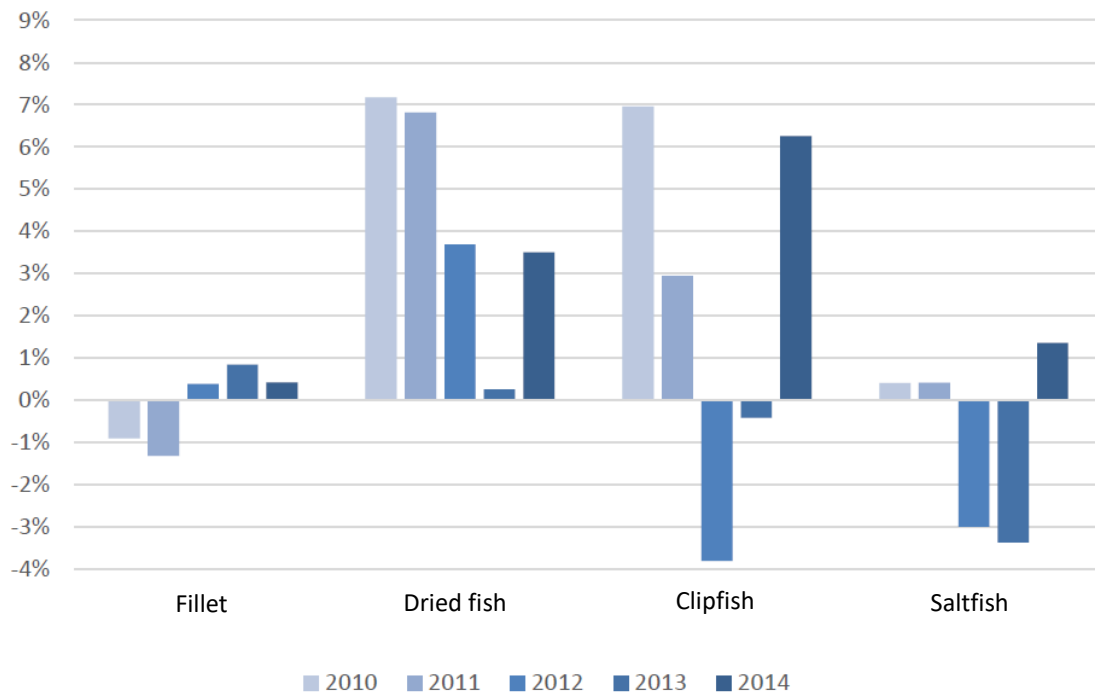


Figure 18 Average net results (in % of sales) for filleting, dried fish, clipfish and salt fish in the period 2010–2014.
Source: Nyrud & Bendiksen (2017)

Fig 18 shows the differences in profitability between the different sectors the latter years and if any conclusions could be drawn it is that while filleting and saltfish struggle the most, clipfish and dried fish processors seems to have considerable better profitability. However, on average, profitability must be said to be low in this part of the seafood industry.

Main Influencing Factor for Value Chain Dynamic

- With stand alone links in the value chain, and limited ability for vertical integration, efforts in synchronising of the value chain activities throughout the chain is, in general, difficult.
- A highly seasonal supply of fresh cod during the year makes it hard to follow a strategy where continuous supply of fresh products to the market.
 - The cod value chain is exceedingly a push supply chain, rather than a pull chain
 - The clipfish seems to be the one sector that fully has adapted to this by advantageously exploiting also frozen cod raw material in production. By this strategy they have insulated themselves from the varying supply of fresh raw material.
 - The highest penalty is paid by the filleting sector, which follow an economy of scale strategy (large firms with high fixed costs) under circumstances where frozen products meet fierce competition from other low cost fish species, and where the more profitable fresh fish filleting is complicated by the varying fresh fish supply.
- A highly productive labour force, with corresponding high salaries, constitute a considerable cost disadvantage for the Norwegian seafood industry.
 - Seasonality in labour demand has led to a large increase in the use of temporary employment, especially from new member states of the EU (Henriksen *et al.*, 2017).
- A trend in later years is a horizontal consolidation where highly profitable redfish companies (i.e. aquaculture) has acquired large shareholdings or whole concerns in the whitefish industry. A development expected to reinforce the competitiveness in the whitefish sector,

through co-operation and benefitting from marketing competences from the aquaculture sector. An example being Lerøy acquiring Norway Seafoods, two of the largest seafood businesses in Norway.

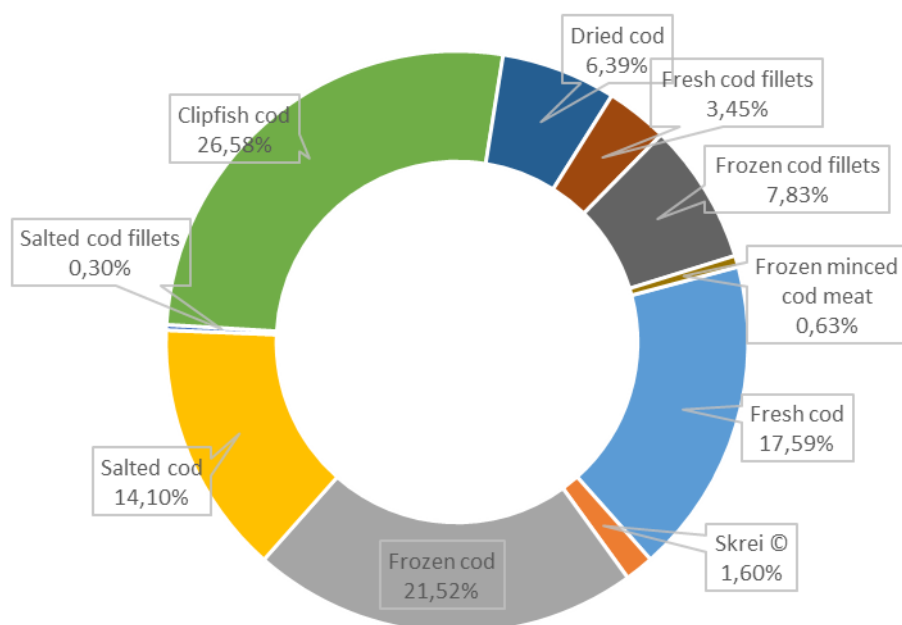
Value Creation and Utilisation

Despite a continued focus on better utilisation of by-products from formerly unutilized resources in the cod sector, the Norwegian seafood industry has not quite achieved it's goals. Within pelagic fishery and aquaculture 100 % of the resource is utilised in one way or another – either for human or animal consumption. The main obstacle within whitefish is that vessels to some degree behead and gut their fish in the open sea (and also in a few cases process on board; filleting), and either because of limited cargo capacity or lacking economic incentives, fail to bring the head and intestines ashore. The above mentioned development within the coastal fisheries, where most all purchasers have installed gutting lines, involves that most all whitefish from the coastal fleet is landed live weight. Before, by-products was discarded off shore, which still takes place to a large degree in the off-shore fleet (cod trawlers and autoliners), even though a small tendency later years have been that also these vessels attends to more of the discards – and some even process it to meal and/or oil at sea.

According to Richardsen *et al.* (2017) the share of byproducts that are landed and utilised in the whitefish sector (cod, haddock, saithe, Greenland halibut, ling, tusk, redfish and wolf-fish) in 2016 was roughly 44 %. In total, the catch of these species in 2016 was roughly 740,000 tonnes live weight, while expected byproduct volume (intestines, heads, liver, roe, skin, spine, etc.) added up to up to 319,200 tons. While the share of byproduct utilization in the coastal fleet was 90 %, the corresponding figure for the off-shore fleet was 6 %.

In the export statistics we find both dried cod heads, frozen and frozen edible byproducts from cod, preserved, fresh or frozen cod liver, and minced fish meat from cod (often a byproduct from cut-offs in filleting production). All together these are exported for a total of mEUR 21.8 mill (in 2016).

Norwegian cod exports 2015 - live weight



In

Figure below, we illustrate the Norwegian export of cod in 2015 by live weight, displaying how much of the catch that goes to different uses. The total catch of cod by Norwegian vessels in 2015 was 422,242 tons. In addition we imported 16,366 tons. Our export of (wild caught cod) added up to 205,100 tons of cod products, *product weight*. Recalculated into live weight that adds up to 416,385 tons. Hence, there's a discrepancy of roughly 22,222 tons live weight – not accounted for in this easy input output calculation. Some is due to the domestic cod consumption. In 2015, this was estimated by the Norwegian Seafood council to be in the range of 15,100 tons *product weight*. About 60 % of this was fresh or frozen H/G-cod, with the rest being prepared in different ways. Hence, in the end most of the cod catch is accounted for. Other sources of errors remain since there can be a substantial time lag between the time of catch and landing, not to speak of the production throughput time and warehousing between landing and exporting. In the figure below, the before mentioned byproducts are NOT accounted for, since they in any case is included when recalculating from product to live weight. The true nature of these are exactly byproducts – created in the process of producing other main products.

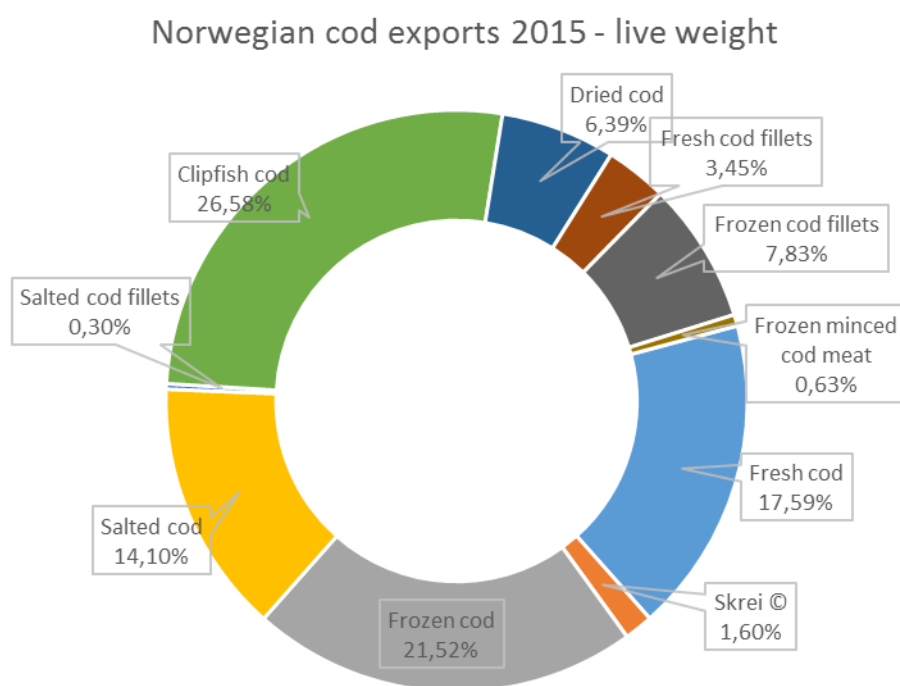


Figure 19 Norwegian export of cod products – shares based on recalculated live weight volumes (in total 416,385 tons).
Source: NSC/Nofima

Again we see that about a quarter of all landed fish is exported as clipfish, and that roughly 40 % of all cod landings are exported with little or no processing activities on land (fresh, Skrei © and frozen). However, much of the fresh packed fish is nevertheless demanded consumer products abroad, meeting high willingness to pay among consumers. At the same time, some of this fish goes to further processing abroad before meeting customers' needs.

The utilization of rest raw materials/byproducts have great potential both in dietary and in pharmaceutical industry, under the condition that it is brought ashore and made available, and to some degree that it comes in sufficient volumes. Cod liver oil have been extracted for centuries, as one example. For a better utilisation, beyond animal food, it must not only be landed – but in a

suitable quality for its best use. Landings of round fish and gutting lines, have been of great help in safeguarding more of this supply. However, in order to increase the volumes also the off-shore fleet has to take care of the rest raw materials. Hitherto, the economic incentives have not been strong enough to support such a development, and there is to our knowledge not many signals in that direction even if there exist some sporadic evidence that some vessels install the gear and equipment necessary.

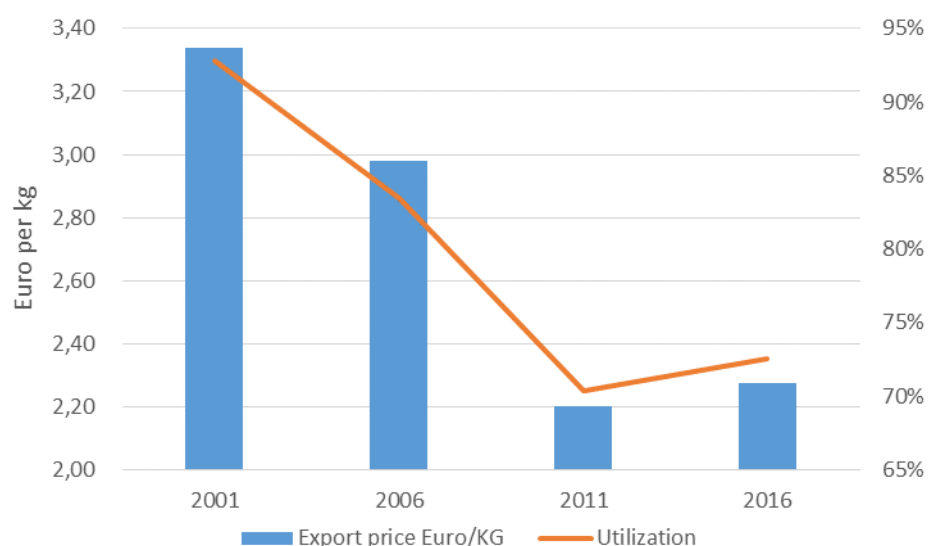


Figure 20 Export price per kg (or rather: export value in EUR, divided on catch volume) and utilization (sum of export and domestic consumption estimated in wet weight as share of catch in round weight) for Norwegian caught cod in 2001, 2006, 2011 and 2016. Source: Directorate of fisheries and Norwegian Seafood Council

Marketing Sector

Structure of the Marketing Sector

Direct sales, commissioned sales, commodities or products. Origin and brands

Like the rest of the cod value chain, the marketing sector in the value chain is also a heterogeneous business environment, where you find all kinds of actors. From small independent firms, which export (and sell domestically) fish on contract for different producers, to sales departments in large concerns caretaking the sale and export of own production (and in some cases also contract out the processing of own fish, for instance to China, before importing it again for domestic sales).

The export system of fish was reorganised and deregulated in the early 1990'ies. Until then, there were "export commissions" for the different products, in which all exporters had to be members (with resemblance to the old guild systems). In order to be a registered exporter you had to be a member, and in order to be a member you needed experience as an exporter in the member firms. Then, as the Norwegian Seafood Council was established in 1991, the regulations where mirrored and it became free to establish as a producer, with just a small fee to be paid.

Even though foreigners interconnect Norway and fish and especially cod and salmon, we have few (if any) brands within these product categories. Perhaps the stockfish (dried fish) to Italy is our best and oldest example, but stockfish from Lofoten was only recently appointed a Regional Certificate of Origin certification. Private brands are if not absent, then at least little recognizable in the end markets. The NSC, however, as the responsibly party for generic marketing for Norwegian branding, has for years marketed seafood under the labels shown below (the eldest – in Norwegian and English – to the left). This are not stand-alone brands, but are meant to be presented together with other (firm-) brands



The absence of private brands can be due to many of the products' commodity nature. Even though private brands have little significance, Norwegian cod has a good reputation in many markets. Again, perhaps especially in the Italian stockfish market, but also in the Portuguese and Brazilian clipfish market.

Export

Norway exports cod and cod products to roughly 80 nations world-wide. In 2017, the export of cod reached 216,087 tons, at m€ 976.6 value. In 2016, we exported roughly the same volume (214,754 tons) and the export value was m€ 937.7. Cod is the second most important export species (after salmon) and constitutes about 10 % of the total export value (in 2017, m€ 10,134.7). In 2015, the share of cod was 11 %.

NSC has offices in many important cod importing countries (Brazil, France, UK, Italy, China, Portugal, Spain, Sweden, Germany, Poland) where the marketing is country dependent – depending on regional/national consumption and cooking.

Portugal is the most important export market for cod (26 % in 2017, ahead of Denmark, China and Italy), but Portugal does not reach up among our 10 most important seafood markets overall. However, roughly 80 % of Norwegian cod export value goes to the EU. Below,

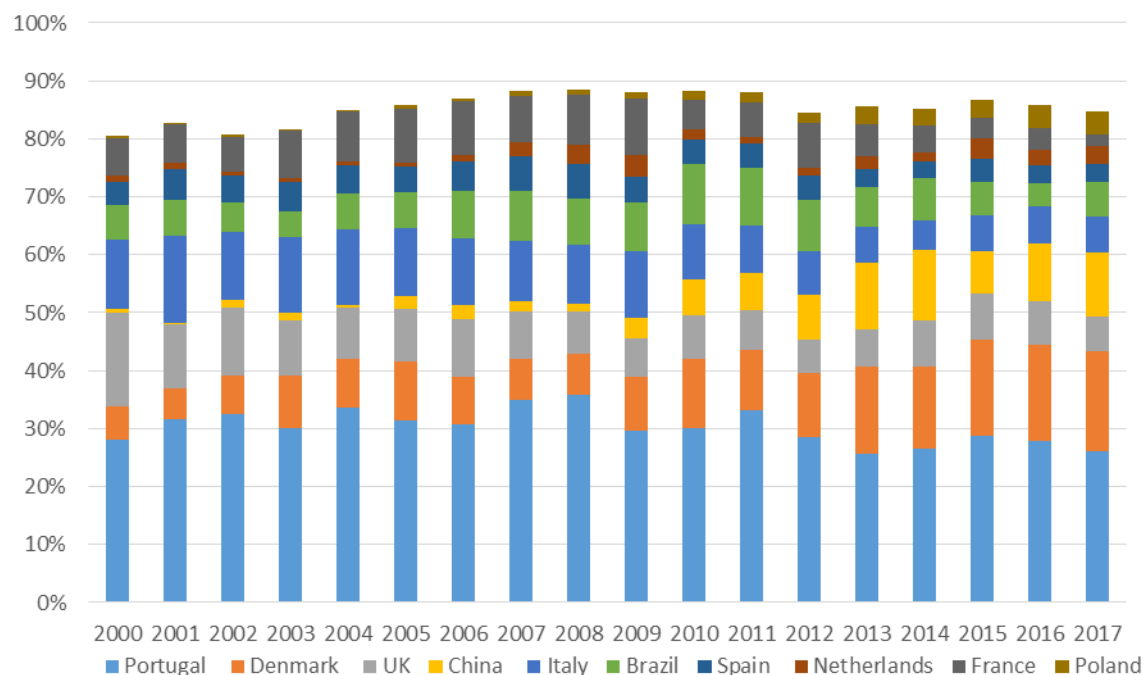


Figure 21, the 10 most important export markets for Norwegian cod in the period 2000–2015 is illustrated. In this period, the cod export value varied between m€ 542 (2009) and m€ 879.

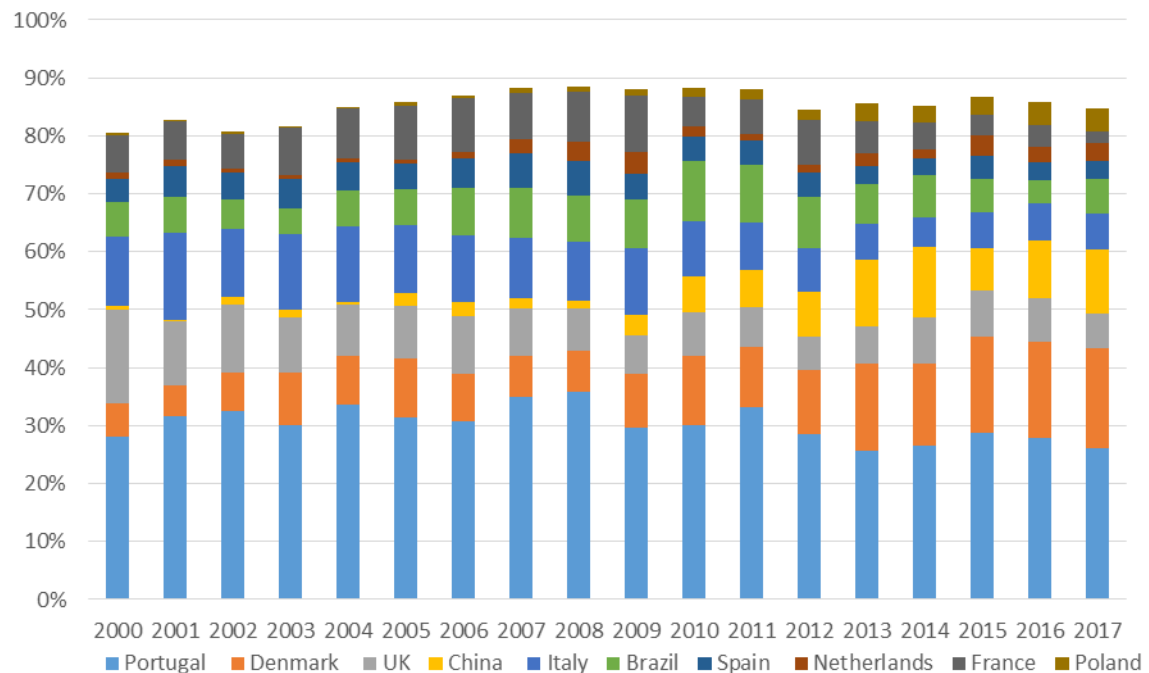


Figure 211 Norwegian cod export value by 10 most important countries in 2015, for the period 2000–2017 (as share of total export value for cod). Source: NSC

The illustration show that Portugal, Denmark and the UK is responsible for roughly 50 % of Norwegian cod exports. Moreover, the 10 most important nations receives 80–88 % of our export value. Hence, roughly 70 other countries receive cod from Norway in the range of 12–20 percent of our export value. We also see that over the period China, Denmark and Poland have increased their shares at the expense of France, Spain, Portugal and UK. The reason for this development is the large export later year of unprocessed goods, going mainly to Denmark and Poland (but also Lithuania) as fresh cod, and to China and Poland as frozen.

Import from the perspective of consuming/processing country

As mentioned above, Norway have relatively big landings from foreign vessels, but very little of this enters the Norwegian value chain. Rather, it is exported directly without Norway as origin country. Some of these volumes, however, are imported to the Norwegian processing industry. Also, the clipfish industry imports some Pacific cod (*Cadus macrocephalus*) to their production. In 2015 a total of 8,000 tons frozen cod was imported to Norway, while increasing to 16,000 tons in 2016 (of which 70 % from Russia).

Imports for consumption (animal feed ingredients excluded, like fish meal and -oil) are mainly products and components that we are not self supported with like shrimps and mussels, but not for cod.

Domestic Use or Consumption

Norwegian inhabitants have a seafood consumption of about 20 kg per capita, and cod is the most consumed species – just ahead of salmon, and twice the volume of shrimps – with about 13,000 tons in 2016 (a reduction from 2015 when it was above 15,000 tons). Most is consumed natural.

A reason for the reduction can be the increased price on seafood products, whereas the price of other edible consumer goods (meat, vegetables, fruit and dairy products) have dropped in later years. Reduced availability and a generation effect (elderly eats more fish than the younger; except sushi that is) can also be a part of the explanation for this.

Price Transmission

Studying the price transmission in the value chain for Norwegian cod is not a straight forward task. Even if we selected the same product, from the same firm, to the same market, the margins (as well in shares as in monetary values) would change from year to year, and probably also from batch to batch. Even within fixed price contracts the margins could change despite the same first hand price and retail price, since currency fluctuation can alter the balance/weights.

In a study from 2011, Bendiksen (2012) analyses the price formation and the trading margin in the value chain for a selected seafood products sold in retail in both Norway and abroad. The two examples brought forward below both stems from his analysis. A main finding brought forward by Bendiksen (2012) is that retail prices are strongly influenced by campaign- and special offer prices, and that a large share of the seafood retail sales happens in connection with campaigns. In one example, from one of the major Norwegian retail chains, a weeklong campaign on salmon products, with a substantial discount, led to a sale 200 times higher than the usual weekly sales of such products. Also, it is challenging revealing price information between links in the value chain since these are not stated anywhere officially. This makes it difficult to make precise calculations over prices and margins that are traded during a given time or a given quantity. Between some links, price statements can be obtained, in others, prices are inaccessible or only of anecdotal character.

Below, the first example from Bendiksen is whole cod fillets in UK fish counters. On average the price paid by consumers was £ 11.8 (€ 13.6) in the three largest retails chains. Fishers in Norway were paid about NOK 15 (€ 3.6), which make their share about 27 % of the retail price. An assumption behind this is that the fisher is paid the average price for the fish, and a fillet yield of 53 % (from HG).

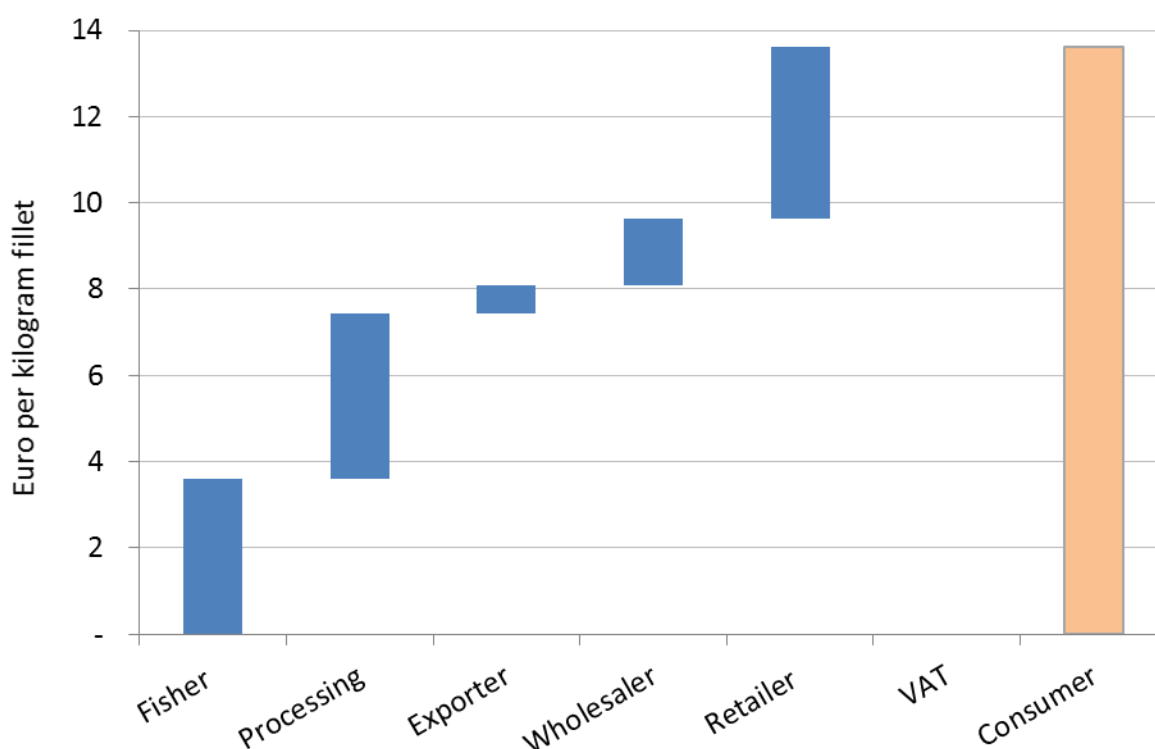


Figure 22 Gross profit in the value chain for fresh whole cod fillets in the UK in 2011. Source: Bendiksen (2012)

The value increase in the value chain, and the links' gross margin per kilogram, is quite different between the links, depending of the tasks the single links or cost occurring tasks are undertaking. The gross margin on cod fillet in stores in UK was at this time typically at a range of 45 %. Actors in UK retail stated a goal of having on average at least 35 % margin on the fresh seafood they sell. The costs of having a fish counter, perishability, sales volume and waste is probably an important reason for the relatively high gross margin. There was no VAT on basic foodstuff in UK at this time.

Fig 68 reveals that as share of the consumer price, the Norwegian processor and exporter take about 28 and 5 % respectively, whereas their gross margins are 110 and 10 %. The UK wholesaler takes 11 % of the consumer price and a gross margin of 20 %, whereas the retailers are granted 29 % of the consumer price, and a gross margin of 40 %. The processor can salvage some other incomes from the cut-off from filleting (minced fish meat), and possible other by-products, but this will depend on how the fish is landed (HG or round weight).

The second example is from clipfish to Portugal in the winter/spring of 2011, where we look at the production of clipfish from fresh cod. Then the first stage of processing is caretaken by a saltfish producer. Then sold to a clipfish producer, who dries the fish before export, (hence, an extra link in the value chain). Moreover, the Portuguese market is the main market for clipfish and volumes are big. In this case, the clipfish is exported by the clipfish processor, directly to the retail chain – surpassing the link of wholesalers. On average, the Portuguese consumer paid € 7.9 per kilogram whole clipfish, and the clipfish yield in production was assumed to be 52 % (from HG)¹⁵.

¹⁵ This is considerable higher than the official Norwegian conversion factors for clipfish, which is 41 %, and follow expert considerations. From frozen HG cod to clipfish, the yield is considered to be higher – 59 %.

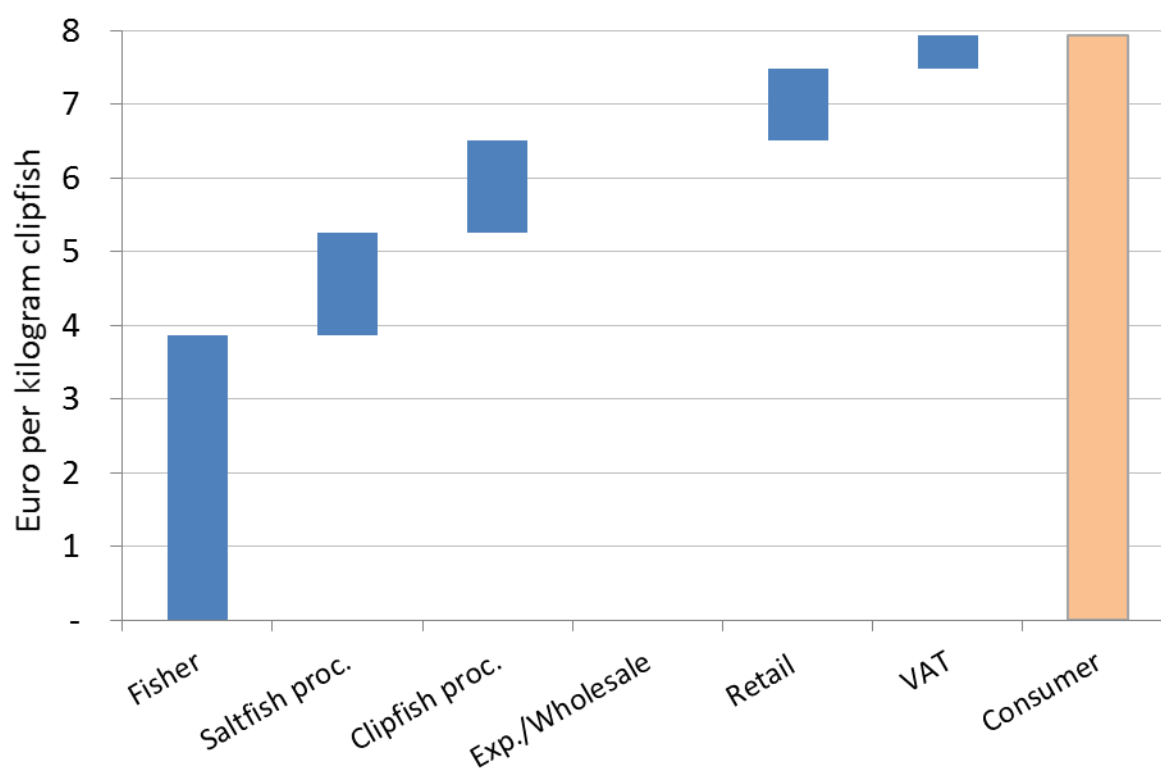


Figure 23 Average gross profit in the value chain for clipfish in Portugal in 2011, produced from fresh cod. Source: Bendiksen (2012)

A first glance at fig 23 show that the gross margin in the retail sector is considerably lower for clipfish to Portugal than for fillets to UK. Among other things, this is due to the tough competition on clipfish among retailers. Clipfish is often used as loss leader, and in some cases sold with a loss just to tempt customers to the store. Another reason is that most clipfish in Portugal is sold whole from the store, which demands next to no repacking, slicing or piecing – and no cold storage medium.

Here, we see that fisher's share of consumption price is almost half, whereas Norwegian saltfish and clipfish processors take a share of 18 and 16 %, respectively. The Portuguese retails sector's share is 12 percent, while the state takes some due to a 6 % value added tax. The gross margin is 36 and 24 % respectively for the saltfish and clipfish producer, while 15 % for the retail sector.

The two examples of price transmission above show great differences in which links the margins arise, depending of course of competitive pressure, product nature and which tasks undertaken in each link. These figures are by no means an indication of the profit generation in the sectors. In 2011 the Norwegian filleting industry had an average gross margin of 4.2 % of sales, whereas the clipfish and the saltfish industry reached 18.5 and 4.1 % respectively.

Overall Economic Performance and Competitiveness of the Fisheries Value Chain - Norway

Value Chain Dynamics

The dynamics in the value chain is a result of the actions undertaken by the actors present; given the competitive pressure and conditions they are working under, which is put forward by nature, markets and different regulative agencies. With fish being typical common pool resources, most commercial fisheries in Western developed societies are heavily regulated, in order to avoid the problems associated with high technological capacity and the “tragedy of the commons”.

In Norway, the onset of such regulation – and especially the closing of the fisheries – have been closely related to resources crises. First, in the early 1970’ies the fishery for Norwegian spring spawning herring was closed as the stock was nearly extinct. Then, in the early 1990’ies, the bad shape of the northeast Arctic cod stock, leading to an all time low quota (130,000 tons) – involved a closing of the coastal fishery for cod in Norway. Also, in the early 1990’ies, the subsidies was abandoned and the industry was deregulated with respect to the former seafood export legislation, giving rise to new entrants. Former laws on the use of freezing equipment on board and with respect to landings from foreign vessels, were abolished, which led to an almost instant increase in the landing of cod to the industry from Russian trawlers, while many Norwegian trawlers altered their landings from fresh to frozen whitefish. During the end of the 1990’ies and the 2000’nds, the onset of market based structuring measures for the fleet, where more than one quotas could be acquired on one vessel/hull, led to a further reduction of the Norwegian fishing fleet – both in number of vessels and fishers.

Still, the goals of the fisheries policy, i.e. ecological, economic and social sustainability, have been relatively constant throughout the last 25 years. Some will claim, however, that over the period, greater emphasis have been attached to the goal of economic sustainability, in arranging for a more profitable fishery sector, on the expense of the social sustainability (fostering employment and settlement in rural fishery dependent areas).

Unlike the Icelandic seafood industry, it has been prohibited for other than registered fishers to own fishing vessels. After WWII and to the end of the 1980’ies, when the rebuilding and industrialising the seafood industry with emphasis on a freezing filleting industry, corner stone firms with responsibility for employment in rural areas, were exempted the prohibition and granted ownership to cod trawlers. Today, many of these are on the hands of stand alone fishing firms, even though to larger seafood processing firms still own trawlers. However, these processor owned trawlers land their whitefish mainly frozen, leaving it to some degree up to the coastal fleet to supply filleting or other processing firms in the concerns with fresh raw material. A new development in more recent years have been a tendency that fishermen have bought or erected processing facilities (in as much as up to 10 instances) – an example of downstream vertical integration. There has also been a tendency towards profit generating firms in the aquaculture sector to acquire firms in the whitefish industry.

Over years now, with historically high cod quotas and more quota gathered on fewer vessels, the fishing fleet has shown an increased profitability, which has spurred new investments in vessels, equipment and technology. Today the fleet follows high technological standards and is very efficient.

Some concerns regarding this is about how the raw material quality is attended to under volume driven and efficient operations. Even the development in the processing sector, where on land gutting lines give incentives to land fresh fish round, supports the efficiency of the vessels.

The Norwegian fish processing industry is to some degree “fighting against windmills”. The traditional, labour intensive filleting industry, is located in a high wage nation with little unemployment and a choosy labour force. For years the element of foreigners in the processing industry has been high, of both new residents and seasonal workers coming for shorter periods. This goes not only for the whitefish processing industry, but also in salmon slaughterhouses. Under the period with increased cod quotas, much more of the landings traditionally going to the conventional (dried, salt and clipfish) processing industry is now exported as raw material to other nations, in the form of both fresh and frozen whole cod. This is in line with classic Ricardian economics and comparative advantages, in a globalised trade with seafood where the division of labour see no national borders. For certain, this is at odds with a central objective in our fisheries policy; to increase the national value creation of our resources, but in a business environment where the disadvantages of our cost level becomes a great barrier, profit seeking actors will find their ways to escape this cost penalty.

Norway is a big actor in the international trade with cod, but can not be said to have any market power or dominance in their main markets. Competition is hard in most markets, with supply of cod from Russia, Iceland, the Faroese and others in the Northeast Atlantic. Moreover, whitefish substitutes from other areas and species (hake, haddock, Pollock and others) to some degree fulfil customer satisfaction in the same manner as cod. On the few markets where Norway is a dominating actor, like stockfish (dried cod) in Italy and bacalhau (clipfish) to Portugal, Norwegian actors are many and the market competitive and fragmented.

In the marketing sector, the structure is considered fragmented with many exporters, helped by the generic marketing by the Norwegian Seafood Council (www.seafood.no). Recent trends where financial muscles is increased by aquaculture firms entering the whitefish sector, can enhance the logistics and marketing channels for cod and other whitefish, by taking advantage of the competence built over years in the salmon sector. Learning from that side need not imply the same raw material export as in the salmon sector, where up to 90 % of the fish is sold fresh, gutted with head.

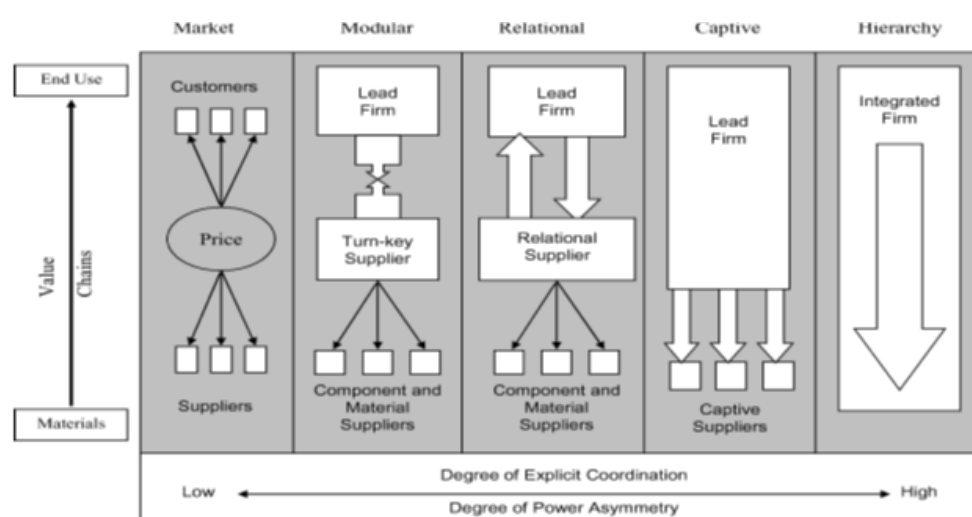
22.1 Governmental Form

The Norwegian seafood industry and the cod sector has always been one that has been relying on international trade and foreign markets. Some would even suggest that cod built this country. In modern times (after WWII), up until the new seafood export legislation in the 1990’ies, all branches in the cod sector was subject to the trade conditions dictated by the sectoral export commissions. These commissions was leading actors in the centralised export, where they lead negotiations and entered into common agreements for most all important seafood products. They were, like in Iceland at that time, a *captive* lead firm that explicitly coordinated the export, and by that had great influence on the business environment. Also, the relational side of horizontal cooperation in the processing

industry was under the impact of these export commissions¹⁶. In addition to carry out the export, they controlled that determined prices and sales conditions was upheld by the producers. Under these there were export organizations protected by law.

After the new Export Act in 1992, these export commissions were dissolved, and new liberal rules granted practically anyone paying an export fee could to start export of seafood. With this many processors above a certain side (or even just processors that have found it opportunistic) have started their own export. There are of course cooperation between exporters, processors and both, where some quantities/products/species are sold by stand alone exporters, while some is caretaken in-house, but in general the structure and governance form in the marketing sector is atomistic. Some large exporters exists within some products, and also some major processing firms dominate the export of other products, but in general a *market* to *modular* form of this trade is the usual. This is our impression of the chain as a whole, and we cannot see a big development towards one governmental form or the other throughout the latest 10 to 20 years.

This is of course a coarse picture of the conditions in the industry, where you find all kinds of vessels (from 6 meters one-man boats to 90 meters long trawlers with a crew of 20 men), landing fish to 200–300 landing sites or even freezing or filleting the fish on board for auctions or contract sales, to Norwegian traders/processors or even export directly to foreign customers. For a small vessel with only one purchaser in proximity, the element of a captive market can of course be great. The same experience could be found among small processors which sell (some of) their specialised products to a trader/exporter, or even exports himself to a single customer abroad. Or even for a small exporter whose greatest customer/supplier is setting the conditions. But again, from our perspective, on an overall basis trying to cover the cod value chain, the coordination of the flow of goods, payments and information is done among single free units, for which the price is the domination factor of transaction. The power between purchasers and suppliers is balanced in the way that terms of trade is governed by the price, even though relations play a role together with trust and esteem/reputation.

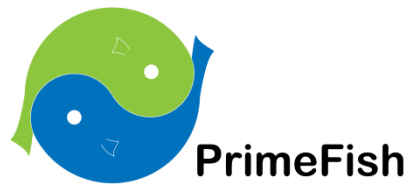


¹⁶ All in all 13 export commissions existed for different products (fresh fish, frozen fish and fillet, frozen herring, fresh herring, salted herring, fat herring, herring meal and oil, clipfish and saltfish, dried fish, salted roe, fish liver oil, canned fish and fish meal).

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Fisheries Value Chain
Evaluation of industry dynamics, opportunities
and threats to industry

Newfoundland and Labrador Cod

Prepared by
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Heather Manuel
Ray Hayter

February, 2018

List of Acronyms- Newfoundland

CDN	Canadian; or Canadian Dollars (\$CDN)
DFLR	Department of Fisheries and Land Resources, Government of Newfoundland and Labrador
DFO	Fisheries and Oceans Canada
EU	European Union
HOG	Head on and gutted
IFMP	Integrated Fisheries Management Plan
Kg	Kilogram(s)
LOA	Length over all, refers to total vessel length
Mt	Metric Tonnes
NL	Newfoundland and Labrador
TAC	Total allowable Catch

Dictionary - Newfoundland

Buddy Up- a DFO-authorized temporary arrangement allowing a maximum of two (2) two license holders holding valid licenses for the same species, the same fishing area and the same gear type to operate from the same vessel. It mandates that the two license holders be present on the vessel during harvesting.

Controlling Agreements- an agreement whereby a person, or company, or organization has entered into an agreement with a commercial fishing enterprise that gives influence or control over the license holder's decision to request the issuance of a replacement license to another person.

Enterprise Combining: A policy that permits Independent Core fish harvesters to acquire another enterprise for the purpose of combining, and results in the removal of one enterprise, vessel registration and duplicate species licenses.

Fish Landing Station- means any site where fish or marine plants are offloaded for the purpose of marketing (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador).

Fishing License: An instrument used by the Minister, under authority of the [Fisheries Act](#), grants authorization to a person, including an Aboriginal organization, to harvest certain species of fish or marine plants subject to the conditions attached to the license. This is a temporary grant as licenses are issued for a fixed period, usually annually.

Homeport: The port from which a fish harvester's enterprise is based.

Minimum Processing Requirement- means the minimum amount of transformation of a species from its live and/or landed state before the product may be shipped from Newfoundland and Labrador (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Primary Processing- means the processing of fish as part of its preparation for market by applying any one or more of the following processes to it: washing, cleaning, icing, skinning, shucking, filleting, portioning, pickling, cooking, salting, curing, drying, freezing or canning. A primary process fish or seafood product is one that has been washed, cleaned, iced, skinned shucked, filleted, portioned, pickled, cooked, salted, cured, dried, frozen and/or canned. (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Professionalization Classification: Fish harvester registration classification as an apprentice, Level I or Level II professional fish harvester, as acquired through the Professional Fish Harvesters' Certification Board.

**Note- unless otherwise stated, the above definitions are from the Fisheries Licensing Policy for Newfoundland and Labrador Region,*

Source: <http://www.dfo-mpo.gc.ca/reports-rapports/regs/licences-permis/nfld-Labrador-tn-labrador-eng.htm#term>

Conversion References - Newfoundland

Units of Measure

UNIT	POUNDS (lb)	KILOGRAMS (kg)
Metric tonne or tonne (Mt)	2204 pounds	1000

Foreign Exchange Conversions for Period 1999-2016

Year	CDN:EURO	EURO:CDN
1999	0.63	1.58
2000	0.73	1.37
2001	0.72	1.39
2002	0.68	1.48
2003	0.63	1.58
2004	0.62	1.62
2005	0.66	1.50
2006	0.70	1.42
2007	0.68	1.47
2008	0.64	1.56
2009	0.63	1.59
2010	0.73	1.36
2011	0.73	1.38
2012	0.78	1.28
2013	0.73	1.37
2014	0.68	1.47
2015	0.71	1.42
2016	0.68	1.47
2017	0.69	1.45

HHI Index - Newfoundland

The HHI is an industry benchmarking tool that measures the size of firms relative to their sector. It provides an indication of the level of consolidation and associated competition among them. HHI is commonly used as market concentration measure in anti-trust cases. It is measured using the following formula:

$$HHI = \sum_{i=1}^N S_i^2$$

Where S_i is the market share (expressed as fractions) of a company i and N is the number of companies. It is sometimes limited to the 50 largest companies in an industry i.e. in the case of highly fragmented sectors. The index is a 0 to 1 range, where 1 indicates a monopoly situation. According to U.S. merger guidelines, a HHI below 0.15 is an unconcentrated market, a HHI between 0.15 and 0.25 is moderately concentrated and a HHI larger than 0.25 indicates a high concentration.

The NL cod fishery is a relatively homogenous industry with the majority of landings (~95%) coming from predominately small, independently owned and operated vessels <45 feet (13.7m) in length. Comparatively, there are much fewer larger companies with fully integrated systems in operation. There are approximately 73 primary and 2 secondary processing facilities, the majority of which compete for available cod product.

The current fisheries management structure in NL, in particular the allocations of quota or weekly catch limits, caps the number of licenses an enterprise can acquire. Similarly, the fleet separation policy is also having an impact on the level of concentration, the competitiveness and consolidation by harvesters and processing companies.

Figures 4a-b highlights that there has been a significant consolidation in the industry based on the total number of registered fishing vessels, the total number of registered harvesters and the total number of registered groundfish licenses.

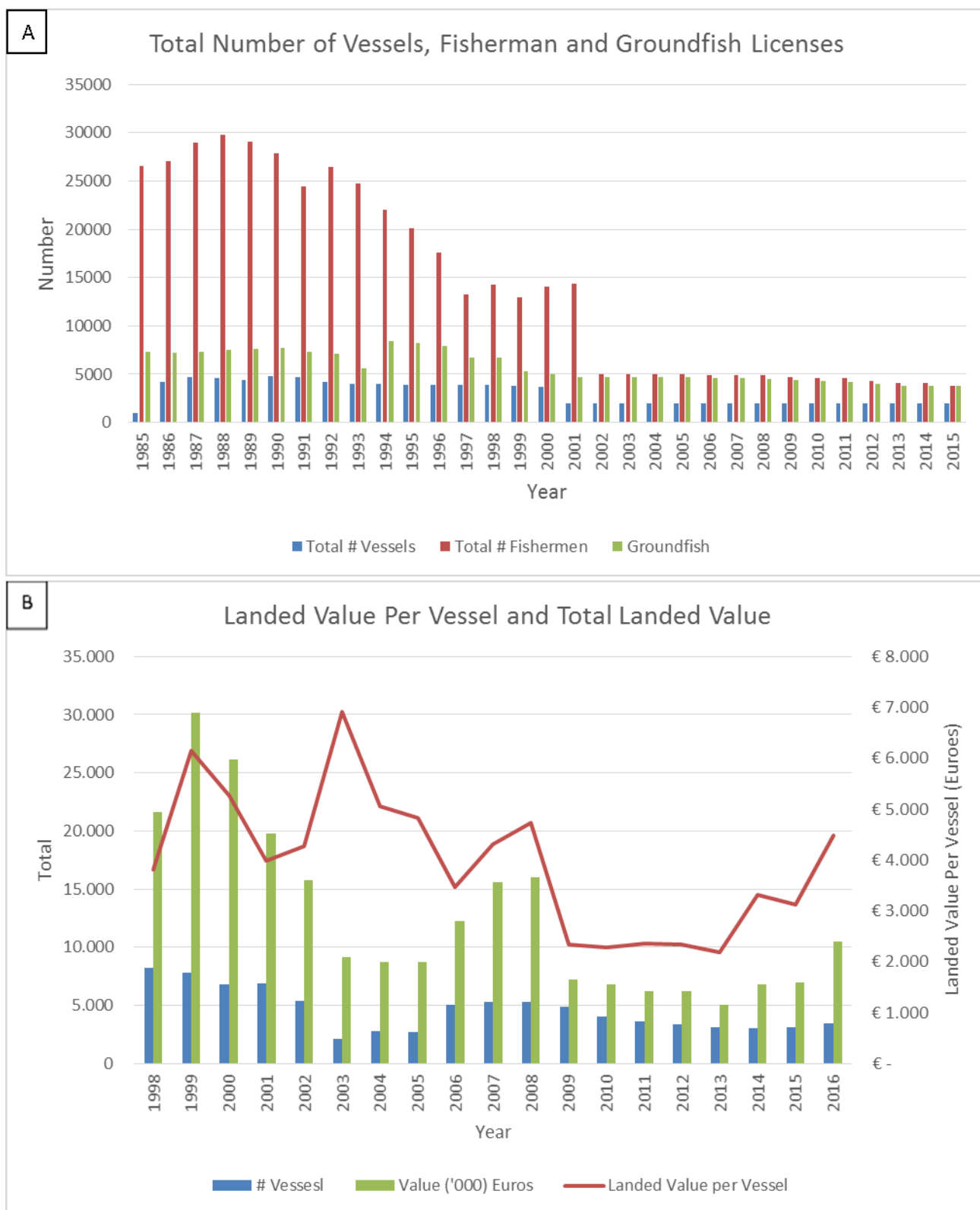


Figure 4a-b: Consolidation of the Fishing Industry based on (A) total number of registered vessels, fish harvesters and number of groundfish licenses issued in NL and (B) total industry value and landed value per Vessel

Fisheries Management System - Newfoundland

General Description

Fisheries and Oceans (DFO) is responsible for management of the Canadian fisheries stocks in accordance with the roles and responsibilities outlined in Canada's Fisheries Act. The major objectives and priorities of the DFO's fisheries management policies include ensuring environmental sustainability and conservation of the resource, ensuring access based on adjacency or proximity to the resources, consideration of the relative dependence of coastal communities and the dependence of various fleet sectors, as well as factors such as economic efficiency and fleet mobility. Inclusion of stakeholders in the decision-making process is regarded as a key priority for fisheries management in Canada (Fisheries Management Decisions, 2017; Sustainable Fisheries Framework, 2017).

Generally, DFO allocates quotas for each stock/species (or group of species) in accordance with a specific fishing season and within a specified fisheries management division, as shown in (Figure 5, Table 1). The key regions or fisheries management divisions for cod quota or allocation in NL are:

- iv. 3K (including 2J3KL)
- v. 3Ps
- vi. 4R (including 4R3Pn)

Information included in a fisheries decision may include:

- opening and closing dates for the season,
- total allowable catches (TAC),
- and management plans (Fisheries Management Plans, 2017) with certain fisheries managed through multi-year Integrated Fisheries Management Plans (Integrated Fisheries Management Plans, 2017).

In Newfoundland, Atlantic cod are managed through a series of strategies. As noted in Table 1, pending the NAFO region, the cod fishery can be a set quota, a weekly allowance or allocation, or may be an experimental fishery. Based on principles of adjacency and the numbers of vessels /harvesters participating in the fishery, the coastal fleet (<65 feet) has a strong position within the NL fisheries sector.

The 3Ps and 4R fleets are managed by a quota of total allowable catch (TAC) as outlined in Table 1. Whereas the Northern Cod (area 2J3KL) fishery is managed through a Groundfish Fishery Integrated Fisheries Management Plan (IFMP). The plan places cod under moratorium except for the on-going stewardship program (Integrated Fisheries Management Plans-Groundfish NAFO, 2017). Variances in fishing regulations between the 3Ps/4R and the Northern cod (2J3KL) are complex with allocation varying based on vessel length, gear type and historic access. Similarly rules governing transferability of quota, and the ability to buddy-up are based on location and vessel length and can vary yearly. There is not a consistent set of fisheries regulations across region or vessel length and in some cases regulations also vary within a single bay pending the size of the vessel or other determining factors.

For Northern cod, the IFMP is a both a guiding document and process for managing the stock. Specifically, the IFMP provides the planning framework for the conservation and sustainable use of

fisheries resources and the process by which the fishery will be managed for a period of time. As noted by DFO, IFMP's combine the best available science with industry data on capacity and methods for harvesting that species (Integrated Fisheries Management Plans, 2017). In addition to science and conservation, IFMP consider traditional knowledge and other factors such as the economic, social and cultural importance of the fisheries in determining its management.

For the 2017 season, the management approach for the 2J3KL Northern Cod Stewardship/by-catch fishery is based on a proposal submitted by Newfoundland and Labrador Groundfish Industry Development Council (NL-GIDC). The NL-GIDC is a collaboration between the Fish Food and Allied Workers Union (FFAW) and various Newfoundland and Labrador seafood processors (2017 Northern Cod Stewardship / By-catch Fishery 2J3KL management approach, 2017). The NL-GIDC was formed in April, 2016 as a united industry lobby (FFAW and Seafood Processors), focused primarily on 2J3KL cod fish, and providing advice and input into programs, policies, management plans and other initiatives related to the species management. The group focuses primarily on inshore or coastal vessels (<65 feet).

Table 2 outlines the weekly catch allowance for the Northern cod stewardship fishery. The IFMP for 2017 is a one year stewardship fishery that includes an extended season and weekly landing limits. Restrictions limiting harvesters to fishing in their homeports were removed and the weekly limits for combined enterprises were greater than the base weekly limit by an amount proportional to the level of combining. These changes are an acknowledgement of the Department's Combining Policy and the investments made by harvesters to acquire additional allocations (2017 Northern Cod Stewardship / By-catch Fishery 2J3KL management approach, 2017). Standard restrictions are outlined in Table 2.

In general, under an IFMP type of management plan, seasonal adjustments may be made through the fisheries decision process. Decisions regarding quotas and TACs are made by the minister based on recommendations from DFO science and fisheries management. The quotas within each division are then distributed amongst the fleet sectors.

The FFAWNL-GIDC state that the weekly allocation of cod is a strategic approach that enables harvesters and processors to focus on product quality while allowing both the opportunity to scale their operations in accordance with the existing quotas and anticipated quotas as the stock rebuilds.

Anecdotal reports from some harvesters, particularly in the 65 feet vessel class or larger, disagree with this theory and report that the low weekly allowance does not support the economics for vessels above 40 feet.

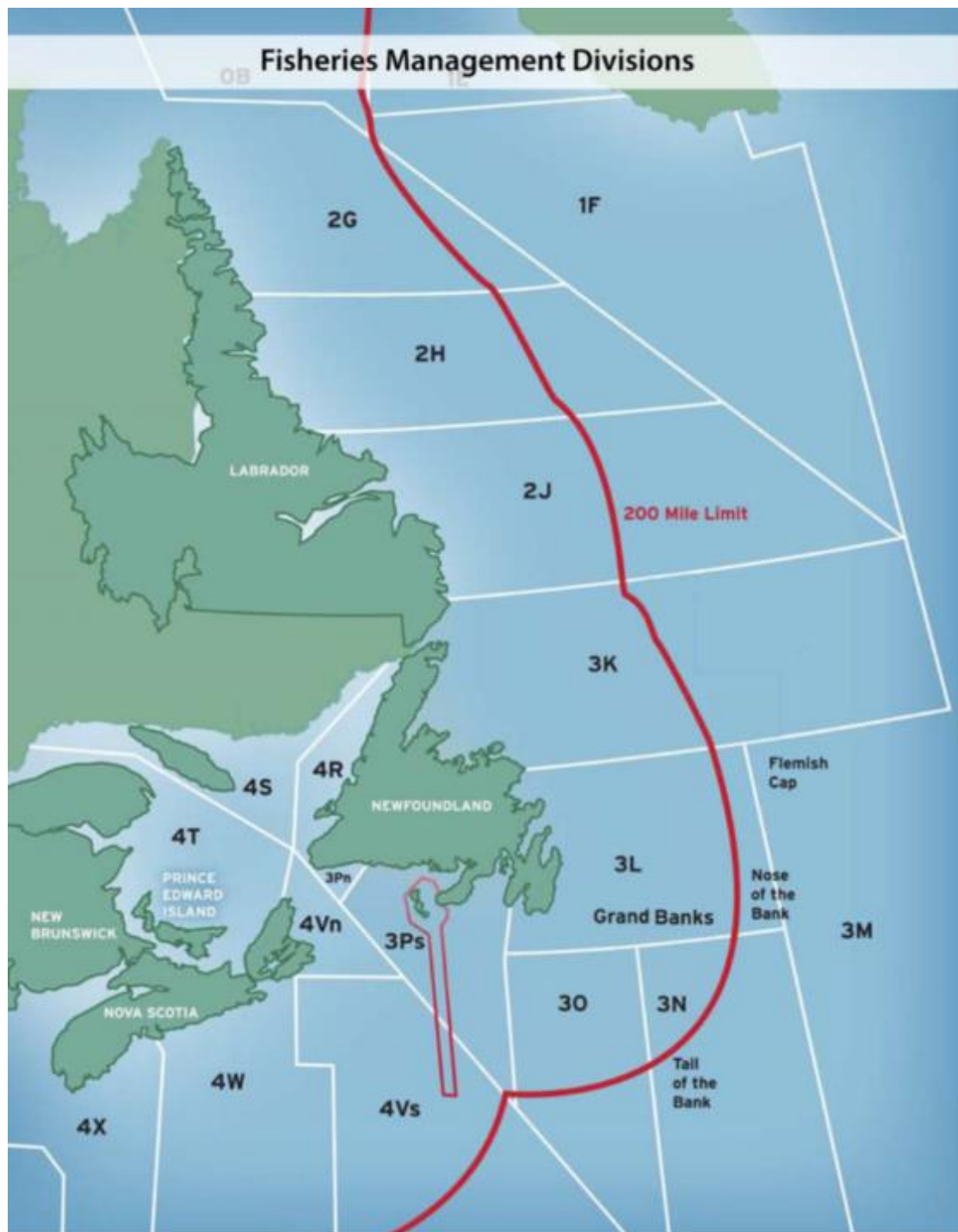


Figure 5: NAFO Fisheries Management Zones for Newfoundland and Labrador (Retrieved from Department of Fisheries and Land Resources, Seafood Industry Year in Review, 2016, http://www.fishaq.gov.nl.ca/publications/pdf/SYIR_2016.pdf).

Table 1: Newfoundland and Labrador Atlantic Cod- Species Quota Report (table data compilation from http://www.nfl.dfo-mpo.gc.ca/publications/reports_rapports/Cod_Morue_2017_eng.htm; December 29, 2017).

NAFO Division	Quota Definition	2013 Quota (Mt)	2013 Catch (Mt)	2014 Quota (Mt)	2014 Catch (Mt)	2015 Quota (Mt)	2015 Catch (Mt)	2016 Quota (Mt)	2016 Catch (Mt)	2017 Quota (Mt)	2017 Catch (Mt)
3K	Cod Quality Pilot Project Fixed Gear< 65	0	0	0	0	0	206	0	191	0	401
3K	2J3KL Sentinel Fishery	0	202	0	202	0	214	0	134	0	0
3K	2J3KL - Northern Cod Stewardship – Fixed Gear	0	3864	0	4276	0	3928	0	9645	0	12277
3Ps	3Ps - Fixed Gear < 35' PB - Area 10	2663	1535	2663	1812	Fishery listed <65' for this year	Fishery listed <65' for this year	Fishery listed <65' for this year	Fishery listed <65' for year	1505	2100
3Ps	3Ps - Fixed Gear 35'-64', PB - Area 10	1010	461	1010	802	4308	2515	4165	2276	571	863
3Ps	3Ps - Fixed Gear < 35' FB and West - Area 11	2308	542	2308	736	Fishery listed <65' for this year	Fishery listed <65' for year	Fishery listed <65' for year	Fishery listed <65' for year	1304	573
3Ps	3Ps - Fixed Gear 35-64', FB and West - Area 11	613	113	613	362	3426	1133	3312	1359	346	201
3Ps	3Ps Sentinel	153	8			180	5	174	5	0	0
4R	4R3Pn - Fixed Gear < 65' (July)	482	454	482	454	482	468	482	575	1271	1255

4R	4R3Pn - Fixed Gear < 65' (September)	161	186	161	263	111	128	161	93	424	467
4R	4R3Pn - Sentinel Fishery	200	36	200	25	200	44	200	43	0	0
4R	4R3Pn - Cod By-Catch Greenland Halibut Fishery	5	1	5	4	5	2	5	7	0	0
4R	4R3Pn - Cod By-Catch Atlantic Halibut Fishery	18	23	18	31	18	31	18	55	18	24
Total Quota and Catch Rates		7,613	7,425	7,460	8,967	8,730	8,675	8,517	14,383	5,439	18,161
Total for All NAFO Divisions		10,774	8,585	11,004	11,285	12,454	11,053	12,214	16,034	8,262	18,858

Table 2: Weekly Catch Limits for the Northern Cod Stewardship/By-Catch Fishery.

	Weekly Limit (Kg/week)			Notes/Restrictions
	Dates	2J	3KL	
2011*	For Season	1700	1700	For fixed gear; vessels <65 feet; homeport in 2J3KL
2012*	For Season	1700	1700	For fixed gear; vessels <65 feet; homeport in 2J3KL
2013	For Season	2268	2268	For fixed gear; vessels <65 feet; homeport in 2J3KL
2014	For Season	2268	2268	For fixed gear; vessels <65 feet; homeport in 2J3KL
2015	For Season	2268	2268	For fixed gear; vessels <65 feet; homeport in 2J3KL
2016*	August 15-September 4	907	907	Harvesters are not restricted to homeport; restricted to 12 mile limit; weekly limits for combined enterprises will not be limited to base weekly limit but amount proportional to the level of combining.
	September 4-end of season	1361	1361	
2017*	June 12-30	1815	1815	Harvesters will not be restricted to fishing in the bay of their homeport.
	July	0	0	
	August	1815	907	Many of the management measures previously in place for this fishery will continue, including:
	September	2268	1361	
	October	2268	2268	
	November	2268	2268	

* One year fisheries management plan.

Policies on Fleet Separation and Independent Core Status

Within the Fisheries Licensing Policy for Newfoundland and Labrador there is a *Fleet Separation Policy* where the objective is to separate the inshore fish harvesting sector and the processing sectors. As a result of this policy, inshore licenses cannot be issued to corporations (typically the offshore fleet sector), including those involved in the fish processing sector (Fisheries Licensing Policy Newfoundland and Labrador Region, 2017).

This policy was strengthened on April 12, 2007, when the Minister of Fisheries enacted the *Policy to Preserve the Independence of the Inshore Fleet in Canada's Atlantic Fisheries*. (Policy for Preserving the Independence of the Inshore Fleet in Canada's Atlantic Fisheries, 2010). Known as PIIFCAF, the policy applies to fish harvesters (vessels <65 feet or 19.8m) who held or wished to apply for licenses. Its aim is to terminate 'controlling agreements' and strengthen the Owner-Operator and Fleet Separation policies. PIIFCAF ensures that harvesters actively engaged in the fishery and the consultative process are the ones who benefit from the privilege of the license.

The objectives of this Policy are to:

- Reaffirm the importance of maintaining an independent and economically viable inshore fleet;
- Strengthen the application of the Owner-Operator and Fleet Separation policies;
- Ensure that the benefits of fishing licenses flow to the fish harvester and the coastal community; and
- Assist fish harvesters in retaining control of their fishing enterprises.

Effective April, 2007, the Policy created the Independent Core category as the eligibility criteria for the receipt of new or replacement vessel-based fishing licenses in the inshore sector of Atlantic Canada. The Independent Core category is available to inshore fish harvesters who have vessel-based fishing licenses issued in their name and are not party to Controlling Agreements

The policy was implemented to ensure fish harvesters were able to retain control of their enterprises/license. The policy set a framework/criteria for harvesters to transfer or replace their existing license with the new designation identified as "Independent Core." (DFO, 2017). The policy data for 'independent core' status appears in the DFO statistics for the year 2009. The Independent Core category is an eligibility criteria for the receipt of new or replacement inshore vessel-based licenses. A non-core harvester does not meet those criteria. Further information regarding the Independent Core status can be found in the Fisheries Licensing Policy for the Newfoundland and Labrador Region that was modified (2017).

Licensed Commercial Fisherman and Professionalization

Prior to 1996, commercial fishermen in NL were required to register with DFO on an annual basis as either part-time or full-time, but due to deficiencies with the distinction between part-time and full-time fishermen, fisher registration was eliminated in 1996 and replaced by a system of enterprise registration. In 1996, following a review of all existing enterprises, DFO established the terms Core and Non-Core (Professional Fish Harvesters Certification Board, 2015). "Core" refers to the status of a commercial fishing enterprise which holds key species licenses, have an attachment to the fishery and be dependent on the fishery (Roy, 1997). A "fishing enterprise" is defined as an authorized fishing business under which multiple fishing licenses or vessels up to 27 meters (90 feet) operate. Each

enterprise is controlled by one owner who directs fishing effort among that owner's vessels and licenses (Fisheries Licensing Policy Newfoundland and Labrador Region, 2017).

In 1996, DFO made a commitment that no more Core licenses would be issued. Therefore, the only way to obtain a Core enterprise in NL is through the transfer of an existing Core enterprise (e.g. If a Core enterprise owner is retiring, his/her Core enterprise can be transferred to an eligible fish harvester).

The classification 'independent core' became effective as of 2007 with harvesters having two years for documentation. Details on the classification of the independent core status are presented in the previous section *Policies on Fleet Separation and Independent Core Status*. Figure 6 highlights the number of changes in the number of core, independent core and non-core licensed harvesters over time. As noted, the classification of independent core was implemented in 2007 but the two year period for documentation meant that the numbers of licensed participants appeared in the 2009 data set.

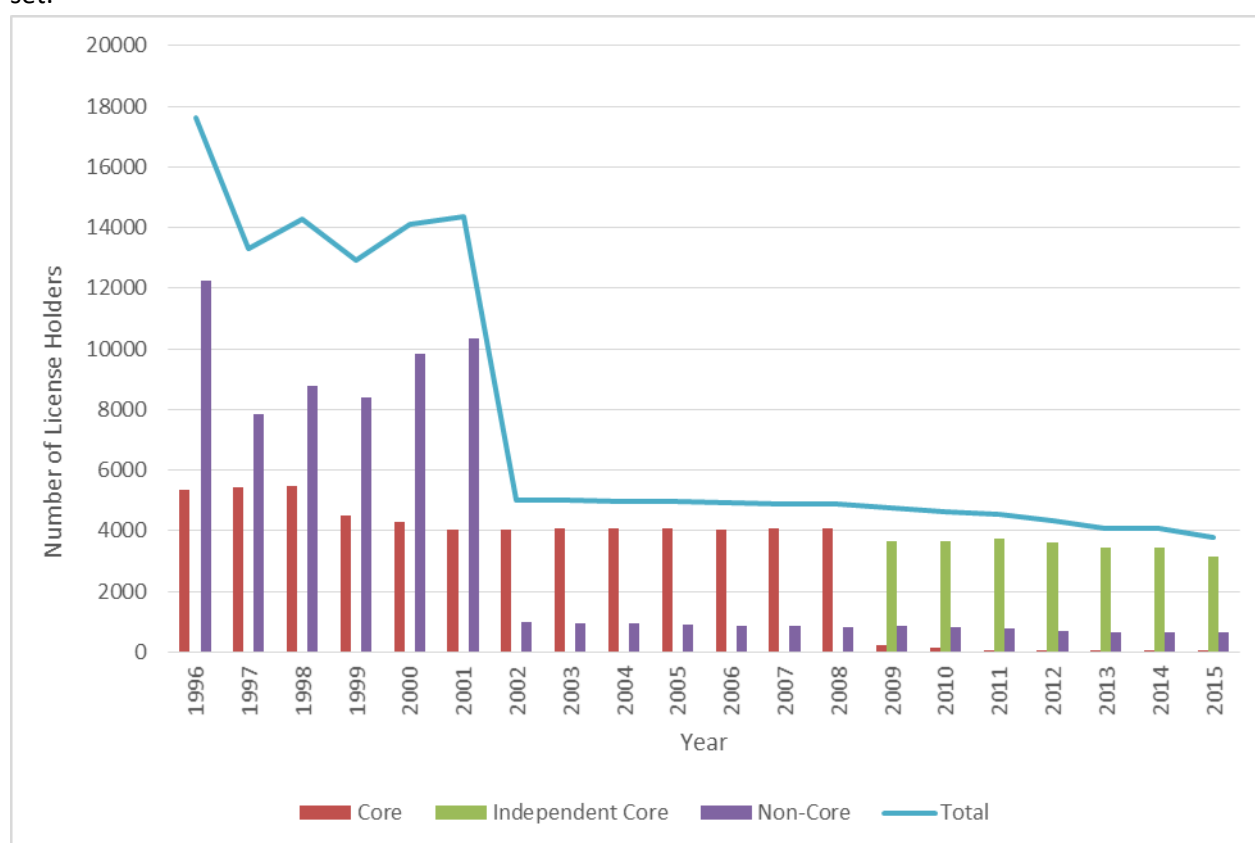


Figure 6: Number of Core, Independent Core and Non-Core Registered Licenses in Newfoundland from 1996 to 2015.

Entry into the Fishery

Currently, all commercial fishing activities in Atlantic Canada are subject to limited-entry licensing by DFO for inshore and offshore fisheries. Under Canada's Fisheries Act, a fishing license is defined as an instrument by which the Minister of Fisheries and Oceans grants permission to a person to harvest certain species of fish or marine plants subject to the conditions attached to the license. Individual quotas are implemented as a condition on the fishing license and thus cannot be transferred (re-

issued) unless the entire license is transferred (Roy, 1997). Extensive details on the changing of License and Enterprise Details is outlined in the Fisheries Licensing Policy Newfoundland and Labrador Region (Source: <http://www.dfo-mpo.gc.ca/reports-rapports/regs/licenses-permis/nfld-Labrador-tn-labrador-eng.htm>)

The issuance of new commercial licenses or annual renewal of commercial licenses can only be approved if the fish harvester is eligible through the Professional Fish Harvesters Certification Board (PFHCB; DFO, 2017).

In order to be eligible to apply for licenses and quotas, or receive the transfer of a core enterprise in NL, DFO requires that the harvester/vessel owners be certified as a Level II professional fish harvesters (PFHCB, 2015). In order for a new entrant to become a professional fish harvester in Newfoundland and Labrador the individual would have to:

- Be sponsored by a registered professional owner/operator or a registered professional skipper on a designated fishing enterprise.
- Complete basic safety training course.
- Classed as an Apprentice.

Level I requirements:

- Two years minimum of full-time fishing activities.
- Must earn 55 land-based credits.

Level II requirements

- Additional three years of full time fishing activities.
- Additional 60 land-based credits.
- The individual can now acquire a fishing enterprise.

Professionalization is defined as a means to recognize special skills and experience required to become a professional in the fishing sector. Professionalization can either be granted by “grandfathering” or by qualifying for professionalization. Grandfathering is the granting of professional status to those who have a longer-term attachment to fishing, while new entrants must qualify through training and experience for professionalization. In Newfoundland and Labrador professionalization is obtained through the PFHCB. All license holders are personally required to actively fish their licenses; some exceptions such as a DFO authorized substitute operator, those with a SHORE Skipper status or licenses issued under the Aboriginal Communal Fishing License Regulations are exempt (DFO, 2017).

The PFHCB is a non-profit organization created by and operating for the benefit of all Newfoundland and Labrador fish harvesters. The Board became operational in 1997 after the Professional Fish Harvesters Act was declared by the Newfoundland and Labrador House of Assembly. When the Board became functional in 1997 the DFO registration system and its categories of full-time/part-time fisherman was replaced with the new designations of Apprentice Fish Harvester, Professional Fish Harvester Level I, and Professional Fish Harvester Level II. Further information regarding the role of the Professional Fish Harvesters Certification Board can be found at <http://www.pfhcb.com/>.

Under the general guidelines for commercial fishing vessel registrations, in order to engage in commercial fishing for any species of fish referred to in these Regulations the following criteria must be met:

- a vessel registration card has been issued in respect of the vessel;
- the use of the vessel to fish for that species of fish is authorized by a license; and
- Fish harvesters must renew their vessel registration annually by December 31 of each calendar year or they will be cancelled (DFO, 2017)
- only Canadian vessels as defined by Transport Canada may be registered
- the person who is using the vessel is named in the license and is authorized to fish for that species;
- Policies indicates that no person shall fish for any species of fish set out in Schedule I of these regulations unless he holds a fisher's registration card; and he is authorized to fish for that species. A person is authorized to fish for a species of fish if that person is:
 - a) on board a vessel and is named as the operator of that vessel in a license that authorizes the use of that vessel to fish for that species;
 - b) accompanying a person referred to in paragraph (a) or (b); or
 - c) on board a vessel the owner of which is the holder of a license that authorizes the use of that vessel in fishing for that species and an operator is not named in the license.

Where a license is issued authorizing the use of a vessel to fish for a species of fish and an operator is not named in the license, any registered fisherman may operate that vessel to fish for that species (Information copied from Atlantic Fishery Regulations Part II sections 13 and 14; Department of Justice, 2015).

Vessel Replacement Enterprise Combining

Under the Fisheries Licensing Policy for Newfoundland and Labrador, effective April 12, 2007, a new vessel replacement policy was implemented with three specific fleets being identified. The harvester's primary vessel is the largest vessel registered within their vessel eligibility:

- *Less than 12.2m (40') length over all-* Core enterprise owners who held maximum vessel eligibility up to 10.6m (34'11") prior to April 12, 2007 permitted to register a vessel up to a maximum of 12.2m (39'11") LOA, as their primary vessel.
- *Less than 19.8m (65') length over all-* Core enterprise owners who held maximum vessel eligibility between 10.6m (35') – 19.8m (64'11") LOA prior to April 12, 2007 permitted to register a vessel up to a maximum of 19.8m (64'11") LOA, as their primary vessel. Only one vessel 12.2m (40') LOA or greater is permitted, unless grandfathered in prior to 1983. Those grandfathered will lose the second vessel registration (>12.2 m = 40' LOA) upon the re-issuance of the enterprise and/or death of the enterprise owner.

- *Less than 27.4m (90') length over all-* Core enterprise owners who held maximum vessel eligibility between 10.6m (35') – 19.8m (64'11") LOA prior to April 12, 2007 permitted to register a vessel up to a maximum of 27.4m (89'11") LOA, as their primary vessel, providing they are in the following fleets:
 - NAFO Divisions 2J3KL full-time Snow crab;
 - NAFO Divisions 2J3K supplementary and the NAFO Division 3L large supplementary Snow crab;
 - NAFO Division 3L small supplementary Snow crab license holders who also hold a Northern shrimp license;
 - NAFO Division 4R Northern and Gulf shrimp fleets;
 - Northern shrimp license holders who do not hold a Snow crab license.
- Eligibility to register a vessel 19.8m (65') LOA or greater is directly tied to the licenses outlined in Subsection 14.10 (c). Reissuance of these licenses from an enterprise will result in the loss of the 27.4m (89'11") LOA vessel eligibility.
- Eligible fish harvesters who opt to acquire a vessel 19.8m (65') – 27.4m (89'11") LOA are inshore fish harvesters, and will continue to operate on the basis of inshore licensing policies applicable to fish harvesters operating vessels less than 19.8m (65') LOA, including PIIFCAF, and Fleet Separation and Owner-Operator Policies.

Secondary Vessels:

- Core enterprises may register two secondary vessels in addition to their primary vessel registration, to a maximum of three vessels per enterprise.
- Core enterprises with more than three vessels registrations as of April 12, 2007, are grandfathered. Registrations not renewed will result in cancellation of the grandfathering provision.
- Secondary vessels may be up to a maximum 8.5m (28') LOA for the first vessel, and up to a maximum 6.1m (20') LOA for the second

(Information for this section was copied directly from the Fisheries Licensing Policy Newfoundland and Labrador Region, 2018)

In 2008, DFO introduced the enterprise combining policy as a means of permanently reducing the size of the fishing fleet without the need for DFO financial assistance. Under this policy, an independent core enterprise can purchase one other independent core enterprise, with the stipulation that one vessel registration and one core enterprise must be permanently retired (DFO, 2008; Schrank and Roy, 2013)- this was commonly referred to as the 2:1 combining policy. This approach enables the surviving core operator to potentially double his/her quotas or harvesting levels of key species (Schrank and Roy, 2013). More information on the enterprise combining policy can be found in the DFO archives at <http://www.nfl.dfo-mpo.gc.ca/e0016996>.

Currently, enterprises in the NAFO Division 3Ps can implement a 3:1 combining policy for cod licenses, availing of either a full or shared license (Coffin, Pers. Comm. 2017, <http://www.nfl.dfo-mpo.gc.ca/NL/CP/Orders/2017/nf17079NAFO3Pscombining>).

Main Influences of Management on Value Chain Dynamics

Entry barriers to the system:

- No new licenses being issued by DFO
- Entry into fishery is based on acquisition of existing licenses
- Requires a professional fish harvester certification
 - Significant investment in terms of education and training and at-sea experience
- Cost of entry into the fishery is prohibitive due to the high cost of capital investment (vessels, gear, etc.) and the cost of licenses
 - Uncertainty over future allocation/quotas and if there will be return on investment

Exit barriers from the industry:

- Low exit barriers licenses are easily sold; open market for license
- No regulations governing the sales
 - Exit not linked to potential resource re-allocation for new entrants; i.e. portion of share or allocation is not reinvested back into the fishery
 - No financial reinvestment (e.g. no tax or fee) required to be paid by harvester upon sale of license and exit from the system

Possibilities to upgrade in the system:

- Limited opportunity for vertical integration based on PIICAF and allocation of first 115,000 tonnes to inshore sector
- Upgrading is based on number of licenses purchased

Transferability of quota/weekly allocation:

- Limit on combining (maximum set at 2:1 or 3:1) shares or allocation for inshore fleet
- Transfer of shares/allocation between vessels is permanent (inshore fleet);
- Larger offshore vessels can transfer quota between vessels annually- it is not permanent
- Opportunity to buddy-up is limited or restricted based on region and season

Management measurements:

- Landing obligation- must land all catch unless a species exemption is received from DFO
- Minimum processing requirement; cannot process at sea
- Fishing season is determined annually; reportedly based on ease of access to the fishery and not linked to market conditions
- Gear restriction in place (e.g. fixed versus mobile gear)

Industry Structure and Employment

As stated in the previous section, the NL Fishing industry is characterized by the Fleet Separation Policy which separates the inshore fish harvesting sector and the processing sector and is intended to protect the independence of the fish harvester. The Fleet Separation Policy/PIIFCAF applies primarily to inshore/nearshore fish harvesters in an effort to terminate controlling agreements. Thus, vertical integration is considered minimal when compared to the Icelandic fishery which is dominated by vertical integration.

Before 2007, the fishing fleet in Newfoundland and Labrador used to be split based on the following vessel length categories:

- i. Inshore- Vessels measuring 0-34'11" feet or 0-10.7 m
- ii. Inshore- Vessels measuring 35' - 44'11" or 10.7m- 13.7m
- iii. Nearshore- Vessels measuring 35' - 64' 11" feet or 10.7 - 19.8m
- iv. Mid-shore- Vessels measuring 65' - 99' 11" feet or 19.9 - 30.4m
- v. Offshore- vessels measuring > 100 feet or >30.5m

Since 2007, and the implementation of the new vessel replacement policy three specific fleets were identified with all three collectively being referred to as the inshore fleet:

- i. Less than 40 feet (39'11") or 12.2m (inshore/coastal fleet)
- ii. Less than 65 feet (40'-64'11") or 19.8m (inshore/nearshore fleet)
- iii. Less than 90 feet (65'-89'11") or 27.4 m (inshore/mid-shore fleet)

Vessels >90 feet (27.4m) are typically associated with the offshore sector. Vertical integration occurs primarily in the offshore sector which is owned by larger corporations with licenses having existed prior to the cod moratorium. A 2016 announcement by the Minister of Fisheries Dominic LeBlanc, confirmed that as cod recovers and a commercial fishery becomes viable, the first 115,000 Mt of Northern cod will be allocated to the inshore fleet, thereby limiting the growth opportunity for the offshore, vertically integrated sector.

There are examples of small scale, 'vertical integration' type models in the NL fishery. These include community based fisheries cooperatives, such as the Labrador Shrimp Company, the Petty Harbour Coop and the Fogo Island Coop. Harvesters, who are members of the cooperative, sell their product directly to their processing facility which in turn assumes responsibility for marketing and sales of the product. The cooperatives are typically made up of harvesters, plant workers and a management team with all members having input into the value chain.

In recent years, a much smaller scaled 'vertical integration' model is occurring amongst local inshore harvesters. As an outcome of the Cod Stewardship Program's weekly allocation of cod, some inshore fisherman are reporting that it is more economically viable (due to low weekly catch allocations) to land, process and market their own product instead of selling directly to a licensed processing facility. In such cases, the inshore harvester sells directly to local consumers or restaurants. Processing regulations prohibit these groups from exporting the product outside of the province as product that is exported out of the province must go through a registered processing facility. The main products forms produced and marketed by the inshore fisherman include cod fillets, cheeks, tongues, heads and salted and/or dried product. DFO (2017) reported that for the 2017 stewardship fishery, there

was just over 12,271 Mt of cod landed with ~83% going to licensed processing facilities and ~17% for personal use and local sales (Corbett, 2017).

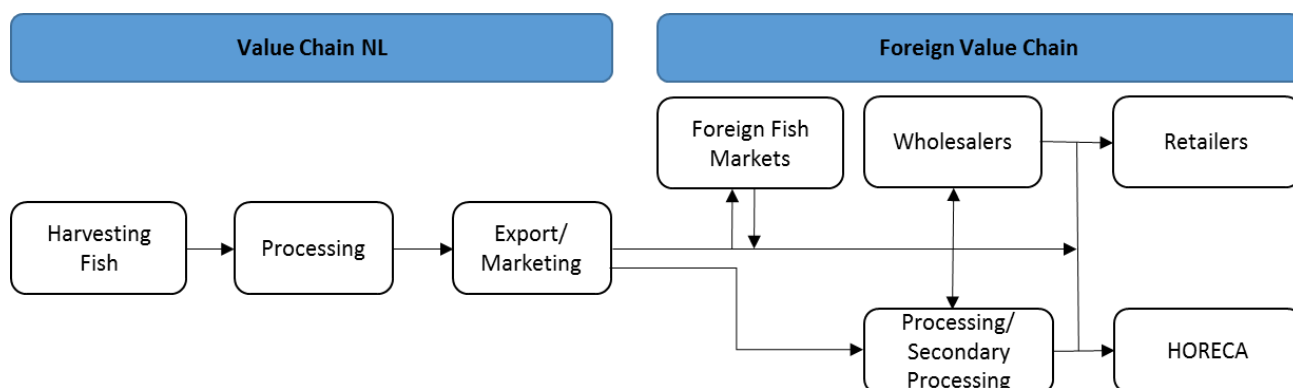


Figure 7: The NL cod value chain.

As outlined in Figure 7: The NL cod value chain is a relatively linear process with fish landed, processed and exported and distributed among secondary processors, wholesalers and retailers. Some of the product is exported to foreign fish markets where it can be further processed and re-imported into NL. Prior to the recently implemented CETA agreement, a unique feature of the NL fishery was the minimum processing requirements for landed catch. Under the new agreement, which came into effect in September, 2017, minimum processing requirements were lifted enabling duty free access to NL seafood products either immediately or to be phased in over the next seven years (Canada European Union Comprehensive Economic and Trade Agreement (CETA), 2018; How will CETA Benefit Newfoundland and Labrador, 2018), Canada-European Union Comprehensive Economic and Trade Agreement Now in Effect, 2018).

The inshore sector lands fresh, head-on and gutted fish. The offshore sector lands a combination of fresh or frozen head-on and gutted fish pending the vessel on which it was harvested. The offshore vessels may utilize larger factory freezer trawler vessels or enter into agreements with smaller inshore boats for catching the allocated quota.

Employment and Demographics

Employment statistics for the NL fishery (both the harvesting and processing sectors) are based on cumulative data for all commercial species harvested and processed and therefore cannot be differentiated based on cod alone. The majority of harvesters and processing facilities tend to operate multi-species operations so data is presented as such.

Figure 8a-b presents the employment data for the harvesting and processing sectors based on person years- PY (Figure 8a) and the total number of individuals employed (Figure 8b) for the period 1999-2016.

The data is compiled from data presented in the Department of Fisheries and Land Resources' Annual Year in Review Reports (Source: <http://www.fishaq.gov.nl.ca/publications/index.html#seafood>).

For both the harvesting and processing sectors there has been a consolidation in the industry as reflected in the decrease in the person years and number of individuals working in the fishery (Figure

8a-b). For the harvesting sector, there was a 61% decrease in the average annual employment when comparing person years from 2000 (8800 PY) to 2015 (3400 PY). In terms of total number of individuals employed, the percent decrease was approximately 23% for the same time period (2000: 12,200 individuals; 2015: 9334 individuals).

The average annual employment for the processing sector in person years decreased by 56% from 2000 (6400 PY) to 2015 (2800 PY). The decrease in the number of individuals was reported to be 26% for the same time period 2000 (22,600 individuals) to 2015 (7721 individuals).

Much of the labour force in the NL fishery is regarded as highly seasonal and is augmented by secondary income. Labour for the harvesting vessels and processing facilities are required for short periods of time with individuals either relying on employment assistance programs or having to find alternative employment when the fishing season is closed (Pisces Consulting Limited, 2015).

Figure 9 highlights the total number of fisher harvesters and fish processors who collected government employment insurance benefits and the overall percentage of these workers compared to all employment insurance claims in the province. Overall there has been a decrease in both the number of individuals collecting employment insurance benefits over time and in the percentage of fishery workers compared to total NL workforce receiving employment insurance beneficiaries. The peak years for unemployment claims (1998-2005) is a reflection of the shellfish industry more so than the groundfish or cod industry. The shrimp industry opened in 1998 and this period (1998-2005) was marked by a very short term, fishing season marked by high commercial landings for both shrimp and crab. During these productive shellfish years there was a greater requirement for short term labour for both harvesting and processing. The decrease in employment insurance claims is a reflection of consolidation in both the harvesting and processing sectors with fewer vessels, fewer processing facilities and a decreased requirement for labour.

As noted in the 2015 Pisces Consulting Limited report “NL Seafood Value Chain Infrastructure Benchmarking Marketing Assessment” a lack of renewal in the harvesting and processing sectors is reflected in the demographics with the average age of employees increasing for both sectors. The report notes for the 20 year period (1990-2010) the number of fish harvesters over the age of 55 increased by 35% while fish harvesters under the age of 25 decreased by almost 80%. The same trend was reported for the processing sector.



Figure 8a-b: Total employment in the fishery sector (harvesting and processing) based on Person Years (A) and the total number of individuals (B).

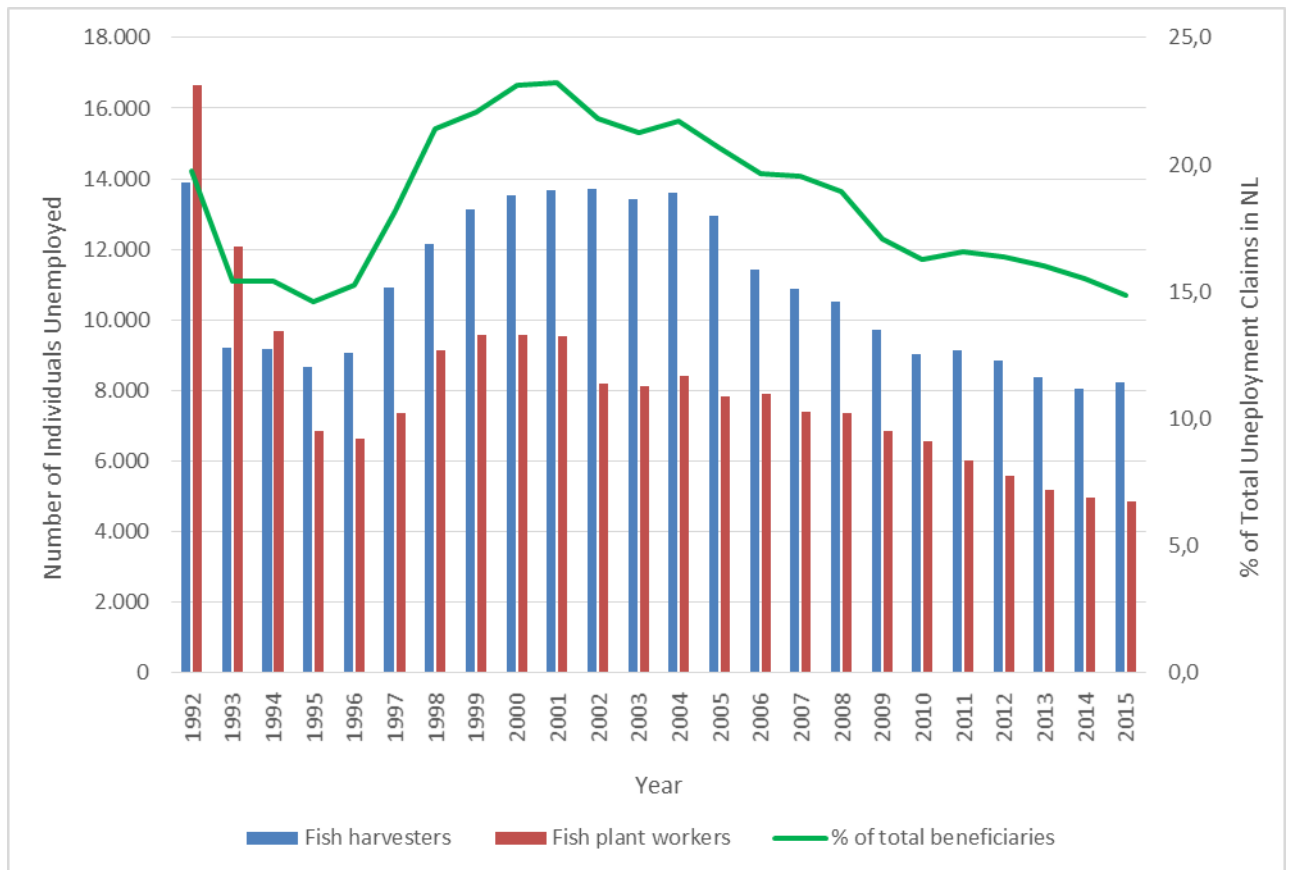


Figure 9: The total number of unemployed individuals in fish harvesting and processing and the percent (%) total of these sectors for the total unemployment claims in NL.

Figures 10a-d highlights the variance in the age categories/demographics of fish harvesters (2005-2015) and processors (2004-2016) based on total numbers (A, C) and percent representation (B, D). The data was data provided by the Professional Fish Harvesters Certification Board and the Department of Fisheries and Land Resources. For both harvesters and processors the graphs indicate that there has been a decrease in the numbers of younger (<35 years) participants and in increase in the number of 60+ participants. The results further confirm the trends noted by the Pisces Consulting Limited report in that there was a decrease in the number of harvesters participating in the fishery in the younger demographics (<30 - <45), and a corresponding increase in the number of 60+ participants. Based on percent representation, the <30 demographic comprised 21% of the harvesters in 2000 and 6% in 2015. An inverse trend was noted with the 60+ age category which comprised 4% of the harvesters in 2000 and 26% in 2015. There are a number of factors which impact the recruitment into the fishery, with one of the most important factors being the high cost of entry into the fishery. As no new licenses are being issues, a new entrant must purchase an existing license from someone looking to sell an enterprise/license. Presently, there are no regulations governing the selling of the licenses. Harvesters can sell their license at 'market' value which for certain species are reported to be in the hundreds of thousands of dollars. This is a strongly debated issue as many harvesters obtained their license to fish the public/common resource at no cost and years later sell the common/public resource license to new entrants at very high costs. People exiting the system are not required to pay exit fees or return a proportion or share of the quota allocation to support new entrants into the system.

It is important to note, that in the context of rural NL, the decrease in employment or lack of recruitment of the younger demographic is a trend not unique to the fishery and is seen across all rural employment sectors. It is amplified however by the fact that the fishery (harvesting and processing) is a primary source of employment for small, rural communities throughout NL. For all industries operating in regional towns and smaller rural communities, high out-migration of young people (especially <35) is occurring as this demographic are moving to larger urban centres and cities and opting for more diversified careers as offered in these urban/city centres.

Ward and Simm's (2016) presentation "Demographic Issues Affecting Seafood Processing in Atlantic Canada" at the Process Automation in Seafood Processing workshop provided an overview of the employment situation in the seafood processing sector. Highlights from this data are presented in Table 3.

The cumulative data shows that seafood processing jobs account for 49.7% of the total employment for communities with populations <8000 people. With 34% of this occurring in communities with populations less than 2000 people. The industry, even as a seasonal employer, is a very critical contributor to the rural economy particularly for communities with <2000 people. The challenge as noted by both the Pisces Consulting Limited report (2015) and the Ward and Simm's presentation (2016) is the lack of renewal in the industry and the subsequent out-migration of youth from the communities and the fishing industry in general. Ward and Simm's (2016) data on population trends (% change) for NL for the period of 2005-2015 is outlined in Table 4. The data shows that there is significant out-migration of people aged 15-54, particularly for the smaller rural communities. The population of the older working group (age 55-64) is relatively stable however projecting forward however their career in the fishery is relatively short-lived.

Table 3: Employment Values for the Seafood Processing Sector based on Functional Economic Region

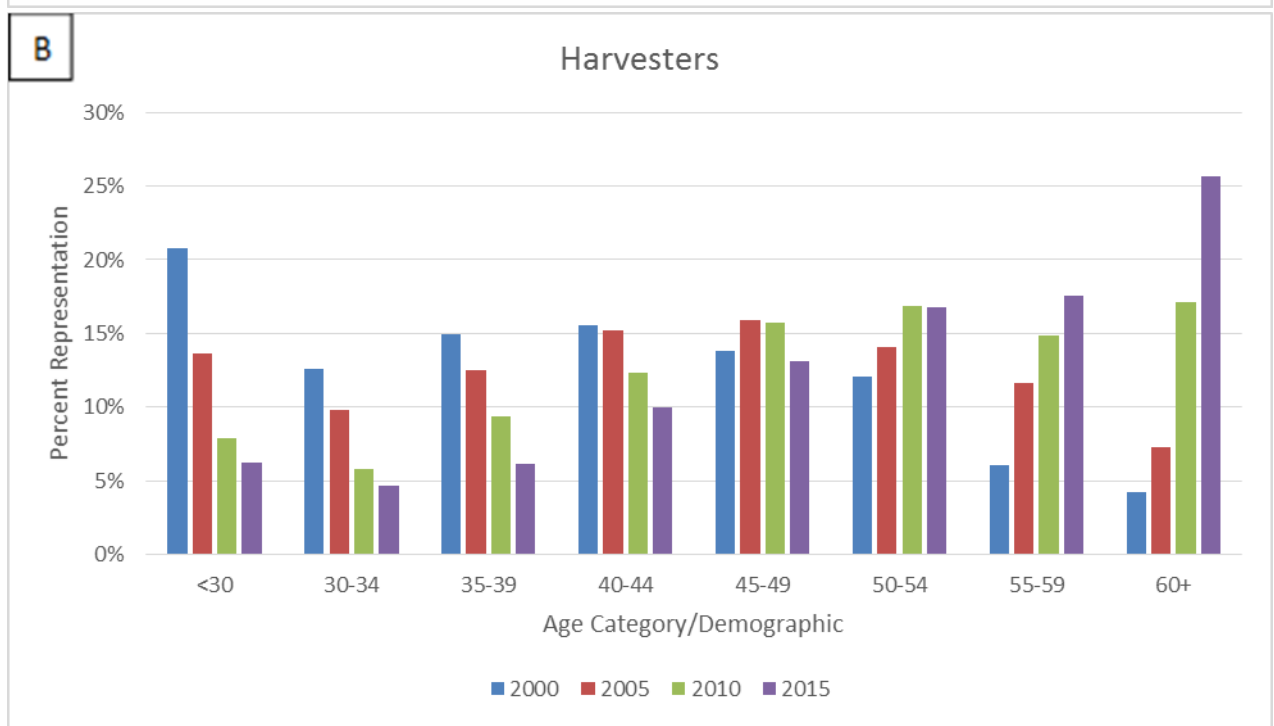
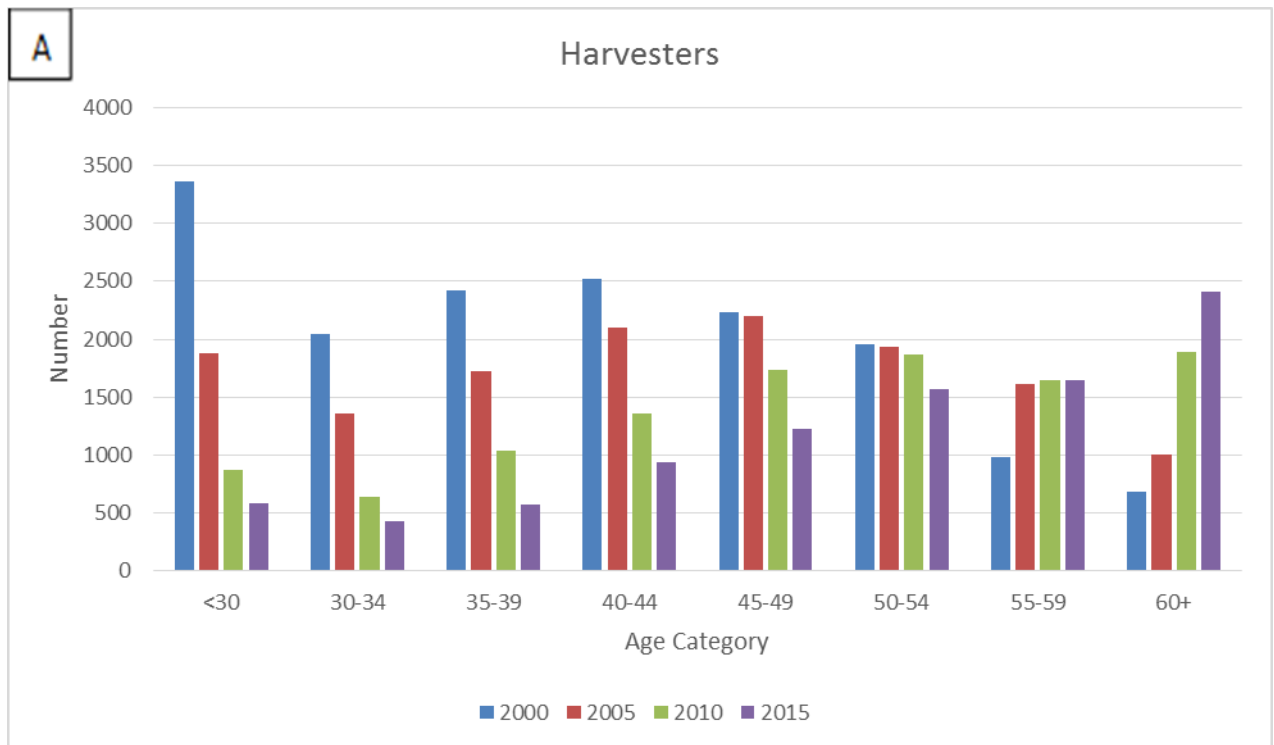
Functional Economic Region	Total Employment (#)	Seafood Processing Employment (#)	Seafood Processing Employment (#)	Seafood Processing (% total employment)	Mean Age
Urban (>40,000)	145,703	1202	10.3	0.8	39.6
City- Regional Town (8,000-40,000)	81,087	2808	24.1	3.5	43.0
First Order Rural (2,000-8,000)	27,811	4376	37.6	15.7	47.4
Second Order Rural (600-2,000)	11,693	2099	18.0	18.0	46.0
Third Order Rural (<600, remote)	7,204	1155	9.9	16.0	46.4

Table 4: Population shift in the different functional economic regions in NL based on age for the period 2005-2015 (Data extracted from Ward and Simms, 2016).

Functional Economic Region	Youth (0-14)	Young Adult (15-24)	Young Working (25-34)	Middle Aged (35-54)	Older Working (55-64)	Seniors (65+)
Urban (>40,000)	+4.88	-10.18	+23.21	+2.70	+19.54	+52.76
City- Regional Town (8,000-40,000)	-7.51	-16.42	-6.49	-14.13	+5.64	+47.99
First Order Rural (2,000-8,000)	-24.11	-29.01	-37.56	-29.10	-0.05	+39.19
Second Order Rural (600-2,000)	-22.09	-32.59	-34.20	-26.22	+6.14	+37.79
Third Order Rural (<600, remote)	-31.26	-35.97	-33.69	-27.14	+6.79	+27.92

There is further concern over the economic stability of these communities as the NL fishery goes through transition. For the past twenty years, seasonal processing employment has been highly dependent on the shellfish sector (shrimp and crab) compared to the cod fishery. The quotas for both shrimp and crab have been decreasing significantly over the past couple of years, whereas the anticipated cod quota increases have been at a lower level than anticipated. As noted by Verge (2017), catches for the cod fishery have been increasing during this period but the allowable harvest levels are not at the levels needed to fill the revenue or profit gaps left by the decreasing shellfish sector. Data presented by Corbett (2017) during the workshop “Cod-Building the Fishery of the Future” highlighted that for active fishermen in the <40’ LOA (<12.2 m), the dependence on cod as a percentage of their total income approximately doubled between 2015 and 2016 for the 2J3KL region. This is evidence that harvesters are relying on cod to fill the economic gap left by the declining shellfish industry, specifically crab for the <40’ LOA (<12.2 m) fleet.

In addition to lower valued, lower harvestable quotas or quantities, when compared to the shellfish sector, cod requires much more labour intensive processing for profit or return on the product. Low birth rates, poor retention of youth, and aging workforce will be issues the cod fishery will have to address over the next couple of years. Factors such as further consolidation of the number of fish plants, identifying strategies to extract absolute maximum value, increased automation and policies on foreign workers will be necessitated if the NL cod industry is to be globally competitive.



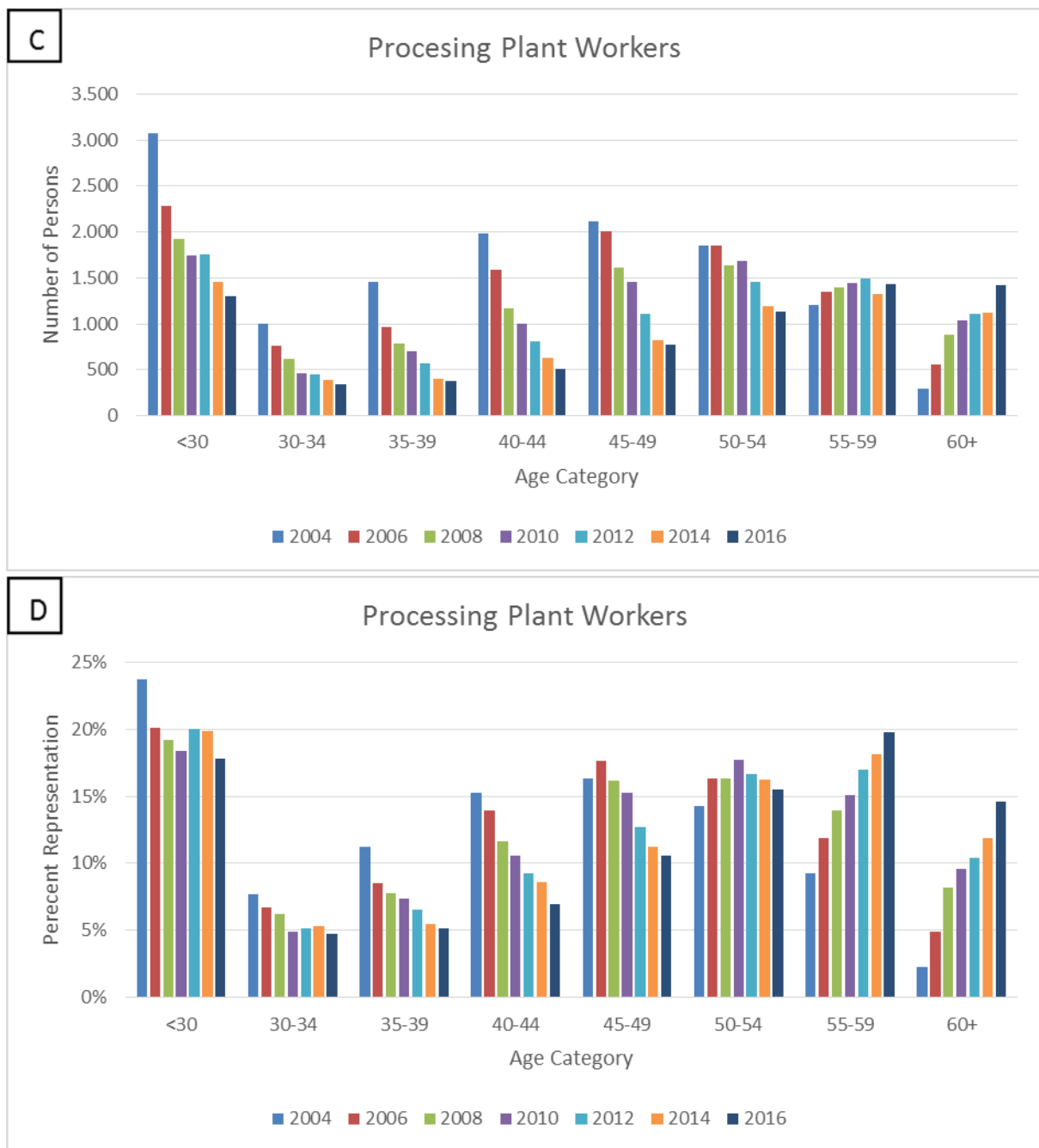


Figure 10 a-d: Demographics of NL fish harvesters based on total numbers (A-B) and proportional representation (C-D) for Harvesters and Processors for the period 2000-2015. (Data Source: Professional Fish Harvesters Certification Board, 2018).

Fishing

Structure of the Fleet (Demersal Fish Stocks)

As noted in the Section 3- Fisheries Management, the NL Fleet was traditionally split into the following categories based on vessel length and its relevant proximity to the coastline:

- i. Inshore- Vessels measuring 0-34'11" feet or 0-10.7 m
- ii. Inshore- Vessels measuring 35' - 44'11" or 10.7m- 13.7m
- iii. Nearshore- Vessels measuring 45' - 64' 11" feet or 13.7 - 19.8m
- iv. Mid-shore- Vessels measuring 65' - 99' 11" feet or 19.9 - 30.4m
- v. Offshore- vessels measuring > 100 feet or >30.5m

Although the 2007 regulations governing the registration/licensing of vessels reclassified the vessel length categories (See Section 3- Fisheries Management Section) statistics recorded by the Department of Fisheries and Oceans which are presented in this section of the report, are based on the earlier categorization. Data presented on the total number of registered fishing vessels was retrieved from Fisheries and Oceans Canada, Atlantic Region Licenses. (Source: <http://www.dfo-mpo.gc.ca/stats/commercial/licenses-permis/licenses-permis-atl-eng.htm>)

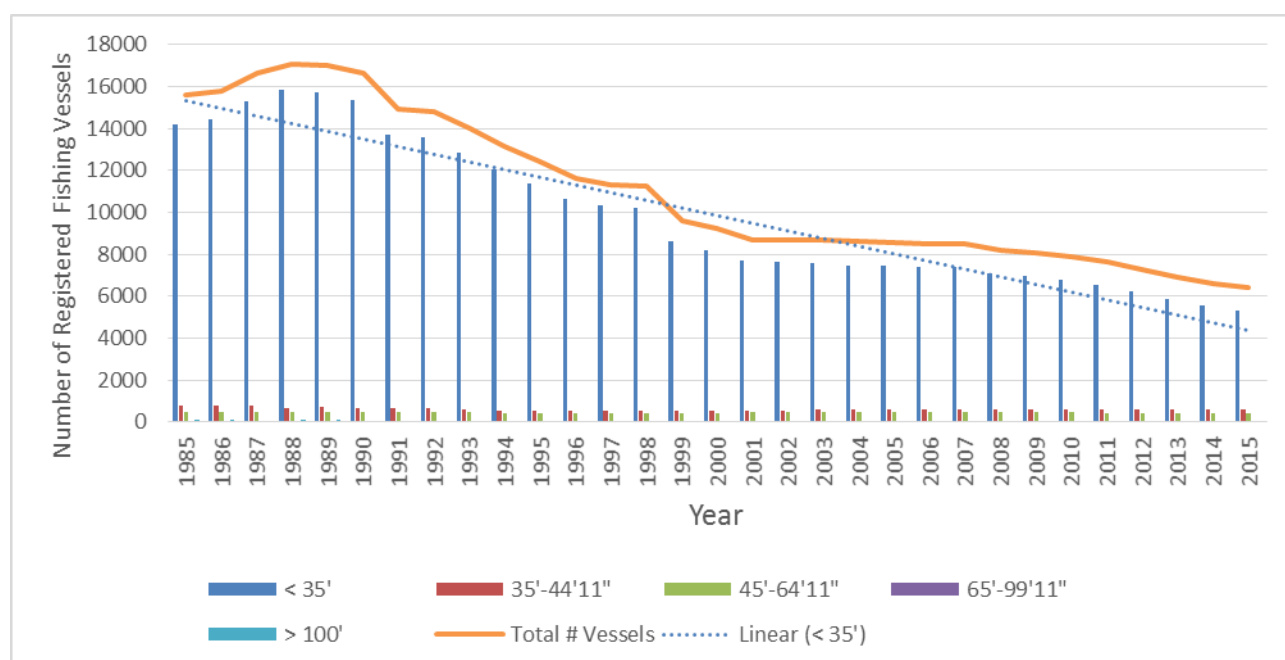


Figure 11: The total number of registered multi-species fishing vessels per size class for 1985-2015.

Figure 11 presents the total number of registered multi-species fishing vessels in NL for each vessel category over a 30 year period (1985-2015) and Table 4 presents the percent change in the number of registered vessel from 1985 to 2015. The graph demonstrates that there has been a significant decrease in the total number of vessels over time (15,583 in 1986 to 6,405 in 2015) primarily due to a 62.4% reduction in boats in the <35 foot category. The >100 foot (>30.5m) also saw a significant decrease in number of registered vessels (80.9%) whereas the 65-<100 foot (19.8,-<30.5m) category had a 211% increase (9 vessels in 1985 to 28 vessels in 2015).

Table 5: Percent decrease in the number of registered fishing vessels per vessel length category from 1985-2015.

Vessel Length	< 35' <10.6 m	35'-44'11" 10.7 m- <13.7m	45'-64'11" 13.7m- <19.8m	65'-99'11" 19.8m- <30.5m	> 100' >30.5m	Total # Vessels
% Decrease in # of Registered Vessels	-62.4	-21.8	-18.7	+211.1	-80.9	-58.9

In 1998, 85% of vessels fishing cod were <35 (10.7m) and 98% were <45' feet (<13.7m). The percent of vessels in the <35 (10.7m) increased to 94% in 2016 and remained the same at 98% for the <45' feet or <13.7m fleet. As with all fishing vessels, the overall number of vessels fishing cod decreased over time (Figure 12).

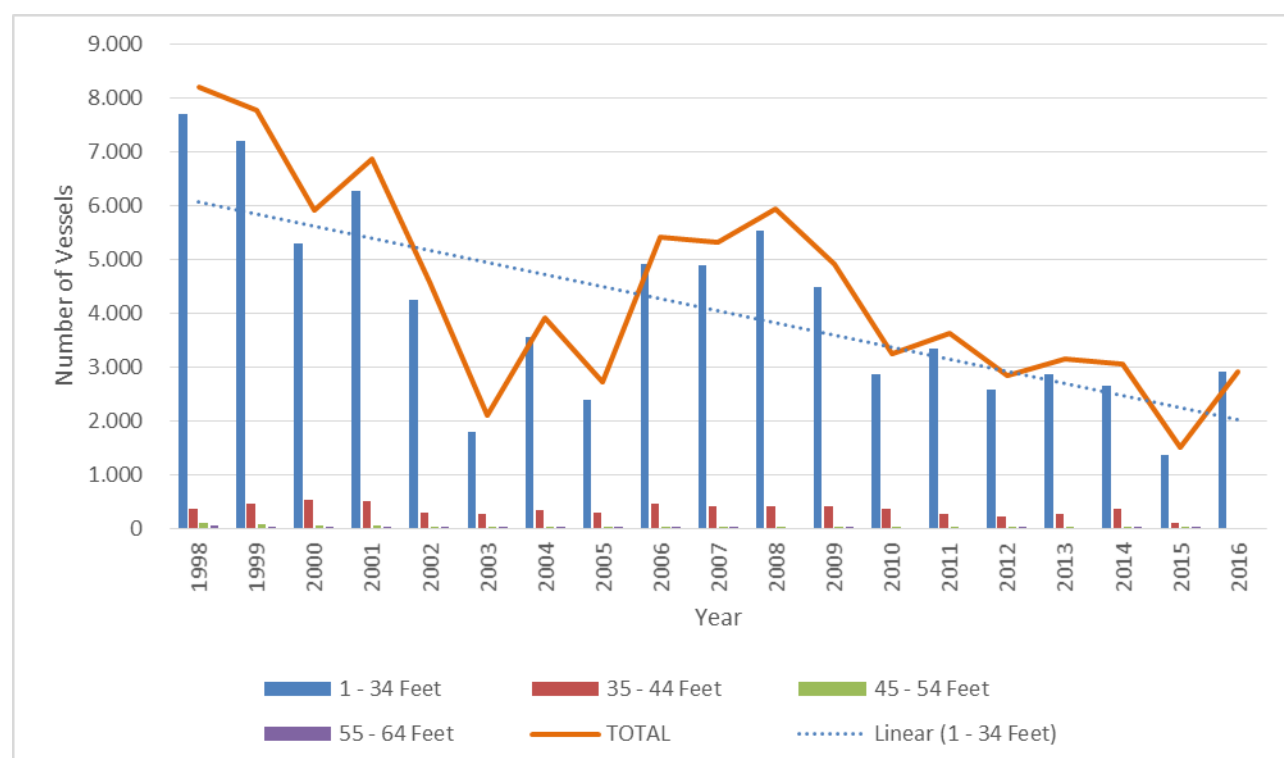


Figure 12: Number of vessels fishing cod for each vessel length class for period 1998-2016.

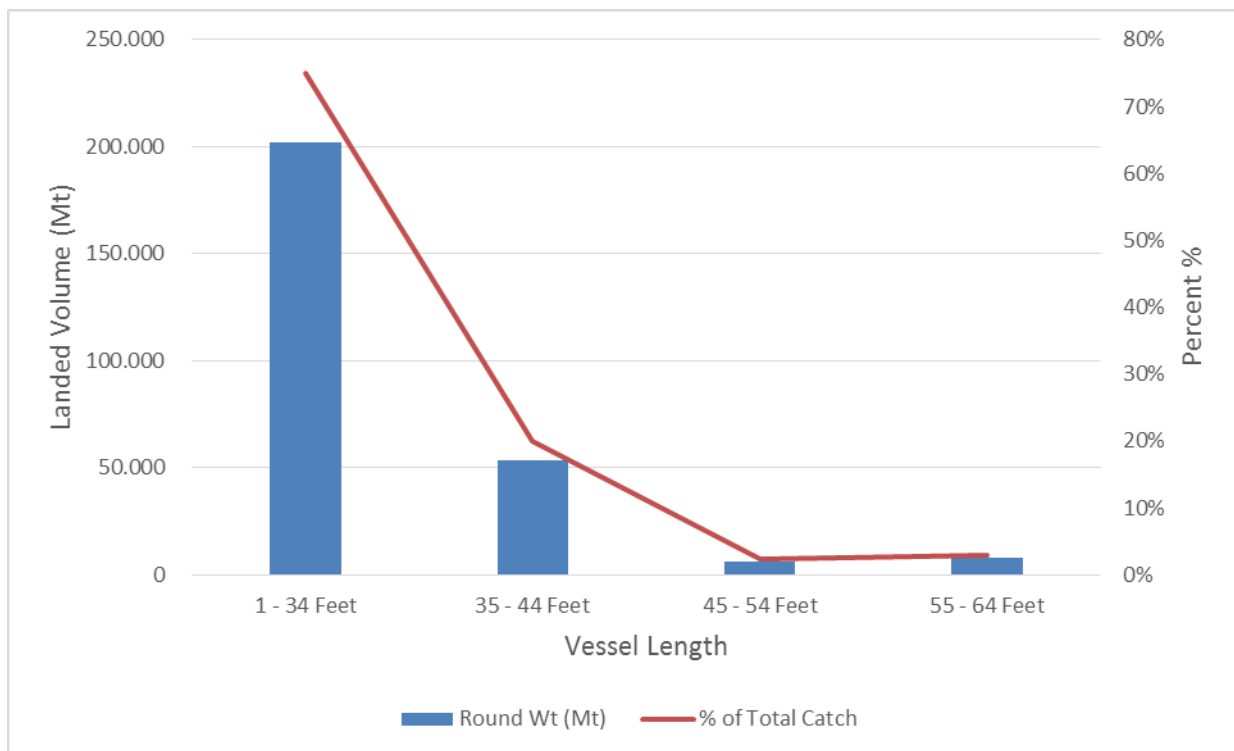


Figure 13: Total landed volume and percent of total catch of cod landed by each vessel length category for the period 1998-2016.

According to data provided by DFO Statistics Branch (Figure 13) between the years 1998-2016 there was approximately 269,382 Mt of cod landed in NL. The <35 foot (<10.6m) fleet captured approximately 75% (201,983 Mt) of the total landed volume during this time. When combined with the <45 feet (<13.7m) fleet the total landings were approximately 95% (255,524Mt) of the total catch. Vessels >45feet (13.7m) accounted for approximately 5% of the total landings (13,858 Mt).

Typically the <45 foot fleet are multi-species vessels, 15 years old or older, constructed primarily from glass-reinforced plastic (GRP) or wood and use gill nets as the predominant gear type followed by hook and line (CREF, 2013; Pisces Consulting Limited, 2015). Results presented by Pisces Consulting Limited (2015) on a survey conducted with harvesters indicated, for the coastal inshore fishery, there is limited use of dedicated bleed tanks, cooling is completed primarily with flake ice or an ice/water slurry mixture and product is generally held in bulk below deck in pens. There is limited financial investment in technology and the report noted that the inshore sector could benefit from enhanced technologies such as mapping technologies, automated jigging and long line technologies and more improved bleeding and chilling methods/systems.

In contrast the Pisces Consulting Limited report (2015) noted the offshore sector utilizes trawling technology, most have dedicated processing dedicated bleed systems and ice slurry systems and make regular investments in technology to improve trawling performance and on-board handling practices.

Table 6 was extracted from a presentation given by Noseworthy during the Cod-Building the Fishery of the Future workshop (November, 2017). A comparison was made of various aspects of the coastal inshore fishery for NL, Iceland and Norway. Based on the information provided on the gear types, the holding and unloading methods, the NL sector is utilizing a lower level of technology compared

to the other regions. As ~95% of cod landings in NL come from the coastal/inshore fleet, the level of technology and the subsequent impact on quality is important for NL's competitiveness in the market.

Table 6: Comparison of Harvesting Methods for NL, Iceland and Norway Coastal Fleets

INSHORE –COASTAL (<40 feet or 12.2 m)						
Variable	NL	Iceland				Norway
Vessel Size	<40 feet (12.2 m)	Coastal Fish License, mostly <10m	Longline Maximum 15m			25’-35’(7.6m-10.7m)
Season	June to November	May-August	Year round, Small ITQ			Primarily winter
Catch Method	Gill net, handline, hook and line	Hanline/jigging	Longline, Handline, (automated and non-automated)			Auto jig
Holding Method	Pens (ice); Tubs (ice and water)	Tubs (Ice and seawater	Tubs (Ice and seawater), some slurry			Tubs (ice and water)
Unloading Method	Bucket	Tubs	Tubs			Tubs
Fishing Duration	1 day	14 hours max	1 day			1 day
Pounds/trip	Varies	773 Kg Max	5-10 Mt			n/a
INSHORE (<90 feet or 27.4m)						
Variable	NL	Iceland				Norway
Vessel Size	<40 feet (12.2 m)-<90 feet	Gillnet: 25-45 metre	Longline: up to 50 metre	Danish Seine; 25-30 metre	Trawler Up to 29 metres	
Season	May-October	February-April Large ITQ	Year round Large ITQ	Year round Large ITQ	Year round Large ITQ	Primarily winter

Catch Method	Gill net, longline, handline	Gill net	Long line (automated)	Danish seine	Trawl	Gill net, longline (automated)
Holding Method	Pens (ice); Tubs (ice and water)	Tubs (ice and seawater)	Tubs (slurry, ice, ice and seawater)	Tubs (slurry, ice, ice and seawater)	Tubs (slurry ice, ice and seawater)	Tubs (ice and water), RSW
Unloading Method	Buckets and pans	Tubs	Tubs	Tubs	Tubs	Tubs, Pump
Fishing Duration	2-4 days	1 day	Up to 6 days	1 day	3-4 days	1 day
Pounds/trip	Varies	10-30 Mt	~80 Mt	Up to 25 Mt		n/a

Fishing Gear

In the history of the cod fishery in NL, there has been a significant shift in the numbers and types of fishing gear used to commercially harvest cod. Gear such as traps and trawls were more prevalent pre-moratorium but showed steady decline during the 1990's and 2000's (Figure 22). Generally speaking, the gear technology side of the NL cod fishery is not considered as technologically advanced as Iceland or Norway due to the fact that the <45 foot (<13.7m) fleet captures ~95% of the landed product (Figure 13) and this vessel category is heavily reliant on gill nets and makes the least investment in terms of new technology. For the past 20+ years, when looking at gear types for all vessel lengths combined (Table 7), 54% of vessels use gill nets followed by baited hand line (26%), longline (19%) and bottom otter trawls, traps and pots (<1% each respectively). In terms of percent of catch ~72% of the total landed volume between 1998-2016 was captured by gill nets, followed by longline (20%), handline (8%). Bottom trawls, although highly efficient and used prominently in Iceland and Norway, have been used primarily by larger and/or offshore vessels and is restricted to area 3Ps.

Table7: Cumulative number of vessels using each gear type (% of total number) and the total landed volume of catch (% of total catch) based on gear type for the period 1998-2016.

Gear Type	# of Vessels (cumulative total)	% of Vessels using Gear	Volume of Catch (cumulative total)	% of Catch
Bottom Otter Trawl	587	0.1 %	2576	1.9%
Gill nets	25796	54.3%	95775	71.7%

(Set of fixed)				
Hand Line (Baited)	12465	26.2%	10609	7.9%
Longline	9129	19.2%	26952	20.2%
Trap	99	0.2%	232	0.2%

As all gear types decreased over time, the decrease is attributed somewhat to the consolidation or reduction in the number of fishing vessels over time as well as issues pertaining to fishing regulations. Based on the data provided by DFO Statistics-NL Region (2016), cod traps ceased being used by 2004 (See Figure 14). Although not documented in the graph, cod pots have been used commercially on a limited scale since 2009 in specific regions of the province (e.g. Area 3K). Data limitations set by DFO privacy regulations prevents the release of data if there are less than 5 representatives in the data set. As cod-potting has been primarily restricted to one or few geographic regions, with a small number of harvesters, this data is not represented in graph.

Specific to the stewardship fishery (area 2J3KL) which is dominated by vessels <45 feet (13.7m), Corbett (2017) presented data at the Cod-Building the Fishery of the Future workshop on the percentage of landings by gear type for the period 2014-2017. When averaging the three years, gill nets were used on more than >80% of the landings compared to hand lines (<20%), longlines (<5%) or cod pots (~1%). As this fishery is a stewardship fishery operating from a weekly allocation of cod quota, (a quota which is not expected to increase significantly over the next couple of years) the limited catch rate and first gate price may restrict a harvester's ability to invest in expensive new technology (e.g. automated jiggers or hook and line systems).

Over the past couple of years, there has been renewed interest by harvesters to transition away from gill nets due in part to potential impact gear type has on the quality of the fish and the first gate price paid to harvesters for their product. In 2016 and 2017, the provincial Department of Fisheries and Land Resources invested >€450,000 in alternate gear technology (e.g. cod pots, automated jiggers, long line systems) through its *Seafood Innovation and Transition Program (SITP)*. As a testament that harvesters are interested in transitioning away from gill net usage, the 2017 SITP received applications for financial support for approximately €3 million for alternative gear technologies.



Figure 14: Number of Vessels Using Each Gear Type for period 1998-2016.

Consolidation

Current fisheries regulations limit the amount of consolidation within in the industry through restrictions on enterprise/license combining (e.g. caps at 2:1 or 3:1 licenses) and policies such as the Fleet Separation Policy/PIICAF which determines who and how much quota (Fisheries Licensing Policy Newfoundland and Labrador Region, 2017) can be acquired by harvesters or processors. Currently, only enterprises held by Independent Core fish harvesters may acquire additional quota and fishing entitlements via enterprise combining- processing companies are prohibited from acquiring new quota shares. As stated in the Fisheries policy for NL, a fish harvester is not eligible to receive a re-issued license if he/she has entered into a controlling agreement, as defined under PIIFCAF. Each time an application is made to re-issue a license, the applicant is required to complete a Declaration Concerning Controlling Agreement before the license is re-issued.

Overall, since the 1992 moratorium there has been significant reduction in the numbers of registered fishing vessels, registered harvesters and issued groundfish licenses in NL. Figure 15 outlines these changes for the period 1998-2015. The greatest decline in the numbers of fisherman occurred between the years 1985 and 2002 (~80%). Since 2002 there has been an additional 25% decrease in the numbers of registered harvesters. In 1985, there were 7316 groundfish licenses issued for NL and in 2015 there were 3742 groundfish licenses issued indicating a consolidation or reduction of 53% of the licenses.

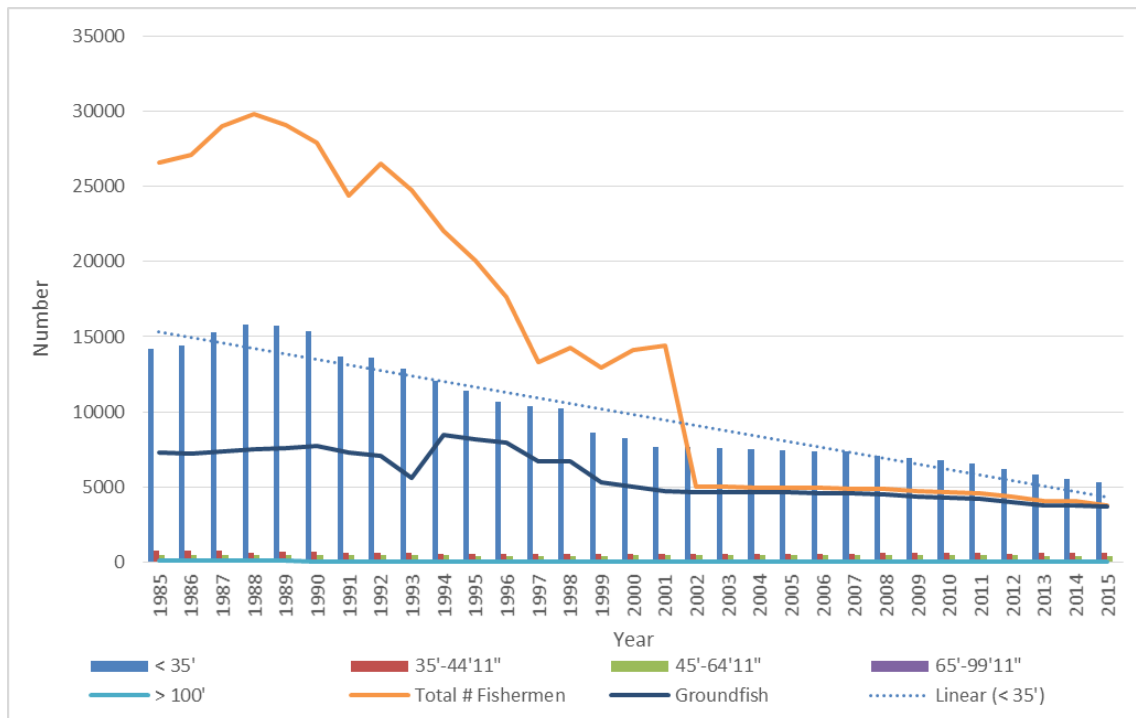


Figure 15: Change in the numbers of registered fishing vessels by length class, the number of registered harvesters and the number of groundfish licenses over time.

With consolidation, one would expect to see an increased catch rate (or quota) per vessel or increased landed value (€) per vessel over time for competitive enterprises. However when looking at the percent change in landed volume over time for the various vessel categories (Table 8), all vessel demonstrated a decrease in catch per vessel over the 18 year period.

Table 8: Percent change in the landed volume of cod for each vessel category.

Vessel Length	Landed Volume (Mt) 1998	Landed Volume (Mt) 2016	% Change
1-34 Feet (<10.7m)	13,892	10,174	-26%
35-44 Feet (<13.7m)	3,351	2,404	-28%
45-54 Feet (<16.7m)	669	517	-22%
55-64 Feet (<19.8m)	1,324	147	-88%
Total	19,239	13,243	-31%

For the NL fishery it is apparent that outcomes of consolidation within the industry is complex. Factors such as quota cuts, moratoriums, and a stewardship fishery with a weekly catch allocation that varies throughout the season have an impact consolidation and the competitiveness of the industry at large.

Financial Performance and Productivity

The financial performance of the fishery has been variable over time however a comparison of the profitability of the various fleet classes (based on net profit as a percent of revenue after the inputted costs of capital) is not able to be calculated for the NL fleet in the same manner as Norway and Iceland as the required data is not available.

A major factor, particularly for area 2J3KL the Stewardship Fishery, is that catch rates are based on a weekly allocation of catch (regardless of vessel size) and not on individual quota so determining the productivity of a vessel is complex because it is not a direct function of effort.

Table 9: Value per vessel, volume per vessel and price per kilogram of landed product for the various vessel categories from 2000-2016 (Data from DFO Statistics, NL Region, 2017).

Landed Value (Euros) Per Vessel Based on Vessel Length									
Vessel length	2000	2002	2004	2006	2008	2010	2012	2014	2016
1 –34 Feet	3,047	2,466	2,643	1,984	2,491	1,399	1,535	1,898	2,768
35–44 Feet	11,797	8,904	6,672	6,537	7,577	4,210	4,793	4,476	4,035
45–54 Feet	10,228	9,668	10,922	8,186	9,906	10,207	11,806	11,465	15,666
55–64 Feet	37,055	23,891	16,606	40,761	68,466	0	0	2,079	3,910
Landed Volume (Kg) Per Vessel Based on Vessel Length									
Vessel length	2000	2002	2004	2006	2008	2010	2012	2014	2016
1 –34 Feet	18,281,479	13,999,116	8,689,748	11,338,749	11,634,863	7,243,060	5,519,487	6,209,111	10,174,364
35–44 Feet	5,204,682	3,151,595	2,342,235	3,119,272	3,192,659	1,902,310	1,382,180	1,679,356	2,404,166
45–54 Feet	557,517	397,573	214,519	264,121	224,456	239,606	230,247	389,333	517,406
55–64 Feet	1,071,461	490,461	254,487	357,545	402,342	0	0	78,220	147,084
Price (Euros) Per Kg									
Vessel length	2000	2002	2004	2006	2008	2010	2012	2014	2016
1-34 Feet	1.43	1.28	1.22	1.15	1.61	0.99	1.12	1.20	1.17
35-44 Feet	1.43	1.29	1.24	1.18	1.65	0.99	1.12	1.21	1.16
45-54 Feet	1.43	1.29	1.23	1.20	1.66	0.99	1.12	1.21	1.16
55-64 Feet	1.42	1.29	1.26	1.14	1.60	0	0	1.21	1.17
All Vessel Lengths Combined- Average Price (Euros) Per Kg of Landed Fish Over Time									
Price/ Kg	1.04	0.87	0.77	0.82	1.04	0.73	0.87	0.82	0.80
All Vessel Lengths Combined- Landed Volume (Kg) per Vessel Over Time for all Vessel Lengths Combined									
Kg/Vessel	3,695.00	3,328.00	4,145.00	2,988.00	2,917.00	2,296.00	2,094.00	2,750.00	3,840.00

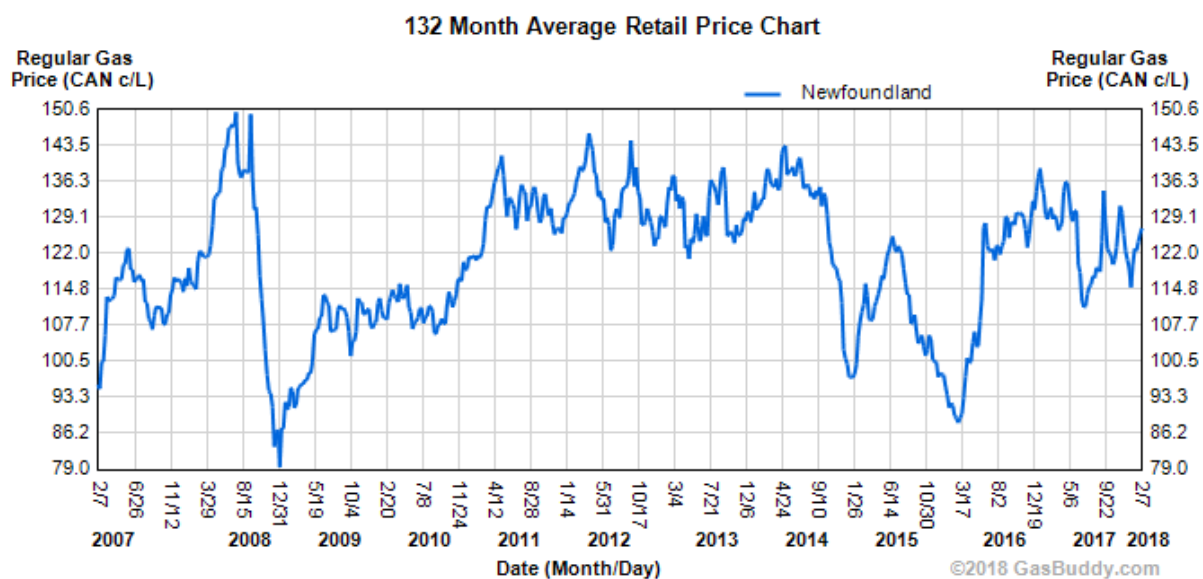


Figure 16: Cost of fuel in NL for the period 2007-2017. (Source: http://www.newfoundlandgasprices.com/Retail_Price_Chart.aspx)

Table 10: Average cost of fuel (cost/litre) for St. John's, NL for the period 1999-2009. (Source: Statistics Canada, <http://statcan.gc.ca/pub/11-402-x/2010000/chap/ener/tbl/tbl03-eng.htm>)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
\$CDN	0.66	0.83	0.79	0.77	0.83	0.92	1.021	1.076	1.110	1.236	1.023
€Euro	0.41	0.61	0.60	0.52	0.52	0.57	0.67	0.75	0.75	0.79	0.64

Across all fleet sectors, the landed value (€) and volumes (Kg) of cod per vessel decreased over time and so did the price paid (€) per kilogram of landed fish (Table 9). When looking at the combined data for all vessel lengths, the price (€) per kilogram of fish dropped from €1.04 in 2000 to €0.80 in 2016 whereas the landed volume per vessel increased over the same period. One can assume that the cost of operations increased over the 16 year period and that the decrease in revenues (when simply based on price paid/kg) has a potential negative impact on the financial performance of these enterprises. By way of example, Figure 16 and Table 10 present is the average price of gas in NL over the past 10 years (Figure 24) and the price of gas in St. John's from 1999-2009 (Table 10). Figure 24, shows the cost of case increased from approximately €0.65/litre (\$0.95CDN/litre) in 2007 to €0.0.86/litre (\$1.25CDN/litre) in 2017. Similarly Table 10 shows that the price of gas increased from €0.41/litre in 1999 to €0.64/litre in 2009. The price of gas is consistently lower in St. John's compared to rural parts of NL. As fuel is a major cost for all vessels, it is good indicator for assessing increased costs of operations and the resulting impact on profitability.

Fishing Fees

Unlike countries such as Iceland, the NL fishing industry does not pay a fishing fee or resource rent based on allocated quote or landed value. Harvesters do pay an annual fees as part of their annual license renewal process but this is not akin to resource rent as in other countries.

Main Influencing Factor for Value Chain Dynamic

Fisheries management system:

- Current weekly allocations may be impacting the economics/profitability of the fleet
 - larger vessels in the fleet may decide not to fish as return on investment is not adequate
 - smaller percentage of smaller vessels with low catch are implementing small scale 'vertically integrated' strategies for profitability
- Technology
 - Industry could benefit from newer/advanced technology available in harvesting (gear) technology, on-board holding technology and off-loading technology
 - low revenues are impacting harvesters ability to invest in technology
 - level of technology on board vessels could be impacting the quality and first gate price
 - Technology is very manually driven
 - Technology is not as advanced as other regions
- Profitability is down despite increase landings and consolidation within the industry Price Settling Mechanism- First Gate Price

Price Settling Mechanism- First Gate Price

The vast majority of the cod fishery is persecuted by the inshore or coastal fleet sector (<65feet or 19.8m). Harvesters are paid based on a negotiated price or contract between the FFAW (the union representing the harvesters) and the processors. Presently, there is no auction system for selling landed product and fisheries policy regulations prohibit vertical integration in the coastal fleet (>65 feet or 19.8m). Formal vertical integration occurs on a very limited scale in vessels >30.5 m and over (i.e. the offshore fleet sector) and in a quasi-form among fisheries cooperatives and local harvesters who sell product directly to consumers and local restaurants.

Market Price vs. Direct Sales

Each year before the start of the respective fishing season, representatives of the FFAW and the processing companies convene as a price settling panel to negotiate the first gate prices paid to harvesters. The grade or quality of the product constitutes the price received with cod graded as either Grade A, B, C, or reject (details on the grading are outlined in Appendix A). The negotiated price is considered the minimum price and it is often augmented by the processing companies.

Reported factors such as wharf competition and securing access to a harvester's more valued species (e.g. shrimp and crab) have, in some incidences, resulted in a disconnect between the price paid and the quality of the fish (Gardner Pinfold Consultants Inc., 2017). When factors extrinsic to the quality of the landed product form the basis of payment, the result can be a disincentive for harvesters to incur higher costs associated with producing top quality.

The negotiated minimum first gate prices for 2010-2017 are outlined in Table 11 and are publically posted on the FFAW's website under fish prices for cod (<http://ffaw.nf.ca/en/cod#.WkZEgE2WyUk>). As the table indicates, for the past seven years payment for product has been based on a number of variables such as region, fish length, reported quality grade, gear technology and/or a combination of these factors. Anecdotal reports from some harvesters state that the process is perceived by many as

complex and contentious with many disagreements over price occurring between harvesters and processors over what is perceived as a lack of transparency in valuing the quality of the product.

In recent years, the price settling panel has shifted focus away from gear type and fish size to a three tiered grade system based on the quality of the product. Factors such as proper handling, holding, traceability and timeliness (time to plant as well as time to grade/process) impact the grade/first gate price; and as such the policies governing these procedure are clearly outlined in the negotiated Standing Fish Price set by the panel and posted on the FFAW website (www.ffwa.nf.ca). These quality focused criteria are directed to both harvesters and processors; with failure to meet or adhere to the terms negatively impacting the financial payment for the product so there is accountability for both the harvester and processor in terms of ensuring quality through the first part of the value chain process.

Vertical Integration

The current Canadian fishing policies dictate the specific rules or requirements governing how a fishing enterprise is owned and operated. Known locally as the ‘owner-operator’ policy, the policy places a requirement of residency in the region in which a quota allocation is held and states that the owner of a fishing enterprise must personally fish his or her own allocation of fish. The premise behind the owner operator policy was to maintain ‘fleet separation’ between the harvesting and processing sectors and to prevent the vertical integration or corporate control of fishing licenses or resource rent. The policy also helps ensure that the licensed fish harvesters are the primary beneficiaries of the adjacent fish resources. It is important to note, that the “fleet separation” or “owner-operator” policies have defined Newfoundland and Labrador’s coastal fleet (<65 or 19.8 m) since its implementation in 1979 (Gardner Pinfold Consultants Inc., 2017). In contrast, vessels operating in the offshore, that are in excess of 30.5m (i.e. the offshore fleet), are exempt from the policy (Gardner Pinfold Consultants Inc., 2017) and can operate as vertically integrated companies. These companies however are limited in number (i.e. predominantly two main companies) and have limited opportunity for expansion based on quota due in part to a recent (2016) announcement from the Federal Minister of Fisheries and Oceans, Hon. Dominic LeBlanc, who confirmed that as the Northern Cod Fishery returns to harvestable levels, the first 115,000 metric tonnes would be allocated to the inshore fleet.

As noted in the section Industry Structure and Employment, there are examples of small scale vertical integration through community cooperatives and local inshore harvesters selling product directly to consumer and local restaurants. . Based on discussions with local harvesters engaged in directly sales, they report receiving approximately €8.35/kg for fillets (fresh or frozen) when they process and sell their catch directly with additional profits derived from the sale of cheeks, tongues, and heads. When selling directly to processors the current rate was €1.21/kg for fresh HOG fish and no secondary markets for cheeks, tongues, and heads. Harvesters have argued that based on the small weekly catch allocations, the economics (return on investment) are greater when they self-process and sell their product directly.

Table 11: First Gate Price (Euros (€)/Kg) for Atlantic Cod in Newfoundland and Labrador for Period 2010-2017.

YEAR	Grade or Differential	Region	Price €/Kg Start of Season	Price €/Kg Middle of Season	Price €/Kg End of Season	Average Price (€)
2017	Grade A (all gear types)	3Ps, 2J3KL, 4R, 3Pn	1.14	N/A	1.26	1.20
	Grade B (all gear types)		0.58	N/A	0.40	0.49
	Grade C (all gear types)		0.30	N/A	0.20	0.25
2016	Grade A (all gear types)	3Ps, 2J3KL, 4R, 3Pn	1.05	N/A	0.78	0.91
	Grade B (all gear types)		0.57	N/A	0.40	0.48
	Grade C (all gear types)		0.30	N/A	0.20	0.25
2015	Grade A (all gear types)	3Ps, 2J3KL, 4R, 3Pn	1.06	N/A	0.75	0.91
	Grade B (all gear types)		0.59	N/A	0.40	0.50
	Grade C (all gear types)		0.31	N/A	0.20	0.26
2014	Grade A (all gear types)	3Ps, 2J3KL, 4R, 3Pn	1.20	N/A	0.80	1.00
	Grade B (all gear types)		0.60	N/A	0.40	0.50
	Grade C (all gear types)		0.30	N/A	0.20	0.25
2013	18"+ All Gear Types; Min. 80% Grade A or reject	3Ps, 2J3KL, 4R, 3Pn	0.80	N/A	0.50	0.65
2012	18"+ All Gear Types; Min. 80% Grade A or reject	3Ps, 2J3KL, 4R, 3Pn	1.03	N/A	0.60	0.82
	18"+ All Gear Types; Min 80% Grade A or rejection	3Ps (July- Sept)	1.03	N/A	0.40	0.72
2011	18"+ All Gear Types; Min 80% Grade A or rejection	3Ps, 2J3KL, 4R	0.97	N/A	0.60	0.78
2010	20"+ Hook and Line	3Ps*	0.88	0.64	0.61	0.71
	20"+ Gillnet and Otter	3Ps*	0.80	0.51	0.56	0.68
	Under 20" Hook and Line	3Ps*	0.64	N/A	0.46	0.55
	Under 20" Gillnet and Otter	3Ps*	0.48	N/A	0.36	0.42
	20"+ Hook and Line	4R, 3Pn, 2J3KL	0.88	N/A	0.61	0.75
	20"+ Gillnet and Otter	4R, 3Pn, 2J3KL	0.80	N/A	0.56	0.68
	Under 20" Hook and Line	4R, 3Pn, 2J3KL	0.64	N/A	0.46	0.55
	Under 20" Gillnet and Otter	4R, 3Pn, 2J3KL	0.48	N/A	0.36	0.42

Auction Market

Unlike countries such as Iceland where the auction market reportedly fostered structural change to the fishing industry by enhancing the direct price paid to fisherman for its product, there is no system for selling seafood in Newfoundland and Labrador. In 2003, the Department of Fisheries and

Aquaculture sponsored the development of an online shrimp auction to catalogue shrimp sales prior to landing. The auction enabled vessels to be redirected to specific plants in order to reduce logistics and handling costs (Pisces Consulting Limited, 2015). A cod auction pilot program was also sponsored for 3Ps cod however in both cases there was little uptake of the program due to the limited number of buyers and participant so the systems were discontinued.

Price According to Fishing Gear

The issue of variance in first gate price paid to harvesters based on the gear type is a highly contentious issue in the NL fishery due largely to the fact that gill nets are the dominant gear type (>72%) in the inshore/coastal fishery. Table 12 (Figure 25) highlights the prices paid (€) per kilogram of fish based on gear type for the years 2000-2016 based on data obtained from DFO Statistics- NL Region (2017).

Table 12: Price (€) paid per Kilogram of cod based on gear type for the period 2000-2016 (Data: DFO Statistics, NL Region)

Gear Type	Year								
	2000	2002	2004	2006	2008	2010	2012	2014	2016
Bottom trawl(stern)	€1.03	€0.88	€0.78	€0.80	€1.02	€-	€-	€-	€-
Gill Net (Set or Fixed)	€1.04	€0.87	€0.76	€0.78	€1.02	€0.72	€0.87	€0.82	€0.80
Hand Line (Baited)	€1.04	€0.86	€0.74	€0.78	€1.04	€0.72	€0.87	€0.81	€0.81
Longline	€1.04	€0.87	€0.75	€0.82	€1.04	€0.72	€0.92	€0.81	€0.81
Trap	€0.69	€0.78	€-	€ -	€ -	€-	€-	€-	€-

Based on Table 12 and Figure 17 there does not appear to be a significant linkage to price paid to harvesters based on harvesting technology. For all gear types, the years 2000 and 2008 had the highest price/kg for all gear types.

In 2005, a project “*Cod Quality Assessment Project 2005*,” conducted by the Department of Fisheries and Aquaculture, tested the effects of gear type, soak time and processing delays on the fillet quality of Atlantic cod. The study examined the at-sea quality of the fish and the post-processing fillet quality as determined by the Department’s fish graders. Result from the report found that experimental cod pots and longlines provided better quality fish than gillnets, a soak time of <12 hours was recommended for all gear types and delayed processing was the greatest contributor to reduced fillet quality (land and process within 12 hours was recommended). Quality of fish from the cod pots were better than the longlines and zero mortality was experienced at capture thereby allowing fishers and processors to start out with the best possible quality raw material before processing. There was no noted difference in quality between cod pots and long lines. The study determined that any quality gains made by using better harvesting technology could be undermined by unnecessarily long soak times or delayed processing.

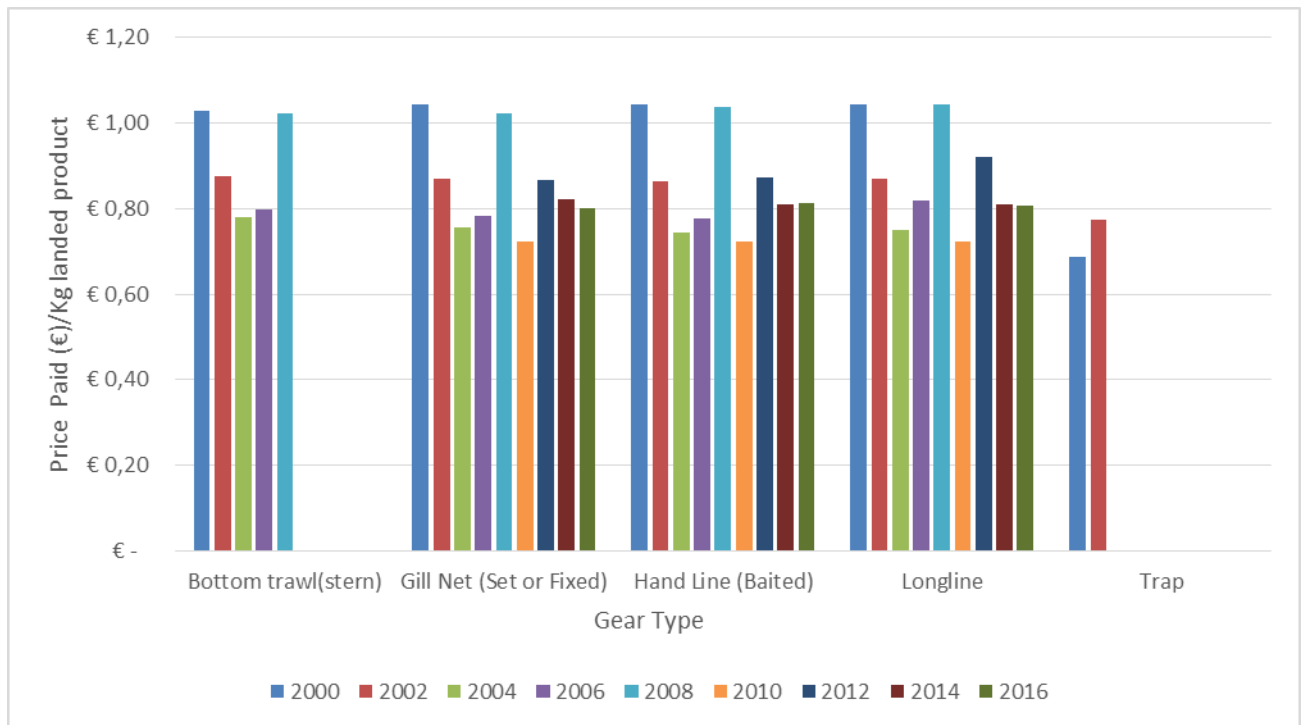


Figure 17: Price (€) paid per Kilogram of cod based on gear type for the period 2000-2016.

A 2016 study conducted by the Meintzer et al. "Identifying the Best pot to build a sustainable pot-based fishery targeting Atlantic cod" evaluated various cod pot technology to determine their effectiveness at catching cod. As part of the study, the research team evaluated anonymously graded receipts provided by the fisheries cooperative which linked the quality grade A, B, C (and subsequent price received) to the gear technology. Result indicated that quality was greatest with cod pots (93.83% Grade A quality), followed by hooks ((90.58% Grade A Quality) whereas only 58.47% of gill net cod had Grade A quality.

Main Influencing Factor for Value Chain Dynamic

Price Formation:

- Current system of price negotiation has not necessarily resulted in higher value paid to harvesters based on decreased price/kg observed over time
- A small percentage of harvesters are choosing to process/sell directly instead of selling to processing facilities because they report a better return on investment when dealing with small weekly catches
- Anecdotal reports indicate that extrinsic factors such as (e.g. securing access to shrimp and cod quota) may impact prices paid to harvesters despite quality of product
- There is no observable price incentive for using fishing gear that yields higher quality product
- Recent study is looking at the impact of gear, quality and the resulting price paid to harvesters-result indicate quality training initiatives can help improve quality and price Processing (all marine fish processing plants)

Processing (All Marine Fish Processing Plants)

Fish Processing Companies

The vast majority of fish processing plants in NL are multi-species plants with have dedicated processing lines per species. The majority of the processing capacity is in primary processing with secondary processing accounting for a very small percentage (~2%) of the overall processing (Manuel and Hayter, 2016).

Consolidation within the NL Fishery affected not only the number of registered vessels, harvesters and groundfish licenses, it also had an effect on the processing sector as well. Simply looking at the number of licensed or registered processing facilities over time, once can see that with the exception of aquaculture processing facilities there has been a reduction in the total number of processing facilities in NL from 2001 to 2015 (Figure 18). Primary processing facilities decreased by 40%, and secondary processing decreased by 71% during this period.

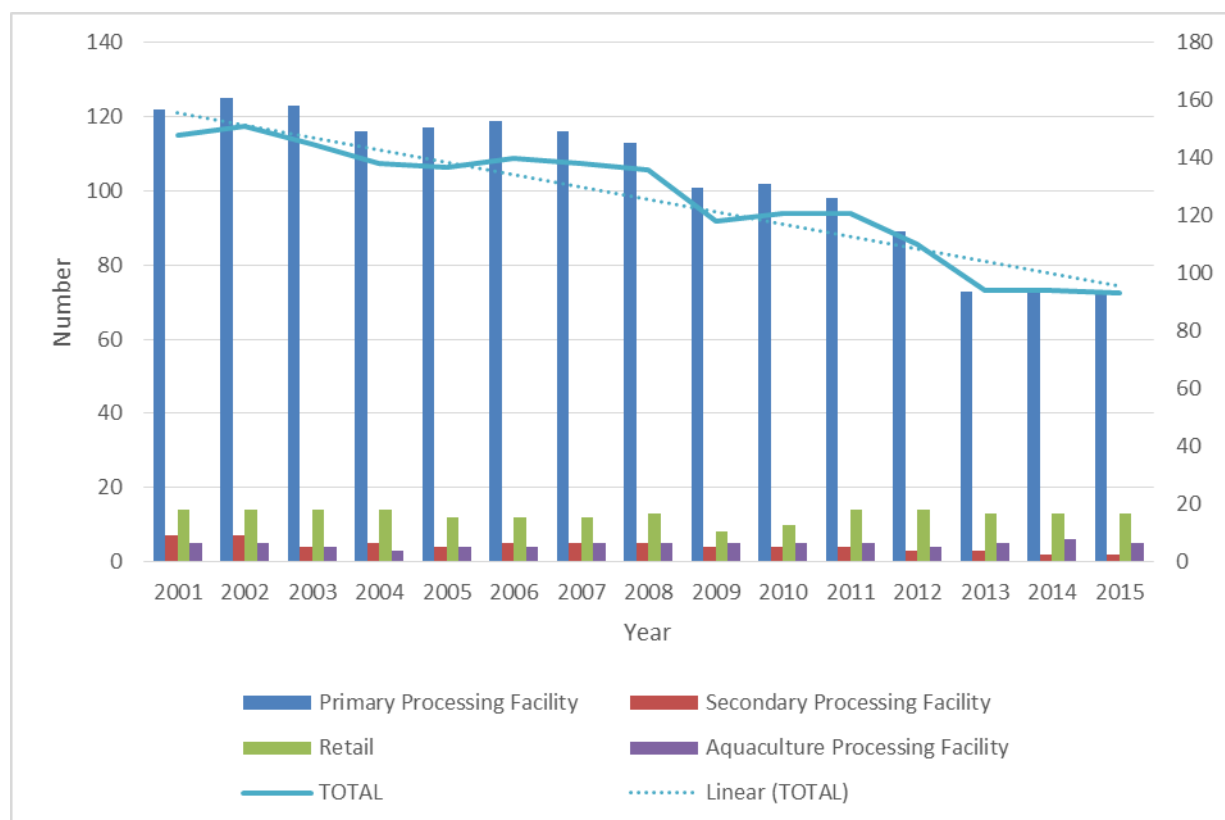


Figure 18: Number of primary, secondary, retail and aquaculture processing facilities in NL (Data source: Government of Newfoundland and Labrador, Department of Fisheries and Land Resources, Fishery Highlights, Source: <http://www.fishaq.gov.nl.ca/stats/industry/index.html>)

Figure 18 shows that for the years 2006 to 2015, there was a 32% decrease in the number of licensed groundfish plants.

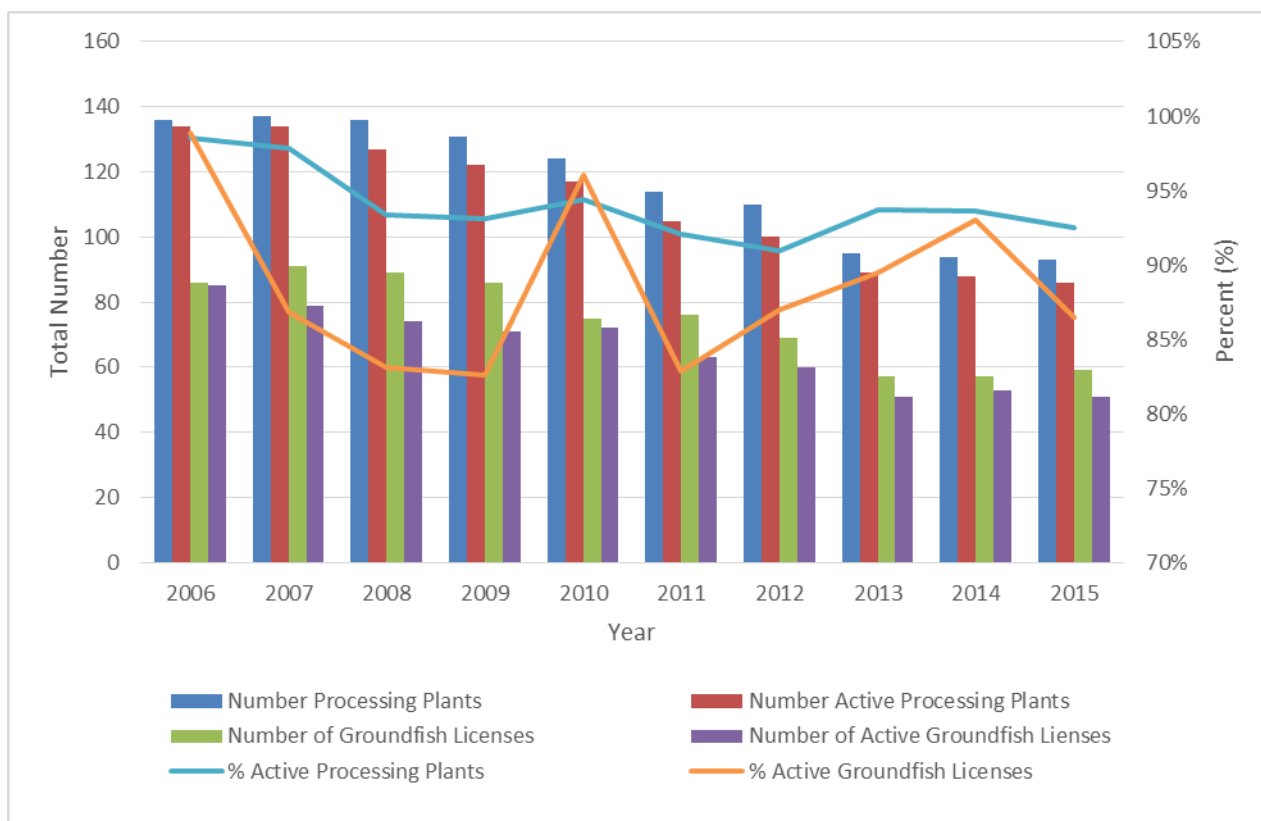


Figure 19: The number of Licensed Processing Plants (total and active) and the number of groundfish processing licenses (total and active) for NL for the period 2006-2015 (Data source: Department of Fisheries and Land Resources, 2017).

In terms of the number of registered plants actively processing, as noted in Figure 19 there is very little variation between the number of registered plants and those actively engaged in processing for the period of 2006-2015 (91-99% of registered plants were actively processing). Specific to licensed groundfish plants (for same time period) 83-99% of plants with groundfish processing licences actively processed groundfish. The year 2006 had the highest number of active plants and active groundfish processing (99% for both).

In 2015, there was 51 active groundfish processing licences and approximately 34,646 Mt of groundfish which included 11,053 Mt tonnes of cod landed in NL (DFLR data, Table 1). Based on these landings and the number of active groundfish processing plants, theoretically the average landed volume per groundfish plant would equate to 679 Mt of groundfish (or 217 Mt of cod) per plant per year. In reality certain plants processed higher or lower volumes of groundfish and cod as not all plants received an equal share of the landed product. Regardless of the share, it is evident that the overall production volume going through a plant is low which makes it challenging to provide year round employment or make significant investment in costly processing technology.

The Pisces Consulting Limited Report (2015) noted that with the exception of a couple of plants, most of the groundfish plants, rely on manual processing methods with limited and out-dated automated technologies. The report also noted that due to the diversity of species, sizes, product forms and number of producers, adoption of technologies to be internationally competitive is challenging.

A follow-up presentation on the report by Noseworthy (2017) noted that factors such as aging demographics, outdated technology, the need to automate and the need to recruit and train highly skilled technical staff will be issues that will challenge the processing sector of the future and will require significant innovation and investment. The presentation also identified processing technology gaps and the benefits to be realized from adopting the new technologies.

In 2003 the Dunne report “Fish Processing Technology” stated that “a renewed effort is clearly need to address the problems still plaguing the processing sector. May of the deficiencies are not necessarily any different now from what they were 10, 20 or even 50 years ago. The species mix has changed, harvesting and processing capabilities are more sophisticated, and gross value of output is at an all-time high. However the problems of the sector remain rooted in excess capacity with the associated results of seasonal operations, unsatisfactory levels of income, instability and volatility, and less than optimum total returns from seafood production.

Product Development and Product Mix

For hundreds of years, the history the NL cod fishery was based on salt fish production. In the late 1960’s the industry shifted towards the production of frozen block products and less so on salted product. By the late 1980’s, the industry- particularly vertically integrated companies such as Fisheries Product International and National Sea Products- continued to produce block (~54 %) but started to shift its production towards uncoated filets and eventually into frozen products primarily 2.5 kg cello-packs, and 4.5 kg IQF shatter packs. The shift was driven primarily to increase profitability by moving towards higher valued non-block products. The industry during the pre-moratorium period was in financial crisis and new product development was critical to financial survival. (Verge, Pers. Comm., 2018). It is interesting to note that this shift to alternate higher- valued product forms happened in advance of the moratorium- even though many people regard the need to adopt to more profitable product forms as a post-moratorium or even recent phenomena. Currently, as with pre-moratorium product changes, poor profitability and competitiveness are driving the conditions of the fishery/processors to look at higher valued product mixes. Equally importantly, the changing consumer/purchaser preferences will also impact product form.

As described in more detail in Section 3.7.2) NL cod was exported as 36 different product forms which for the purpose of this report were collated into the following 10 categories:

1. Fresh, head-on and gutted
2. Fresh fillets
3. Frozen head-on and gutted
4. Frozen, head-off and gutted
5. Frozen fillets (<4.5kg)
6. Frozen fillets in block (<4.5kg)
7. Frozen cod-portions
8. Frozen minced-block
9. Frozen by-product
10. Salted and/or Dried.

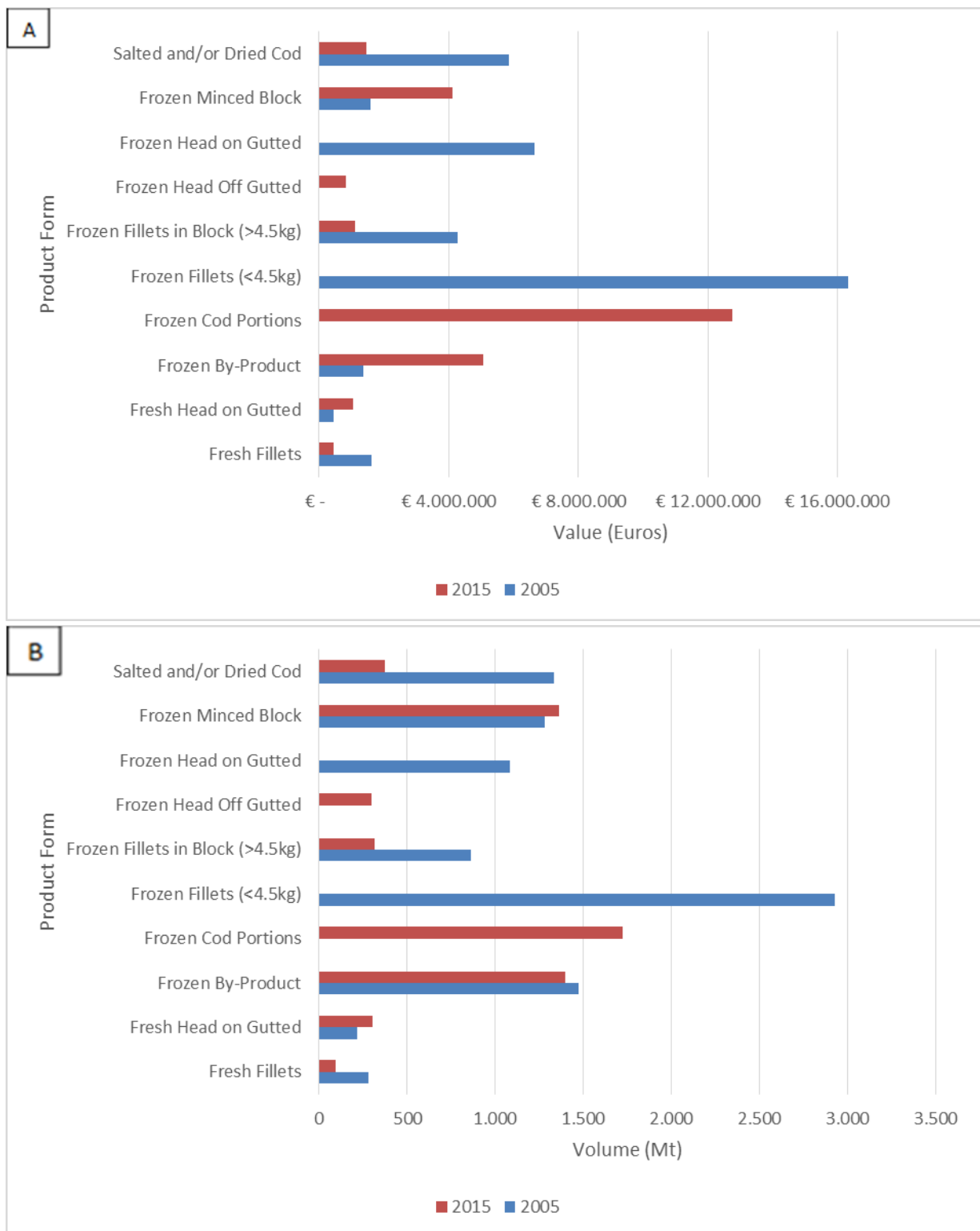


Figure 20a-b: Change in Product Forms of Exported NL Cod Products based on Value (A) and Volume (B) from 2005 to 2015.

In 2005, frozen fillets (<4.5kg) was the NL exported cod product form with the greatest value and volume of export. In 2015, frozen cod portions were the highest product form based on value and volume (Figures 20a-b).

Ideally, NL would like to position itself to sell into the higher fresh fillet markets. Pisces Consulting Limited report (2015) stated the average value of fresh fillets in the US and EU markets returns significantly higher prices than any other individual or combination of products. The report also noted that several transportation logistics will challenge NL's ability to supply a fresh fish market including factors such as limited or no dedicated airfreight services, seasonal weather impacting transportation, inconsistencies in ferry service operations including lack of priority for perishable foods, and distance from EU markets which impact the ability to ship by seas. According to Sackton (2018) 75% of total US cod sales is to the food service sector where frozen fillets is the dominant product form and the demand from this sector is continuing to grow. Sackton also noted that in terms of price consistency, the fresh fillet market shows greater volatility compared to the frozen markets particularly if there is an inconsistent supply. Based on seasonality of the NL cod fishery, the lack of consistency in catchable quota, and the current logistic challenges with transportation, NL may be better positioned in the short term to strategically pursue the US frozen fillet/portion market while it develops more stable logistics and supply systems.

Financial Performance and Productivity

Information regarding the profitability of the processing sector in NL is not able to be determined as the information is not publically available but rather only available at the discretion of the individual processing companies. One can assume that in general, the factors affecting stability of the production output, the stability of the workforce and enhanced methods of operation including automation will all have an impact on the overall productivity and financial performance of a processing facility.

As noted in this report (section 3.5.1 *Fish Processing Companies*) the averaged estimated volume of groundfish available to each licensed, active groundfish plant is relatively low compared to other Iceland and Norway (total of all groundfish species-679 Mt; cod- 279 Mt based on 2015 data).

Furthermore productivity is impacted by the level of automation and available modern processing technology both in fishing and processing of seafood. For countries such as Iceland and Norway, the level of automation has increased significantly with fourth generation flow lines and water jet cutting machine currently being used. Specific to Iceland, trimming of the fillets are now minimal and is limited to cutting out defects that are on the fillets and remove ring worm if found in the fillet. The pin bone is removed in the water cutter as well as belly flap and portioning of the fillets. This enables Iceland to pursue more advanced and complicated product mix as well as more accurate cut and sizes. In addition, robots are increasingly being used in packing and storing of the products. The increased level of automation in Icelandic processing facilities has resulted in the throughput per man hour increasing from 12kg/hour in traditional filleting production to approximately 80 to 100 kg/hour in the most advanced production flow lines today. The drawback to the increasing use of technology and automated systems in fish processing in Iceland is investments in these systems require significant capital investment.

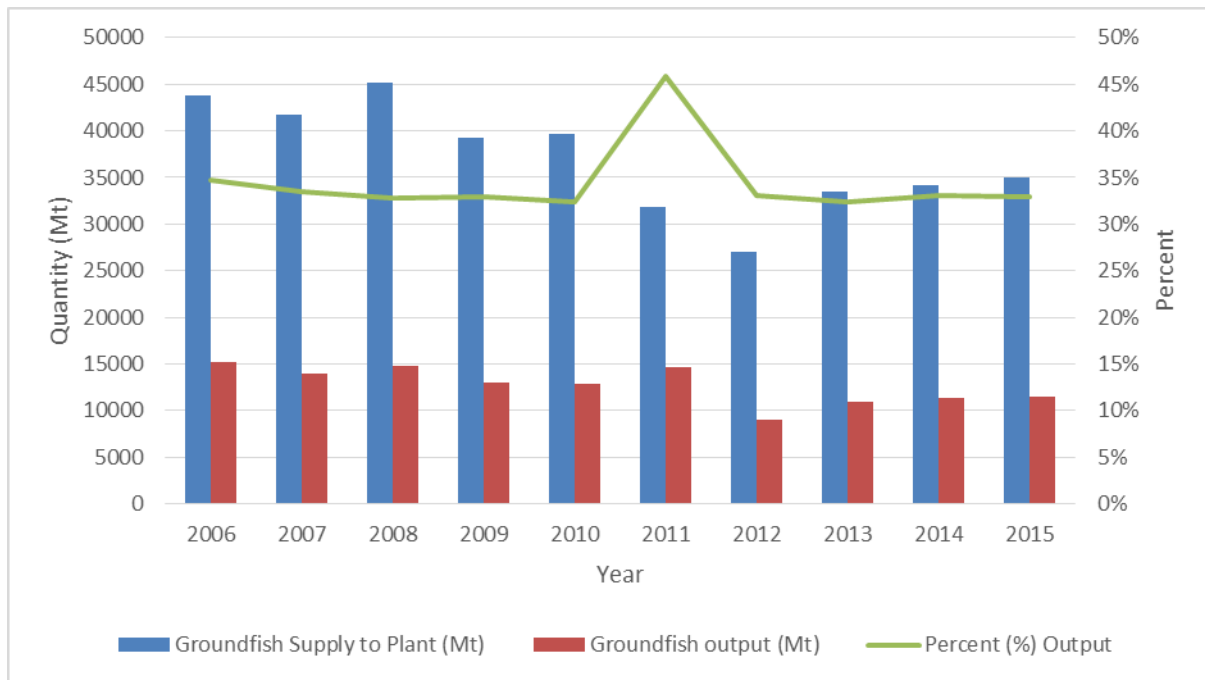


Figure 21: Supply of Groundfish (Mt) to Plants, Production Output (Mt) from the Plant and the Corresponding Percent Output or Yield from the Plants for the period 2006-2015 (Data Source, DFLR, 2016).

Figure 21- provides an overview of the supply of groundfish product (Mt) going into the groundfish plants as well as the production output (Mt) leaving the plant; the corresponding percent output or production yield is also provided. With the exception of 2011, the production output (yield) is relatively stable at ~33% for the 10 year period. This potentially suggests that there has been very little improvement in productivity or output for the 10 years period. Other extrinsic factors such as limits set on catch rates, regulations, etc. will impact the output- however, the stagnancy suggests that the sector as a whole has not advanced in terms of full product utilization (which would increase the production yield) or improved the output per plant or per employee which is indicative of a manually intensive system that is not improving or becoming more efficient over time.

There are multiple reports such as the Dunne (2003) report- *Fish Processing Policy Review*, the Pisces Consulting Limited (2015) report *NL Seafood Value Chain Infrastructure Benchmarking Assessment*, and the Gardner Pinfold Consultants Inc. (201) *Extracting Maximum Value from Canada's Fisheries and Aquaculture Resources*, which outline factors impacting financial performance and productivity of the NL fisheries.

Generally, technology or investment in technology is reportedly noted as a significant factor impacting the profitability of the Canadian seafood processing sector. A report investigating the technology and Investment gaps by Canadian seafood processors noted that processors only re-invest ~2.3% of revenues annually into technology enhancements (Verdon, 2016).

According to the report, the following factors are impacting investing in technology:

- Costs associated with the adoption of automation and robotics technologies appear to be an important barrier

- Seasonality of processing operations appears to be an issue for the adoption of automation and robotics
- Automation and robotics not developed for a specific situation might not adequately answer processors needs;
- Increasing competition with low-labour cost countries stresses the need of adopting automation and robotics in the Canadian processing sector
- Canada appear to face a gap of labour in the fish processing sector in general

Further when looking specifically at the challenges in transitioning to an automated operation, the CCFI report- *Process Automation in Seafood Processing Workshop* (2017) notes the following:

- *“Processing sector participants noted that they often operate in circumstances that do not allow them to justify investment in advanced technologies for any of the main species groups, because of shrinking abundance of some species, industry seasonality, uncertain access to fish harvested, raw materials that are often poor in quality, and inability to take advantage of economies of scale, due to fragmented industry structure.*
- *Most industry participants want to buy off the shelf automation solutions; they are reluctant to invest in risky projects to develop such solutions*
- *The shrinking supply of labour, combined with the inability to adopt advanced technologies, mean that industries within the Canadian fishery are doing less and less processing of fish harvests and are increasingly becoming suppliers of unprocessed or semi-processed raw materials for others to process elsewhere (which allows them to capture much of the value from Canadian resources)*
- *Upscale, higher value products are almost always branded. There is no mechanism to brand unprocessed or semi-processed products. Similarly, many of the seafood industry benefits expected from the pending CETA agreement will not be realized by an industry focused on supplying raw material.”*

The NL cod fishery transitions it will have to address these points if it is to remain globally competitive. Economies of scale, demographics, capital investment, seasonality and unpredictable resource will clearly play a significant role in determining which strategies the industry will adopt for its current and future fisheries.

It is important to note some cod processing facilities in NL already have, or are the process of making technological improvements or investments in modern processing technology. Where this has already occurred there has been anecdotal reports of increased production output or yield and additional efforts made to utilize waster material or by-product.

Main Influencing Factor for Value Chain Dynamic

- Opportunity for improvement in the synchronising of the value chain activities
 - Requires a high degree of cooperation and coordination of logistics between harvesting, processing and marketing sector
 - Currently limited vertical integration, limited coordination between harvesters and processing plants is impacting potential year round supply and subsequent marketing

- Processing facilities and harvesters need to coordinate landing to avoid gluts in plants amplified by seasonality
- Low-medium degree of automation
 - Most plants are using technology that is based on older or more traditional processing forms/products
 - Automation requires significant capital investment and not all plants are able to undertake significant investment based on landings
 - Uncertainty regarding market demands (i.e. product forms) makes it difficult to determine which automation equipment to invest in
 - Not all automated lines support flexibility to respond to changing consumer preferences/products
 - Automation will be a critical issue as the average age of processing worker is 50+ years
- Improvements needed in logistics/coordination within the system (from harvesting to processing to shipping and transportation)
- Need to explore options for transportation to markets
 - Potential cargo transport of fresh fish by planes
 - Shipping in chilled containers (fresh/frozen)
- Need to explore developments in:
 - Packaging (Polystyrene boxes)
 - Super chilling (below 0°C)

Value Creation and Utilisation

For NL, information pertaining to value creation and utilization is based on data for the collective groundfish species which includes, Atlantic cod. The data set was not able to differentiate Atlantic cod only however the overall trends are indicative of what is going on in the NL Atlantic cod fishery.

The average annual production of groundfish in NL for 2006-2015 was 37,110 tonnes which accounted for 51% of the supply to plant. The other 49% (18,180 tonnes) represent processing discards. Groundfish landings for 2006-2015 were comprised of 4 main species: Atlantic Cod (34%); Greenland turbot (30%); Flounders (19%); and Redfish (8%). Flounders include American plaice, Yellowtail, Greysole, and White flounder.

Flounders are mainly sold whole frozen to Asian markets without further processing.

- Ocean Choice International owns 91% of the Yellowtail flounder quota which they harvest year-round and process as frozen at-sea in various product forms including fresh/frozen fillets skin-on/skinless; shatterpack skinless/skin-on fillets; fillet block; whole round; H&G; and by-products, depending on markets (www.oceanchoice.com).

Greenland turbot (halibut) (*Reinhardtius hippoglossoides*) is mainly sold to markets in the US, Asia and Europe as frozen HOG, HGT (head, gut tail removed), fillets or steaks, and heads (www.allenfisheries.com; www.oceanchoice.com).

The main product forms of cod include fresh/frozen fillets and portions (UK), wet salted (Spain), and HOG (US).

- Head-on-gutted (HOG), or dressed, fish are iced and brought to shore for further processing.

- The dressed weight represents, on average 85% of the live weight.
- From the dressed weight, the utilization rate for the main cod products would be 100% for fresh HOG; ~45% to wet salted, 40% to fillet (Gardner Pinfold, 2017).
- Tongues and cheeks are removed and sold separately, heads and bones are ground into pet food or sold to mink farmers, heads are also frozen and sold back to harvesters for bait (Interviews), napes and v-bones are minced, skins are sold for leather products (Gardner Pinfold, 2017; Stakeholder interviews).

Groundfish processing discard rates have been unpredictable and inconsistent, ranging from 38% to 67% throughout the study period (2006-2015).

- The gut, gonads and livers are discarded at sea.
- Other processing by-products such as heads and frames, are diverted to low value uses such as pet food, mink feed, fishmeal and bait
- In 2016 DFLR reported that only 265 tonnes of processing discards from HOG cod processing had been diverted to alternate uses (unspecified).
- There is limited use of cod by-products due to the low volumes and inconsistent supply of raw materials available.

While the volume of groundfish processing discards are high (~ 22,000 tonnes in 2015), their availability is low and unpredictable. Discard rates have increased from 39% in 2006 to 63% in 2015. Utilization rates have decreased from 61% in 2006 to 37% in 2015. Based on the unpredictability, rationalisation steps for better utilisation of by-products and offal (e.g. trimmings from filleting process), heads, roes and liver have not occurred with ic

The value added production of this material, which otherwise had little or no value, has contributed significantly to the higher yield from input and higher average product margin in the recent years.

Main Influencing Factors for Utilization

- Fish are gutted at sea- livers, and roe are dumped overboard
 - Would require changes on board vessels to better handle and hold product
 - Implement a discard ban
- Low volumes or critical mass is an issue
 - Impacts plants ability to store, process and market product
 - Amplified by seasonality
- Entrepreneurial Culture
 - Innovation between industry, institutions and universities
 - Creation of an innovation Seafood Cluster as in Iceland
 - Funds availability

Marketing Sector

Structure of the Marketing Sector

For the offshore, vertically integrated sector, the individual companies assume the role of producing and marketing its own products. Similarly, for the majority of the NL catch which is captured by small independently owned and operated inshore/coastal vessels, the product goes to independent processing plants where the individual plant is responsible for marketing their product forms and securing domestic or international markets.

As noted by the Gardner Pinfold Consultants Inc. Report (2017) one of the challenges in the marketing of Canadian seafood (including NL cod) is that the sector is not selling in the highest value markets or at times of the year when prices are highest. The report also stresses that the current Canadian system, particularly the fisheries management system is not based on extracting maximum value from the resource and is not a market driven model which is impacting the global competitiveness of Canadian seafood products. This synopsis is reflective of the NL cod fishery.

The CCFI Report on Automation (2017), outlined a number of challenges facing the industry which can have a resulting impact on marketing product. Based on the current structure, Canadian and NL fisheries are at the risk of becoming suppliers of unprocessed or semi-processed raw materials for others regions to process. Consistent supply of a higher valued product is easier to brand than seasonally driven and unpredictable unprocessed or semi-processed product. The NL cod sector is highly fragmented and there is very little to no consolidated effort to market product. In addition, the fishery does not have a consistent year round supply (i.e. very seasonal) and the quota or allocation is largely unpredictable from one year to the next.

Systemic issues such as limited quota and a seasonal fishery can impact marketing. By default much of the marketing strategy is still based on business to business relationships established by the individual processing companies and less so on emerging consumer preferences. For certain products (e.g. fresh product), the seasonality has meant that cod is not being marketed when the prices are highest but more so when product is available. By comparison, Iceland limits supply of fresh cod when Norway takes over the market in February –April and then the market back in end of April and supply the market until Feb next year.

Investing in processing technology is a capital intense investment. Much of the automated processing and packaging technology is also purpose driven and not flexible to accommodate changing consumer preferences so being able to respond to evolving market trends can be problematic particularly for smaller processing/marketing companies.

Figure 23 outlines the total value (euros) of all NL seafood exports, the total value (euros) of NL cod exports and the percentage of cod export value to the overall seafood industry. In terms of overall value, since 2010 the cod fishery has comprised ~3% or less of the total value of exported NL seafood (with shellfish being the largest contributor).

The overall value small value of the NL cod fishery, with respect to the shellfish sector, has meant that there has been little to no emphasis placed on creating an image or brand for Newfoundland cod products and that markets are based more on traditional relationships or supply chains than reaching the end consumers.

There is limited niche marketing occurring in the cod sector. It is largely based on niche marketing and is driven largely by community-based cooperatives and retailers. As an example, Fogo Island Fish Inc. has carved out a niche market in Canadian white table restaurants by branding Fogo Island sustainably caught cod-fish. Some speculate that similar marketing strategies should be implemented for the NL cod fishery in general.



Figure 23: Total NL Seafood Export Value (Millions Euros), the total NL Cod Export Value (Millions Euros), and the Percent Value of the NL cod Exports to the Total Seafood Export Value.

Export

According to the Canadian export data for NL Cod (Data Source: CATSNET Agriculture and Agri-food Canada), cod was exported as 36 different product forms (Appendix A) to approximately 18 different countries. For the purpose of this report, the 36 forms were grouped into 11 commonly referred to product forms or categories:

- i. Fresh fillets
- ii. Fresh head-on and gutted (Fresh HOG)
- iii. Frozen head-on and gutted (Frozen HOG)
- iv. Frozen head-off and gutted
- v. Frozen fillets (<4.5 kg)
- vi. Frozen fillets in block (<4.5 kg)
- vii. Frozen fillets in block (>4.5 kg)
- viii. Frozen Cod Portions
- ix. Frozen mined block
- x. Frozen by-product
- xi. Salted and/or dried cod

For the period 2005-2015, based on combined value (Euros) and volume (Mt) of exports, the main export countries for NL cod were the United States, the United Kingdom, Portugal, France and Spain. Since 2011 the United States and the United Kingdom are the dominant markets.

The volume of exports (Mt) to Portugal and Spain showed significant decline after 2010 with markets disappearing in 2012-2013; markets did however show a modest return in 2015 in both countries but on a significantly reduced level compared to the prior decade (Figure 24b, Figure 25b). The same trend was noted for the export value to these countries with the overall value (Euros) of the exported products decreasing from 2005 to 2015.

Export volume (Mt) to the United States decreased from 2005 to 2015; whereas exports to the United Kingdom showed an increase in volume for the same period (Figure 25b). A comparison of the value of the product for this period indicated that the price per metric tonne was greater for products exported to the United States compared to the United Kingdom (Figure 26a) which showed either a decrease or very modest increase during the same time period. This was largely attributed to product form; in 2015 for example, the USA imported higher valued frozen cod portions compared to the UK's greatest valued import- frozen cod by-product. Product exported to France increased in value from 2005-2012 but since 2012 the export value has decreased (Figure 26a). Since 2012, there has been no or little export of NL cod to Spain or Portugal with exports showing a similar overall decrease in product value per metric tonne (Figure 26b). When looking strictly at product form, the three top products in terms of value per kilogram were frozen fillets (<4.5 Kg), frozen cod portions and fresh fillets (Figure 26b).

An analysis of the types of product form exported over time is presented in Figure 27. For 2005-2011, the highest value came from frozen fillets (<4.5 kg), frozen HOG fish and salted and dried cod. Since 2012, these product forms have significantly decreased and have been replaced by frozen cod portions, frozen by-products and frozen minced block.

The total export volume (Mt) in 2005 was 4,723 Mt, valued at €19,060,315. In 2015, the volume of exports had decreased to 2,931 Mt at a value of €13,410,776. When looking at the top five export countries (US, UK, France, Spain and Portugal) only, in 2005 ~45% of the value was from frozen fillets (<4.5kg) exported primarily to the US and Spain; 20% of the value was from fresh HOG exported to the UK and the US; and 16% of the value was from salted and/or dried cod exported primarily to Portugal. By 2015, 50% of the export value came from frozen cod portions exported primarily to the US market followed by the UK; 20% of the value was from frozen cod by-product going primarily to the UK and France markets.

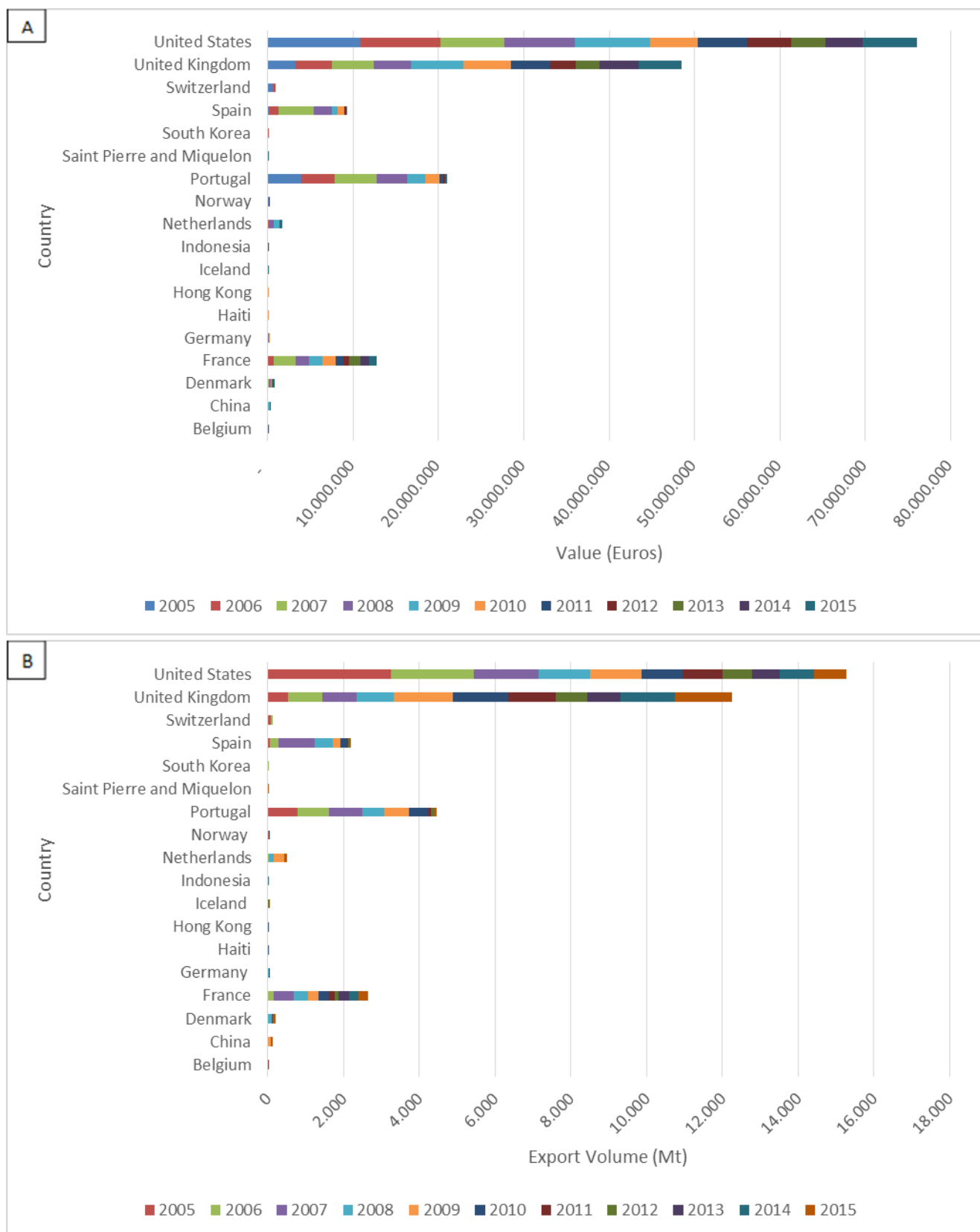


Figure 24a-b: Total list of Countries where NL Cod was exported based on value (Figure A; Euros) and product weight (Figure B; Mt) for the period 2005-2015.

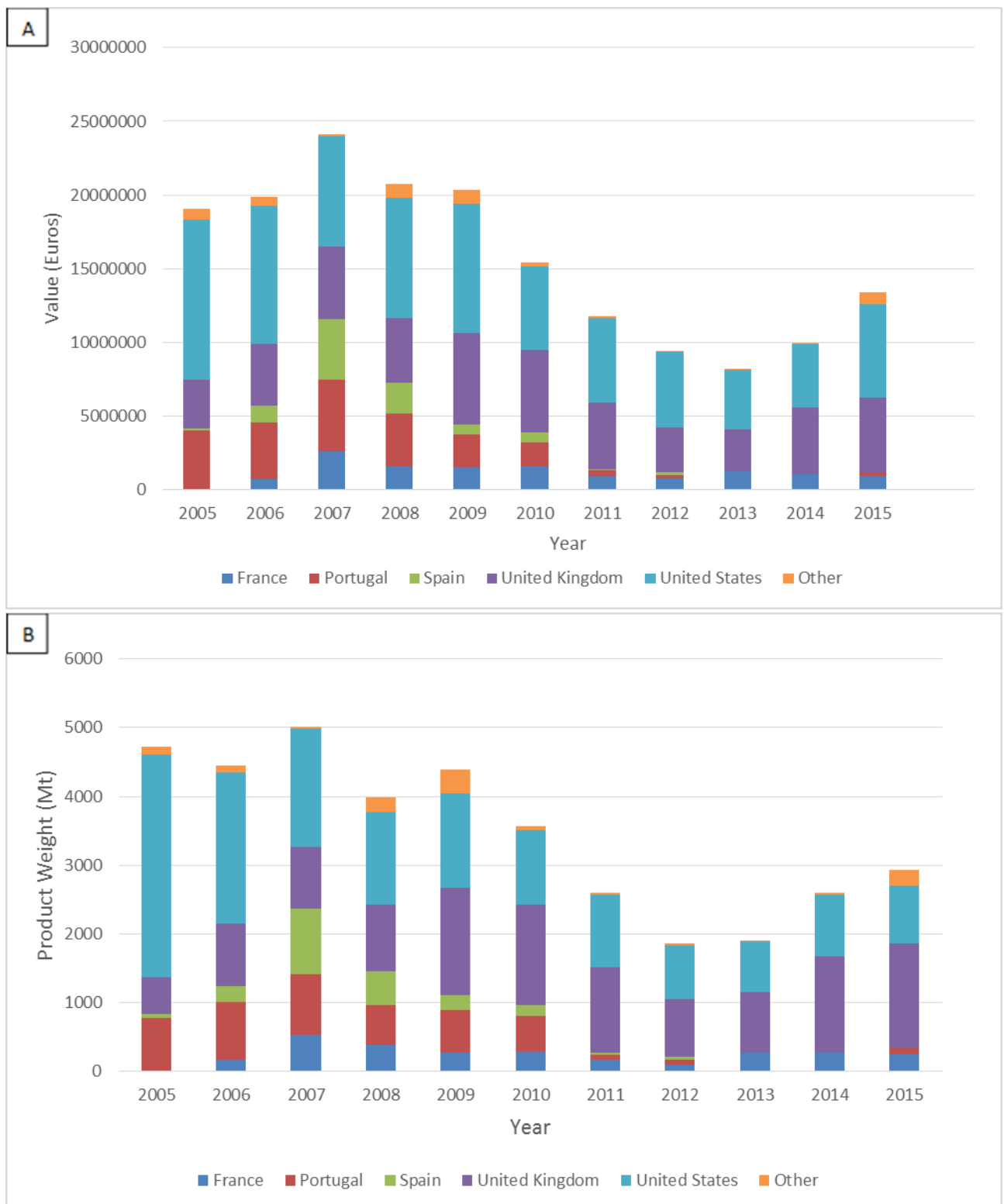


Figure 25a-b: Top Export Countries for NL Cod based on Metric Tonnes for all Product Forms combined for the Period 2005-2015.

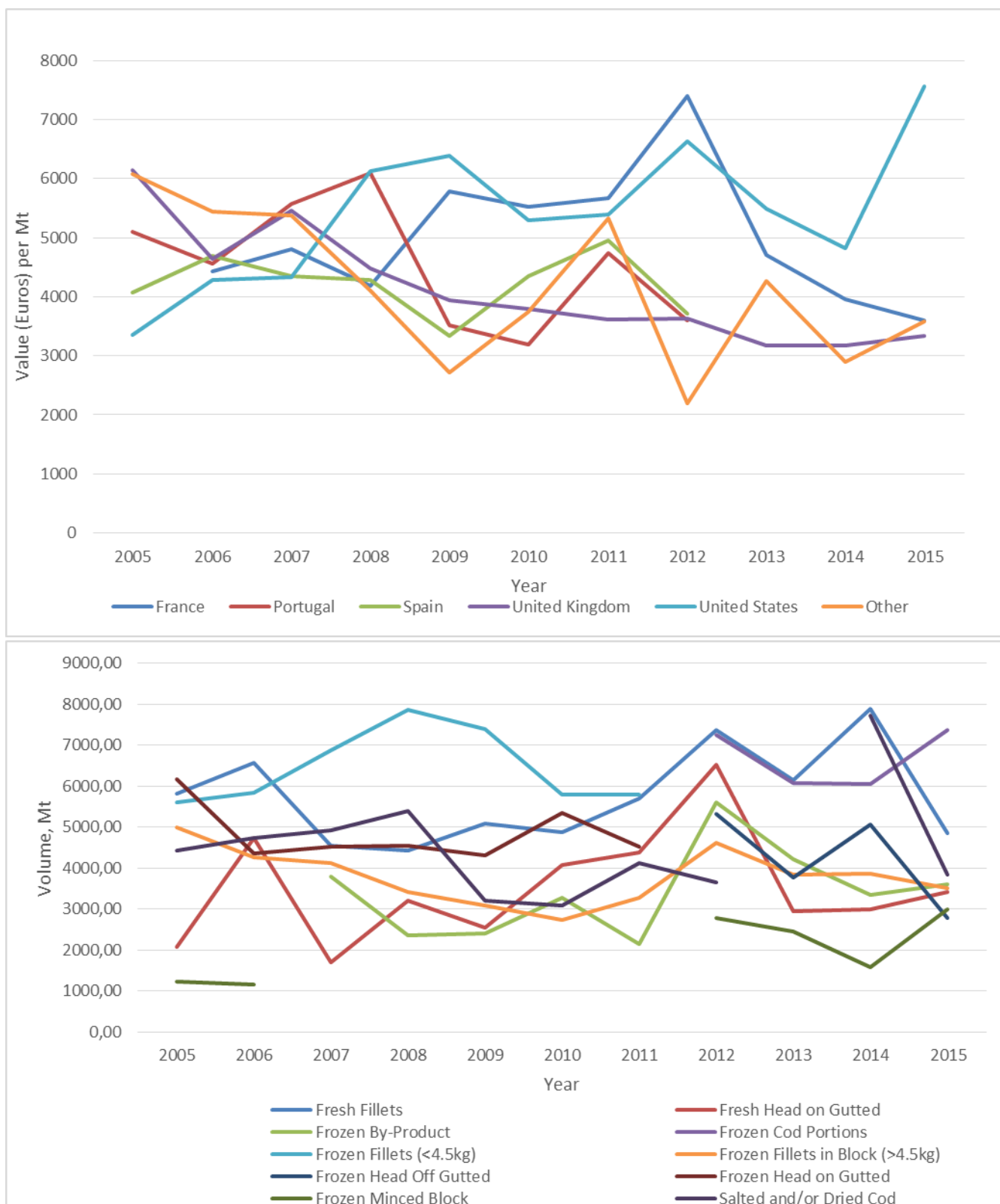


Figure 26a-b: Value (Euros) per metric tonne for NL cod product (all forms combined) for each of the top export countries (A) and for each product form (combined export countries) B.

Main Influencing Factor for Marketing Sector

- Proximity to the US market has been favourable

- Currently there are limits in the capacity to respond to market development/buyers requirements
- Processing technology limited in its flexibility to adjust or adapt to alternate product forms
- Seasonality and quotas (weekly allocation) do not support consistent supply to market and highest priced product forms
- No coordinated marketing strategy for NL cod
- Business to business orientated rather than Business to Consumer driven
 - Limited efforts in reaching or understanding the preferences of the end consumers, whether its product form, packaging preferences, etc.

Domestic Use or Consumption

Domestic fish consumption data, specific to cod has not been determined on either a provincial or national basis. Consumption data, as compiled by Fisheries and Oceans statistics branch, is based on all fish products available in Canada for the period of 1988-2015. Seafood consumption is documented according to the following categories: fresh and frozen at sea, processed sea fish, total shellfish and freshwater. The data is not differentiated whether it is imported into Canada versus harvested and captured in Canada. For the period from 1900 to 2015, the overall trend in seafood consumption has decreased slightly from 8.65 kg/person in 1988 to 7.56 kg/person in 2015. The decrease was mostly noted for fresh and frozen sea fish (4.29 kg/person in 1988 and 2.84 in 2015) and processed at sea fish (2.97 kg/person in 1998 versus 2.6 kg/person in 2015). Shellfish consumption increased slightly during this period (1.2kg/person in 1988 to 1.23 kg/person in 2015) and freshwater fish increased from 0.2 kg/person (1988) to 0.89 kg/person (2015).

As a comparison to Canada's other food production, the overall beef consumption in Canada decreased by 28% for the period 1984-2013; pork decreased by 26%; and the consumption of chicken increased by 69% (Farm Credit Canada, 2015). Based on the data presented in Figure YZ, the total overall seafood consumption for all forms combined decreased by 14.4% for the period 1988-2015. When examining the fresh and frozen sea fish and the processed sea fish, the product forms which would include NL harvested and processed cod, the decrease in seafood consumption was 50.7% and 14.2%, respectively.

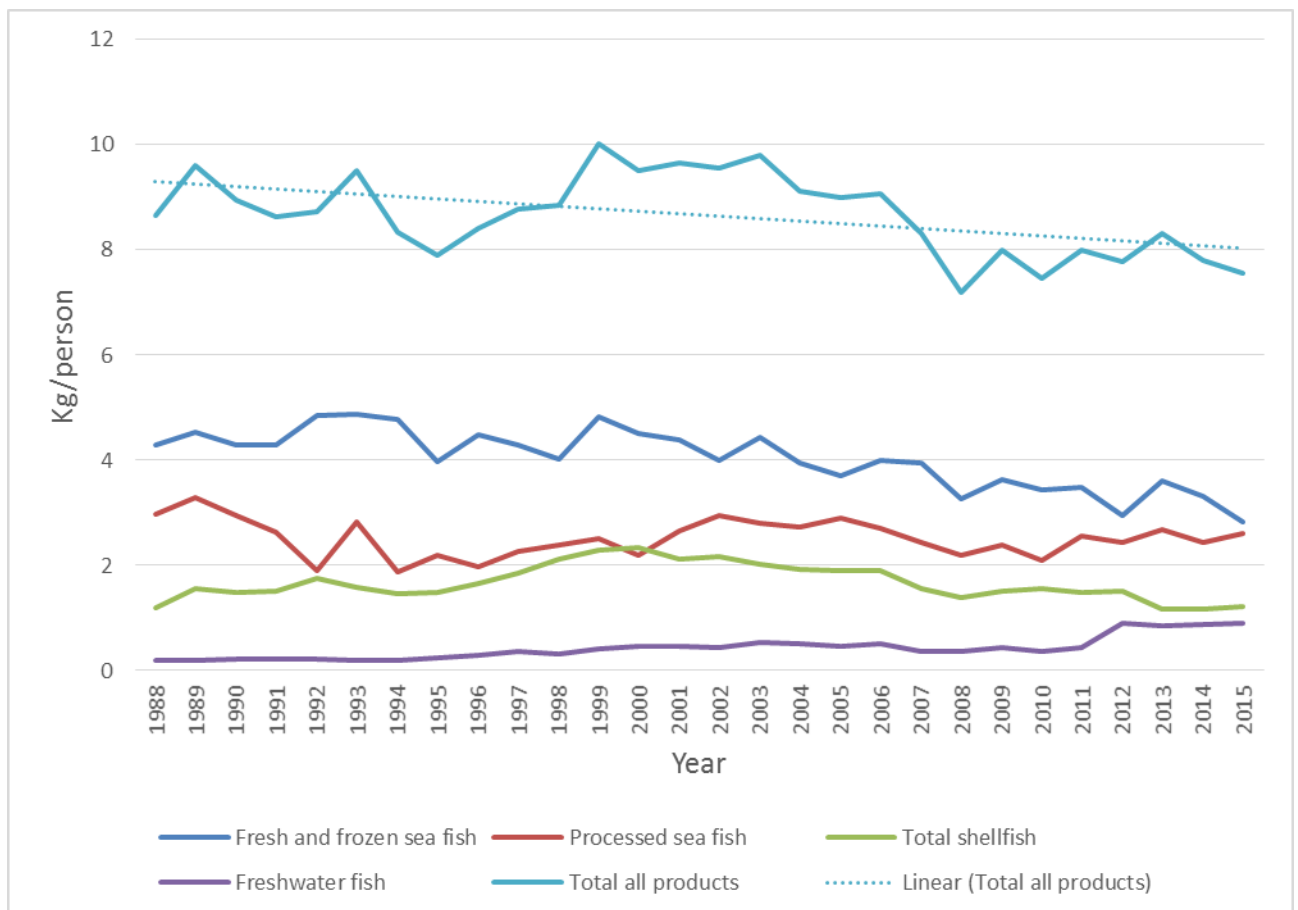


Figure 27: Change in the average domestic consumption of seafood (based on product form/type) for Canadians from 1988 to 2016. (Data Source: Fisheries and Oceans Canada-Consumption: <http://www.dfo-mpo.gc.ca/stats/commercial/consumption-eng.htm>. Retrieved February 5, 2018).

Price Transmission

Determining the price transmission in the value chain for NL Atlantic cod is a complex task because to date no study, nor data collection by a public source, has been conducted to determine the price transmission of various NL cod products through the value chain for either the US or the EU- the two largest export markets for NL Cod.

As presented in Table 13, there is noted monthly variability in the prices of two different product forms (fresh or chilled and frozen fillets) throughout the year and between years. For shipments of cod to the US or the UK, Canadian export data does not differentiate NL cod from other parts of Canada although based on volumes landed it is reasonable to assume that the majority of Atlantic cod comes from NL.

Table 13: Monthly export prices Canadian exported cod products fresh/chilled and frozen fillets for the years 2012-2016 (Data Source CATSNET Agriculture and Agri-food Canada)

Export Price for Canadian fresh or chilled, excluding fish of heading, excluding livers and roes (commodity 30251)- Values are in Euros												
Year	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2012	3.55	2.74	2.83	2.48	2.29	2.39	2.78	3.10	2.76	2.81	3.08	2.86
2013	2.82	2.70	2.25	2.78	2.70	2.23	2.14	2.84	2.85	2.75	2.74	3.20
2014	2.55	2.33	2.47	2.89	2.29	2.28	3.21	3.10	3.09	3.18	3.27	3.19
2015	3.81	2.85	2.93	2.70	2.95	3.65	3.86	3.54	3.80	3.78	3.79	3.45
2016	3.09	3.10	2.56	3.49	3.67	3.73	4.71	3.92	4.12	4.31	4.65	5.56
Export Price for Canadian frozen cod fillets (Commodity 30471)- Values are in Euros												
YEAR	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2012	6.52	6.53	6.88	6.05	7.36	7.89	7.65	7.70	5.72	5.42	6.96	7.51
2013	5.98	3.76	6.03	7.28	3.10	2.70	5.27	4.05	5.90	5.93	4.20	5.06
2014	7.15	6.76	5.78	5.91	8.52	7.03	5.90	7.13	4.66	6.64	7.31	5.50
2015	8.24	8.51	4.21	8.50	6.58	8.72	5.75	6.67	4.60	5.95	8.10	5.40
2016	8.12	5.79	7.73	4.30	7.17	----	6.13	5.78	4.16	8.09	7.62	5.57

When it comes to exports of Canadian cod, (as noted in Section 3.7.2- Exports) the US is Canada's most profitable market with frozen cod portions/fillets having the highest value in 2015 (Figure 32).

Data presented by Sackton (2018) in Figure 34, confirms that frozen fillets is the primary product form of cod in the US market; he also reported that this product form has shown the most consistent and rapid growth in the US market.

Sackton's summary of the total US cod sales explains this trends as it highlights that the food service industry dominates the US cod sales (75%) and the dominant product form for this industry is frozen product (91%).

	Total US Cod Sales	Percent Frozen	Percent Fresh
Foodservice	75%	91%	16%

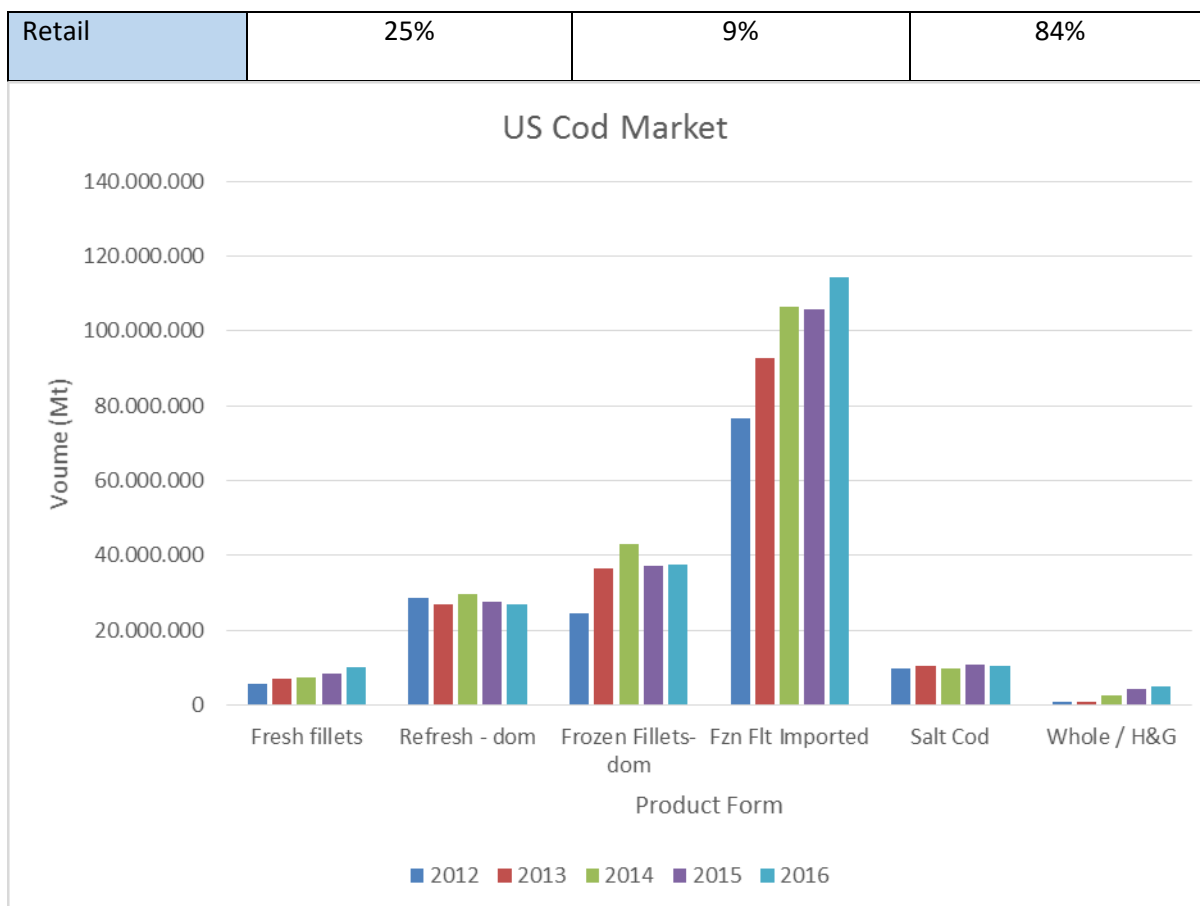


Figure 28: Usage of cod in the US by product Form (Extracted from Sackton, 2018).

When looking specifically at Canadian fresh fillets in the US market, Sackton presents a comparison of prices received over time for Canadian, US and Icelandic fresh fillet products entering the marketplace (Figure 35) as well as the monthly volume of fresh cold fillets imported into the US from Canada and Iceland (Figure 36).

Sackton (2018) notes when comparing Canadian and Icelandic fresh fillets, the Icelandic cod fillets have less price variability because of the consistency of product and volume supplied (Figure 35). He states that buyers have been conditioned to expect a consistent, high quality product from Iceland for which they will pay a premium price. In addition, the volume of Icelandic fresh cod fillets into the US is much larger than the volume of Canadian cod fillets, and as a result there is a more stable market. Seafood buyers value a stable supply of product so they can ensure year round supply for their customers. Sackton notes, that such stability enables the buyers to invest in marketing and promotion initiatives for consumers without fear that they will be left with no fresh cod to sell.

In his report, Sackton suggests Canadian fresh cod is sold at a discount into the US market based on the fact that pricing is consistently lower than the two primary competitive products which are US domestic fresh cod fillets, and imported Icelandic fresh cod fillets.

Sackton sites two key factors are identified for the price differentials. First, the volume of Canadian fresh cod is minimal compared to Iceland, so it will not receive the price premiums paid to stable, year-round suppliers. Secondly, a significant quantity of Canadian fresh cod fillets are sold during the summer months when the fishery is underway, but the quality of the fillets is lower than it is at

other times of the year. This also tends to depress the average price. The volume graph (Figure 36) confirms the fact that Canadian fresh cod fillets are a seasonal item compared to the year round supply of Icelandic fresh cod fillets.

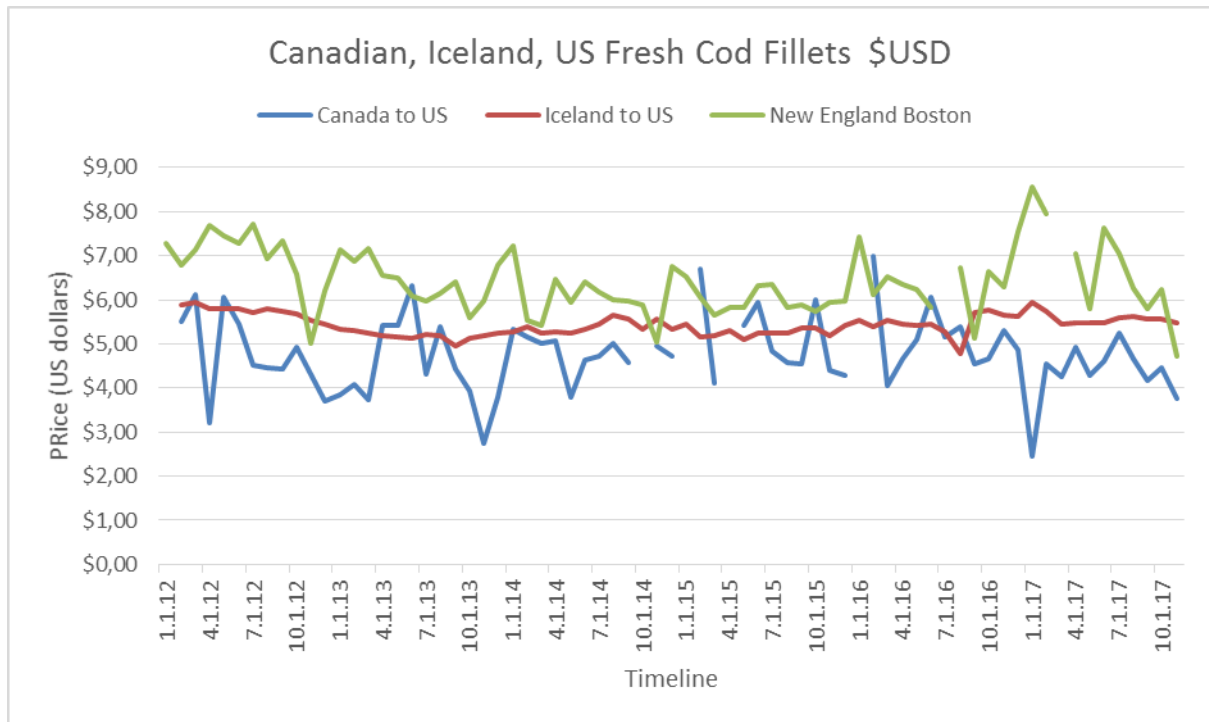


Figure 29: Price Comparison of Icelandic, US and Canadian fresh fillets sold in the US market (Extracted from Sackton, 2018).

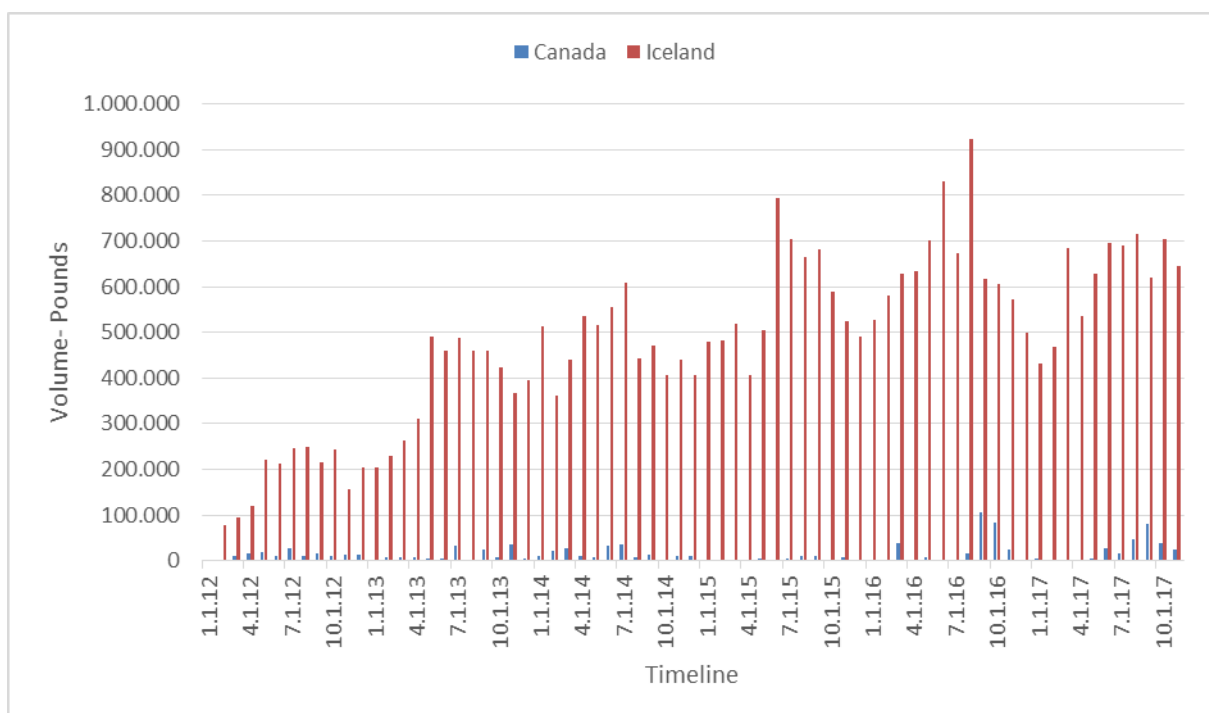


Figure 30: Monthly imports of Canadian and Icelandic fresh cod fillets into the US Market (Extracted from Sackton, 2108)

When an analysis was done on frozen product, Sackton noted that frozen boneless cod loins are the highest value frozen cod product. Virtually all of the frozen Atlantic cod portions sold in the US are double frozen Atlantic cod, caught in Norway or Russia, shipped to China for processing and imported into the US as a twice frozen cod loin.

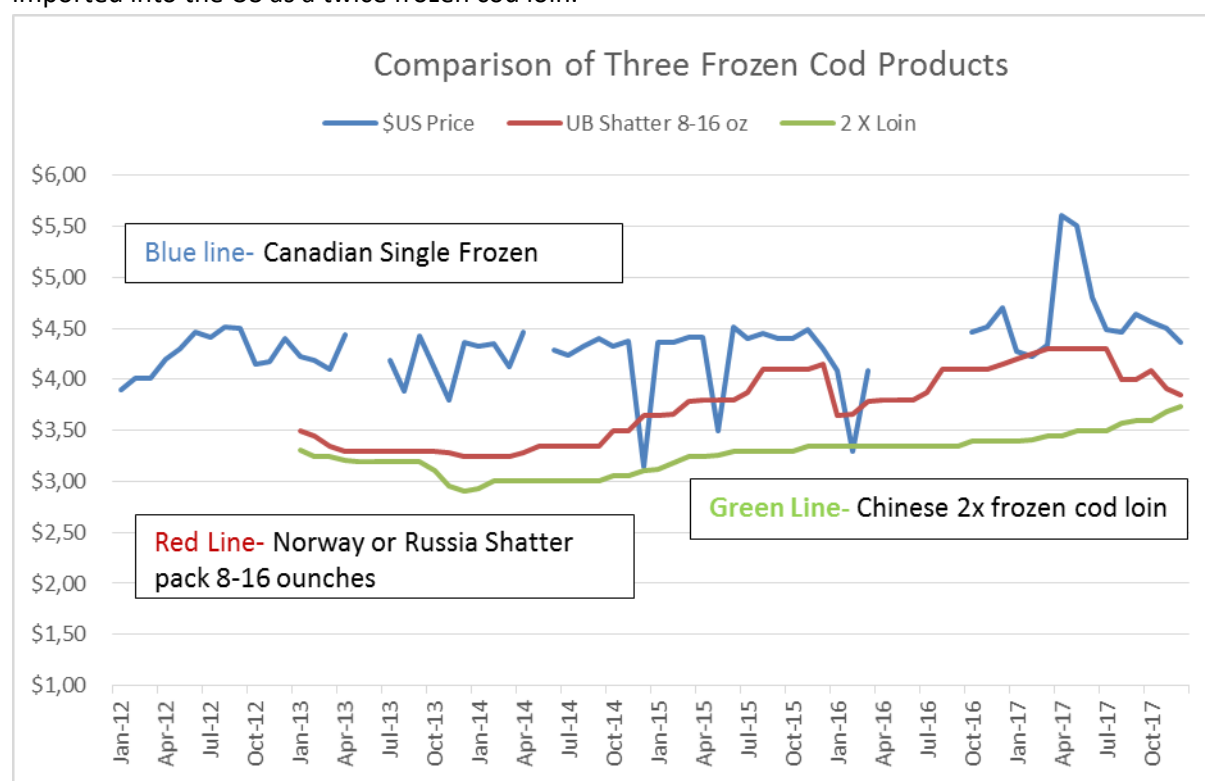


Figure 31: Comparison of prices received in the US market for three frozen products- Canadian single frozen, Norway/Russia shatter pack (8-16 ounces) and Chinese 2x frozen cod loin (Extracted from Sackton, 2018).

When comparing the Canadian single frozen products against the Norwegian/Russian and Chinese frozen products, it is evident that a premium is paid for Canada's single frozen product.

For Canadian and Icelandic frozen cod entering the UK marketplace, Canada and Iceland alternate receiving the higher price (Figure 38, Figure 39). Sackton attributes this in part to the fact that the volumes of the Canadian product are much smaller, and therefore when a percentage of product is of lower value, it lowers the import value, whereas for Icelandic product the presence of some lower quality loads is such a small percentage that it does not have a discernible price impact (Figure 39). Thus the Icelandic price is a better reflection of supply and demand for a consistent product.

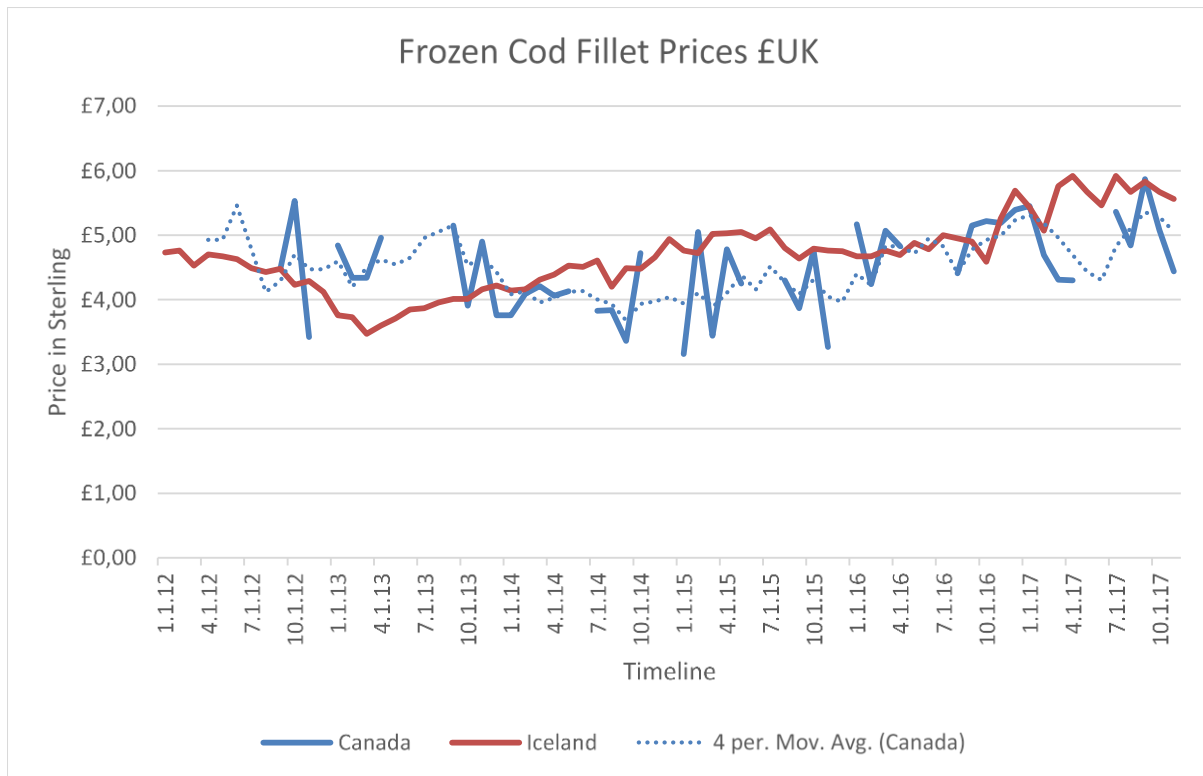


Figure 32: Comparison of Price Received for Canadian and Icelandic frozen Cod Fillets entering the UK market (Extracted from Sackton, 2018).

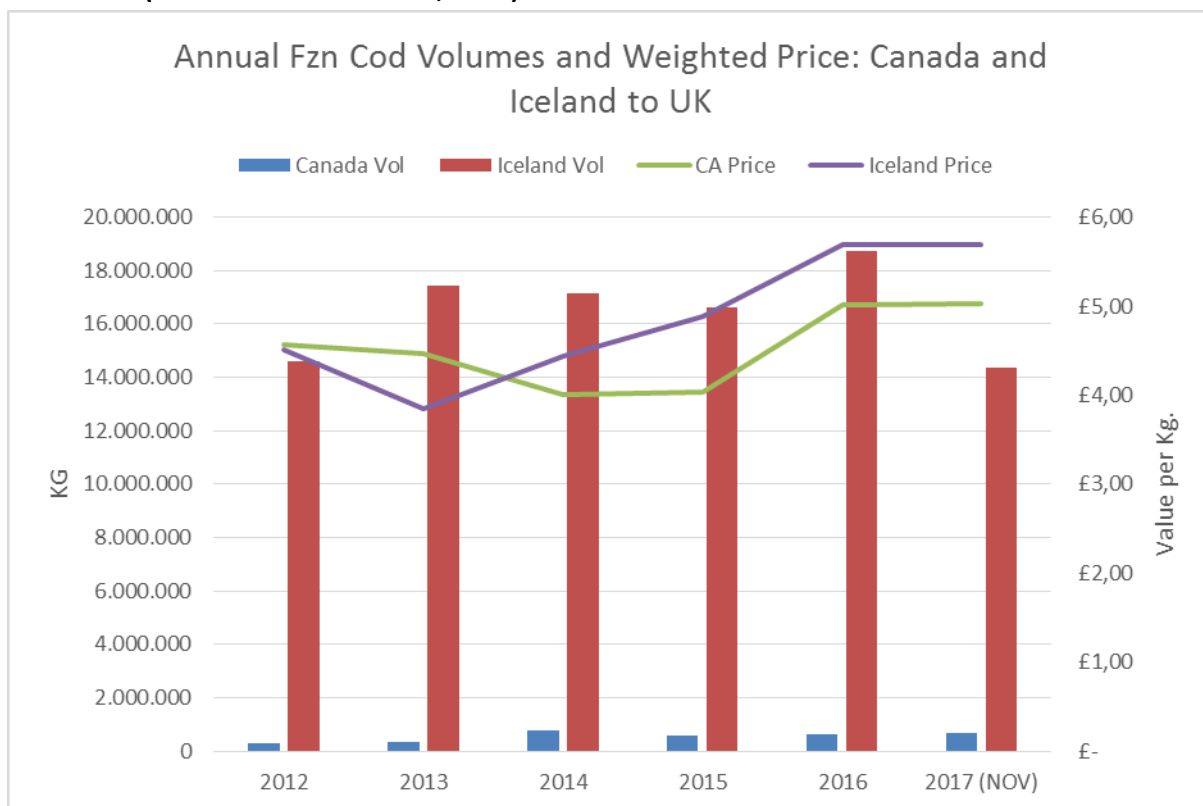


Figure 33: Annual Frozen Cod Volumes and Weighted Price for Canadian versus Icelandic Shipments of Cod to the UK Market (Extracted from Sackton, 2018).

In terms of price transmission and price competitiveness Sackton (2018) concluded that the Canadian cod loins and fillets are very competitive with other high quality single frozen Atlantic cod products. He attributes this to the product being produced in high quality processing plants that is competitive with the processing abilities of any cod plant producing this product in other parts of the world.

He further states where price differentials do emerge, they are likely the result of idiosyncratic factors affecting shipments in a given month, or the result of well-known issues like harvesting during the time when fish is not at peak quality and thus do not demand the highest prices or premium.

Overall Economic Performance and Competitiveness of the Fisheries Value Chain - Newfoundland

Value Chain Dynamics

Value chain dynamics depends heavily on the governmental form of the value chain and the relationship within the value chain. For the NL cod fishery, the fishery is governed by a system that promotes fleet separation between the harvesters and the processor and owner-operator independence is promoted. Under PIICAF, further vertical integration is prohibited.

When looking at the relationship within the value chain, there is fragmentation between the different players:

- Harvesters are disconnected from the market conditions and consumer preferences.
- Independent processors, responsible for processing and marketing of harvested product are disconnected from the government system which determines the seasonality of the fishery and the weekly allocation of catches/quota.
- Government and harvesters are equally disconnected from the value chain logistics (e.g. transportation and export issues).
- First gate price paid to harvesters for landed product is a negotiated agreement and not necessarily linked to market conditions or values and in some cases the quality of the product.
- Similarly, the seasonality of the cod fishery and the weekly allocation of catch or quotas is negotiated and often disconnected from market demand and market priced such that NL is selling its product when the quality is not at its best or the market price is at its lowest for that product form.
- Little to no price differentiation is paid for fish harvested with more sustainable and quality friendly gear types.
- Self-rationalization within the harvesting sector is by a cap or limits on the number of cod licences an enterprise can accumulate.

The Garner Pinfold Consultants Inc. (2017) report noted the following as reasons why Canadian fisheries (including the NL cod fishery) fails to extract maximum value:

- The fishery is not fully utilizing raw materials to produce marketable product
- The fishery is not producing products that generate the highest value
- The fishery is not obtaining the highest prices

- The fishery is not selling the highest value market values or at times of the year when prices are highest

In its simplest form, the Garner report simplifies the value chain into five activities that involves interactions between each:

- Raw material procurement
- Processing
- Marketing and sales
- Logistics
- Customer service

As noted in the previous sections, one of the clear advantages the Icelandic and Norwegian cod fisheries have compared to the NL fishery is the quantify of harvestable biomass. However factors such as the quality of raw materials, the rate and timing of landings, sharply peaked landings, and unpredictability with delivery terms, are factors which devalue the industry but are controllable to some degree.

The NL industry must continue to address the above issues and work collaboratively in order to increase the value of its fishery. Factors such as seasonal gluts, methods to harvest higher quality product including improved gear technology and on-board handling and holding methods, a more integrated communication strategy between harvesters and processors are critical. The industry at large also needs to explore better supply chains though improved or enhanced transportation to key markets.

Governmental Form

There is significant debate as to whether vertical integration is the solution to solving the value chain issues in the NL fishery as it permits all aspects of the value chain to be controlled internally by the respective company. The Icelandic industry attribute vertical integration as well as the auction system among the key factors impacting the success of their industry.

As the Garner report notes, vertical integration alone would not provide the inshore sector with a guarantee of improved performance as the nature of how the fishery is managed is also critically important. While some of the benefits of vertical integration could be managed through better communication and agreements between harvesters and processors- the fisheries management system still has an impact on the performance and profitability of the industry.

Drive Force in Value Chain

The drive force of the Canadian and NL fishery, as noted by Gardner Pinfold report (2017), is to sustain economic wealth for communities; the fisheries management objectives do not include extracting maximum value from its product. As such our system is not a market driven system and as a result Canada's position among leading seafood exporters has declined over the past 30 years. The Gardner Pinfold reports notes, that if Canada is to shift towards a market-driven model then a high level of coordination between harvesting and processing is required to provide the industry with the ability to respond to price signals concerning what products to produce, in what quantities , when and for whom. Factors which are limited by our current system.

Data Limitations- Newfoundland

Several of the data sets, particularly those referenced by the Fisheries and Oceans Canada, NL Regional Statistics Branch are limited by privacy regulations whereby government cannot release data that cannot be clustered as a minimum of five data points. Consequently, certain categories of data such as value/catch data for vessels >65 feet are missing. Data pertaining to NL imports and subsequent re-export is limited and not easily traced through the value chain. Data pertaining to profitability was not attainable as private or company data is not publically available.

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Appendix 2 - Herring country reports from Iceland, Norway, Denmark and Newfoundland



Fisheries Value Chain

Evaluation of industry dynamics, opportunities and threats to
industry

Norway country report herring

Prepared by

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February 2018

3.1 Fisheries management system

3.1.1 General description

Norway harvests on two herring stocks. In the south (the North Sea, Skagerak and Kattegat; ICES-sub-area IV and Division IIIa), we harvest the North Sea herring, which is a shared resource with the EU. The herring is caught with trawl or purse seine, mainly in late spring or summer in the central or northern North Sea, or in the autumn or winter in the southern North Sea. In the Norwegian and Barents Sea Norway harvest the Norwegian spring spawning herring (also called Atlanto-Scandic herring), a stock that is managed in cooperation between Norway, the EU, Faroe Islands, Iceland and Russia. Again, the herring is caught with purse seine and pelagic trawlers, mainly caught at the spawning grounds along the Norwegian coast in the winter. Norway is the largest catch nation (57 per cent of the ICES-estimated catch in 2014), before Russia and Iceland (both 13 % each) and Faroe Islands (8 %).

Most of the herring is caught in Norwegian waters, with smaller shares caught in the EU zone or the “Banana hole”, ref figure below.

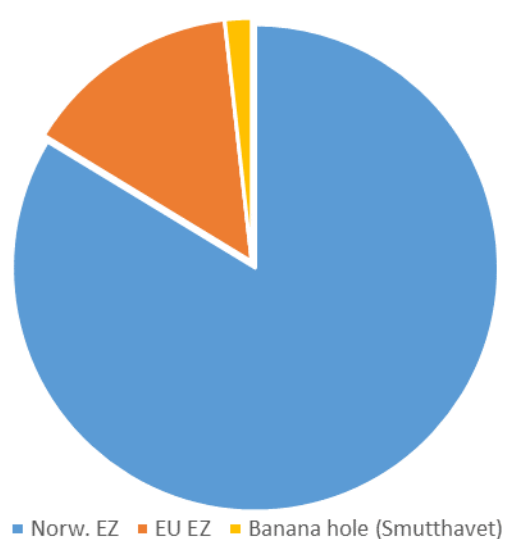


Figure 1 Norwegian herring catches in fishery zones 2014

The herring fisheries is managed by vessel quotas, and distributed through four regulation vessel groups, where most is caught by the coastal fleet and large purse seiners, a small share by trawlers and a minor share by purse seiners without license (PS wo. Lic.). The distribution of the catch on those four groups in 2009 and 2014 is shown below.

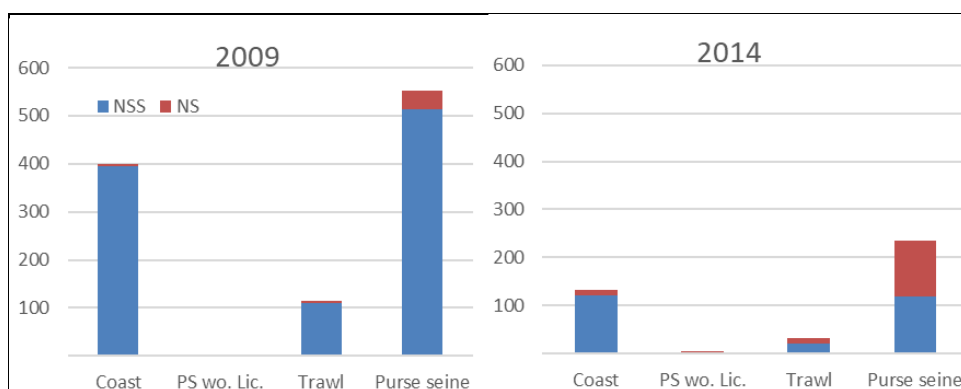


Figure 2 Norwegian catch of Norw. spring spawning (NSS) and North Sea (NS) herring, 2009 and 2014, for different vessel regulation groups

The group “Purse seiners without license” (“PS wo. Lic.”) is a regulations group in the North Sea herring (and mackerel) fishery that consists of about 20 larger coastal seiners that over time built up rights in this fishery. Technically, eight per cent of the quota for licenced off-shore purse seiners are allotted to these vessels. In the Spring spawning herring fishery, these vessels are regulated as belonging to the coastal vessels.

Even though most of the herring is caught by large purse seiners, and larger coastal vessels specializing in pelagic fisheries, a huge number of smaller boats in the demersal fisheries vessel groups also takes part in the herring fisheries. Below, the catch of herring on different (whole year operated – “wyo”) vessel groups in the profitability study is for 2013.

Table 20 Vessel groups in the whole year operated fishing fleet in Norway in 2013 – number of vessels and catch of herring (1000 tonnes). Source: Profitability survey on the Norwegian fishing fleet, Directorate of fisheries

<i>Pelagic fisheries vessel groups</i>			<i>Demersal fisheries vessel groups</i>		
<i>Vessel group</i>	<i># of vessels</i>	<i>Herring catch (1,000 tons)</i>	<i>Vessel group*</i>	<i># of vessels</i>	<i>Herring catch (1,000 tons)</i>
Coastal seiners < 11 m	37	4.8	Conventional gear < 11 m	564	1.6
Coastal seiners 11–21.35 m	86	42.2	Conv. gear 11–14.9 m	275	5.7
Coastal seiners > 21.36 m	55	92.2	Conv. gear 15–20.9 m	31	9.8
Purse seiners	73	279.6	Conv. gear > 21 m	39	16.2
Pelagic trawlers	20	37.8	Conv. off-shore vessels	24	-
			Cod trawlers	40	-
			Coastal shrimp trawlers	123	1.2

*) Length refers to quota length, not necessary the actual length of the vessel.

Table 20 shows that the dedicated demersal vessels only to a limited degree catch any herring. Moreover, the purse seiners dominates the herring catch, while conventional off shore vessels and cod trawlers catches no herring. The purse seiners without license – mentioned in Figure – are found in the group “Coastal seiners above 21.36 m (70 feet)” .

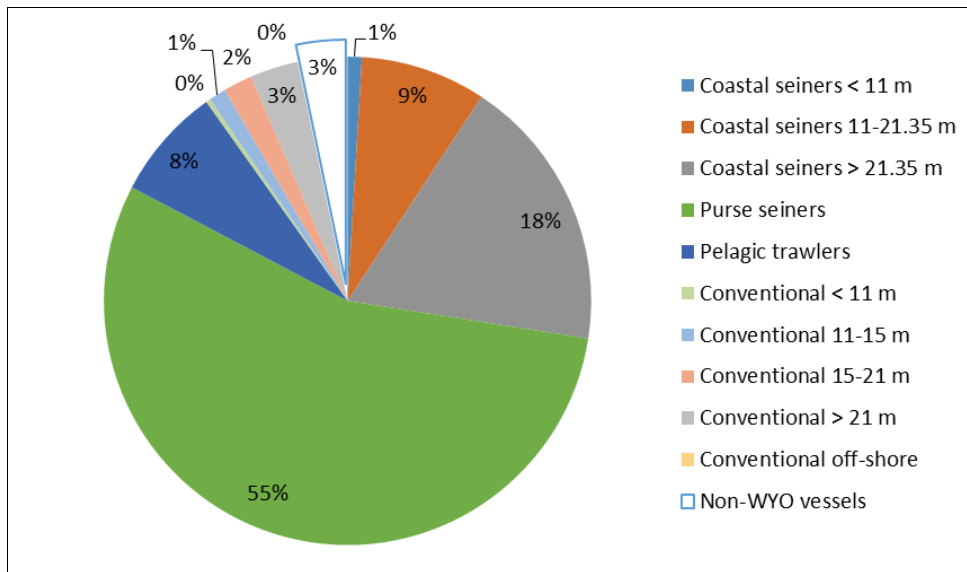


Figure 3 Norwegian herring catch by WYO-vessel groups in 2013. Total landings 507 465 tonnes. Source: Anon., 2015

Figure shows that the pelagic vessels dominate the herring fishery with 90 per cent of the catch, and to a much greater degree than the dominance of the demersal vessels in the catch of cod. Moreover, the herring fishery can be said to be much more professionalised since only three per cent of the catch is taken by vessels not found in the profitability study (as opposite to the cod fishery where the share was 16 per cent). Demersal vessels catch only about seven per cent of the herring in 2013.

3.1.2 Entry barriers to the system

3.1.2.1 Transferability of quota

As shown above, most of the herring quota is caught by large purse seiners. This is a group of vessels that historically has seen a strong reduction. In later years, though, the number of large purse seiners has stabilised just below 80 vessels.

Quota for herring may not be sold without a vessel, but there is still room for expanding the quota for most vessels. We will describe the system in the next chapters.

3.1.2.2 Consolidation processes

To understand the consolidation process in herring fisheries, we need a short summary of the capacity reducing measures that has been applied over the years. The herring fisheries was the first of the Norwegian fisheries to be closed, and since the early seventies a license has been needed to take part in the herring fishery.

The development in number of licenses is shown in Figure 41. There was a strong reduction throughout the 1980ies, but only a moderate reduction since. The last ten years the number of purse seiners has been practically stable.

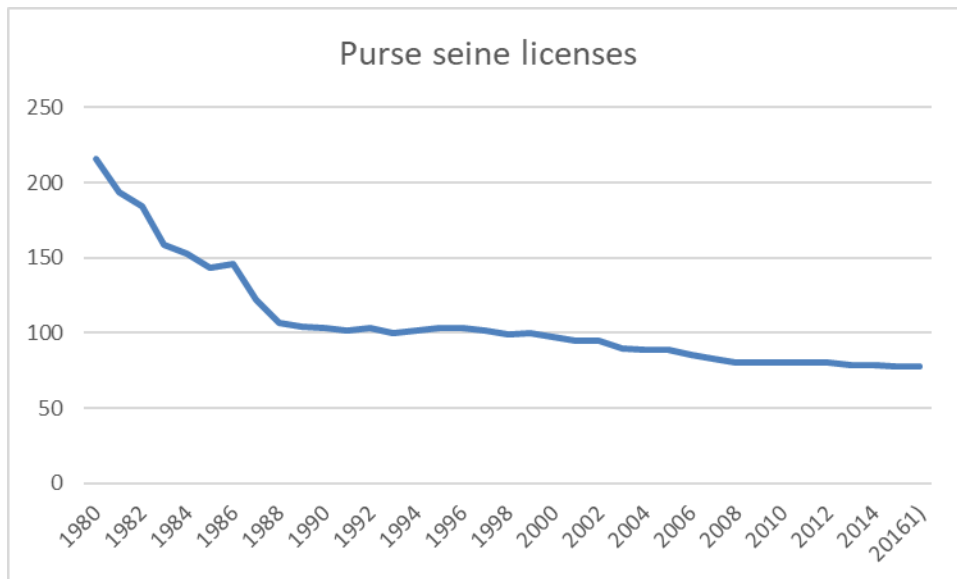


Figure 41 Development of purse seine license 1980 - 2016

The purse seiner's share of the quota is divided among the vessels through a system of "base-tonnes", in which the quota is divided into 41.118 base-tonnes.

3.1.3 Development of quota price and rent

The potential for further restructuring among purse seiners may be illustrated in Figure , where the quota for each of the 78 remaining vessels are plotted, in diminishing order. The blue bars show the base quota for each vessel, whereas the red part of the bars is the so-called "structure quota". This is quota transferred from vessels that has been taken out of active fisheries. As is well illustrated, there is still room for consolidation. Vessels may buy quota from each other, up to a limit of 850 base-tonnes. This limit was recently raised from 650. The illustration is from before the raise, but so far, only two vessels have invested in quota to reach the new 850-limit.

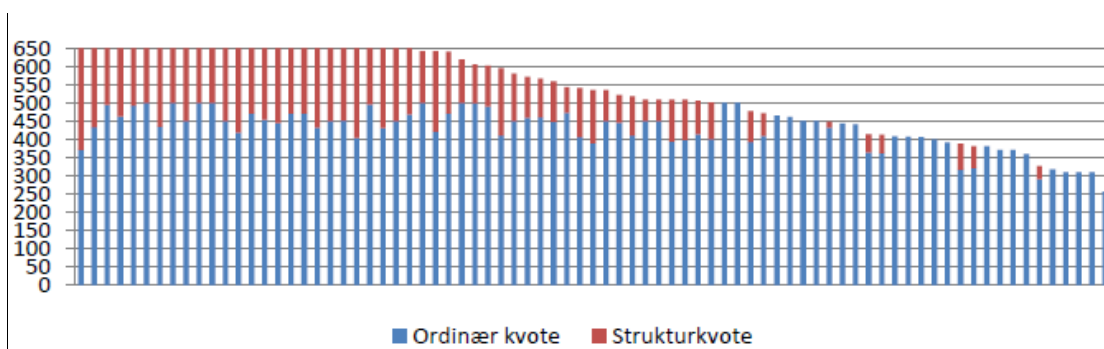


Figure 5 Consolidation in pelagic fisheries. Ordinary and structural quotas of purse seiners. Source: SINTEF

Only two vessels have reached the new limit of 850 tons. With a total amount of 41.118 base tons, a limit of 650 meant that this groups could in theory be reduced to 64 vessels, with the new 850-limit, the group can in theory be reduced to 49 vessels.

In practice, though, many vessels do not seem very interested in further restructuring. They already have good profitability, and new quota is expensive.

3.2 Value chain structure

3.2.1 Fishing

3.2.1.1 Structure of the fleet

Over time, the number of vessels and number of fishermen has been strongly reduced, with increased production per fisherman as a result.

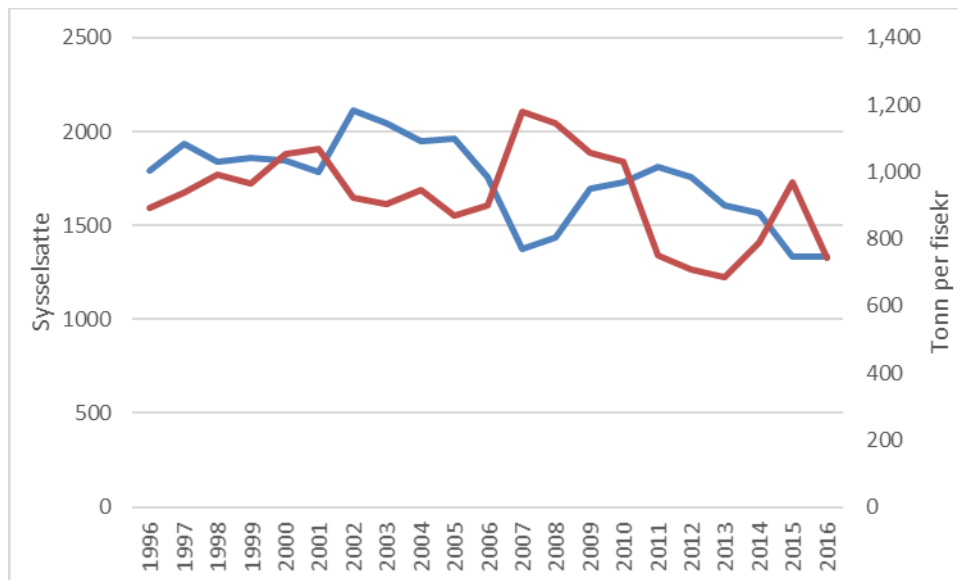


Figure 6 Employment and catch per fisherman in the pelagic fishing fleet. Source: Norwegian Directorate of Fisheries.

3.2.1.2 Financial Performance and productivity

Profitability in the herring fisheries (or pelagic fisheries in general) is very good, particularly among the purse seiners.

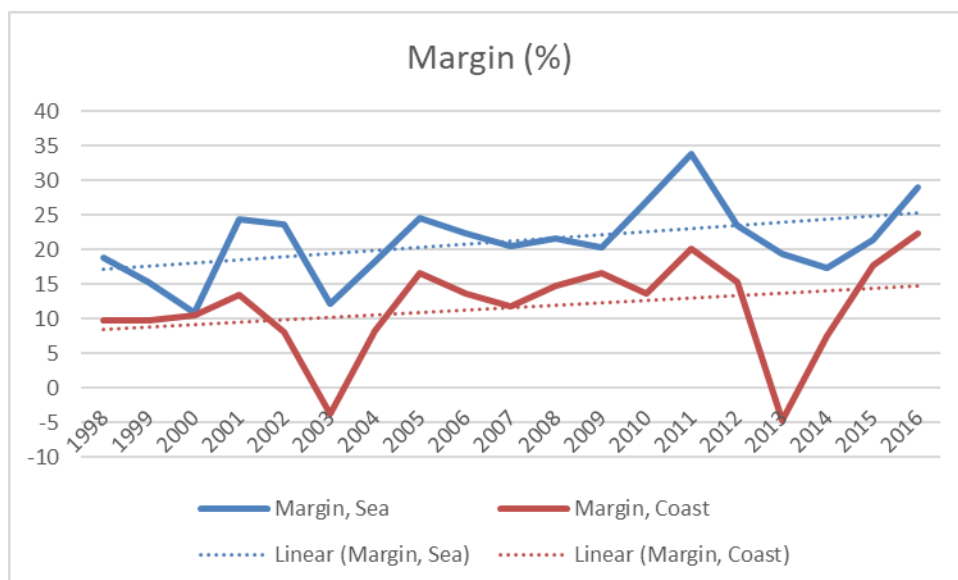


Figure 7 Margin (EBIT/turnover) for purse seiners (sea) and coastal vessels in herring fisheries. Source: Norwegian Directorate of Fisheries.

3.2.2 Price settling mechanism, first gate price

3.2.2.1 Form of selling

Norwegian herring is sold through the Norwegian pelagic auction, Europe's largest pelagic fish auction, with an annual turnover of approximately 1.5 million tonnes at a value of almost NOK 9 billion (€ 966 million). The auction is an electronic auction without physical inspections of products and is based on the first-price sealed-bid method.

3.2.2.2 Price settling mechanism

The next section provides a detailed description about the Norwegian pelagic auction and data.

The first-hand sale of fish in Norway is legally protected through the raw fish act and organized through sales organizations with exclusive rights for co-ordinating the first-hand sale of fish. This includes the right to set minimum prices if there is no consonance on minimum prices between sales organizations and buyer organizations. The raw fish act regulating the first-hand market was established in 1938 following political pressure to protect the fishers from the buyers' market power with regard to the pricing of fish. The Storsildlaget, which organised herring fishers, was a pioneer and was formed in the late 1920s to solve the problem with buyers paying a first-hand price, which did not stand in reasonable relation to the price in the export market. The Norwegian pelagic auction was established in the 1970s and is owned and operated by Norges Sildesalgslag (NSS), the current sales organization for pelagic fishermen in Norway.

In addition to herring, the auction includes species such as mackerel, horse mackerel, sprat, blue whiting, capelin and sand eel. There are some firms owning both fleet and processing capacity in the herring sector, but the auction limits any real vertical integration.

3.2.2.3 Efficiency/effectives – how effective is the system to respond to attributes:

3.2.2.3.1 Quality

Compared with other animal products, fish quality deteriorates rapidly and pelagic fish tends to be more susceptible than other species. Herring is no exception, and its quality is strongly influenced by the catching operation, on-board pumping, chilling and the time it takes to bring the catch to shore for processing and freezing. For example, pumping the fish from the seine net to the on-board storage tanks may lead to bruising and mechanical damage to the fish. Enzymatic activity due to the feed content and amount in the stomach may lead to soft flesh and fillet gaping.

“Some of the sale is based upon contracts and some is traded on the spot market. Especially the fish that goes to Poland and some of the fish to Belarus is on contracts. The contracts are usually based on volume. The last 5 to 7 years less has been on contract, especially after the Russian market closed. There might be some price differences between the different sales forms, but the main difference is that contracts give more safety and predictability. Good to add relevant stuff from interviews with stakeholders”. (Norwegian producer)

Typically, the boats only need to cast the purse seine one or two times to fill their capacity. The fish is pumped directly from the seine into storage tanks with refrigerated seawater.

The pricing mechanism typically responds more efficiently to changes in supply or demand than quality. As there is no inspection before bidding, buyers rely heavily on the reputation and former experience with the vessel. There is a mechanism for complaints, and the price may be adjusted if the complaint is deemed relevant.

3.2.2.3.2 Seasonal fishing vs market demand (timing)

Also herring landings are fluctuating heavily with a strong seasonal component. As mentioned introductorily, the main fishing seasons of North Sea and spring spawning herring is not coinciding. The Norwegian spring spawning herring is mainly caught during the winter (January – February) and late autumn (October – November), while North Sea herring principally is caught during summer months (June) when the fat percentage is at its highest, and the demand from the tradition Dutch market for *matjes herring* is at its peak. In Figure the Norwegian landings of the two species are shown for 2014, together with average monthly share of the annual catch the three last years (2012-2014).

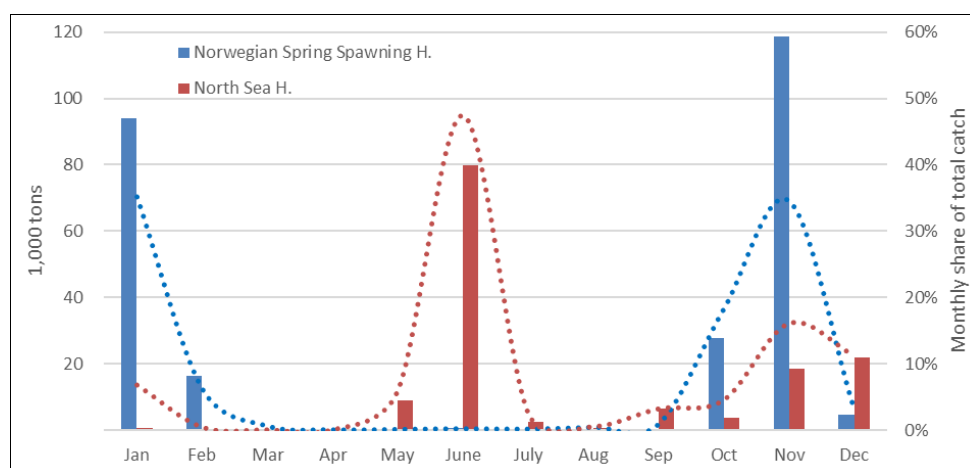


Figure 8 Monthly catch volumes of Norwegian spring spawning and North Sea herring in 2014 (left axis). Stippled lines show the average three-year (2012-2014) share of annual catch landed each month for the two species

Fig 8 shows that the fishery on the two species to some degree coincides at the end of the year. The timely component of these fisheries is to some degree decided by the quality of the fish (fat content) at different seasons, by the markets served (*matjes*) but largely by the spawning and feeding migration of the herring as it seeks to the Norwegian coast from the Barents Sea, Norwegian Sea and the North Sea.

“For the working force, they have some challenges with settlement for the visitors who come to the factory to work. In the peak season there might be 50-100 people who need a place to stay. Usually they have had an agreement with the local tourist industry, but this industry is getting more and more popular also in the winter season and now needs the settlement themselves. Overcapacity is another challenge. This leads to an irrational hunger after fish when the season start in the autumn and the decisions made at this point are not necessarily the best for the production”. (Norwegian producer)

3.2.3 Processing (all marine fish processing plants)

3.2.3.1 Industry structure and employment

The pelagic industry in Norway may be divided in two: the one producing meal and oil, and the one producing seafood. For the seafood part of the industry, herring and mackerel are the most important species, with capelin playing a minor role.

The meal and oil industry receive rest raw material from salmon slaughteries as well as herring filleting/processing. They also produce meal and oil from blue whiting, sand eel and Norway pout.

3.2.3.1.1 Consolidation

Over the last 20 years we have witnessed a marked reduction in the number of buyers of herring, and pelagic fish in general, for consumption.

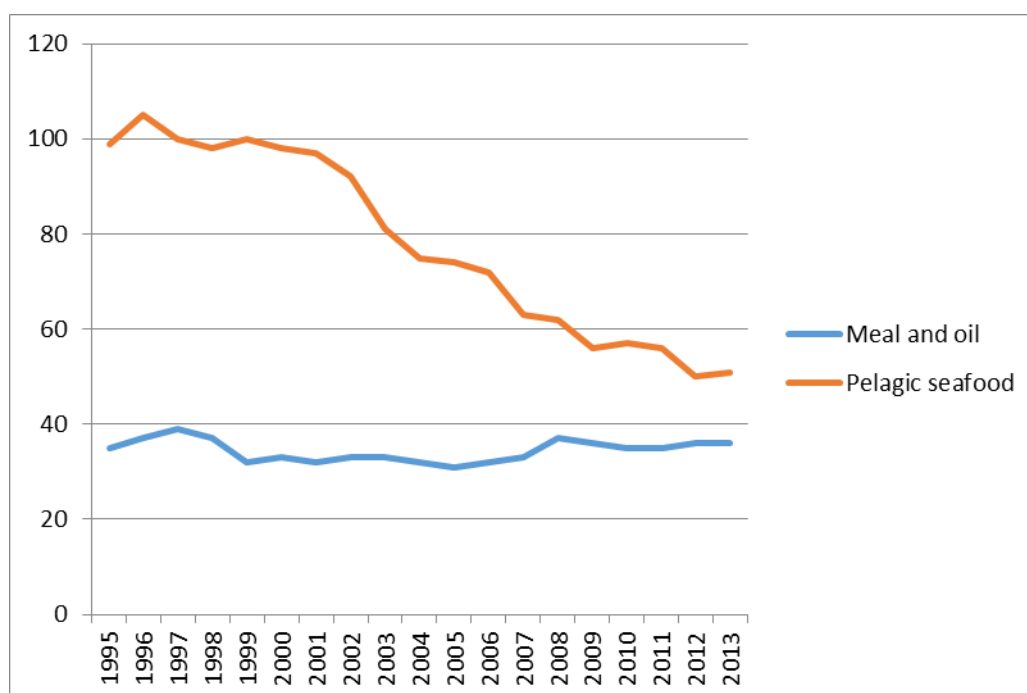


Figure 9 Norwegian producers of herring for human consumption (marked Pelagic seafood) and producers of fish oil and fish meal. Source: Nofima/Norwegian Directorate of Fisheries.

From around 100 producers in 1995, only half are left today. In this period production volumes have increased, so the explanation lies mostly in the construction of more productive and efficient processing facilities. Companies have invested heavily in larger capacity to serve boats with bigger catches, and more automated handling of the fish to save on labour cost.

3.2.3.2 Financial performance and productivity

3.2.3.2.1 Development of profitability over time

Profitability in pelagic processing is relatively low, with margins normally between 2 and 4 %.

Profitability varies a lot, though. In 2002 and 2006 the industry suffered huge losses. In 2002 this was caused by a weakening Norwegian currency. As much of the herring (and even more so the mackerel) is caught during a short season, and sold over the next half year, the industry is vulnerable for changes in price and currency.

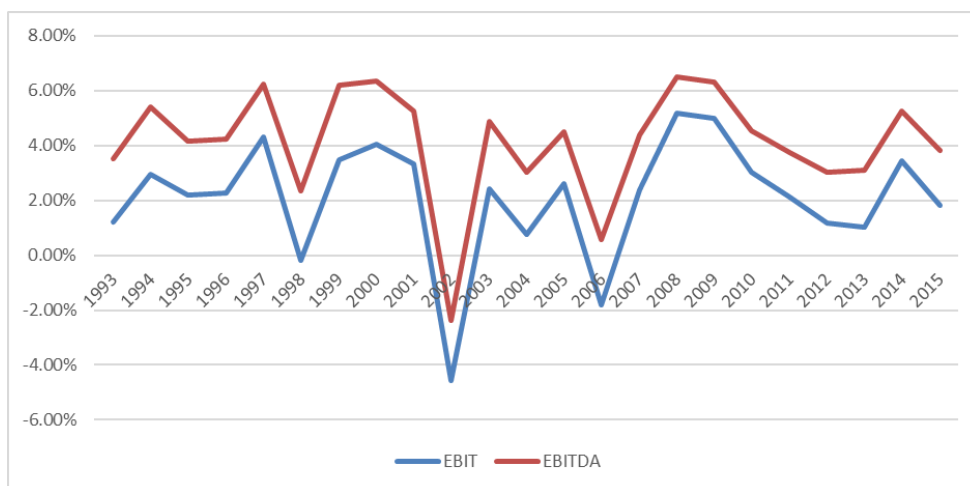


Figure 10 Profitability for Norwegian producers of herring (and mackerel). Source: Nofima.

The industry had a few good years in 2008 and 2009, with increased volumes and less competition for raw material in the wake of the merger of the two largest players into Norway Pelagic. Since then, volumes have decreased, and competition for raw material has increased, even with a new merger between Norway Pelagic and Egersund Seafood into Pelagia.

3.2.3.2.2 Development of productivity over time

The Norwegian producers of pelagic species has invested heavily in automation of production, with an increase in production per employee as a result.

3.3 Value creation and utilisation

Gross value added for the producers of pelagic fish for consumption is shown in the figure below. The value added peaked in 2009 and 2010, when catches of both herring and mackerel was historically high at the same time. Since then, volumes of both has decreased, also bringing down the gross value added.

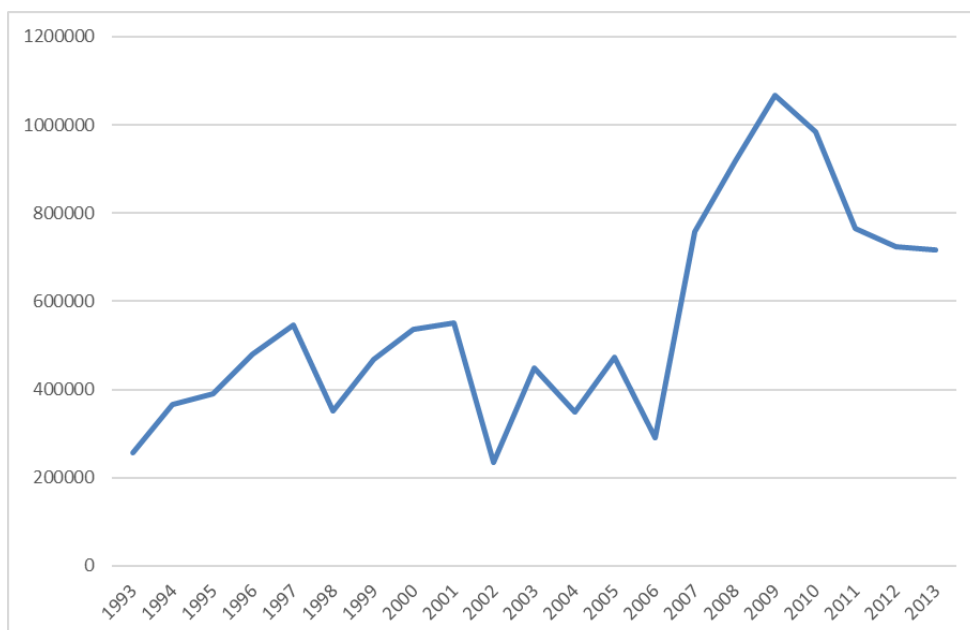


Figure 22 Gross value added for Norwegian companies producing herring (and mackerel) for human consumption. Source: Nofima.

Gross value added in this industry is relatively low given the huge quantities landed and processed. This has three explanations. Firstly, value creation per kilo is low as processing is relatively simple, the fish is normally just packed in 20 kg boxes, then frozen and exported. Some herring is filleted, though, increasing value creation. Secondly, even though volumes are high, and some is filleted, processes have to a very large degree become automated, reducing the labour part of value creation at relatively low levels. Thirdly, even though value creation per kilo of herring and mackerel has increased markedly, this value has not been accrued to the industry, but to the fishing fleet. High capacity in processing, and many producers, lead to very competitive bidding for fish in the first-hand auctions, effectively driving bids to a level that leaves the industry at low gross margins.

3.3.1 Value creation in by products

An increasing portion of the Norwegian herring is filleted. This means that more rest raw material from herring production is available for fish oil and fish meal.

Around 40 % of the herring (210' out of 526.000 tons in 2017) is filleted, leaving an estimated 145.000 tonnes for meal- and oil-production. This is paid a price of around NOK 2,50 per kilo.

3.4 Marketing sector

3.4.1 Export

Norwegian exports of herring is composed as shown below.

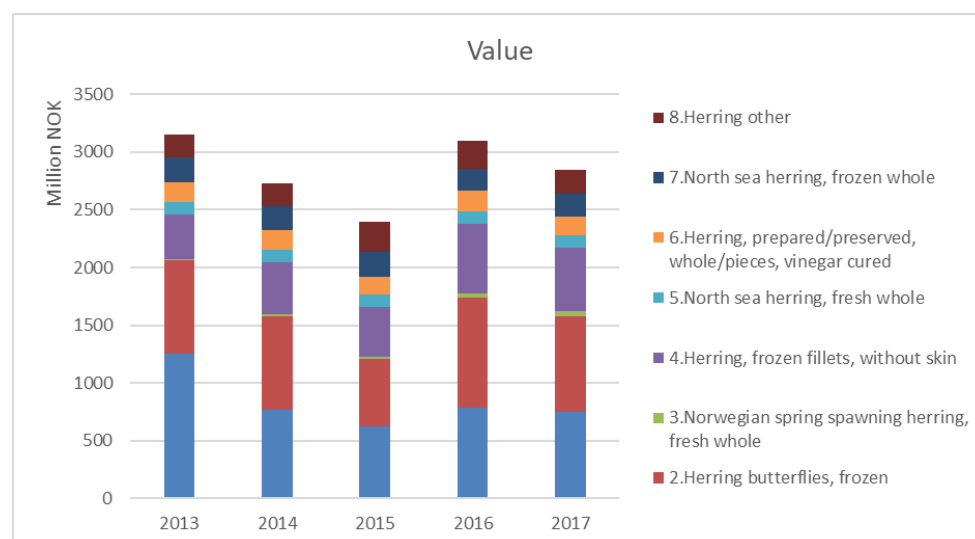


Figure 12 Product varieties of herring.

“Profitability in the last years has been challenging. When there is access to capelin it is better, but this vary a lot. The capacity utilization is very low. In 2016 the days of operating was only 50-60 days throughout the year”. (Norwegian producer)

3.4.2 Main markets

Main markets for Norwegian herring is shown below.

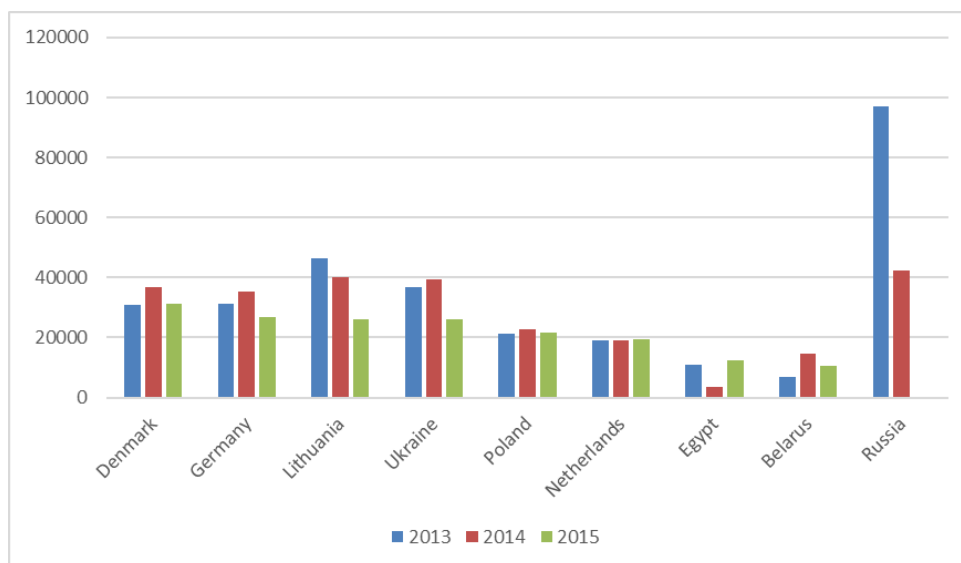


Figure 23 Main markets for Norwegian herring. Source: www.seafood.no

3.4.2.1 Import from the perspective of consuming/processing country Germany as an example.

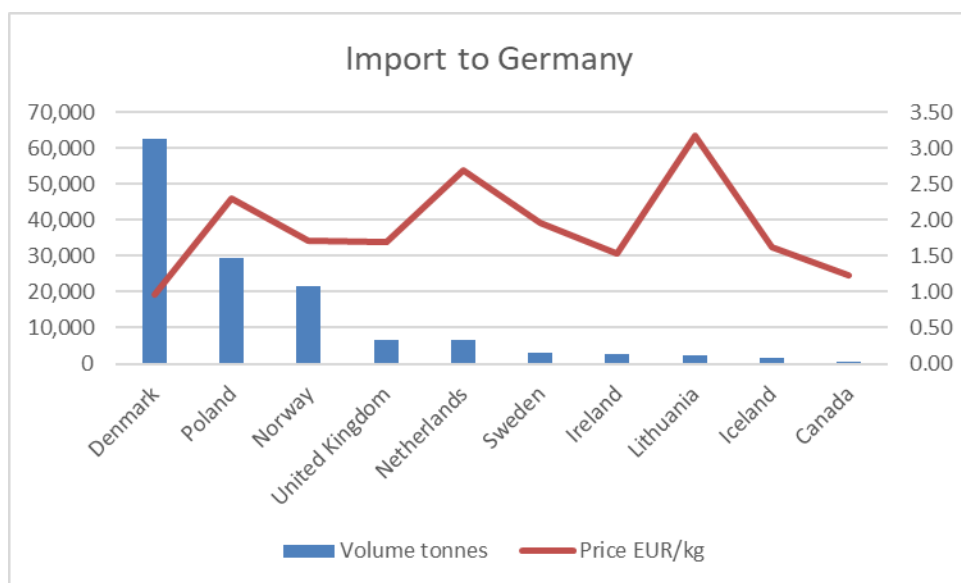


Figure 24 Import of herring to Germany.

3.5 Concentration in herring processing

Over time there has been a marked increase in the processing of herring in Norway. From the mid 1990s there was an increase in the number of active producers, and a marked increase in capacity, both measured as processing capacity per hour, filleting capacity and freezing capacity per day. Note that in the following we will discuss producers of pelagic fish in general, as we have not managed to extract herring data only. Herring constitutes between 35 and 50 % of the exports of pelagic fish from Norway during this period.

Below we present a measure of concentration, CR4, from 1995 through 2015. CR4 shows the share of production of the largest four producers. Over time there has been an increased concentration.

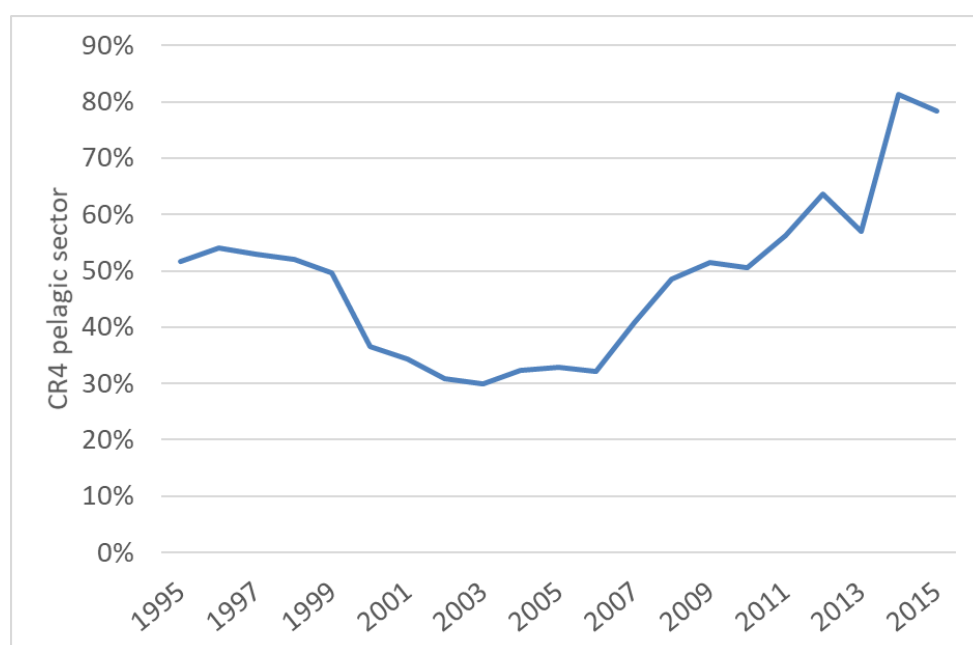


Figure 25 Concentration in the Norwegian pelagic industry.

There was a decrease in concentration from the mid 90ies till around 2005, where more companies established processing plants for pelagic species. The steepest increases in concentration was seen from 2006 to 2008, with the merger that shaped Norway Pelagic, with 16 processing facilities included. The last steep increase is the result of the merger into Pelagia, also resulting in a strong concentration of herring for both human consumption and oil and meal.

3.5.1 Industry Lifecycle

There is a certain tendency of an increased importance of this sector to the economy, as demonstrated in Figure below. The increased contribution to the economy coincides with an increased concentration (without any causal relation

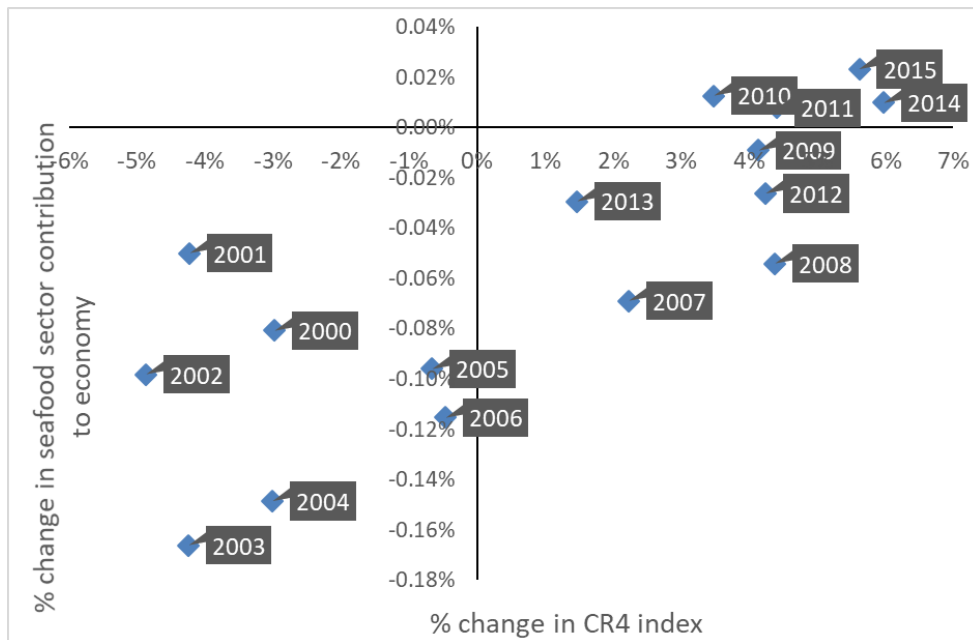


Figure 16 Change in the seafood sector contribution to the economy and consolidation

The pelagic industry does not seem to be occupying a larger share of the seafood sector.

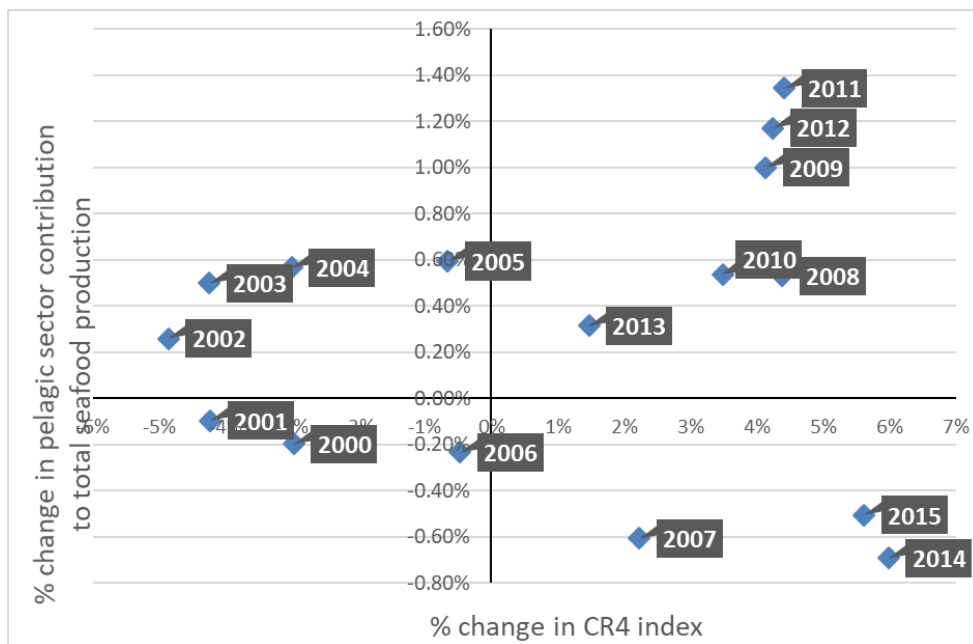


Figure 17 Change in pelagic sector contribution to total seafood production and consolidation

3.6 Overall economic performance and competitiveness of the fisheries value chain

3.6.1 Governmental form

The value chain for pelagic fish from Norway is characterised by strong competition throughout the value chain.

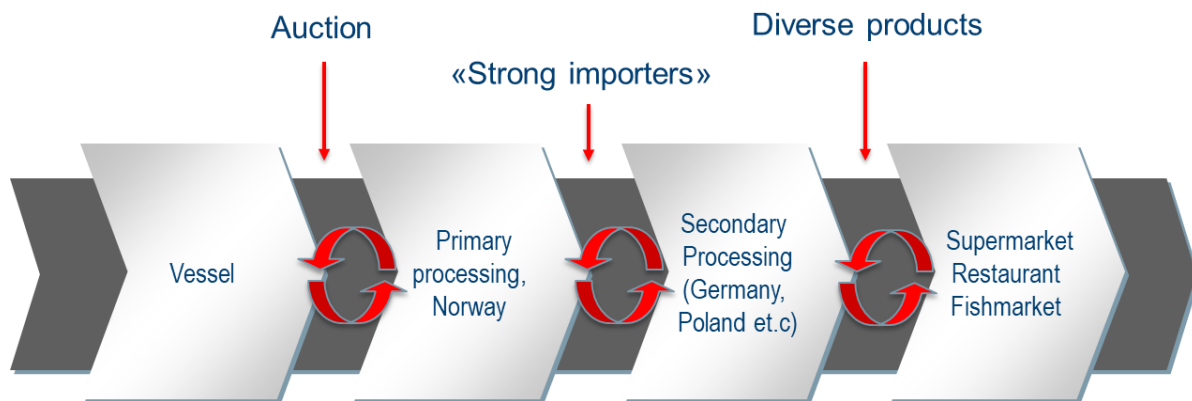


Figure 18 The value chain for Norwegian herring, with three intermediate markets

Herring from Norway is sold in three intermediate markets, with quite different characteristics:

5. The Auction Market
 - a. Many sellers (more than hundred), but one sales point
 - b. Around 25 buyers, huge landing and processing capacity
 - c. First-price, sealed-bid auction
 - d. Strong seasonal peaks
 - e. Quality is variable and hard to control, but generally good
 - f. Efficient auction: leads high profitability in the fleet, low in processing
6. Export of whole frozen or fillets
 - a. Few buyers in each market, which makes the position of Norwegian exporters weak
 - b. Fish is resold to many small producers in some markets, for further processing
 - c. Contract or spot sales
 - d. Relations are important
7. Processed products
 - a. Supermarket chains: Strong buyers in consolidated retail markets
 - b. Huge diversity of products

Main traits/implications:

- d. Efficient auction leads to highest possible (sustainable price: the price that brings down profitability to just above zero in processing) prices: high profitability in the fleet, low in processing
- e. Very efficient primary processing in Norway, highly automated, with large quantities produced at high, even and predictable quality
- f. This is an industry not very well suited to differentiated products, as production is based on scale and standardisation, therefore unlikely to move into highly diversified and small-scale retail markets

The value chain for European herring is quite diverse, with herring moving from the fleet to the consumer through a high number of possible “paths”. Different forms of processing take place in different locations, sometimes with a different number of trading links in between. This makes it hard to describe the production of herring as one value chain. Thus, it is also hard to quantify the different streams.

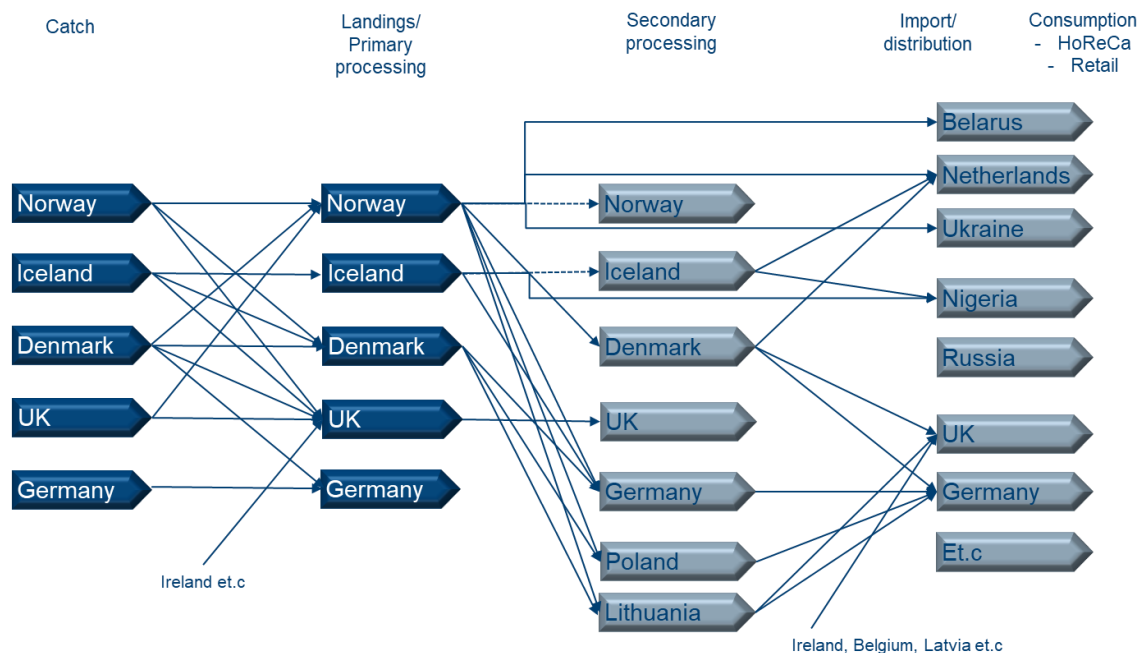


Figure 19 Different streams of herring through the value chain

The power in the value chain seems to be at both extremes of the value chain. The fleet has a very strong position, as it holds a raw material in high demand, and has an auction system able to command the highest possible price for the herring. On the other extreme, supermarket chains act as very strong buyers from processing firms, leaving processors and traders in the value chain in a weak position.

In Norway we have seen several mergers in an attempt to weaken the competitive pressure, and thus to gain a higher margin, only to find that other producers strengthen their position in the wake of the dominant firm. This can be seen in Figure 10, where profit increase after the merger of two large and several smaller companies into Norway Pelagic from 2007. Higher profit for a few years, then their share of the industry diminishes as other companies challenge their position.

Norway Pelagic merged with Egersund Seafood into Pelagia (effective from 2014). It remains to be seen if the competitive pressure will go down as a result of this.

3.7 Strategic Positioning Briefing

- Independent Small boats owners
 - Small boat owners operate a bit differently than the larger purse seiners. They mostly fish close to the coast, often inshore, and through a larger portion of the year than the larger fleet
 - They often sell outside of the auction, to smaller firms, and often to much higher prices than in the high season

- The larger coastal fleet has much of the same pattern as the purse seiners. A share of their catch is sold on contract, sometimes at a lower price than purse seiners. The lower price might stem from both the inability to travel long distances with the herring and the fact that some struggle to achieve the high quality delivered by the most modern purse seiners
- Independent big boat owners
 - All boat owners might be characterised as independent. The sector is dominated by a large and homogeneous fleet of purse seiners (78 boats), where a few boat owners own 2-3 boats, but where no firm catch more than 2 % of the catch value.
- Individual producer
 - Most major processors have a very high degree of automation
 - A few producers producing more processed products, but still only semi-processed, have a slightly higher proportion of manual operations
- Vertical integrated company in fishing, production and marketing.
 - With almost all of the herring sales going through the first-hand auction, the degree of vertical coordination is very low, even though some boat-owners are major stakeholders in processing firms.
 - Even though some of the boat owners also have ownership in processing companies, all of the fish is sold on auction, leaving very little room for vertical coordination.

	Description	Share of Herring fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Coastal seiners 11 – 21m	Close to shore, small-scale fisheries, often off-season	9 %	Medium - capital intensive quota price	Better handling, buy quota.	Quota reduction, price reduction	Almost all goes through auction markets.	Lack of dynamic
Coastal seiners > 21m	Seasonal fisheries of herring and mackerel (and demersal fisheries in other seasons)	18 %	Medium - capital intensive quota price	Better handling. Sale contracts with producers.	Quota reduction, price reduction	Auction markets	Maximize first sale price.
Purse seiners	Large, modern fleet, RSW and good handling > both high efficiency and high quality. Catching in short seasons for herring (and in particular mackerel)	55 %	High - capital intensive quota price	Sale contracts with producers. Buy quota.	Quota reduction, price reduction	Auction market	Maximize first sale price.

Large company in production and marketing	Companies with processing facilities and sales office. High degree of automation in processing. Producing frozen whole and filleted products.		Low/medium/high. Low investment for small/medium-scale simple operations (existing, idle plants), high investment for large, automated factory	Branding, more processed products, market relationships, usage of by-products.	Unstable currency	Auction towards the fleet, highly competitive markets for products,	hard to increase value creation.
Small company in production and marketing, specialising in semi-processed products	Companies with processing facilities and sales office. High degree of automation in primary processing, smaller scale secondary processing. Producing frozen whole and filleted products, as well as marinated smaller pieces.		Medium - depends of market relationships	Branding, market relationship, long time contracts		Auction towards the fleet, highly competitive markets for products	
Export and marketing companies with no own production	Sales company selling fish products from VICs and smaller producers by long term contracts and adhoc trade. Sourcing fish from Iceland and other countries.	0	Low, requires capital to finance ownership of a few hundred tons. Based on market knowledge and relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Relationships are a pre-requisite, but not sufficient, actual trade based on spot price	Monitor markets needs and preferences and share market signals to producers. Risk reduction through network of suppliers.

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G. Sogn-Grundvåg, D. Zhang and A. Iversen (2017): Price Formation at the Norwegian Pelagic Auction. Submitted for Marine Policy



Iceland country report herring

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Sveinn Agnarsson (UICE)

February 2018

4.1 HHI index

One way of expressing consolidation in the seafood sector in different countries is to calculate HHI or Herfindahl, Hirschman index which for the seafood sector can be calculated by summing up the squared quota shares of the firms in question. The index value is found by the sum of the squared market shares of all firms (N): and can be expressed as a normalized figure ($0 \leq \text{HHI} \leq 1$), or taking numbers between 5 and 10,000, for whether market shares are expressed in percentages or rates.

For a company with 100 per cent market share the value will be 10,000 (or corresponding 1), while for a market with 10 firms and 10 per cent market share each the value will be 1,000 or 0.1.

- An H below 0.01 (or 100) indicates a highly competitive industry.
- An H below 0.15 (or 1,500) indicates a concentrated industry.
- An H above an H between 0.15 to 0.25 (or 1,500 to 2,500) indicates moderate concentration.
- 0.25 (above 2,500) indicates high concentration.

Other way to express this consolidation is to calculate the concentration ratio for the biggest companies. For Iceland this is done for the biggest (CR1), the five biggest (CR5) and the ten biggest (CR10).

In table 1 the development in the pelagic sector is expressed for the years 2000 and 2017.

Table 21 Concentration calculation for Iceland the years 2000 and 2017

	2000			2017			
	Herring	Capelin	Blue whiting	Herring	Capelin	Blue whiting	Mackerel
Number of vessels	36	41	19	14	12	15	67
Concentration ratios							
CR1	9.2%	9.6%	21.7%	19.3%	19.7%	18.6%	14.0%
CR4	28.9%	32.6%	56.7%	62.3%	58.3%	60.7%	47.5%
CR5	34.1%	38.3%	63.7%	70.1%	68.6%	69.0%	56.9%
CR10	54.1%	55.2%	92.6%	97.3%	97.2%	96.5%	89.1%
HHI	0.0421	0.0459	0.1205	0.1232	0.1190	0.1221	0.0902

Data for the calculation is from the Directorate of Fisheries in Iceland. Calculations based on catches by all vessels reporting pelagic catches in 2000 and 2017. Concentration calculated by vessel operators; if an operator has many vessels catches of them all are combined.

- It is clear that consolidation has been taking place in Iceland looking at the CR index and biggest company CR1 is close to the quota ceiling of 20%
- The CR10 points toward great consolidation where the 10 biggest have well over 95 % share of most pelagic species.
- The HHI index express that the industry has moved from being a competitive industry to being an almost totally concentrated industry in 2017.

4.2 Fisheries management system

The quota system was introduced in 1983 in Iceland, with quotas on important species, either in the form of quantities or limitations regarding the number of days that ships could fish each year. Before 1983 a quota system had been introduced in the herring fisheries in 1975, and in 1980 this was extended to the fishing of capelin. The main pressure for introducing the quota system was declining fish stocks; first the collapse of the herring stock and later the foreseeable collapse of the capelin stock unless preventive measures were adopted. The same can be said about the demersal species before 1983 when the stock had been declining due to over-fishing. Hannesson (1994) has pointed out that the ownership of quotas involves the right to catch the fish but does not entail ownership of the fish stock. Thus, it is claimed that the quota does not mean the ownership of the fish but rather the right to catch the fish.

From the beginning of the quota system, the quota has been bound to the fishing vessels. In the first years, two main systems were active. First there were quantity quotas where the fishing vessels were assigned certain quantities that they could catch. Then there was the fishing effort system that allowed the vessels to fish for a certain number of days during the year. Later the fishing effort system was abolished for all vessels except for boats under 10 tons that could choose between the two systems. In 1995 the Fisheries Management Act was slightly modified so it would also cover boats under 10 tons, which before had been exempt from the quantity quota (Fisheries Association of Iceland, 1996). A separate small boat quota system (jig and line; isl. krókaaflamarkskerfi) is still available for boats less than 15 GT. These are only allowed for fishing with handlines or longlines. These boats get quotas for all the major demersal species and can freely transfer the quota within this system. However, to prevent consolidation of fishing rights these quotas cannot be transferred to the common quota system.

4.2.1 Quotas

The law in relation to fishing was amended in 1990 to make the quota system more effective, but previously almost all law concerning the quota had attempted to respond to declining fish stocks due to over-fishing. According to the Fisheries Management Act No 38/1990 no one can catch fish inside the Icelandic economic zone without permission from the Ministry of Fisheries, and licenses are allocated for one year at a time. Due to this law, all major fisheries inside the Icelandic economic zone operate according to a uniform system with transferable quotas in all species and fisheries. Hence, nearly all fishing vessels have individual transferable quotas (ITQ), allowing ship owners to buy or sell quotas between ships.

Saevaldsson and Gunnlaugsson (2015) capture the development of the fisheries management system in the pelagic sector in their article about the “The Icelandic pelagic sector and its development under the ITQ management system” in Marine Policy. According to them the main changes were made in 1975 when IQ is implemented on the Icelandic herring and then in 1990/91 when ITQ was implemented.

Table 22 Chronology of the Icelandic pelagic management system

Icelandic herring	1969	TAC imposed
	1972–1974	Herring fisheries prohibited
	1975	IQ introduced and allocated to vessels

	1979	ITQ transferable, among herring licensed vessels
	1980–1983	Ships participating in capelin fisheries temporarily allowed to fish herring
	1990/1991	Unified ITQ system, transferability of quota. Capelin vessels allowed to catch herring
Atlanto-Scandic herring	–1968	Record catch 1965 and 1966, stocks collapse 1968/1969
	1994	Icelandic fisheries commence, following break since 1969
	1995–2001	Quota allocated to vessels in accordance with size
	2002	TQ and part of the uniform system of ITQ's
Capelin	1964	Fisheries commence, catch increases consecutively until 1979
	1980	IQ introduced and allocated to licensed vessels
	1986	ITQ transferability of annual quotes, among capelin licensed vessels
	1988	ITQ permanent quotas consolidation, among capelin licensed vessels
	1990/1991	Unified ITQ system, almost freely transferable quotas
Blue whiting	1973–1983	Open access, maximum annual catch 35.000 metric tons in 1978
	1996	Fishing commences, following a break since 1983
	2002	ITQ allocated to vessels as part of the uniform system of ITQ's
Mackerel	2006	Fisheries commence
	2008	Open access TAC
	2010	IQ introduced, with minimal transferability

The implementation of ITQ in 1991 meant that capelin vessels that were not allowed to have herring quota, could buy herring quota. Hence, it can be claimed that this is the starting point of specialisation in the pelagic sector and consolidation that was necessary for economical sustainably fishing within this part of the sector. There is a limitation (quota ceiling) for the consolidation in the FMs as one company cannot hold more than 20% of the TAC in Icelandic Herring. This quota ceiling is active for Icelandic herring and capelin within the pelagic species that Icelandic companies are fishing.

4.2.2 Main influence on the value chain dynamics

Entry barriers into the system

- All professional fishing in Iceland requires a licence
- Strict laws govern ownership of vessels holding quota (and processing)
 - Must be Icelandic or controlled by Icelanders – foreigners can only own 25% in fishing or fish processing companies
- Capital intensive due to extremely high price of quota (compared with value of products)
- High investment cost in vessels and technology to chill the fish-on-board and process the fish
- Seasonality of the fishing

- Economics of scale and scope
 - Multispecies access is necessary (capelin, blue whiting, mackerel)
 - Reduces seasonal fluctuations and optimises the use of capital
- Small boat access
 - Competitive fishing
 - Migration creating uncertainty in fishing
 - Instability in issuing quotas (political)
- Limited market connection in the price settling mechanism
 - Non-active auction market
 - Low competitiveness due to lack of economics in scale

Exit barriers

- Quotas easily sold and markets available – in Iceland
 - Consolidation is set at 20% for herring which can affect exit
- Vessels and equipment can be sold on the open market

Possibilities to upgrade in the system

- There is no restriction on upgrade or move from species but due to the specialisation of pelagic fishing and processing the vessels/processing are simply too specialized to easily allow a move from pelagic to other species e.g. demersal. This also applies for the processing or freezer trawlers
- Small boats there are limits, except when going into the coastal or quota system

Transferability of quota/regional regulations

- Quota ownership
 - Limitation on consolidation of quota ownership – max 20% ownership of TAC for herring
 - Quota is bound to fishing vessel but companies with number of vessels can transfer quota between vessels
 - 15% of TAC can be transferred between years by companies (need to be confirmed)
 - 5% can be overfished in the fishing year and will then be withdraw from next year TAC

Management measurements

- Landing obligation
 - None
- Min processing requirements
 - None
- Fishing days – regulations /number of days
 - None
- Quantity
 - None
- Closures

- Marine Institute has licences to introduce closures fishing areas if for example share of small fish is too high according to landing or historical landing data
- Discard ban
 - Herring discards were banned in 1977 (with 5 other species)
 - In 1996 a ban on all discards of fish; all species
 - There are measurement's in place to avoid discard
 - Limited withdrawal on unwanted catch from TAC
 - Up to 0,5% of herring can be landed as VS fish (project fund for fisheries), has to be weighted and not is withdraw from TAC
 - 20% to vessel and 80% to the fund
 - Damaged fish is kept separate and weighted not withdrawn from quota
 - By-catch should be recorded, but is mainly cod and lumpfish

4.3 Industry structure and employment

Iceland has access to two stocks within the Atlantic herring, the Icelandic summer spawning herring and the Atlanto-Scandian herring (spring-spawner). Once the yearly quota has been determined for the stocks, it is divided and allocated to individual vessels. In recent years a consolidation has occurred for the quota to relatively few companies that specialize in pelagic fish species. The companies own both vessels (and quota) and processing facilities for food and feed products. For this reason, the value chain structure for pelagic species in Iceland is very simple: the fish is caught and landed by the vessels at their own processing facilities. The herring is processed mainly into frozen fillets, or as headless and gutted fish, and the rest materials and discards are used for fish meal and oil. A small part of the catch is salted and sold as fillets or fillet pieces and currently only two processors have facilities and resources for salting, Lodnuvinnslan in Faskurdfjordur and Vinnslustödin (via Marholmar) in Westman Islands.

The Icelandic herring value chain consists of relatively few components. Figure 1 shows the input-output structure of the Icelandic herring value chain and below are descriptions of the links in the value chain. The stages of the value chain will be described briefly below.

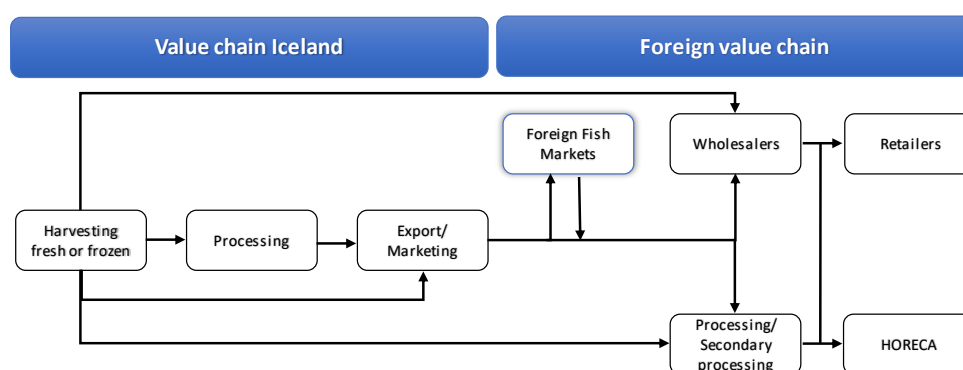


Figure 1: The input output structure of the Icelandic herring value chain

All the companies in the pelagic sector would be regarded as vertically integrated and all of them in mixed operation of pelagic and demersal fishing and processing. Due to this fact no differentiation can be made between the sectors and in the discussion on consolidation, profitability and main influencing factors the Icelandic part of the value chain is used.

4.3.1 Employment

In 2016 it was estimated that 6.600 people worked directly in fishing and fish processing which was a decrease of 100 employees from the year before as can be seen in Figure 5. The number of jobs in the seafood industry accounted for a 3.5% of total jobs in the Icelandic economy in 2016. The seafood sector remains one of the pillars of the Icelandic economy, responsible for a fair share of GDP (8.4%) which is far higher than the percentage of total jobs in the industry.

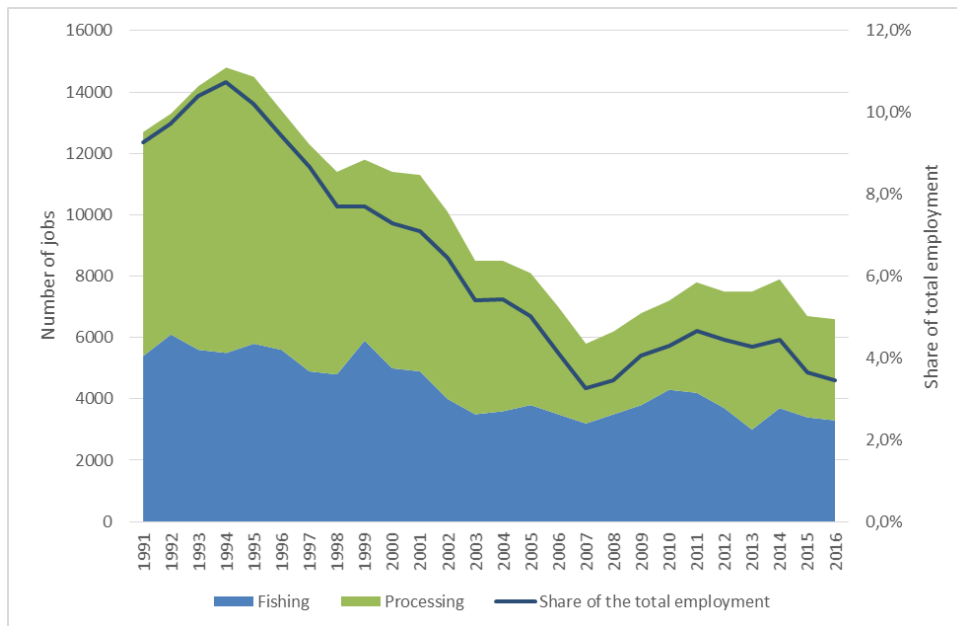


Figure 2. Number of jobs in fishing and processing 1991 to 2016.

According to data from Islandsbanki, each employee made products for the value of 48 million Icelandic krona and the value per employee has been rising during the last few year, due to automation in processing and partly because of better technology in the fishing sector. Productivity in the seafood industry has increased in recent years due to:

- More automation, both in fishing and processing of seafood
- Fish being more highly processed in Iceland before exporting
 - Fillets instead of HG (headed and gutted) for further processing abroad
- Changes from processing on sea to processing on land, where utilization is better (better filleting yield) and promotes better use of by-products and creates more value from each fish.

Employment in the herring sector has changed a lot since the 80s when the most common processing form was salted herring. Today only one company focuses on salted herring (Loðnuvinnslan) and there is some salting carried out at Marholmar a subsidiary of Vinnslustodin. Other processing companies are focusing on frozen herring, as whole (H&G), fillets and butterfly fillets. The rest materials (head, cut-offs, intestines) go for fish meal and oil.

The salting process is highly labour intensive both during the processing and afterwards in filling the barrels with brine and in turning the barrels, to ensure good maturation during the salting. The frozen production has been largely automated during the last decades making the processing almost fully automated but very capital intensive. The development started in 1996 when the output of typical frozen pelagic plant was maximum 300 tons per 24 hours. Now (figures for 2014), about 650 tons and requiring only half of the personnel needed in 1996 (Saevaldsson & Gunnlaugsson, 2015). The automation development in pelagic sector has been faster than in the demersal processing and the degree of automation is higher. This is probably due to the degree of processing, as the pelagic products are mainly commodity for further processing abroad. The same development can be seen in the pelagic fishing fleet; the number of pelagic vessel has decreased as well as the number of fishermen.

4.3.2 Fishing

Historically the catches of herring have fluctuated from one year to another. On a global level the catches of Atlantic herring have fluctuated highly as can be seen in Figure 1. Herring was the main pelagic species caught in Iceland until the collapse of the Atlanto-Scandic herring in 1966. Capelin took over as the main species and was the most important pelagic species in Iceland from 1970 until about 2005. Catches from the Atlanto-Scandic herring stock commenced again in 1994 and have been along with blue whiting of high importance for the pelagic sector. (Figure 5). Blue whiting is mainly been used to produce feed.

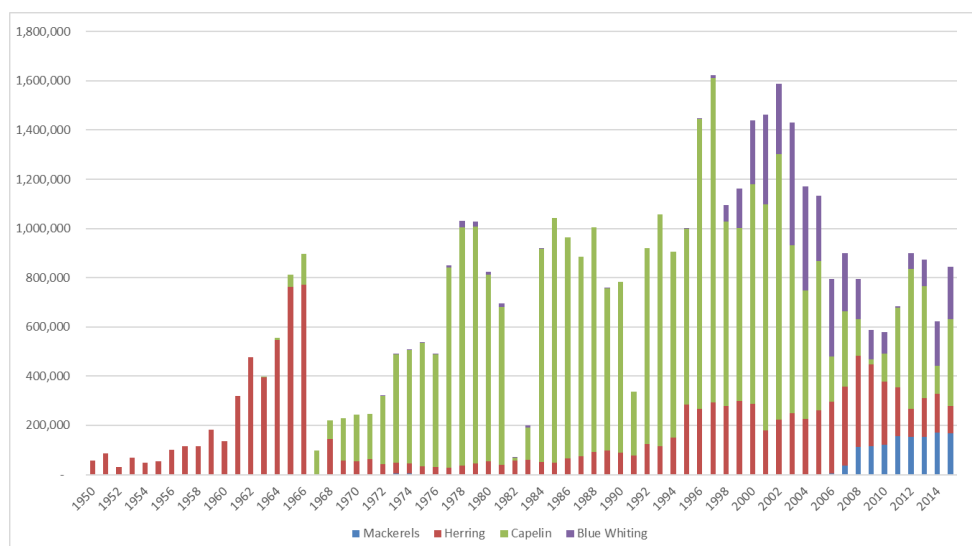


Figure 3. Pelagic fishing in Icelandic water 1950 to 2015

In 2007 mackerel entered the Icelandic jurisdiction and has been caught every year and has been an important addition to the pelagic catch.

Although, historically the pelagic sector has been highly seasonal due to the short seasons of individual pelagic species, it has become in the last few years almost operational “all year” by switching between the species (Figure 4).

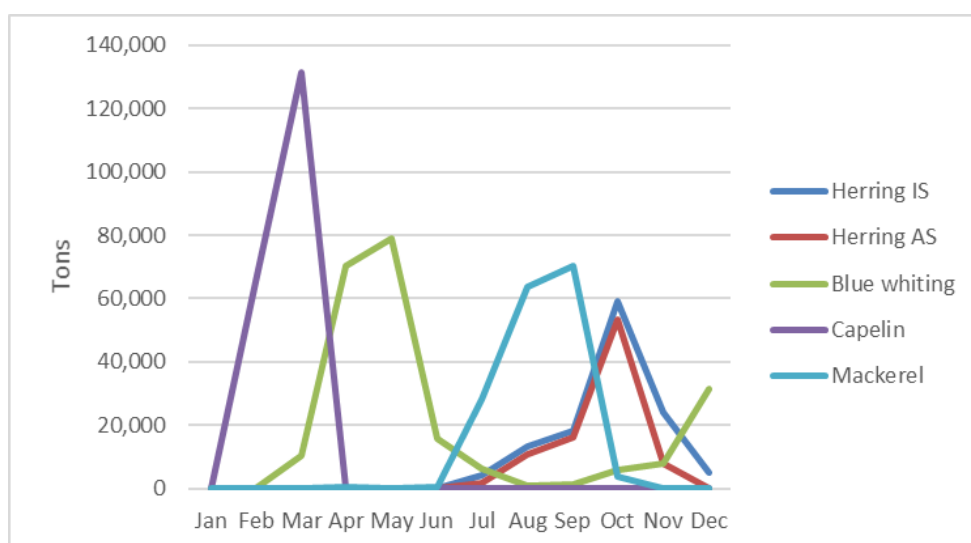


Figure 4. Seasonality of the pelagic catches (figures show catches by months in 2017; Statistics Iceland, 2018).

The difficulty with pelagic fish species is their seasonality and the uncertainty in stock size and quota. Traditionally fish such as herring and mackerel are caught at the time when their fat content is high and they are in good condition for human consumption. The pelagic seasons are as follows in Iceland: Capelin caught between January until middle of March, as at that time the fish migrates close to Iceland for spawning and the fish is valuable for food product (frozen fish, female with roe and finally roe). Blue whiting, which is usually caught during the period March into May or early summer. The mackerel is caught while it is in the Icelandic jurisdiction from June until September and finally herring; first the Atlanto Scandic herring and then the summer spawning stock usually from end of September until December. At that time the herring is fat and is in the best condition for various food products.

The supply of herring is landings from Icelandic vessels. There is some import of herring consumer goods for the domestic market, less than 50 tons annually (Statistics Iceland, 2018), but this import will not be covered in the report. The below section will briefly describe the Icelandic catch sector.

4.3.2.1 Structure of the fleet.

Icelandic landings of herring (and the fleet): The catches of herring are concentrated onto a few large vessels (+60 m trawlers and purse seiners). The fish is landed mainly as fresh chilled (RSW) fish, but part of the landings are from factory vessels that land the herring as frozen whole or as frozen fillets. It is unusual for Icelandic vessels to land in foreign ports as well as foreign vessels landing herring in Iceland.

4.3.2.2 The herring fleet

The Icelandic herring catches are now mainly caught by large vessels of the size 1.400-5.000 gross tons (78% of the catch in 2014). These boats are +60 m. The remainder is mainly caught by vessels of the size 1.000 to 1.399 gross tons (17% of the catch in 2014). Some of the vessels (1.400-5.000t) are freezer trawlers that additionally process the catch on-board into either whole frozen fish (or H&G) or fillets. Most of the catch is now trawl-caught but some is caught by purse seining. From 2003 there have been radical changes in the size of vessels; in 2003 all the herring catch was caught by relatively small vessels (0-50 gross tons). From 2005 onwards, the catch for this size of vessels has been virtually zero except for the last 2 years when they caught 10% and 4% of the herring catch respectively. Recently, a quota has been issued for small boats which currently is 800 tons annually (Anon 2017a).

Table 23 Trawl and purse seiners 1.400-5.000 gross tons, share of the Icelandic herring catches and herring dependency (herring share of gross income) Source: Statistics Iceland, 2018.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Share of Icelandic catches (%)	0	5%	50%	37%	58%	64%	68%	67%	69%	77%	69%	78%
Herring as share of gross income (%)	0	19%	35%	19%	24%	33%	32%	22%	24%	23%	16%	20%
Avr. Price/kg (€)	0,10	0,22	0,27	0,19	0,15	0,26	0,31	0,33	0,56	0,56	0,47	0,43

In 2014, the fleet segment (1.400-5.000 gross tons) consisted of 16 vessels; in 2010, it consisted of 11 vessels. This fleet segment specialises in catching pelagic fish and has caught between 62-69% of the total Icelandic pelagic catch (capelin, blue whiting, mackerel and herring) during the period 2009-2014.

The pelagic fleet has been renewed in the last decades. RSW cooling was first introduced in 1996 and in 2012, 87% of the cargo of the pelagic fleet has RSW cooling system (Saevaldsson & Gunnlaugsson, 2015). This has had great influence on the quality of the raw material as can be seen by landings to meal and oil being 70.7% of the Icelandic herring in 1992 but in 2016 it was 14.9% of the herring.

Frozen at sea started in 1996 but increased rapidly from the year 2000 as can be seen from figure 5 which show the total catch of both Icelandic herring and the Atlanto-Scandic and the share of landing that goes to domestic processing and frozen at sea. The frozen at sea peaked in 2005 when 55% of the total herring was frozen at sea. Since then the frozen at sea accounts for around just over 20% of the total catch or in 2016, 23% of the total, 18.3% of the Atlanto-Scandic and 25.8% of the Icelandic herring.

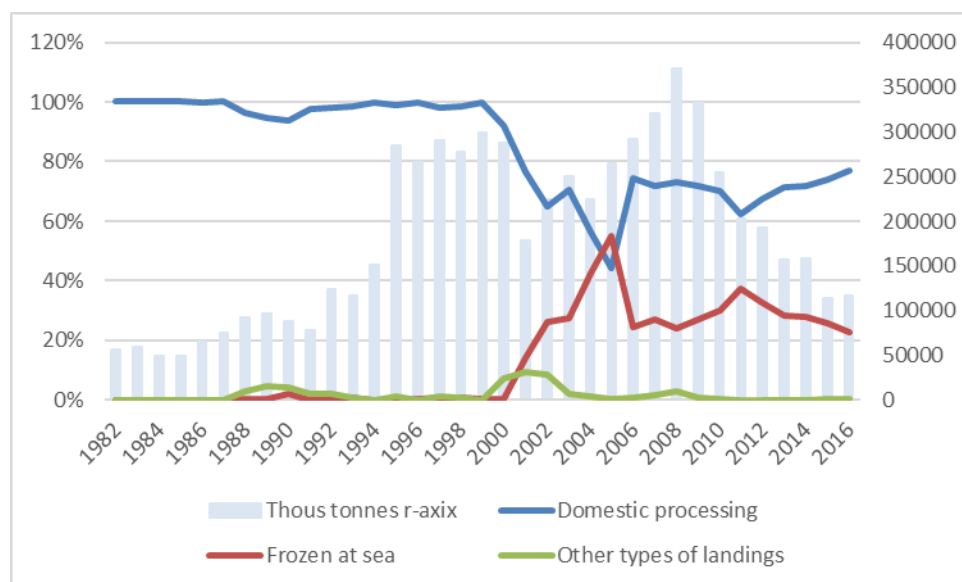


Figure 5. Herring landings 1982 to 2016 – frozen at sea or domestic processing

The freezer trawlers have added to the flexibility and options for value creation within the Icelandic pelagic sector as they are able to process on-board and can follow the fish as it migrates.

4.3.2.3 Landings of herring in Iceland

Figure 6 shows the landings of herring during the period 2000-2017. The landings peaked in 2008 at about 350 thousand tons. From that year the landings have been on a continuous decline. Iceland has 14.52% of the total quota for the Atlanto-Scandic herring but this stock has been declining since 2010 as no large year classes have been produced since 2004 (ICES, 2017). For 2018, ICES advises a quota of 384,197 tons. Further, the Icelandic herring which had shown very stable average landings of about 110 thousand tons annually during the period 1990-2008 became infected with *Ichthyophonus* in 2008. This led to part of the stock dying with low fishing quotas for 2009-2013. The stock is still heavily infected, estimated at 25-45% of the stock depending on the various year classes (Anon, 2017b). It is expected that about 1/3 of the stock will die due to the infection.

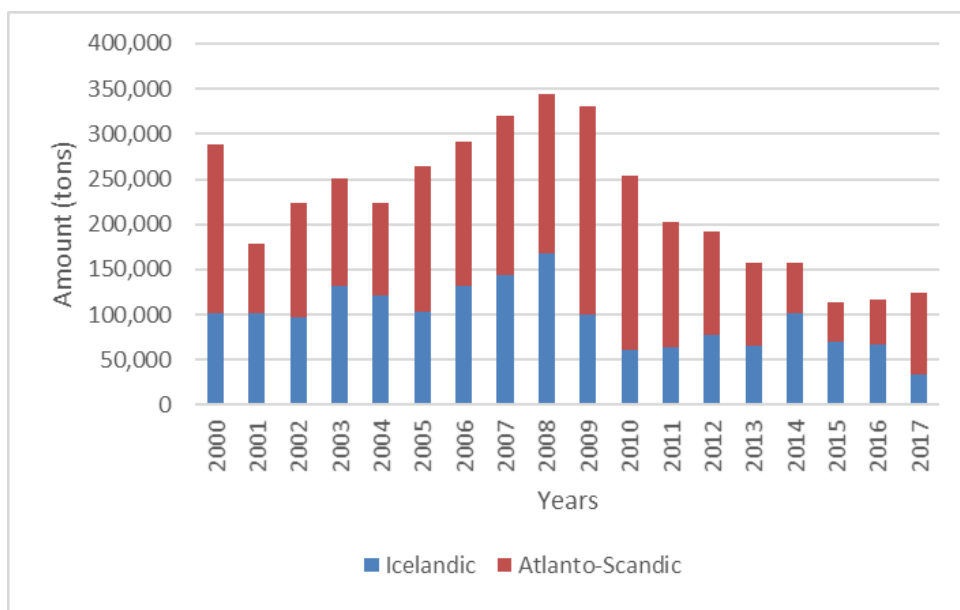


Figure 6: Landings of herring in Iceland during 2000-2017. Source: Statistics Iceland, 2018.

The catch is generally landed directly at the processor, as the companies own both the vessels with the quota and the processing facilities. The herring is not auctioned but the price is determined based on its value for fish meal and oil. The main part of the landed herring is used for human consumption.

Table 24: Herring quota and quota use, Iceland 2006-2015. Source: (Fiskistofa, 2015; ICES, 2015)

	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Iceland	130.000	150.000	150.001	47.000	40.000	45.000	63.133	79.811	77.843	61.479
NVG	106.140	185.600	220.262	238.399	215.183	143.359	120.868	89.817	60.652	41.063
Total	236.140	335.600	370.263	285.399	255.183	188.359	184.001	169.628	138.495	102.542
Total quota use	1,23	0,95	1,00	1,16	1,00	1,08	1,04	0,93	1,14	1,07

4.3.2.4 Fishing gear

Historically the Icelandic herring was caught in purse seine in fjords and in rather shallow water whereas the Atlanto-Scandic herring was caught in much deeper sea and therefore in trawl. Figure 9 shows the catches by gear for the Icelandic herring for the period 1980-2016 (Anon, 2017b).

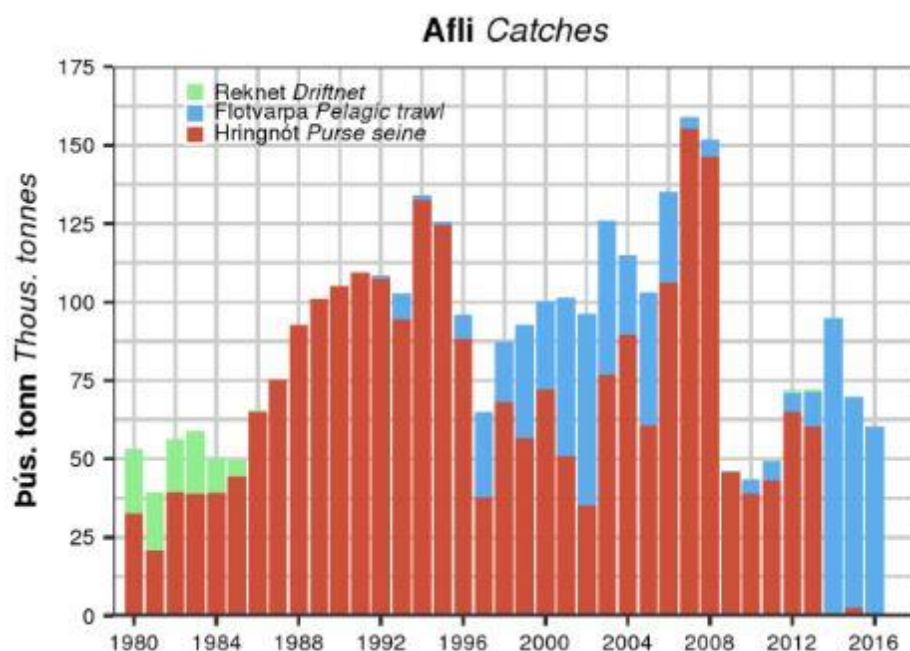


Figure 7. Catches of Icelandic summer spawning herring by gear during 1980-2017.

The use of purse seine has decreased in the recent years and the pelagic trawl taken over as the most important fishing gear. As can be seen in Figure 10 the pelagic trawl has been the dominating fishing gear from 2014.

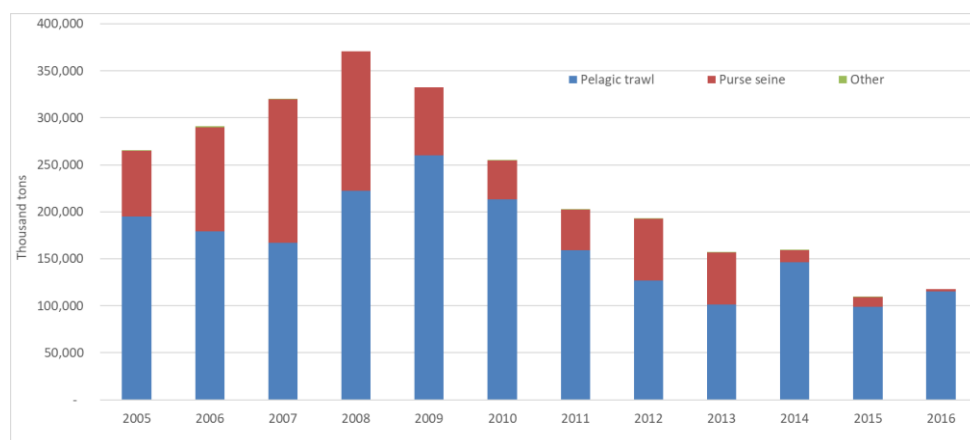


Figure 8. Catches of herring in Iceland by gear during 2005 to 2016.

In 2016 the pelagic trawl dominated the fishing of both herring stocks. In general, the quality of purse seine caught herring is considered better than that of trawl caught herring.

4.3.2.5 Small boat sector

In 2010 the fishing law was temporarily amended allowing the minister to issue a specific quota of 2,000 tons of Icelandic herring and 2,000 tons of Atlanto-Scandic herring for specific allocations (Anon, 2011). The law was amended as the market for herring quota was non-existent creating problems for those utilising herring e.g. as bait. In recent years a part of this quota, initially 500 tons but now 800 tons of the Icelandic herring, has been allocated to the small boat sector (Anon, 2017b).

4.3.3 Price settling mechanism

Price of herring is decided by the Official Bureau of Ex-Vessel Fish Prices (Verðlagstofu Skiptaverðs). The price is decided monthly, where the set-price is changed according to changes in the market price, sometimes with a considerable delay. This price is not used in any transactions other than calculating the vessel crews' wages (based on a share system). It is set by assuming that important cost factors are not included such as direct or indirect costs of quota (leasing or buying).

Historically the price was determined by the market price for fish oil and meal. As the importance of herring to human consumptions has grown, this has changed and the Bureau of Ex Vessel Fish Price now also decides the price for whole herring for freezing. The quantity behind the price is however very limited so the price for fish meal and oil is still the price that is used by the industry. The development of the price in Euros per kg during the last few years in relation to the total catch is shown in Figure 9.

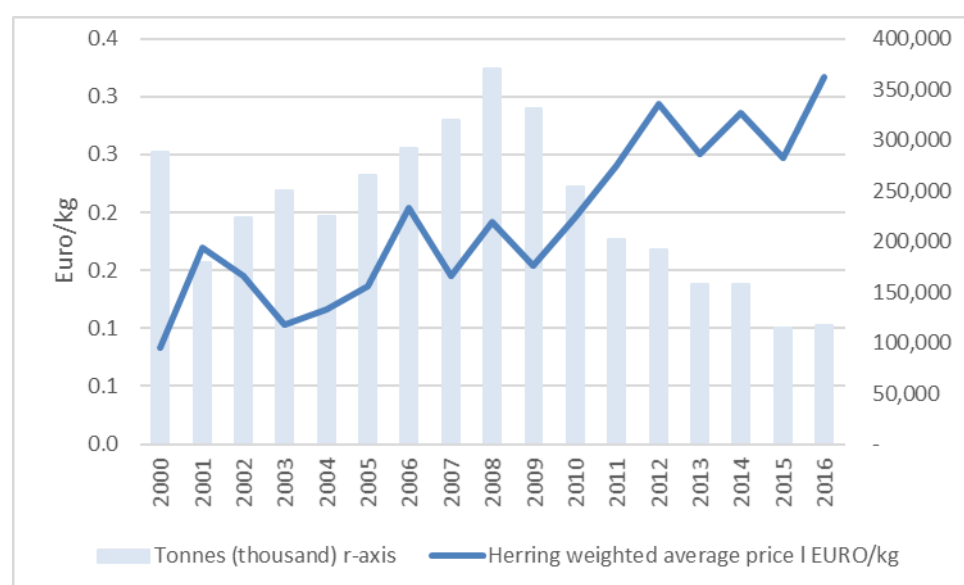


Figure 9. Price of herring according to the official Bureau of Ex-Vessel Fish Prices

Due to the vertical integration within the sector and how the herring is processed very limited quantity of the landed herring goes to the auction markets. The quantity varies, it was 0.19% in 2012 and 0.15% in 2016. This means that there is a very limited effect of the auction markets on the price settling mechanism unlike what is seen for the demersal species. Prices on the auction markets are in general higher than the official price as can be seen in Figure 10.

Figure 10 shows that the auction market price is higher than the official price during the period of study but the limited quantity behind the auction market price makes the comparison unrealistic.

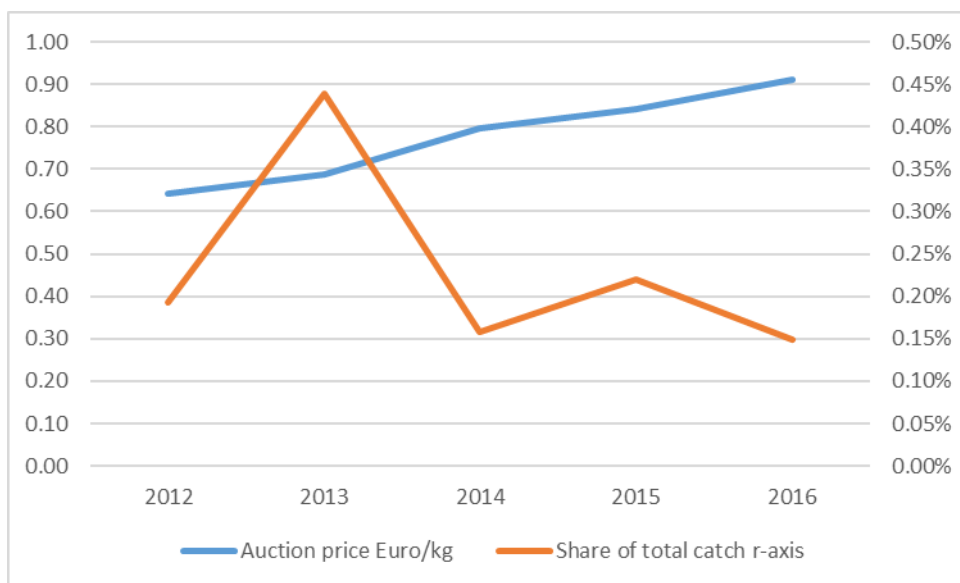


Figure 10. Auction market price and share of total catch

It can be concluded that there is limited marketing influence on the price settling mechanism of herring, as the mechanism is based on the current position and product mix of the industry and there are no new players in the value chain, breaking up that mechanism as has occurred for demersal species in Iceland.

4.3.4 Processing

Historically, the production of fishmeal and oil depended heavily on the catches of capelin and herring, which were the most important species for the meal production. In 1997 about 92.3% of the capelin catch and around 81.3% of the herring was used for fishmeal and oil production¹⁷. Due to an increased catch of herring during the summer time (Atlanto-Scandic herring) the percentage of the catch that went into meal production increased, from nearly 56% in 1991 to around 81.3% in 1997¹⁸.

When the Icelanders started to catch the Atlanto-Scandic herring again in 1994, after the collapse of the stock in 1966 the catch initially was only used for fish meal and oil. The fish migrated from the Norwegian coast to the west to feed and was close to the Icelandic jurisdiction during the summer time (May-July). Further, the fish was often full of feed and caught far from the coast. Few vessels at that time had adequate on-board chilling and no freezer trawlers had yet arrived so the fish was not suitable for land processing.

Figure 13 shows the landings of Atlanto-Scandic herring by months for the period 1994-2016. The figure shows how initially the catches were concentrated to the months of May and June but gradually with improvements in the fleet, (some boats with RSW chilling system and the first freezer trawlers arriving in 1996) a larger and larger part was caught closer to the autumn time. It should be kept in mind that best quality of the Atlanto-Scandic herring for human consumption is obtained during the autumn time. By 2005, a large part of the fish was caught in the autumn time and during the last few years with upgrading of the fleet to RSW on-board chilling most of the catch of the Atlanto-Scandic herring is caught in the autumn time (Figure 13).

¹⁷ Útvegur 1997.

¹⁸ Útvegur 1991.

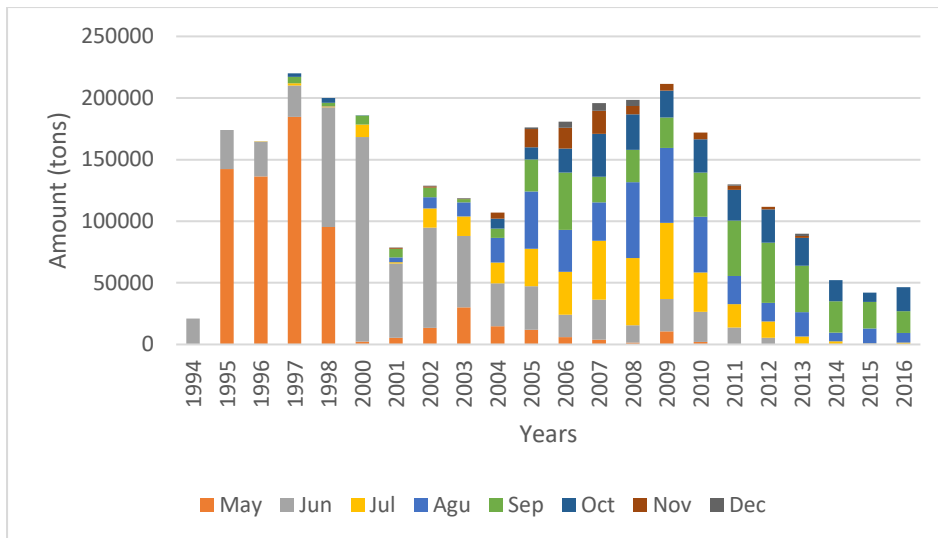


Figure 11. Landings of Atlanto-Scandic herring in Iceland by months during the period 1994-2016

The sector did not only invest in improved vessels but as well in land-based filleting processing (largely automated) and improved freezing and freezer storage. This led to more of the herring catches being processed into fillets or butterfly fillets and the rest materials (bones, head, intestines) used for fish meal and oil. Figure 14 shows that during the period 1994 until 2002 the average export value from Atlanto-Scandic herring was always lower than that of the Icelandic herring reflecting that more of the Icelandic fish was used for human processing. Since 2002 the average export value of Atlanto-Scandic herring has been similar or higher than that of the Icelandic reflecting on the improvements that have taken place in catching, handling and processing of the fish for human consumption.

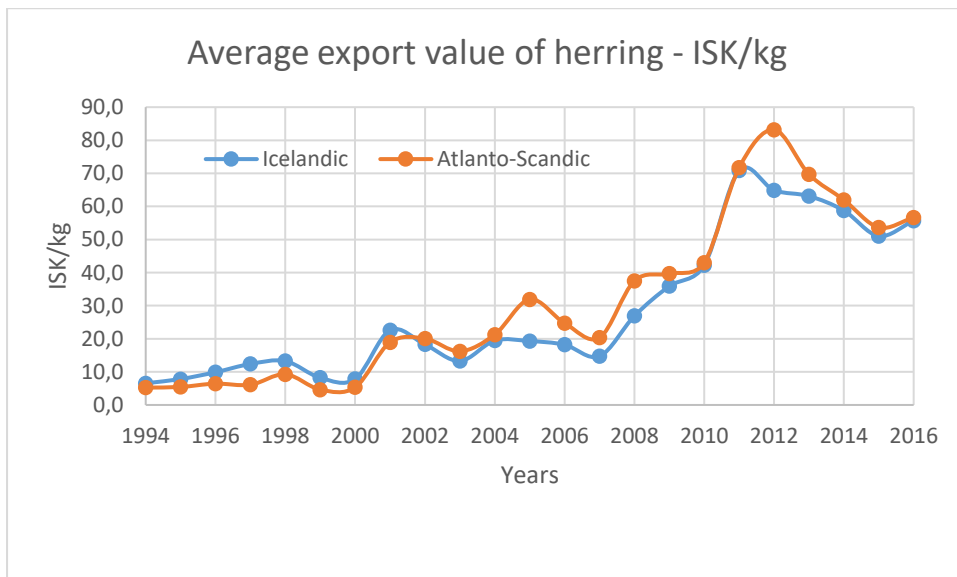


Figure 12. Average export value (ISK/kg) for herring during the period 1994-2010

The quantity of herring that is landed for meal and oil production or reduction has decreased from peaking in 1998 and 1999 when 88.4% of the total herring catch went to reduction. In 2016 this share of the herring catch for reduction is down to 14.9%.

Figure 13 shows the amount of raw material for fish meal and oil production for the period 1992 until 2014. The figure shows the great fluctuation in the amount of raw material for meal production;

currently the main species used for fish meal are capelin and blue whiting. Fishmeal and oil production has fluctuated from around 3% of the total export value of fish product from Iceland to 25%¹⁹.

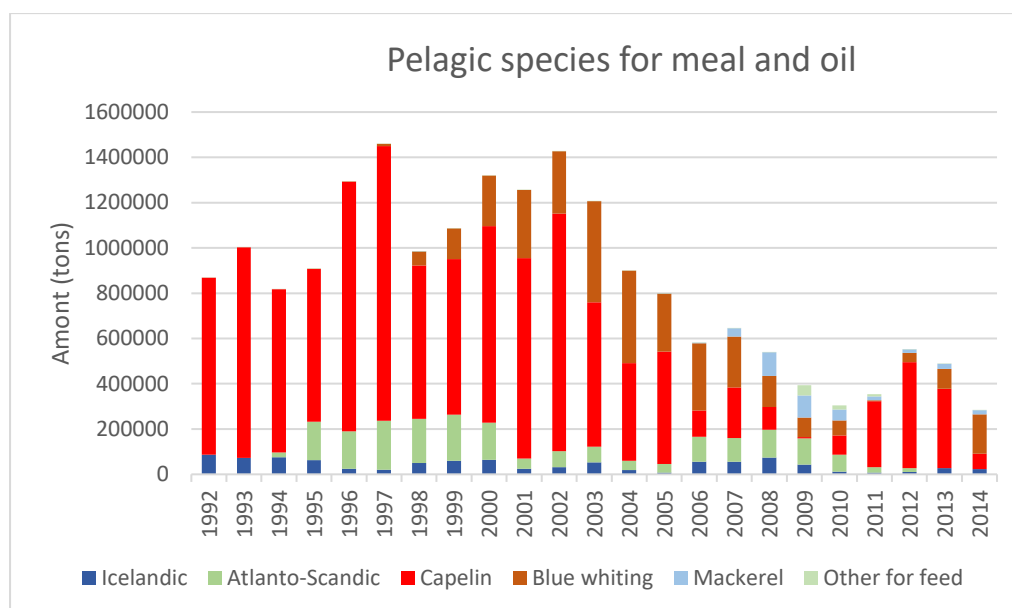


Figure 13. Raw material for fish meal and oil during the years 1992-2014

In view of the fluctuations in the supply of raw materials, the fish meal and oil sector has also gone through consolidations and technological improvements; from the period 1955 to 2015 the number of fish meal plants in Iceland decreased from 54 to 11 (Gudjonsson et al, 2015). Before the 1990s the companies in the fishmeal and oil sector were in most cases separated from other processing companies or the fishing sector. It was though common that fish producers' companies owned a share in fishmeal companies near their processing plants or had a small facility for meal production attached to their production. After 2000 the fish meal and oil sector changed in similar ways as the fishing sector; it went through further consolidation and the remaining fish meal plants became parts of vertical integrated companies. That was also the case for the independent producers of fish meal and oil they were bought up or merged with bigger vertically integrated companies.

The catch of herring in Iceland is now concentrated to a few vessels that are owned by the same companies that process the fish. In recent years the companies have become bigger and quite successful financially by focusing on, not only herring but additionally on other pelagic fish species such as capelin, blue whiting, and mackerel. The setup by the large companies is owning vessels mainly for catching and landing fresh fish (some companies also own factory ships with processing on-board), facilities for processing and freezing the fish and finally fish meal plant(s) for discards and rest material from processing. With this set up, companies have been able to get an excellent return on capital, efficient use of the vessels, facilities and equipment.

In 2014, the summer spawning herring quota was allocated to ten companies. Three of those companies have interlinked ownership and some co-operation so it can be said that 40% of the summer spawning herring quota that year went to companies that work together in catch, processing and marketing. The five remaining companies hold 20%, 14%, 11%, 10% and 3% of the quota. Table 5 shows the share of the 8 companies holding the largest share in the herring quota, along with their

¹⁹ Snævarr, S.

turnover, profit and number of employees. They hold quota in other species as well so profits do not solely come from the herring fishery.

The largest of these companies are all main players in the herring value chain in Iceland and for other pelagic fish.

Table 25: The top 8 companies holding herring quota, their turnover, profit, number of personnel and quota share in 2014. Source: The Icelandic Directorate of Fisheries, 2015.

2014	Iceland herring quota	Turnover €	Profit €	Personnel
Skinney Þinganes	19,59%	59.608.139	11.624.014	247
Síldarvinnslan	15,53%	138.620.691	39.076.764	288
Samherji Iceland	13,74%	119.106.000	24.898.000	410
Ísfélag Vestmannaeyja	13,13%	79.763.659	18.679.726	283
HB Grandi	11,10%	214.911.000	36.320.000	920
Gjögur ISK	10,23%	29.558.037	9.505.276	90
Vinnslustöðin	9,98%	84.291.961	7.217.947	340
Loðnuvinnslan	3,34%	-	-	-

Source: The Icelandic Directorate of Fisheries.

4.3.4.1 Product development and product mix

Processing of herring in Iceland has changed considerably during the period under study (2001-2017). In 2001 and the years before that, considerable part of the herring was salted and exported (salted herring, salted fillets and vinegar cured bits), but during the last few years salting has all but disappeared. In 2001 and the years before that, considerable part of the herring was salted and exported (as salted headless & gutted herring, salted fillets and vinegar cured bits), but during the last few years, salting has all but disappeared. The relative value of salted herring in terms of export value was about 19% in 2001 but from 2010 onwards the relative value is only about 1% (Statistics Iceland, 2018). Although the selling price for salted herring is considerably higher than that of frozen and the market for the products traditional and very stable, most of the Icelandic producers have now stopped producing salted herring. The main reasons for this change is the fact, that the salting has not been streamlined and automated like the freezing and it is still a very manual process. Another reason for this change is frozen herring products are uniform products that can be sold as commodities on the world market, and in the last few years the demand for frozen herring and fillets has been strong and prices for the commodities high. Production and sales of salted herring are however based on manufacturing for individual buyers using their specifications and if there are any issues or problems in the production, the products may not easily be sold to other buyers. Additionally, there are tariffs on some of the salted products into EU. The large producers in Iceland have considered freezing to be more economical and the products easier to handle and sell long-term than salted herring. Now there is only one relatively small company salting herring (Loðnuvinnslan); Vinnslustöðin through their subsidiary, Marholmar, also produces some salted herring. All the others have stopped.

In the last few years, most of the pelagic companies in Iceland have invested in equipment and facilities to freeze the herring efficiently. The filleting of herring has to a large degree been made automatic and investments have been made to improve and enlarge storage facilities for frozen herring.

In 2000 frozen at sea production started to play important role in production of herring (Figures 14 and 15). Until then most of the herring was landed for on-land production. In 2016 around 23% of the herring catch was processed at sea as can be seen in Figure 16. Figure 14 shows that the value of landings frozen at sea account for just over 40% of the total value in 2016.

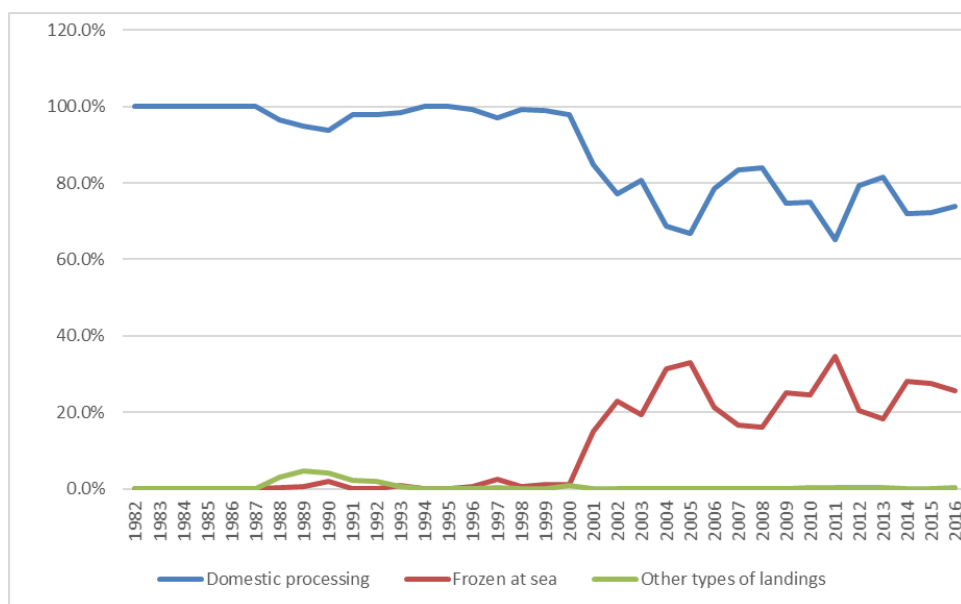


Figure 14. Share of herring landings (as quantity) for on-land and frozen at sea processing for the period 1982 to 2016

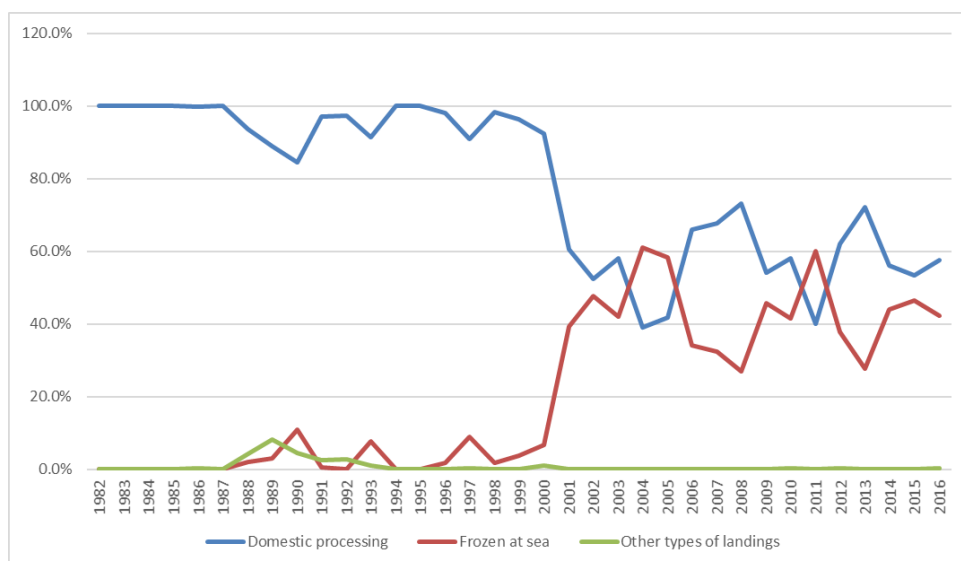


Figure 15. Value of herring landings for processing as a share of the total export value

The difference in volume and value is related to the fact that frozen at sea is produced either as frozen whole or fillets whereas the fish is landed as whole fresh herring for on-land processing.

4.3.4.2 Independent producers

30-40 years ago a number of companies focussed on processing of final herring goods for export mainly for the Soviet union. These were commonly semi-preserved goods in tins or canned herring goods. Often the raw material for these products was salted herring kept in barrels. With the collapse of the Soviet Union in 1989 the production of final goods in Iceland has all but disappeared.

Currently, there are very few producers of final herring consumer goods in Iceland. ORA is probably the best know company and currently produces some marinated herring goods in glass jars for the domestic market (www.ora.is). They use salted and vinegar cured herring for their production. Ora is part of a larger conglomerate of food producers/importers called ISAM. In 2014 the family that owns Ísfélagið í Vestmannaeyjum bought all the shares in ISAM (<https://www.mbl.is/greinasafn/grein/1510521/>).

Egils seafood in Siglufjörður has been in operation since 1921 and they are an independent producer. The company produces cold smoked vacuum packed herring fillets for the domestic market. Frozen herring fillets are used for the production.

Marhólmur is new company established in 2012 as a subsidiary of Vinnslustodin in Westman islands. The company produces various consumer herring goods both in vacuum packs and in plastic buckets for the retail and HoReCa markets in Europe (<http://www.vsv.is/en/products-and-marketing/marholmar-products>). They use salted and vinegar cured herring for their production.

4.3.4.3 Financial performance and productivity

Studying the profitability of the herring sector is difficult since there is little separation in the figures for herring from other pelagic catch and production figures within the datasets by Statistics Iceland. In general, the turning point in the profitability in the Icelandic fish industry was at around 2000. Looking at the profitability in the pelagic sector this development is not unlike other fishing operations in Iceland. The pelagic sector is though more sensitive for fluctuation in TAC. In Figure 16 the historical development of profitability in capelin fishing and processing is compared with overall profitability in fishing and processing in Iceland. The trend of both sectors is similar expect from much lower profit in 1999 and 2000 for the pelagic sector and higher profitability during 2008 to 2012.

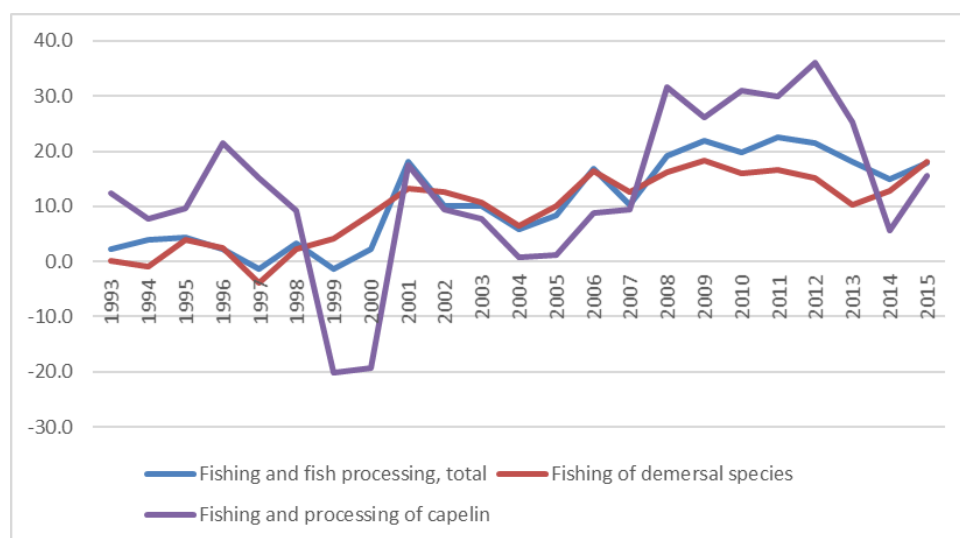


Figure 16. Profitability of the pelagic, demersal sectors and the overall catch and processing sector in Iceland during 1993-2016.

The profitability of the pelagic fish meal and oil sector is shown in Figure 17.

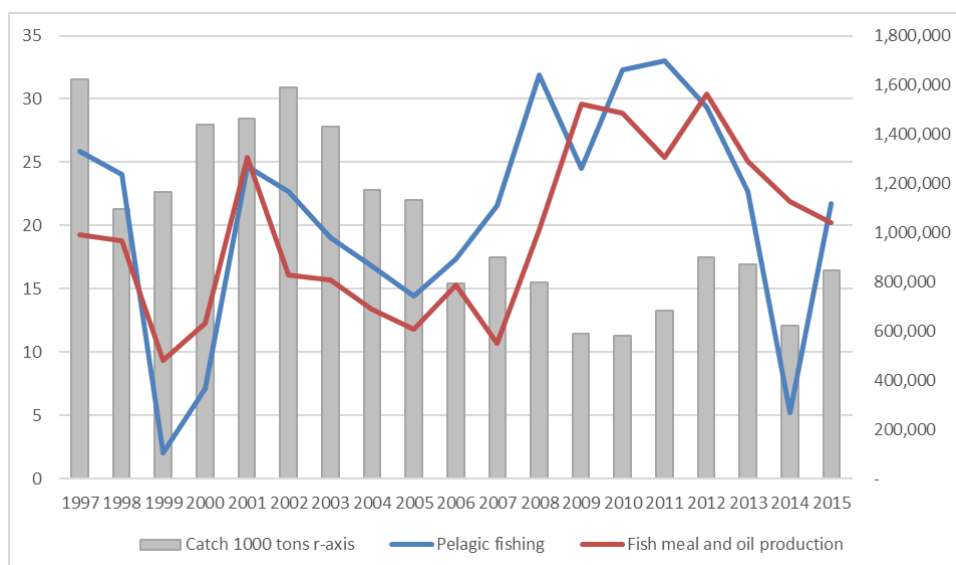


Figure 17. Profitability (EBIDTA) of pelagic fishing and production of oil and meal .

EBIDTA rose sharply with the crash of the Icelandic krona in 2008 due to the economic crisis. It is though interesting to see how well high the EBITA has been during the last few years, although the total catch has decreased. The decline in catch of pelagic species can be traced to fluctuation in capelin catch; in 2009 it went down to 15 thousand tonnes from around 150 thousand tonnes in 2008 and to 115 thousand tonnes in 2010.

The profitability of the fishmeal and oil industry depends a lot on the global price of fish meal and oil which has been rather good for the past years due to high demand. Figure 18 shows the changes in price of fish meal in recent years.

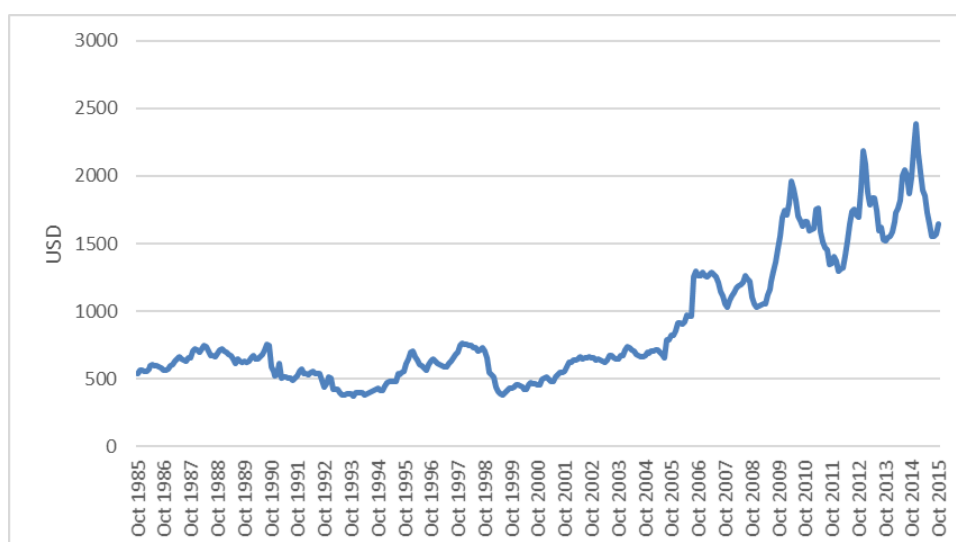


Figure 18. Price of fish meal during 1985-2015. Figures obtained from <http://www.indexmundi.com/commodities/>.
Upprunaleg heimild er World Bank. OK

4.3.5 *Main influencing factor for value chain dynamic*

- ITQ system pushed for consolidation
 - increased efficiency
 - more catches pr. Boat
 - fewer boats catching more fish
 - investment of new vessels with cooling system
 - better quality raw material for land processing
 - reduction in processing trawlers
- Limited market connection in the price settling mechanism
 - Non-active auction market
- Productivity has increased because of more automation, both in fishing and especially on-land processing of seafood.
- Changes from processing on sea to processing on land, where utilization is better (better filleting yield) and promotes better use of by-products creating more value from each fish.
 - Cooling/development in iceless boats
- Longer fishing trips – you can catch good fish further out at sea; seasonality
- Fishing and processing done in harmony by VICs based on
 - Quota status
 - Coordination of landings with processing capacity within each season
 - Also on the limit of investment in processing
- High of automation
 - Capital intensive
 - Consolidation of processing
- Economics of scale and scope
 - Need to have one lactation both freezing and meal and oil
- Seasonality and fluctuation in catches between years affects required employees
 - emphasis on automation
- Limited competition within the pelagic (herring) sector due to consolidation
 - How does this affect product mix?

4.4 Marketing sector (Value creation and utilisation)

The entire landings of herring in Iceland is destined for export as primary raw material (frozen herring). The main markets have historically been Eastern Europe and Russia. The share of value added herring products from Iceland has declined in favour of low value added, filets and frozen fish, the production of which benefits from economies of scale. The catching countries such as Iceland and Norway produce the primary raw material (frozen herring) but secondary processing tends to take place now-a-days in Eastern Europe e.g. Poland and Lithuania and the final consumer products are commonly exported to other countries or markets.

Although considerable secondary processing is carried out in Scandinavia (mainly in Sweden, Denmark and Finland) and Germany virtually no export is to these countries as their demand is mainly as salted or vinegar cured herring.

4.4.1 Structure of the marketing sector

After the monopoly of the Danish merchants ended in 1787 the licence for export from Iceland was bound to Danish citizens until 1855 when it was given free. The export of fish from Iceland was therefore rather free with minimum government interference, with the exception of the WW1 period up until 1930²⁰. From 1900 to 1930 the most important export of fish from Iceland was cod, either salted or whole on ice, and fish liver oil²¹. Most of the export of salted fish during this period went through individual fish merchants who bought the fish from small producers and sold to markets in the Mediterranean countries, mainly Spain and Italy²². After 1930 a period of government interference in export matters and oligopoly took over, until around 1980 when exports increased, along with competition in exporting. This led to liberation of exports in the late 1980s and early 1990s. This discussion about the export sector will be divided into these two periods; that is, firstly the government interference and oligopoly during the period 1930 - 1980, and secondly post- 1980, which was characterised by increased competition and freedom.

In 1934 Síldarútvegsnefnd (Icelandic Herring Board), abbreviated IHB was established. IHB's initial role was to supervise and exercise an overall control on the catching, processing and exporting of herring from Iceland. The reason for the establishment of IHB was overproduction of salted herring without secure contracts leading to "boom and bust" issues for many producers. However, it was not until 1945 that IHB was granted a monopoly in exporting salted herring from Iceland²³. IHB was a private foundation with some of its board members elected by Alþingi (the Icelandic parliament) and others appointed by the Ministry of Fishery.

During 1997 –1999 big changes occurred in the export sector in the Icelandic fish industry. Icelandic Herring board was changed into Íslandssíld hf., in July 1998 and merged with the Union of Icelandic Fish producers on the 1st of January 1999. It can be claimed that the increased freedom in exporting gained during the 80s and 90s is one of the biggest impact factor on the development of the industry as we know the fish industry today. This has meant that the traditional primary marketing companies

²⁰ Jónsson, S.

²¹ Bjarnason, A.

²² Bjarnason, A.

²³ Bjarnason, A.

have faced increased competition both from other marketing companies but also from some producers who have been selling the products on their own.

4.5 Export

4.5.1 Icelandic export of herring products

Almost all the landed herring is processed into export products. The domestic market is small and considerable amount of the herring consumed in Iceland is imported.

The main export groups of herring are frozen fillets, butterfly fillets, whole herring, herring meal and oil. The last two product categories are for feed production, mainly for salmon. Virtually nothing is exported from Iceland of preserved and canned goods (value added).

Figure 22 shows the export of herring products from 2001-2014. Export value wise a peak was reached in 2012, €160.000, but a peak in volume in 2010 (160.000 tons). The reasons for these peaks is that the Atlantic-Scandic stock was at its peak in 2008 and the TACs became smaller in the years following but at the same time the demand for frozen herring commodities was high and new buyers (e.g. Nigeria) were entering the market thus leading to increasing prices especially for fillets. The prices reached a peak in 2012 thus leading to a peak in the export value for herring from Iceland. Beneath Figure 22 there is information on the HS-number for each product category.

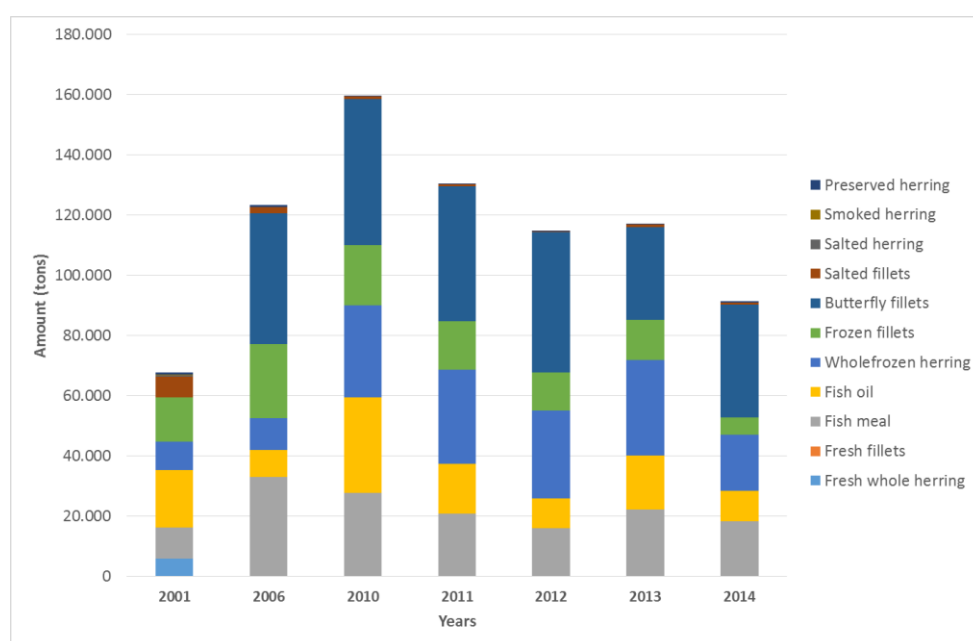


Figure 19. Export of herring products (tons), Iceland 2001-2014. Statistics Iceland, 2016.

- Fresh whole 2001-2006: 03024000,
- Fresh fillets 2013: 3044921
- Herring meal 2001-2013: 23012014
- Herring oil:
- Frozen whole: 2001-2014: 03035000
- Butterfly fillets 2006: 03049026; 2010-2014: 03049931
- Frozen fillets: 2001 & 2006: 03042001 & 03042041; 2010-2014: 03042911 & 03042961
- Salted fillets: 3053931
- Salted herring: 3056102

- Prepared and preserved: 1604 - various

Figure 20 shows the value of exported herring products from Iceland during the period 2001-2014. Below the figure is information about the HS-number for each product category.

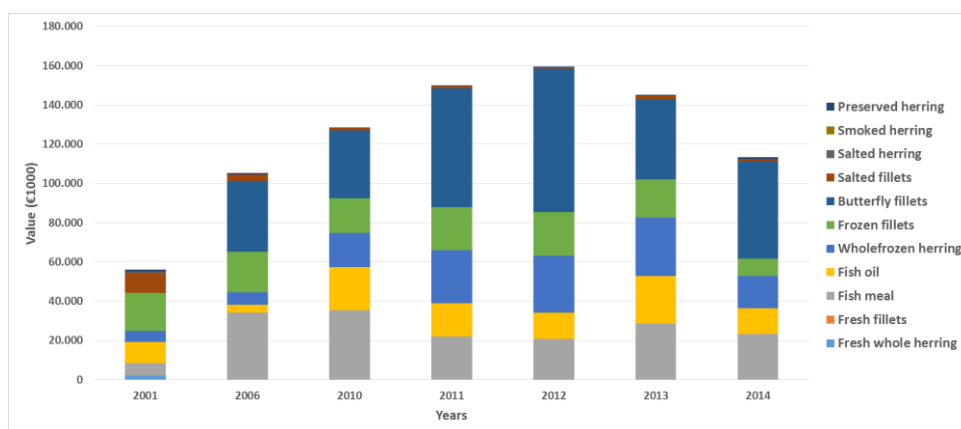


Figure 20. Value of exported herring products from Iceland, 2001-2014. 1000 €. Source: Statistics Iceland, 2016.

- Fresh whole 2001-2006: 03024000,
- Fresh fillets 2013: 3044921
- Herring meal 2001-2013: 23012014
- Herring oil:
- Frozen whole: 2001-2014: 03035000
- Butterfly fillets 2006: 03049026; 2010-2014; 03049931
- Frozen fillets: 2001 & 2006: 03042001 & 03042041; 2010-2014: 03042911 & 03042961
- Salted fillets: 3053931
- Salted herring: 3056102
- Prepared and preserved: 1604 - various

Conversion from ISK to € is based on the yearly average exchange rate from the Central Bank of Iceland²⁴.

Figure 21 shows the relative value of exported herring products from Iceland in 2001-2014. In the figure there is information on the HS-number for each product category.

²⁴ Sedlabanki Islands, February 2016.

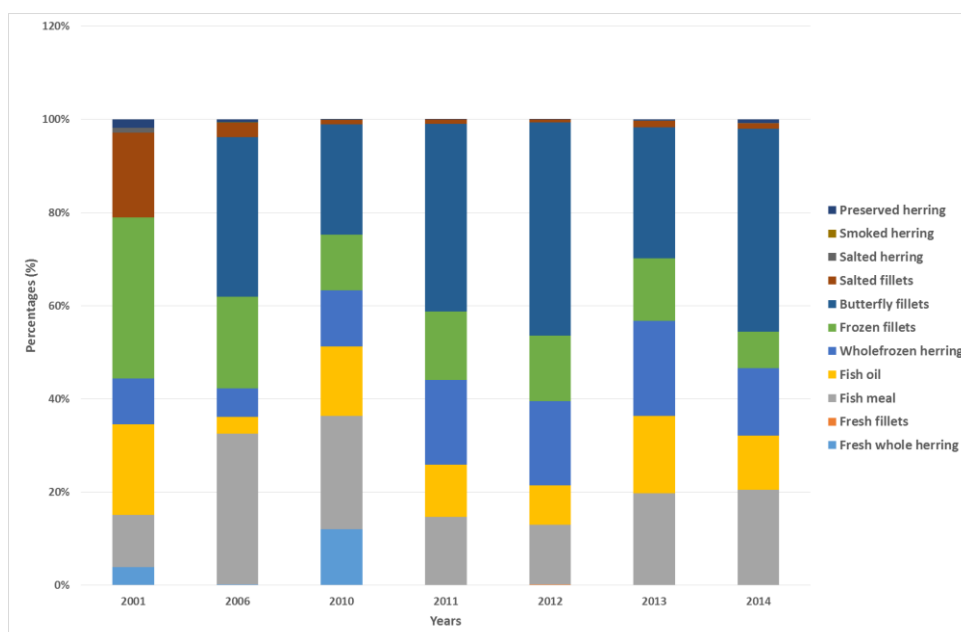


Figure 21. Export of herring from Iceland 2001-2014. Relative in value of product groups. Source: Statistics Iceland, 2016.

- Fresh whole 2001-2006: 03024000,
- Fresh fillets 2013: 3044921
- Herring meal 2001-2013: 23012014
- Herring oil:
- Frozen whole: 2001-2014: 03035000
- Butterfly fillets 2006: 03049026; 2010-2014; 03049931
- Frozen fillets: 2001 & 2006: 03042001 & 03042041; 2010-2014: 03042911 & 03042961
- Salted fillets: 3053931
- Salted herring: 3056102
- Prepared and preserved: 1604 - various

Feed (herring meal and herring oil) is of importance and is mainly produced from herring rest materials from the filleting and discards.

Table 6 shows the average prices for exported herring goods from Iceland in euros. The average price (in €/kg) is higher both for salted (and/or vinegar cured) but as said earlier the industry in Iceland has invested in freezing facilities and focusses on frozen herring. Average prices for preserved herring (consumer goods) are also considerably higher than that of frozen herring but tariffs, minimum 10% tariffs and long distances from final markets affect the amount of final goods produced and exported from in Iceland. In 2014 the total exported amount of preserved goods was 320 tons.

Table 26 Average export values for exported herring products from Iceland 2001-2014.

€/kg	2001	2006	2010	2011	2012	2013	2014
Fresh whole herring	0,4	1,7	2,5	2,6	0,8	0,9	-
Fresh fillets	-	-	-	-	5,0	1,8	-
Fish meal	0,6	1,0	1,3	1,1	1,3	1,3	1,3
Fish oil	0,6	0,4	0,7	1,0	1,3	1,3	1,3
Wholefrozen herring	0,6	0,6	0,6	0,9	1,0	0,9	0,9

Frozen fillets	1,3	0,8	0,9	1,4	1,8	1,5	1,5
Butterfly fillets	0,0	1,0	0,7	1,3	1,6	1,3	1,3
Salted fillets	1,5	1,6	1,5	2,1	2,4	2,3	2,0
Salted herring	1,0	1,2	4,1	2,1	-	3,7	3,0
Smoked herring	5,5	5,8	-	-	-	-	-
Preserved herring	1,2	1,1	4,6	2,6	3,5	3,4	2,7
Average	0,83	0,85	0,80	1,15	1,39	1,24	1,24

4.5.2 Main export countries of Icelandic export of herring products

Most of Icelandic herring export goes into Russia or Eastern part of Europe. Table 7 shows the top five importing countries by years during the last few years. It is noticeable how much variation is seen between the years in the top five importers. The salted fish is however mainly sold to Scandinavia and Canada (Table 28). Russia was in 2014 the most important customer for frozen Icelandic herring. In 2015 Russia banned import of Icelandic food, including that of herring. The ban affected exports and in 2016 Russia only accounted for 9% of the frozen herring and Poland became the most important customer.

Table 27. Icelandic export of frozen herring commodities in 2006, 2010 and 2014. Source: Statistics Iceland

2006		2010		2014		2016	
country	% of value	country	% of value	country	% of value	country	% of value
Lithuania	28	Poland	36	Russia	64	Poland	32
Poland	23	Lithuania	26	Lithuania	15	Ukraine	20
Russia	14	Russia	20	Poland	9	Belarus	16
Faroe Islands	9	Nigeria	1	Holland	3	Lithuania	15
Germany	9	Ukraine	1	Japan	2	Russia	9

Table 28. Icelandic export of salted herring products in 2001, 2006, 2010 and 2014. Source: Statistics Iceland

2001		2006		2010		2014	
country	% of value	country	% of value	country	% of value	country	% of value
Sweden	53%	Finland	40%	Finland	49%	Denmark	56%
Denmark	21%	Sweden	33%	Denmark	24%	Canada	21%
Finland	14%	Canada	18%	Canada	23%	Finland	6%
Canada	4%	Denmark	9%	Spain	3%	Poland	2%
Germany	2%	Faroe Islands	0%	Faroe Islands	0%	Sweden	0%

Fish meal is mainly sold to Norway but some may go into UK and/or Denmark (Table 29).

Table 29 Icelandic export of herring meal in 2006, 2010 and 2014. Source: Statistics Iceland

2006		2010		2014	
country	% of value	country	% of value	country	% of value
Norway	28%	Norway	74%	Norway	87%

Denmark	23%	Denmark	11%	UK	13%
UK	14%	Faroe Isles	6%		
Greece	9%	UK	4%		
Finland	3%	Australia	4%		

4.5.3 Domestic use of products

The domestic market for herring is very small and the producers of herring focus little on that market. Small quantities of mainly salted and vinegar cured herring is used to produce marinated herring for the domestic market. Interestingly imports of marinated herring have been on an increase and were about 47 tons in 2016 (Statistics Iceland, 2018). In 2001 only 1.3 tons were imported for the domestic market.

4.5.4 Main influencing factors

- Limited competition within the pelagic (herring) sector due to consolidation
 - How does this affect product mix?
- Customs on value-added products into EU affects product mix
 - Pressure on commodities
 - And economics of scale; High volume, low value
- Limited markets for herring
- Risk reduction by having many customers as in commodities
 - Few in value added (herring is not a globally known product)

4.6 Overall economic performance and competitiveness of the fisheries value chain

4.6.1 Value Chain dynamics

Value chain dynamics depend heavily on the governmental form of the value chain and the relationship within the value chain. Before 1994 the value chain was governed by the sale and marketing organisation owned by the producers. For the salted herring export it was the Icelandic Herring board that had monopoly of export from Iceland until it was changed in 1998 and later merged with the Union of Icelandic fish Producers in 1999. Frozen herring was sold through two large marketing organisations, Icelandic Freezing plants and Samband of Iceland.

Vertical integration in the fishery industry in Iceland has a long history, which goes back to the early 20th century. The largest fishery companies at that time were vertically integrated with large number of trawlers, in-house processing (salt fish, herring processing and meal/oil reduction) and integrated distribution channels and export activities to the main markets in Europe. In-house distribution activities ended in the 1930s and in 1940s when co-operative sales organisations with export monopoly took over (Union of Icelandic Fish Producers, Icelandic Freezing Plants Samband of Iceland, and Iceland Herring Board (SÚN)). But, the large fishery companies continued in being partially integrated with the harvesting part and the processing part in their own hands. This type of organisation was kept unchanged up into the early 1990s when the quasi-monopoly of the sales co-operatives was discontinued. Consequently, more and more of the larger companies then took the distribution and export activities in their own hands.

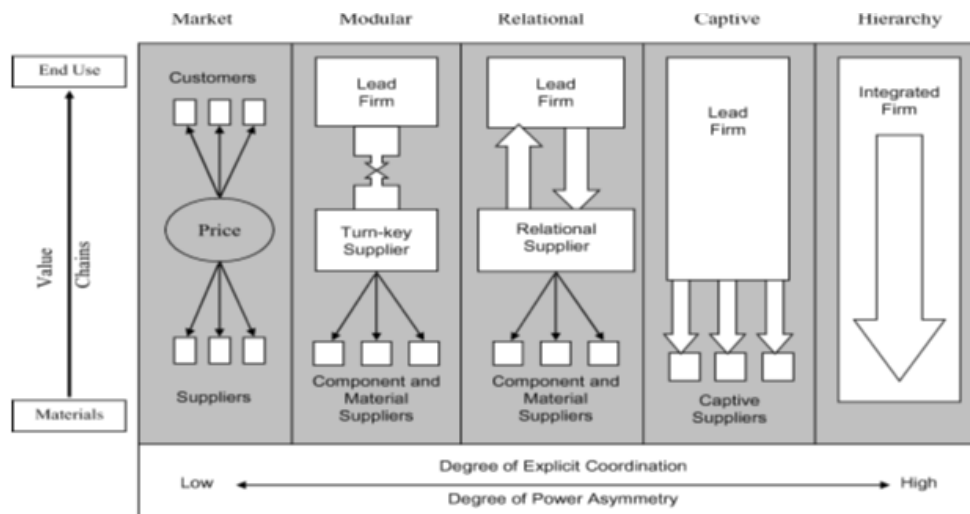
Due to the vertical integration in most Icelandic whitefish chains, the information exchange between the fishing vessels and the processors is seamless. All the catch information as well as the additional information about the trip, haul, fishing gear, etc. is available to the processors. There is no quality information available from the fishing vessels but the haul time, haul size, sea temperature or time from catch until bleeding, could be used as an indicator of quality but this usually is not done today. Most of the big vertically integrated companies have a fleet management system in place to determine delivery times for different vessels and improve supply chain efficiency by reducing wait times.

Icelandic processors in a vertically integrated company place orders to its fishing vessels based on the customer orders and quota status, thus following a pull supply chain system. The processor sends orders to the vessels on how much fish of each main species is wanted, where to catch and when (and sometimes where) to land so they have the desired size and quality of raw material needed for fulfilling customer orders. This is unlike the push supply chain system followed by the Norwegian companies where they must process the fish that they receive.

4.6.1.1 Governmental form

During the period before 1994 when the limited export licences were still active and the operation of the sale organisation still ongoing, producers had to deliver all their products to the sale and marketing organisation (SMOs) for selling. During that time the governmental structure of the value chain of cod from fishing to markets was Captive form as the sale organisation in key position in the value chain where producers had the duty of handing in all their product for selling through the SMOs. This created situation where the SMOs control all flow of information from the market to the producers. After the abolishment of the export licences the sale organisation change the ownership form of the organisation from being co-ops to limited liability companies. Hence, the duty of the producers to

hand over all their products was abolished and most of the producers sold their share in the new companies.



The Herring sector until 1991 was based on many individual boat owners that had the licences to catch herring. During that time the governmental form was based on individual contracts and where the herring was caught. There was no auction market in place but domestic relationship could be regarded with low or medium power asymmetry and therefore market based or in some cases relational where individual boat owners had contract or strong relationship with producers. During the time the number of producers were limited so it can be claimed that ad hoc market relationship was the most common form.

The period during 1991 to 2000 a lot of consolidation occurred as other pelagic boats, mainly capelin boats was allowed to buy herring quota. In 2016 the real number of companies that hold herring quota is only 11. One of them is not vertically integrated and operates one pelagic trawler but the rest is regarded vertically integrated and therefore the domestic part of the value chain is governed through high power asymmetry as hierarchy.

The export part of the value chain has as well changed a lot during the last 30 years. The bigger VIC have in many cases established their own marketing division or even their own marketing companies abroad. In most cases Icelandic companies are selling to middleman abroad as distributors or wholesalers although some are selling directly to retail chain as in the fresh fish markets. In most cases companies have contract with buyers that that could be regarded as relational from of governance. The dependency in the value chain varies a lot depending degree of long term contract in their business instead of ad hoc sale. In interviews with managers in the Icelandic fish industry it is clear that more and more of the TAC is sold before it is caught. This indicates long term relationship and relational governance form in the export part of the value chain term relationship

The pelagic products are in general global commodity products that are sold business to business. The frozen herring commodities are highly standardised and are used as raw material for further processing by the foreign buyers. The fishing is seasonal so the product is commonly frozen or salted so it can be from one season to another. This is different to cod in Iceland, which is increasingly being sold as fresh fillet portions ready for cooking. Hence, the degree of coordination in the value chain of herring is not as great as the supplies are can be stored for a long time.

The high degree of vertical integration can be claimed to one of the prime reasons for the ITQs to be effective in the Icelandic fish industry, avoiding the negative effect of the quota system. These proposed negative effects are for example the lack of power balance between the two sectors, leaving the power in the hands of the quota holders. Hence, the vertical integration has maintained a certain power balance in the industry preventing the fishing sector from becoming too powerful.

Seven companies hold more than 10% of the herring quota each, and together own more than 95% of the total quota. Table 25 shows their quota share, turnover, profit and number of employees. Figure 22 shows how the quota is distributed between different harbours/locations around Iceland.

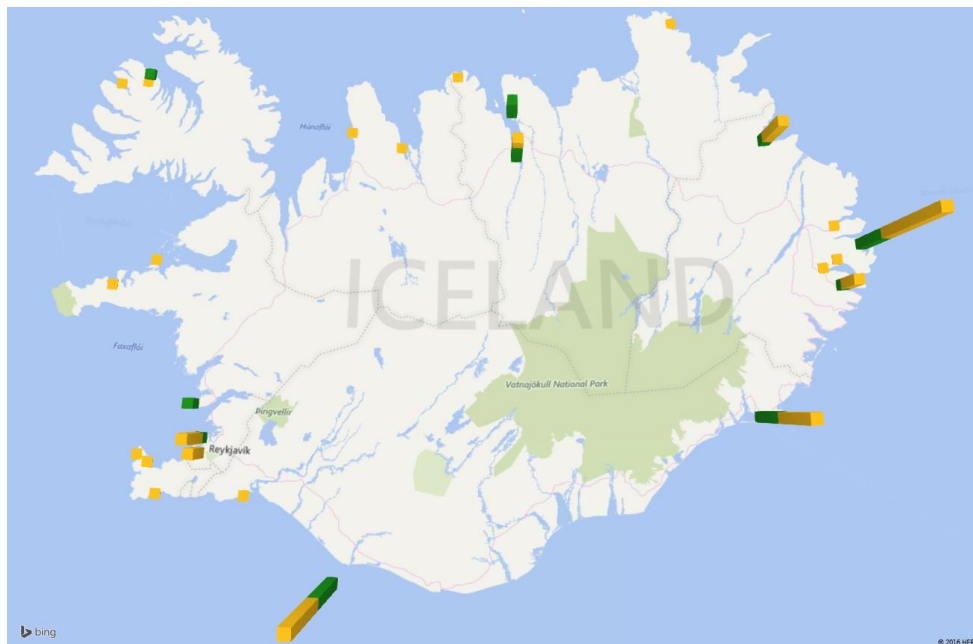


Figure 22. Geographical distribution of the herring quota (green) and herring catch (yellow) in 2014.

It is clear that the VICs companies holding majority of the quota are the leading firm in the value chain of herring in Iceland.

4.8 Strategic positioning briefing

The high degree of vertical integration can be claimed to one of the prime reasons for the ITQs to be effective in the Icelandic fish industry, avoiding the negative effect of the quota system. These proposed negative effects are for example the lack of power balance between the two sectors, leaving the power in the hands of the quota holders. Hence, the vertical integration has maintained a certain power balance in the industry preventing the fishing sector from becoming too powerful.

Imports: Imports consists of a small quantity of consumer goods imported into the country, for domestic consumption. The import data (Statistic Iceland) is based on data from individual importers.

Icelandic herring processing companies: Companies that own the vessels and carry out processing of their own catch including that of meal and oil. Many of the company's own partly or fully other companies that either sell the products directly (direct sales) or via merchants or agents.

Fish merchants: Companies or sales organisations that buy the mainly frozen processed herring from the processing companies and sell the products.

Export: Export consists of the outward movement of goods produced by the processing companies.

Domestic herring market: A very small portion of the herring – as processed or canned, mainly from salted herring – is consumed within Iceland. There is no data on landed herring for domestic use but data on imported consumer goods are available.

	Description	Share of herring fishing	Access barriers	Opportunities and upgrade possibilities	Threats	Value chain relationship	Dynamic in the value chain
Independent small boat owners	<30 tons, number of fishing days limitation and TAC	0.2-.4%	Low	Limited	Low valued fish; profitability low or non-existent due to low volume. Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability	Part in direct sales and part through auction markets.	Lack of dynamic
Independent big boat owners	>30 tons with TAC	12% of Icelandic herring	High - capital intensive quota price	Sell to highest bidding land processing	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect profitability. Reduction in number of independent big boat owners.	Mixture of auction market and contract relationship.	Maximize first sale price.
Individual producer ORA, Egilssíl, Marhólmur	Supplies fish by contracts and from auction markets. Medium and small size producers with often low degree of automatization, mainly focusing on niece markets.	0	Medium - depends on markets needs and level of automatization required.	Market relationships, product mix, long time source and sales contracts,	Unstable currency, Access to supply do to quota system and high degree of VICs. Lack of branding,	Sourcing form auction market and by contracts with boat owners and other producers.	Maximize value from bycatches and serving niece markets
Vertical integrated company in fishing,	Companies with own boats, processing facilities and marketing office.	86,4% of Icelandic herring	Very high - quota price, capital intensive	Branding, product mix, market relationships, usage of by-	Unstable currency, Uncertainty regarding fisheries management system, uncertainty regarding resource rent that could affect	Internal sourcing and auction market when there is	Coordination of fishing and processing according to

production and marketing (VICs)	High degree of atomisation in processing and fishing. Producing fresh, frozen and salted products.		fishing and production.	products, increase quota share up to limit.	profitability. Reduction in number of independent big boat owners. Refresh fish. Lack of branding.	shortage of own catches.	market needs, current sales and quota limitations.
Export and marketing companies with no own production	One big sales company and number of small companies selling fish products from VICs and smaller producers by long term contracts and ad-hoc trade. Sourcing fish from Iceland and other countries.	0	Low - depends of market and supply relationships	Branding, market relationship, long time contracts	Unstable currency, Lack of branding, unstable supply.	Mixture contract relationship ad hoc trade	Monitor markets needs and preferences and share market signals to producers. Risk reduction through network of suppliers.

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Fisheries Value Chain

Denmark country report herring

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October 2017

The Danish herring report

This report contains status and data on the Danish herring sector (catching and processing industries), according to the template prepared by Ögmundur Knútsson, Guðmundur Stefánsson and Valur N. Gunnlaugsson, June 2017.

The report expands the results of the input-output focussed value chain analysis in the herring case report addressed for the PrimeFish deliverable 3.1. For the present report new statistical data from public sources are collected and to some degree personal interviews conducted (direct personal interviews, general industry conversation or telephone-interviews) during 2016 and 2017. In one case also information dating to 2006-8 in relation to projects regarding the pelagic fisheries and herring processing industry has been included. Today the processing sector is a bit reluctant to participate in interviews due to lack of time and a strong internal competition, which creates some closeness about the company activities. This also includes data on utilisation, effectiveness and productivity, extending what is included in the public available account data.

5.1 Herfindahl-Hirschman Index (HHI)

5.1.1 Quota ownership – Atlanto-Scandic herring and North Atlantic herring

The dominant part of the Danish herring quota is allocated by an ITQ system (IOK). These quotas can be sold and has led to concentration of the quota rights at relative few vessels since the IOK-system was introduced as an experiment in 2003.

The quota is allocated to the vessel. Therefore data are linked to vessels, not to companies. The ownership structure can be quite complex; some individuals or companies own several vessels, whereas some vessels has several owners, which might own shares of other vessels as well. The following indicates concentration of Danish quota shares on vessels (though checked for same explicit owner of more than one vessel) at stock basis, not per company or the total herring quotas available in Denmark. The first data on ownership of quotas is 2008, the latest 2017²⁵.

Table 30: Atlanto-Scandic herring – Danish ITQ quotas. No vessels, no of vessels with different owners/owner company* and HHI index.

	2008	2016
Danish TAC (tons)	44.535	20.919
No vessels with quota (ITQ)	23	13
No individual owners*	22	12
HHI-index	0,065	0,113

*The specific ownership is not clear. The quotas are allocated to vessels, which can have different owner structure. Reduction only if same company owns two vessels.

The concentration rate for Danish Atlanto Scandic herring fisheries has increased – almost doubled. But it is still below a HHI-index of 0,15 and is therefore regarded as unconcentrated.

Table 31: North Sea herring– Danish ITQ quotas. No vessels, no of vessels with different owners/owner company* and HHI index.

	2008	2016
Danish TAC (tons)	31.243	98.830
No vessels with quota (ITQ)	8	7
No individual owners*	7	7
HHI-index	0,146	0,182

*The specific ownership is not clear. The quotas are allocated to vessels, which can have different owner structure. Reduction only if same company owns two vessels.

The concentration of the Danish fisheries of North Sea herring has increased. It had the top level to be characterised as an unconcentrated market in 2008, but will be regarded as moderately concentrated by 2017.

5.1.1.1 Purchasing of raw material

A strong consolidation has taken place in the primary processing of herring over the last 10-15 years. Unfortunately there is no data available on volumes of purchasing of herring by the Danish fish

²⁵ This is based on data from the Ministry of Food, the Agriculture and Fisheries Agency. Registration of ITQ vessels quota shares and landings 2008 and 2017 (IOK- og FKA-fartøjers andele og landinger 2017) <http://lbst.dk/fiskeri/fiskeristatistik/statistik-for-fiskeriets-regulering/iok-og-fka-fartoejers-andele-og-landinger-2017/> - found 20/9 2017

processors to document this process in HHI-terms. At present (2017) we have assessments from industry informants and managers that the documented structure of high concentration of primary processor in the herring with two large processors and a few minor processors probably would give a score at the HHI-index around 0,40, which document a high concentration of production in the Danish processing. As will be argued later, this is not problematic from a competition point of view, as the regional (Norway, Germany) competition is high.

5.1.1.2 First gate price

Landings of herring in Denmark origin from Danish as well as foreign vessels (mainly from Norway and Sweden). The landing volume decreased from 2008 with a low in 2011, but has been increasing since. The kilo prices are fluctuating, but show an increasing trend

Table 32: Landing of herring in Denmark, 2008-2016. Volume, first hand value and price/kilo.

year	volume (tons)	value (1000 €)	price/kilo (€)
2008	205.413	69.349	0,34
2009	176.596	53.897	0,31
2010	139.425	50.510	0,00
2011	109.776	60.931	0,00
2012	121.138	79.578	0,00
2013	142.906	71.784	0,50
2014	149.401	62.862	0,42
2015	156.250	74.148	0,48
2016	184.751	104.444	0,57

Source: Ministry of Environment and Food. Danish Agricultural agency. Dynamic landing statistics.

The largest part of the Danish export of herring is whole and frozen herring. This is probably direct export in form of direct landings mainly for German processing industries.

Of the herring landed and processed in Denmark, prepared and processed is by far the largest product group. The volume of this product group has decreased from 2008 to 2016, but due to increasing kilo prices, the value is only slightly decreasing. The export of fillets halved in volume from 2008 to 2012, but has regaining some of the volume, and the value is at a higher level than in 2008. As the last product group, salted, dried or smoked herring is of less importance and has remained stable in the period.

Geographically the Danish export of herring products focus at a minor group of Northern European countries with Germany as the most important export country and Poland as second.

Table 33: Danish export of fillets (flaps and frozen fillets) 2008, 2012 and 2016, volume, value and kilo prices for top 3 countries and total.

	2008				2012				2016		
Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €
Germany	7.553	7.812	1,03	Germany	3.759	7.379	1,96	Germany	4.787	8.959	1,87
Poland	3.563	3.457	0,97	Netherland	2.014	4.578	2,27	Poland	2.302	3.991	1,73
Netherland	1.963	3.172	1,62	Poland	705	1.395	1,98	Sweden	785	1.632	2,08
Total	16.978	18.621	1,10	Total	7.881	16.300	2,07	Total	11.658	21.789	1,87

Table 34: Danish export of whole and frozen herring 2008, 2012 and 2016, volume, value and kilo prices for top 3 countries and total.

	2008				2012				2016		
Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €
Germany	64.314	29.171	0,45	Germany	60.531	41.554	0,69	Germany	54.820	39.715	0,72
Sweden	7.210	3.098	0,43	Netherland	16.929	12.335	0,73	Poland	6.569	5.343	0,81
Norway	1.858	601	0,32	Poland	6.857	5.966	0,87	Sweden	6.162	4.263	0,69
Total	79.514	37.290	0,47	Total	93.036	67.455	0,73	Total	81.950	65.707	0,80

Table 35: Danish export of salted, dried or smoked herring 2008, 2012 and 2016, volume, value and kilo prices for top 3 countries and total.

	2008				2012				2016		
Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €
Netherland	4.300	6.790	1,58	Germany	3.772	8.540	2,26	Germany	3.336	7.791	2,34
Germany	840	1.306	1,55	Netherland	383	866	2,26	Poland	190	809	4,25
Sweden	58	116	1,99	Poland	33	272	8,31	Sweden	31	268	8,65
Total	5.336	8.720	1,63	Total	4.229	9.928	2,35	Total	3.801	9.081	2,39

Table 36: Danish export of prepared or preserved herring 2008, 2012 and 2016, volume, value and kilo prices for top 3 countries and total.

	2008				2012				2016		
Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €	Top 3 countries	Volume, tons	Value, 1000 €	kilo price, €
Poland	18.633	27.396	1,47	Germany	12.536	19.641	1,57	Germany	12.197	31.267	2,56
Germany	14.065	26.206	1,86	Netherland	7.369	38.231	5,19	Poland	7.982	18.563	2,33
Netherland	3.434	5.422	1,58	Poland	572	1.833	3,21	Sweden	1.287	3.172	2,46
Total	39.724	67.443	1,70	Total	22.408	66.156	2,95	Total	24.796	62.415	2,52

Source: Ministry of Environment and Food. Danish Agricultural agency. Dynamic Foreign Trade Table.

The pelagic fleet has been in structural changes since a general crisis around year 2000, which opened for ITQ system from 2003. This has led to concentration of the quotas at fewer vessels which is considerable larger and more modern able to deliver top quality herring. This is indicated by the increasing HHI-index concentration and might be a part of the reason behind increasing kilo prices from 2008 to 2016, though this process was started earlier.

In the same period, the processing industry has been in a strong consolidation process, leading to the high concentration in the indicative HHI-index of around 0,40 according to industry sources. This would expectably lead to lower first hand prices in a limited market. This is not the case, probably because the market is highly internationalised as indicated by 50 % of the Danish quota is landed abroad, while 50 % of the landings in Denmark is from foreign vessels (Eliassen 2016, The herring value chain in Denmark, unpublished draft version).

5.2 Fisheries management system

5.2.1 General description

The allocation of fishing rights to pelagic species, including herring, were in 2003 changed from a ratio allocation to individual transferable quotas based on historical data for fishing of the relevant species. This system had a status as a test from 2003 and a permanent system from 2007 (Fødevareministeriet 2005). The regulation guarantees ownership at least for 8 years (two periods in the parliament), which was in the spring 2017 prolonged to 16 years (Miljø- og Fødevareministeriet 2017b). The pelagic species were allocated based on historical data without any regional or segment limitations for sales.

The opportunity to transfer quotas led to concentration of the quotas, investments in larger and top-modern vessels which deliver top quality herring (and other pelagic species) and offer excellent working and resting condition for the crew.

2009-2013 80-90 % of the Danish herring quota was caught by around 16 vessels in the fleet group trawl and purse seiners of a length of 40 m and over. The vessels are mainly registered in North Jutland, where also the herring processing takes place (see table X, section 4.1.1).

5.2.2 Limitation in management system imposes on the value chain:

There are few limitations in the management system for the value chain. The most important restrictions regards entry regulation of who is defined as a fisher, and a requirement of being active fisher to own vessel and quota, as well as restriction on quota concentration: The first regulations are supposed to prevent “slipper-skippers” and that the industry consists of landbased owners (in Denmark or abroad) and hired active fishers. The recently debated restriction on quota concentration focus on avoiding monopoly-like situations, but is also seen as a way to ensure a broader ownership and activities in various ports, though there are no restrictions in geographical concentration.

The formal barriers to enter the industry as employee is a general demand of having a B-status, which requires a short safety course and documented income from fisheries. To get A-status as fisher the general requirements are Danish citizenship (or two year of work in Denmark) and 1 year as commercial fisher with at least 60 % of the income from the fisheries. The A-status is required to own a vessel or shares of a vessel as well as quotas. For companies with several owners, at least 2/3 of the capital should be owned by persons with a-status as fishers. (Miljø- og Fødevareministeriet 2017b).

There are restrictions in the allowed concentration of quota shares. The parliament had some concern about too high concentration and formulated in the regulations that it should be avoided that the „quotas ended on too few hands“, without specifying the level (Rigsrevisionen 2017). The regulation of limitation of concentration has been changed over the years with the present interpretation for the pelagics of a limit of 10% of all pelagic quota, and 2% of the total pelagic quota if the vessel also owns demersal quota (Miljø- og Fødevareministeriet 2017b). At present there is a public and political discussion if this has been followed and if this too high a level of concentration.

So far exiting the industry has not been a problem. In the consolidation-process, there has been market for quota shares for all vessels and species put on the market. It has been discussed that exiting the pelagic industry might become a problem due to the combination of

- Very high price of the vessels and especially the quotas
- Limitation of quota concentration
- Requirement of at least 2/3-ownership of active fishers with a-status.

For the present limited pelagic fleet and owners/companies further concentration is limited – also due to the recent political debate about “quota-kings” and too high concentration. Therefore potential buyers should be new actors with rights to buy fishing vessels and quotas (the definition of a fisher), or it should be individuals already in the business – crewmembers and skippers - which take over ownership. The latter seems to be the strategy in the pelagic sector, where the ownership of vessel and quotas are handed over to skippers and other crewmembers on share basis allowing them to raise the sufficient capital. Due to the high value entities, this is a processes taking place over many years (pers. Communication).

5.2.3 Development of quota price and rent

Selling/buying or renting quota in the Danish pelagic fisheries takes place on a purely private basis. The ministry register which quotas shares are transferred at temporary (rental) basis or permanent basis. But there is no registration of the prices. In many cases, the vessel and quotas of several species in different areas are sold together for a total price, which means that there are not defined prices for quota on individual species – though buyer and seller will have their own calculations.

Therefore, there is no data on price for buying or renting quota on herring.

5.3 Value chain structure

5.3.1 Fishing

5.3.1.1 Structure of the relevant pelagic fleet

From 2009 to 2015 (available data) the Danish herring quotas has been caught almost exclusively by the vessel group “Purse seiners and trawlers at a length of 40 + meters”. In the period the three segments of trawlers between 12 and 23 meters has caught from 17 % of the volume (top) in 2010 to 6-7 % the last years. The trawlers 23-39 meters caught 12 % of the volume in 2010, which declined to 0,5 % the last years. Therefore, the herring can be said to be targeted by a few minor trawlers, but al dominantly caught by the purse seiners and trawler over 40 meters.

For the purse seiners and trawler 40+ meters herring is not the only or the dominant species, as they are targeting also mackerel and industrial species. Especially the quotas on the industrial species as sandeel is highly fluctuating – influencing the catch composition of the fleet segment.

Table 37: Purse seine and trawl 40+ m: Vessels in the segment, Share of total Danish catch of herring, and Herring dependency of the fleet segment (herring share of total gross income from fishery) 2009-2015

	2009	2010	2011	2012	2013	2014	2015
Number of vessels in the segment	11	13	12	15	16	15	12
Share of total Danish herring catches, %	81,2	68,7	80,1	91,3	90,8	88,2	89,6

Herring share of gross income, %	43,1	21,3	33,0	57,6	40,7	39,3	37,0
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Source: Statistics Denmark; FIREGN2.

Over the period from 2003 with ITQ there has been a tremendous technological development towards large, modern vessels. The fixed assets (end of year) in the group has increased by 50 % from 37,5 mill. €/vessel in 2009 to 55, 9 mill. €/vessel in 2015. Over the period the value of fishing rights make up 70 % of this value, while the tangible assets (vessel, gear etc.) represent 30 % of the total fixed assets. This illustrate increasing investments in the vessel and technology, but also increasing value of quotas and value of acquired quota of pelagic species.

Table 38: Purse seine and trawl 40+ m: Fixed assets/vessel (average), broken into intangible assets (fishing rights) and tangible assets (vessel, gear etc.) 2009-2015

	2009	2010	2011	2012	2013	2014	2015
Fixed asset/vessel mill. €	37,5	35,5	40,6	40,0	39,7	46,5	55,9
-Of which intangible	70,6%	73,0%	76,4%	77,3%	77,6%	73,0%	71,5%
-Of which tangible	29,4%	27,0%	23,6%	22,7%	22,4%	27,0%	28,5%

Source: Statistics Denmark; FIREGN2.

5.3.1.2 Financial Performance and productivity

As described above, herring represent less than half of the total gross income for the vessels, as they are also targeting other species. The following productivity measure from deliverable 2.1 therefore regards the vessel group, not the productivity of herring fisheries.

Productivity of the Danish pelagic fleet was estimated for the period 2009-2014. Average annual growth and standard deviations of landings, capital, labour and aggregated stocks are reported in Table 10-1. All four components of productivity show increases. Landings increased on average by almost 10% per year and stocks by 4.2%, while capital, as measured by the fleet capacity index, and labour both increased by 8.0% and labour by 1.8%.

Table 39: Average growth rates and standard deviation of landings, capital, labour and stocks, and capital - and labour-shares in the Danish pelagic fisheries 2010-2014. Percentages.

	Mean	Standard deviation
% change in		
Landings	9.7	15.9
Capital	8.0	11.8
Labour	8.0	31.8
Stocks	4.2	8.2
Capital share	66.2	11.9
Labour share	33.8	11.9

In Figure 1, the development of the four components of productivity is examined in more detail. During the period under study, Danish pelagic catches have varied considerably between years, but landings have though not contracted as much between years as in pelagic fisheries in some other countries. This is probably mostly due to the fact that the period under consideration is very short, only a few years. There are considerable fluctuations in capital and labour, which can be explained by relatively small number of vessels taking part in the fishery.

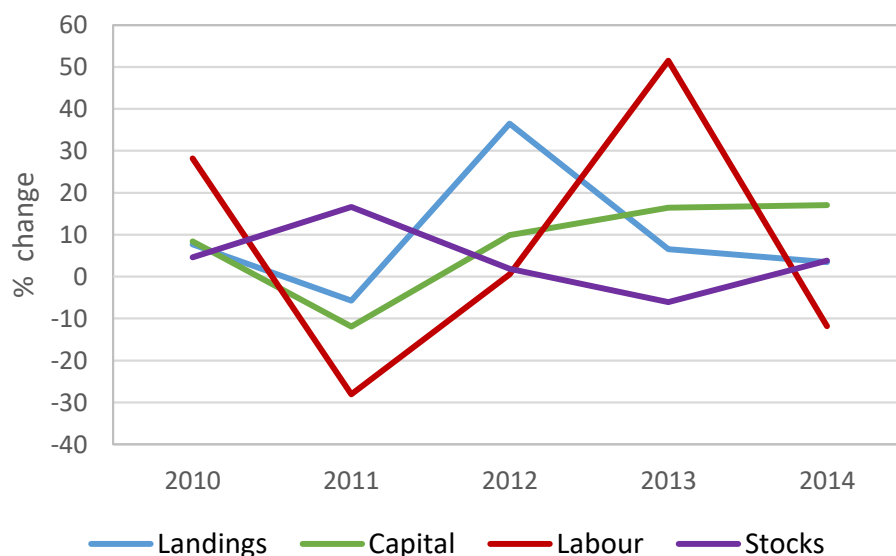


Figure 1 Percentage changes in landings, labour, capital and stocks in the Danish pelagic fisheries, 2010-2014.

5.3.1.3 Price settling mechanism, first gate price

There is no restrictions regarding landing obligation of catch on Danish quota. Generally the vessels land where the company gets the best total outcome in a combination of the first gate price, cost of fuel and time spend on going to the port/company and other payment. Therefore, catches of herring on the Danish quota is landed in Denmark, Norway or Germany.

The open market place for sale is by offering the landings at the auction of “Norges Sildesalgslag”. The Norwegian processors as well as Danish processors buy directly via this auction. The processors offer a price and a certain bonus for deliverance depending on the distance. Direct sales via Norges Sildesalgslag is not always the way for deliverance to Danish processors. In many cases there are some kind of agreement or coordination between the vessel and a processor about deliverance of a certain amount at a certain time. The vessels are generally not holding a formal contract, but coordinates on a continually basis. Even when coordination takes place, the current price at the auction of Norges Sildesalgslag is the basis for negotiations about possible bonus for deliverance.

Apparently one or more processors in Germany offer access to German or Dutch quota in the North Sea owned by the processor as a part of the payment for landing to their facilities (pers. Communication).

Only around 10 % of Danish landings of herring in Denmark are registered at the Danish fish auctions (Ministry of Environment and Food a), while the rest is landed directly to the processors with direct negotiated price setting, though generally departing from the price level of Norges Sildesalgslag.

The market is not fully reflecting the highest quality of herring. In general, the quality of purse seine caught herring is higher than trawl caught herring, as the herring caught trawl depending of trawl time, risk to be pressed in the cod end. It is more time consuming to purse seining a shoal than to trawl it. The extra work, and quality, of the purse seine caught herring is normally not rewarded (pers. communication). It has not been confirmed if this reflect a consumer market which can or will not pay extra for the seine caught quality of herring.

5.3.2 Processing herring

5.3.2.1 Industry structure and employment

The Danish herring processing industry has been through a consolidation process. In this process the production capacity has been reduced to better fit the resource base. The sector is dominated by two large and a number of minor processors. There are only data on turnover for the two large companies, the sizes are therefore not known, but a rough guess would be that the two dominant processors counts for around 75 % of the total processing volume.

The dominant processors; Skagerak Pelagic and SweDen Pelagic Aalbaek A/S (former Nielsens Fiskekesport) are specialized in processing of herring for further processing, mainly in Germany and Poland; whole herring, gutted herring without head, herring flaps and herring fillets and pieces without skin and roe of herring. The companies also marinate the herring in barrels for further processing in next link in the value chain. All though these companies still export for further processing the value added has increased by shift from frozen to fresh and chilled and by a higher degree of marinating, de-skinning and in some cases even cutting the fillets in pieces. These companies hold 225 employees according to the account data.

A few of minor processors also primary process herring, while others are in secondary processing for customer products, often in a combination with final products of other species. The final products of herring are mainly herring in glass or buckets in various marinades for catering or retail and herring roe. These are producing to the home market and for export. Five minor processors are registered to employ up to 250 persons. Given the production volume this reflect a less automated production and a production mix, where herring is not the only, and maybe not the most important product.

5.3.2.2 Financial performance and productivity

The data on economic performance is based on official account data from the companies, here from Bisnode. Here is presented the data for the two dominant herring processors. It is clear, that the profit is at a low level. Skagerak Pelagic is improving the result after tax, while Nielsens Fiskekesport was sold in 2017 as SweDen Pelagic Aalbaek A/S after decreasing result the last years.

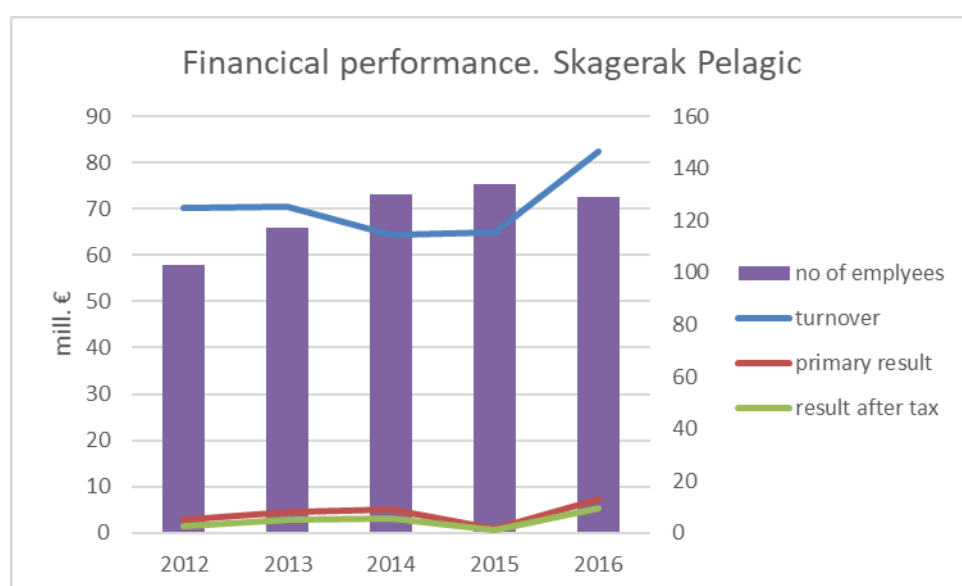
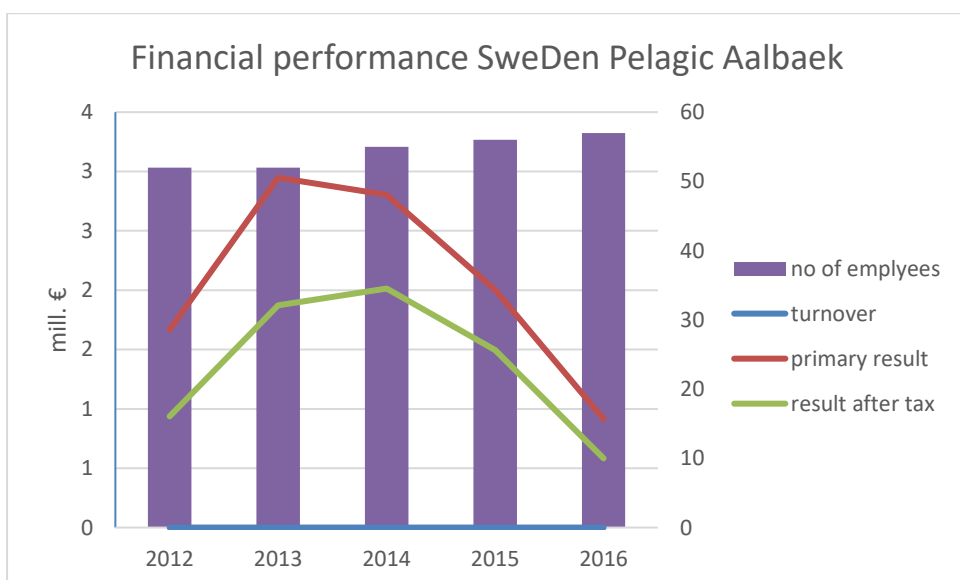
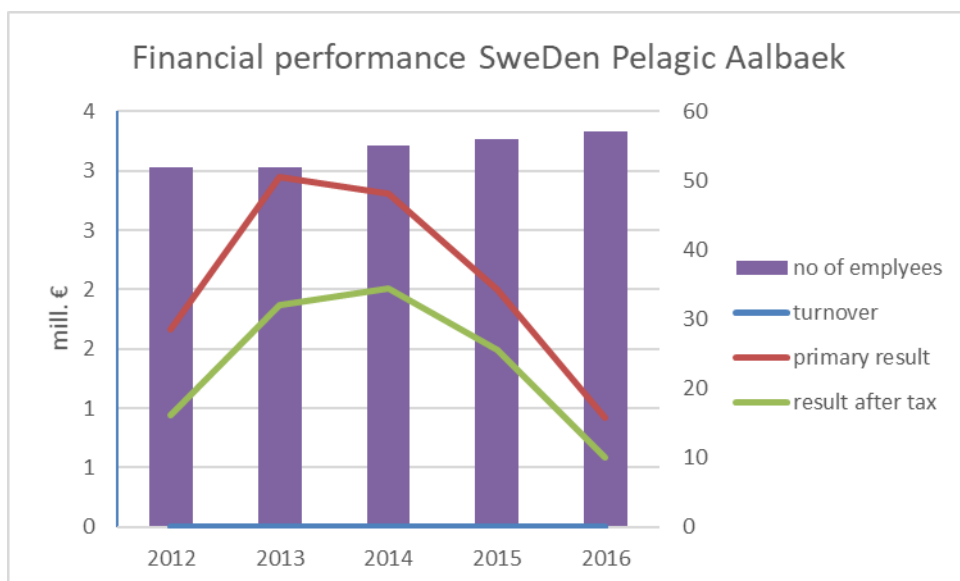


Figure 2: Key economic data for Skagerak Pelagic A/S; turnover, primary result, result after tax, and number of employees, 2012-2016, pr 31/12. Bisnode



No data on productivity is available, as there is no specification of operation cost.

5.3.3 Value creation and utilisation (based on live weight)

No such data are available in a Danish context.

Interview with the dominant processor confirm that the company holds these data. They regard this information as highly confidential and are not willing to share the information outside the management groups of the company.

5.3.4 Marketing sector

5.3.4.1 Structure of the marketing sector

The main part of the export of herring from Danish processors are commodities for further processing in Poland or Germany. The products are sold in direct sales to the processors of final products (pers communication 2006!).

The minor processor of final products are to a high degree targeting the Danish consumer market by producer brands or to an increasing degree by “own brand” for the retail sector. For some of secondary processors the export are limited (Hansen 2016).

5.3.4.2 Export

Export mainly takes place as business to business relation. There are no generic export strategies, nor organisations to handle such issues.

5.3.4.3 Domestic use or consumption

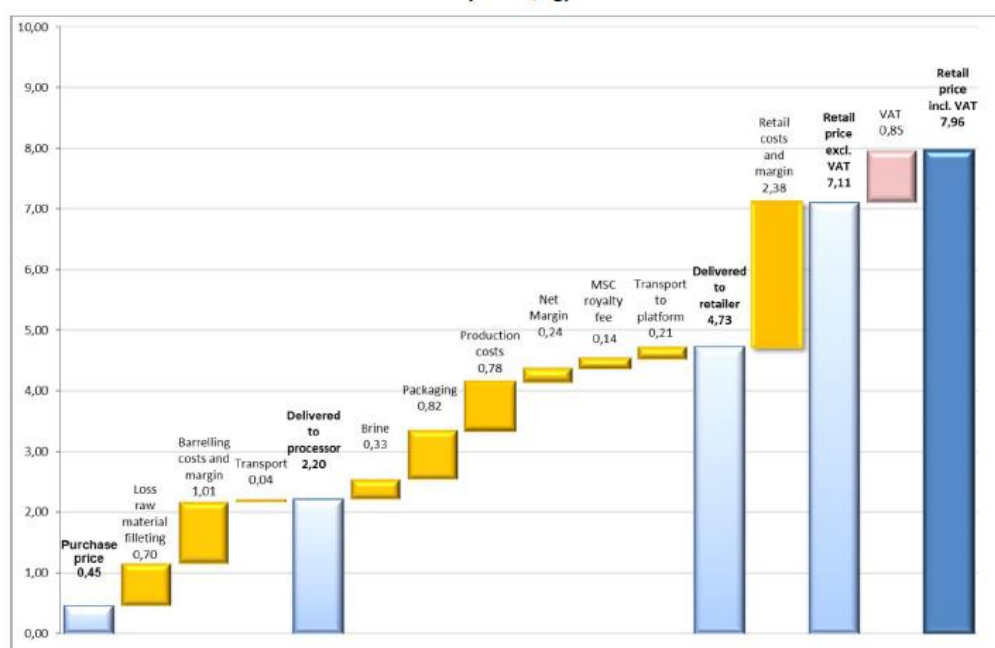
No specific data on domestic herring consumption.

5.3.5 Price transmission

No data are available for price transmission for herring products from Denmark.

Could the EUMOFA report “Case Study: Herring preserved in glass jars in Sweden. Price structure in the supply chain” be used?

Figure 13 - Price transmission for herring in glass jars (with MSC certification) on the Swedish market in 2016 (in EUR/kg)



Source: EUMOFA survey

Figure 3 Price transmission EUMOFA

Tenax

Tenax is one of the largest Danish companies within secondary processing of herring. The company is family owned. Founded in 1987, the company bought another Danish secondary processor Lykkeberg in 2005. 60 employees with 100 in the high season (Hansen 2016). The turnover is not known.

Tenax sell herring in various spices in glass or plastic bucket for the consumer market. Tenax produce three different brands, and offer private label as well (. Tenax exported 10 % of the production in 2016, but planned to develop new receipts for the German market, which were expected to increase the export to 20 % (Hansen 2016).

Industry Lifecycle [SQE: We have no data on the herring industry specific]

Only the number of workplaces (specific addresses) are registered. This means that companies with several working places counts several times. As an example the registered number of working places for production of fish meal and oil has been stable at 6 the last 10 years, while the companies has consolidated into 2 only. As the production plants is still operating, still 6 working places is registered. The slightly decreasing number of work places can hide a stronger consolidation. Note that wages in running prices is slightly increasing, while the number of full-time employees has decreased from 5.000 to 3.200.

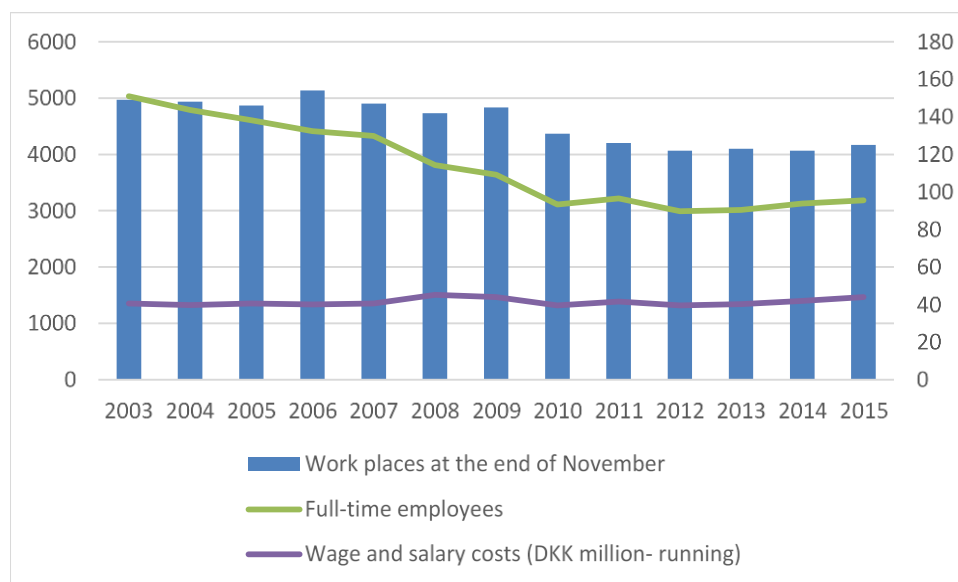


Figure 4: Development in the Danish fish processing industry. No of workplaces, full-time employees (equivalents) and wage and salary costs (mill. DKKR running)

Source: Statistics Denmark. ERHV1 and ERH17X.

5.4 Overall economic performance and competitiveness of the fisheries value chain (in each country)

5.4.1 Value Chain dynamics

5.4.1.1 Governmental form

The assessment of the governmental form is based on recent interviews with an observer of the sector, a vessels owner, a processor and general knowledge of the sector including interviews from other project relations in 2007.

As described earlier the herring industry has been consolidated over the last 15 years. The fleet started consolidate with implementation of ITQ in 2003. The consolidation in the processing followed some year later but has reached a high level of concentration today, which the assessed HHI-index around 0,4 illustrates.

In general the relation between the fleet and the primary processors has been characterized by a market relation, with some degree of negotiation and coordination. In many years on of the large processors integrated fleet (three large vessels) and primary processing. In 2010-2011 the processor sold vessels and quota partly to get capital to buy up and consolidate the herring processing industry. The only example of hierarchy dissolved.

Today the relation is formally market based – the vessels sell and land where the price and income is best. In practice the number of players are limited on both sides. Therefore, there are some coordination between the vessel and the processor. This is a way for the processors to ensure stable supply of resources, and for the vessel, which lands large amount at the time, that there is at least one buyer of the catch at a stable price level. The relation thus can be characterized as modular, or in some cases even relational, in the cases of strong coordination between the processor and one or a few vessels.

Regarding the processing and export market, the consolidation the last 15 and especially 10 years has influenced the governance structure as well.

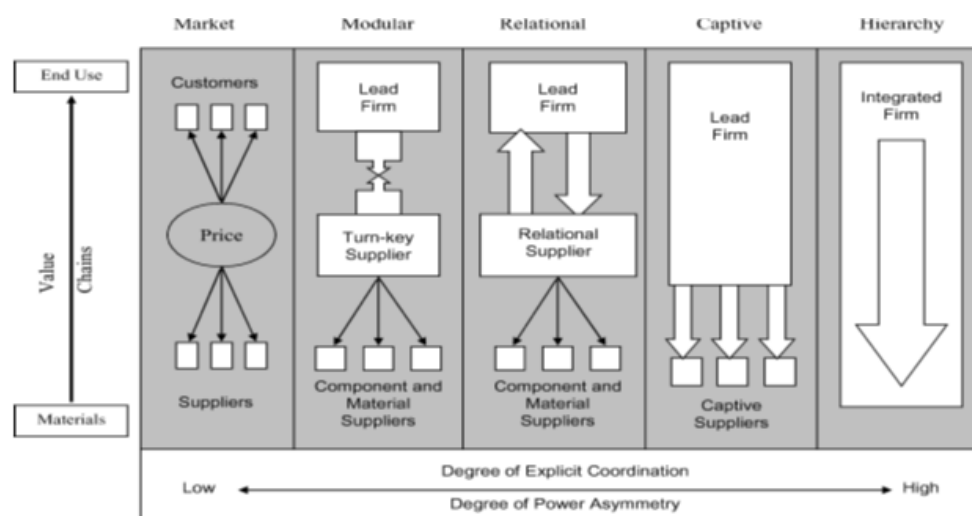
Earlier, the Danish herring-processing sector was characterised by a relative few high number of primary processors. The capacity was relative high, also compared to the resources. They therefore competed hard on attracting landings from Danish, as well as Faroese and Norwegian vessels. Also the export for the German processors were highly competitive. Anecdotal the secondary processors often called several primary processors to put a downwards pressure at the price. The relation was highly competitive at a market basis, while also personal relations and personal knowledge of quality were of importance.

Today the primary processing industry has been through a strong consolidation with few dominant companies left. In this process, also a professionalization of management and sales has taken place. Different types of certification (ISO and environmental certifications) has been implemented. Still personal relations for establishing of contacts and guarantee of quality is very important, according to the informant. The sector is so small that knowledge of problems of quality is spread very fast. Quality is partly maintained by certification systems, but also by social control.

The relation between primary and secondary processor apparently has characteristics from a modular or even relational coordination. Still the relation is highly competitive and market based. Apparently, every link in the value chain are aware the risk of being dependent of a supplier or customer. Therefore, the companies tend to limit input or sales of products to 20-25 % for each customer. This means that the customers always have a range of suppliers and can maintain the price competition between these. This is also a market based limit for consolidation in the Danish industry. The secondary processors probably will not just augment the dependency of the new consolidated supplier of primary products, but rather search for alternative suppliers to avoid dependency.

The larger primary processor has increased the level of value added by marinating, deskinning and in some cases to cut the fillets into pieces, but there seems to be a barrier to upgrade to final products. Several informants have mentioned a fear of having a relation to the main market of secondary processors as supplier *and* competitor in certain markets. While this forms a market barrier for upgrading for the larger primary processors, there is space for minor secondary processors in Denmark also.

Among the informants, some speculate in a future development of strategic alliances in the value chain, as the market for herring and herring products is gradually consolidating. A future scenario might therefore be captive governance structures with closer coordination between two or more links in the value chain. This is speculations and no signs of steps in this direction was mentioned.



5.5 Strategic Positioning Briefing

Independent Small boats owners

- The nature of the herring/pelagic stocks and the industrial processing are that the catches is best done by large modern vessels which can catch large schools and store them under high quality conditions. Therefore, I don't see any upgrading strategies for the small or minor boat owners. Catches of herring here is more like bycatch or for limited local markets, which seems to be quite limited.
- To my knowledge, there is no "alternative" markets or distribution for herring, which could be upgrading strategy for small vessels.

Independent big boat owners

- The fleet seems to be close to the limit of consolidation, also given the recent political debate of "quota-kings". The dominant process has been construction of larger vessels with top-class handling equipment for deliverance of top quality. This process of modernisation will probably continue, as long as the economy in the sector is as profitable as at present.

Individual producer

- The consolidation process has increased the automation among the primary processors. The turnover is up to 580.000 €/employee. A driver for the consolidation has been the necessity of volume in the processing industry, following the still larger pelagic vessels. It turned out to be impossible/expensive not to be able to take a full load from a vessel. Therefore the minor primary processors could choose to increase capacity with the larger vessels or sell to the larger processors with sufficient capacity to take and handle full loads.
- The dominant upgrading process for the producers has been consolidation in larger entities and higher value adding of the product for secondary processing.
- There seems to be barriers for upgrading to be secondary producer of consumer products. This will lead to a double position with direct competition against the customers.

Vertical integrated company in fishing and production

- Vertical integration of primary processing and the fleet was given up 6-7 years ago. The situation was opportune for getting a good price for vessels and especially quota, which was invested in consolidation in the processing industry. An argument used today is that maybe the dis-integration allowed the company to focus better.
- Clearly integration would secure the supply of resources, but the company also in the period of integration bought from other vessels. It can be considered if the dis-integrated situation with informal relations to a larger group of vessels/suppliers allow the company to plan to a higher degree than by being fully integrated.
- The Dutch owned herring processor in Rüggen apparently own vessels and quota as well. But they also produce based on landings from other (here Danish) vessels.

Vertical integrated company in fishing, production and marketing.

- No such companies has been identified in the sector.

5.6 Data limitations and comments

Fishery related data:

The Statistics Denmark provide data on vessel accounts for vessel groups. This is relevant as the Danish herring fisheries is mainly concentrated on one vessel type (purse seine and trawler over 40 m.). Here detailed account data is available at a level of average for the group.

Data on quota- ownership is only available from 2008, though the ITQ (IOK) system has been in place from 2003 for the pelagic sector. This has been used for HHI-index calculation. The source is the homepage of the Danish Ministry of Environment, The Danish Agrifood Agency.

It has not been possible to get new data on productivity. Calculations from 2.1 on a cut and paste basis

Processing related data:

Account data are available in the Bisnode database based on the official accounts for the Danish Business Authority. This data has been used for documenting the economic performance of the largest and herring focussed industries

For most companies there are no legal requirement of telling about turnover in the account data. This factor therefore cannot be used for HHI-index. Instead volume of herring resources has been used, not based on statistical data, but informed from two independent industry managers.

It has not been possible to get data on productivity. Even for the two large companies with turnover, there is no data on cost of labour.

In a Danish context no data on value creation and utilisation in the companies are available. It was asked for under company interviews. It was pointed at, that the company hold these data, regard this information as highly confidential, and are not willing to share the information outside the management groups of the company.

Data for price transmission calculation is available. Instead EUMOFA calculations on Swedish herring in glass might be useful.

Consumption: No specific data on domestic herring consumption are available.

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- FIREGN2: Accounts statistics for fishery.
- ERHV1: WORKPLACES, JOB, FULL-TIME EMPLOYMENT, WAGE AND SALARY COST BY INDUSTRY (DB07) AND UNIT (<http://statistikbanken.dk/statbank5a/default.asp?w=1536>)
- ERH17X: WORKPLACES, JOBS, FULL-TIME EMPLOYEES AND WAGE AND SALARY COSTS BY INDUSTRY (DB03) (DISCONTINUED)

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- Lise Jørgensen Jan 2016
- Mogens Schultz, SE Packaging, Jan 2016.

Fisheries Value Chain
Evaluation of industry dynamics, opportunities and threats to
industry

Canada Atlantic Herring (*Clupea harengus*)

Prepared by
Kelly Moret
Meghan Donovan
Ray Hayter
Heather Manuel

January 2018

List of Acronyms

CDN	Canadian; or Canadian Dollars (\$CDN)
CFIA	Canadian Food Inspection Agency
DFLR	Department of Fisheries and Land Resources, Government of Newfoundland and Labrador
DFO	Fisheries and Oceans Canada
EU	European Union
HOG	Head on, gutted
IFMP	Integrated Fisheries Management Plan
Kg	Kilogram(s)
LOA	Length over all, refers to total vessel length
Mt	Metric Tonnes
NL	Newfoundland and Labrador
PIIFCAF	Policy for Preserving the Independence of the Inshore Fleet in Canada's Atlantic Fisheries
TAC	Total allowable Catch

Dictionary

Buddy Up - a DFO-authorized temporary arrangement allowing a maximum of two (2) two license holders holding valid licenses for the same species, the same fishing area and the same gear type operating from the same vessel.

Controlling Agreements- an agreement whereby a person, or company, or organization has entered into an agreement with a commercial fishing enterprise that gives influence or control over the license holder's decision to request the issuance of a replacement license to another person.

Enterprise Combining: A policy that permits Independent Core fish harvesters to acquire another enterprise for the purpose of combining, and results in the removal of one enterprise, vessel registration and duplicate species licenses.

Fish Landing Station- means any site where fish or marine plants are offloaded for the purpose of marketing (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador).

Fishing License: An instrument used by the Minister, under authority of the Fisheries Act, grants authorization to a person, including an Aboriginal organization, to harvest certain species of fish or marine plants subject to the conditions attached to the license. This is a temporary grant as licenses are issued for a fixed period, usually annually.

Homeport: The port from which a fish harvester's enterprise is based.

Minimum Processing Requirement- means the minimum amount of transformation of a species from its live and/or landed state before the product may be shipped from Newfoundland and Labrador (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Primary Processing- means the processing of fish as part of its preparation for market by applying any one or more of the following processes to it: washing, cleaning, icing, skinning, shucking, filleting, portioning, pickling, cooking, salting, curing, drying, freezing or canning. A primary process fish or seafood product is one that has been washed, cleaned, iced, skinned shucked, filleted, portioned, pickled, cooked, salted, cured, dried, frozen and/or canned. (Source: Fish Processing Licensing Policy Manual, Government of Newfoundland and Labrador)

Professionalization Classification: Fish harvester registration classification as an apprentice, Level I or Level II professional fish harvester, as acquired through the Professional Fish Harvesters' Certification Board.

**Note- unless otherwise stated, the above definitions are from the Fisheries Licensing Policy for Newfoundland and Labrador Region,*

Source: <http://www.dfo-mpo.gc.ca/reports-rapports/regs/licences-permis/nfld-Labrador-tn-labrador-eng.htm#term>

Conversion References

Units of Measure

UNIT	POUNDS (lb)	KILOGRAMS (kg)
Metric tonne or tonne (Mt)	2204 pounds	1000

Foreign Exchange Conversions for Period 1999-2016

Year	CDN:EURO	EURO:CDN
1999	0.63	1.58
2000	0.73	1.37
2001	0.72	1.39
2002	0.68	1.48
2003	0.63	1.58
2004	0.62	1.62
2005	0.66	1.50
2006	0.70	1.42
2007	0.68	1.47
2008	0.64	1.56
2009	0.63	1.59
2010	0.73	1.36
2011	0.73	1.38
2012	0.78	1.28
2013	0.73	1.37
2014	0.68	1.47
2015	0.71	1.42
2016	0.68	1.47
2017	0.69	1.45

6.1 Global Market Review

Herring has been an important food for humans since ancient times; 5,000-7,000-year-old herring bones from the stone-age have been found in Denmark, both indicating consumption and catching of the fish (Albala, 2011). Herring played an important role in the economic development of Iceland during the last century. Herring revenues built up whole villages, ensured renewal of the fishing fleet and allowed thousands of young Icelanders to educate themselves. (Sigurdsson *et al.*, 2007). Herring still plays a large role in the economy of Iceland with about 4-12% of the total value in fish export (Statistics Iceland, 2018). In Canada, the herring fishery has supported major commercial fisheries on both its Pacific and Atlantic coasts. The development of an almost unlimited world market for herring meal and oil, plus major advanced in fishing technology led to overfishing both stocks during the 1950 through to the early 1970's. Since this both fisheries have been strictly regulated. The Canadian herring fishery was valued at ~€28 million in 2015 (Historic Canada-Herring, 2018). The Atlantic herring is one of the most important pelagic fish species in the world with historic catches ranging from about 4 million tons (1965) to about 880 thousand tons (1979). The catches in 2014 were about 1.631 tons (FAO, 2017). Other (true) herrings are the pacific herring, found in the north Pacific and the Araucanian herring found off the cost of Chile. These latter herrings will not be covered in this report.

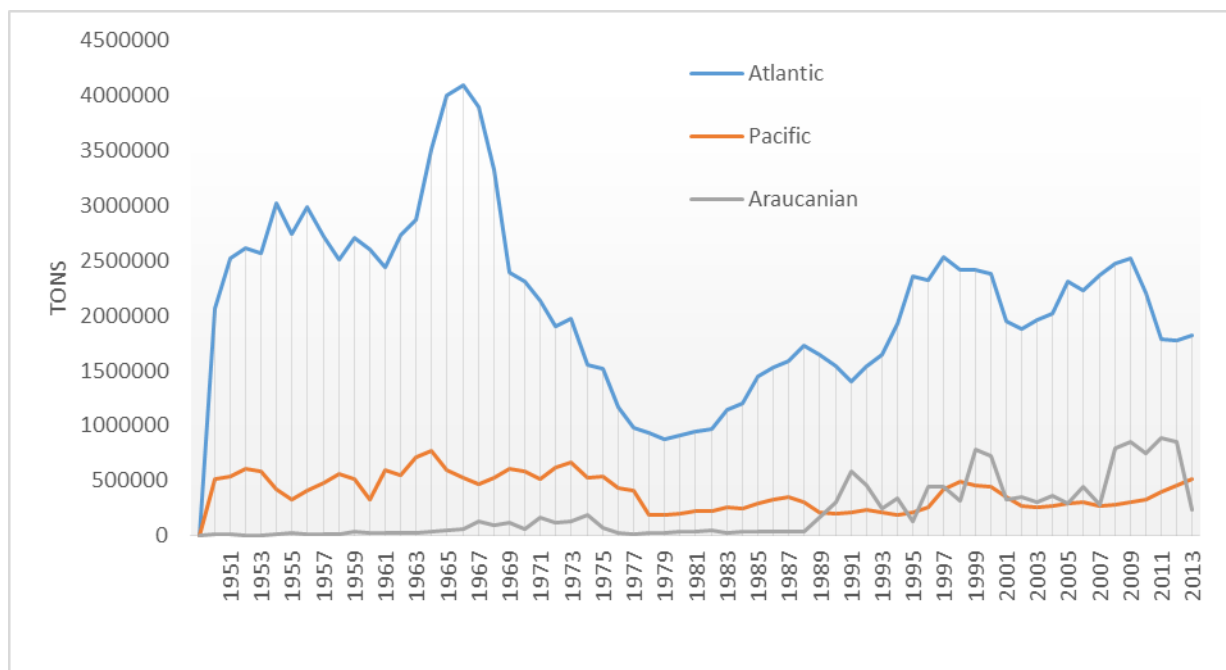


Figure 1: Catches of herring from 1950-2014 (FAO, 2018).

According to the FAO (2016), fishery production varies greatly among species and the ten most productive species and accounted for ~27% of the world's marine capture fisheries production in 2013. Most of the stocks are fully fished and therefore have no potential for increase in production- as seen by the relative stable capture production in Figure 2). The Atlantic herring (*Clupea hargneus*) stocks in both the northeast and northwest Atlantic are considered fully fished. In the Atlantic and adjacent seas, catches of Atlantic herring fell by one third between 2009 and 2014 (Figure 3). Herring captures decreased for the three major fishing countries Norway, Iceland and Russian Federation (FAO, 2016).

Global Capture Production for species (tonnes)

Source: FAO FishStat

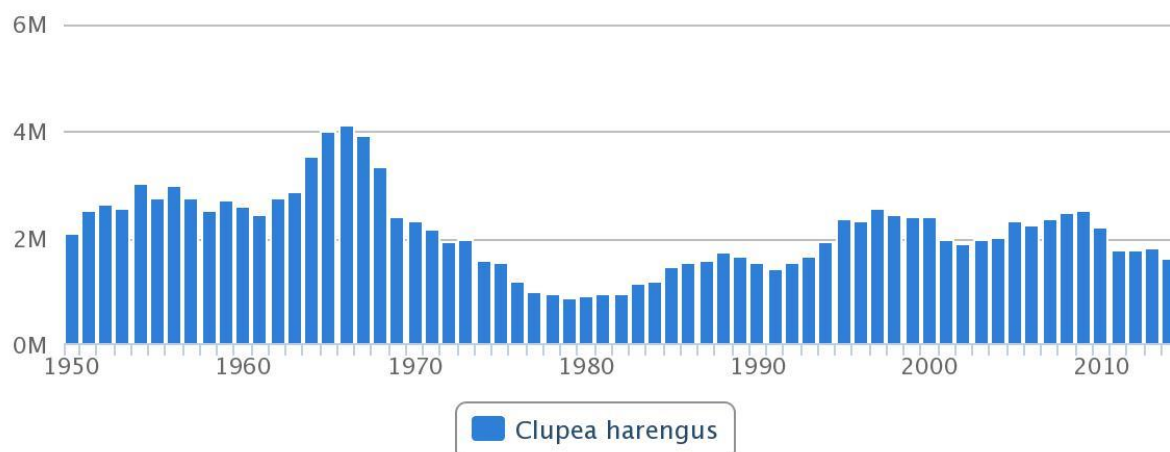


Figure 2: Global Production for Atlantic Herring (Source, FAO FishStat, 2018).

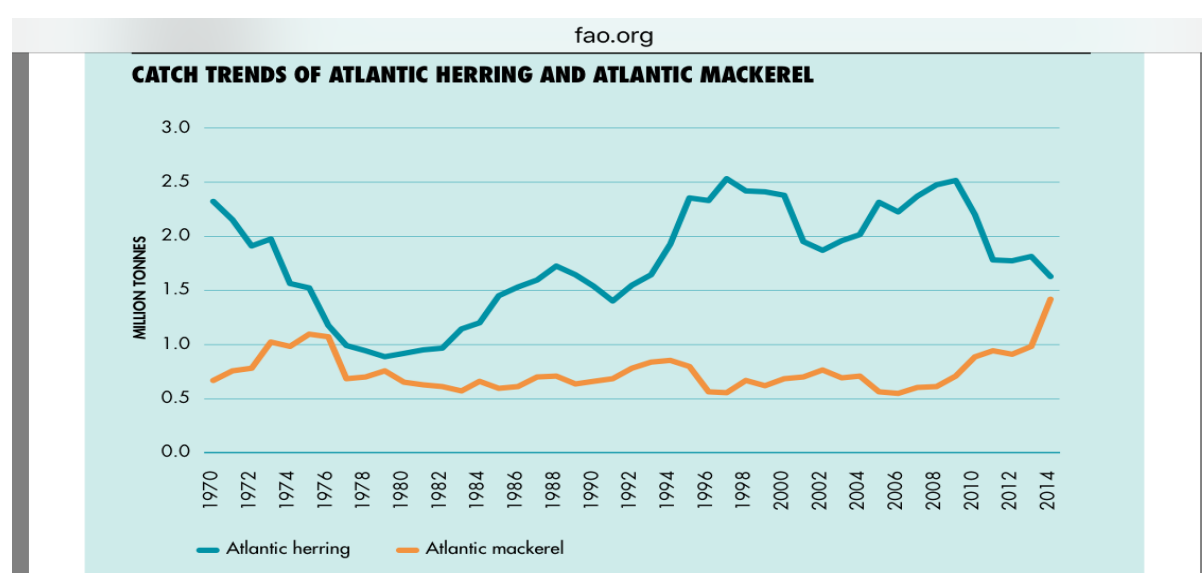


Figure 3: Catch Trends of Atlantic Herring and Atlantic Mackerel from 1970-2014 (Extracted from FAO, 2016).

Canada

Canada's herring fishery includes two species: Atlantic Herring (*Clupea harengus*), harvested in Atlantic Canada on the east coast; and Pacific Herring (*Clupea pallasii*) harvested on the west coast of British Columbia (Figure 4). This report will focus on the Atlantic herring fishery in Atlantic Canada.

Atlantic herring is the most abundant fish in the North Atlantic, and as such, is a critically important fisheries species. Herring is the most captured species by weight in the North Atlantic, accounting for around 20% of the total catch in 2011 North Atlantic Seafood Market Report (2013).



Figure 4: Herring fishing regions in Canada (Source: Fisheries and Oceans Canada).

6.1.1 Main Producers

The main producers of Atlantic herring have traditionally been Norway, Iceland, Russia (previously the Soviet Union) and Canada with on average 60% of the herring catch during the last 20 years (1994-2014) (Figure 5, FAO, 2018). The main herring producer within EU are Denmark, Finland, UK, The Netherlands, Germany, France, Poland and Ireland with about 650 thousand tons on average during the period 2012-2014 (Figure 5).

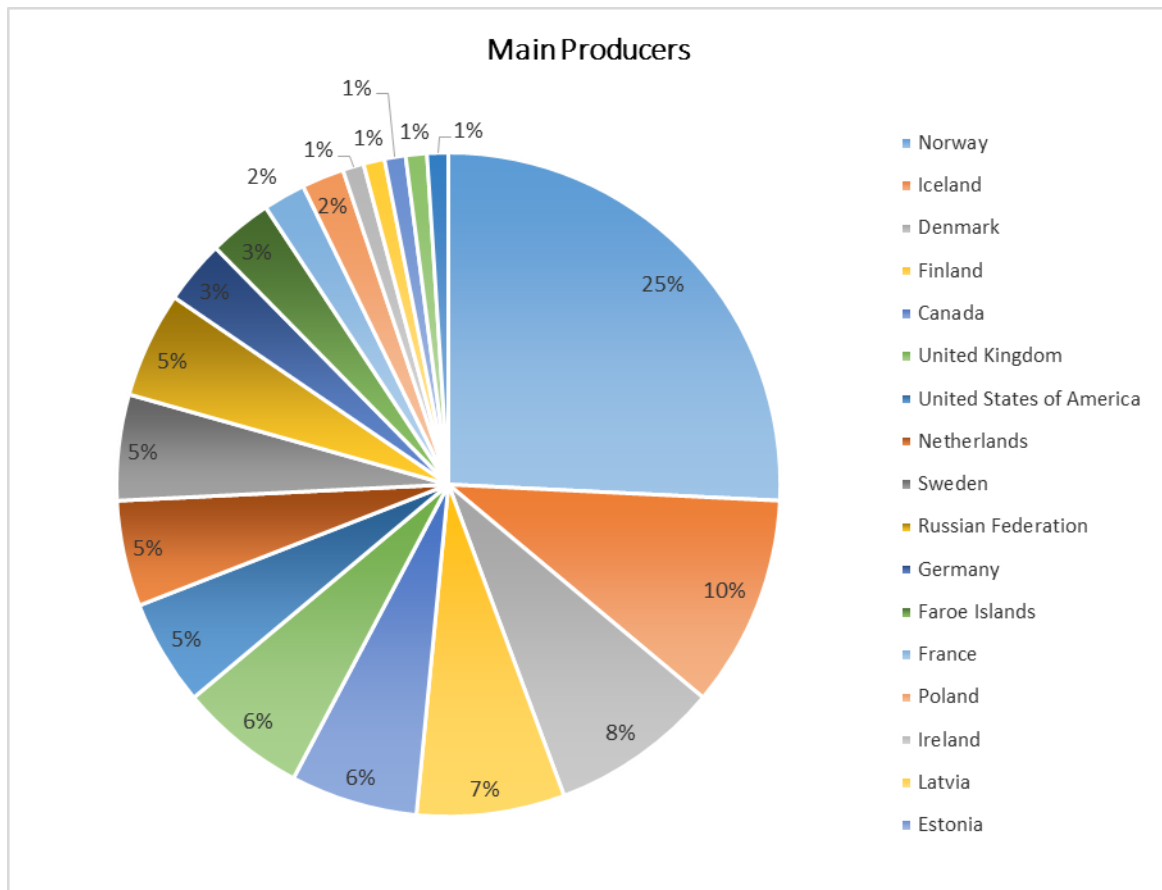


Figure 5: Main Producers of Herring (Source: FAO, 2017).

Canada

Within Canada, total landings of Atlantic herring have declined by 56% since 1990 from 260,273 metric tonnes to 114,200 metric tonnes in 2015 (Figure 5) (Fisheries and Oceans Canada, 2017a) In 2014 the majority (90%) of the landings were landed in Nova Scotia (39%), followed by New Brunswick (28%) and Newfoundland and Labrador (22%) (Figure 6) (Fisheries and Oceans Canada, 2017a).

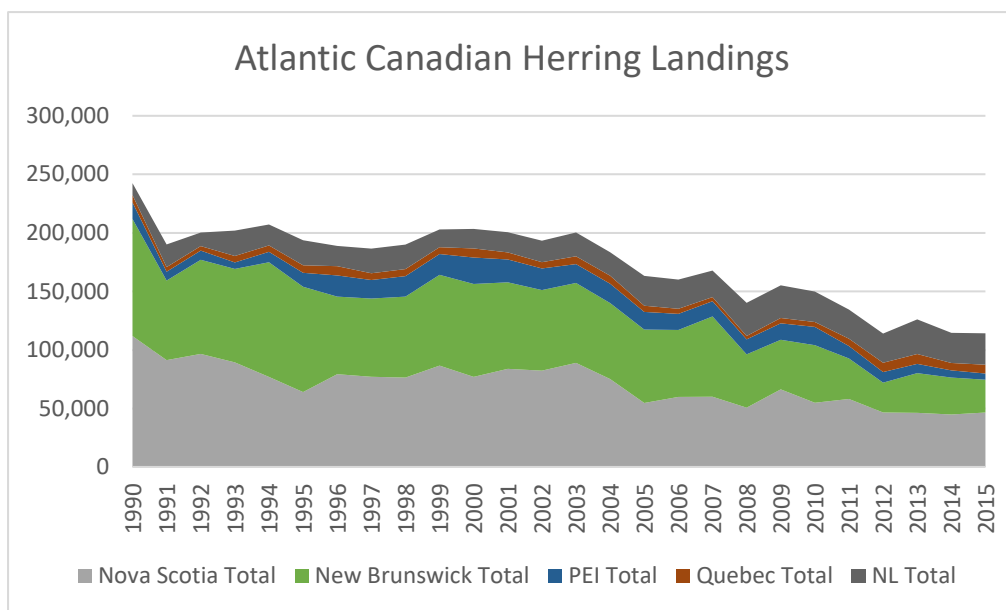


Figure 6: Landings of Atlantic herring in Canada by volume (metric tonnes live weight) (Source Fisheries and Oceans Canada, 2017a)

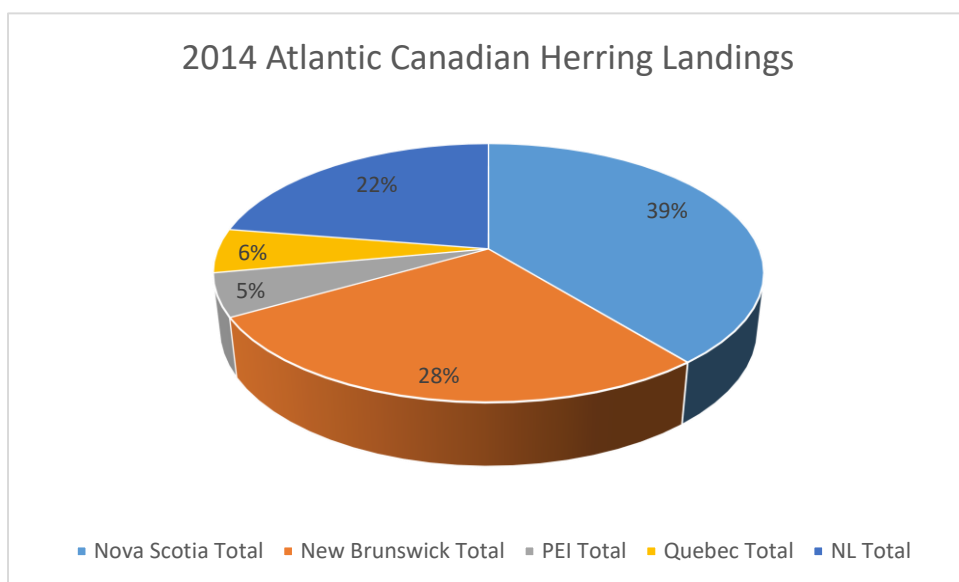


Figure 7: 2014 Landings of Atlantic herring in Canada by volume (Source Fisheries and Oceans Canada, 2017a).

Although the total landings of Atlantic herring have decreased since 1990, the total landed value has remained relatively stable averaging \$36.3 million between 1990 and 2015 (Figure 7) (Fisheries and Oceans Canada, 2017a). However the value (\$/kg) of the landings has more than doubled since 1990. In 1990 the total landed value was \$37.6 million for 260,273 t (\$0.14/kg) compared with \$38.8 million in 2015 for landings of only 114,200 t (\$0.34/kg). In 2014 the majority (89%) of the value of Atlantic herring was shared among three provinces: Nova Scotia (41%), New Brunswick (34%) and Newfoundland and Labrador (14%) (Figure 8) (Fisheries and Oceans Canada, 2017a). These values indicate that NB received the highest value (\$0.42/Kg), followed by Nova Scotia (\$0.36/Kg). NL received the lowest price of all the Atlantic Provinces at only \$0.22/Kg.

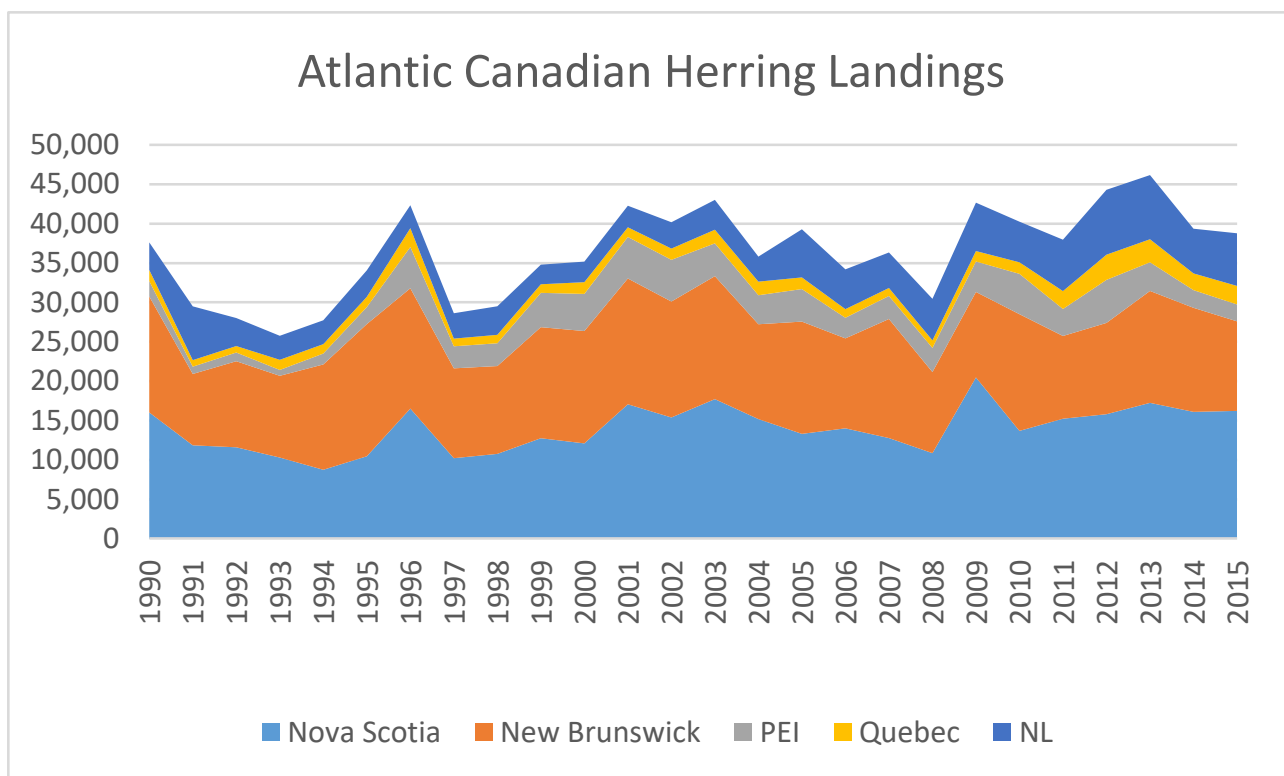


Figure 8: Value (\$000s) of Atlantic Canadian herring landings (Source Fisheries and Oceans Canada, 2017a).

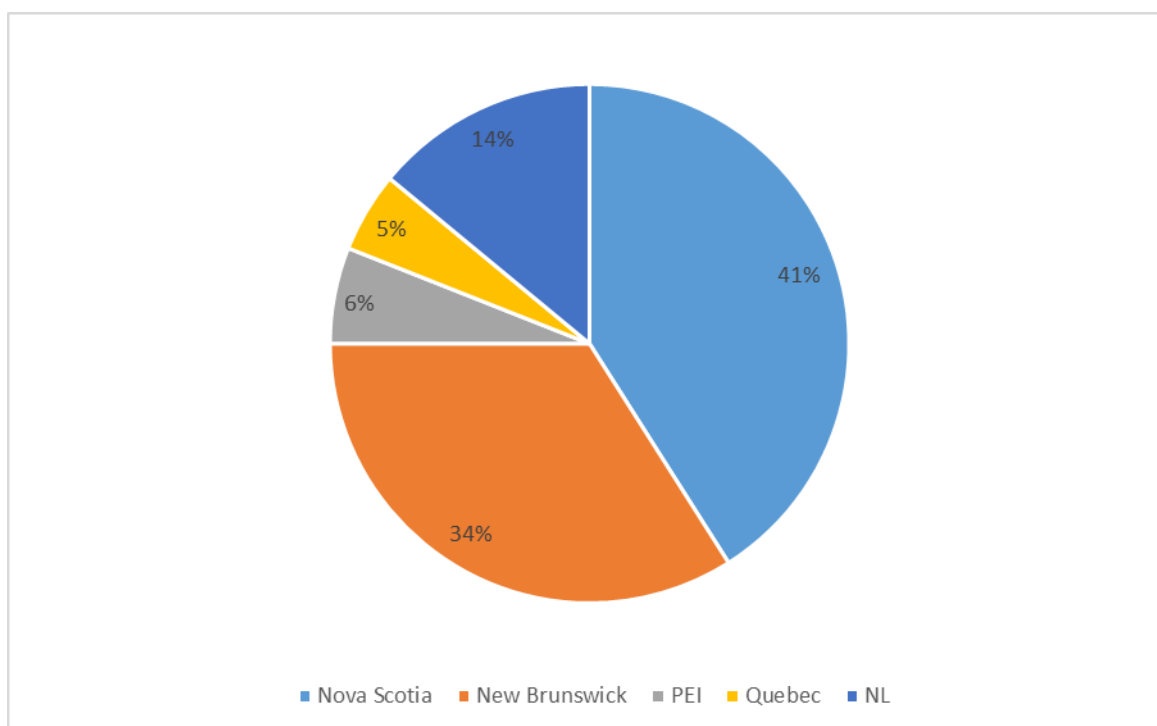


Figure 9: 2014 Value (\$000s) of Atlantic Canadian herring landings (Source: Fisheries and Oceans Canada, 2017a).

6.1.2 Main Markets

The great majority of landings across countries is destined for human consumption and this share has been growing over time. Still, large parts of the Atlantic herring catch e.g. the Baltic herring is mainly used for feed production (Anon, 2018).

The main food markets for herring have traditionally been Eastern Europe and Russia. Herring has been stable food in these region both as a good source of relatively cheap fish and as a protein source. In former times much of the herring was salted in the countries catching the herring before export. However, after the collapse of the Soviet Union at the end of 1991 the market for the primary goods has switched largely from salted herring in barrels to frozen herring (whole, headless and gutted, butterfly fillets, fillets with or without skin). The frozen herring is both eaten as is, but a large part of the import is used for further processing e.g. for salting and marinade (salting or vinegar curing), smoking or canning. The market in Russia has recently become less important due to political reasons and the frozen herring has been exported mainly to other markets in Eastern Europe.

There are traditional markets in Scandinavia (Sweden, Finland, Denmark and Norway) and in Germany for herring and a (small) part of the Atlantic herring catch is salted (mainly in Norway but also in Denmark, Sweden and Iceland). The herring is salted or vinegar cured using traditional recipes into large plastic barrels which serve as the raw material for the final marinated products in glass, plastic or metal containers.

There is also a market for herring in various European countries e.g. for matjes in Holland and smoked in France and UK (as kippers) and some other European countries.

Herring waste materials (bone, head, or intestines) and the part of the catch not intended for processing is used for meal and oil processing. The main market for these products is Norway as feed for farmed salmon.

Herring is a very oily species of fish and has been used for a huge diversity of products and purposes. Historically, smoked, salted, or pickled herring were primarily the methods used to preserve these fish for food. Today these fish are also used in sauces, their roe is considered a delicacy and they are an important bait for other fisheries. Globally, the catch of herring has decreased dramatically from its peak in the 1960s, but has become somewhat stable in recent years (Figures 1-3).

NEWFOUNDLAND AND LABRADOR

The main markets or buyers of NL for the period 2011-2016 is outlined in Table 1. The united States is the largest market for NL herring with the percent share of total herring exports varying from 53% to 83% over the time period. Poland is the second largest buyer with exports between 15-16% during 2014-2016. Other countries such as Japan, Russian Federation and Nigeria have been variable ranging from low (2-3%) to moderate (13-18%) of the export shares.

Table 40: Tops Buyers of NL Herring based on Percent Share of the Exports for the period 2011-2016
(Data Source: CATSNET Agriculture and Agri-food Canada),

Countries	2011	2012	2013	2014	2015	2016
United States	83%	53%	82%	53%	64%	64%
Poland	2%			16%	15%	15%
Lithuania				5%	2%	
Côte d'Ivoire					3%	
Germany					6%	
Ukraine						6%
Japan	2%	13%	2%			3%
South Africa				4%		2%
China	3%					
Nigeria	3%	13%	3%			
Georgia		5%	3%			
Russian Federation		6%		18%		
Egypt			3%			

6.2 HHI Index

The HHI is an industry benchmarking tool that measures the size of firms relative to their sector. It provides an indication of the level of consolidation and associated competition among them. HHI is commonly used as market concentration measure in anti-trust cases. It is measured using the following formula:

$$HHI = \sum_{i=1}^N S_i^2$$

Where S_i is the market share (expressed as fractions) of a company i and N is the number of companies. It is sometimes limited to the 50 largest companies in an industry i.e. in the case of highly fragmented sectors. The index is a 0 to 1 range, where 1 indicates a monopoly situation. According to U.S. merger guidelines, a HHI below 0.15 is an un-concentrated market, a HHI between 0.15 and 0.25 is moderately concentrated and a HHI larger than 0.25 indicates a high concentration.

The current fisheries management structure in NL, specifically the caps on the number of licenses an enterprise can acquire and the fleet separation policy, is also having an impact on the level of concentration, the competitiveness and consolidation by harvesters and processing companies. As such, an HHI index cannot be conducted on the NL fishery.

6.3 Fisheries Management System

6.3.1 General Description

Within Canada, the harvesting of herring is regulated by the federal government- Fisheries and Oceans Canada (DFO) while the on land processing is regulated by the provincial government- the Department of Fisheries and Land Resources (DFLR). The major objectives and priorities of the DFO's fisheries management policies include ensuring environmental sustainability and conservation of the resource, ensuring access based on adjacency or proximity to the resources, consideration of the relative dependence of coastal communities and the dependence of various fleet sectors, as well as factors such as economic efficiency and fleet mobility. Inclusion of stakeholders in the decision-making process is regarded as a key priority for fisheries management in Canada (Fisheries Management Decisions, 2017; Sustainable Fisheries Framework, 2017).

Herring biomass is divided into fishing zones, each with their own quotas and management plans (Table 2). Canada's Atlantic herring fishery occurs mainly in the spring (April/May) and summer (July/August) (Fisheries and Oceans Canada, 2017b).

Atlantic herring in Canada is harvested from FAO Fishing Area 21 which includes the provinces of Nova Scotia, New Brunswick, Newfoundland and Labrador, Prince Edward Island and Quebec. There are nine main NAFO divisions for Atlantic herring in Canada [4] (Figure 7). These include: (1) Scotia-Fundy (4VWX) - Four Areas (4Vn, 4Vs, 4W & 4X); (2) Southern Gulf of St. Lawrence (4T); West Coast Newfoundland (4R); and (4) East & South Coast Newfoundland (3KLP) - One Area Three Zones (3K, 3L & 3P)(Figure 10) (Fisheries and Oceans Canada, 2017b).

Information included in a fisheries decision may include:

- opening and closing dates for the season,
- total allowable catches (TAC),
- and management plans (Fisheries Management Plans, 2017) with certain fisheries managed through multi-year Integrated Fisheries Management Plans (Integrated Fisheries Management Plans, 2017).

In Newfoundland, the Department of Fisheries and Oceans has two sets of guidelines across the 5 major fishing zones; one set is for 4R and the other is for zones 2J, 3K, 3L and 3P. The herring fishery in NAFO Divisions 4R, 2J, 3K, 3L and 3P are comprised of both fixed and mobile gear. Fixed gear must adhere to several measures, in order to minimize the capture of salmon as by-catch (Fisheries and Oceans, 2012, Fisheries and Oceans, 2017c). The minimum size for 4R herring is set at 10.5 inches and for 2J3KLP, the minimum size is 9.75. The small fish tolerance in 2J3KLP was increased in 2017 from 10% to 20%. The tolerance remains 10% in 4R (Fisheries and Oceans, 2017c). Logbook records of catch and fishing activity must be maintained by all mobile gear vessels, all vessels greater than 35 feet in length, as well as vessels less than 35 feet in herring fishing area 14. Purse seiners are required to carry an at-sea observer on some trips. Dockside Monitoring is required for all fleets and areas of the commercial fishery.

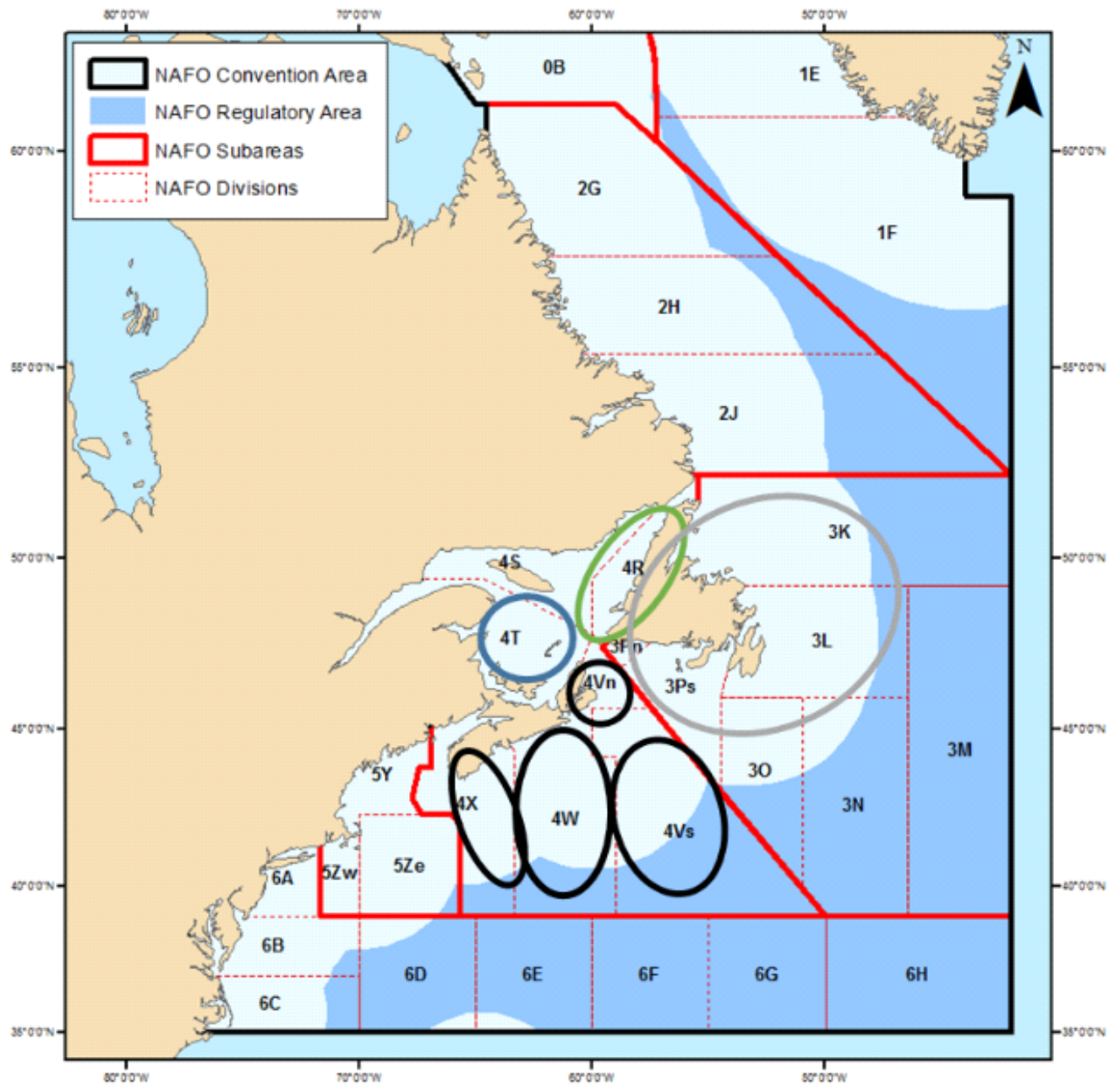


Figure 10: NAFO Divisions for Atlantic Canada's Atlantic herring fishery.

Legend:

Black circles = Scotia-Fundy (4VWX)

Grey circle = East & South Coast Newfoundland (3KLP)

Green Circle = West Coast Newfoundland (4R)

Blue circle = Southern Gulf of St. Lawrence (4T)

Table 41: Newfoundland and Labrador Atlantic Herring- Species Quota Report (table data compilation from <http://www.nfl.dfo-mpo.gc.ca/NL/Species-Quota-Reports>; February 15, 2018)

NAFO Division	Quota Definition	2014 Quota (Mt)	2014 Catch (Mt)	2015 Quota (Mt)	2015 Catch (Mt)	2016 Quota (Mt)	2016 Catch (Mt)	2017 Quota (Mt)	2017 Catch (Mt)
3K	White Bay - Purse Seine							855	895
3L	Bonavista Bay - Purse Seine	1163	1119			1453	616		
3L	Trinity Bay - Purse Seine	1163	1294			1453	1528		
3Ps	Fortune Bay - Bar Seine	1016	801						
4R	4R - Area 13 Fixed Gear	1610	525			1610	1382		
4R	4R - Area 14 Fixed Gear	2990	2112	2990	2972	2990	3154	2990	1792
4R	4R - Purse Seiners < 65'	4400	4503	4400	4448	4400	4397	4400	3217
Total Quota and Catch Rates		12342	10354	7390	7420	11906	11078	8245	5904
Total for All NAFO Divisions		30702	25731	31914	26814	32407	27342	32648	21118

An Integrated Fisheries Management Plan has been enacted in 4WX (Southwest Nova Scotia and the Bay of Fundy), in an effort to stabilize declining stocks. This plan has a set minimum length of 18 cm with a 25% tolerance rate for small fish. No fishing will occur in December, February, March or April. The TAC for these zones has also been reduced (Fisheries and Oceans, 2016). The IFMP is a both a guiding document and process for managing the stock. Specifically, the IFMP provides the planning framework for the conservation and sustainable use of fisheries resources and the process by which the fishery will be managed for a period of time. As noted by DFO, IFMP's combine the best available science with industry data on capacity and methods for harvesting that species (Integrated Fisheries Management Plans, 2017). In addition to science and conservation, IFMP consider traditional knowledge and other factors such as the economic, social and cultural importance of the fisheries in determining its management.

NL Policies on Fleet Separation

Within the Fisheries Licensing Policy for Newfoundland and Labrador there is a *Fleet Separation Policy* where the objective is to separate the inshore fish harvesting sector and the processing sectors. As a result of this policy, inshore licenses cannot be issued to corporations (typically the offshore fleet

sector), including those involved in the fish processing sector (Fisheries Licensing Policy Newfoundland and Labrador Region, 2017).

This policy was strengthened on April 12, 2007, when the Minister of Fisheries enacted the *Policy to Preserve the Independence of the Inshore Fleet in Canada's Atlantic Fisheries*. (Policy for Preserving the Independence of the Inshore Fleet in Canada's Atlantic Fisheries, 2010). Known as PIIFCAF, the policy applies to fish harvesters (vessels <65 feet or 19.8m) who held or wished to apply for licenses. Its aim is to terminate 'controlling agreements' and strengthen the Owner-Operator and Fleet Separation policies. PIIFCAF ensures that harvesters actively engaged in the fishery and the consultative process are the ones who benefit from the privilege of the license.

The objectives of this Policy are to:

- Reaffirm the importance of maintaining an independent and economically viable inshore fleet;
- Strengthen the application of the Owner-Operator and Fleet Separation policies;
- Ensure that the benefits of fishing licenses flow to the fish harvester and the coastal community; and
- Assist fish harvesters in retaining control of their fishing enterprises.

Effective April, 2007, the Policy created the Independent Core category as the eligibility criteria for the receipt of new or replacement vessel-based fishing licenses in the inshore sector of Atlantic Canada. The Independent Core category is available to inshore fish harvesters who have vessel-based fishing licenses issued in their name and are not party to Controlling Agreements

The policy was implemented to ensure fish harvesters were able to retain control of their enterprises/license. The policy set a framework/criteria for harvesters to transfer or replace their existing license with the new designation identified as "Independent Core." The policy data for 'independent core' status appears in the DFO statistics for the year 2009. The Independent Core category is an eligibility criteria for the receipt of new or replacement inshore vessel-based licenses. A non-core harvester does not meet those criteria.

NL Licensed Commercial Fisherman and Professionalization

Prior to 1996, commercial fishermen in NL were required to register with DFO on an annual basis as either part-time or full-time, but due to deficiencies with the distinction between part-time and full-time fishermen, fisher registration was eliminated in 1996 and replaced by a system of enterprise registration. In 1996, following a review of all existing enterprises, DFO established the terms Core and Non-Core (Professional Fish Harvesters Certification Board, 2015). "Core" refers to the status of a commercial fishing enterprise which holds key species licenses, have an attachment to the fishery and be dependent on the fishery (Roy, 1997). A "fishing enterprise" is defined as an authorized fishing business under which multiple fishing licenses or vessels up to 27 meters (90 feet) operate. Each enterprise is controlled by one owner who directs fishing effort among that owner's vessels and licenses (Fisheries Licensing Policy Newfoundland and Labrador Region, 2017).

In 1996, DFO made a commitment that no more Core licenses would be issued. Therefore, the only way to obtain a Core enterprise in NL is through the transfer of an existing Core enterprise (e.g. If a

Core enterprise owner is retiring, his/her Core enterprise can be transferred to an eligible fish harvester).

The classification 'independent core' became effective as of 2007 with harvesters having two years for documentation. Details on the classification of the independent core status are presented in the previous section *Policies on Fleet Separation and Independent Core Status*. Figure 11 highlights the number of changes in the number of core, independent core and non-core licensed harvesters over time. As noted, the classification of independent core was implemented in 2007 but the two year period for documentation meant that the numbers of licensed participants appeared in the 2009 data set.

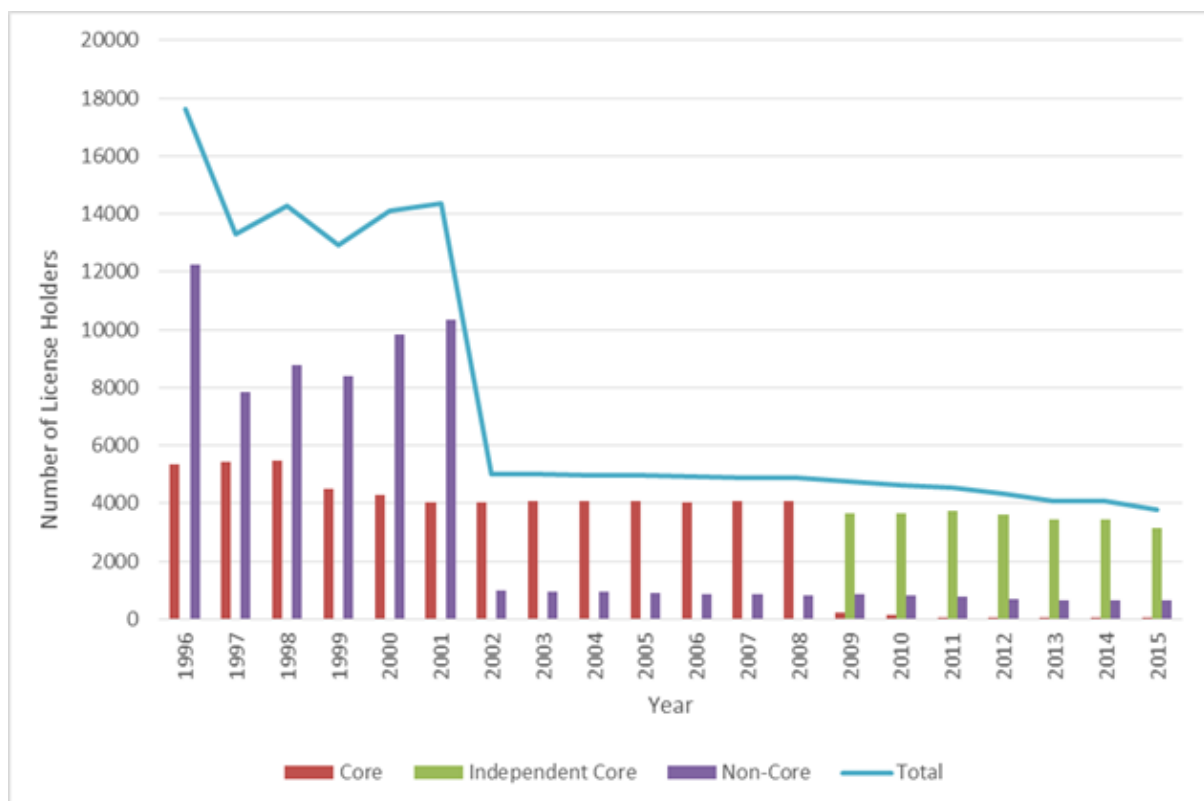


Figure 11: Number of Core, Independent Core and Non-Core Registered Licenses in Newfoundland from 1996-to 2015.

NL Entry into the Fishery

Currently, all commercial fishing activities in Atlantic Canada are subject to limited-entry licensing by DFO for inshore and offshore fisheries. Under Canada's Fisheries Act, a fishing license is defined as an instrument by which the Minister of Fisheries and Oceans grants permission to a person to harvest certain species of fish or marine plants subject to the conditions attached to the license. Individual quotas are implemented as a condition on the fishing license and thus cannot be transferred (re-issued) unless the entire license is transferred (Roy, 1997). Extensive details on the changing of License and Enterprise Details is outlined in the Fisheries Licensing Policy Newfoundland and Labrador Region (Source: <http://www.dfo-mpo.gc.ca/reports-rapports/regs/licenses-permis/nfld-Labrador-tn-labrador-eng.htm>)

The issuance of new commercial licenses or annual renewal of commercial licenses can only be approved if the fish harvester is eligible through the Professional Fish Harvesters Certification Board (PFHCB 2015).

In order to be eligible to apply for licenses and quotas, or receive the transfer of a core enterprise in NL, DFO requires that the harvester/vessel owners be certified as a Level II professional fish harvesters (PFHCB, 2015). In order for a new entrant to become a professional fish harvester in Newfoundland and Labrador the individual would have to:

- Be sponsored by a registered professional owner/operator or a registered professional skipper on a designated fishing enterprise.
- Complete basic safety training course.
- Classed as an Apprentice.

Level I requirements:

- Two years minimum of full-time fishing activities.
- Must earn 55 land-based credits.

Level II requirements

- Additional three years of full time fishing activities.
- Additional 60 land-based credits.
- The individual can now acquire a fishing enterprise.

Professionalization is defined as a means to recognize special skills and experience required to become a professional in the fishing sector. Professionalization can either be granted by "grandfathering" or by qualifying for professionalization. Grandfathering is the granting of professional status to those who have a longer-term attachment to fishing, while new entrants must qualify through training and experience for professionalization. In Newfoundland and Labrador professionalization is obtained through the PFHCB. All license holders are personally required to actively fish their licenses; some exceptions such as a DFO authorized substitute operator, those with a SHORE Skipper status or licenses issued under the Aboriginal Communal Fishing License Regulations are exempt.

The PFHCB is a non-profit organization created by and operating for the benefit of all Newfoundland and Labrador fish harvesters. The Board became operational in 1997 after the Professional Fish Harvesters Act was declared by the Newfoundland and Labrador House of Assembly. When the Board became functional in 1997 the DFO registration system and its categories of full-time/part-time fisherman was replaced with the new designations of Apprentice Fish Harvester, Professional Fish Harvester Level I, and Professional Fish Harvester Level II. Further information regarding the role of the Professional Fish Harvesters Certification Board can be found at <http://www.pfhcb.com/> .

Under the general guidelines for commercial fishing vessel registrations, in order to engage in commercial fishing for any species of fish referred to in these Regulations the following criteria must be met:

- a vessel registration card has been issued in respect of the vessel;
- the use of the vessel to fish for that species of fish is authorized by a license; and
- Fish harvesters must renew their vessel registration annually by December 31 of each calendar year or they will be cancelled
- only Canadian vessels as defined by Transport Canada may be registered
- the person who is using the vessel is named in the license and is authorized to fish for that species;
- Policies indicates that no person shall fish for any species of fish set out in Schedule I of these regulations unless he holds a fisher's registration card; and he is authorized to fish for that species. A person is authorized to fish for a species of fish if that person is:
 - d) on board a vessel and is named as the operator of that vessel in a license that authorizes the use of that vessel to fish for that species;
 - e) accompanying a person referred to in paragraph (a) or (b); or
 - f) on board a vessel the owner of which is the holder of a license that authorizes the use of that vessel in fishing for that species and an operator is not named in the license.

Where a license is issued authorizing the use of a vessel to fish for a species of fish and an operator is not named in the license, any registered fisherman may operate that vessel to fish for that species (Information copied from Atlantic Fishery Regulations Part II sections 13 and 14; Department of Justice, 2015 Source: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-86-21/index.html>).

NL Vessel Replacement Enterprise Combining

Under the Fisheries Licensing Policy for Newfoundland and Labrador, effective April 12, 2007, a new vessel replacement policy was implemented with three specific fleets being identified. The harvester's primary vessel is the largest vessel registered within their vessel eligibility:

- *Less than 12.2m (40') length over all-* Core enterprise owners who held maximum vessel eligibility up to 10.6m (34'11") prior to April 12, 2007 permitted to register a vessel up to a maximum of 12.2m (39'11") LOA, as their primary vessel.
- *Less than 19.8m (65') length over all-* Core enterprise owners who held maximum vessel eligibility between 10.6m (35') – 19.8m (64'11") LOA prior to April 12, 2007 permitted to register a vessel up to a maximum of 19.8m (64'11") LOA, as their primary vessel. Only one vessel 12.2m (40') LOA or greater is permitted, unless grandfathered in prior to 1983. Those grandfathered will lose the second vessel registration (>12.2 m = 40' LOA) upon the re-issuance of the enterprise and/or death of the enterprise owner.
- *Less than 27.4m (90') length over all-* Core enterprise owners who held maximum vessel eligibility between 10.6m (35') – 19.8m (64'11") LOA prior to April 12, 2007 permitted to register a vessel up to a maximum of 27.4m (89'11") LOA, as their primary vessel, providing they are in the following fleets:
 - NAFO Divisions 2J3KL full-time Snow crab;
 - NAFO Divisions 2J3K supplementary and the NAFO Division 3L large supplementary Snow crab;
 - NAFO Division 3L small supplementary Snow crab license holders who also hold a Northern shrimp license;
 - NAFO Division 4R Northern and Gulf shrimp fleets;
 - Northern shrimp license holders who do not hold a Snow crab license.
- Eligibility to register a vessel 19.8m (65') LOA or greater is directly tied to the licenses outlined in Subsection 14.10 (c). Reissuance of these licenses from an enterprise will result in the loss of the 27.4m (89'11") LOA vessel eligibility.
- Eligible fish harvesters who opt to acquire a vessel 19.8m (65') – 27.4m (89'11") LOA are inshore fish harvesters, and will continue to operate on the basis of inshore licensing policies applicable to fish harvesters operating vessels less than 19.8m (65') LOA, including PIIFCAF, and Fleet Separation and Owner-Operator Policies.

Secondary Vessels:

- Core enterprises may register two secondary vessels in addition to their primary vessel registration, to a maximum of three vessels per enterprise.
- Core enterprises with more than three vessels registrations as of April 12, 2007, are grandfathered. Registrations not renewed will result in cancellation of the grandfathering provision.
- Secondary vessels may be up to a maximum 8.5m (28') LOA for the first vessel, and up to a maximum 6.1m (20') LOA for the second

(Information for this section was copied directly from the Fisheries Licensing Policy Newfoundland and Labrador Region, 2017)

In 2008, DFO introduced the enterprise combining policy as a means of permanently reducing the size of the fishing fleet without the need for DFO financial assistance. Under this policy, an independent core enterprise can purchase one other independent core enterprise, with the stipulation that one vessel registration and one core enterprise must be permanently retired (Fisheries Licensing Policy for Newfoundland and Labrador Region, 2017) this was commonly referred to as the 2:1 combining policy. This approach enables the surviving core operator to potentially double his/her quotas or harvesting levels of key species (Schrang and Roy, 2013). For the herring fishery up to two enterprises or licenses can be combined (2:1).

6.3.2 Main Influences of Management on Value Chain Dynamics

Entry barriers to the system

- Requires a professional fish harvester certification
 - Significant investment in terms of education and training and at-sea experience
- Cost of entry into the fishery is prohibitive due to the high cost of capital investment (vessels, gear, etc.) and the cost of licences
 - Uncertainty over future allocation/quotas and if there will be return on investment

Exit barriers from the industry

- Low exit barriers licenses are easily sold; open market for licence
- No regulations governing the sales
 - Exit not linked to potential resource re-allocation for new entrants; i.e. portion of share or allocation is not reinvested back into the fishery
 - No financial reinvestment (e.g. no tax or fee) required to be paid by harvester upon sale of licence and exit from the system

Possibilities to upgrade in the system

- Limited opportunity for vertical integration based on PIIFCAF (Herring purse seine is exempted from PIIFCAF) (Fisheries and Oceans Canada, 2010)
- Upgrading is based on number of licences purchased

Transferability of quota/weekly allocation

- Limit on combining (2:1) shares or allocation for inshore fleet
- Transfer of shares/allocation between vessels is permanent (inshore fleet);
- There are opportunities to buddy-up for certain gear types/regions

Management measurements

- Landing obligation- must land all catch unless a species exemption is received from DFO
- Minimum processing requirement; cannot process at sea
- Fishing season is determined annually; it is not linked to market conditions
- Gear restriction in place (e.g. fixed versus mobile gear)

6.3.3 Industry Structure and Employment

Vessels used in the herring fishery are classed by length and gear type. Typically DFO regulations affect vessels according to three categories:

- i. Less than 35 feet (fixed gear)
- ii. Greater than 35 feet (fixed gear)
- iii. All mobile gear vessels

Fixed gear fishers are restricted to fishing in their area of residence. Mobile gear fishers have a broader choice of areas to fish, but must also fish near their area of residence.

Employment statistics for the NL fishery (both the harvesting and processing sectors) are based on cumulative data for all commercial species harvested and processed and therefore cannot be differentiated based on herring alone. The majority of harvesters and processing facilities tend to operate multi-species operations so data is presented as such.

Figure 12 a-b presents the employment data for the harvesting and processing sectors based on person years- PY (A) and the total number of individuals employed (B) for the period 1999-2016. The data is compiled from data presented in the Department of Fisheries and Land Resources' Annual Year in Review Reports (Source: <http://www.fishaq.gov.nl.ca/publications/index.html#seafood>).

For both the harvesting and processing sectors there has been a consolidation in the industry as reflected in the decrease in the person years and number of individuals working in the fishery (Figure 12a-b). For the harvesting sector, there was a 61% decrease in the average annual employment when comparing person years from 2000 (8800 PY) to 2015 (3400 PY). In terms of total number of individuals employed, the percent decrease was approximately 23% for the same time period (2000: 12,200 individuals; 2015: 9334 individuals).

The average annual employment for the processing sector decreased by 56% from 2000 (6400 PY) to 2015 (2800 PY). The decrease in the number of individuals was reported to be 26% for the same time period 2000 (22,600 individuals) to 2015 (7721 individuals).

For the majority of labour force in the NL fishery the industry is regarded as highly seasonal and is augmented by secondary income. Labour for the harvesting vessels and processing facilities are required for short periods of time with individuals either relying on employment assistance programs or having to find alternative employment when the fishing season is closed (Pisces Consulting Limited, 2015).

Figure 13 highlights the total number of fisher harvesters and fish processors who collected government employment insurance benefits and the overall percentage of these workers compared to all employment insurance claims in the province. Overall there has been a decrease in both the number of individuals collecting employment insurance benefits over time and in the percentage of fishery workers compared to total NL workforce receiving employment insurance beneficiaries. The peak years for unemployment claims (1998-2005) is a reflection of the shellfish industry more so than the finfish industries. The shrimp industry opened in 1998 and this period (1998-2005) was marked by a very short term, fishing season marked by high commercial landings for both shrimp and crab. During these productive shellfish years there was a greater requirement for short term labour for both

harvesting and processing. The decrease in employment insurance claims since this time is not an indicator of more full-time jobs but rather a consolidation of both the harvesting and processing sectors with fewer vessels, fewer processing facilities and a decreased requirement for labour.

As noted in the 2015 Pisces Consulting Limited report “NL Seafood Value Chain Infrastructure Benchmarking Marketing Assessment” a lack of renewal in the harvesting and processing sectors is reflected in the demographics with the average age of employees increasing for both sectors. The report notes for the 20 year period (1990-2010) the number of fish harvesters over the age of 55 increased by 35 while fish harvesters under the age of 25 decreased by almost 80%. The same trend was reported for the processing sector.

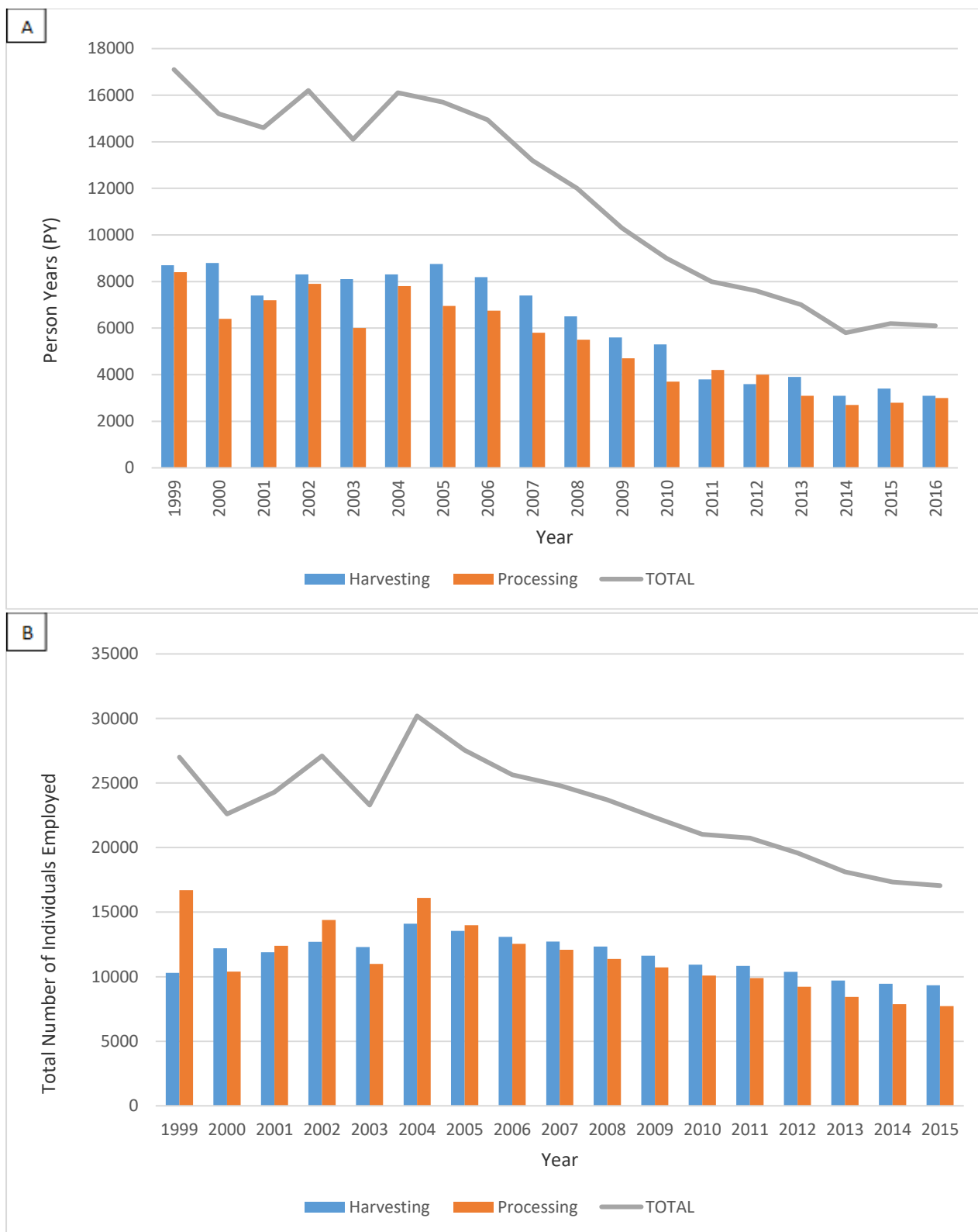


Figure 12a-b: Total employment in the fishery sector (harvesting and processing) based on Person

Years (A) and the total number of individuals (B). (Source: Department of Fisheries and Land Resources- Year in Review: <http://www.fishaq.gov.nl.ca/publications/index.html#seafood>)

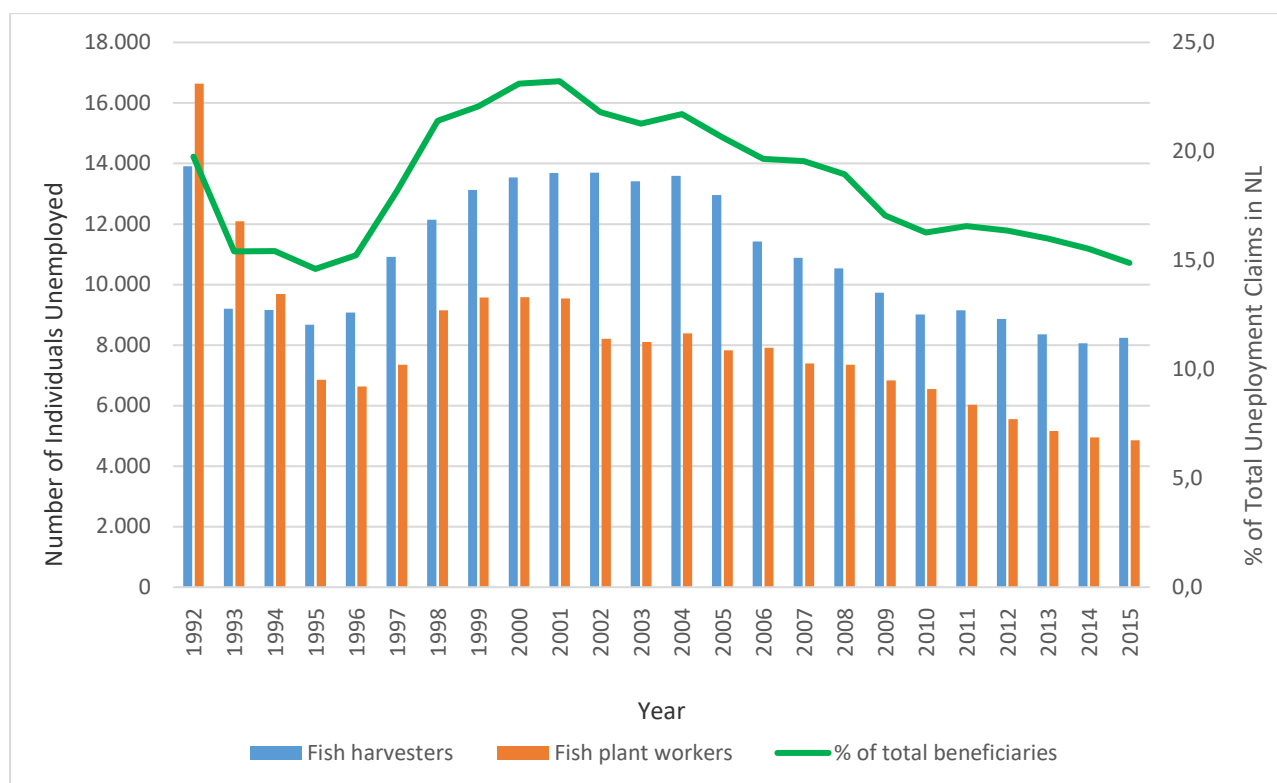


Figure 13: The total number of unemployed individuals in fish harvesting and processing and the percent (%) total of these sectors for the total unemployment claims in NL (Source: Government of Newfoundland and Labrador, Statistics Agency)

In a (2016) presentation “Demographic Issues Affecting Seafood Processing in Atlantic Canada” presented by Ward and Simms, an overview of the employment in the seafood processing sector was presented. Highlights from this data are presented in Table 3.

The cumulative data shows that seafood processing jobs account for 49.7% of the total employment for communities with populations <8000 people. With 34% of this occurring in communities with populations less than 2000 people. The industry, even as a seasonal employer, is a very critical contributor to the rural economy particularly for communities with <2000 people. The challenge as noted by both the 2015 Pisces Consulting Limited report and Ward and Simm’s 2016 presentation is the lack of renewal in the industry and the subsequent out-migration of youth from the communities and the fishing industry in general. Ward and Simm’s (2016) data on population trends (% change) for NL for the period of 2005-2015 is outlined in Table 4. The data shows that there is significant out-migration of people aged 15-54, particularly for the smaller rural communities. The population of the older working group (age 55-64) is relatively stable however projecting forward their career in the fishery is relatively short-lived.

Figures 14a-d highlight the numbers of persons and the percent representation for various age groups for both harvesters and processors in NL. As the graphs indicate there is a shift in the numbers and percentages of young people participating in the fishery (i.e. those <39) with a corresponding increase in the numbers and percentages of 55+ years old. indicate

Table 3: Employment data from across Atlantic Canada (Data extracted from Ward and Simms, 2016).

Functional Economic Region	Total Employment (#)	Seafood Processing Employment (#)	Seafood Processing Employment (#)	Seafood Processing (% total employment)	Mean Age
Urban (>40,000)	145,703	1202	10.3	0.8	39.6
City- Regional Town (8,000-40,000)	81,087	2808	24.1	3.5	43.0
First Order Rural (2,000-8,000)	27,811	4376	37.6	15.7	47.4
Second Order Rural (600-2,000)	11,693	2099	18.0	18.0	46.0
Third Order Rural (<600, remote)	7,204	1155	9.9	16.0	46.4

Table 4: Population shift in the different functional economic regions in NL based on age for the period 2005-2015 (Data extracted from Ward and Simms, 2016).

Functional Economic Region	Youth (0-14)	Young Adult (15-24)	Young Working (25-34)	Middle Aged (35-54)	Older Working (55-64)	Seniors (65+)
Urban (>40,000)	4.88	-10.18	23.21	2.70	19.54	52.76
City- Regional Town (8,000-40,000)	-7.51	-16.42	-6.49	-14.13	5.64	47.99
First Order Rural (2,000-8,000)	-24.11	-29.01	-37.56	-29.10	-0.05	39.19
Second Order Rural (600-2,000)	-22.09	-32.59	-34.20	-26.22	6.14	37.79
Third Order Rural (<600, remote)	-31.26	-35.97	-33.69	-27.14	6.79	27.92

Low birth rates, poor retention of youth, and aging workforce will be issues the herring fishery will have to address over the next couple of years. Factors such as further consolidation of the number of fish plants, identifying strategies to extract absolute maximum value, increased automation and policies on foreign workers will be necessitated if the NL herring industry is to be globally competitive.



Figure 14a-d: Demographics of NL fish harvesters based on total numbers (A-B) and proportional representation (C-D) for Harvesters and Processors for the period 2000-2015. (Data Source: Professional Fish Harvesters Certification Board, 2018, Department of Fisheries and Land Resources).

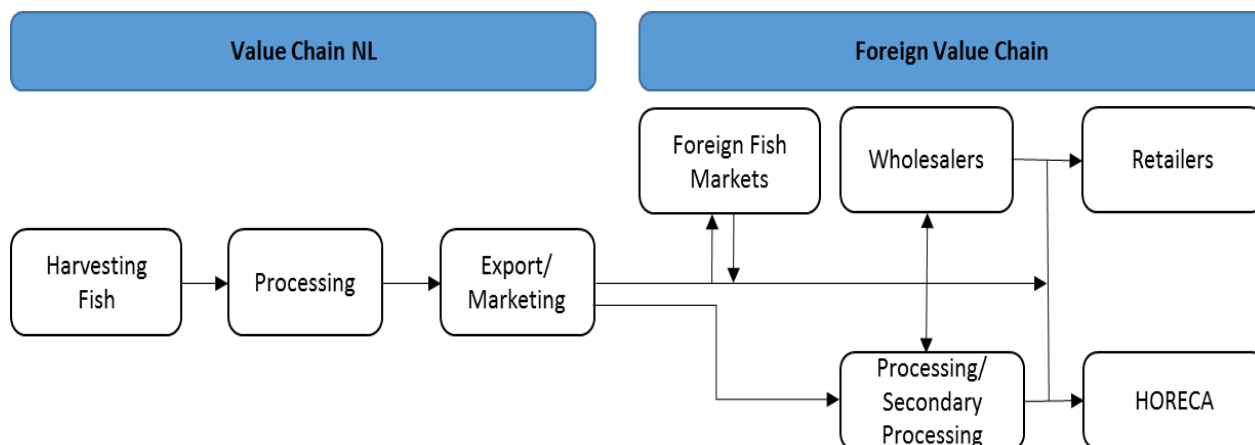


Figure 15: NL Herring Value Chain

As outlined in Figure 15, The NL herring value chain is a relatively linear process with fish landed, processed and exported and distributed among secondary processors, wholesalers and retailers. Some of the product is exported to foreign fish markets where it can be further processed. There is some secondary processing such as salting, drying/smoking and pickling and processing done in NL.

Prior to the recently implemented CETA agreement, a unique feature of the NL fishery is was the minimum processing requirements for landed catch. Under the new agreement, which came into effect in September, 2017, minimum processing requirements were lifted enabling duty free access to NL seafood products either immediately or to be phased in over the next seven years (Canada European Union Comprehensive Economic and Trade Agreement (CETA), 2018; How will CETA Benefit Newfoundland and Labrador, 2018; Canada-European Union Comprehensive Economic and Trade Agreement Now in Effect, 2018).

6.4 Fishing

6.4.1 Structure of the Fleet

As noted in the Section 3- Fisheries Management, the NL Fleet was traditionally split into the following categories based on vessel length and its relevant proximity to the coastline:

- vi. Inshore- Vessels measuring 0-<10.7 m
- vii. Inshore- Vessels measuring 10.7m- <13.7m
- viii. Nearshore- Vessels measuring <13.7 - <19.8m
- ix. Mid-shore- Vessels measuring <19.9 - <30.4m
- x. Offshore- vessels measuring > 30.5m

The herring fleet is commonly referred to, or divided by, the following vessel length and gear type.

- i. Fixed Gear
 - <10.7m (fixed gear)
 - >10.7m (fixed gear)
- ii. All mobile gear vessels

As noted in Figure 16- fixed gear vessels <10.7m land the smallest volume of herring consistently for the period 2014-2017 with the larger fixed gear and mobile gear vessels landing similar quantities of herring. When looking at the percentage of the overall catch (Figure 16), the <10.7m vessels capture approximately 10% of the catch with the remainder divided almost equally between the larger vessel sizes which include both fixed and mobile gear types.

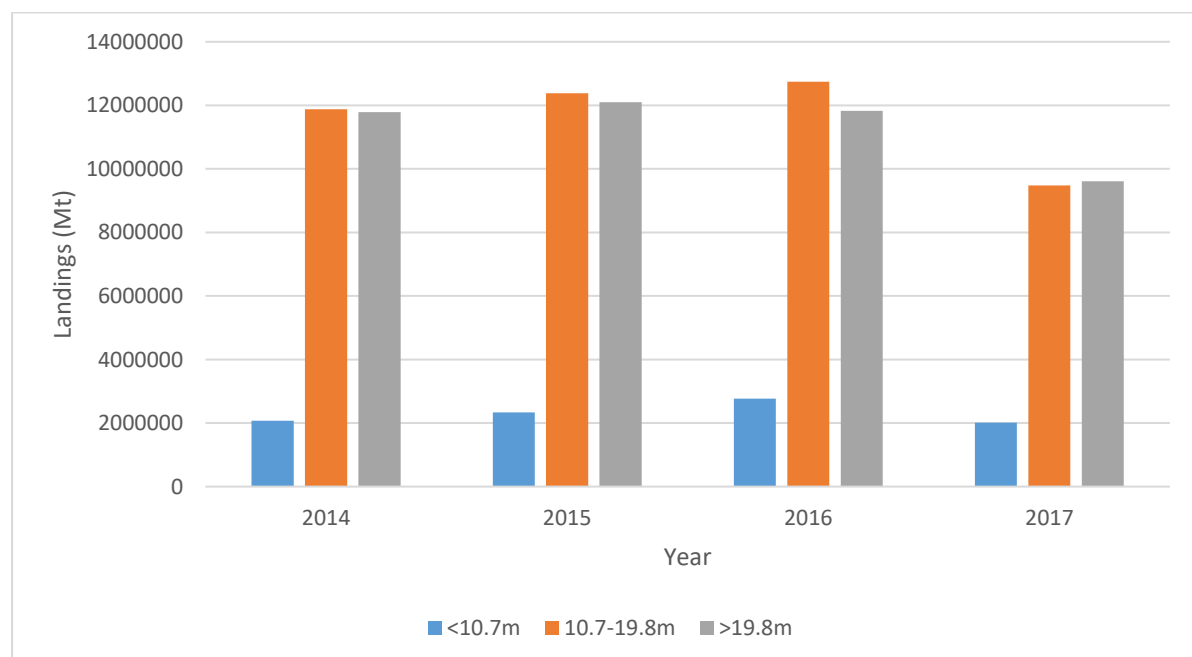


Figure 16: Total Landings of NL Herring (Mt) according to vessel length for 2014-2017.

6.4.2 Fishing Gear

In Atlantic Canada, fishing gear used to capture Atlantic herring include 2 types: Fixed gear (traps, gillnets, weirs); and Mobile gear (purse seines, tuck-ring seines and mid-water trawls) (Govender et al., 2016) NAFO region 4R has MSC certification for purse seines, and the Gulf of St. Lawrence fall fishery is MSC certified for gillnets (Fisheries and Oceans Canada, 2017b). Typically the smaller inshore vessels (<10.7m) are using fixed gear which as noted in Figure 17- comprise a relatively small portion of the overall catch (<10%).

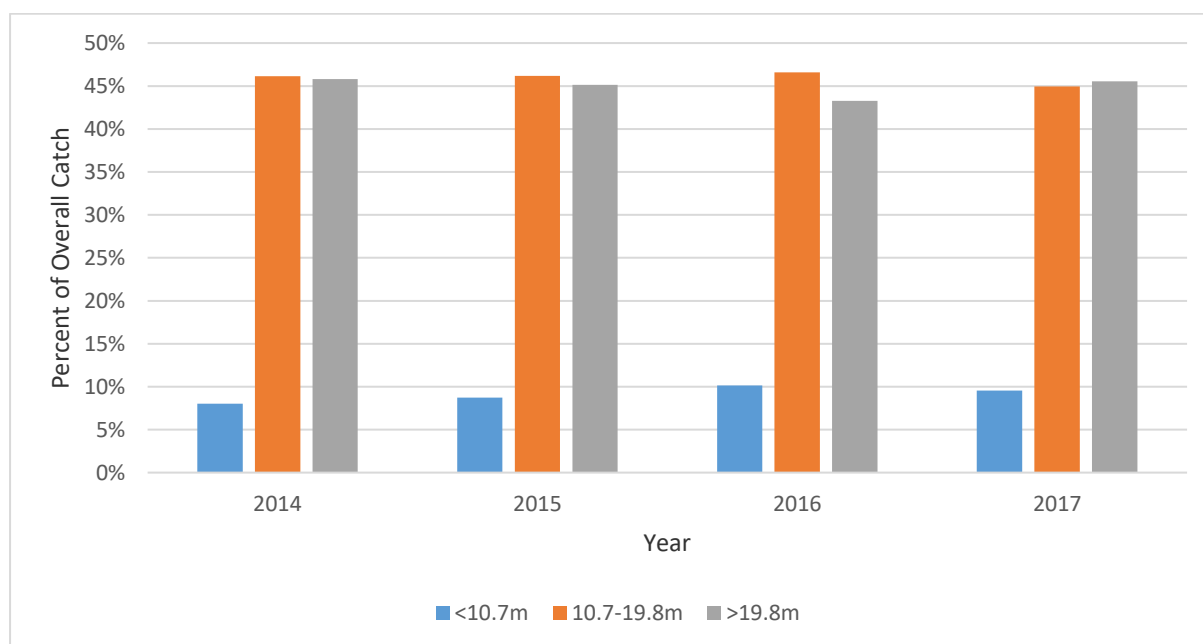


Figure 17: Percent of Overall Catch Captured by each Vessel Length.

6.4.3 Consolidation

Since 1994, there has been consolidation in the herring industry over time (Figure 18) as evidenced by the decreasing number of licenses in each of the respective Canadian provinces fishing herring. Proportionately, NL seems to have incurred the greatest reduction in the number of licenses when looking at the number of licenses issued to all provinces in 1994 compared to the number of licenses issued to all provinces in 2015.

With consolidation, one would expect to see an increased catch rate (or quota) per vessel or increased landed value (€) per vessel over time for competitive enterprises. However when looking at the change in landings per vessel (all regions and vessel types combined) there appears to be a decrease in catch per vessel over the 15 year period (Figure 19). Without having the specifics of the regions, gear types or vessel lengths it is difficult to assess one segment of the fishery is disproportionately impacted by the consolidation in the fishery.

Specific to NL, current fisheries regulations limit the amount of consolidation within in the industry through restrictions on enterprise/license combining (e.g. caps at 2:1 licenses) and policies such as the Fleet Separation Policy/PIICAF which determines who and how much quota (Fisheries Licensing Policy

Newfoundland and Labrador Region, 2017) can be acquired by harvesters or processors. Currently, only enterprises held by Independent Core fish harvesters may acquire additional quota and fishing entitlements via enterprise combining- processing companies are prohibited from acquiring new quota shares. As stated in the Fisheries policy for NL, a fish harvester is not eligible to receive a re-issued license if he/she has entered into a controlling agreement, as defined under PIIFCAF. Each time an application is made to re-issue a license, the applicant is required to complete a Declaration Concerning Controlling Agreement before the license is re-issued.

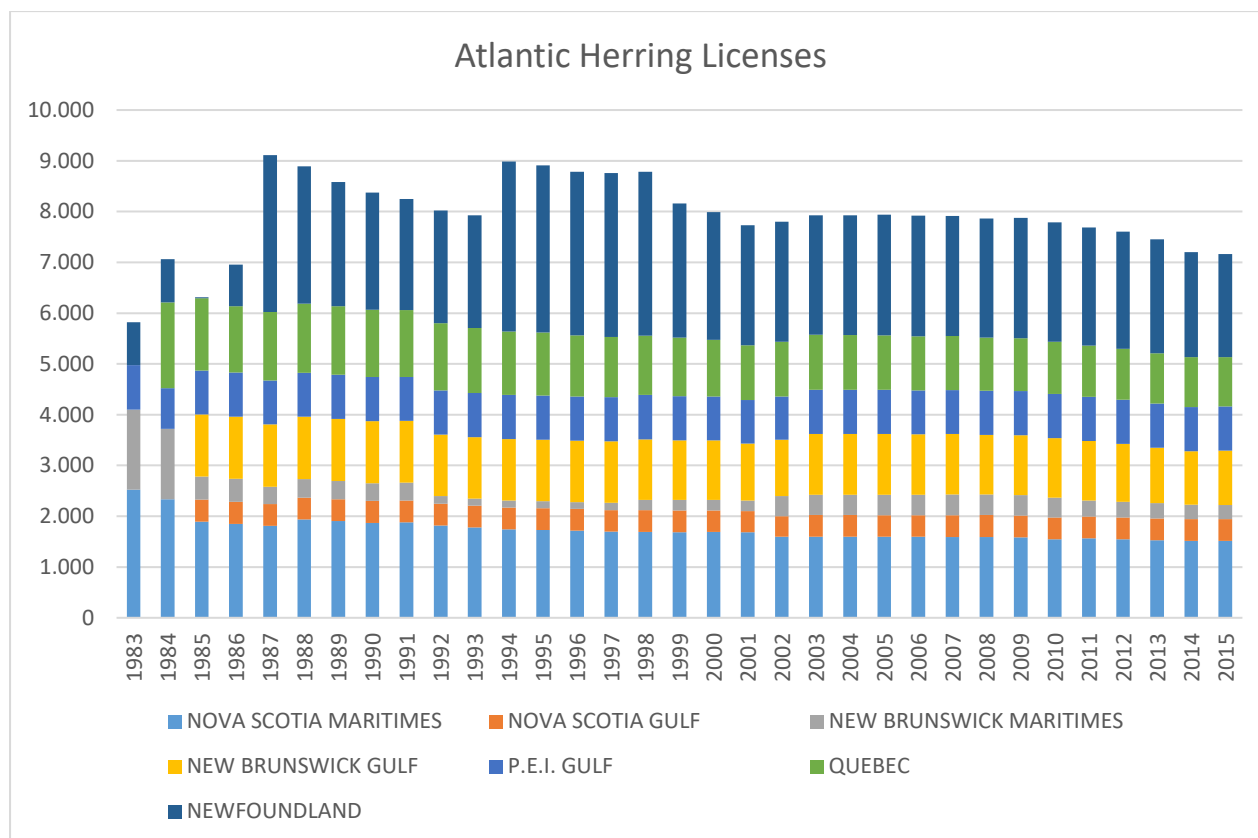


Figure 18: Licenses issued across all herring fisheries in the Atlantic Region. In 1983 and 1984, neither Nova Scotia nor New Brunswick differentiated between Maritimes and Gulf licenses. In 1983, Quebec did not issue any licenses (Source Fisheries and Oceans Canada Statistics- Commercial Licences).

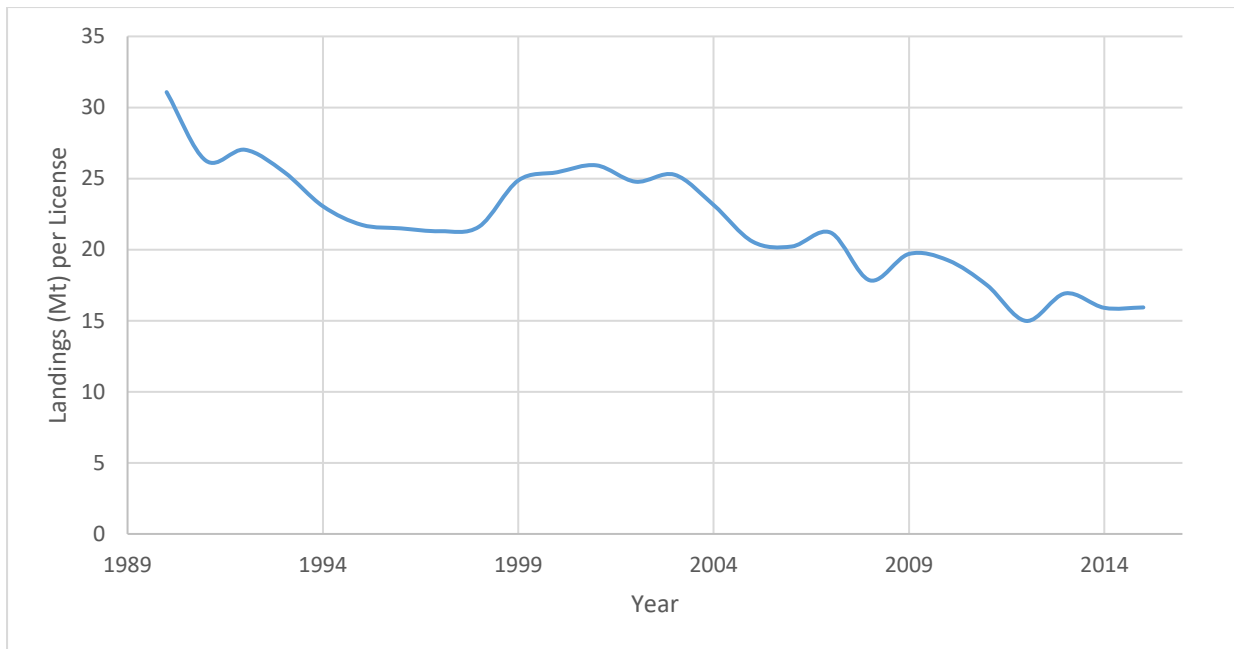


Figure 19: Landings (Mt) of Canadian Atlantic Herring per herring license. All license types and all NAFO regions have been grouped (Source Fisheries and Oceans Statistics).

6.4.4 Financial Performance and Productivity

The financial performance of the fishery has been variable over time however a comparison of the profitability of the various fleet classes (based on net profit as a percent of revenue after the inputted costs of capital) is not able to be calculated for the NL fleet as the data not publically available but only available at the discretion of the independent countries.

There has been a steady decrease in Atlantic herring landings in Canada since 1990, resulting in a corresponding decline in the amount of landings per license in Atlantic Canada (Figure 21). Despite the decrease in landings there has been a steady increase in the first gate price (Table 5) which may offset some of the losses incurred by decreasing quotas. The decreasing quota are an effect off DFO attempting to maintain the health of Canadian fish stocks. It is hard to say what the productivity of individual vessel types is, as many vessels carry more than one license, and there is no available data on the number of vessels or vessel types by license. Heavy dependence on US exports for profitability- which makes the industry vulnerable to foreign exchange rates.

6.4.5 Fishing Fees

Unlike countries such as Iceland, the Canadian fishing industry does not pay a fishing fee based on catch quota or value. Harvesters do pay annual fees as part of their license renewal.

6.4.6 Main Influencing Factor for Value Chain Dynamic

- Value of the product is increasing as Canadian quotas decrease
- Fish are increasingly being processed more in Canada instead of being exported for secondary or value added processing
- Consolidation in the fleet, and reduction in the number of licenses

- There is no clear link between gear type and value of landings (first gate price)
- Heavily dependent on US market for exports- currency exchange will impact profitability

6.4.7 Price Settling Mechanism- First Gate Price

The price of herring is dependent largely on the quality of the flesh, with higher fat content fish receiving higher prices. Fish harvested in the spring and summer will have greater fat content than fall and winter fish. Typically in Newfoundland, fish harvesters will receive between 5 and 10 cents per pound of herring caught (Atlantic Herring, n.d.). The value of herring has been increasing over the years. The individual prices per year are displayed in Table 5 (Fisheries and Oceans Canada, 2008; Fisheries and Oceans Canada, 2018). In Newfoundland first hand price is negotiated annually between the harvesters and the processors with an average price per kilogram determined in advance of the season; the negotiated price is subjected to change throughout the season. Unlike other fisheries, the FFAW (the union representing the harvesters and processors) are not actively engaged in the price negotiations for herring.

Table 5: First Gate Price of Atlantic herring in Canada.

Year	€/kg	\$CDN/kg
2014	0.15	0.22
2015	0.18	0.25
2016	0.20	0.30
2017	0.21	0.30

6.4.8 Price According to Fishing Gear

Data on the prices paid for mobile versus fixed gear is unavailable. However, when one looks at the prices paid for landings based on vessel length one can see that the price paid for fish increased over time, however there was no difference in the price paid to the different vessel classes; typically smaller vessels are fixed gear and the larger vessels are mobile gear.

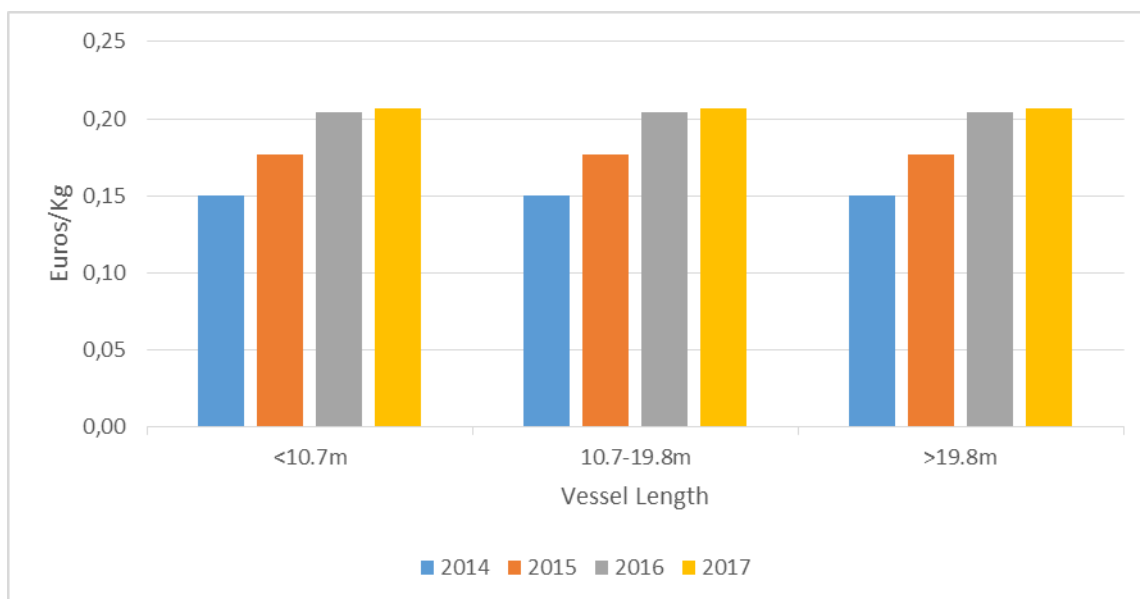


Figure 20: Price paid (€) per kilogram of fish for each of the vessel length classes for the period 2014-2017 (Data Source: Fisheries and Oceans Canada, Statistics, Commercial Landings and Values).

6.4.9 Main Influencing Factor for Value Chain Dynamic

- Current system of price negotiation has not necessarily resulted in higher value paid to harvesters based on decreased price/kg observed over time
- A small percentage of harvesters are choosing to process/sell directly instead of selling to processing facilities because they report a better return on investment when dealing with small weekly catches
- Anecdotal reports indicate that extrinsic factors such as (e.g. securing access to shrimp and cod quota) may impact prices paid to harvesters despite quality of product
- There is no observable price incentive for using fishing gear that yields higher quality product
- Recent study is looking at the impact of gear, quality and the resulting price paid to harvesters- result indicate quality training initiatives can help improve quality and price Processing (all marine fish processing plants)

6.4.10 Processing

6.4.10.1 Fish Processing Companies

The Canadian value chain for Atlantic herring is presented in Figure 15. While the majority of Atlantic herring is exported, a small volume is sold or used within Canada as bait or for fishmeal. Food exports are typically in the form of primary or secondary processed products (e.g. whole fresh/chilled/frozen, frozen fillets, smoked, salted or in brine [not dried or smoked], prepared or preserved whole or in pieces) (Statistics Canada, 2017). Some of these products (e.g. first stage marinades) are further processed in the United States and then re-imported back into Canada.

The majority of the processing plants are small to medium sized enterprises (SMEs) and the industry mainly is not vertically integrated, with the exception of one large processor which owns its own vessels. Most plants are multi-species plants. There are 2 major herring processors in Atlantic Canada with one focused on canned herring and the other on first stage marinades.

According to the Canadian Seafood Buyer's Guide 2017 (Canadian Seafood Buyer's Guide, 2017) the following is the number of herring processors in Atlantic Canada by province:

Table 6: Number of herring processors in Atlantic Canada by province.

Province	# of Processors
NB	26
NL	15
NS	26
PEI	3
QE	7

Specific to NL, in 2007, there was a total landing of 25,731,279kg of herring. Assuming 15 plants were actively processing herring this approximates 1.72 million tonnes of herring available per plant. In reality there was variance in the amount of herring processed per plant as some plants processed greater quantities than others.

6.4.10.2 Product Development/ Product Mix

Canada

The summary or groupings of Canadian herring product forms are listed below; it should be noted that this classification does not distinguish between Atlantic and Pacific herring) (Fisheries and Oceans Canada, 2017b).

- Herrings, fresh or chilled, dressed
- Herring, frozen, dressed
- Herring fillets, frozen
- Smoked herrings, including fillets
- Herrings, salted or in brine, not dried/smoked
- Herrings, prepared or preserved, whole or in pieces

Canadian product category data for 2007 is presented in Table 7 where the percent quantities and values are presented for the various product forms. Smoked and canned herring have the highest % production and %value.

Table 7: Canadian Exports of Atlantic Herring by Product Category 2007 (Atlantic Canada Exports Herring, 2018).

Product Category	Quantity	Value
Smoked	28%	28%
Canned	14%	25%
Whole, dressed, fresh	12%	3%
Fillets, frozen	10%	6%
Whole, dressed frozen	8%	3%
Livers & roes	7%	18%
Pickled, cured	6%	7%
Salted and/or dried	1%	3%

Specific to NL- Herring was exported as 26 different product forms based on CATSNET Agriculture and Agri-food Canada data).

03024000 - Herrings, fresh or chilled, excluding heading 03.04, livers and roes (Kilogram)
03024100 - Herrings, fresh/chilled, o/t fish of No 03.04, o/t offal of Nos 0302.91-0302.99 (Kilogram)
03035000 - Herrings, frozen, excluding heading No 03.04, livers and roes (Kilogram)
03035100 - Herrings, frozen, o/t fish of No 03.04, o/t fish offal of Nos 0303.91-0303.99 (Kilogram)
03038020 - Herring roe, frozen (Kilogram)
03039010 - Herring roe, frozen (Kilogram)
03042040 - Herring fillets, frozen (Kilogram)
03042940 - Herring fillets, frozen (Kilogram)
03048600 - Fillets, of herring, frozen (Kilogram)
03052020 - Herring roes and milt, dried/smoked/salted/in brine (Kilogram)
03053010 - Herring fillets, dried, salted or in brine but not smoked (Kilogram)
03053910 - Herring fillets, dried, salted or in brine but not smoked (Kilogram)
03054200 - Herring, smoked, including fillets, o/t edible fish offal (Kilogram)
03054210 - Kippered herrings, including fillets, other than edible fish offal (Kilogram)
03054220 - Smoked herrings, boneless, including fillets, other than edible fish offal (Kilogram)
03054230 - Herrings, bloaters, including fillets, other than edible fish offal (Kilogram)
03055400 - Herrings, anchovies, sardines, mackerel, etc, dried, o/t edible offal, w/n sa, n smoked (Kilogram)
03056100 - Herrings, salted or in brine, but not dried or smoked, other than edible fish offal (Kilogram)
15042010 - Herring fats & oils & their fractions, o/t liver, refined/not, not chemically mod (Kilogram)
16041210 - Pickled fillets, of herring (Kilogram)
16041211 - Herring, pickled, fillets, in airtight containers (Kilogram)
16041219 - Herring, pickled, whole or in pieces, except fillets (Kilogram)
16041220 - Pickled herrings, not minced, o/t fillets (Kilogram)
16041229 - Herring, nes, in airtight containers (Kilogram)
16041290 - Prepared/preserved, of herrings, whole/in pieces, not minced, nes (Kilogram)
23012010 - Herring meal and pilchard meal, unfit for human consumption (Kilogram)

In terms of quantity and percent share of the catch, the product forms were categorized as 5 key product types based on EU classifications (Table 8). From 2000 to 2016 there was a shift away from whole herring (frozen and fresh). Herring (salted, dried and smokes) as well as Herring (preserved and prepared) dominate the NL export product forms.

Table 8: Various Product forms for NL Herring based on volume of catch and % share of total catch.

Product Forms (Quantity and Share of Yearly Catch)	2000	2002	2004	2006	2008	2010	2012	2014	2016
Whole Herring (frozen and fresh) Mt % share of total landings	2,457,071 42%	2,461,198 35%	4,230,152 45%	2,373,021 42%	2,784,668 38%	1,522,546 30%	25,002 1%	2,907 0%	0 0%
Filletts (frozen) Mt % share of total landings	190849 3%	1274395 18%	1903857 20%	613652 11%	2442181 33%	357515 7%	0 0%	0 0%	13531 0%
Herring (salted,dried,smoked) Mt % share of total landings	345956 6%	761023 11%	434247 5%	166912 3%	169745 2%	896688 18%	2379197 49%	2556746 50%	2594895 50%
Herring (prepared/preserved) Mt % share of total landings	2774277 48%	2522022 36%	2703324 29%	2411676 43%	1862928 25%	2242261 44%	2447657 50%	2559653 50%	2608426 50%

Fish Meal and Oil



Figure 261: Canadian fish meal production by year (Index Mundi,2017).

Canada's total fishmeal production has been stagnant since 1993 at 65,000 tonnes (Figure 21) (Index Mundi, 2017). Atlantic herring accounts for ~28,000 tonnes (43%) of the total fishmeal production and contributes ~6000 tonnes of fish oil annually based on average production volumes reported (by FAO and IFFO) between 2001 and 2006 (Peron et al 2010).

6.4.11 Financial Performance and Productivity

Financial performance and productivity cannot be determined for NL as the information is not publically available and at the discretion of private companies.

6.4.12 Main Influencing Factor for Value Chain Dynamic

- Level of automation/secondary product development
 - Capital intensive investment
- Value chain logistics
 - Transportation
 - Coordination among players (harvesters, processors, government)
- Access to fish through auction markets
- Changing consumer/buyer preferences
- Fluctuations in foreign currency

- Transportation infrastructure to markets
 - Cargo transport of fresh fish by planes
 - Shipping in chilled containers (fresh/frozen)
- Developments in:
 - Packaging (Polystyrene boxes)
 - Super chilling (below 0°C)

6.4.13 Value Creation and Utilisation

In more recent years, better utilization of by-products has increased the productivity and value of the herring industry. The demand for roes and livers in particular has increased the value of herring over the years, as these products are now considered to be valuable, high-quality product as opposed to wastage. These products accounted for 18% of the export value of herring in 2007.

Data pertaining to value creation and utilization is currently under review by the provincial Department of Fisheries and Land Resources and therefore not available for this report. The herring fishery has comparatively less wastage (e.g. trimmings) and better utilization of by-product (e.g. roe) compared to the other fisheries in NL.

6.4.14 Marketing Sector

6.3.14.1 Structure of the Marketing Sector

The decreasing fish stocks and the resultant decrease in TAC has made value creation of exports important for profitability more difficult. The fishery has had to rely on increasing the cost of products and reducing wastage of herring by increasing utilization of the fish.

For the offshore, vertically integrated sector, the individual companies assume the role of producing and marketing its own products. Similarly, for the majority of the NL catch which is captured by small independently owned and operated inshore/coastal vessels, the product goes to independent processing plants where the individual plant is responsible for marketing their product forms and securing domestic or international markets.

As noted by the Gardner Pinfold Consultants Inc. Report (2017) one of the challenges in the marketing of Canadian seafood is that the sector is not selling in the highest value markets or at times of the year when prices are highest. The report also stresses that the current Canadian system, particularly the fisheries management system is not based on extracting maximum value from the resource and is not a market driven model which is impacting the global competitiveness of Canadian seafood products.

The CCFI Report on Automation (2017), outlined a number of challenges facing the industry which can have a resulting impact on marketing product. Based on the current structure, Canadian and NL fisheries are at the risk of becoming suppliers of unprocessed or semi-processed raw materials for others regions to process. Consistent supply of a higher valued product is easier to brand than seasonally driven and unpredictable unprocessed or semi-processed product.

Systemic issues such as limited quota and a seasonal fishery can impact marketing. By default much of the marketing strategy is still based on business to business relationships established by the individual processing companies and less so on emerging consumer preferences. For certain products (e.g. fresh product), the seasonality has meant that product may not be marketed when the prices are highest but more so when product is available. Investing in processing technology is a capital intense

investment. Much of the automated processing and packaging technology is also purpose driven and not flexible to accommodate changing consumer preferences so being able to respond to evolving market trends can be problematic particularly for smaller processing/marketing companies.

6.3.14.2 Export

According to the Agri-Food Canada's export data for Canadian herring, product was exported to 60 different countries (Figure 9a-b). The main product forms discussed in this report will focus on the 7 most common categories.

- i. Herrings, frozen, o/t fish of No 03.04, o/t fish offal of Nos 0303.91-0303.99 (Kilogram)
- ii. Herrings, bloaters, including fillets, other than edible fish offal (Kilogram)
- iii. Herring, kipper snacks, in airtight containers (Kilogram)
- iv. Herring roes and milt, dried/smoked/salted/in brine (Kilogram)
- v. Herring, pickled, fillets, in airtight containers (Kilogram)
- vi. Herring roe, frozen (Kilogram)
- vii. Others

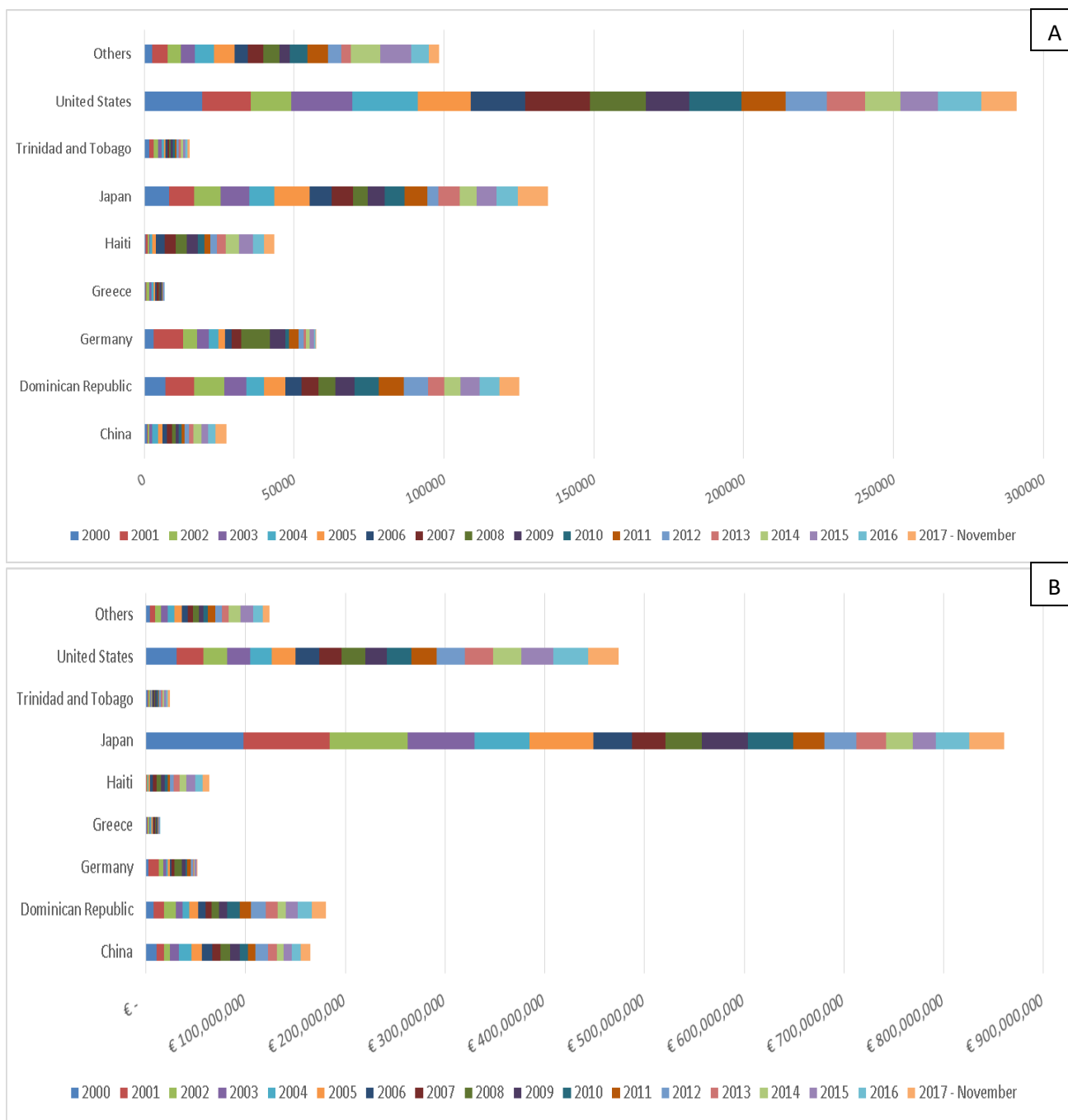


Figure 22a-b: Total Canadian herring exports from 2000-2017, by value (figure A, euros) and volume (figure B, Mt).

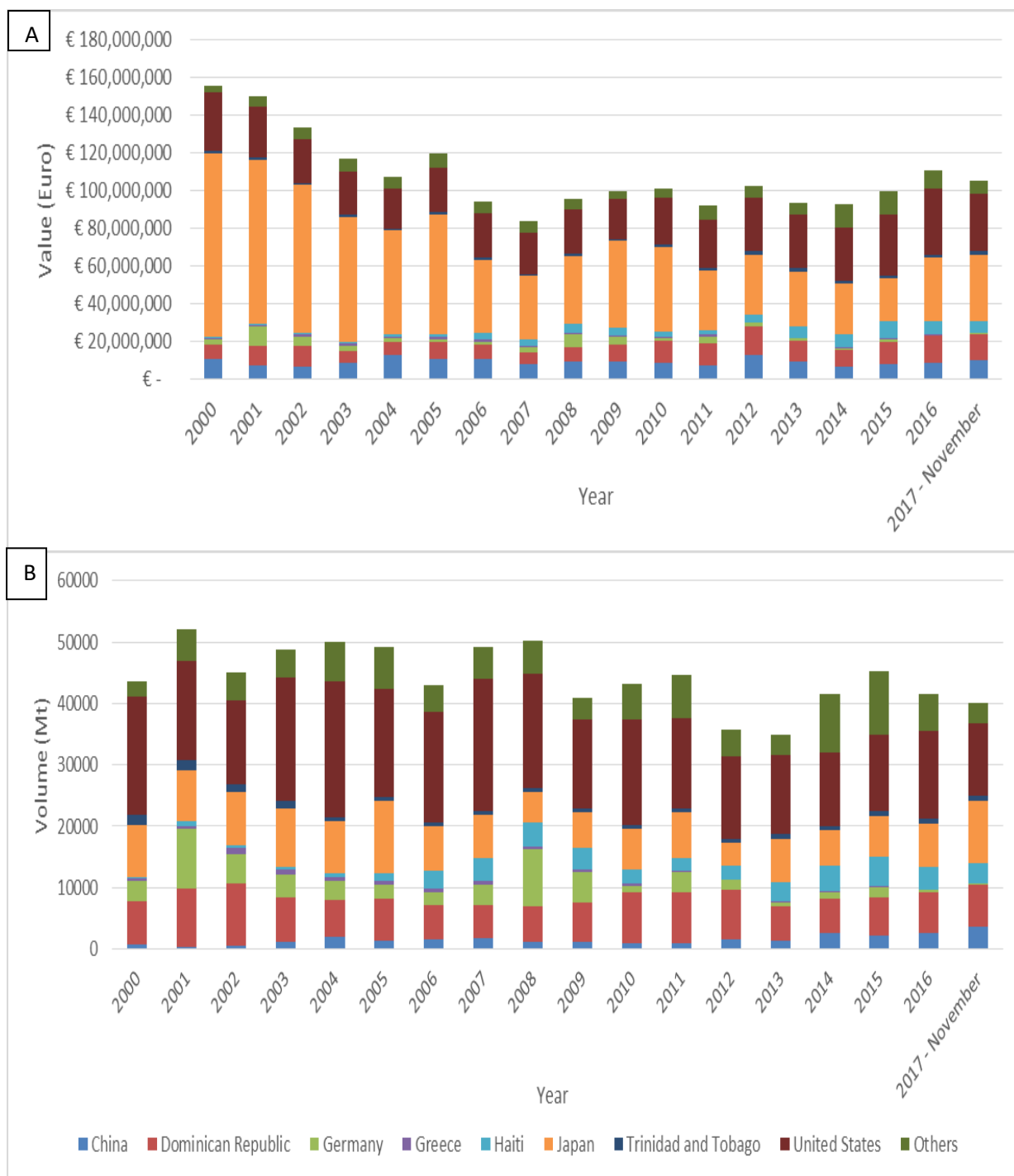


Figure 23a-b: Annual Canadian herring exports from 2000-2017 for each country by value (A-euros) and volume (B-Mt).

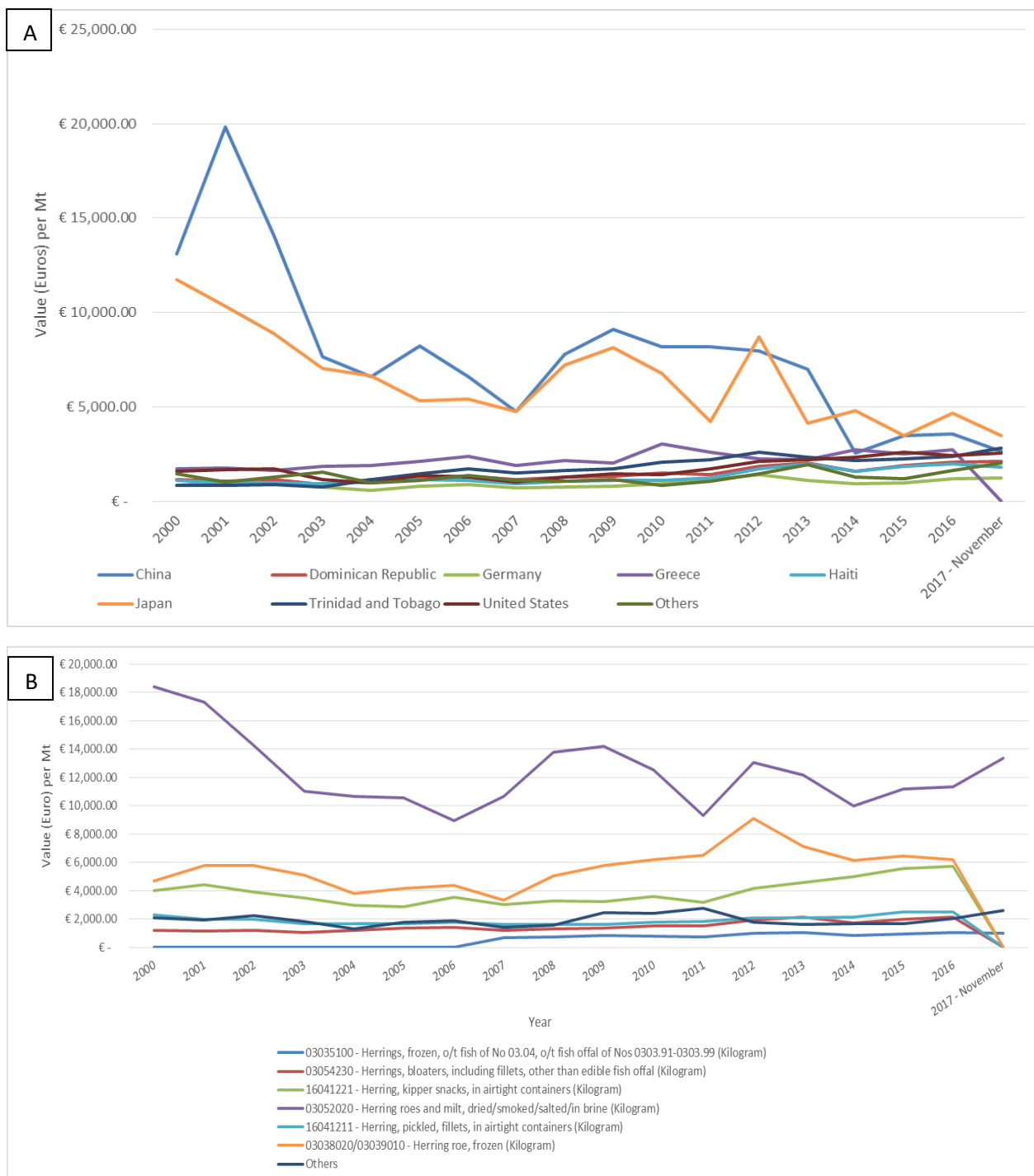


Figure 24a-b: Value (Euros) per Mt for Canadian herring (Figure A, all forms combined, for each of the top export countries) and (Figure B, product forms for combined export countries).

For the period of 2000-2017, based on the combined value (Euros) and volume (Mt) of exports, the main export countries for Canadian herring were Japan and the United States (Figure 22a-b). The US imports the greatest volume (Mt) whereas Japan has higher value (Euros).

When looking at the annual exports for each country Greece exports had been decreasing since 2012, before disappearing entirely in 2017. Haiti has been showing increases since 2005 in the past two decades, exports to China have been increasing in volume, however the overall value of these exports

has been fairly consistent. The value of exports to the United States has been fairly stable, however the volume of exports has been decreasing over time.

Figure 24a-b shows the value per metric tonne according to country and product form. China and Japan had relatively high value per metric tonne. Although this value/mt has been fluctuating, the overall trend has been a decrease over time. In the case of China, larger volumes of herring are being imported over the time frame of 2000-2017, however the product value is decreasing, likely due to lower value product being imported over higher value product. In Japan, this decrease is due greatly in part by the significant reduction in the importation of high value roe. The lowest value products are the frozen and the bloaters which are most likely destined for the Caribbean markets.

The three biggest importing countries, Japan, the United States and the Dominican Republic, all primarily import different herring products from Canada. The main products that get exported from Canada to Japan are roe, either smoked, salted, dried, or frozen; the United States primarily gets imports of pickled herring fillets from Canada and the Dominican Republic import bloaters.

The Canadian Food Inspection Agency (CFIA) is in charge of verifying that Canadian exports meet Canadian requirements of food products as well as those of the importing country. Licenses are valid for one year from date of issuance, and the license holder must maintain compliance with the conditions of the license. Licenses vary based on export type of fresh or live fish, cold storage fish, and mechanical can-screened fish (Canadian Food Inspection Agency, 2014).

The top 3 export destinations for herring in 2007 were; USA (51%), Caribbean (23%) and Europe (15%). In 2017, the top three countries were USA (32%), Japan (30%) and the Dominican Republic (12.5%) (Fisheries and Oceans, 2008).

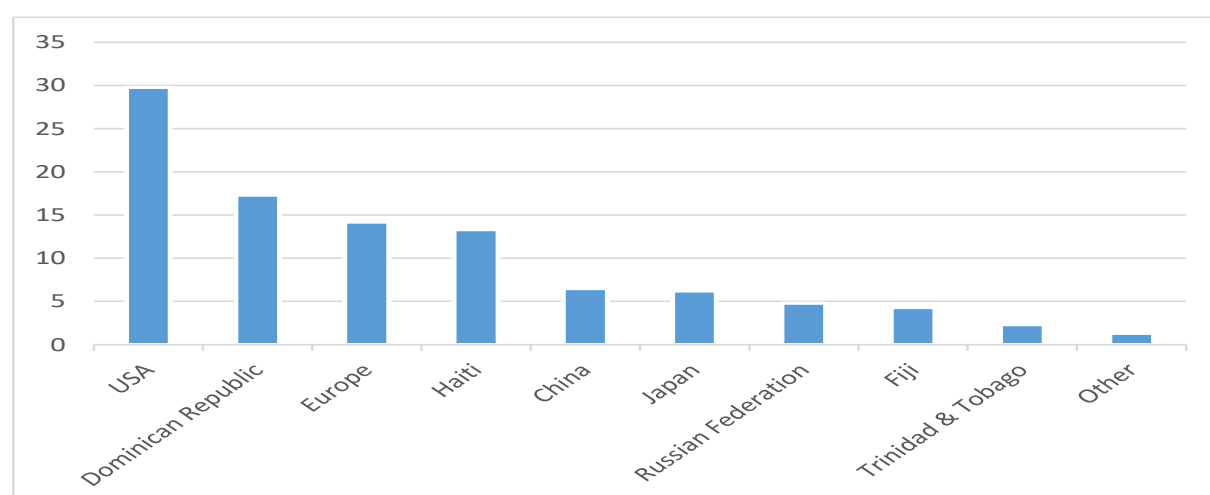


Figure 25: Destination of Canadian Exports of Herring (Pacific and Atlantic) in Volume for 2014 (Statistics Canada, 2018).

The major destinations of Canadian exports of herring (includes Atlantic and Pacific herring) reported for 2014 are presented in Figure 25 and include the USA > Caribbean > Europe > Asia (Statistics Canada, 2017).

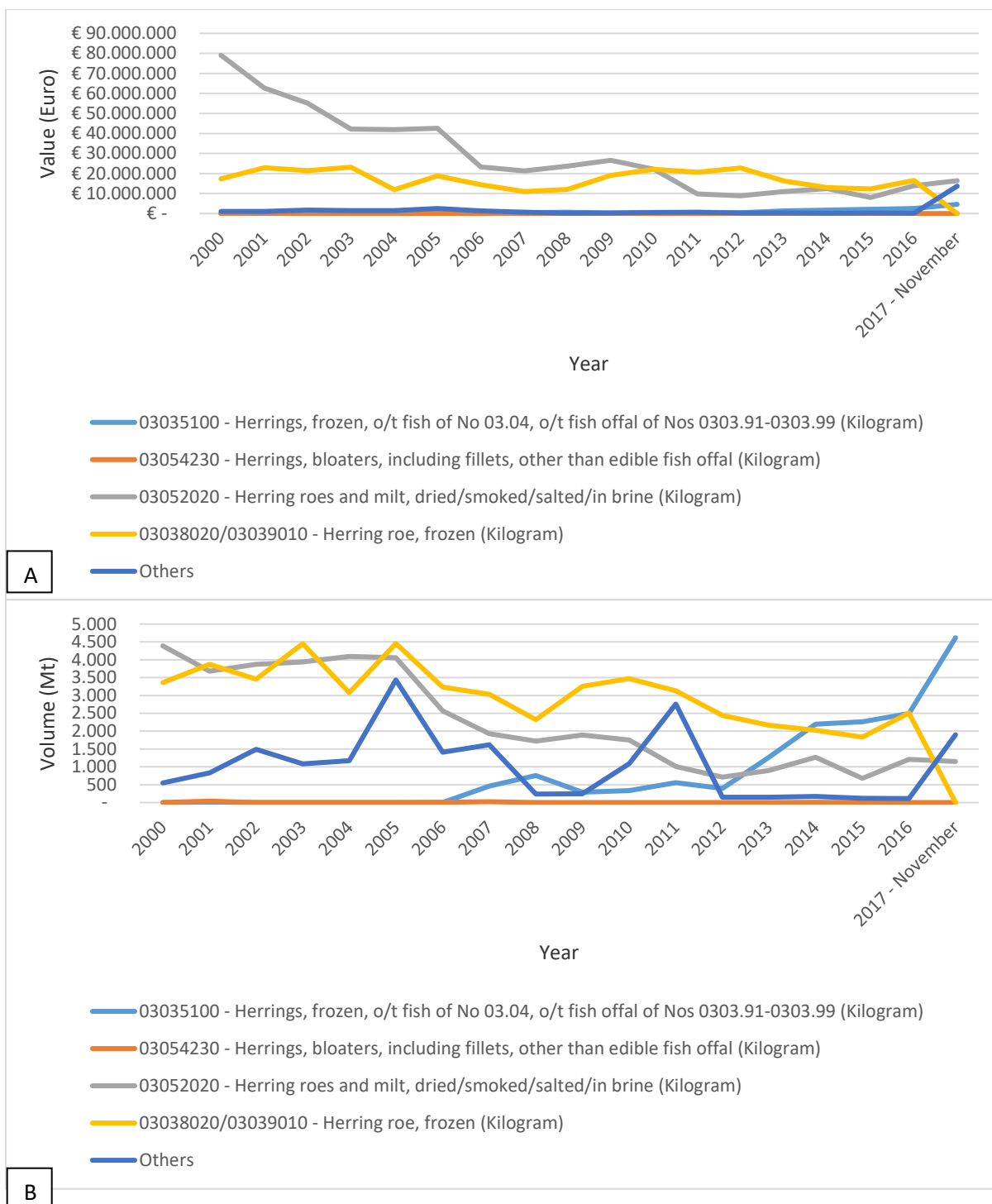


Figure 26a-b: Canadian herring products exported to Japan based on value (Euros; Figure A) and Volume (Mt; Figure B).

Looking specifically at the Japanese market (Figure 26a-b), herring roes (dried/smoked/salted/brined) and frozen comprise the greatest volume of export with the highest value. In 2016-2017, frozen herring product showed an increase both in value and export volume.

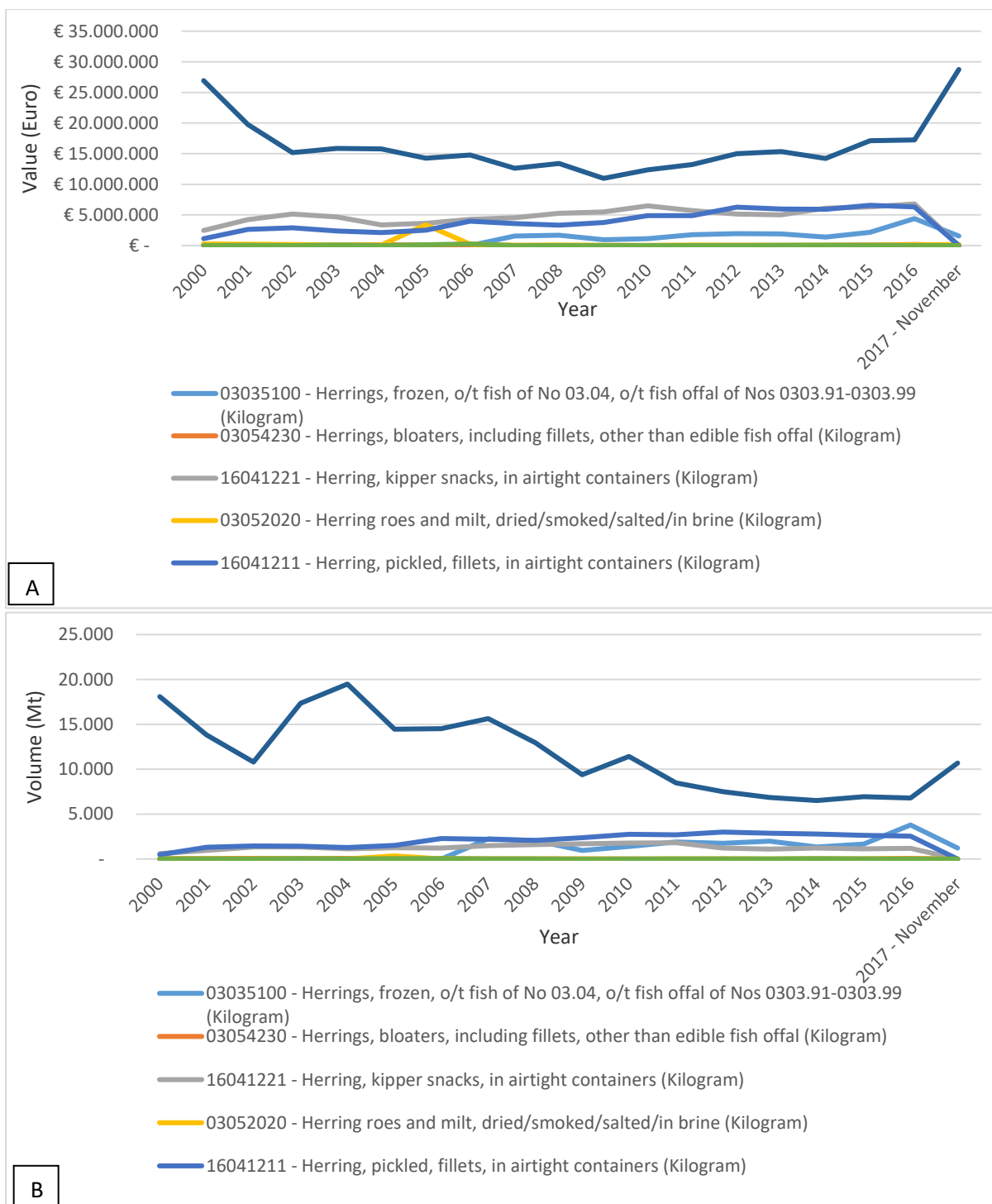


Figure 27a-b: Canadian herring products exported to the United States based on value (Euros; Figure A) and Volume (Mt; Figure B).

For the US market (Figure 27a-b), herring (pickled, fillets) shipped in airtight containers had the highest export value and volume. Between the years 2004-2015, even though there was a slight decrease in export volume of these products, the corresponding value increased during the same period. Exports for 2016-2017 have shown an increase in both volume and value.

For 2015, the average export price of herring ranged from €1.03/kg for frozen (round and fillets) products to €2.84/kg for prepared herring, whole in in pieces, but not minced (Table 9 and Figure 2) (Statistics Canada, 2017). Figure 27 highlights the variability in prices within a year. Nationally, Canadian exports have been decreasing for both Pacific and Atlantic herring (Figure 28).

Table 9: Average export prices of Canadian herring (Pacific and Atlantic) (Statistics Canada, 2017).

Commodity	Average Price (\$/kg)
030351 Frozen, round	€1.03
030486 Herring fillets, frozen	€1.03
030542 Smoked herrings, including fillets	€1.78
030561 Herrings, salted or in brine, not dried/smoked	€1.37
160412 Herrings, prepared or preserved, whole or in pieces, but nor minced	€2.84

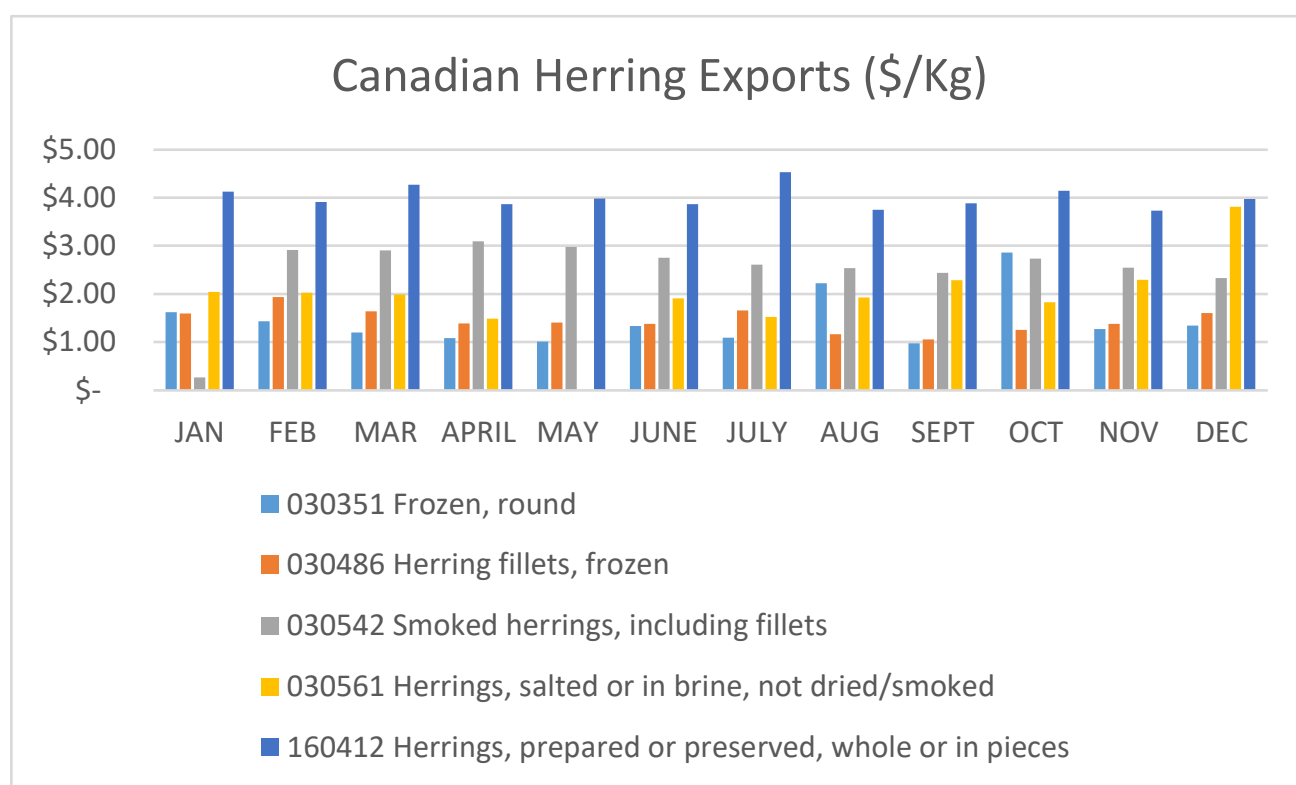


Figure 28: Monthly export prices of herring (Pacific and Atlantic) by product category (Statistics Canada, 2017).

Figure 29 a-b shows the value and the volume of Canadian herring exports and how these exports have changed over time. Roe, while still being one of the highest value products, is no longer being exported in the massive volumes it once was. Since 2006, pickled herring fillets have become one of the most exported products by volume, however the product is of very low value. Figure 30 shows the proportion of the total exported value that each product has accounted for between 2000 and November 2017.

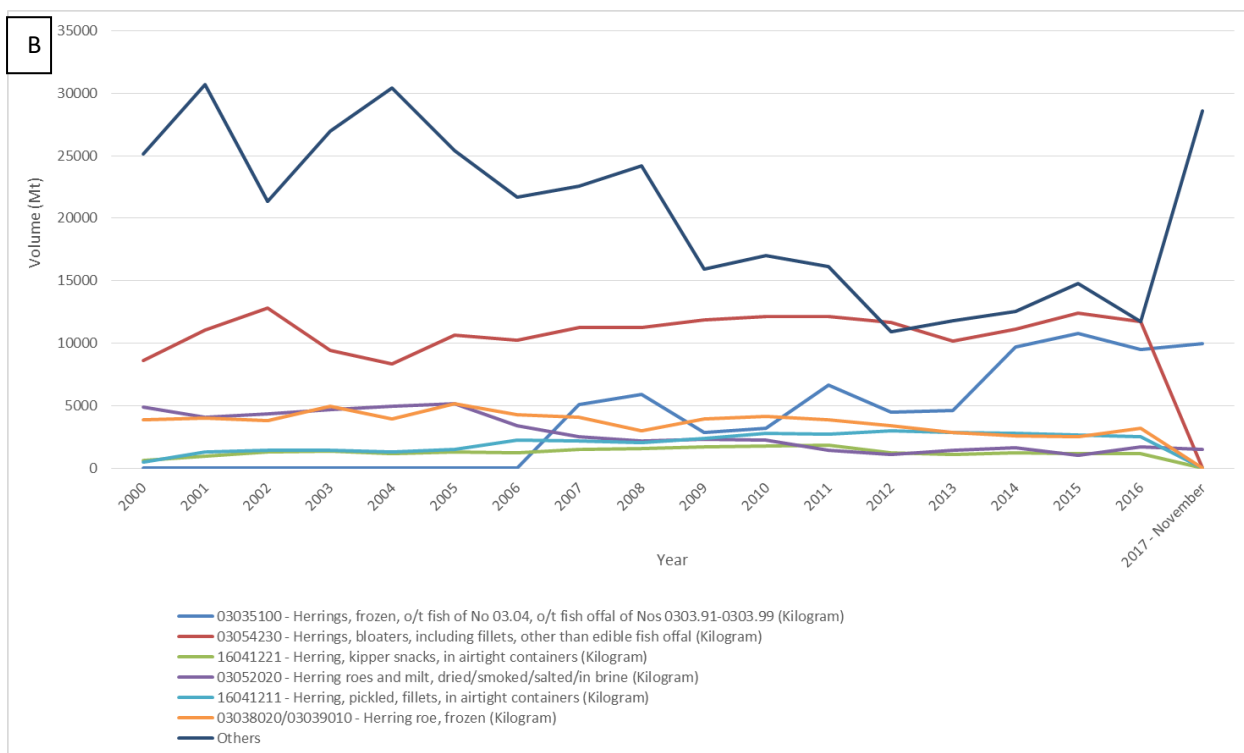
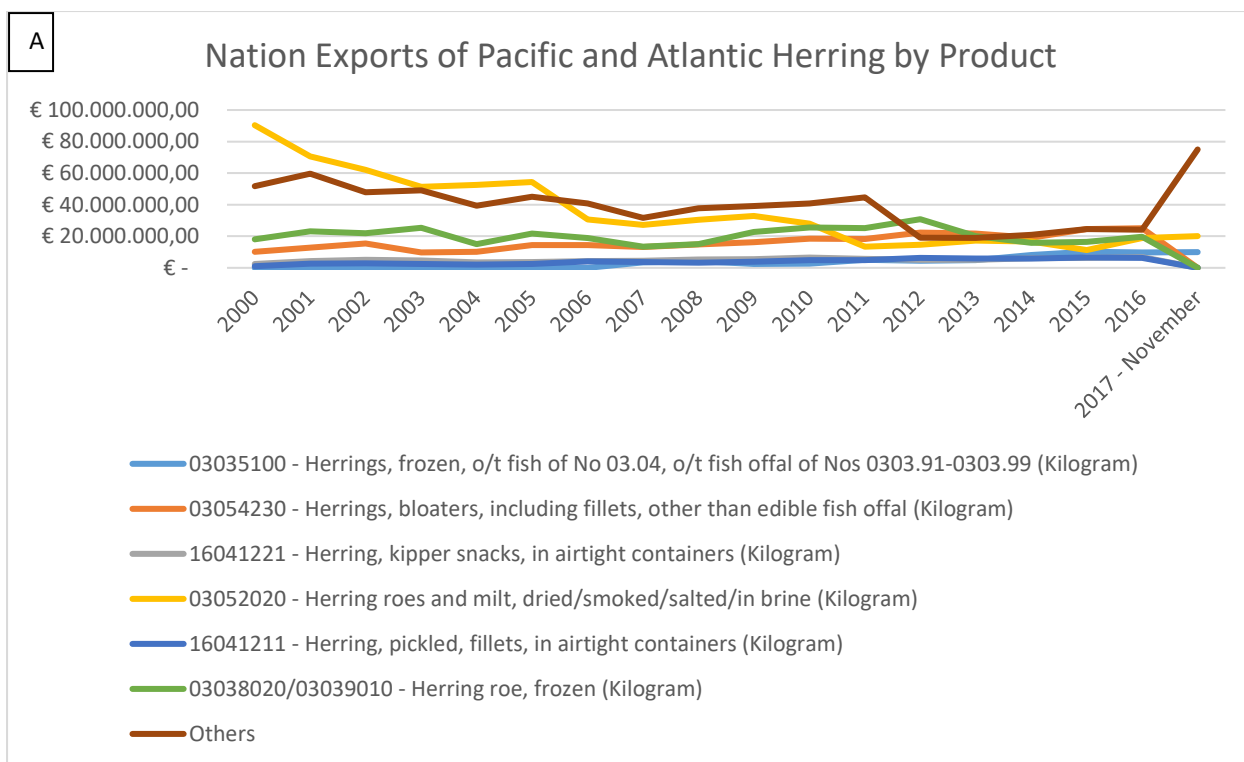


Figure 29a-b: Total value (Euros) and volume (Mt) of the various Canadian Exported Product Forms for the period 2000 to 2017 (November).

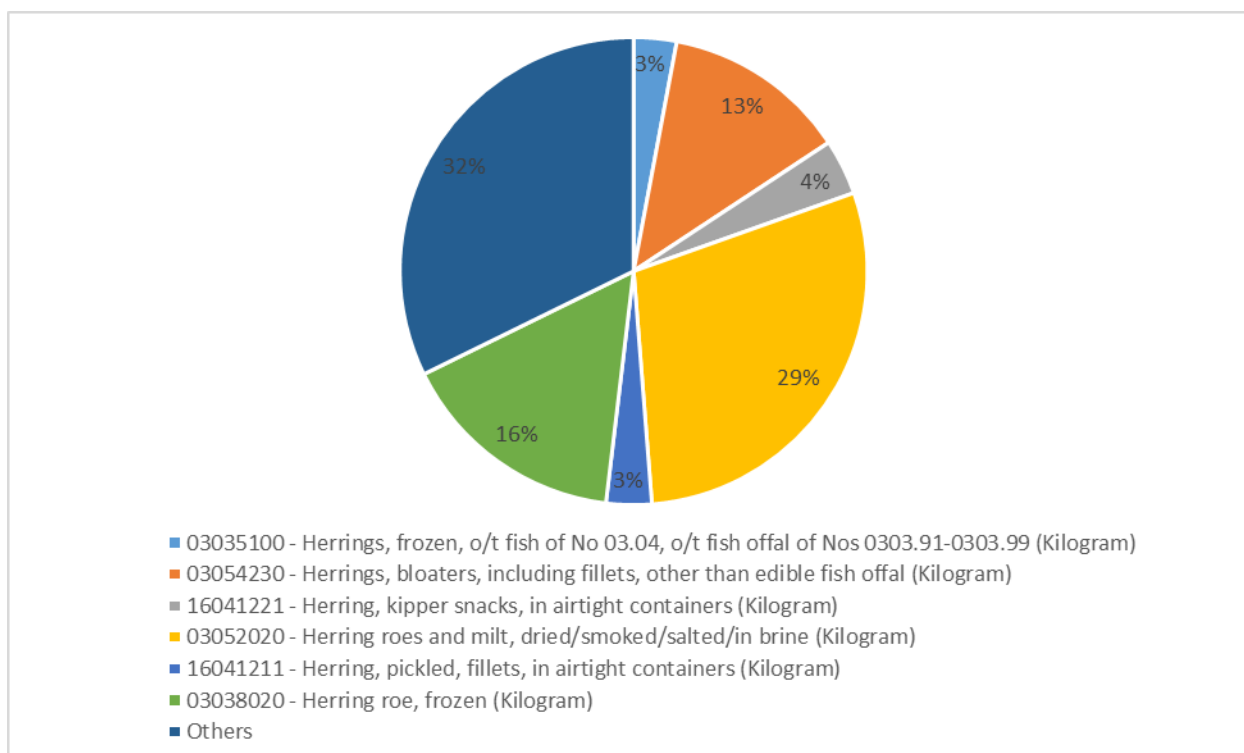


Figure 30: Proportion of Canadian herring exports by product, grouping all import countries from 2000 to November 2017.

When looking specifically at herring exports from NL (Figure 31) various salted products represent the greatest share of the value followed by frozen herring product forms. Fish meal/oil and other product forms constitute only a very small percent of the total export forms.

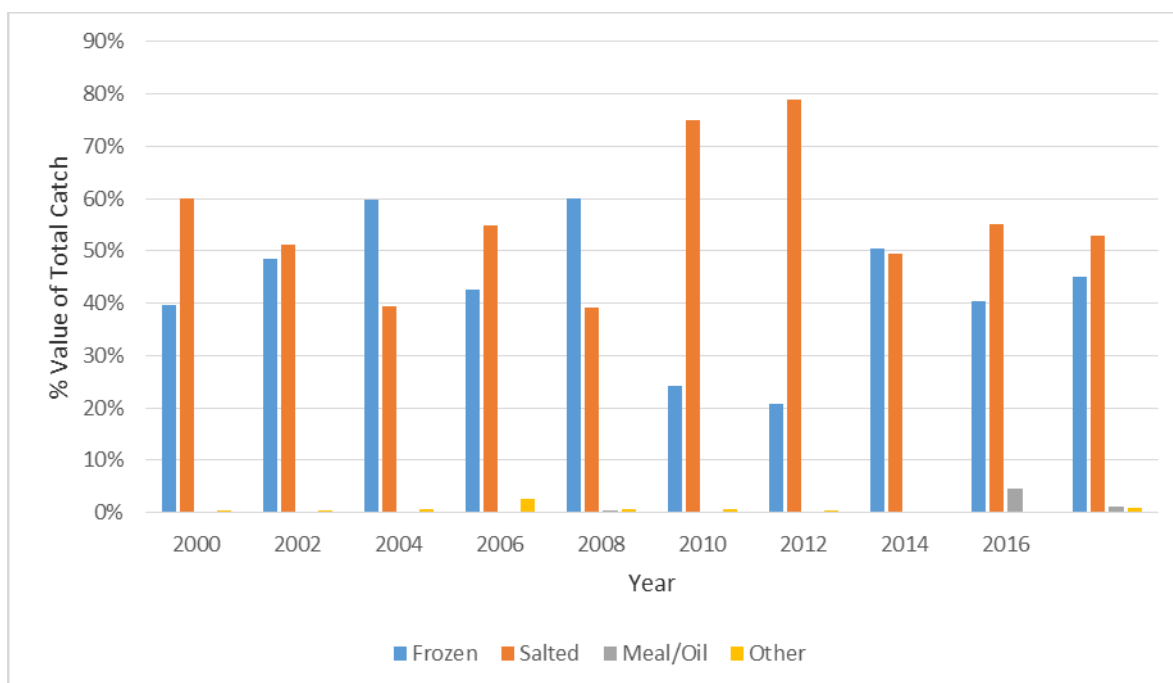


Figure 31: Percent Value of the total catch for NL exported herring products for 2000-2016.

6.3.14.3 Import from the perspective of consuming/processing country

Canada groups the importation value of small pelagic fish together. As such, the value of imported herring, mackerel and sardines averaged €23.1 million (\$CDN-33 million) per year from 2006 to 2012 (Fisheries and Oceans Canada, 2012).

6.3.14.4 Domestic Use or Consumption

Domestic fish consumption data, specific to herring has not been determined on either a provincial or national basis. Consumption data, as compiled by Fisheries and Oceans statistics branch (Fisheries and Oceans, 2018b), is based on all fish products available in Canada for the period of 1988-2015. Seafood consumption is documented according to the following categories: fresh and frozen at sea, processed sea fish, total shellfish and freshwater. The data is not differentiated whether it is imported into Canada versus harvested and captured in Canada. For the period from 1900 to 2015, the overall trend in seafood consumption has decreased slightly from 8.65 kg/person in 1988 to 7.56 kg/person in 2015. The decrease was mostly noted for fresh and frozen sea fish (4.29 kg/person in 1988 and 2.84 in 2015) and processed at sea fish (2.97 kg/person in 1998 versus 2.6 kg/person in 2015). Shellfish consumption increased slightly during this period (1.2kg/person in 1988 to 1.23 kg/person in 2015) and freshwater fish increased from 0.2 kg/person (1988) to 0.89 kg/person (2015).

As a comparison to Canada's other food production, the overall beef consumption in Canada decreased by 28% for the period 1984-2013; pork decreased by 26%; and the consumption of chicken increased by 69% (Farm Credit Canada, 2015). Based on the data presented in Figure 31, the total overall seafood consumption for all forms combined decreased by 14.4% for the period 1988-2015. When examining the fresh and frozen sea fish and the processed sea fish, the product forms which would include NL harvested and processed herring, the decrease in seafood consumption was 50.7% and 14.2%, respectively.

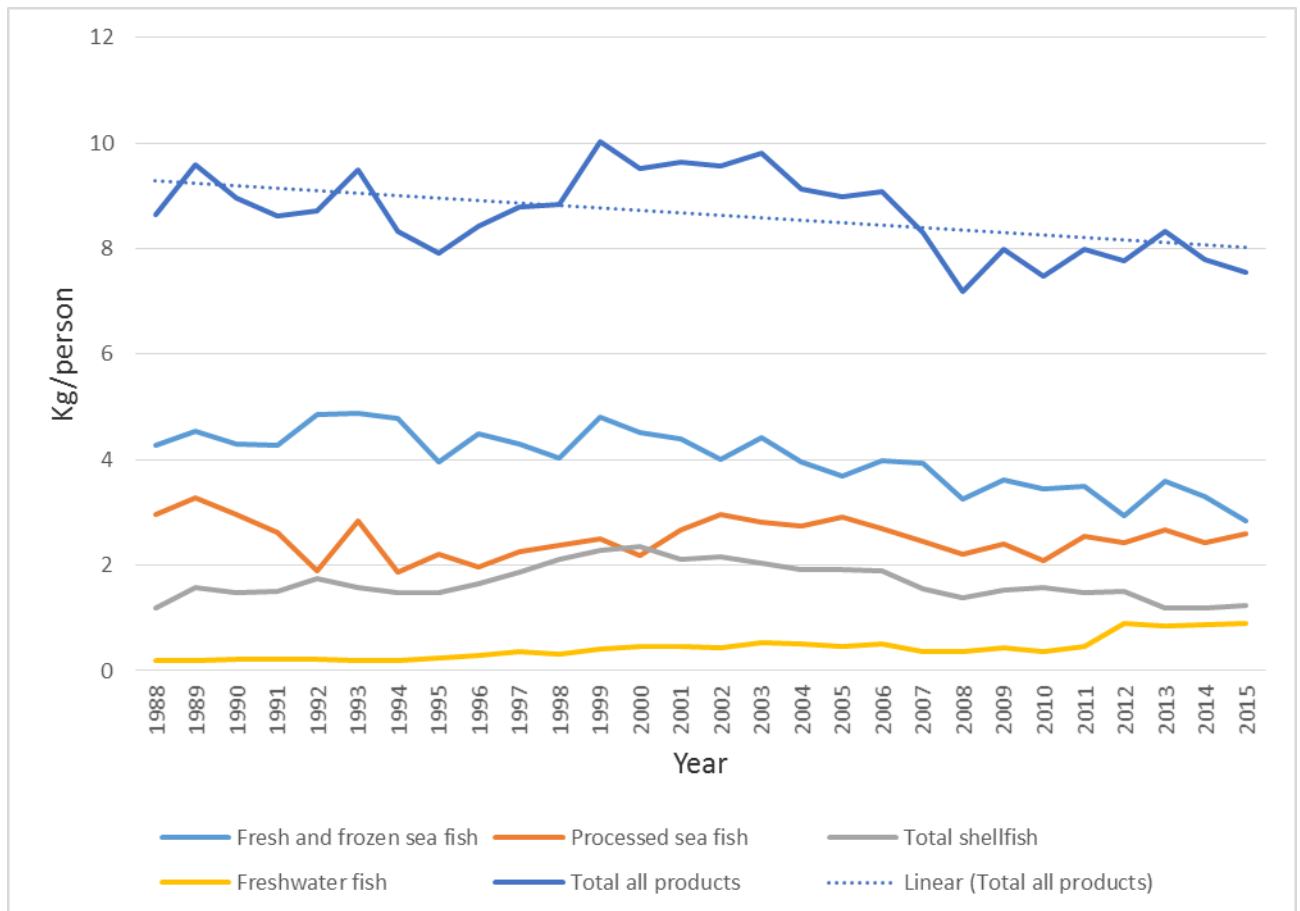


Figure 32: Change in the average domestic consumption of seafood (based on product form/type) for Canadians from 1998 to 2016. (Data Source: Fisheries and Oceans Canada-Consumption: <http://www.dfo-mpo.gc.ca/stats/commercial/consumption-eng.htm>. Retrieved February 5, 2018).

6.3.15 Price Transmission

Price transmission can be very difficult to accurately gauge, especially when considering that the price of exports can fluctuate so heavily over time largely impacted by changes in foreign currency. The price per product can be very different depending on the quality of the product being exported. Once Canadian herring products get to their destination country, further processing and packaging may occur, resulting in even greater costs to the final consumer.

Within Newfoundland, typically the consumer can purchase pickled herring at around €6.4/kg (\$10 CDN/kg). Transport out of the province would increase the cost of this product. Pickled herring is usually sold commercially in jars of varying sizes, both in Canada and the United States. Typically these jars hold anywhere from 250 grams of herring to 1 kilogram.

6.5 Overall Economic Performance and Competitiveness of the Fisheries Value Chain

6.5.1 Value Chain Dynamics

Value chain dynamics depends heavily on the governmental form of the value chain and the relationship within the value chain. When looking at the relationship within the value chain, there is fragmentation between the different players:

- Harvesters are disconnected from the market conditions and consumer preferences.

- Independent processors, responsible for processing and marketing of harvested product are disconnected from the government system which determines the seasonality of the fishery.
- Government and harvesters are equally disconnected from the value chain logistics (e.g. transportation and export issues).
- First gate price paid to harvesters for landed product is not necessarily linked to market conditions or values and in some cases the quality of the product.
- Similarly, the seasonality of the fishery may be disconnected from market demand and market prices
- there does not appear to be any differentiation paid to harvesters based on gear types.
- Self-rationalization within the harvesting sector is determined based on caps on the number of licences an enterprise can accumulate (2:1).
- The Garner Pinfold Consultants Inc. (2017) report noted the following as reasons why Canadian fisheries fails to extract maximum value:
 - The fishery is not fully utilizing raw materials to produce marketable product
 - The fishery is not producing products that generate the highest value
 - The fishery is not obtaining the highest prices
 - The fishery is not selling the highest value market values or at times of the year when prices are highest

In its simplest form, the Garner report simplifies the value chain into five activities that involves interactions between each:

- Raw material procurement
- Processing
- Marketing and sales
- Logistics
- Customer service

Clearly the TAC has an impact on profitability however factors such as the quality of raw materials, the rate and timing of landings, sharply peaked landings, and unpredictability with delivery terms, are factors which devalue the industry but are controllable to some degree.

The NL industry must continue to address the above issues and work collaboratively in order to increase the value of its fishery. The industry could also benefit from enhanced transportation to key markets.

6.5.2 *Governmental Form*

There is significant debate as to whether vertical integration is the solution to solving the value chain issues in the NL fishery as it permits all aspects of the value chain to be controlled internally by the respective company. The Icelandic industry attribute vertical integration as well as the auction system among the key factors impacting the success of their industry.

As the Gardner report notes, vertical integration alone would not provide the inshore sector with a guarantee of improved performance as the nature of how the fishery is managed is also critically important. While some of the benefits of vertical integration could be managed through better

communication and agreements between harvesters and processors- the fisheries management system still has an impact on the performance and profitability of the industry.

6.5.3 Drive Force in Value Chain

The drive force of the Canadian and NL fishery, as noted by Gardner Pinfold report (2017), is to sustain economic wealth for communities; the fisheries management objectives do not include extracting maximum value from its product. As such our system is not a market driven system and as a result Canada's position among leading seafood exporters has declined over the past 30 years. The Gardner Pinfold reports notes, that if Canada is to shift towards a market-driven model then a high level of coordination between harvesting and processing is required to provide the industry with the ability to respond to price signals concerning what products to produce, in what quantities , when and for whom. Factors which are limited by our current system.

6.6 Strategic Position Briefing

In general, the main strengths of the Newfoundland and Labrador system is the proximity of the resource to the landing sites and the proximity to the North American markets.

The industry is putting more emphasis on the quality of the product and efforts are being made to expand into the fresh fillet markets. Labour costs when compared to European costs are cheaper however the industry is currently very labour dependent as most of processing sector is manually driven with limited automation.

The export market to the US continues to remain strong as the market has shifted to higher value product forms and the overall price has increased despite decreases in biomass.

From an economic or value chain perspective, the NL fishing industry is a social resource where market conditions have limited consideration in terms of the structure or management of the industry.

Compared to the European market the challenges for the NL market are based on economies of scale as the NL biomass or landed volume is a fraction of that produced by the EU nations. The current industry structure limits the transferability of quota between vessels thus impacting the self-rationalization within the industry. The current fishery has a seasonality that is not necessarily linked to market demand or prices.

Strict regulation on enterprise combining and owner operator fleet separation has influenced vertical integration within the industry. The lack of exit barriers has resulted in licenses being sold at extremely high value which is negatively impacting new entrants into the industry as the costs are prohibitive.

Demographics are challenging both the harvesting and processing sectors as the average age of participants is >50 years+ and recruitment of people <30 years has been declining. To combat pending labour losses, the fishery (harvesting/processing) will have to move towards more automated systems. For the limited harvestable resource, the number of landing ports (>400) and potentially processing facilities adds a level of complexity to the logistics component of the value chain. Many processing facilities have aging and outdated equipment based on current markets.

Data Limitations

Several of the data sets, particularly those referenced by the Fisheries and Oceans Canada, NL Regional Statistics Branch are limited by privacy regulations whereby government cannot release data that cannot be clustered as a minimum of five data points. Consequently, certain categories of data such as value/catch data for vessels >65 feet are missing. Data pertaining to NL imports and subsequent re-export is limited and not easily traced through the value chain. Data pertaining to profitability was not attainable as private or company data is not publically available.

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Appendix 3 - Salmon strategic positioning case studies

Wester Ross

Title: Strategies for survival as an SME in a consolidating sector

Key strategic issue

The Atlantic salmon production industry is often referred to as the most advanced form of large-scale aquaculture. Its rapid growth in Europe immediately after its inception in 1970s has been due to the entrance of a large number of small-scale family owned companies. This boom in the number of businesses has been followed by a gradual restructuring of the sector through mergers and acquisitions and an evolution into a mature industry, dominated by a few large multi-national enterprises. Increasing firm scale has been the main determinant of the growing output and productivity of the industry and the falling consumer prices of a globally traded commodity. Hardly any of the indigenous family-owned SMEs have survived in this highly intensive price-based competition. The case presents the strategy one of these firms from the UK. The lessons which can be learned from it would be of value to start-ups considering entry in this sector and existing businesses in sectors following similar trajectories.

History

Wester Ross was founded in late 1970s. It is one of UK's oldest independent, owner-operated salmon production businesses. Since it was established the company has expanded by renting and acquiring new seawater production sites. Throughout its existence it has been reliant on internal sources and debt funding to finance its projects. In 2006 four of the employees bought the company from its retiring owners in management buyout supported financially by the government, ensuring the company remains locally owned. Over the years it has been actively adopting new technologies, while keeping some 'traditional' aspects of its production methods, retaining and strengthening its identity - its key source of competitive advantage.

Company at a glance

Type of company	LTD
Established	1977
Number of employees (2015)	49
Turnover (2015), £ GBP	9.5 million
Scale	Medium

Profit margin (2015), %	6.7
Share in UK salmon (2014), %	0.8
Operations	Domestic
Ownership	Private company, locally-owned
Value chain activities	smolt production, grow-out, primary processing, marketing
Products	fresh whole and gutted salmon, fresh fillets
Buyers	distributors/wholesalers, smokeries, small retail outlets, restaurants
Markets	UK 30%; international 70%
Competitive strategy	niche / focus

Key financials

	2015	2014	2013	2012	2011	2010
Turnover (GBP)	9,448,657	6,300,638	8,028,457	7,801,092	6,534,347	8,261,250
Overseas Turnover (GBP)	5,199,453	3,662,783	4,019,664	2,466,870	1,727,939	1,627,051
Profit (Loss) before Taxation (GBP)	629,657	-886,092	352,300	253,162	87,054	933,227
Profit Margin (%)	6.66	-14.06	4.39	3.25	1.33	11.30
Number of Employees	49	44	51	51	50	51

Resources and competences

The company's operations are located on the west coast of Scotland where numerous coastal lochs provide a suitable environment for farming Atlantic salmon. The picturesque and historical location adds to the firm's image. The company consists of three marine grow-out sites, a freshwater smolt production unit, a small primary processing plant and a sales and administration office in close proximity of each other. With about 60 employees in total, the company can be classified as an SME, but represents the largest employer and a centre of activity in a small community. It is one of the oldest players in the industry with considerable experience in the business.

Its annual production is around 2000 tonnes a year. The grow-out facilities consist of relatively small, square wooden and/or steel cages which are suitable for less exposed to waves sites. The cages, some of which made by hand by the company itself, are of the type used in the 1980s and currently are some of the smallest according to Scottish and global salmon farming standards.

Further, it has adopted an 'all natural' approach to farming. The firm uses custom-made environmentally friendly fish feed composed of trimming from the fish processing industry, rather than conventional fish meal. The feed is delivered by hand, instead of using automated feeding systems which have become the norm in salmon aquaculture. The company does not use medicines in combatting sea lice, the major health problem in salmon aquaculture. Instead it uses only cleaner fish, an innovative technology of which it has been an early adopter.

A key constraint for the success of family-owned businesses is the access to funding for financing new projects. *"If you're listed on the Oslo stock exchange raising new capital is significantly cheaper than if you're privately owned and rely on internal resources or external debt funding."* The company's CEO

Instrumental in accessing capital has been a local bank which the company has been working with for more than a decade, as well the EMFF and the Scottish government which in 2017 supported with nearly £1million the acquisition of two marine sites which the company has been previously leasing from other farmers.

Financially constrained to major expansion, the firm has focused on developing its brand and marketing strategy to obtaining a premium price for its products. Key intangible resources for the firm's brand lie in its identity: history, location, people, facilities, ethos, allowing it to attach a "story" and a human touch to its products, and contrast itself from the media inspired image of 'industrial forms of aquaculture'.

Generic competition strategy

While all salmon producers in Scotland can be said to follow a broad differentiation strategy based on provenance and quality, the company appears to have adopted a 'focus' strategy, targeting narrower set of customers. It targets the educated consumer in upper-end market segments, who value attributes such as rural, rustic, local, traditional, owner-operated, hand-reared, small-scale, environmentally-friendly, natural, organic, and willing to pay a premium for a product "with a story". This strategy is consistent with the firm's position within the industry. As a small company it does not attempt to be a market leader, or a low cost producer, which are strategies more suitable to firms with economies of scale.

Markets

Most of the company's produce is sold to other businesses including small specialised retail outlets (e.g. fish mongers, farm shops, smokeries, seafood distributors) and high-end restaurants. Keeping the quality of the product high and maintaining good relationships with buyers are key success factors for these market channels. Since the company relies on a third party to portray its image to the end consumer, educating the buyer about the products attributes also becomes critical.

The larger proportion of produce is exported, particularly to the USA. Other markets served include Switzerland, France, Belgium, Germany, Canada, Middle East, Asia. The proportion of products destined to export has increased from 20% five years ago to 70% as of 2017, in line with the firm's policy of establishing presence in emerging markets.

The company used to supply a major multiple retailer in the domestic UK market, however, likely due to pressure from environmental protection groups, in the midst of reports claiming excess sea lice loads at some of its sites, the supply was interrupted under the request of the retailer in 2014. While the company was a 'minor supplier', for an SME a contract with retailer accounts for a large proportion of the overall sales of the company. Losing access to this buyer resulted in a 20% sales drop and a loss of nearly £1million in 2014. This emphasises the risks – especially acute for smaller enterprises, of dependency on one or few customers, particularly when there is a large inequality in bargaining power. Since then the company has refocused its marketing strategy into targeting the food service and small retailer channels and accessing a wider geographic markets through export.

Products

The product range includes whole fish with sizes from 2-10 kg but on average 4 to 7kg fish for the first part of the year and 3 to 5 kg fish the second part of the year. Part of the fish are gutted and further processed into fillets according to customers' requirements, at their own processing plant.

The 'all natural' approach employing farming methods and long experience in the business make possible the production of salmon with distinct taste. *"The fact that we're selling to the same customers every week is because they like the taste of the product. We're supplying a product that is noticeably different to the alternatives". CEO*

While the 'traditional' farming facilities and methods may be seen as a disadvantage in terms of productivity, they are in line with the location of the farming sites, small bays, sheltered location and the leasing arrangements of the sites (general lack of security in investment). Moreover, the company has realised the value of these aspects as resources for brand building, turning a technological disadvantage into a marketing advantage.

'The thing about the [American] market is you're dealing with a very highly educated consumer. They want a strong story as to why they should buy our salmon. If you can tune into that there is a big potential market.' CEO

The company has obtained the threshold certifications for accessing the UK multiple-retail market, GlobalGAP, as well as business to consumer certifications, Freedom Foods (RSPCA) which now covers most of Scottish output, as well as Friends of the Sea, which also ensures market access, particularly to retailers in Mediterranean countries.

The company used to be "Label Rouge" certified, a quality assurance relating to the sensory characteristics of the product, particularly important in accessing high-end French outlets. However, the firm dropped the certification likely due to a shift in target geographical markets and the discrepancy between its marketing message portraying an environmentally-friendly producer, and the fact that the certification is achieved through the use of feeds with high content of fish meal made of wild caught fish.

Firm Structure

While the production capacity of the firm is large compared to the average EU aquaculture producer, at the background of the major players in the Scottish salmon production business the company is a small one accounting for around 1% of the value of salmon in the country and about 1/50 of the production of the largest company in the sector.

Key constraint for its expansion has been its ownership structure. For small-scale privately-owned companies access to funding is a common limitation. Planned is an expansion in production levels by 30%, in line with the high demand for its products, as well as upgrading the production facilities, on two sites which the company purchased in 2017. The ownership of the farm gives the company full control of the site and security for investment. This move has been supported by the EMFF which underscores its importance to the competitiveness of aquaculture SMEs in the EU. Similarly, maintaining good relationships with banks can be crucial for the competitiveness of an enterprise.

The value chain of the company, incorporating smolt production, on growing, processing and marketing activities, is a common one for the salmon industry. It is almost a threshold requirement

for competing in this sector. While some players in this industry have also included secondary processing capabilities in their value chains, the focus on low levels of value addition of this company is in line with the demand characteristics of its distribution channels. Deciding to move up the value chain and produce value-added products (e.g. ready to eat, transformed etc) would necessitate channelling products into a different set of buyers. Adapting the processing plant for this type of products would require significant investment, while carrying the risks of entering a competitive environment in which the company has no experience. If the new set of buyers include major multiple retailers, the scale of the processing plant would likely also need to be larger in order to ensure the quantity and continuity of supply usually demanded by these buyers. With core competencies in the farming link on the value chain and in line with its scale and access to resources, the decision to only engage with primary processing is a logical one. On the other hand, some simple processing operation (such as smoking) which do not require large scale and sophisticated equipment, might provide opportunities for further value addition, particularly in combination with a strong brand.

Saumon de France

Saumon de France represents an interesting study case for being the only producer of salmon raised at sea in France. The group claims to be delivering products with much less fat than other farmed fish, because its salmon permanently swims in the strong counter currents in Europe. The company innovates by succeeding to combine aquaponics techniques and fish farming, thus achieving environmentally friendly and GMO-free products. Although it is a small-scale company with about 20 employees, the group takes pride in delivering high quality products, focusing its efforts on the French market. It is important to understand the functioning and development process of small-scale groups like this, in order to comprehend the entire spectre of aquaculture services and products that France is capable to host and provide.

Saumon de France was founded in 1978 in Cherbourg. It becomes the first company to grow Atlantic salmon in marine water in France in 1997. In February 2005 Dag Næss bought the company from the Norwegian group Inaq. In March 2008, the Commercial Court of Cherbourg places it in receivership for six months. The company is struggling after losing 200 tonnes of salmon due to disease and fails to recover, being put into liquidation. In May 2008, the company was acquired by GMG SAS, formed by Franck Gouix, Gavin Moss and Franck Gondal. The company receives the Flavour of the Year Award in 2009. In 2014, GMG becomes a subsidiary of Aquaponic Management Project (AMP) and in 2016 two million euros are invested in the company's further development. A new building was inaugurated on May 12, which sells salmon in fillets and smoked portions. Overview information of the company is presented in Table 42.

Table 42. Saumon de France overview

Type of company	LTD
Number of employees	~20 (50 expectations in 2018)
Turnover	€2M (€6M expectations in 2018)
Scale	small
Annual output (volume)	250 tonnes of salmon per year (expecting 600 tons in 2017)
Margin	

Share in French salmon (2016)	<1%
Operations	Domestic
Established	1978
Ownership	cooperative
Value chain activities	embryo eggs, smolt production, grow-out, primary processing, secondary processing
Products	fresh salmon, smoked salmon
Supplying	distributors with fresh and smoked fish
Markets	France
Competitive strategy	differentiation

Competitive positioning strategy

Key resources

The group has 15 ha on the maritime public domain area between Fort West and East in the Great Harbor. Its aquaculture farm, created in 1991, is protected by the dike 2.5 km offshore. This geographical position helps sheltering the breeding process from bad weather. Strong currents allow a constant renewal of the water. The group has at its disposal:

- 16 cages (15x 20 x 6 m) that are used for rearing of introduction of smolts. In these cages, they can easily be fed by hand to ensure the proper integration of the fish in the marine environment
- 8 cages (30 x 30 x 10 m) which are used for ideal for the development of the salmon.
- 4 circular cages (35 m and 32 m diameter and 10 m deep) that allow the increase of production at sea.
- Fish processing and smoking facilities

Competition strategy

The group places strong attention on high quality and freshness. The salmon is eviscerated, washed, clipped, then calibrated, boxed, and iced to be shipped each day by carrier. The shipment is possible from 12 to 24 hours after production.

The fish swim constantly against the current, which allows it to be low in fat and produce the Salmon France Smoked product which is one with the lowest fat content on the market, of less than 8% on average. Thanks to a low stocking density of 12kg/m³ of water, or only 1.2% as represented in Table 43, the salmon has intact fins like wild fish, as seen in Figure 5. Animal welfare is an integral part of the company's quality policy. The salmon receives a balanced diet from sustainable marine ingredients.

Table 43. Density of the cages of Saumon de France compared to other salmon producers

	Saumon de France	Atlantic organic salmon	Atlantic salmon Label Rouge from Scotland	Atlantic salmon Label Rouge from Norway
Density in cages	<12kg/m ³	<10kg/m ³	<15kg/m ³	<20kg/m ³

Products

Saumon de France specializes in smoked and fresh salmon products. Smoked salmon products come in packages of several sizes (4, 6, 8, 10 slices or whole fillet). Saumon de France products are accessible to the consumers through fish markets and high-end restaurants. Currently the company supplies 2 fish markets in Cherbourg. The company offers their clients the possibility to order products online, be it personal or for re-sale. The company also produces smoked haddock, smoked mackerel, cold-fired mackerel and trout rillettes.

Market segments

Being such a small-scale organisation, Saumon de France stays competitive by focusing on the high quality and freshness of their products, thus targeting high-end restaurants and consumers which value what the group has to offer. The range of prices can be anywhere between €5.50 and €88 depending on the type of the product and package size. The fresh salmon bought online is about €30/kg. The prices for products available for personal consumption can be seen on the company's website (<https://www.saumonfrance.fr/boutique/>).

Labelling and certifications

Saumon de France fish are bred with guaranteed GMO-free food. 40% of the food is composed of ingredients of plant origin, which contributes to the preservation of marine resources. The group has been recognized by the French Culinary College as a Quality Artisan Producer.

Value chain coordination and power relations

Relationship with buyers

Being a small-scale company Saumon de France has a strong relationship with the buyers of their products. Besides offering their products in an online store, the group offers advices on the preparation of their products and recipes based on them on their official website. Highly regarded French chefs like Guillaume Gomez, appreciate the high quality of the Saumon de France fish sharing the purchase on social media. The company's products are often mentioned in other media, like news outlets, online and printed articles and popular TV shows (like Très Très Bon), reassuring the buyers in the top quality of the products delivered by Saumon de France.

Relationship with suppliers

Saumon de France depends on cooperating with other service providers in order to continue and improve their development process. Their collaboration with SALMO, helped the company have an advantageous position for its hatchery (at just 10 km from the farm) in Cherbourg-en-Cotentin, thus the group can easily control the evolution of its salmon from the egg. Saumon de France produces its own eggs but also buys eggs from Scottish and Norwegian specialists. The company hatches the eggs

until the fry reach the weight of 100 gr, partially vertically with hatcheries, nursing grow-out and primary processing.

Firm structure

At the end of 2014, Saumon de France was acquired by the AMP group, which is a part of a larger group MTH, mainly invested in aquaculture and agro-food industries. Aquaponic Management Project (AMP) is a multidimensional aquaculture production group which uses Aquaponics techniques: joint production of fish and plants with respect towards the environment, optimization of water resources and care of the quality of high and cultivated products. The AMP group owns two subsidiaries that enable it to produce high-end, high value-added production of French origin: GMG Saumon de France and STPA (Society for the Transformation of Aquaculture Products).

Upgrading

In 2016 the group invested €2 million to accelerate its development; 500,000 were invested in processing equipment, while €1.5 million were invested in an above ground basin in Tourlaville to ensure the "pre-enlargement" of smolts.

With its smolts pond, AMP / GMG Saumon de France also has the ambition to "seasonally adjust its production", to be present throughout the year, including between November and August, not only from December to June. The equipment is planned to operate in a closed circuit according to the biological effluent treatment aquaponics mechanism that combines plant cultivation and fish farming. The water fertilized by fish waste is to be used for the production of fruits and vegetables.

The group has set the goal to increase its production from 250 tonnes per year to 3000 tonnes in 2017. To increase its volumes, AMP / GMG declares itself in particular ready to study the possibilities of implantation within the Normandy off-shore wind farms and within the tidal farms. Other plans include the opening of a factory store, which would satisfy customers who want to buy directly from the producer. The store would be located just next to the factory in the Produimer area, Port des Flamands.

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Salmon producer (anonymous) - Norway

The firm is a medium sized, locally owned, vertically integrated salmon producer in the north of Norway. It represents an interesting case study for several reasons. The structure of the world salmon industry has shifted towards being dominated by a few large multi-national enterprises,

whereas the case company has remained locally owned. The main production strategy in Norway is production of little value added product - gutted whole salmon. Value adding activities primarily takes place closer to or within the main markets. This is both within the main consumer countries and in lower-cost neighbour countries. The case company has followed a different strategy, also selling products that are more processed. In-depth studies of this company can both shed light on how a medium sized and locally owned company with a somewhat different upgrading strategy than most survives within a consolidated sector and a high-cost environment for processing.

The company was founded 1989. Established when the founder took over a bankrupt license in North Norway. Since then grown gradually, by acquiring more licenses, vertically integrated into slaughter and smolt production; upgraded to filleting and freezing and other secondary processing. Key facts about the company are presented in Table 44.

Table 44. Company overview

Type of company	Limited responsibility
Number of employees (2015)	470, including smolt, farming and processing, transport
Turnover (2015)	2200 million NOK
Scale	medium
Annual output (volume)	44.000 tonnes WFE, 14 million smolts, 70.000 tonnes harvest (including for other companies, value added production 3-4000 t
Margin (2015)	6.70%
Share in Norwegian salmon (2015)	4%
Operations	Domestic only
Established	1989
Ownership	Private company, locally and family owned
Value chain activities	smolt production, grow-out, primary processing, secondary processing, live fish transport, own sales operations
Products	fresh whole salmon, fresh fillets, frozen portions, marinated frozen portions. Also some frozen whole and frozen fillets. By-products are processed to protein concentrate and fish oil.
Supplying	
Markets	EU, Japan, China, USA, Eastern-Europe
Competitive strategy	Good relations with buyers
Value chain activities	Grow-out, smolt production, VAP processing

Competitive positioning strategy

Key resources

The company can be classified as a medium size with currently 470 employees, about half at the processing factory. Around 80 people work with sea-based farming.

The company is vertically integrated having smolt production, grow-out sites, a primary and secondary processing unit, and a sales and administration office. All its operations are based in Norway.

The company operates seven marine grow-out sites. The grow-out facilities consist of plastic circular cages. Key resources are the licenses the company owns, as this imposes a relatively strict cap on production. According to interview with management they also look on the vertically integrated operations as an important competitive advantage.

Competition strategy

Products

The case company supplies salmon primarily during the most important growing season, from May to November. 2/3 of harvest is during the second half. Some idle periods, primarily during Jan-March due to little harvest primarily due to low growth and the biomass restriction scheme in Norway. Shipments are done several times a day. About 90% of their production is sold as fresh whole salmon, but the company also supply a limited range of value-added products, notably fillet portions and marinated fillet portions. These products are frozen. This activity is not highly profitable, but is generally carried out for employment and production logistic purposes. There is no strong branding activity, value added products are processed for private labels.

Distribution channels

The company supplies whole salmon to primarily processing firms, both smokeries and other processors, and wholesalers. Value-added products are frozen and sold through private labels. In all cases the company markets its products to other businesses (B2B marketing).

Market segments

The company does not specifically target market segments that place special value on particular attributes. It has however noticed that some of their customers value the fact that the company is owner-operated. It has also received feedback that indicates that salmon from the north is of better quality than salmon grown at higher temperatures.

Pricing

The company primarily sells on spot terms. Although they have longstanding relations with core buyers, there are no formal contracts or agreements on terms, quantities or timing. Prices are negotiated usually on Fridays.

Labelling and certifications

The company has not presently any voluntary certifications. It is in the process of obtaining GlobalGAP certification which is a business to business (B2B) certification. The company indicated that this primarily is to ensure continued access to the retail market. The company said that the requirements were so strict that this would allow ASC certification as well. The requirements were relatively easy to meet, as their production more or less already followed these standards. Costs would primarily be associated with documentation and reporting.

Value chain coordination and power relations

Relationship with buyers

The firm supplies primarily processors and wholesalers. They are a major supplier to three clients, supplying a relatively large share of their inputs. They also had a range of smaller clients. They produced value added products for three private labels. As mentioned there were no formal agreements with clients for fresh salmon, but the relationships went far back, more than 10 years. They claimed to have relatively strong personal relationships with these clients that were a strong motivator for trade. This assures both seller and buyer that there would be no “mess” in the transaction process. Payments would arrive, there would be no speculative reclaims and the client could generally trust the product to be of a specified quality. The company was not concerned with risk of their customer portfolio.

Relationship with suppliers

Important inputs are smolts, feed, labour, farming equipment, transport, processing equipment, boxes, delousing. The company supplies its own smolts and even sells some to other farmers.

Feed is provided by a nearby company with which the company has longstanding relations and even supplies with some fish protein and oil from by-products from the processing plant. They claimed feed prices were relatively transparent, so they were sure they got competitive prices. Some special feed were sourced from other suppliers.

Informal institutions

The company was under the impression that the local ownership, strong local commitments both in terms of workforce and use of suppliers and reinvestment of profits in innovative projects provided them with goodwill. This saw them escaping some claims other companies meet.

Upgrading

The company identified four strengths that contributes to their relatively strong competitive position.

- 1) They control much of the value chain, from broodstock and eggs to ready-made products (for private label, that is). This way they may plan and control quantity and quality of input to each stage in the production. The company buys eggs, but has hatchery, smolt production, grow-out, well-boat, workboats, primary and secondary production fully owned.
- 2) They have good prospects for growth. In a situation with almost no growth, this company is close to being awarded new licenses for their offshore-farming project.
- 3) It is a healthy company, with healthy finances
- 4) They have a strong reputation

The company has focused its upgrading efforts on its production process, where its core competency and competitive advantage lie i.e. process upgrading. They have invested heavily in automation of the slaughtering process, packaging of whole fish as well as the automated production of consumer-sized portions. They have innovated and invested in innovative freezing technology.

Salmon farming has over time been quite profitable, in some periods very profitable, as shown for the largest firms in figure 15.



Figure 1. Profit margins of salmon aquaculture firms in Norway. Source: BvD ORBIS

Institutions

The company experienced the formal institutions governing the sector as supportive and well-functioning. However, some of the regulations these institutions handled were problematic for particularly the company's processing division. The fixed maximum allowed biomass restriction favours harvesting during the period with highest growth. This places the processing plant at a disadvantage, requiring continuous supply of fish. At present, the value added from processing was not sufficient to detract from optimization at the farming level and having processing plant idle for periods of the year.

Also the regulations did not help sufficiently to have good utilization of production areas when there are more than one firm. In some instances, the company had experienced that it was impossible to coordinate stocking, harvesting and fallowing sufficiently between firms. Regulations should give stronger emphasis on this.

In general the trade institutions and frameworks were considered good, but for some markets like Russia and China there is large room for improvement. The company sold a considerable share of its production to Russian clients ahead of the boycott. Tariffs for some products, like especially smoked salmon, were too high to allow competitive production from Norway.

A major challenge in increasing value-added production, is the Norwegian MTB-regulation (production per license is restricted by a Maximum Allowed Biomass). If the firm or the industry is close to this limit, as the Norwegian industry has been for some years, this means that production varies with sea temperature, with low production in the winter month and higher production in the

summer and autumn. For a producer aiming to supply industrial customer, with an expectation of regular supply, this growth pattern is far from ideal.

The firm also realises that moving further down the value chain, producing more value-added products, requires the build-up of both a larger and a more advanced marketing competence, combined with a sales force closer knit to or located in the market countries. They are considering this as a long-term development.

Forms of distribution have evolved slowly in this industry. The firm exports about half of its production themselves, the rest is exported through a handful of exporters with whom they have long-term relations. Their own sales operations are dimensioned for handling the volume of the low season, while they rely on other exporters to take the extra workload in sales during the high season. This outsourcing of sales is an indication that products are still very homogeneous products.

It is hard for the firm to claim any unique advantages compared to the rest of the industry. Products are of a pretty uniform quality and appearance, leaving the firm's "way of doing business" as the only differentiators. Honesty/accountability, reliability, and a straightforward way of doing business, was their understanding of core values of the firm.

Bakkafrost

Key strategic issue

The Faroe Islands is perfect location for the premium salmon production. Its remote location is surrounded by pristine clean water, cool steady sea temperature, strong currents, and accessible fjord that cut deep inland. Salmon farming industry is vital for the small Faroese economy, representing a half of total export value and providing 900 employments out of workforce of 22,000 of the island economy. There are only three firms operating in the salmon farming sector and Bakkafrost is the largest firm representing 62% of total production volume of the entire islands, and is the eighth biggest in the world. The salmon produced by Bakkafrost is renowned in the world for its top quality and prestige. The company faces two challenges for the expanding and sustaining its business, namely the farming capacity of the island being fully reached and the biological risk of the Atlantic salmon. With a unique advantage of natural condition for perfect Atlantic salmon, the generic strategy of the company for its long-term profitability is to strengthen its market position by producing healthy, nutritious and sustainable salmon, and promoting the Faroe Islands as a boutique origin for marketing the top quality product.

The vertical integrating operation including all activities along the value chain from feed, farming, harvesting, value added production, by-products, and distribution will ensure the sustainability and caring of the environment-values. The company has followed strictly the implementation of the veterinary regime in the Faroe Islands, which is a set of law implemented since 2003. The veterinary model aims to increase biological and veterinary security and to support a sustainable and healthy operation. The company is implementing an investment of more than kr. 2 billion in onshore facilities in 2016-20. The investment will make it possible to increase the onshore time (aka head-starting), during which the young fish (smolt) grow before being released into the fjords, the output capacity will be increased by around 30 per cent over a number of years, starting in 2020. Besides increasing capacity, longer time in the onshore freshwater facilities means that the fish farmed are

less exposed to diseases, and hence the risk of fluctuations in output is reduced. In addition, the company has set its plan to increase its value added product to 50%.

History

The Bakkafrost business was established in 1968, when the first processing plant was built. In the first ten years, the business activity was to catch herring in the Faroese fjords and to process and sell spiced and marinated herring fillets, and packaging of flatfish from other Faroese fish producers for the UK market. In 1979, Bakkafrost became one of the first companies starting fish farming in the Faroe Islands.

In 1986, Bakkafrost company was incorporated as Sp/f Faroe Salmon Group and started production of farmed salmon and smolt. The Group was restructured in 1992 by establishing P/F Alistøðin á Bakka, which had farming licences for salmon in two fjords, slaughtering capacities for salmon in Glyvrar as well as pelagic processing capabilities and production of styropor boxes for transportation of fish. A value added product (VAP) factory for salmon was built in 1995 in Glyvrar.

During 2000s, the Group grew through acquisitions and mergers, increasing VAP and its farming capacity. The Group gained access to six new fish farming fjords and two hatcheries for production of smolt and fry in 2006. Bakkafrost and Vestlax merged in 2010 and became the largest farming company in the Faroe Islands with around 55% of the farmed salmon from the Faroe Islands. It became a fully integrated company, ranging from smolt production to farming to finished VAP products. On 26 March 2010, the company was listed on Oslo Børs and broadened its shareholder base. In addition to local Faroese investors, the company is now owned by international investors from all over Europe and the USA.

Bakkafrost acquired P/F Havsbrún in 2011, which is a modern, internationally renowned producer of fishmeal, fish oil and fish feed situated in the Faroe Islands. The majority of the produced fishmeal and oil is used for its own fish feed production, and the rest is being exported. In 2012, the Havsbrún Group, acquired in 2011, was integrated into the Bakkafrost Group. In 2015, the Group started feeding its salmon with feed produced from fish oil, which is cleaned from environmental pollutants.

Over 50 years of the history with several M&A, Bakkafrost currently dominates the salmon farming industry of the Faroe Island. The company shares 62% of the salmon production in the Islands and is probably the most vertically integrated salmon farming company in the world. Bakkafrost controls all aspects of production-from feed to finished value added products. This ensures unrivalled traceability and consistent high quality. The whole fresh salmon supplied by Bakkafrost has price premium and the demand for the top quality salmon is increasing. In 2016, the company had a farming volume of 47,542 t gutted weight, revenue of 3,202.69 million Danish kroner, and a net profit of 1,338.9 million Danish kroner. The company operates three main segments such as FOF (fishmeal, fish oil and fish feed), farming (hatcheries, growth-out, harvesting and packaging), and VAP (value added product including processing and sale). Bakkafrost has launched a planning investment of more than 2 billion Danish kroner in onshore facilities in 2016-20 that will make it possible to increase the production capacity and output capacity around 30 per cent over a number of years, starting in 2020.

The company at a glance

Type of company	Publicly listed <i>company (Oslo Børs)</i>
Established	1968
Number of employees (2016)	820
Turnover (2016), 1000 DKK	3,202,686
Scale	Big
Profit margin (2016) %	41.81%
Share in Faroe Islands salmon (2016) %	62%
Operations	Domestic
Ownership	Public company, internationally- owned
Value chain activities	Fish oil, feed, smolt production, grow-out, primary processing, marketing
Products	whole-fish (fresh, iced and frozen), frozen portion, head, belly flaps, skin and backbones
Buyers	Distributors/wholesalers/restaurants
Markets	US, China, Russia, EU
Competitive strategy	Vertical integration/top quality salmon for price premium

Source: Bakkafrøst -Annual Report 2016.

Financial performance

	2016	2015	2014	2013	2012
Turnover (1000 DKK)	3,202,686	2,850,363	2,683,319	2,491,081	1,855,544
Overseas Turnover (1000DKK)	0	0	0	0	0
Profit (Loss) before Taxation (1000DKK)	1,632,614	924,471	899,191	727,351	323,681
Profit Margin (%) (Net Earning/Turnover)	41.81%	28.42%	24.12%	23.65%	14.44%
Number of Employees	820	725	700	640	590

Source: Bakkafrøst -Annual Report 2013; 2014; 2015; 2016

Resources and competences

Faroe Islands possess a perfect condition for premium salmon production. Its remote location is complemented by pristine clear waters, cool steady sea temperatures, strong currents and accessible fjords. Drawn to this perfect mix of conditions, the Faroe Islands is a boutique origin for top quality salmon. The salmon farmed in Faroe Islands has a big size (an average weight of around 5.2 kg) and better in color (redder) compared to Atlantic salmon produced in other countries. Consumers who have preference to Faroese salmon have to pay a considerable price premium.

Farmed salmon is a vital part of the Faroese economy, representing about 50% of the country's export and providing valuable jobs for rural communities. Bakkafrøst is a dominating aquaculture firm in the Faroe Islands. The company possesses 19 farming sites out of the total 26 sites, and 6 out of 8 hatchery sites, and represents for nearly 80% of total employment in the sector. The situation

provides Bakkafrøst a unique position in the Faroe community and thus gets the unlimited support from Faroe government.

Bakkafrøst has long-term experiences of 50 years operating within the seafood industry. The company overall long-term strategy is to focus on core business activities that could secure a healthy, attractive and competitive low-cost salmon farming group. The company has developed a fully vertical integrated production controlling all aspects of the entire value chain from producing fish meal to value added products. Since 2015 the company has feed its salmon with feed produced from fish oil, which is cleaned for environment and achieved Aquaculture Steward Council (ASC) for its salmon farming sites. The company has been fully self-supplied its salmon smolt since 2014. Uniquely, Bakkafrøst even produces its own fishmeal and fish oil, which is used for the company's salmon feed. This gives Bakkafrøst full control and responsibility over all aspects of production, and it gives the company's clients unparalleled traceability.

The company was listed on Oslo Børs in 2010 and broadened its shareholder base. As a public company, Bakkafrøst can attract local Faroese investors as well as international investors from all over Europe and the USA. It means that the company has a financial capacity for its sustainable development strategy. In addition, the public company requires its operation transparent and sustainable. Bakkafrøst is a member of Global Salmon Initiative's (GSI) and voluntarily posts transparency statistics through online sustainability report.

Faroe Islands is small in size, thus the farming capacity of the Islands is limited and fully exploited. To overcome this natural challenge, Bakkafrøst has launched a planning investment of more than 2 billion Danish kroner in onshore facilities in 2016-20. The investment will make it possible to increase the production capacity and output capacity around 30 per cent over a number of years, starting in 2020. Besides increasing capacity, longer time in the onshore freshwater facilities means that the fish farmed are less exposed to diseases, and hence the risk of fluctuations in output is reduced.

Strategic choices

Generic competition strategy

Bakkafrøst strategy is to strengthen its market position and be a top world-class company in the salmon industry; its mission is to provide consumers worldwide with a wide range of healthy and nutritious salmon products (Annual Report, 2016). Utilizing sustainably and promoting wisely the natural conditions as perfect for top quality salmon with boutique origin of Faroese islands is determined as the core strategy. The company has developed a fully vertical integrated production system in order to optimize the total value chain from feed to finished product, secure a long-term sustainable increase in production and the welfare and well-being of the salmon. The company has been implementing an investment plan in onshore facilities in 2016-20 in order to increase its limited farming capacity by 30% and reduce biological risks and diseases of salmon.

Products

Bakkafrøst salmon products include whole-fish (fresh, iced and frozen), frozen portion, head, belly flaps, skin and backbones. Bakkafrøst superior salmon is in high demand from sushi restaurants and other discerning customers. The company can deliver the fresh whole salmon by air to most

destinations within 72 hours of harvesting. The product is recognized as the top quality because of the excellent natural condition in the Faroe Islands and the complete vertically integrated farming system, in which all aspects of the production from fish meal and fish oil to finished product are fully controlled. Bakkafrost salmon has got the ASC certification for its environmental and sustainable farming.

The company strategy is to keep its salmon product, typically the fresh salmon, as the top quality in the world in order to earn the highest price in the international markets. To achieve this strategy, the company operates and promotes a sustainable business by emphasizing a responsibility towards the environment integrity, fish welfare, and sustainability. The company separates farming areas (fjords) with different biological conditions, applies strict management regulations to reduce fish mortality, and has lowest average feed conversion, full traceability from salmon roe to the final product, rich in Omega 3 and non GMO feed. Bakkafrost started feeding its salmon with feed produced from fish oil in 2015, which is cleaned for environmental pollutants. The sustainability of the farming is also ensured by certifying the entire value chain.

The company has achieved different certificates such as Global GAP, ASC, HCCP, IFS and BRC. In 2014, Bakkafrost announced the goal to get the first farming site ASC certified in 2015 and plan to have all its farming sites ASC certified by 2020. The ASC standard was developed in cooperation with World Wild Fund (WWF) for nature and is seen as the most stringent standard in the aquaculture industry with requirements regarding fish welfare, sea lice, smolt production, feed production and the environment. Bakkafrost farming site, Gøtuvík, became ASC certified in 2015 as the first Faroese farming site to get an ASC certification, and in 2016, Bakkafrost farming site, Gulin, became ASC certified. The company is still working on getting more farming sites ASC certified.

Market & marketing

As the Faroe Islands produce only about 3% of the world's salmon and demand is very high for the origin. United States, China, Russia and Europe are markets for Bakkafrost salmon. Demand for the whole Atlantic fresh salmon with Faroese origin has been increasing vastly recent years and customers who have a preference for the Faroe Islands origin have to pay a premium.

Bakkafrost fresh salmon is well placed to access the US, China and Russia. Faroese salmon producers in general are in a favourable competitive position in the US market. The US market accounted for 33% of Bakkafrost's total sales of whole fresh salmon of the company in 2016. Bakkafrost has established an experienced sales force with long-term relations with customers in the US. The company has a running operation and on-going sales of large salmon, supported by efficient logistical systems for the distribution of the products (both fresh and frozen) from the Faroe Islands to the US. The US market prefers the higher-than-average size and weight and the high level of Omega-3 offered in the salmon produced in the Faroe Islands. Since 2011, the export of large fresh salmon to China has increased significantly. The logistics from the Faroe Islands to China are also efficient. The sales to Asia, which is mainly China, accounted for 25% of total sales of fresh whole salmon in 2016. The sales to Russia increased significantly following the import ban of Norwegian salmon to Russia since Q3/2014. Of the total sales of fresh whole salmon, the Eastern Europe market, where Russia is the main market, accounted for 23% in 2016.

Bakkafrost's strategy is determined to further strengthening its position in the marketplace by investing and marketing of the below USPs (unique selling points). Producing healthy, sustainable, top quality salmon, and big size are goals that can create value for the customers and thereby maximize the Group's result. The natural conditions in and around the Faroe Islands are perfect for raising salmon. The company continuously promotes the Faroe Islands origin as a boutique origin for top quality salmon. In addition, the Faroe Islands aquaculture industry produces the largest Atlantic salmon in the world. The average weight of Faroese salmon in 2016 was 5.2 kg, gutted weight. The price difference between the different sizes of salmon has been historically big during the last years, where especially the 6+ kg salmon sizes have received a considerable price premium. This is due to a lack of supply of larger size salmon as it requires good biology to produce large salmon. Bakkafrost aims at producing salmon with an average weight of around 5.2 kg, gutted weight, which is possible due to the Group's good biological situation. The brand preference for Bakkafrost's salmon is especially strong in the US and China. Bakkafrost's salmon appeals especially to the premium sushi segment, as it has a strong sustainability profile. Bakkafrost does not use any antibiotics and only uses Non-GMO raw material in the feed.

By focusing on meeting existing customers' demand, Bakkafrost benefits from its long-term relationships with a large number of customers. The relationships with customers have proven to give a competitive advantage through product development and marketing. In addition, the company aims at selling its salmon as directly as possible to the best paying segments worldwide. The company's strategy is to have a healthy geographical sales diversification to minimize the risk of any individual market fluctuations. By working closely with key freight forwarders, the company has developed an industry leading logistic setup, which ensures that Bakkafrost's salmon is delivered as fresh as possible by airfreight worldwide at the most competitive transport prices. 55.6% of Bakkafrost's fresh salmon was exported by airfreight in 2016. The company's salmon is shipped to major airports, where the salmon is transported with passenger airlines to markets worldwide.

Firm structure

Bakkafrost is the market leader and largest salmon farmer in the Faroe Islands, accounting for 68% of total salmon production of the Faroe. The Group is fully integrated, from production of fishmeal, fish oil and fish feed to production of smolt, farming, value added products and sales. The company has 820 full-time employees. The company has three segments of operation: i) fishmeal, fish oil and feed (FOF), ii) hatcheries, farming, harvesting and packaging, and iii) value added products (processing) and sales.



Figure 2. The Operation Structure of the Bakkafrost Group

FOF segment

The FOF (fishmeal, -oil and feed) segment produces fishmeal, fish oil and fish feed. Over 90% of the production is used for fish feed, which is used internally in the farming segment. The quality of the fish feed is important to the quality of the salmon from Bakkafrost. The production of fishmeal and fish oil depends on the sourcing of raw material, and the availability is highly related to the quotas for pelagic fishery in the North Atlantic. Total revenues for FOF segment in 2016 amounted to 1,158.1 million Danish kroner, accounting for 36% of total Group's revenue. Bakkafrost's strategy is to have a high content of fish oil in the feed, resulting in a salmon with a high content of omega 3. Even though all tests show that the levels of pollutants in the Bakkafrost salmon are well within the safety limits imposed by e.g. the European Union, Bakkafrost has cleaned the fish oil used for Bakkafrost's salmon feed for PCB and other pollution from early 2015.

Farming segment

Bakkafrost is operating 6 hatcheries and 20 farming sites. In 2016, the company transferred 11 million smolts to the sea and the farming segment harvested 47,542 tonnes gutted weight salmon. The farming segment produces high quality Atlantic salmon from juveniles to the harvest size. The salmon is sold to fresh fish markets globally and to the internal VAP production. The farming sites are located in the southern, central and northern part of the Faroe Islands. The company has followed strictly the implementation of the veterinary regime in the Faroe Islands, which is a set of law implemented since 2003. The veterinary model aims to increase biological and veterinary security and to support a sustainable and healthy operation. Through total separation of salmon generations, vaccination against different diseases (ISA among others), strict regulation of movement of equipment and fish and other regulations, the results for the 2005-2015 generations on feed conversion ratio, mortality and productivity are among the best results ever seen in the Faroese history of salmon production and are stable, compared to peers in the industry. The Faroese veterinary system has improved fish health and reduced costs. Thus, Bakkafrost's EBIT per kg has improved and is among the highest, compared to peers.

The farming costs have increased, over three to five years, which is related to the increased feed cost and health cost, and to the fact that the farming sites have been moved further out the fjords to more exposed areas, where more expensive equipment is needed. Bakkafrost uses salmon feed with a high marine profile, which is relatively costly, because of the high level of marine ingredients. The company gets other benefits from this diet, which is similar to the diet of the wild salmon. Good animal welfare has positive impact on non-feed cost elements and results in higher production efficiency. The health cost mainly relates to treatments against sea lice. The most used treatment has been medical treatment, but in 2015, the company began using fresh water treatment against sea lice on board. In addition to this, Bakkafrost has used lumpfish at some farming sites to reduce number of sea lice. The company will increase its use of lumpfish and has made investment, which will use a system with lukewarm sea water against sea lice.

VAP segment

The VAP (value added products) segment produces skinless and boneless portions of salmon. Bakkafrost has long-term experience in producing and selling value added products. The main

market for the VAP products is Europe with increasing sales in other markets. The VAP products are sold on long-term contracts. In 2016, the total VAP production represented 37% of the harvested volumes. Bakkafrøst's long-term strategy is that VAP products shall represent 40–50% of the Group's harvested volumes.

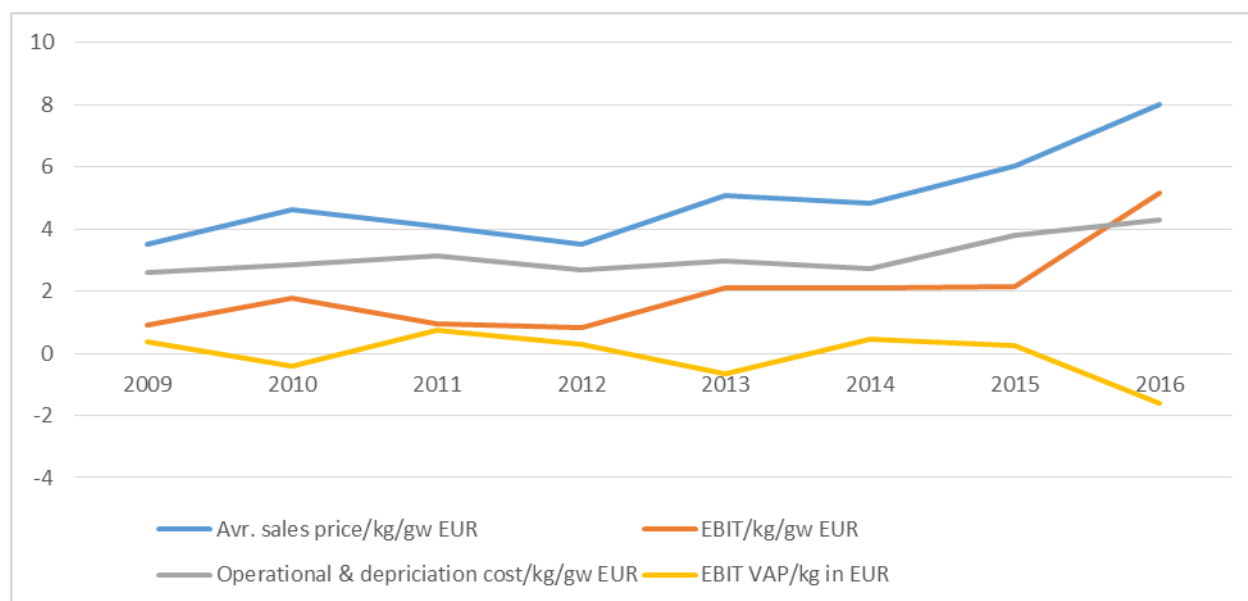


Figure 3. Bakkafrøst's Value Chain 'Equalizer'. Source: Syntesa

The sales of VAP products stabilize the Group's earnings, as the sales are based on fixed-price contracts. However, if the spot price increases for unforeseen reasons the company will lose from fixed price contract and the VAP product will be less profitable. For instance, in 2016 the spot price of global salmon increasing significantly due to the lost production from Chile and Norway gave Bakkafrøst an extremely successful year although EBIT VAP/kg of this year was decreased dramatically. As a large producer at global scale, Bakkafrøst cannot be dependent on the market uncertainty. Increasing proportion of VAP product helps the Group sustain its long-term strategy.

Bakkafrøst has over the last three years been working on merging seven factories into one. The company replaced two old packaging factories in 2014 with a new packaging factory in Glyvrrar. The new packaging factory is integrated into the new harvest/VAP factory, which has been under construction for the last two years. The harvesting part of the factory started operation in the summer of 2016, and according to plan the full factory at Glyvrrar will be in operation from January 2017. This will secure a more cost conscious production from packaging to finished value added product ready for the market. The new VAP factory, which is combined with the new harvest factory at Glyvrrar, will increase the production capacity and give flexibility to expand the portfolio of VAP products. Relatively short distances between farming areas and processing facilities and well-developed infrastructure offer cost-efficient transportation of both feed and fish on land and at sea.

Ownership

The company was listed on Oslo Børs and broadened its shareholder base to investors in US and Europe. As an international firm, Bakkafrøst operates transparently, aiming to maximize benefits of shareholders and value to its customers.

Conclusion

Bakkafrost is the largest salmon farming group in Faroe Islands and the eight-world largest company in the salmon aquaculture industry. The generic strategy of the company is to strengthen its market position as the top quality salmon producers. The company probably has the most fully vertical integration in the world that controls the entire value chain from fishmeal to the finished salmon. The company implements the veterinary model aiming to increase biological and veterinary security and to support a sustainable and healthy operation. Producing healthy, sustainable, top quality salmon with a high content of omega 3 and big size can create value for the customers and thereby maximize the Group's result. Promoting the Faroe Islands origin as a boutique origin for top quality salmon is the marketing strategy that company exploits from its favourable environmental conditions. Strengthening its market position is the core strategy, the company in the meantime is implementing the investment plan to expand its production capacity by 30% starting from 2021 and increase the percent of value added product to 50%.

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Competition context

The British (and wider EU) market for the traditional portion-size rainbow trout is in long-term decline. This can be attributed to changing consumer preferences - especially in Northern and Western Europe - away from whole fish, which is increasingly seen as too demanding in terms of preparation, containing undesired bones and having an unattractive presentation. The consumer today has access to a large variety of seafood products and chooses those which provide the most utility. Increasingly, these are the value-added products which save time and effort in preparation and cooking, and better complement a modern lifestyle. This is one of the primary reasons why small-size fish lose popularity – there is limited amount of value that can be added to a plate-size fish. Much more value can be derived from a large size fish by undergoing different levels of processing, ultimately resulting in an overall more competitive product of higher demand. At the background of a moribund trout market and a declining industry, Dawnfresh (DF), the leading trout producer in the UK has employed an innovative approach in its effort to revive consumers' interest in trout. This case study presents the strategy of a trout company whose business model borrows significantly from the much more successful nowadays salmon industry. However, in producing products similar to salmon-based ones - and thus gaining access to a much larger market - the company also enters a competitive environment in which its competitors become the much larger companies in the consolidated and integrated UK salmon sector. The case study discusses the implications of such strategy.

Overview

Starting out as a cold-water prawn (aka' scampi') processing business in the 1980s, Dawnfresh has become the UK's largest trout producer, through a series of acquisitions of seafood businesses. The company increased its presence in rainbow trout, which is its current focus, in 2004 and 2008 with the acquisition of major producing and processing enterprises.

Dawnfresh entered the trout sector in 2004 when it acquired Silver Trout (Intrafish, Oct 2008), an English trout processor based in Hampshire. The Silver Trout deal also gave DF access to ASDA supermarket chains, with whom Silver Trout had established trading relations (Intrafish, 2005). In addition to continuing Silver Trout's business in whole fish and fillets, Dawnfresh intended to develop a range of value-added trout products for the domestic and international markets (Intrafish, n.d.).

In 2008 DF also acquired the bankrupt Belshill Scotland-based Scot Trout which was estimated to have added £35 million (£43.9 million/\$69.1 million) to Dawnfresh sales, putting annual turnover at around £70 million (£87.8 million/\$138.3 million). Scot trout had 25 land-based trout farms, and the hot- and cold-smoking business of R&R Spink & Daniel's Sweet Herring, and nearly 500 employees (Intrafish, Jul 2008). With its acquisition of Scot Trout added the noted Arbroath Smokie smoked haddock product to its portfolio. Most recently under the Scot Trout umbrella, RR Spink has smoked the product in Arbroath since 1715 (Intrafish, 2008b). It now controls 85% of the domestic trout business, following its acquisition of Scot Trout and Salmon.

In 2008 Dawnfresh also acquired a number of sites from a trout producer Kames Fish Farming

Currently the company's value chain spans fish farming, including production of own juvenile fish, and primary and secondary (value-added) processing. The only activities which the company does not control are ova and fish feed production, and retailing. The company is owned by Alistair Salvesen, one of the top richest people in Scotland. Key facts about the company are presented in Table 45.

Table 45. Dawnfresh overview

Type of company	Private limited Company
Number of employees (2016)	~300 to 500
Turnover (2016)	> £60 million in 2016
Scale	Medium
Annual output (volume) tonnes	Farming - 5000 t
Margin (2016)	Negative
Market share	
Operations	3 hatcheries; 3 freshwater sites (for portion size trout), 5 seawater sites (for large size trout, 3 processing plants – Uddingston (chilled products), Arbroath (smoked); Granton on Spey (pickled)
Established	1980s
Ownership	Private
Products	portion size trout (300g); loch trout (4-5kg, 6-7kg); value added rainbow trout and salmon
Supplying	Multiple retail chains in UK and Europe
Markets	UK and Europe
Competitive strategy	Leading B2B supplier for low-end retailers
Value chain activities	Production of trout from egg to market size; primary and value-added processing

Competition strategy

The company uses a business model similar to those in the salmon industry. The production process, including the facilities, closely resembles that of salmon. Senior management in the company also have considerable expertise in salmon production.

Products and Markets

The firm grows trout to three market sizes: portion size (300-400g) in freshwater sites, which are retailed as whole fresh fish in UK multiple retail chain, while sea loch sites are used for rearing trout to a larger size, which form the main product output of the company. Two different sizes of large trout are grown in seawater: 70% of the marine production is of 4-5 kg, which enters the UK formal retail sector (Sainsbury's, Tesco, M&S) after processing and value addition, predominantly under retailers own brand and marketed as loch trout. DF is considering expanding its brand presence in this segment. The company also produces smaller amounts of portion-size trout in fresh water lochs (300-400g) which is retailed as a whole fish to same UK retail outlets.

The remaining 30% of 6-7kg is a niche product, exported by airfreight whole head-on gutted – mainly to the US and Canada, where it is destined mainly to the high-end food service sector. This product has a high margin of around 20-30% and the company is considering whether to dedicate more of its production capacity to it, for which it is performing a cost-benefit analysis.

As most trout production is destined for domestic markets, major competition is also local. However, competition is also with the salmon sector as the products of Dawnfresh are close substitutes.

‘Export’ whole 7kg+ fish are branded as Loch Etive trout, whilst very little of product retailed in the UK is under own brand. The reason for that is believed to be the general image problem of trout in the UK and promotion costs associated with the still relatively small company production of 5,000t/year. So strategy more on supply-side issues and mainly rely on retailers for UK branding. Trout still fetches a reasonable price – but not as much as salmon in the UK. The most successful in-house branding is for smoked trout.

The ‘retail’ market is currently very competitive; key seafood secondary processor competitors include Penney’s, Macraes and Marine Harvest with their Rosyth plant. Consistent with its supply volume, Marine Harvest also has much more streamlined processing of 1-4 product lines. All suppliers aim to achieved preferred supplier status – DF with lower volume has to do this by agreeing to diverse product lines – which may involve loss-leaders.

Business model:

Eggs are purchased from companies specializing in genetic selection, and from different suppliers depending on the season, in order to ensure continuity.

The eggs are hatched in DF’s own hatcheries and the juveniles then on-grown to around 300g (which is the average weight of a traditional portion-size trout) before being transferred to the sea cages. By doing so, the company ensures that the fish are strong enough to adapt to seawater and minimizes the biological risks associated with rearing fish in cages for long periods. Stocking in larger fish also allow better utilization of the production facilities and DF is considering the use of recirculated aquaculture systems (RAS) in order to grow fish to even larger sizes under controlled conditions before moving them to marine pens.

All large size trout are currently grown in net cages in the same water body, Loch Etive. Having access to the loch, is an important advantage to the company as it allows it to grow fish to a large size cost-effectively. The costs of growing trout to 4-5 kg are similar to those of salmon. In addition, the low salinity of the water provides a suitable environment for the rearing of trout while presents no interest to salmon companies, due to the poor performance of salmon in such conditions. Also, lower average salinity reduces the severity of sea lice infections, which represent a major challenge to the salmon industry.

DF’s current fish farming facilities comprise a combination of different systems, acquired from other producers and developed by the company itself, and lack standardization. This is one aspect which the company feels can be improved and has invested in. Using standardized equipment streamlines the production process and improves the efficiency of the enterprise.

The company endeavors to expand its production of trout from 5000t to 10000t per year, but the expansion of production is constrained by the availability of production sites. Development of new farming sites in the sea is difficult due to the strict regulation regarding release of wastes. It is further complicated by campaigners against the development of aquaculture. To increase the production of its most successful product (4-5kg) the company is looking to replace its portion size trout production with large size trout and increase its purchase of table trout from other farms in the UK. Portion trout has a low but stable profit margin of around 2% compared to large trout where the margin can be up to 40%.

At farm level focus is on gaining improved understanding of cost-benefit of different production strategies for larger and smaller sized fish i.e. considering premiums, FCR, survival rates and other operational costs.

Expansion through acquisition of farms sites from other producers have been the main vehicle for growth in the salmon industry. DF has unsuccessfully attempted to acquire the production facilities of a salmon company. Producing salmon in addition to trout would have given the company higher bargaining power against the retailers who are much more dependent on salmon than they are on trout and would allow DF to more easily sell its trout product lines.

Over the years the company has invested in upgrading its processing facilities, improving efficiency and the capacity to process multiple lines of products. Additional amounts of salmon, portion size trout, sea bass and seabream are purchased from external suppliers and processed by the company, to fully utilize the capacity of the processing plant. Currently there are more than 300 lines of products, the company produces, which allows it to satisfy buyers (retailers) needs and gain the status of a 'preferred supplier' but this also incurs significant costs by reducing the efficiency of the process (by starting and stopping the production lines frequently). Better understanding of the costs-benefits of each product line, would be the basis for taking strategic decisions and improving the profitability of the company (see below).

Profitability

Although some parts of DF are profitable, the company as a whole has never reached profitability,

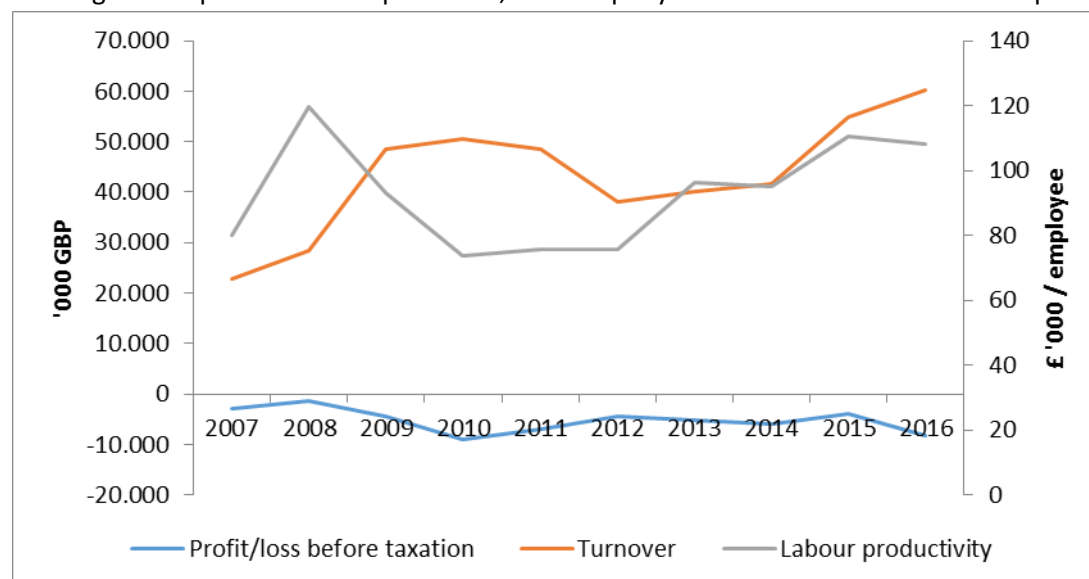


Figure. Operating losses of £8million in the last financial year – grew year on year as production grew with no or insufficient concomitant efficiency increases.

Margins for ‘portion’ trout are low but stable e.g. 2-3% whilst large ‘export’ trout can realise margins of 20-30%. Though there is considerable uncertainty around forecasting of margins for trout raw materials and different processed product lines. In processing this stems from the presence of some 300 product lines. Often processing lines must be stopped – cleaned – ran for a new product for as little as 30mins – stopped/ cleaned again and reverted. This introduces considerable inefficiencies which are difficult to cost. Uddingston labour requirements swell from around 200 permanent to 500 staff to meet seasonal Christmas demand. The addition of these temporary staff also introduces in-efficiencies increasing unit costs.

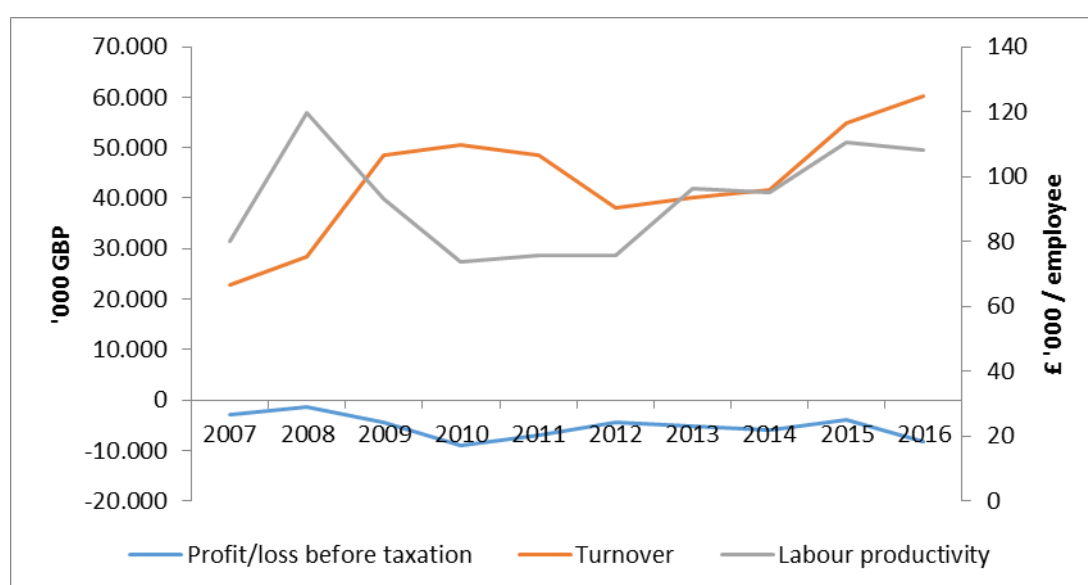


Figure 4. Dawnfresh's financial performance. Source: FAME

3.1.1 Aqualande Cooperative Group

Aqualande Cooperative Group is a European leader in aquaculture and, particularly, the biggest trout production company in France. It is a vertically integrated company, which is not typical for France. It has three main activities: selection and reproduction, grow-out and processing. In addition, the company is also diversified into production of marine fish species. Thus, Aqualande Cooperative Group has developed an integrated aquaculture industry which can potentially bring competitive advantages to company and to sector as whole. Brief overview of the company is presented in Table.

Table 14. Aqualande Cooperative Group overview

Type of company	Limited Liability Company / Société anonyme à conseil d'administration
Number of employees	650
Turnover	€98,8M
Scale	large
Annual output (volume)	10 000 tons, including more than 8,200 tons of large trout (≥ 3 kg)

Margin (2015)	8.81%
Operations	Domestic and international
Established	1981
Ownership	cooperative
Value chain activities	embryo eggs, smolt production, grow-out, primary processing, secondary processing
Products	fresh whole, frozen whole, fresh fillets, frozen fillets, fresh steaks, frozen steaks, smoked fillets, roe
Supplying	fish farms with embryo eggs and smolts, distributors with fresh and smoked fish, smokeries with fresh fish
Markets	France and international
Competitive strategy	differentiation

History

At the basis of "Groupe Aqualande" stood "SCA Aquaculture Farmers in the Landes", founded in 1981. In 1986 followed the creation of the first centre for breeding and reproduction of trout in Pissos (Landes), with another unit for fresh fish processing built in Roquefort in 1988. Year 1991 brought the creation of the now known Aqualande Ltd (AQUALANDE SA). In 1992 Aqualande diversifies into marine farming with its first farm for sea bass. 1993 was significant through the launch of their Trout Caviar, worldwide recognized for its high quality. In 1995 Aqualande purchases "Ferme Marine du Douhet", a sea bream hatchery, following with another purchase in 2003, of "Poisson du Soleil", a sea bass hatchery. In 2006, Groupe Aqualande celebrates the opening of a new plant of 4300m² dedicated exclusively to smoked trout. The years of 2007 and 2009 have seen the launch of new smoked products. The processing plant in Sarbazan is extended in 2012. A new purchase is made in 2013, this time of 5 trout farms from Norway Seafoods. In 2016 Groupe Aqualande opens the fish feed factory AQUALIA.

Competitive positioning strategy

Key resources

In over 35 years of activity Groupe Aqualande has developed a structure in the South-West of France with numerous farms fully integrated in their environment in the forest of Les Landes, Pyrenees, Languedoc and La Rioja (Spain), and 4 centres for selection and reproduction. The organization succeeds in producing 10,000 tons of trout and 350 tons of sea bass per year. The trout are grown to a larger size of about 3 kg which allows fish to be filleted and Nearly 3 out of 4 smoked trout sold in France have been processed at Aqualande.

Groupe Aqualande separates its activities into 3 main parts:

- Selection and reproduction, organized in:
 - trout: four breeding centres and hatcheries in Aquitaine and a partnership with 2 breeding centres in Spain for a total production of 450 million embryo trout eggs (leading producer in the world) with sales all over the world
 - marine fish (sea bass, sea bream, corbina): 2 marine hatcheries on the Ile d'Oleron and Sète, and 5 pre-growing sites: 1 in the Vendée, 3 in Languedoc- Roussillon, 1 on the Island of Qeshm in Iran, producing in total 80 million fingerlings

- Trout farms, grouped in “Cooperative Farmers in Landes”, organized in 32 farms spread over the forest of Aquitaine and the Pyrenees, Les Charentes, Le Languedoc and Rioja (in Spain)
- Trout processing, with plants in Sarbazan and Roquefort in the Landes:
 - 1 site which is specialized in processing for fresh and frozen fish markets
 - 1 site which is highly specialized in the production of cold smoked trout

Groupe Aqualande controls:

- 2 processing plants (Roquefort and Sarbazan in the Landes)
- 2 centres for genetic selection and breeding (Pissos and Casteljaloux) and 2 more with partnerships in Spain for a total production of 450 million embryo eggs
- 2 marine fish hatcheries (Ile d'Oleron and Sète) for production of 68 million fry
- 25 fish farms: 19 farms in Landes, 3 farms in Gironde, 3 farms in Pyrenees Atlantiques, 2 farms in Hautes Pyrenees, 1 farm in Gard, 1 farm in Charnes, 1 farm in Spain

The staff of 650 peoples are distributed in the following way:

- 100 people on sites for selection and breeding (trout, bass, bream, corbina)
- 120 people on farms for trout and bass
- 450 people on the sites of Roquefort and Sarbazan (factories and offices)

Competitive strategy

The company places a strong attention on the high-quality production process, starting from the farms and ending with the finished products in stores.

To ensure its commitment to a sustainable development approach, Groupe Aqualande joined the diagnosis 3D, which identifies and evaluates the practices of the implemented work on 8 criteria: Governance, Market and Customers, Safety and Health at Work, Environment, Economy, Social, Sociability, quality system and products. Groupe Aqualande claims to be the only aquaculture company that has been the evaluated AFAQ 26000 successfully, with the results: Maturity Level 3.

The company claims to heavily focus on the preservation of the environment, succeeding in doing it by applying the following actions:

- having a membership of GDSAA (Group for Aquatic Aquaculture Heath Protection) monitoring tools at the service of fish farmers to protect the aquatic environment and the health of the fish
- achieving a IBGN on each site (Biotic Index global standard)
- completing 2 analyses of water samples 24h on regular basis
- participation in SAGE (Land use planning and water management)
- reducing below 25% the use of wild fish from fishing, in order to avoid exhausting wild fish stocks

Groupe Aqualande engages in a strong policy of eliminating antibiotics and have reduced their use by 4 in 10 years, achieving the lowest rate of antibiotic use in all livestock sectors.

Market positioning

Products

Groupe Aqualande has several popular brands under which it produces various products. It holds around 70% of the French smoked trout market. The majority of products are distributed through the retail network.

Ovive is the premium well-known brand of the company. It promotes optimal breeding and feeding conditions of the trout, careful and precise selection of the product and overall high quality. Ovive delivers large varieties of smoked trout products (from different regions or combined with various condiments) and trout and salmon eggs products.

The brand Landvika, is a market leader in quality smoked trout, which was launched more than 20 years ago, and is many times medallist in the International Exhibition of Agriculture in Paris. Landvika's smoked trout became the first brand of smoked trout in France in 1998. Some smoked trout products under the Landvika brand have Label Rouge certification, which guarantees the highest quality of the trout. Besides the smoked trout products Landvika produces wild salmon roe and trout roe.

The brand Aqualande Marée specializes in freshly caught fish, delivering it to the consumer in various sizes and quantities, some of which are labeled as organic. Some of these products are Gutted Trout, Large Trout fillets, Organic Trout and Organic "Bio" large Trout fillets.

Aqualande Surgelé is the Groupe Aqualande's brand which distributes frozen fish products to the consumers, in distinct packages as seen in Figure 9, from 340g to 1kg, offering 10kg bulks to whole sales and food services.

The group's strain with natural breeding in autumn is extended by photo-period and gives availability and production all year round.

Distribution channels

Besides its main market, France, Groupe Aqualande targets exports to Asia-Pacific and Western Europe areas. Some of the main countries for export being: Belgium, Switzerland, Germany, Denmark, Spain, United Kingdom, Italy, Japan, Poland, Turkey, Bulgaria, Morocco, Netherlands, Sweden.

Groupe Aqualande exports 70% of its production of eggs in a controlled logistic schedule over short and long distances.

90% of the production from 2 marine hatcheries is exported. The company's marine subsidiaries have developed markets on the Mediterranean the perimeter. The company has two marine hatcheries which relied on the interchange of technologies to produce three species. The range of products and services developed by Groupe Aqualande corresponds to the changes in demand of the customers, from the larva to the pre-grown alevin (fry). The development of the export market and the logistics necessary for this trade drove the group to master the delivery, marketing and export of its live juveniles in the best technical and administrative conditions.

Products intended for the internal market are distributed to well-known networks of supermarkets like Carrefour, Leclerc, Hyper U, etc. The group also distributes products to whole sales and food services in packages of larger than usual quantities.

Market segments

Groupe Aqualande focuses on market segments in which eco-friendliness, naturalness, healthiness (low quantities of used antibiotics), tradition (having the first brand of smoked trout in France) and

most of all, high quality are extremely valued. The attention to high quality can be noticed throughout their products starting with the carefulness and professionalism of the farming process all the way to the packaging and various labels and certifications. The fact that the group operates within French territory and has deep roots within its lands and culture can play a strong role in influencing French consumers to consider their products. Ovide smoked trout products can be found at prices fluctuating between €2.70 and €5.

Labelling and certifications

Members of the German retailers - Hauptverband des Deutschen Einzelhandels (HDE) - and those of its French counterpart - Fédération des Entreprises du Commerce and Distribution (FCD) - have created a reference frame for quality and food safety called International Food Standard (IFS). It allows to evaluate the levels of quality and safety of food suppliers on the basis of a uniform approach. This standard is applicable to all stages of food processing.

Groupe Aqualande's workshops in Roquefort and Sarbazan are certified according to IFS (International Food Standard) standards at the upper level for the preparation of the smoked trout and pasteurized fish eggs.

The company obtained the "Origin France Guarantee" label for the production of "OVIVE smoked trout" in October 2011. The concerned products comply with all the obligations required by the label's strict specifications. The label indicates a product born, raised and transformed in France. These criteria have been certified by Bureau Veritas Certification.

The group's environmental management system has enabled it to obtain the NFV 01-007 certification "quality management system and the environment of aquaculture production" for all its sites as of 2004. The Sarbazan site is certified ISO 14001.

Several of Aqualande's products carry the Label Rouge. Label Rouge certifies that the products have specific characteristics which ensure a high level of quality. The company adheres to PAC and is audited several times a year by a certification organization to ensure that it complies with the specifications and Label Rouge control plans.

Some other certifications include: "Global Gap Certification" of the site for selection and breeding (2011).

Value chain coordination

Groupe Aqualande takes pride in building relationships with its clients based on accountability and transparency and providing exceptionally fresh products. The fish is harvested in the morning and immediately processed in their plant in Roquefort. Immediately after processing (gutting and filleting) the fish is packed either in MAP trays or in regular polystyrene boxes with ice for sales at the seafood counters in a matter of a day after harvesting.

As mentioned above, the group distributes its products to whole sales, food services and large networks of supermarkets like Leclerc, Carrefour, Hyper U.

One of the main objective of the group, for the 2014-2016 interval was to promote the "Responsible Purchasing" charter within all Group entities and to conduct an evaluation of the Group's suppliers

integrating the Corporate Social Responsibility criteria. 40% of the group's major suppliers have signed its "responsible purchasing charter". 86% of the company's purchases (packaging, supplies and transport) are achieved in France.

Informal institutions

Besides having a strong sense of value for the natural environment and taking actions to preserve the healthiness of its products, Groupe Aqualande targets to influence multiple sectors which have a relationship with aquaculture. Some of its objectives are to continue an active follow-up of compliance of ICPE files on fish farms and processing workshops, gradually integrate control of aquaculture nutrition into the industry, ensure a leading role in inter-professional bodies to defend the interests of the aquaculture sector in France and in Europe, to perpetuate the existing aquaculture structures and increase the fish potential by developing new breeding techniques in "recirculated system". The group succeeded in organising presentation meetings with the Corporate Social Responsibility (CSR) approach in all local administrations and sharing of CSR commitments with the Group's fish farmers.

Upgrading of competitive advantage

Besides keeping the high-quality standards, which won the company the above-mentioned certifications and labels and promoting the environmentally-friendly culture, Groupe Aqualande plans on staying competitive on the market by following the objectives described in Table 15.

The main key is to strengthen the position in the already strong aspects (like production of smoked trout), while trying to innovate and adapt to the consumer's changing preferences in order to stay relevant on the market and keep a steady growth.

Table 15. Groupe Aqualande's objectives for 2014-2016

Administration	<p>Evaluate the performance of the dialogue with the stakeholders; Continue an active follow-up of compliance of ICPE files on fish farms and processing workshops Gradually integrate control of aquaculture nutrition into our industry; Ensure a leading role in inter-professional bodies to defend the interests of the aquaculture sector in France and in Europe ;</p> <p>To perpetuate the existing aquaculture structures and increase the fish potential by developing new breeding techniques in "recirculated system";</p>
Society	<p>Improve the food performance of the fish by reducing the share of fish products used in the food; Continue and intensify the health strategy for "0 antibiotics"; Select new fish lines that are more resistant to disease; Controlling vaccination prophylaxis: target of 100% of sites at Group level; Consolidating the societal acceptability of aquaculture activity on its territories: role of river sentinel; Promote the "Responsible Purchasing" charter within all Group entities; Carry out an evaluation of the Group's suppliers integrating the Corporate Social Responsibility criteria; Focus on local and sustainable resources; Continue and implement business continuity plans within all Group entities;</p>

	Continue the deployment of Corporate Social Responsibility policy within all Group entities. Evaluate the AQUALAND Group according to the AFAQ 26000 model and reach level 4 in 2017
Social & Environment	Benefit 100% of CDI employees from an individual annual interview; Decrease the number of work-related accidents by 10%; Conduct a quality of work life survey for all employees every 2 years; Deploying the Group's ethical and social charter within the different entities Develop skills and shared culture of the values of the products through training and transfer of know-how through sponsorship and learning; Develop cross-functional communication between Group entities;
Economy	Develop zootechnical knowledge and control of reproductive functions of new aquaculture species with high commercial potential; Diversify the range of fish species offered to the customers; Adapting the selection criteria of fish to the breeding constraints of the customers; Promote the development of the hatchery and pre-grow-out activities through export partnerships; Promote the transmission of fish farms; To develop and modernize the transformation workshops in order to increase production capacities by favouring local employment and improving the quality of life at work; Consolidate the leading position in the aquaculture market by highlighting the responsible values of the group's products and proposing new products; Developing the reputation of the smoked trout products and brands in order to conquer new consumers; Continue to innovate with new trout-based products to differentiate and respond better to customers' expectations;

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Aquapri

Aquapri is a family owned company with long family traditions within especially fish trading. Later own aquaculture production was developed, partly for supplying the product portfolio. The company is organized in two companies, but driven as one based on the holding company. Overview information of the company is presented in Table 146.

Table 146. Company overview

Number of employees (2015)	105
Turnover (2015)	27 million €
Scale	large
Annual output (volume)	5.800 t trout + 500 t pike perch
Sites	16 land plants, 6 sea plants, 1 slaughter plant, 3 processing sites, 3 administrative sites.
Operation	Export mainly
Established	1900
Ownership	Private company, family owned
Value chain activities	fry to grow-out, primary + some detail processing
Products	roe for consumption; Sujiko and caviar, and fresh and frozen whole and filets of large trout. The company further trade other fresh fish products.
Supplying	distributors/wholesalers, institutions and starting up with retail packaging
Markets	Japan, Ukraine, EU, USA

Competitive positioning strategy**Key resources**

The company can be classified as a large company in a Danish context with 105 employees. The company is vertically integrated having a hatchery for own use, grow-up in some of the 16 land plants, followed by full growing partly on land and partly in the 6 sea based plants. The primary processing in form of slaughtering takes place in Aarøsund, in the Southern part of Jutland. Here the Japanese customer buying roe for sujiko has 6-8 man stationed for the primary processing of the high quality roe, while company employees takes care of processing of the rest of the roe for caviar and processing and packaging whole and fillets of the trout flesh for the markets.

The company has developed farming of pike perch in fully recirculated plants in land. This production is expected to reach 6-700 tons a year. The pike perch is a supplement to the trading of especially fresh water fish, which is a minor part of the company activities.

Competition strategy

The company has several products, based on large trout and a parallel production of perch pike. The company focus on roe as a high price product, with a relative stabile market for roe and caviar. Prices mainly dependent on product quality, which is within the area of control for Aquapri.

The flesh of the trout is sold a filets or whole but this product is highly dependent of the market for (especially) Norwegian salmon and thereby hard to control for the company. The roe trout is priced 10-15 DKKR (1-2 €) below the salmon, partly because of the lower quality in regard colour.

The company regard sale of small trout as unattractive due to low prices, with competition on cost reduction, while Aquapri focus on quality and marketing. Therefore they focus on large roe trout. The roe gives a more stable economy, while the market for fish flesh follows the (apparently) more fluctuating salmon prices.

Market positioning**Products**

Roe from the large trout is the primary product for Aquapri. It is used in different ways:

- The high quality fresh roe is processed for sujiko by Japanese employees from a customer directly in the company
- Some whole roe sacks are frozen and sold to Ukraine, Russia and other markets.
- Aquapri also process caviar for bulk or in consumer products for food service and retail.

Aquapri regards the flesh from the large trout as the secondary product. They slaughter the trout when the roe is best, which means it is difficult to control the colour which is an important “quality” at the market – (the colour of the flesh variates in the period of roe).

- whole or fillets - fresh or frozen. As all trout are slaughtered in a few month a year to get the roe, not all can be sold as fresh. The rest is frozen.

Distribution channels

For the sujiko roe AquaPri has worked with a specific Japanese company for 30 years. The Japanese company has own staff to select the roe and do the processing of Sujiko for the Japanese market. There might be changes in the demand from the Japanese market or authorities, but probably not or very little. AquaPri does not necessarily know about possible changes in changed quality requirements, as the Japanese staff is doing the processing.

Besides Japan AquaPri sells to markets especially in Europe, via channels of relatively stable buyers of the caviar and whole fish. There are also some buyers in Australia and the US. AquaPri has had long-term relation to buyers in Russia which took up to 40 % of the value. This has been on hold since the boycott.

The bulk product of roe or caviar is sold to traders bringing it to e.g. Japanese restaurants, while the retail production of caviar is sold to a German company, which produces the glass packaging for China and other markets.

Besides selling via established channels the products are presented at international fish fairs (Anuga, Shanghai, Brussels and others) and the company travels to follow up on potential customers in the Middle east markets, South America, China. The company regards itself as more market oriented than other Danish companies in the industry, leading to more focus on market and quality and a higher cost of production for health issues, certifications etc.

There are three-four persons in the trading department.



Figure 5. Aquapri markets. Source: <http://aquapri.dk/da/om-aquapri/vores-markeder/>

Market segments

The geographical coverage of Aquapri' products is presented in Figure . The sujiko roe is specialised for a limited Japanese market. The bulk product of roe or caviar is sold to traders bringing it to e.g. Japanese restaurants.

Retail production of caviar is sold to a German company which produces the glass packaging for China and other markets – but specific segments is not known. Aquapri are developing a more customised packaging of caviar aim to get in German or French supermarkets for more visible positions in the shop than the traditional fish shelves.

The trout flesh is distributed by the traders. Markets segments might be institutions, but this is not known.

Labelling and certifications

Many customers start asking for ASC. So far only one production site in Aquapri is ASC certificated (Rakkeby Dambrug which produces eggs and smolt for use in other Aquapri plants). Especially the German market asks for ASC, this requirement is slowly spreading to rest of Europe, while it is not an issue outside Europe (e.g. Japan).

During the interview the first reaction was that the ASC certification and the organizational processes was seen as a cost only. Later it was discussed that to some degree the processes also create value by systematizing the documentation of the processes. The documents are structured which ease the internal communication between the different plants. All equipment and organization are registered and this gives a better overview in the organization and the individual plant. The processes are not changed as such, but with the ASC certification there are deadlines for information of staff etc.

Seen from the consumer point of view the company feel that the ASC do not give the consumer anything new or more. The production process as such has not changed with the certification. It is only documented what is done. In a Danish context the consumer does not get anything new. There are other regulations securing that no child labor is used or that the taxes are paid etc.

Aquapri has meet interest for the Global GAP certification from some customers. In Germany the interest is more focused at process certification and food security (IFC) rather than sustainability. Same about BRC in UK. Aquapri is not yet certified here, but they are in the process of being certified. It is a change of the organization to adjust to these certifications.

Aquapri refer to an own developed own-check system, which is developed as the high national standards and controlled by an independent laboratory (the Højmarklaboratoriet A/S, which is central for food security control in the Danish fish processing sector, cooperating with research institutes and universities). Besides is referred to the general high standard of the Danish public food security as a guarantee for high food security.

Value chain coordination and power relations

The main value of the production is distributed through established channels. Especially in Japan and the European market, the buyers are relative stable and long-time relations; the sujiko production taking place by the customer in the processing plant in Arøsund and “stable relations” to European buyers (traders) of caviar and whole fish. The type of relation and power in the relation is not described.

Aquapri though also participate at fairs for establishing new trading relations. In regard the product development they use the fairs also for getting insight in end-user taste and the functionality of the new packaging. In other regards they are not in direct relation with the end-users.

Aquapri has a full integrated production from hatching to slaughtering. The input of feed is seen as standard product. Therefore, the interaction with the feed providers was not regarded as decisive.

Upgrading of competitive advantage

The company is focussing on quality as the main competitive factor, explaining why they are not entering the more cost based competitive markets of small/portion trout or salmon production. This is especially the case for the roe products. They are testing a new retail product for caviar in a user-friendly packaging. It is not developed fully yet, but they hope this will be another nice product.

The products of the trout flesh is less for the quality markets, though this is less clear from the case study.

Based on a history of fish trading of pike perch, the company has diversified into farming of these in a fully circulated land based farm.

Danforel

Danforel was originally organized as a co-operative owned company by Danish trout producers in the 1940's. This company slaughtered, cleaned and processed the trout. The company also worked on some kind of product development. This company got bankruptcy in the 1970s the co-operative concept eroded. After several re-organization and different owners, the present owner Erik Hansen took over Danforel in 1998. It was a pure processing company selling via sales agents. In 2003 the company established their own sales department. During the crisis 2008 several of the supplying independent aquaculture producers got bankruptcy. In order to ensure supply Danforel took over a plant. This has developed to 7 plants and 2 rented and operated by Danaqua (a part of the holding company). Takeover of the bankruptcy plants allowed Danforel a guaranteed supply in volume and time, which was a problem for a stable year round supply for the retail markets. Overview information of the company is presented in Table 147.

Table 147. Danforel overview

Number of employees (2017)	120
Turnover	
Scale	large
Annual output (volume)	input for processing: 6.000 t small trout
Company structure	Danforel Holding 100 % own four companies. One owning the buildings, a small oil and protein processing company and the two main activities: Danaqua Aps with 7 owned (and 2 rented) land based aquaculture plants and the original company Danforel A/S processing portion trout in Grindsted, Jutland.
Operations	Export mainly
Established	1940s. Present ownership in 1998

Ownership	Private owned PLC
Value chain activities	fry to grow-out, primary + some detail processing
Products	Smoked trout fillet. 110-1200 g packages with different types of species. Own label and private label. Small production of oil and protein under development
Supplying	Retailers, 2-3 % for catering
Markets	Europe, mainly Germany
Competitive strategy	specialised producer of smoked portion trout

Competitive positioning strategy

Danforel can be classified as a specialised producer of smoked portion trout in retail packages. The company is 60-70 % self-supplying of trout for processing (Danaqua). The fish are grown to a standard portion size of around 300 g. The rest is bought from small independent Danish producers of small trout. A small share of the supply is ecological (the Danish national ecological label).

Danforel focus is smoked portion trout in retail packages (MAP or vacuum packaged) in various portions and with different spices.

Danforel strategy is to be an important partner for the large European (especially German) retail sector on smoked portion trout. This is based on being (relative) high volume supplier, with customer adjusted packaging (MAP/vacuum) in different sizes and spices variations.

Driven by a need of securing supply, Danforel has a strategy of having a high degree of self-supply. By entering in roofed and re-circulated production, Danforel was able to guarantee stable supply all year (also winter) for the retail market.

Danforel has a strategy focused product development; by retail and end user contact being able to make approximately two new products a year. For example, starting MAP packing before the main market begins; deliver end-user products in packages with three different products in each unit etc.

Over the years Danforel has upgraded by taking over production downstream in the value chain. Danforel (and the owner) tries to be in the forefront of development in customer and end-user needs, by minor product development steps, without having a dedicated product development group. Danforel tries to diversify into oil and protein (omega -3) but it is not clear how dedicated this upgrading strategy is – or how successful it is.

Market positioning

Products

Danforel is specialised in smoked trout fillets without skin mainly in end-user packaging.

- Small MAP packaging of 100, 125, 250, and 500 g packages.
 - o The 125 g MAP packages is available with 8 different sauces.
- Vacuum packages of 500 and 1200 g.
- Ecological smoked trout fillet in 125 g packages

The products is in Danforel own brand (Danforel/Dantrout) or as private label.

Danforel is slowly developing a production of oil and protein based on by product from the portion production. This is in a slow development.

Distribution channels

The dominant distribution channel is direct sale to larger European retail chains.

Market segments

Main market segment is the retail market for smoked portion trout while 2-3 % of the production is for catering.

Labelling and certifications

At the homepage Danforel announce certification of food security and environmental certifications. Regarding food security, Danforel announces they are certified according to the IFS standard (International Food Standard). And uses HACCP principals for ensuring a high hygienically standard.

Danforel holds several environmental labels. Parts of the aquaculture production from the Danforel plants are certified with the Danish ecological label and the German "Naturland" label. Danforel was one of the first Danish companies with eco-certification. They were 2-3 years too early to get it at the market as ecological trout, but it gave credibility later as being ready when the market opened.

4 of the Danforel (e.g. Danaqua) plants are ASC certificated (Abild farm, Christiansminde farm, Ejstrupholm farm and Nørre Vium farm). At the homepage this is not announced although it has been obtained since 2014. Apparently, Danforel want to be prepared for customer requirement of ASC certification, but do not yet see this as a sales argument at the homepage (the last has though not been confirmed by the company).

Value chain coordination and power relations

Danforel is in a close personally interaction with the main buyers in the retail chains. Although the retailers are huge entities, the relation is seen as a partnership because Danforel has a size which is not easy to replace. Danforel had a strong dependency of supply from the Danish aquaculture producers, but this has been reduced by buying production plants in bankruptcy, which also allowed for a better planning of production over the year.

The relation to the independent suppliers is only briefly described. Danforel has earlier tried to establish a cooperation on product development. Danforel paid 0,25 Dkk. less per kilo to the producers in order to finance product development for mutual interest. According to a critical producer, it was never clear for the producers that this "agreement" resulted in higher prices (interview with a small independent producer).

4.5.7 The Edinburgh Salmon Company (ESCo)

Strategic significance

The Edinburgh Salmon Company (ESCo) showcases a business model focused on a single activity (salmon processing) at a time of increasing consolidation in the salmon value chain in the UK, both horizontally and vertically. Not only are companies in the farming stage of the chain becoming bigger through mergers and acquisitions, but also increasingly vertically integrated i.e. incorporating other activities such as processing. ESCo is neither a large company nor a vertically integrated one,

however, through its choice of suppliers and markets it has positioned itself between two powerful and highly consolidated industries – salmon farming and multiple retail. Due to this position the company is vulnerable to the erosion in its profit margins because of low bargaining power on both sides.

Key figures

ESCo was established in 1992 as Edinburgh Smoked Salmon Company with a primary focus on smoking salmon. It was acquired in 2012 by Meralience which is part of John West Group, itself owned by Thai Union. Currently about 300 people are being employed and last year's turnover was about £49 million. Brief overview of the company is presented in Table .

Table 18. ESCo overview

Type of company	Private limited Company
Number of employees (2016)	~300
Turnover (2016)	~£49 million
Scale	Medium
Annual output (volume) tonnes	
Margin (2016)	
Market share	
Operations	Only domestic, Scotland; single factory
Established	1992
Ownership	Thai Union Group
Products	Value added salmon, 'ready to cook' and 'ready to eat'; gutted fresh salmon
Supplying	Discount/low-end multiple retail chains in UK and Europe
Markets	UK and Europe
Competitive strategy	Leading B2B supplier for low-end retailers
Value chain activities	Salmonid processing only

Competitive strategy

ESCo's supplies predominantly the domestic UK market and a smaller proportion of its products are exported to continental Europe. The main customers of ESCo are mainly discount / low end retail chains - Asda, Lidl, Aldi, Delhaize (Belgium). A contract with the sandwich chain Pret A Manger was lost in 2017 to competitor Young's²⁶. The company presently only supplies retail chains, with products marketed under the retailer's own brand. In the past they used to supply small quantities to restaurants but they found that it was not worth the effort because of the small size of orders and the special and different requirement of restaurants, which prevents achieving economies of scale. On the other hand retailers order in large amount, which is more profitable for ESCo to produce.

The company is now diversified into 'all kinds of products' of the 'ready to cook' and 'ready to eat' category and able to produce anything that the customer wants. In 2016 the rough distribution of

²⁶ <https://www.undercurrentnews.com/2017/05/30/youngs-takes-pret-a-manger-business-from-thai-union-owned-esco/>

production was 75% raw salmon (fillets, portions, value added uncooked), 15% smoked and 10% cooked. In addition to salmon there is a small amount of lake trout (300-500g from the Trossachs) being processed (into gutted fish and fillets either fresh or smoked).

The main retailer they supply is Asda (where they are positioned both in the high end expensive range as well as the value range – the middle price range was taken over by Young's) but apart from this in 2016 they have signed contracts with Aldi and Lidl as well.

The company has only one function – fish processing. There are two processing units within the company – one for primary processing (gutting) and a much larger value adding unit.

The primary processing unit, which is small, consisting of around 20 employees (manually gutting the fish) when it works at full capacity, operates on a contractual basis with salmon farms in Scotland such as Loch Duart – a relatively small salmon farming company which does not have a processing unit. The fish are gutted manually and packaged in Styrofoam boxes bearing Loch Duart's logos. Considerable amount of these are then exported to mainland Europe.

The VAP processing unit is where the majority of output comes from and most employment is generated. It is equipped with modern food processing equipment.

Esco is not a vertically integrated company. They had attempted to upgrade their value chain by acquiring a farm but had not succeeded in the bidding process and the farm was acquired by another producer. They do not have own transport either, they contract transport companies (2 for the inbound logistics and 4 for the outbound).

The majority of the raw material for the VAP processing unit has a Scottish origin (about 75%) and the rest is from Norway. In Scotland, their suppliers of raw material are Marine Harvest, Cooke Aquaculture, Ocean Quality (Grieg Seafoods), Scottish Salmon Company, Scottish Sea Farms, and Loch Duart. All of these, apart from Loch Duart, have their own processing units and as such can be classified as competitors of ESCo. Esco signs contracts with these farms but the price of raw material is not specified, it depends on the spot market prices for salmon, and farms do not guarantee quantity – these are negotiated constantly. On the supply side, this insecurity puts the company in a vulnerable position.

On the other hand, contracts with retailers, who are their main customers, are very exacting – they include strict specifications on prices and quantities for their suppliers. They also impose many other requirements with regards to forms and conditions of processing according to which they regularly audit the company. Selling most of its VAP produce (at the time of investigation) to one big powerful buyer powerful (ASDA) is a dangerous strategy, as losing this customer would have an enormous impact on the company's performance (see Wester Ross case). This was partly the reason for developing a more diversified customer base including other retail chains such as the smaller but growing ALDI and Lidl.

As such, the company is "squeezed" between powerful suppliers and powerful buyers. The dangerous consequences of this strategic position can be illustrated by the fact that in 2016 the company saw fairly heavy losses, as it found itself unable to pass on high raw material prices to

customers²⁷. That resulted in an operating loss of £7m - compared to a £1.1m profit for the prior period - while total comprehensive losses came to £6.9m, from a gain of £887. Up until that year, buying salmon at spot market prices was seen by them as profitable and they had not expected this to be a problem. From next year however (2017), they would like to move to fixed price contracts with the farms to avoid further losses.

Continuity of supply is also one of their main obstacles – to coordinate the requirements of their customers for timing of delivery and quality with what is available on the fish farms in terms of supply. Sometimes they would want a certain size of fish but that may not be available at the time when they want it. In addition, their customers have special requests based on reputation of the farmer – they would ask ESCo not to buy from certain farms who are known to have bad reputation. They are very interested in the provenance of the raw material as well.

In terms of upgrading there are constant improvement being introduced in the company - in the production processes - to make them more efficient and thus reduce costs of processing - as well as in the development of new products. In 2012 they invested £3 million in expansion of processing capacity and improving production processes. Every year they develop 30 to 50 new products out of which 6-7 would be accepted by the retailers. The process of new product development starts in their NPD unit (1 person) and when a prototype is developed staff would try it and if they approve it, they present the product to retailers. If the retailer accepts it, the price is negotiated depending on the amount of product they want to order. The main innovation area is in the methods of decreasing the price of products.

Marketing information is very important for them. They also have a market research unit who is responsible for finding new customers and expanding the markets. There have been plans to develop own brand of products in order to derive more value out of processing, and it is a possibility for the future, however the focus currently has been placed on becoming a leader in supplying products under the retailers own brands. The management sees the future development of the company in having a more diverse range of customers, to spread the risk of losing clients.

Now that they are under the corporate “hat” of Thai Union (TU), they feel that there is better access to financial resources, in both upgrading the processing technology, as well as in sustaining difficult times – the headquarters understanding the losses due of high raw material price and is still willing to invest in the company believing that that will pay off in the future as it sees potential in the company and a good strategic fit between the various business in its portfolio.

The certifications ESCo holds (BRC, HACCP) represent requirements from their customers (retailers) and do not provide any price premium, they only act as access to the market. They would be audited by retailers (unannounced audits, lasting up to three days) who check if the company is producing according to the way they have agreed. ESCo also inspects their own suppliers but not to the same extent.

With its current strategic position, the company’s main operational challenges are ensuring the continuity of supply of raw material, at times when it is needed. They are able to predict changes in

²⁷ <https://www.undercurrentnews.com/2017/09/25/edinburgh-salmon-co-dives-into-losses-on-high-raw-material-price/>

the environment linked to seasonality of markets e.g. increased demand around Christmas and Easter but weather related issues are unpredictable (e.g. the flooding in England last year which resulted in closure of warehouses and thus unpredictable drop in demand). Weather would also be an obstacle sometimes because when bad it would prevent the farmers from harvesting.

Qualified labour availability is another challenge, because the way the plant works is not continuous but depends on demand from customers and finding the workforce when it is needed could be a difficult. The majority of workers are non-British national (mainly Polish). Some of the staff are permanent but other are recruited through an agency when they are needed.

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Appendix 4 - Pangasius strategic positioning case studies

Case study 1: An Phu Seafood corp.

Title: Improving raw material quality by vertical integration

Key strategic issue

AN PHU SEAFOOD is a small-medium pangasius firm, with modern-equipped processing factories in Vietnam. The firm business includes farming, producing and exporting pangasius. The company export its pangasius to mainly Asia (China), Middle East, the EU. To meet increasing high demand from international markets, company's ambition is to enlarge production scope and develop closed and vertical integrated production system that will produce the good quality product with mass quantity, strictly conformed to the food safety standard, diversify product to satisfy the highest requirement of the customer, and control quality from the breeding fish to dining table. The company set up the strictly food safety assurance and traceability by plan "*from farm to fork*". Company's target is to provide the customer with the nutritious product for good health and good taste. The company will enlarge the production scope by proceeding their initiated projects which are feed manufacturing factory, packaging factory, by-products processing factory. Compliance with its quality management system and product traceability is the first requirement of the import market, especially meeting high standards of the large distribution systems in the world. The company is not only focusing on the pangasius fillet but diversifying its business by producing tilapia.

History

An Phu Seafood Corp was established on March, 2007 in accordance with Business Registration/Tax ID : 1400595233 issued 14 March 2007 by Dong Thap Department of Planning and Investment. The company is being led by Ms. Nguyen Thi Non a chairwoman of the company (An Phu 2017).

- Nov 2008, An Phu started their operations on 2 modern factories. The automatic processing system is applied in order to improve the quality and economize the labour.
- In 2011, An Phu has invested Con Lat farm which is 1st farm in Ben Tre with 31 ha of farming area producing 7,500 MT of raw fish (ASC, 2017a)
- In 2013, An Phu invested Phu Binh farm which is 2nd farm in Ben Tre with 54 ha of farming area producing 9,900 MT of raw fish (ASC, 2017a).
- In 2009, An Phu has been approved to be entering into EU market with EU code of DL 26 (Taichinhdientu 2009).

These two farms in Ben Tre have been certified against Aquaculture Sustainable Council (ASC) as of April 28, 2017. The company has a great development after over 10 years of operation. Now An Phu is one of members of Vietnam Association of Seafood Exporters and Producers (VASEP) and Vietnam Pangasius Association (VINAPA). The company has planned to invest on seafood processing, pangasius and tilapia farming, and feed manufacturing and develop a closed production system to control quality, risk and costs.

The company at a glance

Type of company	CORP
Established	2007
Number of employees (2016)	Around 1,500 employees (Tam Tru 2015) However, there are 53 employees working at 2 An Phu's farms in Ben Tre (ASC 2017a)
Turnover (2015), US\$ million	37 (Export value 2015)
Scale	Small-Medium
Profit margin (2016) %	No data
Share in VN Pangasius (2015 or 2016) %	No data
Operations	International
Ownership	Private
Value chain activities	Packing or Repacking, Processing - Preservation, Processing - Primary processing, Processing - Secondary processing, Storage, Trading Fish (Buying/Selling) of Pangasius Products (ASC 2017b)
Products	Pangasius Fish Fillet, Pangasius Whole Fish, Value Added Products, Block, loin and portion pangasius
Buyers	West Europe; East Europe; Canada; Australia; Asia; South America; Middle East; Africa, Egypt...
Markets	West Europe; East Europe; Canada; Australia; Asia; South America; Middle East; Africa, Egypt...
Competitive strategy	Reduce the cost production and ensure best quality

Financial performance – key financial measures

No data

Resources and competences

Most of raw material source of An Phu processing plant comes from around 100 ha of farming area along the Mekong Rivers in Dong Thap, Vinh Long and Ben Tre where the natural conditions suitable for aquaculture activities. With 2 big water sources from Hau River and Tien River and its canals accordingly are frequently supplying the water directly to the farms.

The certification achievement systems of An Phu are helping them to set strict requirements for responsible aquaculture that minimize the key environmental and social impacts of aquaculture. In another hand, the reputation in product quality of An Phu products are being improved through their efforts to comply with international standards such as GlobalGAP, BAP, ISO 22000:2005, BRC 2005, ASC.

The capacity of the factory is 600 MT of raw material per day (equivalent to 200 metric tons of finished product) per day. An Phu is owning 2 modern factories with processing lines imported from EU and Japan. The factories' modern equipment including: trimming conveyor system, IQF freezers, contact freezers, skinning machines, grading machines, metal detectors, vacuum packing machine, pure water treatment system and waste water treatment system.

An Phu has the employees with well trained in special sectors such as manufacturing and farming skills. Successful, loyal and experienced sales team with a multi-cultural and linguistic background. They have the knowledge and relationships to penetrate international markets; facilitate improvement and innovation; and deploy new business development plans.

In 2013, 2014 and 2016, the company has been ranked as the top prestigious exporters in Vietnam (Viettrade 2017b). Although, the market was fluctuated in past years, An Phu still has a stable market share and sustainable position among the industry and strong growth.

Apart from raw fish sourced of two farms located in Ben Tre province, the company still needs to buy the raw fish from external smaller scale farmers in the region. This small-scale aquaculture normally leads to the unstable fish quality. In addition, those small scale farmers are willing to sell their raw fish to other companies whenever other company are offering better price. Therefore, the collaboration between the company and small farmers are loosely and getting more challenges if the market fluctuation (Phu Hung 2016)

With the difficulty of pangasius industry in recent years, farmers couldn't sell fish because there is no more demand from the markets that caused fish prices fell below the cost of production. Therefore, from July 2015 to 2016 many small farmers reduce the farming. As resulted, the number of abandoned ponds was increasing and in another hand others farmers have switched into other fish species for higher domestic consumption. Therefore, many small and medium pangasius firms often face raw materials shortage. Eventually, there is no continuous production capacity to meet rising demand for immediate sales.

Lacking of integrated farming, processing and by-products systems, An Phu has to depend on external raw material sources. In fact, the company still is being belonged to the external sources of feed and fingerlings (ASC, 2017a). There are some initiated projects which are not implemented yet such as feed manufacturing factory, packaging factory, by-products processing factory and so on due to lack of capital (Dong Thap PPC, 2014)

An Phu lacks market diversification in different segments, and lack of readiness to deeply penetrate large market segments dominated by lower quality products, thus hard to compete on price. In addition, the company is struggling to find new businesses and distribution channels.

Strategic choices

Generic competition strategy

To overcome challenges in the future, remain the positive growth and expand the market share in the following years, An Phu strategy is to complete the vertically integrated system including hatchery, feed, grow out farms and processing plant. Along with strengthening its position in the existing markets, An Phu persistently seeks for opportunities and opens up new markets such as South America, China, and Middle East to improve its diversity and flexibility of the structural shift of the market. The Company will concentrate in improving the image and quality of Pangasius in the world directly through the marketing and indirectly through the quality certification. The company will continue to seek opportunities to generate more revenue from other farming species such as Tilapia. An Phu will continue to create added values for customers and enlarge the production scope,

differentiate itself more clearly from its rivals. The Company will also invest in technology related to its core product selling business as well as research and development in manufacturing and farming.

Products

An Phu produces two fish species that are pangasius and tilapia. Pangasius product category includes mainly frozen items such as welltrimmed fillets, untrimmed fillets, pangasius steaks; semitrimmed fillets, frozen pangasius rolls, and few value added products such as breaded fingers, breaded fillets. The tilapia product category consists only frozen tilapia fillets and whole tilapia. The most potential market for Pangasius butterfly and Pangasius fillets are in China, South America and Middle East. An Phu strategy is to increase product quality and diversity frozen items meeting demand of specific segments and in specific markets. The company advertises to reach new target customers within these geographic regions through strengthening their appearance in markets such as China International (Guangzhou) Fishery and Seafood, China Food Material E-Commerce Festival, Seafood Expo Global Brussels Belgium, Seafex Dubai. (An Phu 2017).

An Phu recognize the most important aspect for the sustainable development from product quality assurance. The fresh raw material source of An Phu processing comes from their own farming regions and farming ponds under the investment project with the farmer. The company has invested on the total area of 100 ha along the Mekong river in Dong Thap and Vinh Long, where their environment is the best in Mekong Delta. In order to make Panga healthy and nutritious, An Phu is building its farming region and ponds under the investment with farmers focusing on: controlling strictly from baby fish, breeding, feeding ingredients; monitoring fish health on daily basis to prevent from the risks of diseases, and testing antibiotic in compliance with Food Safety rules before harvest.

Markets

An Phu Seafood Corp is focusing to meet the demand and expand to these target markets such as West Europe, East Europe, Canada, Australia, Asia (China), South America, Middle East, Africa and Egypt. Since 2015, exports to main markets such as EU showed the decline due to technical barriers, therefore, the company shifted to other large potential markets such as China, Brazil, Mexico, Colombia and Saudi Arabia.

As prioritized, An Phu has strengthened their marketing in China market which is the most potential market for Pangasius butterfly and Pangasius fillets in 2016. However, China market is not only a big opportunity with the estimated export value increase of going up 40% but has also many risks including the risk of payment, buy goods without certificates for consignments through unregulated trade.

The second potential market is Brazil which is the most potential market of frozen fish fillets (HS0304) since 2013. Forecasting difficulties in the US market, businesses have managed to expand their market to Mexico, Brazil and Colombia where export value has increased over 30 percent, 45 percent and 15 percent over the same period last year. In addition, Saudi Arabia has posted a year on year increase of nearly 13 percent. However, the company is facing the exchange rate fluctuations challenges in these markets.

Firm structure

The company currently organizes under corporation model and its management apparatus according to the function of key activities, including (i) aquaculture, (ii) acquisition, (iii) processing, (iv) financial accounting, (v) basic construction, (vi) human resource and (vii) sales. Department heads will report directly to the Directors in charge of these departments. The departments are organized by operational function, from raw materials, manufacturing to trading. Directors of each department are in charge of their results and directly report to General Director. However, this current structure is not helping An Phu to focus on core business areas while each department doesn't fully strengthen their performance and responsibility. Further, the company couldn't adapt with the market changes and impacts. Especially, the human resources are not able to face the challenges of the markets. In reality, the model should be reorganized into the different aspects of the company's global aquaculture business to provide premium seafood from sustainable aquaculture, to speed up development with a combination of research, development, and education; and to provide premium wellness products derived from sustainable aquaculture. To complete these targets, An Phu considers human resource development as key step to strengthen management structure of the company, empower human resources department to increase the productivity in production and business activities.

Conclusion

An Phu is a medium seafood producing firm in Mekong delta, with the specializing activity in farming and processing pangasius (mainly) and tilapia. The company's core strategy for the sustainable development to increase and insecure the quality of export products and diversify product items for different market segments. The company is developing a vertical integration to control the entire value chain from feeding to distributing business. The company is constantly increasing its own farming areas to reduce the risks of raw material shortage and low quality.

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Case study 2: Hung Ca corp.

Title: Developing integrated production for best quality and natural pangasius products

Key strategic issue

Hungca becomes one of Vietnam's most prestigious and biggest companies in cultivating, processing, exporting Pangasius. Currently, Hungca owns the farming area up to 700 hectares, located in different 5 areas in Dong Thap province, in which a large proportion has been certified by Global G.A.P. Over 30 years' experience in the industry, Hung Ca continues to set higher targets and long-term strategies to capture opportunities in domestic and international markets. To overcome the market challenges, Hung Ca continues its long track record of stable growth and lay the foundation in innovative market strategies, new product development and sustainable farming techniques. The company has established the integrated production system including feed manufacturing, farming, processing and own distribution channel to improve the control the entire value chains for quality insurance. Increasing value added products (VAP) and penetrating new emerging markets in Russia, South America, and Asia is also the tactics to expand the production scales.

History

Mr. Tran Van Hung, which is the chairman of his named company, is one of the most experienced pangasius farmers in Mekong delta. He has started farming pangasius in a large number of canal areas in Dong Thap province since 1979. In the 1980s he owned the biggest harvest capacity that was about 70 MT per day, providing mainly for domestic market. From 1992, he increased investing in farming in floating raft, including 9 big rafts, providing 100-300 MT pangasius raw material for the processing factories and widening the lake and raft's area, standardizing farming and production.

In 2003, Dong Thap Province appealed for developing the farming fish in alluvial flat. Mr. Hung invested in dredging 34 ha hillock in Tan Thanh and Tan Binh Commune, Thanh Binh District in order to continue the expansion. Besides expanding the farm, Hung Ca focuses on improving the fountain-head, raise fish by industrial feed meal made from broken rice, bran, marine fish that improved the fish's quality, reduced farming cost, enhanced the cost price, tended to the export. Getting success in farming and providing high quality pangasius raw material, Hung Ca built the prestige gradually in the seafood field and tended to expand the distribution channel, especially in export.

Hung Ca Co., Ltd was official established in February 2006 in Thanh Binh Industrial Zone, Dong Thap Province with 250 ha of farming area and the investment capital USD 45,000,000, at the present, spending ten years establishing and development (Hung Ca 2017). In the same year, the company established a processing factory with capacity 50,000 MT per year, and opened Hung Ca office in Ho Chi Minh City. Hung Ca Products, Pangasius fillet has been launched in the international market, especially in Europe, Middle East, Russia, Asia, South America.

In 2007, Mr. Tran Van Hung-chairman of the company was awarded the certificate of "typical of Vietnamese creativity" for the research and implementation of clean farming system by Vietnam Union of Science and Technology Associations.

In 2008, Hung Ca has been approved the license to sell the products in EU market under EU code DL 126. Continuously, Hung Ca achieved the quality certificates for example ISO 22000:2005, BRC, HACCP and IFS.

In June 2010, Hung Ca is one of the first 6 companies achieved GlobalGap certification which help the company confidently penetrate into difficult markets in Europe and prove Hung Ca's reputation in the international market. In August 2010, Hung Ca has operated the 2nd factory of Van Y with capacity 80,000 MT/year which help increase the total capacity of Hung Ca company up to 120,000 MT/year. Further, Thanh Binh farm in Dong Thap province has been certified ASC in 16 January 2015.

In 2015, Hung Ca was receiving a fund from Vietinbank Leasing Co. The fund is used for establishing new cooling store with capacity 10,000 MT and processing factory with capacity of 300 MT/day. The project has been approved by the local authority since 2013 on the investment 393 billion VND, in which a part of infrastructure represents 154 billion VND, mechanic investment is 238 billion VND. Vietinbank Leasing Co. is committing to fund 168 billion VND. As planned, the factories are starting its operations from Q3/2015. This is 3rd processing plan of Hung Ca which is currently biggest and most modern in the industry (Vasep 2015).

The company at a glance

Type of company	LTD
Established	2006
Number of employees (2016)	4000
Turnover (2016), VND million	54 Million USD
Scale	Large
Profit margin (2016) %	NA
Share in VN Pangasius (2016) %	3% in 2016 Top 4 Pangasius/Basa/Tra Fish supplier in Vietnam.
Operations	International
Ownership	Private
Value chain activities	Farming, Processing and Exporting Pangasius Products
Products	Pangasius Fish Fillet, Pangasius Whole Fish, Value Added Products, Block, loin and portion pangasius
Buyers	America, North US, South US, EU, Africa (Morocco, Algeria, Nigeria), Asia, Middle East, Russia

Markets	America, North US, South US, EU, Africa (Morocco, Algeria, Nigeria), Asia, Middle East, Russia
Competitive strategy	Reduce the cost production and ensure best quality

Financial performance

	2016	2015	2014	2013	2012	2011
Turnover (VND million)						2,036
Overseas Turnover (VND million)			59 Million USD (VBPS 2014)			
Profit (Loss) before Taxation (DKK)						
Profit Margin (%)						
Number of Employees						4000

Resources and competences

After 30 years of development, Hung Ca Company has become one of the companies growing, processing and exporting seafood that possess prestige for quality. Hung Ca has an integrated farming model from hatchery, feed factory, grow-out farms and processing plant. The company is owning the large pangasius farming area in the Mekong river delta. In addition to strict monitoring the production processes, the Company applies a closed production process from farming, processing and export under HACCP, BRC, HALAL, ISO 22000, IFS, GLOBAL GAP, ASC international standards, particularly the management process according to ASC standards. On the other hand, with more than 4,000 skilled young workers and work under the direct management of many highly dedicated professionals, Hung Ca is supplying the best quality product, more and more complete distribution system and development, providing for customers with superior products that reach international standards.

Due to well control on quality, for many years, Hung Ca has overcome many difficulties from demanding markets such as USA, EU, and constantly builds credibility, and conquers many different markets around the world through the commodities of pangasius fish and value added products from pangasius. As proof of their development, Hung Ca has expanded their capacity by funded by Vietinbank leasing to invest new factories and in 2015.

Although Hung Ca products are being exported in many country. They still need to have a strong brand in specific market. Due to expansion of new factory in 2015, Hung Ca has a shortage of skilled workers to meet development and expansion requirements of the company, especially with new projects. Especially, Hung Ca is planning to penetrate the new markets, therefore, experience in new businesses and distribution channels is very crucial to this strategy.

Strategic choices

Generic competition strategy

To ensure the continuous production and better response to market demand, Hung Ca is developing an intergarded production system from feed factory, hatchery, farms to processing plants. The

company gradually assert its position and reputation in the market, has set out the guidelines, policies and put the quality on top, considering it as a guideline to survive in the development process. Accordingly, the Company continues to complete the program applying VietGAP, Global GAP, ASC standards in the future with the goal that the entire pangasius material area will be certified, and these certificates will confirm the quality of the products, and recognize the ongoing efforts of Hung Ca that always think for the customers, contribute to ensuring the sustainable development of the fishery sector, especially to promoting the image of pangasius of Vietnam.

Investment on R&D activities is ongoing project supporting the long-term strategy. The R&D investment include the application of new technology in farming, processing and packaging, that can enhance the competitiveness of the company in domestic and international markets.

Products

Hung Ca is offering Pangasius well trimmed fillet mostly for Europe, Middle East, North America, Asia, South America, Africa, pangasius fillet untrimmed for Russia, the Middle East, Eastern Europe, and Africa. In addition, the company also supplies Pangasius Steak, Pangasius HGT, Value Added Products (Pangasius Skewered, fish paste, pangasius Paste Stuffed With Bitter Ground, Pangasius Breaded), Pangasius Block, Portion, Fillet Roll, loin,... with different specifications according to clients demand.

Some value added products of Hung Ca co.



The demand for ready-to-eat and easy-to-cook, value-added white fish products (such as microwave products and fish snacks) is increasing. The pressures of time and consumers' unfamiliarity with preparing fish are the main cause of this trend. Consumers interested in such convenience products prefer meals that are quick to prepare but also healthy.

Although pangasius frozen fillets account for the largest export share, increasing VAP is one of the important strategies to strengthen market position and expand the market share. Pangasius paste stuffed with mushroom, pangasius paste stuffed with bitter ground, pangasius skewered, pangasius breaded, pangasius fish paste are some new VAPs that the company starts supplying to the emerging markets in middle East and Asia.

Markets

Hung Ca has exported its products to more than 50 countries in the world, in which Europe, Russia, and North America are the most important markets. Asian, South America and Middle East are emerging markets and the company is making attempt to expand the shares in these new markets.

Europe market has the highest Pangasius consumption at this moment which occupies almost 50%. With the great developing potential, Europe is assessed to be the traditional market of Hung Ca in next years and it is continued to be the biggest market in Pangasius exportation field all over the world. Hung Ca continues maintaining and expanding this market by providing many kinds of value added product, industrial block, Global Gap standard products in order to meet demand of this strict market.

The company faces several challenges, such as overcoming the added water scandal, high temperatures resulting in more diseases, and an anti-dumping policy in the United States and more campaigned of pangasius image damage in EU markets in 2017. Now, Hung Ca is promoting the products in China, Mexico, Brazil and Chile. Regarding the US market, the big challenge of Hung Ca is to have 0% antidumping rate for exports to the U.S market as their main goals of Hung Ca in future.

Hung Ca is one of ten businesses who are authorized to export to Russia. While the Europe usually requires the fish with small size and high quality, Russia is an easy-to-please market with the demand of fish with big size and simple specification. It brings 17.94% of the total sales in 2009, stays at the second position behind Europe.

Middle East is evaluated as the potential market with high seafood consumption in future. In 2009, Hung Ca developed and widened the Middle East by more than ten importing countries, it brought 5.96% of the total sales. It is estimated that this figure will also increase in the future. Currently, only 10% of Hung Ca products are consumed domestically. In addition, Hung Ca also aims to increase sales in the domestic market to about 20-30% in the near future (QDND 2017)

Firm structure

The company currently organizes under corporation model and its management apparatus according to the function of key activities, including (i) aquaculture, (ii) acquisition, (iii) processing, (iv) financial accounting, (v) basic construction, (vi) human resource and (vii) sales. Department heads will report directly to the Directors in charge of these departments. However, the company is originated from a family business. Family-based business creates a special and positive relationship with their employees, but they can face issues when seeking to recruit non-family talent into the firm and promote their full performance. To overcome the challenges, Hung Ca often have a attractive policy to engage the talent employees to work in their company.

They are aiming to maintain their position as one of the leading seafood manufacturer in Viet Nam under the motto *"Best Quality, Natural Products"*. Currently, Hung Ca is one of 3 biggest shareholders of Van Y company in Dong Thap where its original investment is 12,6 Million USD. In addition, the company is strengthening the marketing and market communication through the international and national exhibitions. Therefore, the focuses at the moment of Hung Ca are to hire the skilled employees to fulfil their new factory and bring Hung Ca brand to wider approach to the markets. They are focusing to develop logistics activities with the ambition to supply the products directly to supermarkets and to do not belong to the logistic service providers (Hung Ca 2017)

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Case study 3: Vinh Hoan corp.

Title: Innovating, diversifying and branding the sustainable pangasius aquaculture

Key strategic issue

Aquaculture already provides over half the world's seafood. Impacts of environment in aquaculture operations is one of the top concerns among stakeholders today from consumers to investors, governments as well as non-governmental organisations. Falling short on ethical or environmental grounds has become one of the easiest ways to lose a sale. Vinh Hoan Corporation is at the forefront of this fact. The company believes that today corporate responsibility and environmentally sustainability have evolved from buzzwords to business imperatives. So, from the beginning the company has pioneered a different way to server customers with reliable and ethic products. The core strategy of Vinh Hoan is to continue leading the industry, by investing on sustainable aquaculture, supplying only premium seafood products and by-products. Developing new value added-products meeting demand of diversified customers and strengthening its brand name in international markets are strategic business options. Vinh Hoan sets up its own mission is to develop its sustainable business model to not only maximize the profit of its shareholders but also to help upgrading the pangasius industry of Vietnam. The company has developed the vertically integrated production system from farming, processing to exporting. The company is uncompromisingly committed to its highest standard of food safety, quality and environmental stewardship by controlling product quality throughout the entire supply chain.

History

Vinh Hoan private company was founded in late 1997 by Mrs. Trương Thị Lệ Khanh in Dong Thap province as a small rented workshop processing all types of seafood. Vinh Hoan was transformed to Vinh Hoan limited company in 1998 and the first processing workshop was built in 1999. In 2007, Vinh Hoan Co. changed its legal type to joint stock company and listed on the Vietnamese Stock Market in Ho Chi Minh city, established an branch in USA, and the first feed production SJC in Dong Thap province. The second workshop was built and operated in 2008.

An export food company named Van Duc Tien Giang was acquired to Vinh Hoan in 2014 and it has the second fillet processing plant and first ready-to-eat product plant in 2016. Vinh Hoan Cooperation has established and operated a by-product factory producing collagen and gelatin in 2015. In the same year, the cooperation opened Octogone trading limited companies in Singapore and Guangzhou, China.

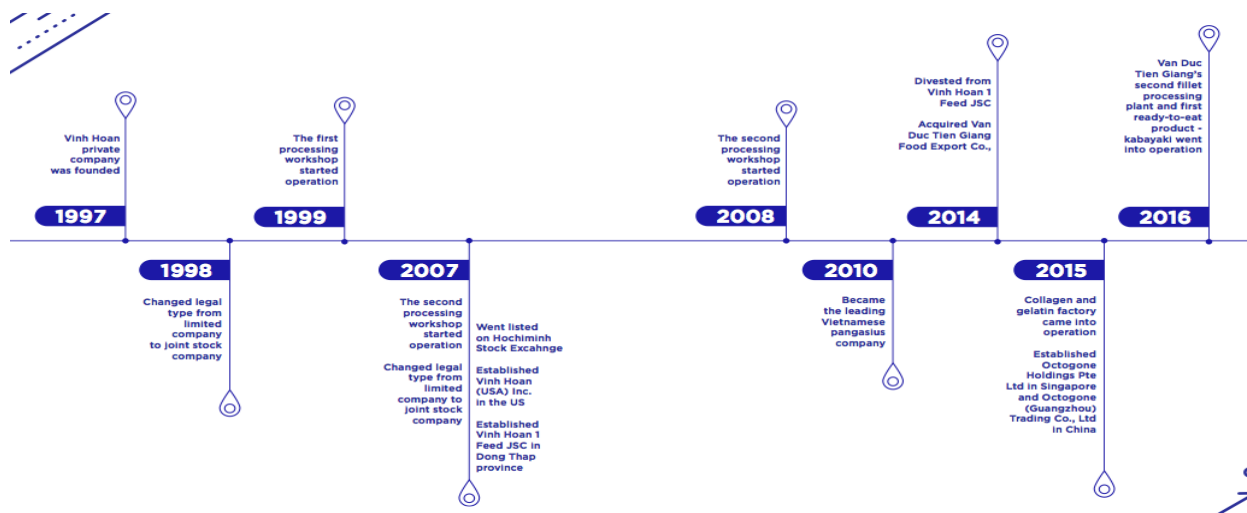


Figure 1. Historical milestones of the company (Vinh Hoan Annual Report 2016)

During 20 years of establishment and development, Vinh Hoan has grown gradually over the years and has become the leading export enterprise in Vietnam pangasius industry. Forbes magazine has recognized Vinh Hoan as one of the best publicly-traded companies in Vietnam. The company has built up and operated effectively for many years based on the integrated production model, the self-control of raw materials and the differentiation in product quality management. Vinh Hoan brand has become well perceived and renowned in the global seafood market with its ability and commitment to provide high quality, safe, nutritious, delicious pangasius that are cultured under international sustainable standards.

In parallel with the development of scale, export and production capacity the management team and employees of Vinh Hoan also accumulated experience and professional knowledge; and its workforce also increased dramatically. Vinh Hoan's staff are not only limited to the territory of Vietnam but also in other countries. Along with the human resource development process, the corporate governance system is also strengthened and updated commensuration with the group's expansion.

The company at a glance

Type of company	Joint Stock Company
Established	1997
Number of employees (2016)	7,000
Turnover (2016) in VND million	7,369,982
Scale	Large
Profit margin (2016) %	7.76%
Share in VN Pangasius (2016) %	15%

Operations	International
Ownership	Publicly joint stock company
Value chain activities	Farming, Processing, Exporting
Products	Frozen pangasius, value-added pangasius, collagen and gelatin
Buyers	Importers from U.S., EU, Australia, Canada, China, Hongkong
Markets	The U.S., the EU, Australia, Canada, China, Hongkong
Competitive strategy	High quality product, renowned brand name, and expanding direct distribution channels, and exploring new markets

Financial performance key financial measures

	2016	2015	2014	2013	2012
Turnover (VND million)	7,369,982	6,527,521	6,300,115	5,104,982	4,236,484
Overseas Turnover					
Profit (Loss) before Taxation (VND million)	672,433	386,668	587,062	227,547	269,636
Profit Margin (%)	7.76%	4.97%	6.98%	3.11%	4.98%
Number of Employees	7,000	6800	na	na	na

Resources and competences

Over 20 years of development, Vinh Hoan has evolved from a small processing and export company to the first in pangasius industry. As a public joint stock company Vinh Hoan has advantages in term of financial capacity and management skills. Compared to many pangasius enterprises at the present time, the healthy financial status and no burden of loans has sustained Vinh Hoan for development in a long term. In addition, Vinh Hoan is a single exporter who always have advantage of tax rate and reputation in the US market.

The company has developed its management culture and vision in compatible with international standards. The company has excellent and experienced management team working cohesively for many years, and a multinational and multicultural sale team that understand different foreign markets and has a wide network. The farming and processing technician team with advanced working skills is significant human capacity advantage.

Vinh Hoan has become the leading company in pangasius industry with good growth for many consecutive years. The cooperation has been renowned for quality of products and quality management systems, sustainable farming under international standards, particularly in the European markets. The Company is capable of leading the industry's strategy to promote and improve the image of Vietnam pangasius particularly and aquaculture industry in general. Vinh Hoan brand name usually has got price premium from importers. Integration production from hatchery, farm to processing of finished products and by-products, help to ensure the supply of raw material and optimize profitability of the whole value chain.

Although pangasius has not good reputation in many export market such as the EU, the company has great potentials of market development, especially in retail and value added products segments. The world aquaculture is growing and replacing for wild caught products to provide nutrition for the growing population which creates opportunities to develop major products and by-products.

Vietnamese government has paid much attention in support the pangasius industry by promoting free trade, marketing and public relations to improve the image of pangasius in the future. Pangasius still maintains the competitive advantage in price compared to other white fish products, due to it's a productive species.

Beside the strengths the company also has some weaknesses. That is the lack of direct labor sources for new processing plants. Vietnam has ranked as the low middle-income economy since 2009, average wage of employment has increased and workforce has more limited due to the development of many industries in the Mekong delta. Although the Vinh Hoan pangasius brand has got some price premium from importers, the strong brand name in retailed market has not yet recognized. The company has lack of sales experience in the new markets and an ERP system not yet applied.

Increasing production costs is also disadvantage for the company. The increase of production costs is because the labor costs, and the increasing expenses for alleviating the environmental and climate impacts from the productions. The trade and technical barriers in import countries, especially the EU markets, is still existed. The image and quality of pangasius in international markets are still affected negatively by smear media campaign of the rivals.

Strategic choices

Generic strategy

As the leading producer of the pangasius industry, Vinh Hoan generic strategy is to continue the leading by expanding the production, improving product quality and safety, strengthening brand name, diversifying markets and product lines, and increasing organic production and value added-products. Applying the integrated production, investing on R&D for organic and premium quality pangasius and development skills of workforce are the specific strategies, helping Vinh Hoan products being the first choice for consumers. The 2016 strategy plans an annual revenue growth rate at 15% - 20%, by combining expansion in production capacity and development in products and markets. The company also presented to its shareholders and investors the vision to 2020: doubling 2016's revenue and EBITDA.

Pangasius is a native fish species with the best growth conditions in Vietnam, and suits to produce a boneless fillet product with white meat, mild taste, and is especially raised under the international standards of sustainability. Therefore, with much competence in developing high quality market segment, Vinh Hoan certainly continues to invest and develop to push pangasius to more premium products preferred by consumers, and Vinh Hoan will be the top choice of consumers. As the results, the Company aims continue to boost growths in revenue and scale in the next 3 years since 2016, increasingly diversifies product lists and expands markets. Besides the marketing plans to help Vinh Hoan more differentiated in the market, the Company will also set out the strategy to boost product brands in new markets, provided that it does not conflict existing the distribution partnership that the Company has had with strategic customers. Vinh Hoan will also seek the opportunities to create revenue and profit in the other aquatic species that can create synergies with the Company's existing businesses. The Company will also focus on collagen and gelatin, the sales foundation of which has been developed for the next point of growth. Besides, the Company also focuses on

increasing the competitiveness on production costs, improving profits and profit margins over the years.

Products and production

Premium products

Vinh Hoan's portfolio have been increasingly diversified over the years, being divided into 4 main product categories: 1) Frozen seafood; 2) Value-added products from pangasius; 3) By-products and 4) Collagen and gelatin products. Vinh Hoan strategy is to produce and distribute only premium products; that is the product with quality is superior than the products of its pangasius peers.

The frozen products from pangasius, tilapia and barramundi are processed to the form of fillet skin off, fillet with skin on, steak, whole round. These are primary products of Vinh Hoan and make highest contribution to total revenue. Products from pangasius, barramundi, shrimp blended with flour, spices and other ingredients. They are processed more delicately to bring more choices for consumers and create higher gross profit margin than the common frozen seafood.

There are 2 sub-categories of value-added products, consisting of: Ready-to-cook products: breaded, marinated, burger, fish roll-ups, fish and shrimp balls, fish fillet with "char marked", and ready-to-eat products: seared pangasius, steamed or boiled pangasius. The value-added products recorded an increase of 20% in export sales with the successful launch of marinated products to the EU market. Also, in 2016, a series of new value added products has been introduced, notably the grilled pangasius in teriyaki sauce-Vinh Hoan's first ready-to-eat product, which is expected to be the catalyst for sales breakthrough of the value-added products in 2017 and the following years.

With the low price of exported fillets, most pangasius producers have earnings basing on it by-products. The by-products are produced by utilizing the left-over from the processing of fillet, to optimize the recovery value. The by-products include fish meal, fish oil that are used to process animal feed and refined fish oil. The by-product can also be used in food processing, for example, fish fin, stomachs and bladders are used for human consumption, especially in Asian dishes.

Vinh Hoan is one of the first company produce collagen and gelatin products. These products are made from hydrolysis of pangasius skin. Collagen in powder form is widely used in the cosmetics, food and beverages and supplemental products. Gelatin in powder form is used in the pharmaceuticals and food industry. In 2016, although not fully achieving the target for new businesses, the company had received large and important orders for collagen and gelatin products. The customers, with whom Vinh Hoan made concerted efforts to build relationship, introduced trial products and continuously advised on technical applications, has placed their first orders, creating the motives to the employees and the momentum for revenue's acceleration phase in subsequent years.

Beside the pangasius and its relating products, Vinh Hoan also diversifies its production to other freshwater species such as tilapia and barramundi (Asian sea bass). Barramundi had an impressive growth in 2016, growing by approximately 40% versus 2015 thanks to the development of sales to supermarkets. After the trial operations in 2015, last year the company continued farming, processing and developing markets for tilapia with sales exceeding US\$1 million in 2016.

Expanding production and distribution channel

Although pangasius farming and processing are core business activities, Vinh Hoan corporation diversity its business to reduce risks and sustain the long-term value for the shareholders. Vinh Hoan recently has invested and established six key units as presented in Figure 2, including farming, processing, and extracting/manufacturing by-products, and sale distribution.

- 1) *Vinh Hoan Food 2 Co., Ltd* was established in 2011, with charter capital of VND100 billion (or \$5 million), of which 99.3% contributed by Vinh Hoan. The principal business of Vinh Hoan Food 2 Co is grains milling, rice polishing, rice importing and exporting.
- (2) *Vinh Hoan 4 One Member Co., Ltd* was established in 2012, with charter capital of VND50 billion (US\$2.5 million). Vinh Hoan has not contributed capital into this company. The principal business is processing, preserving seafood and other aquatic products. The construction and operation of Vinh Hoan 4 is yet to start.
- (3) *Vinh Hoan Collagen Corporation* was established in 2011, with charter capital of VND100 billion (or US\$5 million), of which 90% (VND90 billion) contributed by Vinh Hoan. The principal business is the extracting and manufacturing of hydrolized collagen and gelatin.
- (4) *Van Duc Tien Giang Food Export Co., Ltd* was acquired by Vinh Hoan in the period from 2014-2015. The principal business is the farming, processing, preserving and trading of seafood and other aquatic products.
- (5) *Octogone Holdings Pte. Ltd* was established in Singapore in 2015, with committed capital of US\$700,000, of which 100% was contributed by Vinh Hoan. The principal business is trading, importing and exporting marine and aquatic products.
- (6) *Octogone (Guangzhou) Trading Co., Ltd* was established in China in 2015 through direct investment of Octogone Holdings Pte., Ltd. Principal business is trading, importing and exporting marine and aquatic products

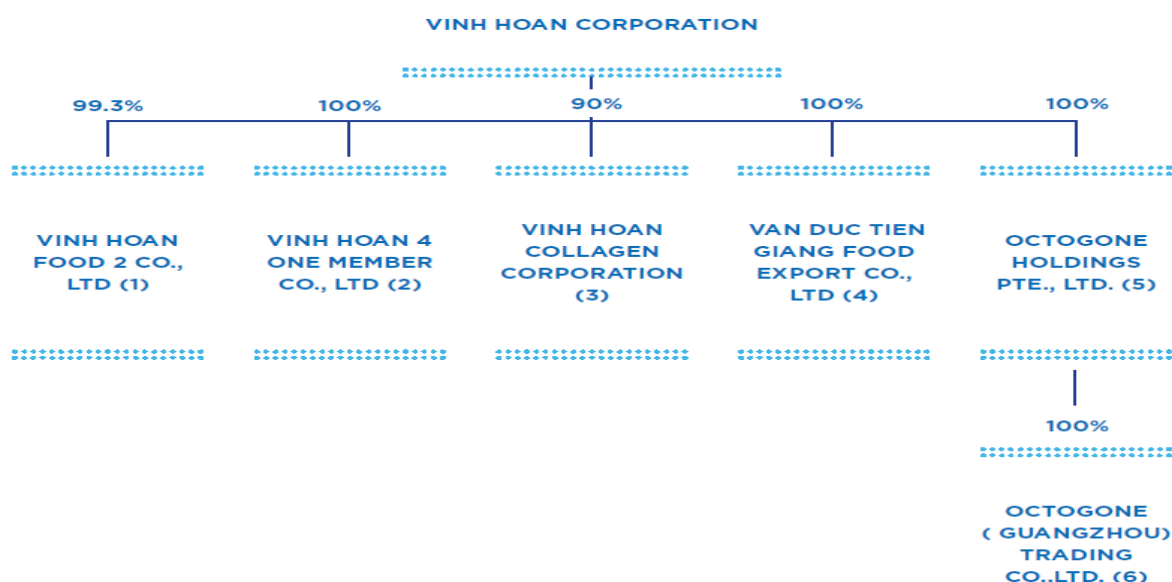


Figure 2. Vinh Hoan's new established production and distribution units (2016 Report)

The pangasius processing factory No 2 of Vinh Hoan's subsidiary Van Duc Tien Giang went into operation by mid-year with the capacity of 150 tons of raw material per day, adding 20% of processing capacity to the entire company. Additionally, Van Duc Tien Giang also completed the construction of a value-added products facility located next to the filleting facility. The facility comprises a line of grilled pangasius with capacity of 2,000 tons of finished products per year, and a workshop for production of breaded, seasoned and other cooked products. The successful investment in the factory will boost the sales and marketing activities of value-added products in the future.

By the end of 2016, the company made the acquisition deal of 100% stake in Thanh Binh Dong Thap Fisheries JSC. The deal completed in early 2017. It is alleged that this M&A deal will bring more synergies and is the proper jigsaw puzzle piece in Vinh Hoan's complete picture of long-term development. Thanh Binh itself owns two frozen pangasius processing plants with a total design capacity of up to 400 tons of raw material per day, a cold storage and other appurtenance facilities on a total land area of approximately 8 hectares. The company expects to expand processing capacity of Thanh Binh plant No.1 to 150 MT per day by the end of 2017 and put the plant No.2 into operation at the capacity of 150 MT per day by the end of 2018. Additionally, with the abundant land bank, Vinh Hoan anticipated to construct a fishmeal and fish oil factory to optimize the value from pangasius by-products.

Thus, in the year 2016 only, the Company had combined two options of self construction and M&A to achieve the efficiency of investment costs, effective management of production and transportation of raw materials, and at the same time, to timely meet the required processing capacity in its 2016-2018 business plan.

In early 2016, the pangasius industry suffered from many difficulties in raw materials due to drought, water shortage, and salinity intrusion, resulting in narrower farming area and skyrocketing prices of raw fish at some time during the year. The company had prepared for this tough situation by expanding its farming area, increasing the self-supply ratio from 60% to 65%, significantly contributing to profitable results of the year. Besides increasing volume, in recent years Vinh Hoan has always focused on the quality of its raw materials, especially on achieving international aquaculture certificates which are required by the premium market segments where Vinh Hoan has competitive edge over other peers. Currently, Vinh Hoan own the largest number of farms certified in Vietnam with total area of farming area achieving Aquaculture Stewardship Council (ASC), Best Aquaculture Practices (BAP), and the Global Good Agricultural Practice (GlobalGAP) being 140 ha, 155ha, and 180ha respectively; year-on-year growth rates being 100%, 88%, and 93% respectively.

Market and marketing

Vinh Hoan's products are now shipped to over 40 countries. The EU and the U.S are its two main markets which together accounted for 72% of total export value of the company. Vinh Hoan secured stable growth in its traditional markets such as the UK and Belgium, which help sustained its footholds in EU. The year of 2016 saw a remarkable growth of the Chinese market, moving from seventh rank in previous year to third rank, consisting over 6% of Vinh Hoan's total export value. In addition, other markets such as Mexico and Canada also grew well, accounting for 2% and 5% respectively of the total export value. Share of the rest: Australia (4%), Hong Kong (4%), ASEAN (2%), Japan (1%) and others (2%).

In pangasius industry, Vinh Hoan accounted for 15% of total Vietnam export value in 2016, maintaining its leading position in the market. The US was Vinh Hoan's top export market in 2016. Vinh Hoan accounted for 38% of Vietnam's pangasius exports to this market. In the EU market, despite the industry's 8.5% year-on-year decline as being hit by the EU's economic downturn and unfair competition, Vinh Hoan still managed to stabilize its export turnover thanks to its sales policy that stands on premium market segments, large distribution system and company prestige. With exceptional high growth in the UK and Belgium, in 2016 Vinh Hoan accounted for 14% of Vietnam pangasius exports to the EU and increased its share in the EU's premium segment from 23% to 25%.

The year of 2016 also recorded the booming of the Chinese market, the entire industry saw a record-high growth of 59% year-on-year. Accordingly, Vinh Hoan doubled its sales to China compared to 2015, accounting for 8% of total Vietnam's exports to this market. Vinh Hoan continued to maintain its leading position in several traditional export markets such as Canada and Hong Kong, where it accounted for 35% and 29% of total exports respectively. Vinh Hoan also maintained steady growths and high market shares in the other markets including Japan (25%), Mexico (7%) and Australia (27%).

In addition to maintaining its existing markets, the company focuses on expanding direct distribution channels and exploring new markets. By the end of 2016, this strategy has proved successful when Vinh Hoan gained five more new markets including Pakistan, Thailand, India, Greece and Reunion, expanding its customer network to approximately 300 in over 40 countries. The markets with outstanding growth were Japan, China and Mexico with growth rate of 230%, 137%, and 73% respectively. Notably, the company successfully introduced products of Vinh Foods brand into Mercadona as the largest supermarket chain in Spain.

The company focuses investing in issues related to workers and the environment for a sustainable business future, is actively in response to the risks and has long-terms planning in all aspects. Along with the increase of market share in the traditional markets, Vinh Hoan is seeking opportunities and opening up new markets, developing value added products to increase diversity and create flexibility in shifting marketing structure over the years. Vinh Hoan has been pioneering in general programs of the industry and state competent authorities to improve pangasius image, aiming to build a national brand for the fish, increasing the prestige of Vietnam's trade, and avoid the trade barriers in the future. With the establishment of Vinh Aquaculture division, the company has R&D projects to improve farming conditions to cope with climate change in the distant future, increasingly improve the efficiency and quality of raw materials.

Since 2015 the company has conducted research and built a marketing strategy to bring Vinh Hoan's brand to an upper level, after passing the period of strong growth as a leading pangasius producer in Vietnam, proceeding to become a global company, contributing more to the transformation of the world's sustainable aquaculture which will play an important role in providing delicious, safe and healthy food sources without creating negative impacts on the environment. In August 2016, the company successfully launched its new brand identity with new vision, mission, and three main divisions of Vinh Hoan brand, including: i) Vinh Foods specializes in premium frozen seafood products; 2) Vinh Aquaculture undertakes activities of research, development and certification for sustainable aquaculture, and 3) Vinh Wellness provides collagen and gelatin products from pangasius.

Firm structure

Overall strategy and mission of Vinh Hoan cooperation is to advance the application of sustainable aquaculture in three dimensions. That is to produce food from sustainable aquaculture, produce wellness products from sustainable aquaculture, and produce knowledge about sustainable aquaculture that can be shared with others.

In 2016, with the establishment of 3 divisions including VINH Foods, VINH Aquaculture and VINH Wellness under the branding positioning strategy, the Company made some restructuring so that the management system becomes more consistent and core functions-centric, thereby encouraging efficiency and internal healthy competition. Accordingly, the organizational chart of the company starting 01 April 2017 follows that of joint stock companies chaired by the General Meeting of Shareholders, Supervisory Board, Board of Directors, the Executive Board consisting CEO and functional directors.



Figure 3. Divisions of Vinh Hoan cooperation.

- **Vinh Foods:** focussing on processing and developing new premium seafood products including pangasius, tilapia and Barramundi products from sustainable aquaculture;
- **Vinh Aquaculture:** focusing on farming, helping advance sustainable tropical aquaculture with a combination of research, development, education, and on-site training;
- **Vinh Wellness:** focusing on producing and providing premium wellness products derived from sustainable aquaculture such as collagen and gelatine.

The manufacturing departments comprise the sustainable development of fish farming and processing, production of gelatin and collagen. Non-manufacturing function departments comprise the business relations, accounting -finance, sales and marketing, resources and development. Managers of each department are responsible to report directly to respective functional director. Each manufacturing department is organized by functions throughout the business phases from raw material receipt, processing, and sales.

The CEO of each subsidiary is responsible for the business results of that subsidiary, and reports directly to the group CEO. For overseas subsidiaries which primarily operate in sales and market development function, they coordinate with overall sales strategies of the parent company. The CEO of overseas subsidiary is responsible for reporting to the Regional Sales Director.

With the vision and mission built to position Vinh Hoan brand, the company believes in its ability to improve the selling price and pricing power in the coming years, as well as creating the spiritual value to attract labor source for production development of the Company. On the occasion of the 20th anniversary of its establishment, the company is accelerating some important welfare programs to thank workers, to engage their loyalty with the Company and attract more skilled workforce. Vinh Hoan will continue to create added value for customers, make increasingly big difference to increase its competition in the sector. The company will also invest in technological content in production and business.

In the long-term, the company does not underestimate the risks of business environment, but always actively be well prepared with long-term plans. The company consistently complies with domestic and international laws and regulations, especially does not let business profit override the environment. Vinh Hoan is healthily competitive for long-term future, focusing on sustainability. Finally, the implementation of the company corporate brand is critical for sales differentiation and attracting skilled labors helping the company overcome the challenges and develop well.

Ownership

The company was listed on Vietnamese Stock Market in Ho Chi Minh city and broadened its shareholder base to international investors. As a public firm, Vinh Hoan must operate transparently, aiming to maximize benefits of shareholders and value to its customers.

Conclusion

Over 20 years of establish and development, Vinh Hoan cooperation has become the number one pangasius producer in the world. The company business activities include farming, processing and manufacturing the by-products made from the pangasius and other aquatic species. The core strategy of Vinh Hoan is to continue leading the industry, by investing on sustainable aquaculture, supplying only premium seafood products and its by-products. Developing new products meeting demand of diversified customers and strengthening its brand name in international markets are also strategic business options. Vinh Hoan sets up its own mission is to develop its sustainable business model to not only maximize the profit of its shareholders but also to help upgrading the pangasius industry of Vietnam.

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Case study 4: Hung Vuong corp.

Title: M&A strategy to form a vertically integrating production system to control the entire value chains

Key strategic issue

Established since 2003, Hung Vuong Corporation (HVC) is one of the leading pangasius exporters in Vietnam. The export revenue in 2012 was approximately 250 million US dollars and about 400 million US dollars in 2015. The company own the closed production system from produce breed, feed to raising farms, processing, cold storage and exporting. All of these insourced operations create the high quality series of products from pangasius. In addition, the fully integrated production system allows the company ensures quality products, environment management and reducing costs that generate competitive advantage. Sustainable development with the ecological environmental protection is one of the top ranking targets to build up the company reputation with the green, quality and competitive products from pangasius. All of the farms are located at the most favourable sites of the clean water sources and meet the SQF 1000, ASC, BAP, or Global GAP standards.

Since 2007, Hung Vuong Corp has set target to dominate pangasius industry with an expected share of over 30%. The Corporation was expanding fast with many M&A transitions, especially in years 2012-2016. The company strategy is to develop a vertically integrated production system from producing feed, seed to farming, processing pangasius and by-products from pangasius. The vertical integration is expected to take advantages of economic scale, better control costs, product quality and safety. However, at the present (late 2017) the company is on the most challenging situation. The marginal profit is reducing significantly over last years. Huge lost and much unpaid debt are reported in annual report 2017. The market price of Hung Vuong stock is dramatically decreasing to only half original price. One of causes of the present situation is the strategy of variant investment. The company expanded its business to some sectors that it is so risky and lack of experience such as real estate.

History

Hung Vuong Corporation was initially established under the name of Hung Vuong Limited Company in September, 2003 with its major function as a processing plant of pangasius for export. At that time, the original business activity of company was collecting raw material from local farms in region, then processing frozen fillet catfish for export. The initial charter capital was 1.92 million Euros with a capacity of 50 tons of material per day and 500 employees. The second and third factory was established in 2004 and 2006 with a capacity of 150 and 160 ton material per day

Later, the company enlarged its scope and officially changed its name into Hung Vuong Corporation in 2007. Since then, Hung Vuong Corporation set ups an ambition is to dominate the

pangasius industry, developing on closed and vertically integrated system of pangasius production from producing feed, breed, aquaculture, processing, cold storage, and exporting.

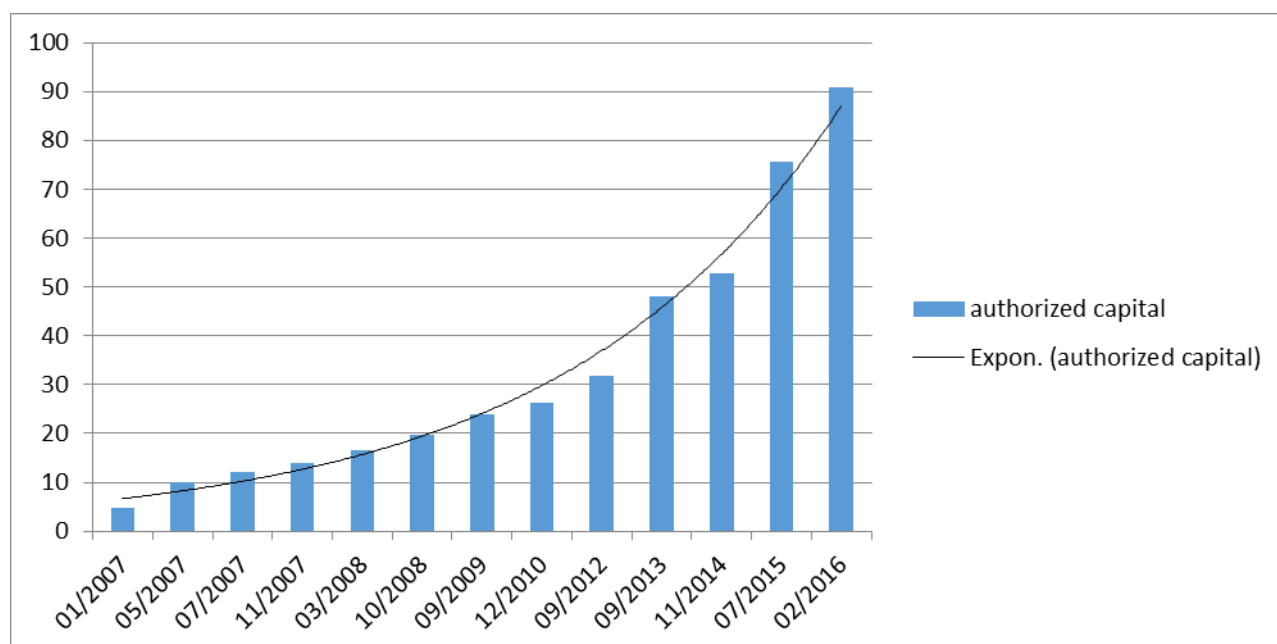


Figure 1. changes in authorized capital of Hung Vuong corporation 2007 – 2016. Unit: million Euro

Established in 2003, Hung Vuong has been continuously developing, with spectacular growth steps, affirming the position of a leading enterprise in the field of aquaculture and processing seafood export with a closed model. In 2003, the turnover of Hung Vuong reached 0.46 million euro by 2012 sales reached 320 million euro, up 1,000 times. At the same time, the work force of 400 staffs has so far increased more than 30 times at 12,000 staffs. By means of the long-term investment process in both vertical and horizontal dimensions, Hung Vuong was significantly contributed to the development of the seafood industry in particular and the Vietnamese economy in general. However, profit margins of this corporation decreased rapidly from 4.11% in 2012 to 2.64% and continue to jump down to 0.19% in 2017. Only in 2014, profit margin increase from 2.64% to 3.02% because the reason behind is they issued shared to raise equity.

In 2007, as speedy expanded in frozen fillet catfish for export in global market, Hung Vuong Co.,Ltd decided to raise capital through official public issues shares in Ho Chi Minh Stock Exchange in 2007 to 4.8 million Euros as an authorized capital. Only in one year, this joint stock company changed three times in term of authorized capital 4.8 million euro to 14 million euro in the end of 2007. There was a significant authorized capital of Hung Vuong Corporation from 14 million euro to 52.8 million euro between 2007 and 2014. As a remarkable increased and expanded of Hung Vuong Corporation, this company continue experienced hot boost in authorized capital in 2015, and 2016 at 75.67, and 90.8 million euro respectively. Consequence, the expansion of corporation dragged on the increase in number of subsidiaries and other joint venture companies. Until 2017, there are more than 27 subsidiaries and joint venture companies which are 19 subsidiaries own more than 50% shares and 4 subsidiaries own 100% shares.

Beside the core business is producing and exporting seafood products, Hung Vuong Corp also involves in other business sectors such as real estate, producing animal feed and pig farming. Hung

Vuong has a real estate company locating in Ho Chi Minh city, the real estate company owns some high valued lands that expect to increase the profit margin. Pig breed is one of the business is expected to produce high profit in Hung Vuong Corporation. Until 2017, the company has 1,493 sows and 43 first generation pigs imported from Denmark. The first generation of these parental pigs is 1,574 piglets. Theses pig farms are expected to produce 300,000 pigs and after three years have 1 million piglets and reproduce 10,000 parents' pigs.

The factory of animal feed at Viet Thang Company can produce 500,000 tons of feed per year in which 350,000 tons / year for animal feed and estimate 150,000 ton per year for fish feed.

After a fast expansion period and huge investment, Hung Vuong corp is currently (late 2017) facing many challenges. The company has reported a huge lost in 2017 () and large paid debt (). The Hung Vuong stock's price is reducing dramatically in last six months of 2017. The company has decided to withdrawn from real estate business and sell most real estate property to pay the debt.

The company at a glance

Type of company	Joint stock
Established	2003
Number of employees (2016)	16,000
Turnover (2016) in Euro million	691.34
Scale	Large
Profit margin (2016) %	0.32%
Share in VN pangasius (2015)	7.0% (3 rd)
Operations	International
Ownership	Publics
Value chain activities	Fish fingerlings production, Feed production, Aquaculture, Processing and export, cold storage
Products	Frozen, fresh fish and add-valued products from pangasius fish.
Buyers	Importers from EU, Middle East, the U.S., Australia, Russia, Mexico (Rusian Fish Company; E Guillem, S.L.; Mascato)
Markets	EU, Middle East, the U.S., Australia, Russia, Mexico
Competitive strategy	Merger & Acquisition, closed process production, multi-sector investments

Source: Hung Vuong Corporation Annual Report 2016; VASEP quarterly report in 2015

Financial performance

	2017	2016	2015	2014	2013	2012
Turnover (Euro million)	613.25	691.34	493.48	80.56	441.68	307.52
Overseas Turnover (Euro million)	289.11	259.66	143.20	3.22	152.92	172.76
Percentage of overseas turnover (%)	47.14	37.56	29.02	28.84	34.62	56.18
Profit (Loss) before Taxation (Euro million)	1.16	2.24	6.04	1.15	11.68	12.88
Profit Margin (%)	0.19	0.32	1.22	3.02	2.64	4.11

Source: Hung Vuong Corporation Annual Report 2012; 2013; 2014; 2015; 2016; 2017

Resources and competences

Hung Vuong Corporation applied closed and vertically integrated production system links activities from fingerling fish to produce feed, aquaculture practices, processing, storage and export. The hatcheries provide quality seed for the farms. Fish smolt is fed by feed produced by the own company. Market sized-fishes are then harvested and delivered to the processing plants. Manufactured products are conserved in the cold storages. The by-products from the processing are re-used as inputs to the feed factory. The closed and integrated production system helps company control the quality, safety and expect to increase the marginal profit for the shareholders.

In aquaculture, the company currently operates about 350 hectares of pangasius farms located in several areas in the Mekong Delta. These farming ponds supply around 200,000 tons of fish material annually for their own processing demand. In order to meet demand of smolt for farming, the company developed the fish fingerling production and establish feed factory as the first step in the whole supply chain. The fish is fed with high quality floating pellets produced by one of the company's factories. In addition, company pays much attention on recruiting and training its technical teams in aquaculture.

In processing units, the company owns recently seven processing factories to serve own main activity in processing and exporting. All of the factories are well equipped with modern and advanced equipment. As a part of the strategy, factories are located along the riverbanks in order to make the raw fish transportation from farms to plants conveniently. One of the reasons is that the freshness, colors and strong tissue structure of the pangasius material are the very important elements to ensure the quality of final products. The products have large variety, including frozen and fresh fish forms such as well trimmed pangasius fillet, half trimmed pangasius fillet, untrimmed pangasius fillet, pangasius portion to some add valued products such as skewered pangasius, breaded pangasius and roll rose pangasius fish.

The feed factory has capacity to supply 30% of total fish feed demand in the entire Mekong Delta. There are 6 factories located in Dong Thap and Vinh Long province that can produce animal feed with total output capacity is 905,000 metric tons per year. In 2013, the volume of fish feed is 571,577 ton and animal feed is 17,537 tons. These factories produced to meet the internal demand of HungVuong Company about fish feed is 237,697 ton accounting for 42% of total output, the rest of fish feed is used for external demand.

In addition, cold storage is one of Hung Vuong Corporation business field. They invested two cold storages well-known equipment import from Japan and Europe, have highest capacity in Vietnam located in Tan Tao industrial zone in Ho Chi Minh City. Total capacity of two cold storages is 42,000 ton which are work in 2007 and 2008 respectively.

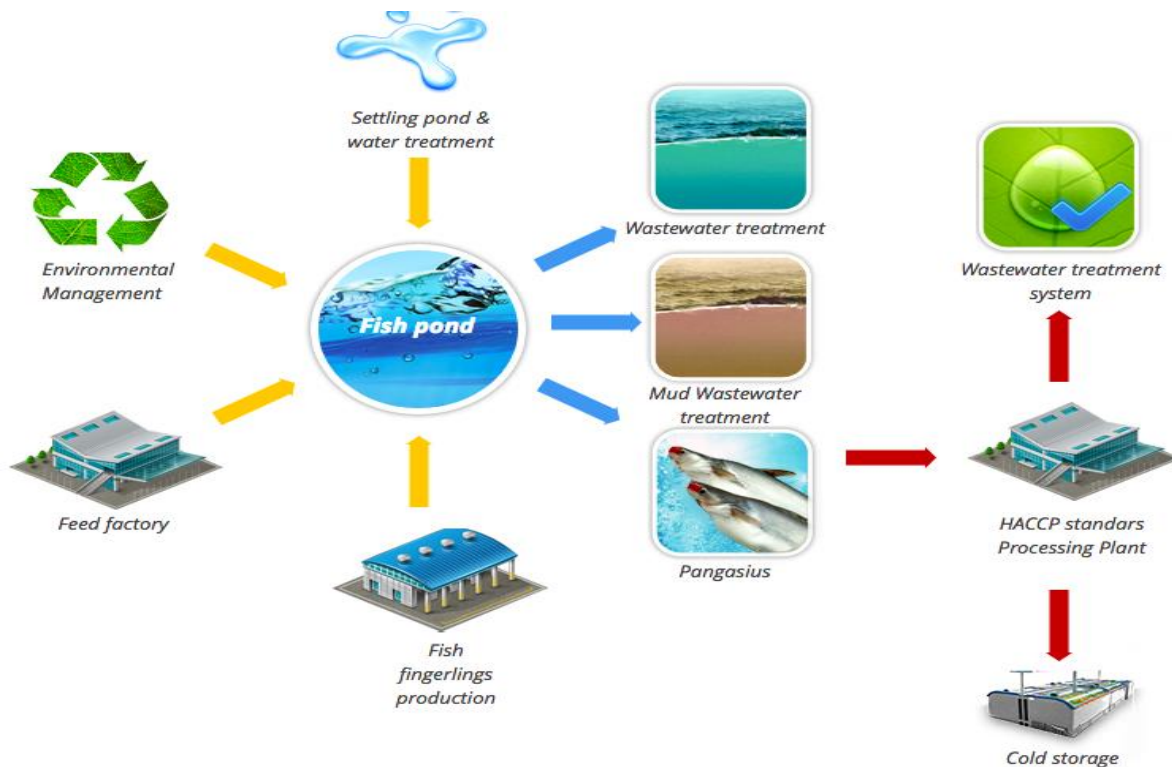


Figure 2. Vertically integrated production system of Hung Vuong Corporation

All producing and processing plants and storage have strictly applied the HACCP standard as well as Global GAP, BRC, IFS, GMP, ISO 9001: 2008, ISO 22000: 2005, HALAL, ISO/IEC 17025: 2005, ASC, BAP and VietGAP. In conjunction with the quality management programs, other hygienic regulations concerning food safety are strictly applied to all the processing lines.

Strategic choices

Generic competition strategy

Became a “king of pangasius” in Vietnam from 2009, Hung Vuong Corporation plays an important role in Vietnam aquaculture. The generic strategy of Hung Vuong is to lead the pangasius sector in scale, quality and sustainable business model. There are three main strategies of Hung Vuong Corp has been used to compete with other rivals in the same business area included: Expanding scale by Merger and Acquisition, applying completely the vertical integration production process, and improving core quality products to meet global standards.

The corporation outlined clearly a path to expanding its business scale by M&A strategy. In the end of 2012, by purchasing 5.63 million shares of Viet Thang Company accounting for 55.31% of total shares, Hung Vuong controlled Viet Thang Company and turned it into one of the subsidiaries to produce animal feed. After that, with a huge capital, Hung Vuong Corp expands their influence to other sectors and buys more subsidiaries which are aquaculture for export, processing seafood, processing other aquatic products, meat and poultry, cold storage and real estate. The diversifying business reduces significant the percent of the export value of frozen in total company turnover, from 56 % in 2012 to 34% in 2013. The decreasing trend continued to decrease until 2015.

The M&A strategy is to meet a bigger vision that to be the first pangasius producers with vertical integration. The merging Viet Thang Company in 2012 is the milestone that helps Hung Vuong Corp producing animal feed in the entire closed process, aiming to save cost and manage the quality. The animal feed produced by Hung Vuong exceeds its own internal demand from pangasius and shrimp aquaculture and a part of the production is supplied to external seafood producers in the region. The investment in feed production is also the strategy of controlling and reducing the fish deceases caused by low quality feed supplied inn the market.

At the same time of expanding the production and investing the vertical integration, Hung Vuong also invested intensively in improving the productivity and quality of pangasius production by implementing the international standards. The company currently have applied most standards required by national and international markets such as HCCP, Global GAP, BRC, IFS, GMP, ISO 9001: 2008, HALAL, ISO/IEC 17025: 2005, ASC, BAP and VietGAP. These standards could provide Hung Vuong pangasius products the entry tickets to all high-demand and restrict markets such as Europe and the United States.

Hung Vuong has become one of the top company in pangasius industry in a short time, using M&A strategy. However, the quick expansion has brought the company critical challenge. That the profit margin decreased gradually at 4.11% to 1.22% from 2012 to 2015 and huge debt need to pay is reported in the end 2017. The fast expansion and diversifying investment without well-prepared management capacity is one possible reason, the another is that the merging nearly bankrupted companies with low production and management skills has imposed the financial burden on Hung Vuong.

Products

Hung Vuong set specific criteria in production and business in three main areas: aquatic food, aquaculture, processing seafood for export, and high technology pig farm.

Hung Vuong Corporation's pangasius products have large variety, including frozen and fresh fish forms such as well trimmed pangasius fillet, half trimmed pangasius fillet, untrimmed pangasius fillets; pangasius portion to some add valued products such as skewered pangasius, breaded pangasius and roll rose pangasius fish. The company's strategy is to increase high quality value added product with convenient orientation.

Investing deeply the entire value chain by M&A strategy is an option to control completely the production in critical aspects such as cost deduction and quality improvement. Hung Vuong plans to lead the sector in production scale and also top quality products.

Markets

Since 2003, the total export value of pangasius fish products from Hung Vuong Corporation gradually increased significantly and reached 150 million USD in 2008, 245 million USD in 2011, and peaked 400 million USD in 2015. The Europe and the America are the two main markets for the company, accounting for 40% and 20% respectively. Hung Vuong Corporation became the pangasius export leader in Vietnam with more than 40 big customers from Europe, Ukraine, and Egypt, some in the Middle East, Canada, Mexico, and other countries in the Americas.

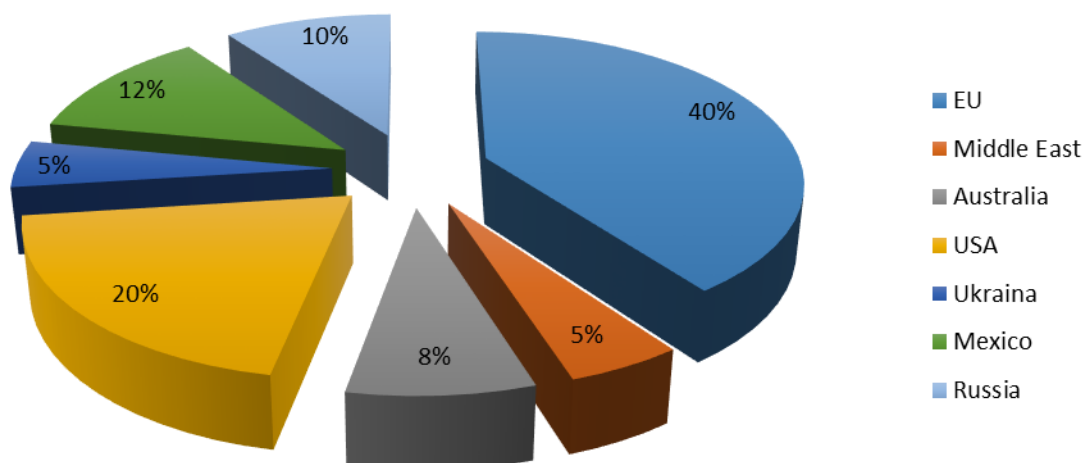


Figure 3. Pangasius Export Markets of Hung Vuong in 2015

The market strategy is to remain market positions in EU and US by increasing product quality, safety and reputations, and to look for new markets in Asia and South America. Because the barriers of the anti-dumping tariffs, farm bill in the US and negative social media and shut down stocking pangasius in some large supermarket in the EU, Hung Vuong export shares in these markets are narrowed down. Russia, China, Southeast Asian and South America are new markets that Hung Vuong targets to expand. The demand for quality in these new markets are easy to meet but the price should be reasonable low.

Firm structure

Hung Vuong compant structure consists three main divisions that are Aquaculture, Processing, and Food (Figure 4). Processing division includes 8 factories processing aquatic products, equipped with high standard and modern equipment meeting international standard from US and EU markets. The aquaculture focuses on farming pangasius and other aquatic species. The food division is to produce fish feed and other animal food.

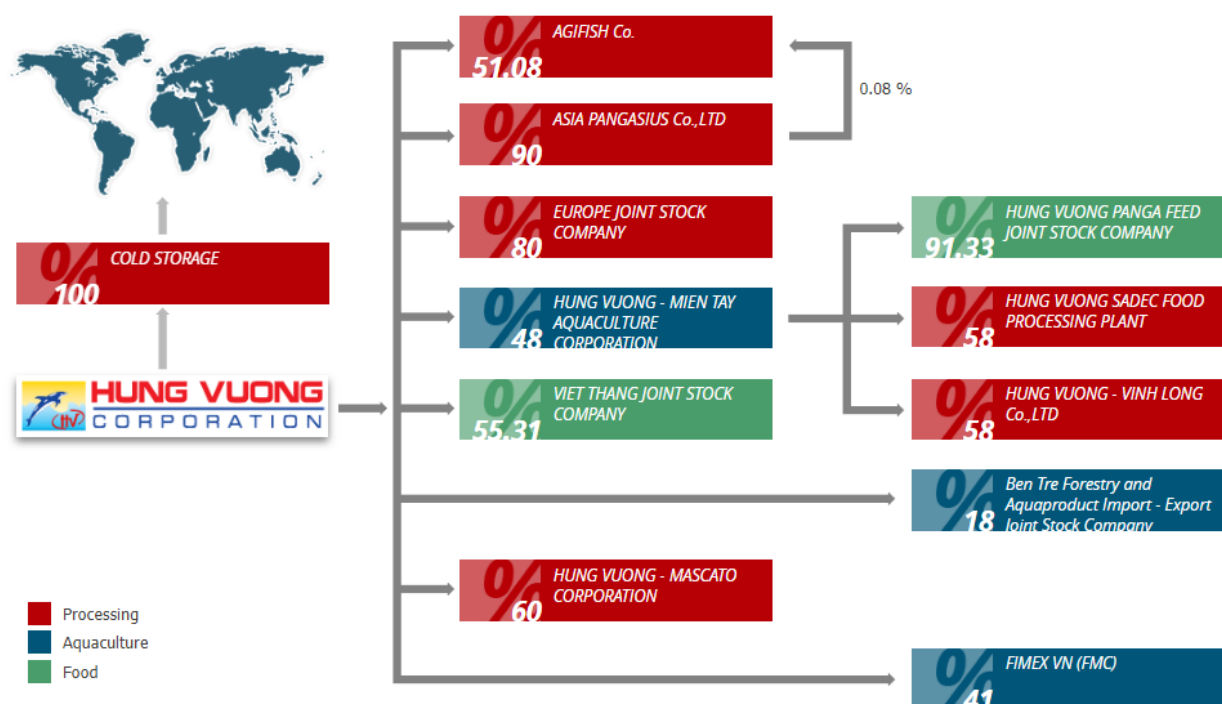


Figure 4. Hung Vuong Corporation's Structure

With the ambitious strategy to be multi-sectoral business cooperation has invested and expanded quickly its scale and scopes to various fields, including aquaculture, seafood production, fish meal, animal food, poultry and pig farm, and real estate. The company has 8 subsidiaries and 1 venture company, with over 51% charter capital. The three most significant investments to subsidiaries have been distributed to Viet Thang Joint Stock Company, AGIFISH Company, and An Lac Real Estate Company with amount of budget are 709, 447, and 263 billion VND, respectively. However, in August 2017, Hung Vuong Corporation plans to sell An Lac Real Estate Company to reinvest in core business. The new strategy of the company is to sell inefficiency units and withdraw real estate investment to have more capitals for paying debt and invest to effective and core production units. However, to overcome the current challenge, in 2018 shareholders' meeting agreed to divestment more than 50% shares in Viet Thang Company and in Fimex Company (FMC). Theses strongly actions of Hung Vuong Corporation shown that not only sell inefficiency sector but also sell strong sector which is related to closed process of Corporation. Viet Thang subsidiary is the biggest subsidiaries in Corporation and Fimex have high profit which play an important role to maintain animal feed to process of shrimp, pangasius and pig in corporation.

Conclusion

Hung Vuong Corporations one of the largest groups in Dong Thap province and in top 10 seafood exporter in Vietnam in 2015. The generic strategy of the company is to strengthen its top market position in pangasius industry. The company probably has the most fully vertical integration that controls the entire value chain from raw material to the finished catfish products. The company implements the M&A strategy aiming not only to improve closed process products but also expand to multi-sector investment of group. Consequences, the turnover of Hung Vuong Corporation increased remarkable while profit margin reduce significantly simultaneously because they lose core

productions. In recent times, this corporation sell ineffectiveness sector such as real estate to reinvest and recovery on core production which is frozen fillet catfish export. The company is facing the most difficult time from mid-2017, where the profit margin is going down and huge debt is on due.

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Case study Summary

Over 30 years of development, pangasius is becoming a large scale industry, reached the peak production of 1.24 million tons and export to over 100 countries with 1.8 billion dollars in 2017. The industry has high potential markets and production capacity, however, it has exploited almost its advantages; for example, high productive areas are all used, production costs is increased because Vietnam has become a low-middle income country. Pangasius sector has to re-position its strategies to sustain the long-term development. The industry consists over 100 firms, in which about 20 firms dominate the sector and account for 80% export value. The development strategies are more in a bottom-up model, that pangasius firms develop their own visions and plan from production to markets, basing on their internal capacity and position in the industry.

Vinh Hoan is the top producer with the export value accounting for 16% of total pangasius export. Vinh Hoan set its clear strategy to become a modern and successful business model to lead the industry. Its long-term investment has been much on the applying technologies in farming premium quality and organic pangasius, extending value added-product lines, developing brand in international markets and exploiting the domestic markets. As a public listed company Vinh Hoan take advantages to increase its capital for development but more important the joint stock company has to operate transparently and be monitored by investors. Three divisions including Vinh Aquaculture, Vinh Food and Vinh Wellness are clearly structured, reflecting the company activities from farming, processing, marketing and by-product produced from pangasius. The sound and unique strategy of Vinh Hoan has been succeeded.

Hung Vuong was also the top pangasius producer and its ambition was to become the largest firms with production representing 20% of the sector. The company has developed a high vertical integration from producing feed, seed, growing-out, producing and marketing, aiming to control the product quality and production costs. While the sustainable development with the ecological environmental protection and building up the company reputation with the green, quality and competitive products from pangasius is considered the right path, its investment and expansion strategy has not been succeeded. Hung Vuong had expanded its scale by A&M strategy and activities in poor experience and high risk area (e.g., real estate), leading huge lost in 2017. The fast expansion but lacking human capacity and proper business model are another weakness.

Hung Ca is a medium scale firm but the owner is the first pangasius farmer and distributor in the region. The development strategy is to capture opportunities in domestic and international markets, by investing on in innovative market strategies, new product development and sustainable farming techniques. The company has established the integrated production system including feed manufacturing, farming, processing and own distribution channel to improve the control the entire value chains for quality insurance. Increasing value added products and penetrating new emerging markets in Russia, South America, and Asia is also the tactics to expand the production scales. An Phu is a medium small-scale firm and its strategy is similar to Hung Ca company. An Phu aims to enlarge the production scope, with proceeding its initiated projects which are feed manufacturing factory, packaging factory, by-products processing factory. Compliance with its quality management system and product traceability is set as a high priority. The company is not only focusing on the pangasius fillet but diversifying its business by producing tilapia. The two medium and small scale firms follow the traditional business model and less ambitious strategy with a focusing on expanding the market and increasing the quality in all aspects along the value chain. The small and medium size

company like An Phu and Hung Ca will have good business performance if the international markets are favoured. Those types of strategy will lead the company continuing to be vulnerable with the shocks of international markets.

The generic strategy of pangasius firms now should focus on its quality, market reputation and its management system. The advantages from high productive species and low labour cost have been exploited fully. The internal competition lacking the coordination has led the sector very vulnerable from international market shocks. It seems to be that pangasius producers have recognized the importance of market requirement in terms of quality, safety and environment protection. The strategy development of Vinh Hoan, that focuses on core business activities, clear vision and transparent business model, could be a good business case.