FISHERIES IN DENMARK
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NOTE
Abstract

The present note was requested by the Committee on Fisheries of the European Parliament for its Delegation to the northern part of Jutland, Denmark (28-30 October 2013). The note provides a review of the main characteristics of the Danish fisheries sector, covering both the North and Baltic seas, and the waters of Skagerrak and Kattegat. It provides an overview of issues such as the legal and institutional framework, fisheries management, catches, the fishing fleet, fishing industry, trade, employment, the fish market and marine research.
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LIST OF ABBREVIATIONS

**Bpa** Precautionary biomass level

**BSPA** Baltic Sea Protected Areas

**CFP** Common Fisheries Policy

**CPUE** Catch per Unit of Effort

**DKK** Danish Krone, *dansk krone*

**EFF** European Fisheries Fund

**Eurostat** European Statistical Office

**$F_{0.1}$** Fishing mortality reference point often used for pelagic species as an indicator for the MSY level

**FAO** Food and Agriculture Organisation of the United Nations

**$F_{\text{MSY}}$** Fishing mortality at MSY

**$F_{\text{pa}}$** Fishing mortality reference point for the Precautionary Approach

**FKA** Fartygs Kvot Andel (Vessel Quota Share)

**HELCOM** Helsinki Commission (Baltic Sea Environment)

**IBTS** International Bottom Trawl Survey

**ICES** International Council for the Exploration of the Sea

**IQ** Individual Quota

**ITQ** Individual Transferable Quota

**MEDPOL** The marine pollution assessment and control component of Mediterranean Action Plan

**MPA** Marine Protected Area

**MSC** Marine Stewardship Council

**MSFD** Marine Strategic Framework Directive

**MSY** Maximum Sustainable Yield

**MSY B_{\text{trigger}}** Low biomass reference point used in the ICES MSY framework as a warning calling for management action

**Natura 2000** A comprehensive set of protected areas established in accordance with the Habitat and Birds directives

**NSAS** North Sea Autumn Spawners (Herring)

**oal** Overall length (of a vessel)
OSPAR  OSPAR Commission (Northeast Atlantic Environment)
PO  Producer organisation
PSU  Practical Salinity Unit
RBM  Rights-Based Management
SPA  Special Protection Areas
SCI  Sites of Community Importance
STECF  Scientific, Technical and Economic Committee for Fisheries
TAC  Total Allowable Catch
TURF  Territorial Use Rights in Fisheries
WBSS  Western Baltic Spring Spawning (Herring)
WSSD  World Summit on Sustainable Development (Johannesburg 2002)
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EXECUTIVE SUMMARY

Denmark is located in the Scandinavian region of Northern Europe, and consists of the peninsula of Jutland, which accounts for 70% of Denmark's total area, and some 400 named islands (just 82 inhabited). Denmark has 7 314 km of tidal shoreline (including small bays and inlets); no location in Denmark is further from the coast than 52 km. It is bordered by waters with different profiles and ecosystems, from the North Sea through the Skagerrak and Kattegat, to the Baltic Sea - corresponding to the main Danish fishing areas.

The global financial crisis cut Danish GDP in 2008-09, followed by a modest recovery in 2010 with GDP growth of 1.3%; however, the country experienced a technical recession in 2012 when GDP growth was -0.5%. Historically low levels of unemployment rose sharply with the recession and remained at about 6% over 2010-12, rising above 7% in 2013.

Fisheries represent about 0.15% of GDP, where in 2011 the Gross Value Added of the fisheries sector was about EUR 1 300 million. The total annual catch value has been approximately DKK 3 000 million (EUR 400 million) and the value of exported fishery products (incl. products based on imported raw material) DKK 16 500 million (EUR 2 200 million). Fisheries are an important industry in Denmark considering that Denmark is the fifth largest exporter of fish and fish products in the world (with a recent high of 4% of its total export value in 2009), with about 85% of Danish exports staying within the EU. Denmark is a major importer of raw materials used for further processing and then re-exported.

Fisheries in Denmark (excluding Greenland and the Faeroe Islands) are managed within the Common Fisheries Policy, and the authority responsible for monitoring and enforcing EU and national conservation policies is the Danish Directorate of Fisheries, which is a part of the Ministry of Food, Agriculture and Fisheries. The aquaculture sector is regulated by the Fisheries Act under the Ministry of Food, Agriculture and Fisheries and is mainly governed through the implementation of environmental regulations. Although the overall contribution of the fisheries sector to the Danish economy is minor, fisheries constitute a very important economic activity in specific regions, e.g. in Western and Northern Jutland and the island of Bornholm in the Baltic Sea. Norway lobster in the Kattegat and blue mussels in Limfjorden are also of significant local importance.

Table 1: Key data

<table>
<thead>
<tr>
<th>Area</th>
<th>42 915 km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>5 602 628 (at 1 Jan 2013)</td>
</tr>
<tr>
<td>Flag</td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>Copenhagen (København)</td>
</tr>
<tr>
<td>Coastline</td>
<td>7 314 km</td>
</tr>
<tr>
<td>West Coast</td>
<td>North Sea</td>
</tr>
<tr>
<td>North Coast</td>
<td>Skagerrak (North Sea)</td>
</tr>
<tr>
<td>East Coast</td>
<td>Kattegat and Oresund; Baltic Sea</td>
</tr>
<tr>
<td>GDP (EUR, at ppp)</td>
<td>158 146 billion (total)</td>
</tr>
<tr>
<td></td>
<td>28 338 (per capita, 2012 est.)</td>
</tr>
</tbody>
</table>

Source: Diverse
The capture fisheries sector consists of:

1. the industrial fishery for fishmeal and fish oil, mainly for sandeel, Norway pout, blue whiting and sprat (almost exclusively caught in the North Sea);
2. the pelagic fishery for human consumption, mainly herring and mackerel stored in Cold Sea Water (CSW) tanks and landed whole; and
3. the demersal fishery for white fish (cod, hake, haddock, whiting, saithe), flatfish (sole, plaice, flounder, etc.), Norway lobster and deep water prawns.

Cod, herring, mackerel and flatfish species are the main fishery for human consumption in Danish waters, accounting for more than 60% of the value of fish landings. In recent years a new species – the pelagic boar-fish - has emerged in the English Channel and south of England and Ireland. Still, the bulk of Danish catches have been made up of fish for reduction contributing 68% of the total commercial landing by weight.

Catches have dropped from 1.5 million tonnes to less than half that volume over the past decade. This decrease is mainly due to a dramatic drop in the catches of sand-eel in the North Sea and decreases in other food fish catches. The quotas were lowered for a number of species and various measures were implemented, in particular, to enable the recovery of cod stocks.

Aquaculture production in Denmark concentrates mainly on rainbow trout, farmed in freshwater. Blue mussels, sea trout, chars and pike perch are produced in small quantities, with several marine fish farms and mussel farms. There is a long tradition, especially in parts of Jutland, of raising trout in ponds. In 2011, aquaculture production was estimated at 34 900 tonnes.

Modern production technology is employed on over 20 farms where up to 95% of the water is recirculated. These so-called “model farms”, under influence from strict Danish environmental restrictions, have fostered the development of cleaner technology and have had the positive by-effect that this technology is now exported all over the world.

Danish commercial inland fisheries are negligible, while sports fishing and angling are highly popular.

The Danish fishing fleet in 2013 was composed of 2742 vessels, with nearly nine-tenths of the fleet consisting of vessels under 25 GT — predominantly gill netters. Still, trawlers account for about three quarters of tonnage power (with under a hundred vessels over 150 GT). Like the industry as a whole, the fleet has undergone significant re-structuring over the past 15 years. This has been due a variety of factors including: the decrease in the cod fisheries catch; compliance with conservation objectives; capacity adjustment of the fishing fleet; and the increased centralization of the processing industry. The production of fish and shellfish from aquaculture is expected to show a higher growth in coming years, especially in relation to saltwater breeding. The Danish fishing fleet has been able to cope with the changing conditions over the past decades by shifting from one fishery to another or by adopting new fishing methods.

The most important commercial fishery takes place from the harbours on the west coast of Jutland: Hvide Sande, Thyboron, Hanstholm, Hirtshals and Skagen, and from Strandby on the east coast of Northern Jutland. The Baltic fishery takes place from the large fishing harbour at Nexø on Bornholm. In the course of a year most vessels take part in different fisheries and fishing patterns change from year to year. Vessels with a home port in one of the west coast harbours will make seasonal visits to the Baltic Sea to fish cod or sprat, and
vessels from the inner Danish waters will fish in the North Sea during the summer season. There are only a few trawlers left that target pelagic species using pelagic trawls. These are big vessels equipped with tanks containing refrigerated sea water (RSW) for holding the catch.

The **purse seiners have their home port in Hirtshals** and they are all multi-purpose vessels able to fish either with pelagic trawls or purse seines. They are the biggest vessels in the Danish fleet, measuring more than 60 meters LOA, with modern equipment, and capable of holding up to 2 500 tonnes of fish.

Anchor (or Danish) seining was a very important fishing method in the middle of the last century, but had since lost out to more productive methods like trawling. It is now attracting renewed interest because of the low fuel consumption and the excellent quality of the catch taken by this fishing method.

There is a large mussel fishery located in the Wadden Sea, which is located in the south-east part of the North Sea, and in the Limfjord. Occasionally mussel banks will also be found in other parts of Denmark, i.e. the eastern coast of Jutland, and the Isefjord. Vessels employed in these fisheries use mussel dredges.

The largest **fishing communities** are found around the harbours in Jutland. Vessels are concentrated here as are the associated service industries, like engine workshops, net manufacturers, providers of fishing tackle etc. As the size of fishing fleet declines, fishing is concentrated in fewer harbours. Formerly important fishing communities in Esbjerg, Frederikshavn, Grenå (all in Jutland) have more or less disappeared in recent years. The same fate has met several minor harbours spread along the shores of the Danish islands. People directly involved in fisheries account for less than 0.2% of the population. Fewer than 10 000 individuals are employed in catching, selling, processing and transporting fish. Employment was almost halved in the past decade: the state of fish stocks has not permitted an increase in landings, while there has been a constant increase in the productivity and efficiency of the harvesting and production units.

The **fish processing industry** is scattered all over Denmark, but – naturally - most factories are found in Northern Jutland not far from the landing sites. Another reason for the concentration in North Jutland is that this region is a transport hub for the marine traffic which *inter alia* brings fish and shellfish to Denmark. Export of fresh and chilled fish is taken care of by many small enterprises that engage in sorting, filleting, packing and transporting fish. Fish, local landings as well as imports, are processed by medium to large fishing industries. The processing includes: filleting, smoking, curing, freezing, and canning. In many locations these downstream activities are important as they provide much employment in the fishing communities.

The **retail market is small** when compared with the large quantities of fish that are processed in the country. Danish businesses selling fish on the European market find it to be more attractive than the Danish market. The biggest markets are found in Germany and Italy, and Danish supply and demand for fish is determined to a large degree by foreign fishing and foreign markets. This double dependence is unusual. The annual consumption of fish in Denmark is 20 – 25 kg of live weight equivalent, average on a European scale.

Danish **imports of fish and fishery products** support a large part of the fish processing industry. The value of imports equalled 171% of the value of landings in 2009. Imports arrive from foreign fishing vessels landing their catch in one of the Danish fishing harbours, or they originate in fish landed abroad, and then bought and brought to Denmark by ship or
lorry. Three groups make up little over half of the imports: whole fish, fillets and prepared-preserved fish.

**Exports** are composed of a number of very different products, with three large groups - whole fish, fillets and prepared/preserved fish - making up over half of the exports, but fish meal and oil, as well as freshwater fish and various shellfish (Norway lobster, shrimps, and blue mussels) also prominent.

A major restructuring of **Danish research** took place in 2007. As a result the majority of research on fish biology is now part of the Danish Technological University (DTU). Previously it was handled by the Ministry of Food, Agriculture and Fisheries, and now is it performed by "DTU Aqua" upon request from the Ministry. A number of institutions are present in the **North Sea Science Park in Hirtshals**, including the Norwegian science foundation SINTEF Fisheries and Aquaculture managing a large 1 200 m³ flume tank. (FAO Fisheries and Aquaculture Department)
1. INTRODUCTION

Denmark, officially the Kingdom of Denmark (Kongeriget Danmark), is located in the Scandinavian region of Northern Europe. Denmark borders on Germany to the south, Sweden to the east (connected by a bridge-tunnel across the Öresund), Norway to the north and Poland to the south-east. It has been a member of the European Union since 1973. Denmark maintains four opt-outs from European Union policies, as outlined in the 1992 Edinburgh Agreement\(^1\) following the Maastricht Treaty's initial rejection in a referendum (it was later accepted in a second referendum in 1993).

Denmark consists of the peninsula of Jutland, which accounts for 70% of Denmark's total area, and some 400 named islands. Of these, just 82 are inhabited. Denmark has 7 314 km of tidal shoreline (including small bays and inlets); no location in Denmark is further from the coast than 52 km.

Denmark has a territory of 42 915 km\(^2\) and a population of ca. 5.6 million inhabitants\(^2\). The population density is 129.9 inhabitants per km\(^2\). The main cities are Copenhagen, the capital, followed by Aarhus, Aalborg and Odense. The GDP per capita amounts to EUR 43 700\(^3\) with an unemployment rate of 7.2%\(^4\).

The Kingdom of Denmark also has two autonomous constituent countries in the North Atlantic Ocean, namely the Faroe Islands and Greenland, both of which remain outside the European Union.

Denmark, which is not a member of the Eurozone and whose currency is the Danish Krone (DKK), has a modern market economy featuring a high-tech agricultural sector, state-of-the-art industry with world-leading firms in pharmaceuticals, maritime shipping and renewable energy, but with a high dependence on foreign trade. Denmark is a net exporter of food and energy but depends on imports of raw materials for the manufacturing sector.

The Danish business structure has experienced comprehensive changes in recent decades. Denmark has gone from an agricultural and industrial society to a society where services are the dominant activity. At the turn of the millennium, almost three fourths of all employed

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\(^1\) The four opt-outs concern the EMU, the Common Security and Defence Policy (CSDP), Justice and Home Affairs (JHA) and the citizenship of the European Union.

The EMU opt-out means Denmark is not obliged to participate in the third phase of the European Exchange Rate Mechanism, i.e. to replace the Danish krone with the euro. The abolition of the euro opt-out was put to a referendum in 2000 and was rejected.

The CSDP opt-out originally meant Denmark would not be obliged to join the Western European Union (which originally handled the defence tasks of the EU). Now it means that Denmark does not participate in the European Union's foreign policy where defence is concerned. Hence it does not take part in decisions, does not act in that area and does not contribute troops to missions conducted under the auspices of the European Union, does not participate in the European Defence Agency.

The JHA opt-out exempts Denmark from certain areas of home affairs. Significant parts of these areas were transferred from the third European Union pillar to the first under the Amsterdam Treaty; Denmark's opt-outs from these areas were kept valid through additional protocols. Acts made under those powers are not binding on Denmark except for those relating to Schengen, which are instead conducted on an intergovernmental basis with Denmark. Under the Treaty of Lisbon, Denmark can change its JHA opt-out from a complete opt-out to the case-by-case opt-in version applying to Ireland and the United Kingdom whenever they wish.

The citizenship opt-out stated that European citizenship did not replace national citizenship; this opt-out was rendered meaningless when the Amsterdam Treaty adopted the same wording for all members. The current government of Helle Thorning-Schmidt (S&D) has said it intends to hold a referendum on ending the opt-outs on Common Security and Defence Policy, as well as Justice and Home Affairs.

\(^2\) 5 602 628 at 1/01/2013 (Source: Danmarks Statistik).

\(^3\) End of 2012 (Source: Eurostat).

\(^4\) March 2013 (Source: Eurostat).
persons were working in the service sector. Services include private services in the form of trade, transport, finance, knowledge-based services and personal services as well as public services. The growth of the service sector has continued in the new millennium until the economic crisis in 2008.

The global financial crisis has caused a slowdown through increased borrowing costs and lower export demand, consumer confidence, and investment. The global financial crisis cut Danish real GDP in 2008-09. Denmark made a modest recovery in 2010 with real GDP growth of 1.3%, in part because of increased government spending; however, the country experienced a technical recession in 2012 when the GDP was -0.5%. Historically low levels of unemployment rose sharply with the recession and remained at about 6% over 2010-12, rising above 7% in 2013.

Fisheries are an important industry in Denmark considering that Denmark is the fifth largest exporter of fish and fish products in the world. Agriculture, forestry and fisheries represent about 1% of the GDP of Denmark, where in 2011 the Gross Value Added of the fisheries sector was about EUR 1 300 million\(^5\).

The total annual catch value is approximately DKK 3 000 million (EUR 400 million) and the value of exported fishery products (incl. products based on imported raw material) is DKK 16 500 million (EUR 2 200 million)\(^6\).

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\(^5\) Danmarks Statistik.

\(^6\) Ministry of Food, Agriculture and Fisheries of Denmark.
1.1. Organisation of the State

Denmark is a constitutional monarchy, ruled under the 1953 constitution. The single-chamber parliament or Folketing has 179 elected members directly for a 4 year term. The Head of State is Queen Margarita II (since January 1972), and the Prime Minister Helle Thorning-Schmidt (since October 2011) of the Social Democrats or Socialdemokraterne (whose Members sit in the S&D Group in the European Parliament).

The political system of Denmark is known as "negative parliamentary", which means that the Government may never have a majority against it in the Parliament, but it is not required to have the support of an actual majority. In fact, since 1909, no single party has had the majority in Parliament. Governments often consist of several political parties, with one or more parties supporting the Government while not actually forming part of it. In this way, the Government will not have a majority against it in the Parliament.

On 1 January 2007 the Danish Municipal Reform established the five new regions, replacing the former counties or amter, and at the same time the number of municipalities or kommuner was cut from 270 to 98.

The five new regions are the Capital Region (Region Hovedstaden), the Sealand Region (Region Sjaelland), Region of Southern Denmark (Region Syddanmark), Central Denmark Region (Region Midtjylland), and North Denmark Region (Region Nordjylland).
The five regions of Denmark differ in relation to their physical geography, areas and populations. For example, more than 30 per cent of the inhabitants of Denmark live in the Capital Region of Denmark, which at the same time is the absolute smallest region.

Table 2: Areas and populations of the region

<table>
<thead>
<tr>
<th>REGION</th>
<th>POPULATION</th>
<th>AREA (Km²)</th>
<th>INHABITANTS PER Km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>1 702 388</td>
<td>2 561</td>
<td>665</td>
</tr>
<tr>
<td>Sealand</td>
<td>819 071</td>
<td>7 273</td>
<td>113</td>
</tr>
<tr>
<td>Southern Denmark</td>
<td>1 200 858</td>
<td>12 191</td>
<td>99</td>
</tr>
<tr>
<td>Central Denmark</td>
<td>1 262 115</td>
<td>13 142</td>
<td>96</td>
</tr>
<tr>
<td>North Denmark</td>
<td>579 787</td>
<td>7 931</td>
<td>73</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5 564 219</strong></td>
<td><strong>43 098</strong></td>
<td><strong>129</strong></td>
</tr>
</tbody>
</table>

Source: Danish Regions, April 2011

The governing bodies of the regions are the regional councils with 41 members directly elected for four years periods. The regional council chairman is elected by the regional councils.
1.2. Geography overview

Denmark has a coastline that is extraordinary long, at more than 7 300 km, corresponding to almost 1.5 metres of coast per inhabitant. Denmark is strategically situated between the North and Baltic Seas, connected by three straits. The Danish Straits consist of the Sound, the Great Belt and the Little Belt. They have had fundamental economic and strategic importance since the IX century.

Denmark’s maritime area consists of a 3-mile territorial sea, a 4-mile customs zone, a 24-mile nature conservation zone, a 200-mile fishing territory, a 200-mile continental shelf and various special zones. (*The law of the sea, Tullio Treves, 1997*)

Denmark’s coastline borders on fundamentally distinct marine areas, varying from brackish waters with a salinity of ca. 6‰ in the southern part of the Baltic Sea, to completely marine conditions in the bottom waters in the Kattegat, Skagerrak and moving out into the North Sea (Map 3).

**Map 3: Bottom salinity in the Baltic Sea, Kattegat and Skagerrak.**

[Map image]


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7 Denmark in figures 2013. (Source: *Danmarks Statistik*)
To the east, the **Baltic Sea** has varied seafloor topography, with a maximum depth of 459 m and large areas less than 25 m deep (ca. 30% of the basin). Several deeper basins are separated by shallow thresholds (Map 5), which limits the water exchange and influences the hydrographical and ecological characteristics. Water is permanently stratified with colder and more saline deep water layers. As a result, lack of oxygen (anoxy) can occur in the deep basins, with critical consequences on benthos as well as on the survival of cod egg and larvae. Eutrophication has also become a problem in the Baltic Sea which, amplified by the anoxic bottom conditions, causes seasonal hypoxia in shallow waters, thus affecting coastal biodiversity and recruitment of coastal spawning fish species.

Close to the northern and eastern shore, the **Skagerrak, Kattegat and Öresund** form the transition area between the North Sea and the Baltic Sea. The sea bottom gradually deepens northward, and hydrographic conditions are strongly influenced by the run-off of freshwater from the Baltic Sea and input of Atlantic water through the North Sea. Waters in the Kattegat and Öresund are also stratified vertically, and a sharp pycnocline separates low salinity surface water from saline bottom water. Oxygen deficiency may occur, exacerbated by large scale eutrophication of coastal waters.

Saltwater inflows through the Skagerrak-Kattegat-Öresund gateway strongly influence the hydrography of the Baltic Sea, as they provide oxygen-rich waters into the Baltic and limit the extent of anoxic bottoms.

**Map 4: Seafloor bathymetry in the Baltic Sea, Kattegat and Skagerrak.**

Source: Popescu, I., *op cit.*
1.3. The Baltic Sea Ecosystem

The Baltic Sea fish community is relatively simple, with few dominating species.

- The commercial marine fish species with the northernmost distribution range are cod, herring, sprat and flounder.
- Among the non-commercial are eelpout, sand goby, the smaller sand eel and pipefish.
- The coastal water in the Baltic is dominated by freshwater species such as perch, pike and roach.

The species distribution is primarily a function of salinity and temperature tolerance, but the fish community is also affected by anthropogenic factors such as eutrophication and fishery.

Rapid changes in the ecosystem (regime shifts) can be found all across the Baltic Sea. The most dramatic recent regime shift occurred in the late 1980s, from a fish community dominated by cod and herring to one dominated by sprat (Figure 1), and was accompanied by a change in the abundance and composition of zooplankton. This shift was brought on by an excessive fishing mortality which reduced the spawning biomass of cod to an unsustainable level. (Popescu, op. cit.)

Significant scientific effort in recent years has improved understanding of the Baltic Sea ecosystem, and in particular of how the fish species interact. There have been changes in the structure of the food web (regime shifts) in the Baltic Sea during the last 40 years.

The size of the sprat stock and to some degree the herring stock depend on cod predation and hence on the size of the cod stock. Since the early 1990s, the cod stock has been low as a result of excessive fishing and unfavourable environmental conditions. The removal of cod led to a shift in the structure of the central Baltic Sea ecosystem and allowed a substantial increase of the population of sprat that feeds strictly on zooplankton. As a consequence, total zooplankton biomass has declined and phytoplankton increased.

In recent years, hydrological conditions for cod recruitment have improved, not only in terms of favourable conditions for egg and larval survival, but also potentially enhancing the development of one of the key zooplankton prey for cod larvae, the copepod Pseudocalanus spp. Cod recruitment success, however, has not increased as expected, possibly because of the high resources for larval cod, but also in the changed size structure of sprat population and predation by sprat on cod eggs. The feedback mechanisms potentially delaying cod recovery can be found not only in the top-down control by sprat on the food. MSY is therefore done on the exploitation level using simple exploitation reference points such as F0.1.

1.4. The Kattegat and Öresund Ecosystems

These coastal marine areas are relatively species-rich and productive coastal regions, and provide habitat for a great variety of commercially important fish species. The fish community already includes many of the species found in the North Sea. Pelagic species like herring, sprat and mackerel are fished in these regions, as are demersal species like cod, haddock and various flatfish. Norway lobster and shrimp are also fished on a large scale.
The fish community in the Kattegat has changed over time. Some species, e.g. haddock, are now extremely rare, and the size composition of species such as cod and plaice has decreased during the 20th century. In the case of cod, biomass has fallen nearly continuously for 20-30 years and is presently below safe biological limits. The decline of the cod stock in the Kattegat has shown associations with the disappearance of separate spawning aggregations/subpopulations in the Kattegat area (Svedäng and Bardon 2003). Herring biomass has also decreased in the 2000s.

The marine ecosystem in the Kattegat has been considered to be rather productive, and the extremely low abundance of fish in sizes of commercial interest should be regarded as the final phase of an erosion process. This process started 150 years ago, when longline fishing began to take place on an industrial scale and resources like halibut and ling were exhausted. The degradation of the ecosystem, however, became much more severe when motor trawling was introduced at the beginning of the twentieth century. Species like haddock, pollack, whiting and turbot are no longer of commercial interest as they have successively become depleted. The cod stock in the Kattegat has shrunk to a remnant population over the last two to three decades. The decline of the cod stock in the Kattegat is linked to the disappearance of separate spawning aggregations/sub-populations in the Kattegat area.

Such structural changes within the stocks are very alarming, as the disappearance of stock units could effectively hinder a recovery of depleted areas even after substantial reductions in fishing activity.

Sea surface summer temperatures in the Kattegat-Öresund region increased by 2°C over 1984-2001. This increase was much faster than expected as a result of global warming (ca. 3°C over the next 70-100 years), and is likely contributing to some of the ecological changes seen in the Kattegat. Temperatures are now as high, or higher, than at any time since the start of measurements by ICES in 1921 (ICES, 2007).

Oxygen depletion events in the Kattegat and neighbouring estuaries occur due to the interaction of eutrophication with specific hydrographic events. Such oxygen-depleted bottom areas have increased steadily in the Kattegat since the 1970s. These events reduce the size of habitat for benthic fish species and kill benthic prey for fish species.

On the whole, a great many of formerly important fish species have either disappeared or have been reduced to remnant populations in the Kattegat, while the fish community in the Öresund has been less affected. It is reasonable to believe that the much higher levels of productivity of cod and other demersal species in the Öresund is linked to the absence of trawling within the area.

Productivity is higher in the Öresund and the Kattegat than in the Baltic Sea, as is the diversity in terms of the number of fish species, the number of invertebrates, and the individual growth rates for most fishes. Where oceanic waters are encountered (i.e., mostly at greater depths), the production of commercially interesting shellfish such as blue mussels (Mytilus edulis), shrimp (Pandalus borealis), Norway lobster, crab (Cancer pagurus) and lobster (Homarus gammarus) is also high.

The higher salinity and greater inflow of nutrients are the main reasons why productivity and diversity are higher in the Öresund and the Kattegat than in the Baltic Sea. The strong currents in the area supply the Öresund and Kattegat with a continuous inflow of nutrients from the Atlantic Ocean, the Baltic Sea and southern North Sea, which supports plant plankton production. In addition, the temperature regime is more favourable in the Öresund and the Kattegat than in the Baltic Sea.
Apart from physical constraints, animals and plants interact and affect one another by predation and competition for space and food. Interactions between species and populations form the ecosystems and limit the number and growth of individuals. Man is presently one of the most important actors in marine ecosystems, and fisheries play a crucial role in the structuring of the marine environment. This influence occurs both directly and collaterally. Direct effects include increased mortality of both young and old animals of various kinds, and the physical disturbance of seabeds and organisms connected to those habitats. Due to the differences in fishing regulations, the impact on and disturbance of the ecosystem is also higher in the Kattegat than in the Öresund.

A significant number of formerly important fish species have either disappeared or have been reduced to remnant populations in the Kattegat. The size structure of these fish stocks has also been profoundly altered, as the abundance of older (and thus larger) individuals has diminished. The indirect effects, such as changes in competition and survivorship within and between species, are difficult to estimate.

The Kattegat cod biomass has fallen nearly continuously for the last three to four decades, and has been below safe biological limits since 2001. Agreed TACs and reported landings have fallen continuously since 2000. The total reported landings of cod in the Kattegat in 2009 were 197 tonnes; during the 1970s reported annual landings fluctuated between 15,000 and 20,000 tonnes (see Figure 1 below). In 2002, ICES advised that a moratorium should be placed on the fishing of this stock, and that a rebuilding plan should be implemented in order to raise SSB above the agreed Bpa (10 500 tonnes). The decline of the cod stock in the Kattegat has been linked to the disappearance of separate spawning aggregations/sub-populations in the Kattegat area. The biomass of plaice is uncertain but nevertheless continues to support important commercial fisheries. The sole biomass increased in the late 1990s and early 2000s, the herring biomass decreased in the 2000s, and nowadays Norway lobster has become the backbone of the demersal fishery. (Svedäng, H., Long-Term Impact of Different Fishing Methods on the Ecosystem in the Kattegat and Öresund, 2010)

**Figure 1: The biomass of cod, sprat and herring in the Baltic Sea**

![Biological Impact of Fishery on Ecosystem](image-url)
1.5. The North Sea and Skagerrak Ecosystem

The North Sea may seem a small, shallow pool compared with the oceans (total surface area approx. 750 000 km², average depth 95 m), but nevertheless it is teeming with life. The water supply from the Atlantic Ocean and the discharge from a number of major rivers create a perfect climate for micro-organisms. These ideal circumstances stimulate the development of plankton, which forms the basis for an extensive food web. Thus, the North Sea is a rich area and a very important fishing ground: 5% of the world’s total fish catch is caught here. However, fishing activity varies sharply in the countries around the North Sea. Denmark’s fish catch accounts for 45% of the total volume. (The Management Unit of the North Sea Mathematical Models, MUMM).

The fish community has been called temperature-boreal, and its biomass is dominated by a relatively small number of species, which include flatfishes (primarily plaice, flounder (Platichthys flesus), dab (Limanda limanda), sole (Solea solea), turbot (Psetta maxima), but historically also halibut), gadoids (primarily cod, but historically also haddock, whiting (Merlangius merlangus) and pollack (Pollachius pollachius)), and pelagic fishes (e.g., herring, sprat (Sprattus sprattus)). The community is supplemented on a seasonal basis by migrant species, including mackerel (Scomber scombrus), garfish (Belone belone), and occasionally horse mackerel (Trachurus trachurus). (Svedäng, H., op. cit.)

Overall in the North Sea, the erosion of the entire fish community has been taking place for more than a century, and in large parts of the North Sea cod is presently considered to be commercially extinct. An even more profound reduction in demersal fish abundance has taken place in the eastern inshore of the Skagerrak. Recruitment to the sandeel, Norway pout, North Sea cod and North Sea herring stocks has been poor over the past decade. This is probably caused by changes in the physical and biological conditions. Cod and sandeel stocks have been heavily exploited, and the recruitment failures have probably been mainly due to overfishing. Fishing for North Sea cod should have been stopped in the mid-2000s. Illegal landings and discards have in the past created considerable problems for the assessment of some stocks, particularly North Sea cod and mackerel.

The spawning stocks of haddock, mackerel, herring and sprat have been quite good. For plaice and cod, however, the situation reached critical towards the end of the last decade. Anglerfish and Norway lobster fisheries have developed over the last 20 years. The fishery for Norway lobster declined up to the mid-2000s, but data from 2005 on have indicated a new increase. The catches of young and immature anglerfish have been too big. (Olivert-Amado, Fisheries in Norway, 2008)

Similar to cod, the waters of the Skagerrak and the Kattegat seem to function as nursery areas for of variety of herring stocks originating from the adjacent North Sea or the Baltic Sea (Ruzzante et al., 2006). Thus, herring of local origin co-exist with juvenile and adult herring from both the western Baltic Sea and the North Sea (Ruzzante et al., 2006). After hatching in spring in the North Sea, some of the resulting larvae drift into the Skagerrak/Kattegat, where they stay for between one and two years before swimming back for spawning in the North Sea. Similarly, larvae also drift to the Skagerrak from spring spawning areas in the Kattegat and, in particular, in the western Baltic. In addition to the larval drift into the Skagerrak, adult herring of the western Baltic population also undergo annual feeding migrations towards the Skagerrak during summer. In other words, during the summer adult herring in the Skagerrak could be of local origin or could come from the Kattegat/the Western Baltic, whereas juvenile herring are mostly from the North Sea. During the winter, adult herring in the Kattegat are largely local in origin, whereas among juvenile herring, the North Sea origin dominates. (Svedäng, H., op cit.)
2. LEGAL AND INSTITUTIONAL FRAMEWORK

2.1. Law

Danish fisheries systems and policies sit within the context of both regional and international fisheries agreements. The international framework is provided by the UN Convention on the Law of the Sea (1982), FAO Conference Resolution 15/93 and the UN agreement of 1995 (Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks). The FAO Code of Conduct for Responsible Fisheries 4/95 has no legal force but it has political implications for the management systems.

Since November 2004, Denmark has been a Party to the 1982 UN Convention on the Law of the Sea. On 19 December 2003, on the same day that other EC countries and the EC itself, Denmark became Party to the 1995 UN Fish Stocks Agreement, and made a declaration recalling "that as a Member of the European Community, Denmark has transferred competence to the European Community in respect of certain matters governed by the Agreement, which are specified in the Annex to this letter". Through the European Community, it is Party to the 1993 FAO Compliance Agreement.

Since 1973 when Denmark joined the EU, the fisheries policy and management have come under the umbrella of the Common Fisheries Policy (CFP), and specifically its 2013 revision - including the total discards ban in the Skagerrak to apply as of 2014. Needless to say, the new European Maritime and Fisheries Fund (EMFF) 2014-2020 will also provide a new well-defined framework for the implementation of the CFP.

2.2. Institutions

The responsible authority for monitoring and enforcing EU and national conservation policies is the Danish Directorate of Fisheries, which is a part of the Ministry of Food, Agriculture and Fisheries. The aquaculture sector is regulated by the Fisheries Act under the Ministry of Food, Agriculture and Fisheries and is mainly governed through the implementation of environmental regulations.


The mission and vision of the Ministry of Food, Agriculture and Fisheries are set in the context of Denmark's position as the fifth largest exporter of fish and fishery products in the world. Both fisheries and aquaculture are experiencing changes and development, and the production of fish and shellfish in the aquaculture sector is expected to show higher growth in coming years.

The key concern of the Ministry is to make the most of the quantity of fish available to Denmark. This means getting the maximum value from the fish catch and conserving resources. The use of optimal fishing methods – conserving catch and limiting discards - are important focal points.
There is a great potential for development in the field of aquaculture. Especially within saltwater breeding, more species will be raised in the future than is the case today. The greatest challenge in this type of production is to reduce the impact on the environment and on eco-systems.

The Ministry seeks to act through:

- regulation and inspections of the fishing industry;
- support for research in fisheries and aquaculture production;
- support for the development of fisheries, the fish industry, fishery harbours and aquaculture; and,
- fish management and fishing licence arrangements for recreational fisheries.
3. FISHERIES MANAGEMENT

The responsible authority for monitoring and enforcing EU and national conservation policies is the Danish Directorate of Fisheries, which is a part of the Ministry of Food, Agriculture and Fisheries. The Directorate carries out inspection at sea and of landings. Inspection of veterinary standards is the responsibility of the Danish Veterinary and Food Administration, also part of the Ministry of Food, Agriculture and Fisheries.

The Common Fisheries Policy (CFP) is the foundation for all Danish fisheries regulations. However, a number of national regulations have been formulated to reflect local fishing conditions as well as the national resource exploitation policy.

Today access to fishing is governed by a range of measures:

- Input controls:
- Licences to fish;
- Days at sea;
- Output controls:
- Total allowable catch (TAC) negotiated in the EU system;
- Individual Transferable Quotas (ITQ), used in the herring and the mackerel fisheries;
- Quota shares allocated to individual vessels (can be pooled together for a group of vessels).
- Technical measures:
- For a wide range of species, minimum landing size; in some cases these are higher than those specified in the CFP;
- Fishery specific, minimum mesh size for trawl gear (and Danish seine), and for gill nets and purse seines;
- Closed areas;
- Closed seasons; established to protect fish during spawning and/or migration, but also to ensure fish quality and to reflect the market situation;
- Size limitations on vessels and on engine power;
- Restrictions in the use of certain fishing gear in specific areas (i.e. purse seine, beam trawl);
- Detailed specification for trawl attachments like protection bags, round straps, exit windows and grids; and,
- Detailed specifications for cod-ends and for netting configurations, like square mesh (T45) panels and turned meshes (T90).

(FAO Fisheries and Aquaculture Department)

Apart from the TAC quotas, several additional measures are worth mentioning:

- There are three seasonally closed areas in the Baltic Sea (1 May - 31 October) in the Bornholm Deep, Gdansk Deep and Gotlands Deep. These have been established to protect cod;
- A near-total ban on towed fishing gear (i.e., otter and midwater trawls, Danish and purse seines) has been in place since 1932 in the Oresund sea area between Denmark and Sweden, due to its status as a heavily trafficked navigational area. This ban has not been implemented in a small part of the northern Oresund area adjacent to Kattegat. In 2009, however, this trawl fishery became more restricted as trawling was banned from February to March (i.e., during the cod spawning period);
Since 2009, the EU has operated a scheme with **real-time closures in the North Sea and Skagerrak** in areas with presence of juvenile cod, haddock, whiting and saithe (based only on information gathered during inspections at sea), with fish below the following sizes regarded as juveniles: Cod - 35 cm, Haddock - 30 cm, Whiting - 27 cm, Saithe - 35 cm.

Before 2007, quotas in Denmark were split into 14-days rations that were continuously adjusted, based on the amount of quota left. In 2007, this system was changed to a **rights-based system (Vessel Quota Share, or FKA)**, which is best characterised as an Individual Transferable Quota (ITQ) system, since the fishermen can sell and buy fishing rights.

In addition to Total Allowable Catches (TAC) regulations, **fishing in the Kattegat is regulated by the number of fishing days**. Analysis of the development of total fishing activity in the Kattegat by the Scientific, Technical and Economic Committee for Fisheries (STECF) through its Sub-group SG-MOS, showed that the total nominal effort (kWdays) of the Danish fleet in the Kattegat had been halved between 2000 and 2008. Fishing in the Kattegat is dominated by trawling, primarily with mesh sizes of 90-99 mm at present. A major shift in fishing gear occurred between 2003 and 2004, when the use of 70-89 mm trawls without sorting grids was banned. This caused an increase in the 90-99 mm trawl fishery in 2004. The activity of 90-99 mm trawls was stable between 2006 and 2008. Swedish nominal activity in the Kattegat was also stable during this period. In recent years, the use of trawls equipped with a species sorting grid in the Nephrops fishery, as well as trawls equipped with 120 mm escape windows, has increased. Since nominal reductions in cod TAC had not resulted in a lowered fishing mortality, closed areas were implemented in the Kattegat in 2009 as a mean to achieve reductions in fishing activity in the spawning area.

**Marine protected areas** (MPAs) have been advocated as a mean for resolving the problem of over-exploitation of fishery resources, and the results of a 2010 European Parliament study comparing the ecosystems of the Kattegat and Oresund supported this point of view. However, the situation in the Kattegat has only been alleviated to a minor extent by the presence of an adjacent MPA of a considerable size (the surface of the Oresund is about one-tenth the size of the Kattegat). More importantly, this example of an existing MPA showed the weakness of the restricted spatial preservation concept. As the prohibited area in the Oresund was instituted in 1932, it has apparently not been successful in sustaining the population structure in the heavily exploited Kattegat. In other words, the demersal stock decline was not effectively halted by the presence of an adjacent MPA, and spill over effects have not been detectable. (Svedäng, H. *op. cit.*).
Box 1: Brown shrimp fisheries

BROWN SHRIMP (*Crangon crangon*)

Although brown shrimp (*Crangon crangon*) is of minor importance for the Danish marine fishery (only about 2% of total revenues; c. 70 persons in employment related to this fishery), it provides an interesting example of a fishery with growth potential, no sign of overfishing and no overarching management measures until now. This has led to a discussion of good practices, potential problems and the way forward.

Denmark has no significant market and no companies involved in brown shrimp processing, all Danish brown shrimp fishermen are organized in one PO, and the entire Danish production is bought by Dutch wholesalers and transported to the Netherlands. In the framework of the MSC certification process management plans have been developed in Denmark as in Germany and the Netherlands, but have not yet completed the certification process. The Danish fishermen are convinced that their future economic success will depend on a successful MSC certification.

The Danish shrimpers had set harvest control rules. Limits for landing of shrimp were set to quantities varying (sometimes only 2 or 3 t per week) according to market situations for 10 years. The last limit was 6 t per vessel and week. However, as free fishing was the rule in Germany and in the Netherlands in 2010 and as prices had dropped considerably, the Danish fishermen also decided to skip their limit to compete with the other fleets via higher amounts landed.

The Danish PO is only a political instrument and does not interfere with the trade which is entirely up to the single fisherman selling his catch freely to trading and processing companies.

**Measures of Limitation of Catches**

For the Danish fishermen the best possible regulation is a result based system, which means that fishermen cannot sell their shrimp if their catch does not meet the standards set by their PO. One of these standards is the share of too small shrimp in the landed catch which should not exceed 15% at the beginning of the process and could lead, by time and experience, to lower values.

**Extension of Rules**

As Danish shrimpers have agreed upon having one PO which has membership of more than 65% of the vessels and/or landings, the rules set up by the PO are also binding for the rest of the shrimping fleet according to Danish and EU regulations. These rules are not relevant to foreign vessels in Danish waters, which could lead to problems and tension between fleets.

4. CATCHES

While the inner Danish waters -shallow and productive- have been the source of a substantial production of fish, shellfish and mussels in spite of the brackish nature of the waters which limits species diversity, the west coast of Jutland faces the North Sea, one of the most productive fishing grounds in the world.

The Danish commercial fishery is characterized by three sub-sectors:

- A demersal fishery with trawls, Danish seines and gill nets for round-fish species like cod and haddock, and various flatfish like plaice, sole and turbot. In many of these fisheries Norway lobster makes up an important by-catch.
- A trawl fishery for sand eel, Norway pout, blue whiting, etc., supplied to the fish meal industry; and,
- A pelagic fishery with purse seines and pelagic trawls for herring and mackerel.

There is a long tradition, especially in parts of Jutland, of raising trout in ponds. Today there are also several marine fish farms and mussel farms. Inland fisheries are by and large limited to sports and recreational activities.

Compared to total EU catches, the Danish catch has been significant, especially in weight.

**Table 3: Size of total catches in Denmark as percentage of total EU catches, 2004-2011**

<table>
<thead>
<tr>
<th>Tonnes live weight</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-27</td>
<td>5 874 589</td>
<td>5 641 307</td>
<td>5 450 184</td>
<td>5 179 667</td>
<td>5 175 809</td>
<td>5 067 813</td>
<td>4 943 780</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>1 090 161</td>
<td>910 634</td>
<td>867 857</td>
<td>653 016</td>
<td>690 621</td>
<td>777 747</td>
<td>828 014</td>
<td>716 233</td>
</tr>
<tr>
<td>% Denmark</td>
<td>18,56</td>
<td>16,14</td>
<td>15,92</td>
<td>12,61</td>
<td>13,34</td>
<td>15,35</td>
<td>16,75</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Eurostat

4.1 Sea Fisheries

The development of the weight of Danish commercial catches over 2001 – 2010 is given in Figure 2 below. Catches have dropped from 1.5 million tonnes to around 600 000 tonnes in this period. This decrease is mainly due to a dramatic drop in the catches of sand-eel in the North Sea and decreases in other food fish catches. The quotas were lowered for a number of species and various measures were implemented, in particular, to enable the recovery of cod stocks.
Table 4 shows the value of the Danish catches over 2004 - 2012. A comparison of the two figures reflects that the fishery for reduction is composed of low-value species.

Table 4: Value of the Danish catches in 2004-2012 (DKK million)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Roundfishes</td>
<td>750</td>
<td>869</td>
<td>834</td>
<td>781</td>
<td>768</td>
<td>659</td>
<td>747</td>
<td>742</td>
<td>688</td>
</tr>
<tr>
<td>Flatfishes</td>
<td>512</td>
<td>547</td>
<td>638</td>
<td>542</td>
<td>481</td>
<td>366</td>
<td>404</td>
<td>458</td>
<td>420</td>
</tr>
<tr>
<td>Atlantic Herring</td>
<td>388</td>
<td>559</td>
<td>620</td>
<td>581</td>
<td>515</td>
<td>400</td>
<td>375</td>
<td>453</td>
<td>591</td>
</tr>
<tr>
<td>Atlantic Mackerel</td>
<td>180</td>
<td>306</td>
<td>220</td>
<td>136</td>
<td>149</td>
<td>102</td>
<td>189</td>
<td>347</td>
<td>192</td>
</tr>
<tr>
<td>Fish for reduction</td>
<td>776</td>
<td>666</td>
<td>865</td>
<td>823</td>
<td>627</td>
<td>662</td>
<td>1.181</td>
<td>1.099</td>
<td>672</td>
</tr>
<tr>
<td>Crustaceans and molluscs</td>
<td>528</td>
<td>662</td>
<td>621</td>
<td>757</td>
<td>579</td>
<td>390</td>
<td>429</td>
<td>461</td>
<td>450</td>
</tr>
<tr>
<td>Other fishes</td>
<td>141</td>
<td>132</td>
<td>141</td>
<td>123</td>
<td>106</td>
<td>104</td>
<td>111</td>
<td>109</td>
<td>104</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,275</strong></td>
<td><strong>3,742</strong></td>
<td><strong>3,939</strong></td>
<td><strong>3,743</strong></td>
<td><strong>3,224</strong></td>
<td><strong>2,683</strong></td>
<td><strong>3,436</strong></td>
<td><strong>3,669</strong></td>
<td><strong>3,118</strong></td>
</tr>
</tbody>
</table>

Source: Statistics Denmark

The catches by weight and by main species groups are also given in Figure X below. Most of the landings come from certain key species. By far the most important catches in terms of weight have been from so-called “industrial fisheries” (a term used in Denmark for the trawl fishery directed at species processed into fish meal and oil). For instance, in 2010 the bulk of Danish catches were made up of fish for reduction contributing 68% of total commercial landings.

Catches consisted of sand eel, sprat, blue whiting, and Norway pout. In recent years a new species – the pelagic boar-fish - has emerged in the English Channel and south of England and Ireland. The fishery for this species started in 2006 and in 2010 yielded around 75 000 tonnes. The future of this fishery is uncertain, as a precautionary ban on catching this species has been introduced. The status of the stocks is not known and the sustainability of present exploitation needs to be investigated.

The herring fishery for canning and curing is the second largest fishery, taking 12% of landings. The remaining part is made up of a long list of fish species including roundfish, flatfish, cod, and plaice as well as shellfish and molluscs.
The value of the catch of the Danish landings shows a very different picture (Figure 4). Landings of fish, shellfish and molluscs were worth EUR 397 million in 2010. Fish for reduction accounted for 30% of the total value. In the pelagic sector herring and mackerel contributed EUR 32 and 45 million respectively. The most important demersal fish was cod, with plaice coming second. The value of Norway lobster – about 8 EUR/kg - explains why this shellfish species is so attractive for the fishermen.

**Figure 3: Denmark - The landings from Danish vessels in 2010 (values in brackets are from 2009)**

![Diagram showing landings from Danish vessels in 2010](image)

Source: Danish Fishermen Association, the Directorate of Fisheries.

**Figure 4: The value of landings from Danish vessels in 2010, million EUR (values in brackets are from 2009)**

![Diagram showing the value of landings from Danish vessels in 2010](image)

Source: Danish Fishermen Association, the Directorate of Fisheries
The value of Norway lobster – about 8 EUR/kg – explains why this shellfish species has continued to be so attractive for the fishermen. The box below provides a look at the Danish catches in the Kattegat and Skagerrak.

**Box 2: Norway lobster fisheries**

<table>
<thead>
<tr>
<th><strong>NORWAY LOBSTER (Nephrops norvegicus)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development of catch and stock parameters</strong></td>
</tr>
<tr>
<td>Norway lobster is fished mainly using bottom-trawls, but there is also a pot fishery. The Danish catches have been ca. 75% of the total in Kattegat and Skagerrak. By-catch of benthic fish has been high with the trawl gear hitherto used, but can be considerably reduced using a sorting grid. However, large quantities of undersized Norway lobster have still continued to be discarded.</td>
</tr>
<tr>
<td><strong>State of stock:</strong></td>
</tr>
<tr>
<td>The relative precautionary exploitation boundaries cannot be assessed. Commercial fisheries indices (landings per unit of effort) suggest that the stocks in the Kattegat and Skagerrak are exploited at a sustainable level.</td>
</tr>
<tr>
<td><strong>ICES advice:</strong></td>
</tr>
<tr>
<td>Due to uncertainty of the available data, ICES is not able to reliably forecast catches. The recommendation is not to exceed the current levels of exploitation. Measures to ensure species selection (sorting grids) should be used to minimise the by-catch of cod and other benthic fish species.</td>
</tr>
</tbody>
</table>

**Source:** Popescu, I., op cit.

### 4.2. Aquaculture

Rearing rainbow trout in ponds is a century-long tradition in Denmark. Water from brooks and rivers was diverted to ponds, where rainbow trout were reared to about 300 – 350 g. Not long ago it used to be that the fish were fed minced fish, often sprat.

However, environmental considerations and the regulations these gave rise to have forced producers to change production methods. Fish are today fed with pellets containing high quality protein and other vital additives. Concrete ponds are gradually replacing earthen ponds and farm effluents are monitored strictly to reduce the amount of nutrients returning to the brook or river.

Today land based aquaculture in Denmark is carried out in 214 farms. In 2009 they produced 32 100 tonnes of fish, mainly rainbow trout with a value of DKK 615 million (approx. EUR 82.5 million). This production has been stable over the last decade and has been achieved by adhering to strict regulations designed to avoid excess effluent of nutrients. Each farm has a maximum amount of fish that it can produce. In many cases this maximum has been reached and some farms have been forced to reduce production.

Modern production technology is employed on 25 farms that in 2009 produced 8 200 tonnes (DKK 139 million, approx. EUR 18.6 million). On these farms up to 9% of the water is recirculated. These so-called “model farms” have reduced the effluents of nutrients
considerably. The strict Danish environmental restrictions have fostered the development of cleaner technology and have had the positive by-effect that this technology is now exported all over the world where modern water recirculation is used for fish production.

Marine aquaculture started in the 1970s, but the conditions in the inner Danish waters are not ideal. There is occasional ice cover and sensitive eco-systems limit the discharge of nutrients, which limits growth of marine aquaculture. In 2010 there were 19 farms in the inner Danish waters, which produced 10 300 tonnes with a value of DKK 318 million (equivalent to approx. EUR 42.6 million).

In recent years several attempts have been made to produce mussels in the marine environments. In the sheltered areas of the Limfjord and elsewhere various arrangements for producing mussel production on ropes have been tested and success came in 2003. Since then production on 21 sites have risen to a 2 600 tonnes (value DKK 13.1 million, equivalent to approx. EUR 1.8 million).

Figure 5 below renders well the evolution of the size of the aquaculture sector and the continued preponderance of trout rearing, while Table 5 provides the detailed numbers for all aquaculture facilities in Denmark.

**Figure 5: Evolution of the number of aquaculture facilities in Denmark by type of facilities (2004-2011)**

Source: Statistics Denmark
Table 5: Number of aquaculture facilities in Denmark, 2004-2011

<table>
<thead>
<tr>
<th>Farm type</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional trout farms</td>
<td>275</td>
<td>271</td>
<td>248</td>
<td>234</td>
<td>208</td>
<td>189</td>
<td>177</td>
<td>162</td>
</tr>
<tr>
<td>Trout farms with re-circulation</td>
<td>23</td>
<td>23</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trout farms with re-circulation, type 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>16</td>
<td>14</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Trout farms with re-circulation, type 3</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Sea farms</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Eel farms</td>
<td>11</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Shellfish farms</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>11</td>
<td>10</td>
<td>21</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Other farms</td>
<td>12</td>
<td>15</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>All fish farms</strong></td>
<td><strong>348</strong></td>
<td><strong>347</strong></td>
<td><strong>325</strong></td>
<td><strong>303</strong></td>
<td><strong>280</strong></td>
<td><strong>272</strong></td>
<td><strong>257</strong></td>
<td><strong>234</strong></td>
</tr>
</tbody>
</table>

*Source: Statistics Denmark*

4.3. Inland Fisheries

Fisheries in lakes and rivers are marginal in Denmark, and are by and large only of interest to recreational fishers, with sports fishing and angling quite popular amongst Danes. Participants must have a permit. In 2011 the permit cost DKK 250 (about EUR 33.5). This fee was paid by 34 500 individuals. Another 40 000 individuals acquired a temporary (day or week) permit. There are approximately 30 000 members of the Danish Sports Angling Association. Permit-holders may fish along the Danish coasts, but fishing rights in lakes, rivers and brooks are privately held and fishing may only be done in agreement with the landowner. Several “put-and-take” lakes have been established in recent decades.
5. FISHING FLEET

At the beginning of 2013, the Danish fishing fleet comprised 2,742 registered fishing vessels with a total capacity of 65,169 GT and 230,013 kW. The main features of the average vessel are shown in Table 6 below. The Danish fleet is composed of small vessels (<12 m) for fishing with set gillnets for species of industrial purpose, the vast majority crustacean and molluscs and other species such as sprat or Norway puot.

Table 6: Characteristics of the average fishing vessel in Denmark, 2013

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross tonnage</td>
<td>23.8 tonnes</td>
</tr>
<tr>
<td>Engine power</td>
<td>83.9 kW</td>
</tr>
<tr>
<td>Length</td>
<td>9 m</td>
</tr>
<tr>
<td>Age</td>
<td>31 years</td>
</tr>
</tbody>
</table>

Data source: Community Fishing Fleet Register

Small vessels commonly using passive gears represent the bulk of the fleet (81% of the number of vessels, Figure 6). While vessels longer than 24 m account for fewer than 3% of the number of vessels, they represent more than 63% of the total gross tonnage. This segment mostly consists of large pelagic trawlers.

Table 7: The Danish fishing fleet by length category, 2013

The vast majority of the registered fishing vessels are made of fiberglass (64%), while 25% are made of wood and around 10% of metal. Since 1995 the number of vessels made of wood has decreased by 78%, while vessels made of fiberglass significantly rose in number by more than 110% and vessels made of metal remained constant.


### 5.1. Fishing gear

Most Danish vessels (around 80% of the total fleet) use set gillnets which go in pair with small vessels (<12 m). Nevertheless, the remaining 20% of the fleet is made of vessels using bottom otter trawls (13%), boat dredges (3%) and other kinds of fishing gear, which correspond mostly to vessels longer than 24 m. Indeed, vessels equipped with bottom otter trawls dominate the capacity of the Danish fleet (53% of the gross tonnage and 43% of the engine power). Midwater otter trawls, which only represent 0.4% of the total fleet, account for 11% of the gross tonnage. Set gillnets, the most commonly used fishing gear in terms of the number of vessels, account for less than 20% of the gross tonnage.

**Figure 6: Evolution of the gross tonnage of vessels using the main fishing gears, 1995-2013**

More than half of the fishing vessels (57.9%) are considered to be specialised, but this category represents only 45.4% of the gross tonnage of the Danish fleet. The remaining 48.3% of the gross tonnage remains with non-specialised vessels which account for 36.5% of the total number of vessels. The non-specialised vessels include most of the vessels equipped with bottom otter trawls, while the vast majority of vessels equipped with set gillnets are included in the specialised category.
### Table 8: Main fishing gear used by the Danish fleet, 2013

<table>
<thead>
<tr>
<th>CODE</th>
<th>GEAR</th>
<th>VESSELS</th>
<th>TONNAGE</th>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>No.</strong></td>
<td><strong>%</strong></td>
<td><strong>GT</strong></td>
<td><strong>kW</strong></td>
</tr>
<tr>
<td>GNS</td>
<td>Set Gillnets</td>
<td>2 201</td>
<td>80.3%</td>
<td>12 673</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTB</td>
<td>Bottom otter trawls</td>
<td>359</td>
<td>13.1%</td>
<td>34 387</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td>Purse seines</td>
<td>3</td>
<td>0.1%</td>
<td>5 782</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTM</td>
<td>Midwater otter trawls</td>
<td>12</td>
<td>0.4%</td>
<td>7 096</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRB</td>
<td>Boat dredges</td>
<td>73</td>
<td>2.7%</td>
<td>1 468</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDN</td>
<td>Danish seines</td>
<td>35</td>
<td>1.3%</td>
<td>1 842</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBB</td>
<td>Beam trawl</td>
<td>15</td>
<td>0.5%</td>
<td>1 405</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLS</td>
<td>Set longlines</td>
<td>34</td>
<td>1.2%</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHER</td>
<td></td>
<td>8</td>
<td>0.3%</td>
<td>414</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>2 740</td>
<td>100%</td>
<td>65 166</td>
</tr>
</tbody>
</table>

**Data source:** Community Fishing Fleet Register
Table 9: Fishing gear used by the Danish fleet (main gear - subsidiary gear), 2013

<table>
<thead>
<tr>
<th>CODE</th>
<th>VESSELS</th>
<th>TONNAGE</th>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>GT</td>
</tr>
<tr>
<td>OTB NO</td>
<td>121</td>
<td>4.4%</td>
<td>17 965</td>
</tr>
<tr>
<td>GNS NO</td>
<td>443</td>
<td>16.2%</td>
<td>5 015</td>
</tr>
<tr>
<td>GNS GNS</td>
<td>948</td>
<td>34.6%</td>
<td>3 571</td>
</tr>
<tr>
<td>SDN NO</td>
<td>21</td>
<td>0.8%</td>
<td>955</td>
</tr>
<tr>
<td>TBB NO</td>
<td>6</td>
<td>0.2%</td>
<td>804</td>
</tr>
<tr>
<td>DRB NO</td>
<td>18</td>
<td>0.7%</td>
<td>802</td>
</tr>
<tr>
<td>DRB DRB</td>
<td>29</td>
<td>1.1%</td>
<td>443</td>
</tr>
<tr>
<td>Specialised</td>
<td>1 586</td>
<td>57.9%</td>
<td>29 554</td>
</tr>
<tr>
<td>OTB OTB</td>
<td>67</td>
<td>2.4%</td>
<td>8 060</td>
</tr>
<tr>
<td>PS OTB</td>
<td>3</td>
<td>0.1%</td>
<td>5 782</td>
</tr>
<tr>
<td>OTM OTB</td>
<td>8</td>
<td>0.3%</td>
<td>3 435</td>
</tr>
<tr>
<td>OTB OTM</td>
<td>20</td>
<td>0.7%</td>
<td>2 896</td>
</tr>
<tr>
<td>OTB GNS</td>
<td>127</td>
<td>4.6%</td>
<td>2 731</td>
</tr>
<tr>
<td>OTB PS</td>
<td>2</td>
<td>0.1%</td>
<td>1 344</td>
</tr>
<tr>
<td>OTM PS</td>
<td>1</td>
<td>0.0%</td>
<td>1 424</td>
</tr>
<tr>
<td>GNS OTB</td>
<td>174</td>
<td>6.4%</td>
<td>1 914</td>
</tr>
<tr>
<td>GNS LLS</td>
<td>302</td>
<td>11.0%</td>
<td>1 239</td>
</tr>
<tr>
<td>OTB SDN</td>
<td>9</td>
<td>0.3%</td>
<td>937</td>
</tr>
<tr>
<td>SDN OTB</td>
<td>7</td>
<td>0.3%</td>
<td>759</td>
</tr>
<tr>
<td>GNS LTL</td>
<td>49</td>
<td>1.8%</td>
<td>300</td>
</tr>
<tr>
<td>TBB OTB</td>
<td>7</td>
<td>0.3%</td>
<td>445</td>
</tr>
<tr>
<td>GNS GND</td>
<td>225</td>
<td>8.2%</td>
<td>190</td>
</tr>
<tr>
<td>Non specialised</td>
<td>1 001</td>
<td>36.5%</td>
<td>31 455</td>
</tr>
<tr>
<td>Other</td>
<td>153</td>
<td>5.6%</td>
<td>4 156</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2 740</td>
<td>100%</td>
<td>65 166</td>
</tr>
</tbody>
</table>

Data source: Community Fishing Fleet Register

---

8 Gear corresponding to each code is indicated in Table X. NO = no subsidiary gear is indicated
5.2. Fishing ports

A total of 591 fishing ports are currently registered in Denmark. However, in 2013 only 295 of them had at least one registered fishing vessel, and only 74 ports host more than ten vessels. The Central Denmark Region concentrated around 33% of the total number of vessels, followed by the Sealand Region with 22%. Looking at fleet capacity, the Central Denmark Region concentrated 41% of the gross tonnage, and North Denmark Region nearly 35%, while the Sealand Region accounted for just 3% of the gross tonnage.

The main Danish fishing port in terms of fleet capacity is Thyborøn (Table 10, Map 5), which accounts for ca. 20% of the total gross tonnage of the Danish ports. Other significant ports include Hirtshals and Skagen, both in the North Region, with 16% and 12% of the gross tonnage respectively.

Table 10: The main fishing ports in Denmark, 2013

<table>
<thead>
<tr>
<th>PORT</th>
<th>REGION</th>
<th>VESSELS</th>
<th>TONNAGE</th>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>GT</td>
<td>kW</td>
</tr>
<tr>
<td>SKAGEN</td>
<td>NORTH REGION</td>
<td>61</td>
<td>7 718</td>
<td>12%</td>
</tr>
<tr>
<td>ESBJERG</td>
<td>SOUTHERN REGION</td>
<td>30</td>
<td>4 374</td>
<td>7%</td>
</tr>
<tr>
<td>HVIDE SANDE</td>
<td>CENTRAL REGION</td>
<td>166</td>
<td>3 770</td>
<td>6%</td>
</tr>
<tr>
<td>THYBORØN</td>
<td>CENTRAL REGION</td>
<td>123</td>
<td>12 731</td>
<td>20%</td>
</tr>
<tr>
<td>HANSTHOLM</td>
<td>CENTRAL REGION</td>
<td>109</td>
<td>5 742</td>
<td>9%</td>
</tr>
<tr>
<td>HIRTSHALS</td>
<td>NORTH REGION</td>
<td>111</td>
<td>10 465</td>
<td>16%</td>
</tr>
<tr>
<td>NEXØ</td>
<td>CAPITAL REGION</td>
<td>36</td>
<td>3 512</td>
<td>5%</td>
</tr>
<tr>
<td>GILLELEJE</td>
<td>CAPITAL REGION</td>
<td>57</td>
<td>957</td>
<td>1%</td>
</tr>
<tr>
<td>KARREBÆKSMINDE</td>
<td>SEALAND REGION</td>
<td>49</td>
<td>124</td>
<td>0%</td>
</tr>
<tr>
<td>RØDVIG</td>
<td>SEALAND REGION</td>
<td>41</td>
<td>515</td>
<td>1%</td>
</tr>
</tbody>
</table>

Data source: Community Fishing Fleet Register

One point worth noting is that almost all the main important ports are situated on the West coast of Denmark, on the North Sea, including the three ports with the biggest capacity, i.e. Thyborøn, Hirtshals and Skagen (Map 5). Just one port, Nexø, is situated in the Baltic Sea, on Bornholm Island -thus formally falling under the Capital Region.
Map 5: Location of the main fishing ports in Denmark. The gross tonnage is indicated.

Data source: Community Fishing Fleet Register

5.3. Evolution of the fishing fleet

In the 1995-2013 period, the Danish fleet suffered a steep decline. In 2013, the total number of vessels is half that of 1995, while the fleet capacity decreased by somewhat less and is now 40% smaller than in 1995. (Figure 7).

Figure 7: Evolution of the Danish fishing fleet in terms of number of vessels, gross tonnage and engine power, 1995-2013
Nevertheless, analysing the decrease of total number of vessels and fleet capacity per different length, under 12m, 12-24m, and over 24m, it is possible to discern some differences. (Figures 8 and 9). Most recently, vessels over 24m have dropped in number in more rapidly than other vessels, but over the same period, the fleet capacity for this kind of vessels has remained stable. Since 2006, the number of vessels under 12m has been more or less stable; since 1995, their fleet capacity has seen a greater reduction than for other vessels.

**Figure 8: Evolution of the Danish fishing fleet in terms of number of vessels by different lengths, 1995-2013**

Data source: Community Fishing Fleet Register

**Figure 9: Evolution of the Danish fishing fleet in terms of gross tonnage by different lengths, 1995-2013**

Data source: Community Fishing Fleet Register
6. PROCESSING INDUSTRY, TRADE, EMPLOYMENT

6.1. Processing Industry

The fish processing industry is scattered all over Denmark, but – naturally - most factories are found in Northern Jutland not far from the landing sites. Another reason for the concentration in North Jutland is that this region is a transport hub for the marine traffic which inter alia brings fish and shellfish to Denmark. Export of fresh and chilled fish is taken care of by many small enterprises that engage in sorting, filleting, packing and transporting fish. Fish, local landings as well as imports, are processed by medium to large fishing industries. The processing includes: filleting, smoking, curing, freezing, and canning. In many locations these downstream activities are important as they provide much employment in the fishing communities. Part of the Danish landings (industrial fisheries for sprat, herring) is destined for the production of fish meal and fish oil.

6.2. Trade

Commercial fish catches and aquaculture production have for many years made up a substantial part of commodities exported from Denmark, accounting for around 4% of the total export value in 2009. Today Denmark also imports large volumes of unprocessed fish from the Faeroe Islands, Greenland, Norway and Russia. Much of this fish is processed and exported. This makes Denmark a major supplier of seafood products to the European Union. In fact the EU receives about 85% of Danish seafood exports.

Danish imports of fish and fishery products support a large part of the Danish fish processing industry. The value of imports equalled 171% of the value of the Danish landings in 2009. Imports arrive from foreign fishing vessels landing their catch in one of the Danish fishing harbours, or they originate in fish landed abroad, and then bought and brought to Denmark by ship or lorry. Figure 10 shows the distribution of the value of the import on various product groups in 2009. Three groups make up little over half of the imports. They are: whole fish, fillets and prepared-preserved fish.
Fish exports are composed of a number of very different products (Figure 11). The three large groups - whole fish, fillets and prepared/preserved fish - make up 56% of the exports, but fish meal and oil, as well as freshwater fish and various shellfish (Norway lobster, shrimps, and blue mussels) are also prominent.

The table below provides the detailed figures for all trade in fish and fisheries products, grouped by countries, in 2011.
### Table 11: Danish foreign trade in fish and fish products, 2011 (Weight/Value)

<table>
<thead>
<tr>
<th></th>
<th>Import</th>
<th></th>
<th>Export</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight in tonnes</td>
<td>Value in 1,000 DKK</td>
<td>Part of value in %</td>
<td>Weight in tonnes</td>
</tr>
<tr>
<td>EU-countries</td>
<td>622 341</td>
<td>4 094 441</td>
<td>29.73</td>
<td>600 558</td>
</tr>
<tr>
<td>Belgium and Luxembourg</td>
<td>1 608</td>
<td>58 354</td>
<td>0.42</td>
<td>11 531</td>
</tr>
<tr>
<td>Cyprus</td>
<td>10</td>
<td>251</td>
<td>0.00</td>
<td>1 824</td>
</tr>
<tr>
<td>Estonia</td>
<td>4 592</td>
<td>53 850</td>
<td>0.39</td>
<td>4 631</td>
</tr>
<tr>
<td>Finland</td>
<td>37 146</td>
<td>63 650</td>
<td>0.46</td>
<td>12 207</td>
</tr>
<tr>
<td>Romania</td>
<td>111</td>
<td>6 313</td>
<td>0.05</td>
<td>1 714</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>1 763</td>
</tr>
<tr>
<td>France (incl. Monaco)</td>
<td>6 947</td>
<td>171 604</td>
<td>1.25</td>
<td>53 172</td>
</tr>
<tr>
<td>Greece</td>
<td>236</td>
<td>9 559</td>
<td>0.07</td>
<td>22 893</td>
</tr>
<tr>
<td>Netherlands</td>
<td>21 309</td>
<td>369 693</td>
<td>2.68</td>
<td>47 888</td>
</tr>
<tr>
<td>Ireland</td>
<td>8 550</td>
<td>32 875</td>
<td>0.24</td>
<td>3 479</td>
</tr>
<tr>
<td>Italy</td>
<td>746</td>
<td>31 603</td>
<td>0.23</td>
<td>44 937</td>
</tr>
<tr>
<td>Latvia</td>
<td>4 436</td>
<td>34 600</td>
<td>0.25</td>
<td>2 018</td>
</tr>
<tr>
<td>Lithuania</td>
<td>16 497</td>
<td>59 648</td>
<td>0.43</td>
<td>1 549</td>
</tr>
<tr>
<td>Malta</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>240</td>
</tr>
<tr>
<td>Poland</td>
<td>64 240</td>
<td>566 488</td>
<td>4.11</td>
<td>44 040</td>
</tr>
<tr>
<td>Portugal</td>
<td>197</td>
<td>7 581</td>
<td>0.06</td>
<td>1 437</td>
</tr>
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<td>0.00</td>
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<td>66 865</td>
<td>0.49</td>
<td>17 271</td>
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<td>117 574</td>
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<td>266 304</td>
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<td>0.02</td>
<td>4 624</td>
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<tr>
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<td>1 325 906</td>
<td>9.63</td>
<td>147 083</td>
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<tr>
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<td>1 149</td>
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<td>45</td>
<td>2 681</td>
<td>0.02</td>
<td>3 956</td>
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<td>20.37</td>
<td>206 661</td>
</tr>
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<td>50 970</td>
<td>418 446</td>
<td>3.04</td>
<td>15 340</td>
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<tr>
<td>Liechtenstein</td>
<td>0</td>
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<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>Norway</td>
<td>210 844</td>
<td>2 386 310</td>
<td>17.33</td>
<td>184 267</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5</td>
<td>1 309</td>
<td>0.01</td>
<td>7 052</td>
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<tr>
<td>Other countries</td>
<td>348 567</td>
<td>6 873 062</td>
<td>49.90</td>
<td>153 563</td>
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<tr>
<td>Greenland</td>
<td>106 763</td>
<td>2 413 978</td>
<td>17.53</td>
<td>4 225</td>
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<td>Faroe Islands</td>
<td>34 296</td>
<td>926 233</td>
<td>6.72</td>
<td>23 054</td>
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<td>68 654</td>
<td>0.50</td>
<td>15 983</td>
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<td>The Far East</td>
<td>20 605</td>
<td>754 085</td>
<td>5.47</td>
<td>52 369</td>
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<td>Canada</td>
<td>24 417</td>
<td>978 312</td>
<td>7.10</td>
<td>9 817</td>
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<td>United States of America</td>
<td>50 251</td>
<td>610 100</td>
<td>4.43</td>
<td>2 787</td>
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<tr>
<td>World total</td>
<td>1 232 727</td>
<td>13 773 568</td>
<td>100.00</td>
<td>960 782</td>
</tr>
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</table>

Source: the Danish AgriFish Agency
6.3. Employment

The total number of fishing enterprises in the Danish fleet was 1,574 in 2010. The near-totality of fishing enterprises owned a single vessel, and 4% of enterprises owned two to five fishing vessels. Only 1 fishing enterprise owned six or more active fishing vessels. (European Commission, 2012)

Employment in the fisheries sector has significantly decreased since 2000. In fact, the employment in 2009 was around 45% lower than in the beginning of the decade, when almost 16,000 persons worked in fisheries, production, aquaculture, sales, etc. Total employment in 2009 was under 9,000 employees. (Figure 12)

Figure 12: Evolution of the employment in fisheries sector in Denmark, 2000-2009

Most jobs in the fisheries sector are located in the three regions which compose the Jutland peninsula, as well as the Capital region. (Table 12). By sub-sector, production, mainly the processing and preserving of fish, crustaceans and molluscs, has the biggest share of employment (Figure 13). It accounts for 46% of the total employment in the fisheries sector, where more than half of the jobs are held by women (making production the only sub-sector where more women are employed than men).

Employment in aquaculture accounts for only 5% of the total employment in fisheries, with jobs in freshwater aquaculture mainly held by men in the Central Region or the Region of Southern Denmark.

As the size of fishing fleet declines, fishing is being concentrated in fewer harbours. Formerly important fishing communities in Esbjerg, Frederikshavn, Grenå (all in Jutland) have more or less disappeared in recent years. The same fate has met several minor harbours spread along the shores of the Danish islands.
Figure 13: Employment in fisheries and aquaculture in Denmark, 2009

Table 12: Employment by fisheries sub-sector, region and gender, 2009

<table>
<thead>
<tr>
<th>REGION</th>
<th>FISHERIES</th>
<th>FISHING</th>
<th>AQUACULTURE</th>
<th>PRODUCTION</th>
<th>WHOLE/RETAIL SALE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUTS-2</td>
<td>TOTAL M</td>
<td>F</td>
<td>Total</td>
<td>M</td>
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<tr>
<td>North Region</td>
<td>3.553</td>
<td>654</td>
<td>26</td>
<td>680</td>
<td>80</td>
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<tr>
<td>Central Region</td>
<td>1.792</td>
<td>553</td>
<td>22</td>
<td>575</td>
<td>162</td>
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<tr>
<td>Southern Denmark</td>
<td>2.167</td>
<td>302</td>
<td>9</td>
<td>311</td>
<td>136</td>
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<tr>
<td>Capital Region</td>
<td>939</td>
<td>255</td>
<td>6</td>
<td>261</td>
<td>3</td>
</tr>
<tr>
<td>Sealand Region</td>
<td>543</td>
<td>227</td>
<td>6</td>
<td>233</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.994</strong></td>
<td><strong>1.991</strong></td>
<td><strong>69</strong></td>
<td><strong>2.060</strong></td>
<td><strong>391</strong></td>
</tr>
</tbody>
</table>

Source: Danish AgriFish Agency. Ministry of Food, Agriculture and Fisheries
7. FISH MARKET

Denmark is a major exporter of fish products. In 2007 it was ranked sixth in the world. At the same time, Denmark is a major importer of fish, which is processed and re-exported.

The retail market for fish and fishery products is small when compared with the large quantities of fish that are processed in the country. The Danish annual per capita consumption is about 22 kilograms per year, which is close to the European average. In fact, the Danish businesses that sell fish on the European market find this market to be more attractive than the Danish market. The biggest markets are found in Germany and Italy (Figure 14). Investments by Danish fish traders are therefore often made in foreign markets, while fish marketing campaigns aiming to improve public health through increased fish consumption in Denmark are often supported by the Danish authorities.

Figure 14: Exports of fish and fishery products by country (million EUR)

Imports originate mainly from fisheries conducted in the North-east Atlantic area (Figure 15). Salmon and herring are imported from Norway, and cold water shrimp from Greenland and Canada. Whitefish has traditionally been supplied by Norway and the Faeroe Islands, but supplies are widening. Falling European supplies of cod are replaced partially by import of Alaska Pollack from the USA and Russia, hoki from New Zealand and Pangasius from South-east Asia.
Figure 15: Imports of fish and fishery products by country (million EUR)

Source: FAO, Fisheries and Aquaculture Department
8. RESEARCH, EDUCATION AND TRAINING

8.1. Research

A major restructuring of Danish research took place in 2007. As a result the majority of research on fish biology is now part of the Danish Technological University (DTU). Previously it was handled by the Ministry of Food, Agriculture and Fisheries. The restructuring resulted in a merger of the Danish Institute for Fisheries Research (DIFRES) and the DTU, which became “DTU Aqua”. The various national and international obligations within research, monitoring and data collection are performed by DTU-Aqua upon request from the Ministry.

DTU handles fisheries and aquaculture, health and food safety, as well as environmental technology. Examples of research topics are:

- Low-impact, selective and effective fishing methods;
- Simulation models describing selectivity of different nets;
- Energy-friendly fishing;
- Models and tools for evaluating fisheries options and management;
- Models for estimating the impact of fishing on ecosystems; and,
- Indicators for the condition of and pressures on fish stocks and fisheries.

In the University of Aalborg the Institute for Innovative Fisheries Management (IFM) focuses on questions of governance within an ecosystem-based approach to marine management. IFM is specialised in cross-disciplinary collaboration. Main research areas in IFM are:

- Fisheries co-management;
- Social impact assessments; and,
- Coastal community development.

Several approved technological institutes take part in fisheries research. Among them are FORCE Technology which has hydrodynamic expertise in ship hulls and propulsion systems and the Technological Institute (TI), with expertise in fish processing and environmental aspects of food production.

Some of the above institutions are present in the fisheries centre in Hirtshals, The North Sea Science Park (previously known as The North Sea Centre). The large Norwegian science foundation SINTEF Fisheries and Aquaculture also has an office in the North Sea Science Park, where it manages a large 1 200 m³ flume tank.

Denmark is a global hub for the development of fishing gear (in particular towed gears like trawls and the Danish Seine) and to some extent the development and production of fish processing equipment - the result a close and fruitful cooperation between the fishing and processing sectors and (semi-) governmental research institutes. Through cooperative EU research projects the trawl flume tank in Jutland is, for example, the European centre for development of selective and environmental friendly fishing gear.
8.2. The International Council for the Exploration of the Sea (ICES)

Established in 1902 and thus the world’s oldest intergovernmental science organization, ICES is headquartered in Copenhagen, Denmark, where its multinational Secretariat staff of 51 maintain a leading multidisciplinary scientific forum for the exchange of information and ideas on all aspects of marine sciences pertaining to the North Atlantic, including the adjacent Baltic Sea and North Sea, and for the promotion and coordination of marine research by scientists within its member nations. Its principal functions, both when it was established and continuing to the present time, are to:

(i) promote, encourage, develop, and coordinate marine research;
(ii) publish and otherwise disseminate results of research; and
(iii) provide non-biased, non-political scientific advice to member nation governments and international regulatory commissions.

ICES ensures that best available science is accessible for decision-makers to make informed choices on the sustainable use of the marine environment and ecosystems.

The main ICES deliverables are scientific publications, and scientific information and management advice requested by member countries and also international organizations and commissions such as the Oslo Paris Commission (OSPAR), the Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM), the North East Atlantic Fisheries Commission (NEAFC), the North Atlantic Salmon Conservation Organization (NASCO), and the European Commission (EC). Importantly, these products are unbiased, non-political in nature, and based on the best available science.

The Advisory Committee (ACOM) provides advice to clients on fisheries and marine ecosystem issues and the Science Committee (SCICOM) oversees all aspects of the scientific work. Working under ACOM are advice drafting groups, review groups, expert groups, and data/benchmark workshops.

SCICOM is composed of five steering groups, and their subordinate expert groups:

- Ecosystem Functions (SSGEF);
- Human Interactions on Ecosystems (SSGHIE);
- Sustainable Use of Ecosystems (SSGSUE);
- Regional Sea Programmes (SSGRSP); and
- Ecosystem Surveys Science and Technology (SSGESST).

Five operational groups, the Data and Information Group (DIG), ICES Publications and Communications Group (PUBCOM), ICES Training Programme, and the Annual Science Conference Group, all report directly to SCICOM, but also work closely with the Advisory Programme.

ACOM and SCICOM share joint activities in the following strategically important areas:

- ACOM/SCICOM Strategic Initiative on Stock Assessment Methods (SISAM);
- ACOM/SCICOM Strategic Initiative on Biodiversity Science and Advice (SIBAS);
- ICES/PICES Strategic Initiative on Climate Change Effects on Marine Ecosystems (SICCME).

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9 Eight founding nations: Denmark, Finland, Germany, the Netherlands, Norway, Sweden, Russia, and the United Kingdom; today, 20 countries including, outside Europe, Canada, the Russian Federation and the United States of America.
8.3. Education and Training

Young persons, 16–18 years old, who want to engage in fishing, must take a 2-year course to obtain a “Blue Certificate”. Older persons must pass a 3-week training course in safety and basic seaman-ship that is mandatory for everyone who wants to work on a fishing vessel.

A 2-year education for fishermen is offered at the Fisheries Training Centre in Thyborøn. Students are given basic training in safety and health, seaman-ship, navigation, engines, hydraulics, use of radio and other communication systems.

Fishing masters are trained at the Skippers School in Skagen, which provides courses for those who want to become Fishing Master of 3rd degree (restricted) and Fishing Master of 1st degree (unlimited), both according to international agreements.

Both of the above schools also run a wide range of vocational training courses. (FAO, Fisheries and Aquaculture Department)
REFERENCES

## ANNEX: COMPLETE FAO STATISTICS FOR DENMARK, 2013

<table>
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<td>23.3</td>
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<td>1541.2</td>
<td>790.5</td>
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<td>35.2</td>
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<td>36.3</td>
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<td>716.2</td>
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<td><strong>EMPLOYMENT (thousands)</strong></td>
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<td></td>
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<td>4.6</td>
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<td><strong>FLEET (thousands boats)</strong></td>
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<td></td>
</tr>
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</table>
| Fish food supply (thousand tonnes in live weight equivalent) | 107.0 | 116.7 | 120.0 | 128.7 | 126.2 | ...
| Per Capita Supply (kilograms) | 20.9 | 22.7 | 22.5 | 23.3 | 22.7 | ...
| Fish Proteins (grams per capita per day) | 9.4 | 8.2 | 5.9 | 8.5 | 9.1 | ...
| Fish/Animal Proteins (per cent) | 16.6 | 12.5 | 8.7 | 12.3 | 12.5 | ...
| Fish/Total Proteins (per cent) | 10.6 | 8.3 | 5.6 | 7.8 | 7.9 | ...

1) Excluding aq. plants

2) Due to rounding total may not sum up
Denmark — Composition of capture production — 2011

Denmark — Aquaculture production

Denmark — Major species groups in aquaculture production
Denmark – Import and export value of fish and fishery products

Denmark – Major species groups in import

Denmark – Major species groups in export
Denmark — Per capita supply of fish and fishery products

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