**Food and Agriculture
Organization of the
United Nations**

Techno-economic performance review of selected fishing fleets in Europe

Techno-economic performance review of selected fishing fleets in Europe

by

Natacha Carvalho
European Commission Joint Research Centre
Ispra, Italy

Raymon van Anrooy
Fishing Operations and Technology Branch
FAO Fisheries and Aquaculture Department
Rome, Italy

Terje Vassdal
Arctic University of Norway
Tromsø, Norway

Murat Dağtekin
Central Fisheries Research Institute of Turkey
Trabzon, Turkey

Preparation of this document

This publication on the techno-economic performance of selected marine fishing fleets in Europe was prepared in 2019–2020 by Dr Natacha Carvalho of the European Commission Joint Research Centre, Dr Raymon van Anrooy of the FAO Fisheries and Aquaculture Department, Dr Terje Vassdal of the Arctic University of Norway and Dr Murat Dağtekin of the Central Fisheries Research Institute of Turkey. The publication is largely based on the data collected by national governments within the European Union Data Collection Framework (DCF) and by the Directorate of Fisheries in Norway and the Turkish Statistical Institute. The information presented uses the data of 2016 as base year for comparison purposes. The information is completed in some cases with additional data from 2017 and from surveys conducted in 2019. The document includes eight national review studies of the main marine capture fisheries fleet segments of the following European countries: Denmark, France, Germany, Italy, Norway, Spain, Turkey and the United Kingdom of Great Britain and Northern Ireland.

The methodology for conducting the national review studies was discussed and agreed at the FAO/Bay of Bengal Programme – Intergovernmental Organization (BOBP-IGO). Expert meeting on methodologies for conducting fishing fleet techno-economic performance reviews, which was held in Chennai, India, on 18–20 September 2018.[1] Following the preparation of the draft national review studies in 2019 an Expert meeting to validate the outcomes and finalize the techno-economic performance review of the main global fishing fleets was held at FAO headquarters in Rome, Italy, on 8–10 October 2019. This latter expert meeting considered it important to publish not just a global review, but to the complete the national review reports and produce also regional reviews for Europe, North and South America, Africa and Asia. This publication on the techno-economic performance of selected fishing fleets in Europe, will thus be accompanied by similar regional reviews for the other regions.

This publication was formatted by Ms Estefanía Burgos and editorial and design assistance was provided by Ms Magda Morales, Ms Marianne Guyonnet and Ms Chorouk Benkabbour of the FAO Fisheries and Aquaculture Department.

---

[1] The report of this Expert Meeting is available online at: www.fao.org/3/ca4427en/ca4427en.pdf

Abstract

This techno-economic performance review of selected fishing fleets in Europe presents the findings of eight European country level studies. The country studies are based on fishing fleet data from 2016 collected by the governments of Denmark, France, Germany, Italy, Spain and the United Kingdom of Great Britain and Northern Ireland within the European Union Data Collection Framework, the Directorate of Fisheries in Norway and the Turkish Statistical Institute, and include also information from surveys conducted in 2019. This regional review was carried out as part of the 2020 FAO Review of the techno-economic performance of the main global fishing fleets. This European regional review includes financial and economic information of 42 fishing fleet segments, including demersal trawlers, purse seiners, pelagic trawlers, long-liners, coastal fishing vessels using passive gears, pots and traps fishing vessels and small-scale hand-liners.

Analysis of the costs and earnings data of 42 of the main fishing fleet segments in Europe showed that all types of vessels had a positive gross cash flow. The average net profit margin of the fishing fleet segments covered in this review was very good with 20 percent. All fleet segments presented positive results in terms of their capital productivity, as the return on fixed tangible assets (ROFTA) was positive. Eighty-five percent of the fishing fleet segments showed ROFTAs of 10 percent and higher. However, thirty-eight percent of the fleet segments demonstrated return on investment (ROI) percentages below 10 percent. On average the highest ROI percentages were realized in 2016 by the demersal trawler of 12–18 m and the purse seine fleet segments.

Comparing the 2016 financial and economic performance results with those of some of the same fleet segments included in the 2002–2003 review study, it is clear that in general fishing fleet performance in Europe improved. Revenues increased faster than costs for most fleet segments. Lower fuel costs and higher seafood prices compared to 2014 and 2015 contributed to the performance improvements in 2016. The highest revenues were made in 2016 by distant water tuna purse seine, pelagic trawlers and deep sea trawler fleets. Revenues by coastal and small-scale vessels were generally substantially lower. The labour costs and running costs were the largest cost components for most fishing fleets in Europe.

All eight countries covered in the review saw a decrease in the number of fishing vessels. These major European fishing countries together reduced the number of active commercial fishing vessels between 2008 and 2016 with 10 percent, from nearly 60 000 to less than 54 000 vessels. All countries covered in this review also saw a reduction in total fleet capacity in gross tonnage (GT) and kilowatts (kW). Moreover, the age structure of the fishing fleets showed an increasing trend for most fleet segments. Few new fishing vessels entered the fleets in 2016.

Contents

Acknowledgements

Acronyms and abbreviations

AER	Annual Economic Report (EU)
AIS	automatic identification system
CFP	Common Fisheries Policy (EU)
DCF	Data Collection Framework (EU)
EBIT	Earnings before interest and taxes
EBITDA	earnings before interest, taxes, depreciation and amortization
EIB	European Investment Bank (EU)
EMFF	European Maritime Fisheries Fund (EU)
EU	European Union
FTE	fulltime-equivalent (employment figures)
GBP	British pound sterling
GPS	Global positioning system
GSA	Geographic subarea of the General Fisheries Commission for the Mediterranean
GT	gross tonnage
GVA	gross value added
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
IOTC	Indian Ocean Tuna Commission
ITQ	individual transferable quotas
kW	kilowatt
LOA	length overall
MAP	multi-annual plan
MSC	Marine Stewardship Council
MSY	maximum sustainable yield
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
nm	nautical mile
OFR	French Outermost Regions
PO	Producer Organization
ROFTA	Return on Fixed Tangible Assets
STECF	Scientific, Technical and Economic Committee for Fisheries (EU)
TAC	total allowable catch
USD	United States Dollar

1. Introduction and background

The marine capture fisheries sector plays in many countries an important role in terms of generating employment, income and foreign exchange earnings. The sector also significantly contributes to meeting the nutritional requirements of the increasing global population.

The United Nations 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) recognizes that the fisheries sector offers many opportunities to reduce hunger and improve nutrition, alleviate poverty, generate economic growth and ensure better use of natural resources. In order to achieve SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development", it is imperative that fishing operations should become environmentally sustainable, socially acceptable and economically viable.

Great efforts are world-wide made towards achieving fisheries sustainable in terms of its interaction with the marine environment. A large number of academic research, conservation and fisheries management projects are focused on environmental sustainability of the fisheries sector. This results in a plethora of information being available on environmental aspects of fisheries, while the economic and social aspects of fisheries often receive much less attention.

It is important that FAO Member States and their fisheries management and decision makers are aware of the economic aspects of fishing operations, monitor the financial and economic feasibility of the fishing fleets, and compare differences between fleets and over time within fishing fleets. Information on the technological and economic performance of the fishing fleets will facilitate fisheries governance processes. Such information is also instrumental for fisheries sector stakeholders, both public and private, to decide on whether to invest in fishing fleets and fisheries related infrastructure.

Therefore, FAO and particularly its Fishing Operations and Technology Branch (FIAO) regularly conduct global studies to analyze the cost structure and economic and financial performance of fishing fleets. These studies form part of the regular monitoring of the economic and financial viability of marine capture fisheries, conducted by FAO in close cooperation with national fisheries research institutions, fisheries administrations and experts in selected countries in Asia, Africa, Latin America and the Caribbean and Europe.

The findings of previous studies carried out in 1995 to 1997, 1999 to 2000 and 2003 to 2005 respectively were reported in FAO Fisheries Technical Papers 377, 421 and 482. The findings of these studies demonstrated that in spite of fully and sometimes overexploited fisheries resources, marine capture fisheries was an economically and financially viable undertaking in the 1990s and first years of this millennium. The studies showed that marine fishing fleets generally generated sufficient revenue to cover the cost of depreciation as well as the opportunity cost of capital and generated funds for reinvestment in addition to employment, income and foreign exchange earnings.

The last FAO global fishing fleet techno-economic performance review study was done in 2002–03 and published in 2005. Since then, FAO has not conducted any major comparative study on fishing fleet performance. However, many developed countries, including Japan, Norway, the United States of America, and the European Union, have continued to carry out their fleet performance measurements in order to regularly monitor the economic and financial feasibility of their fishing sector. In view of the range of methods being applied by countries for doing techno-economic performance

evaluations of their fishing fleets, FAO, in close collaboration with BOBP-IGO, held an Expert meeting on methodologies for conducting fishing fleet techno-economic performance reviews, in Chennai, India, on 18–20 September 2018. At the meeting the advantages and disadvantages of various methodologies applied for reviewing the economic and technical performance of fishing fleets were discussed and a general sampling/survey methodology for conducting techno-economic performance reviews, which can be applied also in developing countries, was developed and agreed.

In 2018–2019 FAO collaborated with many fisheries economists world-wide to carry out national level techno-economic performance reviews of the main fishing fleets, applying the agreed methodology. These national reviews were validated in October 2019 and published in regional review reports. This report on the techno-economic performance of selected fishing fleets in Europe, is accompanied by similar regional reviews for North and South America, Africa and Asia. The 2020 FAO Review of the techno-economic performance of the main global fishing fleets (Fisheries and Aquaculture Technical Paper No. 654) compiles the findings of the national and regional reviews and includes a comparison with the findings of previous global reviews on this subject.

The European countries that were included in the previous global fleet review studies were: France, Germany, Norway and Spain. In this review the same countries are covered, as well as Denmark, Italy, Turkey and the United Kingdom of Great Britain and Northern Ireland. The number of European fleets or fleet segments covered in the latest (2003) review was 26, while 43 fleets are covered in this review. Financial information of 42 fleet segments was available for comparative analysis.

2. Trends in fishing operations and fishing fleet compositions in Europe

The fleets covered in this regional review are the four to seven most important fleet segments of selected European countries in terms of volume and value of seafood landed. The main fishing fleet segments included in this review paper landed in 2016 between 45 percent (Turkey) and 92 percent (Germany) of the total landed volume of seafood in the eight countries. This European regional review includes a total of 43 fleet segments. The vessel types covered are: demersal trawlers (20 fleets), purse seiners (8 fleets), coastal vessels under 12 m using passive gears, such as gillnets, handlines and pots and traps (9 fleets), pelagic trawlers (5 fleets) and a surface longliner fleet.

All eight countries included in this review saw a decrease in the number of fishing vessels since the first years of this millennium. These major fishing countries saw together a reduction of 10 percent in the number of active commercial fishing vessels between 2008 and 2016, from nearly 60 000 to less than 54 000 vessels. The reduction in number was largest in Denmark and Germany with respectively 24 percent and 21 percent in fleet reduction and was smallest in the United Kingdom of Great Britain and Northern Ireland and Turkey with respectively 5 percent and 6 percent fleet reduction over this period.

The fleet capacity in gross tonnage (GT) and kilowatt (kW) also reduced in the European fishing fleets between 2008 and 2016. A distinction should be made between the active and inactive fleets. All countries covered in this review saw a reduction in total fleet capacity in GT and kW. Generally, the inactive fleet saw a larger reduction in GT and kW than the active fleet, as there were relatively more inactive vessels removed from the fishing fleet registries. Frequently active vessels are first reported as inactive and then after some years removed from the vessel registries. The reduction in GT and kW was generally between 8 percent and 26 percent for the active and inactive fishing fleets. Only in the Danish fleet a small increase in GT of 2 percent for active vessels was reported, while the total kW of the same fishing fleet decreased by 14 percent. The (reformed) EU Common Fisheries Policy (CFP) requires the Member States to reduce the fleet capacity gradually to match the status of resources. Each of the Member States has therefore a policy, programme or action plan to reduce fishing capacity, which generally includes (partial) financial compensation of fishing vessel owners for scrapping fishing vessels. Similar programmes have been implemented in recent years in Norway and Turkey.

In general, a new fishing vessel can only enter the active fishing fleet when an old vessel is removed from the fishing fleet. If a new vessel with a large GT and/or kW would like to enter the fleet, this implies that at least a similar quantity of GT or kW is removed from the active fishing fleet and thus sometimes has the consequence of removal of two or more older vessels. Most fisheries authorities in the EU Member States do not allow the full replacement of GT and kW and reduce the capacity allocated to new vessels to meet the EU capacity ceilings regulations.

The age structure of the fishing fleets in Europe shows an increasing trend for most fleet segments. This means that these fleet segments are ageing and that few fishing vessels are constructed and enter these fleets. Vessels are kept operational longer by installing new more fuel efficient engines, modernizing their fishing gear systems and use of proper maintenance and repair regimes. For example, the average age of the demersal trawlers (18–24 m) was in 2016 respectively 26 years in Denmark, 35 years in Germany, 36 years in Norway, 31 years in Italy and 29 years in the United Kingdom of Great Britain and Northern Ireland. In most of these fleet segments the average vessel age increased two to three years over the period 2003–2016. The large pelagic trawler fleet segments show substantial variations in average vessel age between a relatively young fleet of 13 years in the United Kingdom of Great Britain and Northern Ireland and a much older fleet with vessels of 33 years in Germany. Similar pelagic trawlers in Norway, Denmark and Turkey had in 2016 average ages of respectively 19, 22 and 22 years. The large purse seine vessels in France and Turkey had average ages of around 16 years in 2016, while comparable fleets in Spain and Italy showed average vessel ages of respectively 20 and 25 years. Overall, the "oldest" fleet segments can be found among the small-scale vessels (<12 m) using mostly passive gears (traps, gillnets). The average age of the small-scale vessels in 2016 was 32 years in Denmark, 27 to 29 years in Norway, 28 years in Italy, and 23 to 28 years in the United Kingdom of Great Britain and Northern Ireland. In Norway the average age of vessels smaller than 11 m in length increased since 2003 with some 5 years.

The volume of seafood landed (in live weight) per fleet segment differs largely with the target species. Detailed information on target species and landings per fleet segment can be found in the national reports. An example of the wide variety can be found in the demersal trawl fleet segments of 18–24 m. An average Danish vessel in this fleet segment landed in 2016 around 974 tonnes of seafood while an Italian trawler of the same size landed about 38 tonnes. In this fleet segment the average landings by German and the United Kingdom of Great Britain and Northern Ireland trawl fleets were respectively 65 tonnes and 259 tonnes. Among the pelagic trawler fleet segments (>40 m) the variation in volume of seafood landed is less. Danish pelagic trawlers landed some 16 000 tonnes in 2016, while similar vessels in the British and German fleets landed respectively 13 000 and 12 000 tonnes. Comparing the large purse seine fleet segments of France, Spain and Turkey, average vessels in these fleets landed respectively over 5 000 tonnes, nearly 9 000 tonnes and just over 3 000 tonnes of seafood in 2016.

In terms of value of seafood landed, and comparing the same fleets Demersal trawlers 18–24 m, and large pelagic trawlers and large purse seiners, similar variations can be observed. In 2016 an average Danish vessel in the demersal trawler fleet segment (18–14 m) landed seafood valued at around USD 1.2 million, while an Italian vessel would have landed some USD 299 000, a German vessel USD 475 000 and a vessel from the United Kingdom of Great Britain and Northern Ireland some USD 751 000. In comparison a Norwegian demersal trawler fishing for cod landed on average nearly USD 19 million of cod in 2016. Among the pelagic trawler fleet segments (>40 m) the differences in value of seafood landed are higher than in volume terms, as the average landed value of a pelagic trawler in the United Kingdom in 2016 was around USD 12 million, while for the Danish, German and Norwegian pelagic trawlers the landed values were about USD 9 million, USD 7 million and USD 6 million per vessel in the same year. The large purse seine vessels of France, Spain, Turkey and Norway, landed respectively over USD 7.7 million, USD 24.7 million, USD 2.1 million and USD 9.0 million of seafood per vessel in 2016. These major differences are again largely caused by the species targeted and landed.

3. Costs and earnings structures of European fishing fleets

In this chapter the costs and earnings structures of the selected fleet segments are compared, first by country followed by a regional comparison. As much as possible similar cost categories are applied:

Labour costs = personnel costs = labour share and wages (including social security contributions, life/accident and health insurance) (unpaid labour is excluded in EU countries' data), food, stores and other provisions and crew travel related costs.

Running costs = energy costs (including fuel, lubricants/oil/filters) and other variable costs (including harbour dues and levies, ice, bait, salt, fish selling costs and packaging materials and other related operational costs).

Vessel costs = gear replacements, repair & maintenance, vessel repair and maintenance, other non-variable costs (including vessel, equipment and employers insurance, accountancy, audit and legal fees, general expenses, subscriptions), fishing licenses, permits and quota (only annual costs) and the purchase of fishing rights (quotas).

Capital costs = depreciation (of the vessel, engine, equipment, and gears that last more than 3 years), interest and amortization of intangible assets (fishing permits, licences, etc.).

Total costs = labour costs + running costs + vessel costs + capital costs.

The costs shown for the EU Member State fleet segments and Norwegian fleet segments are derived from the official statistical reports of the EU data Collection Framework (DCF) and the Directorate of Fisheries in Norway. The cost data of Turkish fishing vessels was obtained through surveys conducted by one of the authors.

The cost components shares in relation to the total costs of the fleet segments per country are described below.

DENMARK

Labour costs were the largest cost component within the total cost in two of the six Danish fishing fleet segments included in this analysis. For the two mid-size demersal trawler segments (18–24 m and 24–40 m) the labour costs were around 33 percent of the total costs. The value of unpaid labour was not reflected in the labour cost component, but is in fact rather high in the small-scale passive gears and demersal trawlers 12–18 m segments in Denmark. If unpaid labour costs were included, labour costs would increase to 47 percent and 40 percent of total costs for these two fleets respectively. Running costs (including energy costs) were generally higher in the demersal trawler segments (23–26 percent) and vessel costs (including repair and maintenance) were the largest component for small-scale vessels under 10m using passive gears and for the demersal trawlers over 40 m. The costs of leasing quota and fishing rights, reflected in the vessel cost, was substantial (19 percent of total costs) for the large demersal trawlers over 40 m. Capital costs, including annual depreciation, were particularly important for the large pelagic trawlers (38 percent of total costs), while ranging between 15–18 percent for the other segments.

FIGURE 1
Cost items as percentage of the total costs in selected Danish fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Small-scale passive gears <10 m	15%	23%	45%	16%
Demersal trawlers 12–18 m	28%	26%	30%	16%
Demersal trawlers 18–24 m	33%	24%	25%	18%
Demersal trawlers 24–40 m	32%	26%	24%	18%
Demersal trawlers >40 m	21%	23%	41%	15%
Pelagic trawlers >40 m	21%	14%	28%	38%

■ Labour costs ■ Running costs ■ Vessel costs ■ Capital costs

FRANCE

The labour costs component was the largest cost component within the total cost in the small-scale vessel segments and demersal trawler fleets in France. The larger demersal trawler fleet segments (>18 m) spent more than one-third of total costs on running costs, which is largely caused by their relatively higher fuel expenses. In comparison the running costs of the large purse seine fleet were just over 20 percent, while for this fleet segment the vessel costs were relatively highest, due to substantial repair and maintenance costs (the leasing of quota and fishing rights are not costed in vessel costs as these are non-tradable). Given that the opportunity cost of capital for the French fleets was insignificant (less than one percent of total costs), the capital costs component was the smallest cost component for all the French fleet segments in the analysis.

FIGURE 2
Cost items as percentage of the total costs in selected French fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Hook and line vessels <10 m	50%	22%	20%	8%
Gillnetters 10–12 m	52%	19%	21%	9%
Demersal trawlers 12–18 m	44%	27%	19%	9%
Demersal trawlers 18–24 m	38%	33%	19%	10%
Demersal trawlers 24–40 m	33%	33%	23%	12%
Purse seiners >40m Long-distance fleet	36%	21%	43%	

■ Labour costs ■ Running costs ■ Vessel costs ■ Capital costs

GERMANY

Vessel costs were the largest cost component within the total cost in the small-scale vessel segment and beam trawler fleets up to 24 m in Germany. For the larger deep sea trawlers the labour costs were the most important cost component. Due to negative real interest

rates, the opportunity cost of capital for the German fleets was negative, slightly lowering capital costs, which was the smallest cost component for all segments analysed apart from the small-scale passive gear segment.

FIGURE 3
Cost items as percentage of the total costs in selected German fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Passive gears <10 m	15%	21%	43%	20%
Beam trawlers 12–18 m	33%	15%	39%	13%
Beam trawlers 18–24 m	33%	15%	39%	13%
Deep-sea trawlers 24–40 m	40%	27%	20%	12%
Deep-sea trawlers >40 m	36%	26%	19%	19%
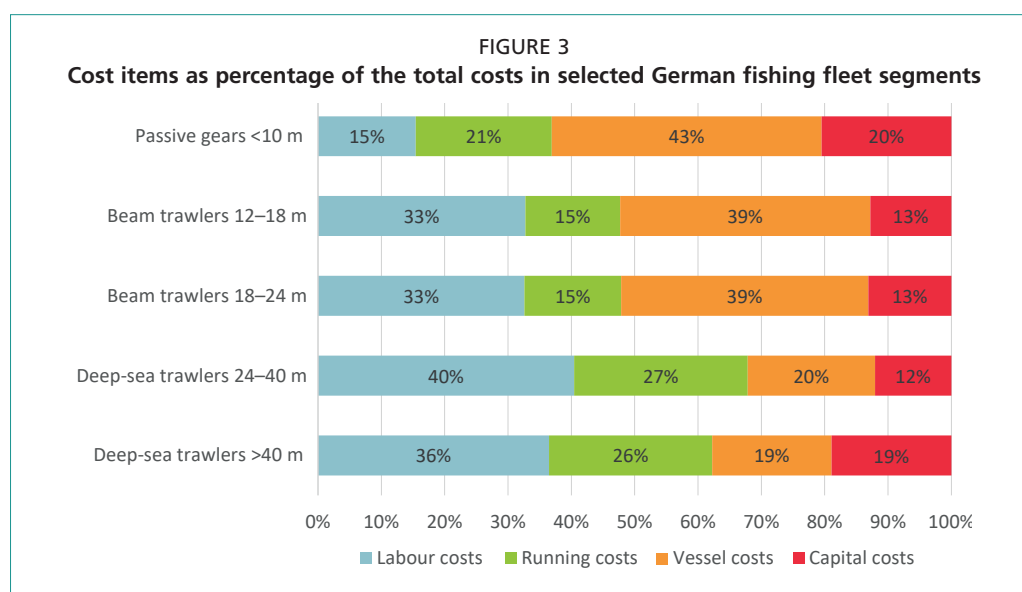
ITALY

For the Italian demersal trawler fleet segments the running costs were the largest cost component within the total costs, with energy costs alone making up 32 percent of total costs. For the purse seine fleet the labour costs were the highest cost component with just over half of the total costs. The unpaid labour in the passive gears fleet segment is however larger than the paid labour costs. If these unpaid labour costs would have been included in the calculation then the total labour costs would have been half the total annual costs of this fleet segment. The vessel costs were the smallest of the cost components for all the fleet segments (leasing of quota is not costed in the vessel costs as these are non-tradable). The capital costs component mainly consists of annual depreciation, and was the largest cost component for the small-scale fleet, when excluding unpaid labour costs.

FIGURE 4
Cost items as percentage of the total costs in selected Italian fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Passive gears 6–12 m	26%	27%	16%	30%
Demersal trawlers 12–18 m	33%	43%	10%	14%
Demersal trawlers 18–24 m	28%	41%	9%	22%
Purse seiners >40 m	52%	14%	11%	22%
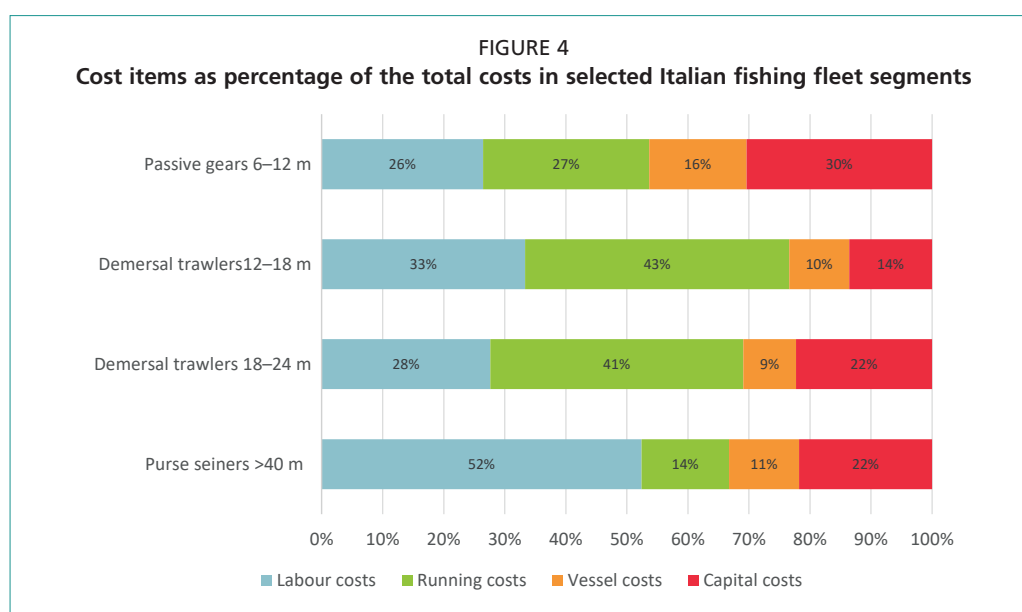
NORWAY

Labour costs were the largest cost component within the total costs of all Norwegian fishing fleet segments. The labour costs ranged between 34 percent for pelagic trawlers and 48 percent for conventional coastal vessels. The vessel costs were for four of the segments the second most important cost component and capital costs were particularly important for the purse seine and pelagic trawler fleets.

FIGURE 5
Cost items as percentage of the total costs in selected Norwegian fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Pelagic trawlers	34%	15%	24%	27%
Large seagoing purse seiners	35%	11%	26%	27%
Coastal purse seine	39%	6%	24%	30%
Coastal shrimp trawlers	41%	19%	29%	11%
Cod trawlers (demersal)	38%	17%	24%	21%
Conventional seagoing vessels	44%	15%	19%	22%
Conventional coastal vessels	48%	7%	29%	16%

■ Labour costs   ■ Running costs   ■ Vessel costs   ■ Capital costs

SPAIN

The three Spanish long-distance fleets - large purse seiners (>40 m), the surface longliners (24–40 m) and demersal trawlers (>40 m) - had relatively large running costs compared to the total cost of these fleets. Running costs were particularly high due to high variable costs and less because of energy costs. The labour costs were the most important cost component for the North Atlantic purse seine fleet (18–24 m) and the demersal trawlers (24–40 m) active in the same area. For the latter fleet segment the value of fishing quota was very high, but this was hardly reflected in the costs of leasing these quota and fishing rights. Similarly, apart from the large purse seine fleet (>40 m), the annual depreciation costs were low compared to the value of physical capital. As a consequence the capital costs reported for these segments were minimal.

FIGURE 6
Cost items as percentage of the total costs in selected Spanish fishing fleet segments

Segment	Labour costs	Running costs	Vessel costs	Capital costs
Surface longliners 24–40 m long-distance fleet	21%	60%	15%	5%
Demersal trawlers 24–40 m North Atlantic fleet	41%	33%	22%	4%
Demersal trawlers >40 m long-distance fleet	25%	53%	18%	4%
Purse seiners 18–24 m North Atlantic fleet	63%	17%	19%	1%
Purse seiners >40 m long-distance fleet	17%	53%	19%	10%

■ Labour costs   ■ Running costs   ■ Vessel costs   ■ Capital costs

TURKEY

The running costs were the main cost component within the Turkish fishing fleets total costs, amounting to 41 to 61 percent of the total costs. Particularly fuel costs and fish selling related costs were high for the Turkish fleets in 2016. Labour costs were relatively low for pelagic trawlers with only 21 percent of the costs spent on labour, while these costs added up to 37 percent for the large purse seiners (>40 m). The depreciation of the fishing vessels was generally high, which resulted in substantial capital costs particularly for bottom trawlers and purse seiners.

FIGURE 7
Cost items as percentage of the total costs in selected Turkish fishing fleet segments
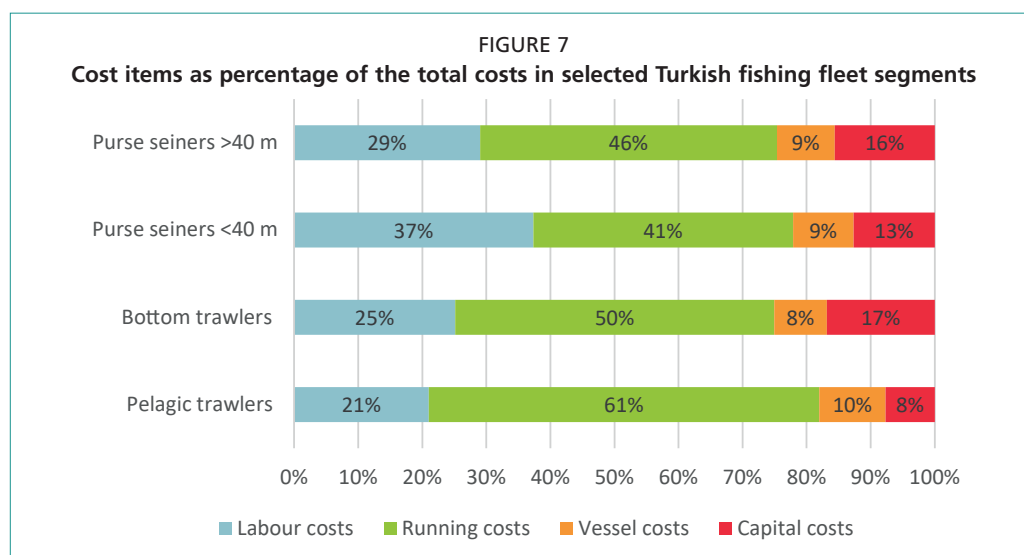
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Labour costs and running costs of the UK fleet segments covered in this review were fairly balanced. Running costs were between 25 and 43 percent and labour costs were 29 to 36 percent of the total cost of these fleets. Vessel costs added up to 32 percent of the total costs for the large pelagic trawlers (>40 m). The lease or rental of quota was a major component of vessel costs for demersal trawlers with 10 to 15 percent of the total costs, but for other fleet segments these costs were minimal. The small-scale pots and traps fishing fleet segment would have about one-quarter higher labour costs if unpaid labour was to be accounted for. Unpaid labour was not reported for the other fleet segments.

FIGURE 8
Cost items as percentage of the total costs in selected UK fishing fleet segments
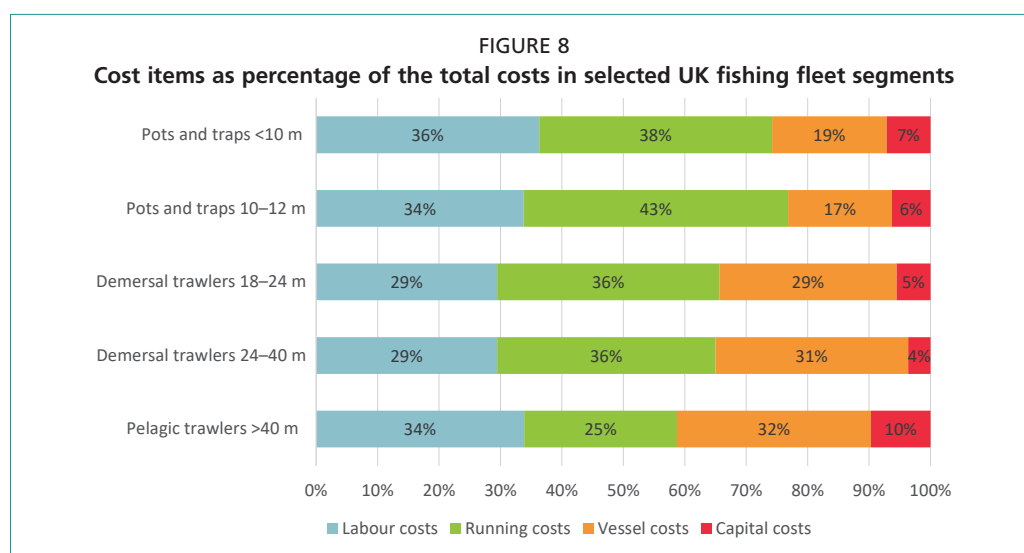
Overall, one can conclude that the labour costs and running costs are the largest cost components for most fishing fleets in Europe. Labour costs were the largest or second largest cost item in 83 percent of the EU fleets analysed; ranging from 63 percent of total costs for Spanish purse seiners18–24 m and 15 percent of total costs for Danish passive gear vessels under 10 m. For the small-scale vessels (<12 m) in most European countries the labour costs (paid and unpaid) are the highest cost component. For other fleets such as demersal trawlers, pelagic trawlers and purse seine vessels the cost components distributions are less pronounced. It was expected that running costs (because of higher fuel costs) would be the main cost component for the demersal trawl fleet segments, but this was not always the case. Fuel prices for marine fuel were at a record low in 2016 for most EU fishing fleets, which helped to reduce fuel costs (over the period 2008–2017). For the EU fishing fleet as a whole, fuel costs as a percentage of total costs were 12 percent in 2016, down from 23.5 percent in 2008. The labour costs component on the largest vessels (>40 m) was anticipated to be relatively smaller compared to running and vessel costs, but evidence for this was not found. Running costs were the largest or second largest cost item in 60 percent of the analysed fleets; ranging from 61 percent of total costs for Turkish pelagic trawlers to only 6 percent of total costs for Norwegian coastal purse seiners. Vessels costs were generally the third largest cost item (for 36 percent of the fleets analysed); ranging from 45 percent of total costs for Danish passive gear vessels under 10 m to only 8 percent of total costs for Turkish bottom trawlers. Capital costs were the smallest or second smallest cost component in 83 percent of the fleets covered; ranging from 38 percent of total costs for Danish pelagic trawlers over 40 m to one percent of total costs for Spanish purse seiners 18–24 m.

Given the large differences between fishing fleet segments and within fishing fleet segments between countries it is not possible to draw European wide conclusions regarding cost component shares for specific vessel sizes or fishing methods.

Compared to the 2003 FAO fishing fleet economic performance review it can be concluded that the cost component distribution of the French fleet segments of demersal trawlers (12–18m) and gillnetters (10–12 m) has remained unchanged. However, the same gillnetter spent in 2016 nearly USD 100 000 more per annum on labour costs than in 2003 (an increase from USD 69 000 to USD 168 000). Total costs in 2003 of a gillnetter were around USD 141 000, while in 2016 this had doubled to USD 298 000. For the demersal trawler (12–18m) fleet segment the total costs per year have increased over the same period from USD 345 000 to USD 556 000, representing a 61 percent increase.

In the Norwegian fishing fleet segments a general trend towards relatively lower labour costs is visible in 2016 data compared to 2003 data, while capital and vessel costs have relatively increased. However, when looking at the USD figures per cost component a rather steep increase of total gross costs between 2007 and 2016 for most of the fleet segments is found. For instance, the pelagic trawler fleet (114 percent), conventional coastal vessel fleet (91 percent), conventional seagoing vessel fleet (100 percent) and demersal cod trawler fleet (102 percent) all appear to have been confronted with doubling of their costs within one decade. In contrast, the large seagoing purse seine fleet saw only a total cost increase over the same period of 28 percent as the running costs of vessels in this fleet segment were actually reduced. Moreover, the coastal purse seine vessels showed an 18 percent decrease (from nearly USD 1.2 million to USD 1 million) in total costs compared to 2007, mainly due to lower vessel costs and running costs, while labour costs remained largely the same.

Similarly, in the German fleet segment of small demersal trawlers (12–18 m) the labour cost component seems to show a slight reduction, while vessel costs have been increasing. The total operational costs of an average trawler in this fleet reduced from USD 175 000 in 2003 to around USD 155 000 in 2016; a reduction of USD 20 000. These latter fleet segments present exemptions to the general rule of increasing operational and capital costs that are found in most fishing fleet segments in Europe.

The revenue of most fishing fleet segments included in this review consisted solely of income earned from sale of seafood landed. However, most of the fleet segments in Denmark, France, Germany and the United Kingdom of Great Britain and Northern Ireland had other income sources that contributed between 2 and 7 percent to the total vessel earnings.[2] Table 1 presents the average revenue from landed seafood only in thousands of USD per vessel for the various fishing fleet segments.

TABLE 1
Average revenue in thousands of USD per vessel from seafood landings in 2016 per fleet segment

Fleet segments per country	Vessels number	2016 revenue from landings (thousand USD)
Denmark		
Pelagic trawlers >40 m	22	9 286
Demersal trawlers >40 m	10	3 377
Demersal trawlers 24–40 m	34	2 382
Demersal trawlers 18–24 m	49	1 113
Demersal trawlers 12–18 m	116	376
Small-scale passive gears <10 m	774	18
United Kingdom of Great Britain and Northern Ireland		
Pelagic trawlers >40 m	28	12 171
Demersal trawlers 24–40 m	87	2 245
Demersal trawlers 18–24 m	167	751
Pots and traps 10–12 m	178	179
Pots and traps <10 m	1 814	52
Germany		
Deep-sea trawlers >40 m	7	7 373
Deep-sea trawlers 24–40 m	9	2 108
Beam trawlers 18–24 m	63	475
Beam trawlers 12–18 m	111	265
Passive gears <10 m	718	9
France		
Purse seiners >40 m	22	7 471
Demersal trawlers 24–40 m	57	2 067
Demersal trawlers 18–24 m	134	1 271
Demersal trawlers 12–18 m	153	648
Gillnetters 10–12 m	173	356
Hook and line <10 m	239	119
Spain		
Purse seiners >40 m	26	16 865
Purse seiners 18–24 m	99	475
Demersal trawlers >40 m	30	5 138
Demersal trawlers 24–40 m	107	1 054
Surface longliners 24–40 m	64	1 798
Italy		
Purse seiners >40 m	11	2 279
Demersal trawlers 18–24 m	633	299
Demersal trawlers12–18 m	1 232	157
Passive gears 6–12 m	5 144	36

---

[2]   Some more information on other income sources and income obtained from leasing out quotas can be found in the national reports.

Fleet segments per country	Vessels number	2016 revenue from landings (thousand USD)
Turkey		
Bottom trawlers	448	306
Pelagic trawlers	146	152
Purse seiners <40 m	453	831
Purse seiners >40 m		2 117
Norway		
Large seagoing purse seiners	73	9 017
Cod trawlers (demersal)	36	18 918
Conventional seagoing vessels	19	9 738
Pelagic trawlers	14	6 170
Coastal purse seine vessels	103	1 617
Coastal shrimp trawlers	103	761
Conventional coastal vessels	1 242	595

Vessels in the large pelagic trawler fleets and large purse seine fleets of >40 m made the largest revenues from seafood landings in 2016. The revenues of vessels in these fleet segments were generally above USD 6 million, with the exception of fleet segments in Italy and Turkey, which presented lower revenues. Most of the large demersal trawler fleet segments of 24–40 m realized revenues of over USD 2 million. Overall the highest revenues were made by distant water tuna purse seine, pelagic trawler and deep sea trawler fleets. Annual revenues of coastal and small-scale vessels were generally substantially lower.

4. Financial and economic performance of selected fishing fleets in Europe

Analysis of the 2016[3] costs and earnings data of 42 of the main fishing fleet segments in Europe showed that all types of vessels had a positive gross cash flow, meaning that the revenues from landings were larger than the total gross costs. Some individual fishing vessels may have shown negative figures, but average vessels in these fleet segments did not make losses. For some fleet segments a large variation in cash flow figures could be observed between vessels fishing in different areas or on specific stocks. For example, German medium sized demersal trawlers (18–24 m) fishing on Western Baltic cod showed low profitability or losses due to the poor status of the stocks. Moreover, some fleet segments were returning to profits after having been in a loss making position in 2015, such as the UK demersal trawlers and seiners of 18–24m and those of 24–40 m, as well as the French industrial purse seiners >40 m long-distant fleet. Similarly some vessels of smaller vessel fleet segments in Norway saw net losses in 2013 and 2014. Better market prices and increased landings in 2016 contributed to the profitability of these fleet segments.

To assess the economic and financial performance of the fishing vessels in the 42 fleet segments eight indicators were used:

Indicators

1. <u>Net cash flow</u> = revenue from landings - total gross costs
2. <u>Gross profit</u> = net cash flow – depreciation - amortization
3. <u>Net profit before taxes</u> = gross profit – interest
4. <u>Net profit margin</u> = net profit before taxes/revenue from landings
5. <u>Return on Fixed Tangible Assets (ROFTA)</u> = net profit before taxes/value of tangible assets
6. <u>Return on Investment (ROI)</u> = net profit before taxes/value of tangible and intangible assets
7. <u>Gross Value Added (GVA)</u> = net cash flow + labour costs
8. <u>GVA to revenue</u> = GVA/revenue from landings

The net cash flow (NCF) can be regarded as an award for entrepreneurship. A net profit margin higher than 20 percent is often considered good, while 10 percent is regarded as average in many industries. The net profit margin is a measure of profitability after all costs have been accounted for, and reflects the percentage of revenue that a vessel owner retains as profit. In this analysis it is used to measure the relative performance of a fishing vessel segment compared to other vessel segments or other activities in the economy and provides an indication of the vessel segment's operating efficiency as it captures the amount of surplus generated per unit of production.[4]

---

[3] The data presented for the Turkish fleet segments are from 2018, as these are the result of sample surveys in 2019.

[4] https://stecf.jrc.ec.europa.eu/documents/43805/1489224/2016_AER_6_METHODOLOGY.pdf

The return on fixed tangible assets (ROFTA) indicator provides a useful measure for the return on capital. A desirable result is positive as the cost of capital is taken into account. The return on investment (ROI) is the most commonly used indicator for financial performance. For the ROI any percentage higher than 10 percent is generally considered good, however in some other sectors only ROI percentages of 12 to 15 percent and higher are considered good.

The gross value added (GVA) figure is perhaps of less importance to individual vessel owners, but is an important figure for fisheries policy and decision makers. It shows the return of the fishing vessel operations to the economy, and is useful for making future fisheries sector investment and expenditure decisions. The GVA to revenue figure is expressed as percentage and provides for the share of revenue that contributes to the economy through the production factors (in this case return to labour).

Table 2 shows the financial and economic performance of the various types of vessels covered in this review.

The average net profit margin of the fishing fleet segments covered in this review was very good with 20 percent. There were only seven out of 41 fleet segments[5] which showed results below 10 percent, which were the demersal trawler segment of 18–24 m in the UK and the large demersal trawlers segments in France and the UK of 24–40 m. Some 83 percent of the vessel segments in this analysis showed good net profit margins (≥10 percent) and 46 percent of the fleet segments even demonstrated very good margins of over 20 percent. The highest net profit margins could be found among purse seine fleet segments, but also some of the demersal trawl segments showed high profit margins.

All fleet segments covered in the review presented positive results in terms of their capital productivity, as the ROFTA was positive. Eighty-five percent of the fishing fleet segments showed ROFTAs of 10 percent and higher, which can be considered good. More than one quarter of the fleet segments (27 percent) demonstrated rather low return on investment (ROI) percentages below the benchmark of 7 percent. Particularly all Danish fishing fleet segments included in the analysis and four out of seven Norwegian fleet segments did not reach the benchmark figure. On the other hand, 44 percent of the fleet segments showed ROIs of 20 percent or more, indicating very good financial and economic results of these fleets. All Spanish and Turkish fleet segments covered in this review had good ROIs of 10 percent or higher.

The GVA to revenue indicator of all 42 fleet segments analysed ranged from 37 percent to 82 percent with an average of 60 percent, which shows that the gross value added by the fishing fleet segments was substantial. This indicator is often used to compare the contributions to the economy by large and small-scale vessels. This review did however not find any major differences between small (<12 m), medium (12–40 m) and large (>40 m) vessel segments, as the average GVA to revenue percentages for these fleets were respectively 60 percent, 58 percent and 63 percent.

---

[5] Due to missing capital costs, net profit and RoFTA could not be calculated for the French purse seiner >40 m fleet

TABLE 2
Indicators of financial and economic performance per fishing fleet segment

Fleet segments per country	Vessels number	Net cash flow (thousand USD)	Net profit margin	RoFTA	RoI	GVA (thousand USD)	GVA to revenue
Denmark							
Pelagic trawlers >40 m	22	5 856	23%	12%	4%	7 069	74%
Demersal trawlers >40 m	10	1 371	11%	15%	4%	1 880	54%
Demersal trawlers 24–40 m	34	837	14%	15%	3%	1 450	60%
Demersal trawlers 18–24 m	49	368	12%	12%	2%	666	60%
Demersal trawlers 12–18 m	116	127	14%	13%	3%	209	56%
Small-scale passive gears <10 m	774	6	11%	9%	5%	8	45%
United Kingdom of Great Britain and Northern Ireland							
Pelagic trawlers >40 m	28	5 307	36%	69%	13%	7 905	65%
Demersal trawlers 24–40 m	87	515	6%	26%	7%	1077	46%
Demersal trawlers 18–24 m	167	150	5%	11%	4%	348	44%
Pots and traps 10–12 m	178	62	29%	66%	32%	107	57%
Pots and traps <10 m	1814	17	25%	48%	26%	32	58%
Germany							
Deep-sea trawlers >40 m	7	2 118	12%	11%	11%	4 501	61%
Deep-sea trawlers 24–40 m	9	579	18%	34%	34%	1 282	61%
Beam trawlers 18–24 m	63	212	34%	88%	88%	321	64%
Beam trawlers 12–18 m	111	117	35%	102%	102%	175	64%
Passive gears <10 m	718	4	22%	30%	30%	5	50%
France							
Purse seiner >40 m	22	1 109	-	-	-	3 386	45%
Demersal trawlers 24–40 m	57	365	6%	9%	9%	997	48%
Demersal trawlers 18–24 m	134	219	8%	15%	15%	669	52%
Demersal trawlers 12–18 m	153	109	8%	18%	18%	380	57%
Gillnetters 10–12 m	173	66	10%	23%	23%	235	65%
Hook and line <10 m	239	28	17%	44%	44%	77	65%
Spain							
Purse seiners >40 m	26	4 817	20%	59%	59%	7 155	42%
Purse seiners 18–24 m	99	106	22%	88%	88%	342	72%
Demersal trawlers >40 m	30	731	8%	122%	104%	1 950	36%
Demersal trawlers 24–40 m	107	293	23%	67%	31%	629	59%
Surface longliners 24–40 m	64	344	15%	94%	69%	660	37%
Italy							
Purse seiners >40 m	11	1 052	31%	48%	48%	1 874	82%
Demersal trawlers 18–24 m	633	87	8%	10%	10%	163	54%
Demersal trawlers12–18 m	1 232	52	23%	55%	55%	92	59%
Passive gears 6–12 m	5 144	21	39%	57%	57%	27	74%
Turkey							
Bottom trawlers	448	77	41%	22%	22%	100	66%
Pelagic trawlers	146	117	33%	34%	34%	160	52%
Purse seiners <40 m	453	361	35%	30%	30%	562	68%
Purse seiners >40 m	-[6]	1 212	49%	41%	41%	1 524	72%
Norway							
Large seagoing purse seiners	73	3 824	27%	10%	7%	6 600	73%
Cod trawlers (demersal)	36	6 983	26%	17%	12%	13 096	69%
Conventional seagoing vessels	19	2 212	13%	8%	5%	6 643	68%
Pelagic trawlers	14	2 248	13%	8%	3%	4 251	69%
Coastal purse seine vessels	103	1 011	17%	8%	4%	1 250	77%
Coastal shrimp trawlers	103	168	11%	8%	7%	447	59%
Conventional coastal vessels	1 242	157	13%	10%	6%	422	71%

---

[6] The total number of purse seiners in Turkey was 453 vessels in 2016. The larger >40 m vessels were included in this total.

Figure 9 shows some of the financial performance indicator averages per fishing fleet segment. The averages were calculated based on fleet segments of similar vessel types of the countries covered in this study. On average the highest net profit margins were realized in 2016 by the purse seiners (29 percent) and pelagic trawlers (>40 m), while demersal trawlers (24–40 m) reported average net profit margins of around 15 percent. The same demersal trawler fleet segment had a relatively low average ROFTA of 28 percent compared to the other fleet segments studies. The highest average ROFTA was 47 percent and was found among the demersal trawler fleet segments of 12–18 m. The average ROI comparison between the fishing fleet segments showed that the highest percentages were realized by the demersal trawler fleet of 12–18 m with 44 percent and the purse seiners with 40 percent. Lower ROI figures, but still good, could be found among the pelagic trawler (>40 m) and demersal trawler (24–40 m) fleet segments with respectively averages of 14 and 16 percent.
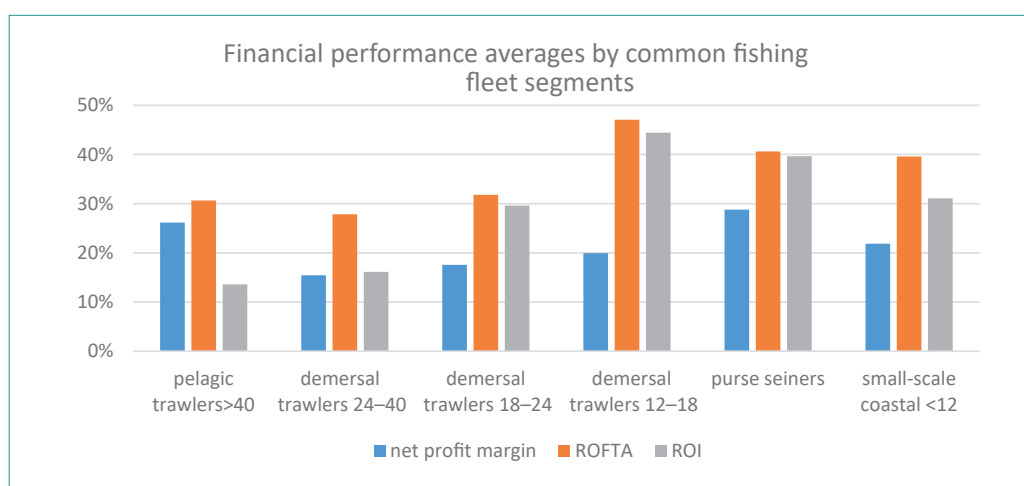
Comparing the 2016 financial and economic performance results with those of some of the same fleet segments that were included in the 2002–03 review study, it is clear that most of the fishing fleets were performing better than 15 years earlier. For example the net cash flow and ROI of a French gillnetter (10–12 m) were respectively USD 8 600 and 8 percent in 2002 and increased in 2016 to USD 66 000 and 23 percent. Similarly the demersal trawl fleet segments showed negative ROIs or slightly positive ROIs of 3 to 5 percent in 2002 and presented in 2016 a ROI range of 9 to 18 percent. The picture for the Norwegian fleet segments remained diverse. Some of the fleet segments that had negative ROIs in 2002 wrote in 2016 positive figures (e.g. shrimp trawlers). However, some other fleet segments, such as the coastal purse seiners and conventional sea going vessels, saw a slight reduction in ROI figures. Compared to 2002–03 the German fishing fleet segments saw tremendous increases in ROI figures in 2016, which may be a consequence of past reductions in fleet capacity.

REFERENCES

FAO, 2001.*Techno-economic performance of marine capture fisheries.* FAO Fisheries Technical Paper No. 421.Rome, FAO. www.fao.org/docrep/004/Y2786E/Y2786E00. htm and *Economic performance and fishing efficiency of marine capture fisheries.* (FAO Fisheries Technical Paper No. 482), 2005. www.fao.org/docrep/008/y6982e/y6982e00. htm

FAO, 2018. *Report of the Expert Meeting on Methodologies for Conducting Fishing Fleet Techno-Economic Performance Reviews, Chennai, India, 18-20 September 2018.* FAO Fisheries and Aquaculture Report No. 1243. Rome, FAO. Available at: www.fao.org/3/ca4427en/ca4427en.pdf

National reports

Report of Denmark

National report of Denmark

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

1. OBJECTIVES AND CONTEXT

This fishing fleet assessment is part of a global assessment carried out by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The Danish fishing fleet produced approximately 0.7 percent of the global capture fisheries production in 2017, and was therefore included in the global fishing fleet performance assessment of FAO. It is also one of the most important producers in the EU fishing fleet, ranking second (2017) or third (2016) in landed volume, and fifth in value.

This is the first time Denmark participates in the FAO global studies on techno-economic performance of the main fishing fleets.

The information presented in this analysis was collected in 2018 by Danish national authorities under the EU Data Collection Framework Regulation.[1] The data were compiled and analysed during two Expert Working Group meetings convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the 2019 Annual Economic Report (AER) on the EU fishing fleet.

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN DEMARK

The marine capture fisheries production[2] in Demark decreased 23 percent in the last 10 years from 867 721 tonnes in 2006 to 670 344 tonnes in 2016 (and -3 percent compared to the 690 584 tonnes in 2008).

The volume (in live-weight equivalent) of seafood landed by the Danish national fleet[3] amounted to 666 822 tonnes in 2016, 3 percent less than in 2008 (690 466 tonnes) and 26 percent less than in 2017 (903 640 tonnes).

At the same time, the number of active commercial fishing vessels decreased by 24 percent, from 1 810 in 2008 to 1 374 in 2016. In 2017, a total of 1 308 vessels were reported as active. Additionally, there were 419 inactive vessels in 2016, down from the 1 003 inactive vessels in 2008. Total fleet capacity in terms of tonnage (GT) and engine power (kW) also decreased, 16 percent and 28 percent respectively, while active GT increased 2 percent and kW decreased by 14 percent. The fleet generated 1 335 jobs in 2016 (-25 percent compared to 2008), corresponding to 1 657 FTEs[4] (a reduction of 20 percent compared to 2008); an average of 1.2 FTE per vessel.

---

[1]   Council Regulation (EC) No 2017/1004 of 17 May 2017
[2]   As reported to FAO, i.e., covers landings by all vessels in Danish ports, irrespective of nationality.
[3]   As reported under the DCF, i.e., covers landings by vessels registered in Denmark.
[4]   FTE is higher than the number of jobs because FTE is estimated based on the DK-standard that a full working year consists of 1,665 working hours. In reality, however, yearly working hours in the Danish fishing fleet are more likely to be around 2 000 hours.

The structure of the Danish fishing fleet has changed considerably since 2003, when the first individual transferable quotas (ITQ) regulation was implemented in the herring fishery. Since then, ITQs have gradually been introduced in other pelagic fisheries. From 2007, demersal fisheries were also managed with vessel quota shares (VQS). These management measures are the main reason for the reductions in fleet capacity.

The Danish capture fisheries sector can be grouped into three main categories:

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

Vessels under 40 m primarily target demersal species, with the exception of the pelagic trawlers 12–18 m, which are mostly dependent on reduction species and pelagic consumption species (mackerel and herring). Vessels above 40 m are almost solely dependent on mackerel, herring and reduction species (i.e. fish species generally used for fish meal and other non-food uses). Dredges and beam trawlers are active in entry-restricted fisheries for mussels and shrimps.

Table 1 provides an overview of the Danish national fishing fleet in terms of size class and main fishing gear. In terms of number, small-scale coastal vessels deploying polyvalent passive gears dominate the Danish fleet, while the over 40 meter pelagic trawlers are by far the top producers (Table 2).

TABLE 1
Overview of the Danish national fishing fleet: number of vessels by main fishing gear and scale, 2016

Main fishing gear	Small-scale, coastal (<10 m)	Small-scale (10–12 m)	Semi-industrial (12–18 m)	Industrial/ semi-industrial (18–24 m)	Industrial/ semi-industrial (24–40 m)	Industrial (>40 m)	Danish national fleet	% over total
Dredgers		9	26				**35**	2.5
Demersal trawlers/ seiners	10	14	116	49	34	10	**233**	17
Polyvalent passive gears	774	49	27				**850**	62
Polyvalent active gears	122	32	34	11			**199**	14.5
Beam trawlers			10	15			**25**	1.8
Pelagic trawlers			10			22	**32**	2.3
Number of active vessels	**906**	**104**	**223**	**75**	**34**	**32**	**1 374**	
% over total	**66**	**8**	**16**	**5**	**2**	**2**		
Inactive vessels	401	8	8	1	1		**419**	
Total number of vessels	**1 307**	**112**	**231**	**76**	**35**	**32**	**1 793**	

TABLE 2

Overview of the Danish national fishing fleet: landings (live weight, tonnes) by main fishing gear and scale, 2016

Main fishing gear	Small-scale, coastal (<10 m)	Small-scale (10–12 m)	Semi-industrial (12–18 m)	Industrial/ semi-industrial (18–24 m)	Industrial/ semi-industrial (24–40 m)	Industrial (>40 m)	Danish national fleet	% over total
Dredgers		9 457	40 077				49 535	7
Demersal trawlers/seiners	461	1 79	19 553	47 711	50 167	85 850	205 535	31
Polyvalent passive gears	4 124	2 026	3 466				9 616	1
Polyvalent active gears	1 165	2 538	5 146	6 232			15 083	2
Beam trawlers			657	1 511			2 169	0.3
Pelagic trawlers			21 522			363 359	384 882	58
Total landings in weight	**5 751**	**15 814**	**90 424**	**55 455**	**50 167**	**449 209**	**666 822**	
% over total	**1**	**2**	**14**	**8**	**8**	**67**		

Production in 2016 amounted to 666 822 tonnes of seafood (live-weight equivalent) with a landed value of USD 526 million. In 2017, total production reached 903 640 tonnes, resulting mainly from a sharp increase in sandeel landings, which did not translate into higher value (USD 485 million) due to a decrease in landings of some higher-valued species, such as herring, mackerel, plaice and cod.

In volume, European sprat is by far the most important species caught by the Danish fishing fleet, making up over 33 percent of the total landings of the national fleet in weight (222 380 tonnes) in 2016, but only 12.5 percent of the value (USD 72.9 million), followed by Atlantic herring with 24 percent of landed volume (160 230 tonnes) and 22 percent of the value (USD 113.7 million). Sandeels represented 20 percent of the landed volume in 2015 but only 4 percent in 2016, rising to 39 percent in 2017. Other important species include Atlantic mackerel, blue mussel, blue whiting, Atlantic cod, European plaice, Norway lobster and common shrimp.

The main fishing ports where the catch is landed are Skagen and Hanstholm in northern Jutland (Nordjylland) and Thyborøn in the centre (Midtjylland).

Skagen is Denmark's biggest fishing port in terms of landed volume and value. It is northern Europe's most important landing port for herring, and the third largest in terms of volume. The majority of the landings is used for consumption; the fish are processed and refined at the many fish producers at the port to be sold and sent to buyers all over Europe in one unbroken refrigerated chain. Thyborøn is a specialised port of call for vessels wishing to land high quality fish for human consumption. Catches are generally landed after short fishing trips and therefore contain high-quality fish. More plaice is landed at Thyborøn than at any other port in Denmark. Port of Hanstholm, within short distance to some of the best fishing grounds in the North Sea, is also one of Denmark's leading ports in the market for consumption fish and home to Denmark's largest fish auction.

There are currently around ten fishmeal factories in the EU, located in six Member States. In 2017, total fishery landings in the EU amounted 5.3 million tonnes, around 25 percent of which was destined for fishmeal and fish oil production (industrial uses). Denmark is by far the largest producer, accounting for roughly half of the total EU fishmeal production. Denmark's fishmeal production is based mainly on small pelagics, such as, blue whiting, sandeel, Norway pout and sprat. Other EU fishmeal and fish oil producers use mainly trimmings in their production.

The Danish national fleet as a whole was in a profit-making position in 2016 and improved on previous year's results. However, a light deterioration in profits was seen in 2017. The profits made are largely attributed to high average prices across species

groups and continued low fuel prices, which mitigate total energy costs. Yet, over the period 2008–2017 there have been significant fluctuations in the economic performance results for the Danish fleet; mainly brought on by fluctuations in external factors, such as fuel and fish prices, which can have significant impacts on individual fleets.

The five economically most important fishing fleets in terms of volume of seafood landed are: (1) the industrial pelagic trawlers (>40 m); (2) the industrial demersal trawlers (>40 m); (3) the semi-industrial/industrial demersal trawlers (24 to 40 m); (4) semi-industrial demersal trawlers (18–24 m); (5) semi-industrial demersal trawlers (12–18 m).

The small-scale coastal fleet using polyvalent passive gears (<10 m) is also included in the analyses for being the most numerous, with 774 vessels and employing 180 fishers. This fleet is characteristic of the low-activity vessels in the Danish fishing fleet, producing less than 1 percent of the total volume landed and almost 3 percent of the value.

The semi-industrial demersal trawler fleet (12–18 m) with 116 vessels (8 percent of the active fleet), landed 3 percent of the total volume and 8 percent of the value of seafood while the semi-industrial/industrial demersal trawler fleet (18–24 m) with 49 vessels (4 percent of the fleet), landed 7 percent of the total volume and 10 percent of the value of seafood.

The industrial demersal trawler fleet (24–40 m) with 34 vessels, landed 8 percent of the total volume and 15 percent of the value while the industrial pelagic trawler fleet, with only 22 vessels, was responsible for 54 percent of the total volume and 39 percent of the value of seafood landed in 2016.

The 10 industrial demersal trawlers over 40 m LOA accounted for a further 13 percent of the volume landed and 6.5 percent of the value (see Table 3).

TABLE 3
Overview of main fishing fleets, 2016

Fishing fleet listed by gear name	Number of vessels	Volume of landings (tonnes)	Value of landings (USD)	Scale[5]	Main fishing areas
Pelagic trawlers >40 m	22	363 359	204 841 696	Industrial	North Sea 27.4.a,b,c (83%); West of Scotland 27.6.a (5%); Skagerrak (3%)
Demersal trawlers >40 m	10	85 850	34 160 614	Industrial	North Sea 27.4.a, b and c (96%); Skagerrak and Kattegat 27.3.a (3%)
Demersal trawlers 24–40 m	34	50 167	80 973 323	Industrial	North Sea 27.4.a and b (65%); Skagerrak and Kattegat 27.3.a (30%); Baltic Sea (4%)
Demersal trawlers 18–24 m	49	47 713	54 512 782	Semi-industrial/ industrial	Skagerrak and Kattegat 27.3.a (64%) North Sea 27.4. b (26%); Baltic Sea 27.3.d.24 and d.25 (6%)
Demersal trawlers 12–18 m	116	19 554	43 582 885	Semi-industrial	Skagerrak and Kattegat 27.3.a (71%); Baltic Sea (21%); North Sea 27.4.a,b (8%);
Polyvalent passive gears 0–10 m	774	4 123	13 820 074	Small-scale	Skagerrak and Kattegat 27.3.a (30%); North Sea 27.4.b (23%); Belt Sea and Sound 27.3.b,c (30%); Baltic Sea 27.3.d.24,25 (17%)

*percentages refer to the proportion of fishing days in the area in 2016.

---

[5]   The scale categories applied within the FAO global review study are: Industrial, semi-industrial, or artisanal/small-scale.

The main species targeted by each fleet in volume are listed in Table 4.

TABLE 4
Main species landed by fishing fleet (percentage over total landed volume in 2016)

Fleets/species landed	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic herring (36%)	European sprat (33%)	Atlantic mackerel (11%)	Blue whiting (11%)	Sandeels (3%)
Demersal trawlers >40 m	European sprat (55%)	Atlantic herring (17%)	Norway pout (15%)	Sandeels (7%)	European plaice (2%)
Demersal trawlers 24–40 m	European sprat (29%)	Atlantic cod (14%)	European plaice (13%)	Norway pout (9%)	Saithe (=Pollock) (6%)
Demersal trawlers 18–24 m	European sprat (49%)	European plaice (12%)	Atlantic herring (9%)	Sandeels (8%)	Atlantic cod (7%)
Demersal trawlers 12–18 m	Atlantic cod (26%)	European sprat (22%)	European plaice (20%)	Norway lobster (10%)	Sandeels (7%)
Polyvalent passive gears 0–10 m	Atlantic cod (35%)	European plaice (19%)	European flounder (6%)	European eel (5%)	Garfish (5%)

The main species landed by each fleet in value are listed in Table 5.

In terms of commercial value generation, herring, mackerel, sprat, plaice, cod and Norway lobster are key to these fleets.

The landed value of herring increased 51 percent between 2015 and 2016, fostering a 28 percent increase in the average price in 2016 (USD 0.66 per kg). Mackerel prices were at a record high in 2011 (USD 2 per kg), but have since fallen and stabilised at around USD 1.3 per kg. With a 12 percent decrease in volume and a 4.5 percent increase in value, the average price of mackerel in 2016 was 19 percent higher than in 2015, contributing to the fleet's improved profitability. The average price of sandeel, plaice and cod also increased compared to 2015.

TABLE 5
Main species landed by fishing fleet (percentage over total landed value in 2016)

Fleets/species landed	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic herring (48%)	Atlantic mackerel (22%)	European sprat (17%)	Blue whiting (7%)	Atlantic horse mackerel (3%)
Demersal trawlers >40 m	European sprat (41%)	Atlantic herring (27%)	Norway pout (11%)	European plaice (7%)	Sandeels (5%)
Demersal trawlers 24–40 m	Atlantic cod (24%)	European plaice (14%)	Angler(=Monk) (10%)	Northern prawn (8%)	European hake (7%)
Demersal trawlers 18–24 m	Norway lobster (22%)	European plaice (19%)	Atlantic cod (14%)	European sprat (13%)	Northern prawn (7%)
Demersal trawlers 12–18 m	Norway lobster (46%)	Atlantic cod (19%)	European plaice (15%)	European sprat (4%)	Common sole (3%)
Polyvalent passive gears 0–10 m	Atlantic cod (27%)	European eel (19%)	European plaice (10%)	Lumpfish (8%)	Common sole (7%)

Fisheries in the EU are managed within the framework of the Common Fisheries Policy (CFP), which aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with MSY) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures are adopted as appropriate, such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas). The EU's CFP leaves it up to member states to decide how to allocate its national fishing quota to its fishing fleet.

As with most other EU countries, Denmark has a compulsory licensing system for its commercial fisheries and complies with the EU's entry-exit scheme, which prevents increasing capacity in the commercial fishing sector. Allocation of fishing opportunities in Denmark is largely based on transferable fishing rights, such as Individual Transferable Quotas (ITQ) and other variations of individual property rights schemes.

These schemes were gradually introduced, starting with pelagic fisheries in 2003 and then the demersal fisheries in 2007. This has resulted in fewer commercial vessels and increased profitability in many segments. The possibility to transfer quotas has resulted in a decrease in fleet capacity without using decommission as a financial instrument.

ITQs are transferable and leasable. Full transfers are made with ministry authorisation. There are limits on quota ownership for the same species. Transfers in the 'coastal fishery' can only take place within that fishery. Quota shares are held by fishers indefinitely, but the ministry can claim back quotas with a 16-year notification period.

Almost all major stocks and fisheries targeted by the Danish fleet are managed through TACs and quotas. The most valuable quotas species for the Danish fishery in 2016 were European sprat (270 000 tonnes), Atlantic herring (150 000 tonnes), sandeel (72 000 tonnes), European plaice (41 000 tonnes), Atlantic mackerel (38 000 tonnes), Atlantic cod (28 000 tonnes) and Norway lobster (10 000 tonnes).

Quotas for Atlantic herring, European plaice and Norway lobster increased by 13 percent, 6 percent and 63 percent compared to 2015, while sandeel, European sprat, mackerel and Atlantic cod decreased by 76 percent, 23 percent, 23 percent and 7 percent. These quotas vary from year to year, some more than others. For example, quota for sandeel went from 305 000 tonnes in 2015 to 72 000 tonnes in 2016, 430 000 tonnes in 2017 and 196 000 tonnes in 2018.

Not all Danish quotas were fully utilised. In 2016, the overall quota utilisation for herring, cod, sprat and mackerel were 97 percent, 83 percent, 90 percent and 99 percent respectively. Lower quota utilisation was seen for sandeel (39 percent), plaice (65 percent) and Norway lobster (41 percent). Reasons for low quota uptake include low catch rates, choke-species limitations, market factors, and limitations on specific fishing gears, seasons and/or areas.

Non-quota fishing opportunities include shellfish licences and periodic catch limits for mussel and oyster dredging. Capacity caps are used to constrain effort in these non-quota fisheries.

Given that the management system is considered to be functioning well, there are no current plans to fundamentally change it. Adjustments are sometimes made in order to account for unwanted situations, such as quota concentration and to facilitate the entry of new fishers.

Currently, the highest profile regulation is the landing obligation. As part of the reformed CFP, catches of quota species may no longer be discarded; all of the catch must be landed and counted against the quota. This discard ban, or Landing Obligation, was fully implemented in January 2019 and applies to all species subject to catch limits (TAC species) or to a minimum reference size (in the Mediterranean).

There has been no obvious economic impact of the landing obligation observed during the first two years of implementation (2015–2016). In general, the pelagic fishery was not expected to be affected too much, as in most of the cases fish is not sorted at sea and usually landed directly to processing plants where sorting takes place. Due to the phasing of the landing obligation in demersal fisheries there has not been any major issues recorded yet but this may change when it starts to include the main potential choke stocks.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Pelagic trawlers >40 m LOA

The industrial pelagic trawler fleet can be characterised by an average length of 56 meters LOA, average gross tonnage of 1 261 tonnes and engine power of 2 388 kW. The average crew size is 6 (9 FTE on average) (see Table 6) and the main fishing gears carried include: midwater and bottom otter trawls (see Table 7).

The average number of days at sea per vessel in 2016 was 150 days, of which 86 were fishing days. The average number of fishing trips was 27, each averaging around 5.5 days.

The Danish large pelagic trawler fleet is made up of 22 vessels, up from 18 vessels in 2015 (representing 2 percent of the active fleet in number) and responsible for more than half (54 percent) of the total volume of seafood landed by the Danish fishing fleet in 2016. This volume of fish (363 359 tonnes) equated to 39 percent of the total value of landings (USD 204.8 million). On average, a vessel landed around 16 516 tonnes valued at USD 9.3 million in 2016.

This fleet as a whole was profitable, generating a net profit of USD 47 million in 2016. The segment has been consistently profitable over the years and in 2016 profit margins increased significantly as energy costs decreased and revenues increased (18.5 percent), despite a decrease in the volume of landings (-13 percent).

In 2016, the total value of landings was USD 204.8 million and 197 FTEs were employed in this fleet segment, contributing to 12 percent of FTEs generated by the Danish fishing fleet.

The 22 vessels that make up this segment operate predominantly in the North Sea and Norwegian Sea. The fleet targets pelagic species for consumption (mackerel and herring) as well as reduction species such as sandeel, sprat, and blue whiting

Herring (36 percent in volume and 48 percent in value) and mackerel (11 percent in volume and 22 percent in value), were the two main species, combined accounting for 47 percent by weight and 70 percent by value of this fleet's total landings in 2016. Sprat (33 percent in volume and 17 percent in value) and blue whiting (11 percent in volume and 7 percent in value) are the next most important species.

Compared to 2015, the average price of the four top species increased in 2016: herring (+25 percent), mackerel (+18 percent), sprat (+9 percent) and blue whiting (+32 percent), together with an overall increase in the total landed value (apart from sprat), contributed to the fleet's higher profits in 2016.

Most of the pelagic species caught by the pelagic fleet are landed in Danish ports.

This fleet segment reported a net cash flow of USD 128.8 million and a total gross profit of USD 48.5 million in 2016, corresponding to an increase of 17 percent and 41 percent respectively compared to 2015.

Demersal trawlers and seiners >40 m LOA

The industrial demersal trawler fleet over 40 m can be characterised by an average length (LOA) of 46 meters and a gross tonnage of 623 tonnes and engine power of 1 330 kW. The average crew size is 5 (with 6 FTE) (see Table 6) and the main fishing gears carried include: bottom otter trawls, beam trawls and midwater otter trawls (see Table 7).

The average number of days at sea per vessel in 2016 was 153 days of which 108 were fishing days. The average number of fishing trips per vessel was 26, each amounting to around 6 days.

Overall, this fleet represented only 1 percent (10 vessels, down from 12 in 2015) of the total number of vessels in the Danish fleet in 2016, while deploying 2 percent of the effort (in days at sea) and landing 13 percent of the total volume (85 850 tonnes) and 6 percent of the total value of landings (USD 34.2 million). On average, a vessel landed around 8 585 tonnes valued at USD 3.4 million in 2016.

This fleet operates predominantly in the North Sea and targets a variety of species but in particular, sprat, herring, Norway pout, sandeels and European plaice.

Landings of Norway pout increased substantially, from 576 tonnes in 2015 to 6 650 tonnes in 2016; as did landings of Atlantic horse mackerel, from 907 tonnes in 2015 to 1 191 tonnes in 2016. Conversely, landings of sprat, herring and sandeel fell

sharply, contributing to the deteriorated performance of the fleet segment in 2016. Values for 2017 indicate a substantial increase in sandeel and mackerel landings, favouring higher profits.

The fleet reported a net cash flow of USD 13.7 million in 2016, a 38 percent fall compared to the USD 22.2 million reported in 2015. Total gross profit was calculated at USD 3.9 million.

Demersal trawlers and seiners 24–40 m LOA

The industrial/semi-industrial demersal trawler fleet can be characterised by an average length of 31 meters LOA and a gross tonnage of 300 tonnes and engine power of 626 kW. The average crew size is 4 (with 9 FTE) (see Table 6) and the main fishing gears carried include: bottom otter trawls, Scottish seines and midwater otter trawls (see Table 7).

The average number of days at sea per vessel in 2016 was 243 days, of which 203 were fishing days. The average number of fishing trips per vessel was 54, each amounting to around 4.5 days.

Overall, this fleet represented only 2 percent (34 vessels, up from 33 vessels in 2015) of the total Danish fishing fleet in 2016, while deploying 9 percent of the effort (in days at sea) and landing 8 percent of the total volume (50 167 tonnes) and 15 percent of the total value of landings (USD 80.9 million). On average, a vessel landed around 1 475 tonnes valued at USD 2.38 million in 2016.

The fleet operates predominantly in the North Sea and Skagerrak and targets a variety of demersal species, in particular, cod, plaice, monkfish, Northern prawn and hake.

Landings in volume and value increased in 2016 compared to 2015 for most of the target species. Furthermore, the average price of these top species increased; cod +16 percent, plaice +12 percent, Northern prawn +29 percent, hake +14.5 percent, contributing to increased revenue and profits.

Around 303 FTEs were employed in this fleet segment in 2016, contributing 18 percent of the FTEs generated by the Danish fishing fleet.

This fleet segment reported a net cash flow of USD 28.5 million and a gross profit of USD 11.6 million in 2016; an improvement on 2015 results.

Demersal trawlers and seiners 18–24 m LOA

The semi-industrial/industrial demersal trawler fleet can be characterised by an average length of 21 meters LOA and a gross tonnage of 107 tonnes and engine power of 306 kW. The average crew size is 3 (with 5 FTEs) (see Table 6) and the main fishing gears carried include: bottom otter trawls (70 percent), Danish seines (15 percent) and midwater otter trawls (6 percent) (see Table 7).

The average number of days at sea per vessel in 2016 was 176 days, of which 158 were fishing days. The average number of fishing trips per vessel was 76, each amounting to around 2 days.

Overall, this fleet represented 4 percent (49 vessels, down from 51 vessels in 2015) of the total Danish fishing fleet in 2016, while deploying 9 percent of the effort (in days at sea) and landing 7 percent of the total volume (47 713 tonnes) and 10 percent of the total value of landings (USD 54.5 million). On average, a vessel landed around 974 tonnes valued at USD 1.1 million in 2016.

The fleet operates predominantly in the North Sea and Skagerrak and targets a variety of species; on the one hand pelagic species such as sprat (49 percent in volume), herring (9 percent) and sandeels (8 percent) and on the other, demersal species such as plaice (12 percent), cod (7 percent) and Norway lobster (3 percent). In value, Norway lobster accounted for 22 percent of the total landed value, followed by plaice (19 percent), cod (14 percent) and then sprat (13 percent) and Northern prawn (7 percent).

In 2016, landings of Norway lobster increased 4.4 percent in volume compared to 2015, triggering a 67 percent increase in value, from USD 14.3 million to USD 24.0 million. Northern prawn landings also increased (7 percent in volume), from USD 3.3 million in 2015 to USD 7.5 million in 2016, i.e., a 35 percent increase in the average landed price. The average price of most of the other main target species also increased in 2016 compared to 2015; plaice +14 percent, cod +27 percent, sprat +19 percent, herring +20 percent, sandeels +32 percent, etc., further contributing to the fleet's improved performance.

This segment has been consistently profitable and increased its net cash flow from USD 14.9 million in 2015 to USD 18 million in 2016. Gross profits increased from USD 3.2 million in 2015 to USD 6.5 million 2016.

Demersal trawlers and seiners 12–18 m LOA

The semi-industrial demersal trawler fleet can be characterised by an average length of 15 meters LOA, gross tonnage of 38 tonnes and engine power of 191 kW. The average crew size is 2 (see Table 6) and the main fishing gears carried include: bottom otter trawls (98 percent) and Danish seines (see Table 7).

The average number of days at sea per vessel in 2016 was 128 days, of which 123 were fishing days. The average number of fishing trips per vessel was 103, each amounting to around 1.2 days.

Overall, this fleet represented 8 percent (116 vessels, down from 124 vessels in 2015) of the total Danish fishing fleet in 2016, while deploying 16 percent of the effort (in days at sea) and landing 3 percent of the total volume (19 554 tonnes). On average, a vessel landed around 169 tonnes valued at USD 375 715 in 2016.

The fleet operates predominantly in Skagerrak and targets a variety of species but primarily Norway lobster, cod and plaice. In 2016, the total value of landings was around USD 43.6 million, contributing to 8 percent of the total landings value by the Danish fishing fleet. Landings of cod in 2016 decreased 28 percent in volume but only 17 percent in value compared to 2015. On the other hand, the landed value of Norway lobster increased 40 percent, from USD 28.5 million in 2015 to USD 39.8 million in 2016.

The fleet segment employed 249 FTEs, contributing to 15 percent of the FTEs generated by the Danish fishing fleet. This segment increased its net cash flow from USD 12.3 million in 2015 to USD 14.7 million in 2016 and gross profits from USD 3.8 million in 2015 to USD 6.4 million 2016. Low fuel prices and higher average landed prices of cod (+17 percent), plaice (+17 percent), Northern prawn (+8 percent) and sprat (+17.5) helped contribute to higher profits in 2016.

Small-scale coastal vessels using passive gears <10 m LOA

In terms of landings value, this fleet accounted for only 3 percent of the total Danish landings value in 2016, but this small-scale fishery contains 774 vessels and 180 fishers (132 FTEs), fishing in the coastal waters of Denmark. This corresponds to 56 percent of the total active fleet, 14 percent of the fishers and 8 percent of the total number of full-time employed in the active Danish fleet, and it is thus important in many harbours in Denmark.

The majority of these vessels are low activity (annual landings less than USD 10 000); collectively responsible for 1 percent of the landings volume (4 123 tonnes) and 3 percent of the value (USD 13.8 million). They are largely dependent of cod and plaice, which makes the fleet very sensitive to quota changes of these species. On average, a vessel landed around 5.3 tonnes valued at nearly USD 18 000 in 2016.

Only a small fraction of the vessels in the small-scale fleet is active at a commercial level. Many owners keep their vessel for social and recreational purposes and although they have fisher or part-time fisher status, they are not economically dependent on the activity. This is confirmed by a large number of inactive vessels under 10 metres and

the small quantities landed by the non-commercial part of the small-scale fleet. If low activity vessels are excluded, profit margins for this fleet segment would be higher.

The small-scale polyvalent fleet can be characterised by an average length of 7 meters and a gross tonnage of 3 tonnes and engine power of 33 kW (see Table 6). The main fishing gears carried include pots, set gillnets and handlines (see Table 7).

The average number of days at sea per vessel in 2016 was 33 days, of which 33 were fishing days, i.e. an average of 33 one-day fishing trips per year.

The fleet segment as a whole was profitable, generating a net cash flow of USD 4.6 million and gross profits of USD 1.6 million in 2016.

TABLE 6
Basic information of each fleet

Average	Pelagic trawlers (>40 m)	Demersal trawlers (>40 m)	Demersal trawlers (24–40 m)	Demersal trawlers (18–24 m)	Demersal trawlers (12–18 m)	Passive gears (<10 m)
Vessel age	22	34	26	31	40	32
Vessel length overall (LOA)	56	46	31	21	15	7
Gross tonnage (GT)	1 261	623	300	107	38	3
Engine power (kW)	2 388	1 330	626	306	191	33
Crew size (persons)	6	5	4	3	2	1
Crew size (FTE)	9	6	9	5	2	0.2
Days at sea	150	153	243	176	128	33
Fishing days	86	108	203	158	123	33
Number of fishing trips	27	26	54	76	103	33

The main fishing methods/fishing gears employed by fishing fleet are presented in Table 7.

TABLE 7
Fishing methods employed by percentage of fishing effort (fishing days) used

	Pelagic trawlers >40 m	Demersal trawlers >40 m	Demersal trawlers 24–40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Passive gears <10 m
Midwater (otter) trawl	96%	12%	4%	6%		
Bottom otter trawl	3%	67%	85%	70%	98%	
Beam trawl		21%				
Otter twin trawl			2%	1.5%		
Danish seines				15%	1.1%	
Scottish seines			8%			
Combined gill-trammel nets						88%
Set gillnets (anchored)				3%		2%
Not known						8.6%

Table 8 presents the estimated number of full-time and part-time workers on each of the main fleets. Most workers on these vessels are full-time employees. Low activity vessels (with an annual turnover of less than USD 10 000) tend to be active seasonally or part time, spending on average less than 25 days at sea.

There were 2 082 persons employed in the fisheries sector in 2017; the majority (96 percent) being males. There are very few female fishers. Women typically have onshore roles, such as accounting and other administrative roles although there are some female deckhands.

Not much information is available on the age structure of the labour force of these fleets, but it clear that it is aging, both crew and vessel owners. The average age of vessel owners in 2009 was 53.9 years and 46.5 for fishers. In 2018, the average age was 58.2 years for owners and 51.5 years for fishers.

Most of the persons (93 percent) employed in the sector are Danish; the rest are mainly from other EU countries.

TABLE 8
Labour Employed in Fishing and main socio-economic indicators

	Total employed	Full-time (FTE)	Average wage per FTE (USD)[6]	Labour productivity (GVA per FTE) (USD thousand)
Pelagic trawlers >40 m LOA	130	197	135 048	787 577
Demersal trawlers >40 m LOA	46	64	79 289	292 987
Demersal trawlers 24–40 m LOA	150	303	68 701	162 617
Demersal trawlers 18–24 m LOA	154	236	61 897	138 306
Demersal trawlers 12–18 m LOA	221	249	38 448	97 653
Passive gears	180	132	13 396	48 332
Total	**882**	**1 181**	**66 472**	**242 891**

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF THE FLEET SEGMENTS
Pelagic trawlers >40 m LOA
Capital investments
The total asset value of the fleet amounted to around USD 1.3 billion in 2016; with tangible assets valued at USD 384.3 million and intangible assets (quota and fishing rights) estimated at USD 837 million. This amounted to an average of USD 59 million per vessel; USD 17.5 million in tangible assets and USD 38 million in intangible assets.

In year investments in 2016 totalled USD 118.7 million, an increase of over 270 percent on 2015 (USD 32 million), amounting to an average of USD 5.4 million per vessel.

Several factors influence the capital value of the fleet, including variations in investments from year to year, in some cases dis-investments, as well as variations in the value of fishing rights.

Operating and owner costs
Total gross costs amounted to USD 80.8 million in 2016 (average of USD 3.6 million per vessel), with operating costs equating to 56 percent. The remaining 44 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 49 million. Annual depreciation amounted to 97 percent of capital costs.

Among the operating costs, crew costs were highest, equating to 59 percent of the operating costs, followed by energy costs (27 percent) and other variable costs (13 percent). The highest owner related costs were made for the leasing/rental of quota (42 percent of owner costs), followed by repair and maintenance (39 percent) and then other fixed costs (19 percent).

In 2016, on average a vessel spent USD 1.2 million on crew costs, USD 557 000 on fuel costs and USD 271 000 on other variable costs. The average amount spent on repair and maintenance was USD 636 000, USD 306 000 on other fixed costs and USD 691 000 on quota.

Revenues
Revenue in 2016 totalled almost USD 210 million; an increase of almost 18 percent compared to 2015. The average revenue per vessel in 2016 was USD 9.5 million.

---

[6] Exchange rates can affect trend analysis (Danish krone to euro to dollar). Exchange rate used euro to dollar: 1 EUR = 1.1069 USD (ECB reference exchange rate, USD/EUR, average of observations throughout 2016; Data Source in SDW: http://sdw.ecb.europa.eu/browse.do?node=9691296).

Economic and financial performance of fishing vessels
In 2016, this fleet segment presented a gross profit of USD 48.5 million and a net profit of USD 47.2 million. On average, this amounted to a net cash flow of USD 5.8 million and a gross profit of USD 2.2 million per vessel. The fleet saw an improvement in the economic results. Profitability was high with a net profit margin of 23 percent. The fleet obtained a GVA to revenue of 74 percent and a RoFTA of 12 percent. RoI was estimated at 4 percent.

Demersal trawlers >40 m LOA
Capital investments
The total asset value of the fleet amounted to around USD 107.6 million in 2016; with tangible assets valued at USD 25.4 million and intangible assets (quota and fishing rights) estimated at USD 68.8 million. This amounted to an average of USD 10.8 million per vessel; USD 2.5 million in tangible assets and USD 6.9 million in intangible assets.

In year investments in 2016 totalled USD 17 million, an increase of 43 percent compared to 2015 (USD 11.9 million), amounting to an average of USD 1.7 million per vessel.

Operating and owner costs
Total gross costs amounted to USD 20.9 million in 2016 (average of USD 2.1 million per vessel), with operating costs equating to 52 percent. The remaining 48 percent consist of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 3.7 million. Annual depreciation amounted to 98 percent of capital costs.

Among the operating costs, crew costs were highest, equating to 47 percent of the operating costs, followed by energy costs (33 percent) and other variable costs (20 percent). The highest owner related costs were made for the leasing/rental of quota (45 percent of owner costs), followed by repair and maintenance (44 percent) and other fixed costs (11 percent).

In 2016, the average vessel spent nearly USD 509 000 on crew costs, USD 355 000 on fuel costs and USD 213 000 on other variable costs. The average amount spent on repair and maintenance was USD 441 000, on other fixed costs USD 113 000 and on quota nearly USD 456 000.

Revenues
Revenue in 2016 totalled almost USD 34.6 million; a 35 percent drop compared to 2015. The average revenue per vessel in 2016 was USD 3.46 million.

Economic and financial performance of fishing vessels
In 2016, this fleet segment presented a gross profit of almost USD 4.0 million and a net profit of USD 3.8 million. Despite the loss in revenue, the fleet saw some improvement in the economic results due to lower costs. Profitability was reasonable with a net profit margin of 11 percent. The fleet obtained a GVA to revenue of 54 percent and a RoFTA of 15 percent. RoI was estimated at 4.1 percent.

Demersal trawlers 24–40 m LOA
Capital investments
The total asset value of the fleet amounted to around USD 356 million in 2016; with tangible assets valued at USD 76.3 million and intangible assets (quota and fishing rights) estimated at USD 248.6 million. This amounted to an average of USD 10.5 million per vessel; USD 2.2 million in tangible assets and USD 7.3 million in intangible assets.

In year investments in 2016 totalled USD 22.3 million, (a significant increase on the USD 2.9 million invested in 2015), amounting to an average of USD 656 071 per vessel.

Several factors influence the capital value of the fleet, including variations in investments from year to year, in some cases dis-investments, as well as variations in the value of fishing rights.

Operating and owner costs
Total gross costs amounted to USD 53 million in 2016 (average of USD 1.6 million per vessel), with operating costs equating to 71 percent. The remaining 29 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 11.7 million. Annual depreciation amounted to 98 percent of capital costs.

Among the operating costs, crew costs were highest at 56 percent of the operating costs, followed by energy costs (24 percent) and other variable costs (21 percent). The highest owner related costs were made for repair and maintenance (53 percent of owner costs), followed by the leasing/rental of quota (29 percent) and other fixed costs (17 percent).

In 2016, the average vessel spent USD 612 000 on crew costs, USD 262 000 on fuel costs and USD 227 000 on other variable costs. The average amount spent on repair and maintenance was USD 243 000, on other fixed costs nearly USD 80 000 and USD 135 000 was spent on quota.

Revenues
Revenue in 2016 amounted to USD 81.5 million; a 14 percent increase compared to 2015. The average revenue was in 2016 about USD 2.4 million per vessel.

Economic and financial performance of fishing vessels
In 2016, this fleet segment obtained a gross profit of USD 11.6 million and a net profit of USD 11.3 million. The fleet improved on 2015 results with a 14 percent net profit margin, up from 8.5 percent in 2015. The fleet obtained a GVA to revenue of 60 percent and a RoFTA of 14.8 percent. RoI was estimated at 3.5 percent.

Demersal trawlers 18–24 m LOA
Capital investments
The total asset value of the fleet amounted to around USD 277 million in 2016; with tangible assets valued at USD 52.0 million and intangible assets (quota and fishing rights) estimated at USD 237 million. This amounted to an average of USD 5.7 million per vessel; USD 1 million in tangible assets and USD 4.8 million in intangible assets.

The fleet segment underwent dis-investments in 2016, totalling USD -7.8 million; following a dis-investment of almost USD -5.8 million in 2015.

Operating and owner costs
Total gross costs amounted to USD 36 million in 2016 (average of USD 744 000 per vessel), with operating costs equating to 70 percent. The remaining 30 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were almost USD 7.8 million. Annual depreciation amounted to 98 percent of capital costs.

Among the operating costs, crew costs were highest at 57 percent of the operating costs, followed by other variable costs (26 percent) and energy costs (17 percent).

The highest owner related costs were made for repair and maintenance (58 percent of owner costs), followed by other fixed costs (23 percent) and the leasing/rental of quota (19 percent).

In 2016, the average vessel spent USD 298 000 on crew costs, USD 87 000 on fuel costs and USD 134 000 on other variable costs. The average expenditures on repair and maintenance were nearly USD 132 000, on other fixed costs USD 51 000 and USD 42 000 was spent on quota.

Revenues
Revenue in 2016 amounted to USD 54.5 million; an 8.6 percent increase compared to 2015. The average revenue in 2016 was some USD 1.1 million per vessel.

Economic and financial performance of fishing vessels
In 2016, this fleet segment obtained a gross profit of USD 6.5 million and a net profit of USD 6.3 million. The fleet improved on 2015 results with an 11.6 percent net profit margin, up from 6 percent in 2015. Net cash flow increased by almost 21 percent, from USD 14.9 million in 2015 to USD 18 million in 2016, largely a result of higher revenue and lower energy costs (-12 percent). Lease/rental payments for quota also decreased by 42 percent. The fleet obtained a GVA to revenue of 60 percent and a RoFTA of 12.2 percent. RoI was estimated at 2.2 percent.

Demersal trawlers 12–18 m LOA
The total asset value of the fleet amounted to around USD 205 million in 2016; with tangible assets valued at USD 47.0 million and intangible assets (quota and fishing rights) estimated at USD 171 million. This amounts to an average of USD 1.8 million per vessel; USD 405 000 in tangible assets and USD 1.5 million in intangible assets.

Almost USD -6.6 million were dis-invested in the fleet segment in 2016; following a dis-investment of almost USD -9.3 million in 2015.

Operating and owner costs
Total gross costs amounted to USD 28.8 million in 2016 (average of USD 249 000 per vessel), with operating costs equating to 64 percent. The remaining 36 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 5.3 million. Annual depreciation amounted to 97 percent of capital costs.

Among the operating costs, crew costs were highest at 52 percent of the operating costs, followed by other variable costs (28 percent) and energy costs (21 percent). The highest owner related costs were made for repair and maintenance (56 percent of owner costs), followed by other fixed costs (26 percent) and the leasing/rental of quota (18 percent).

In 2016, the average vessel spent USD 82 000 on crew costs, USD 33 000 on fuel costs and USD 44 000 on other variable costs. The average expenditures on repair and maintenance were nearly USD 50 000, on other fixed costs added up to almost USD 23 000, while expenses on quota were nearly USD 16 000.

Revenues
Revenue in 2016 amounted to USD 43.6 million; a 15.5 percent increase compared to 2015. The average revenue was close to USD 376 000 per vessel.

Economic and financial performance of fishing vessels
In 2016, this fleet segment obtained a gross profit of USD 6.4 million and a net profit of USD 6.3 million. The fleet improved on 2015 results obtaining a 14.4 percent net profit

margin, up from 9.6 percent in 2015. The net cash flow increased by almost 20 percent, from USD 12.3 million in 2015 to USD 14.7 million in 2016. The fleet obtained a GVA to revenue of 56 percent and a RoFTA of 13.4 percent. RoI was estimated at 2.9 percent.

Polyvalent passive gears <10 m LOA
Capital investments
The total asset value of the fleet amounted to around USD 31.9 million in 2016; with tangible assets valued at USD 18.1 million and intangible assets (quota and fishing rights) estimated at USD 14.3 million. This amounted to an average of USD 41 000 per vessel; USD 23 000 in tangible assets and approximately USD 18 000 in intangible assets. The fleet disinvested USD 184 000 in 2016.

Operating and owner costs
Total gross costs amounted to USD 9.7 million in 2016 (average of almost USD 13 000 per vessel), with operating costs equating to 46 percent. The remaining 54 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 1.9 million. Annual depreciation amounted to 97 percent of capital costs.

Among the operating costs, other variable costs were highest at 47 percent of the operating costs, followed by crew costs (40 percent) and energy costs (13 percent). The highest owner related costs were made for repair and maintenance (55 percent of owner costs), followed by other fixed costs (33 percent) and the leasing/rental of quota (12 percent).

In 2016, the average vessel spent just over USD 2 000 on crew costs, around USD 761 on fuel costs and nearly USD 3 000 on other variable costs. The average expenditures on repair and maintenance were almost USD 4 000, on other fixed costs just over USD 2 000 and less than a USD 1 000 was spent on average on quota.

Revenues
Revenue in 2016 amounted to USD 14.3 million; a 4 percent increase compared to 2015. The average revenue was more than USD 18 000 per vessel.

Economic and financial performance of fishing vessels
In 2016, this fleet segment obtained a net cash flow of USD 4.6 million and a gross profit of USD 1.6 million. The fleet improved on 2015 results obtaining an 11 percent net profit margin, up from 7.6 percent in 2015. The fleet obtained a GVA to revenue of 44.5 percent and a RoFTA of 8.8 percent. RoI was estimated at 4.9 percent.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES
Fishing vessel owners/fishing cooperatives and producer organisations in Demark have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national), USD 7 billion is EU contribution, for the period 2014–2020. The allocation for Denmark was set at USD 296 million, with an EU contribution of USD 230 million, i.e., co-funding of 78 percent. USD 82 million is set aside to support a sustainable and innovative fishing sector.

The EMFF budget for the sustainable development of fisheries and environmental protection for Denmark is USD 82.1 million, of which the national contribution is USD 27.3 million. One of the main objectives of the Danish programme is to facilitate

implementation of the discard ban. EMFF support will therefore target investments that aim at decreasing and handling unwanted catches. Other areas that will receive significant support are protection of marine biodiversity and restoration of rivers to protect biodiversity and facilitate fish migration.

Support from the EMFF can be provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include:

(1) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms (e.g. with lower interest rates, longer repayment periods, or fewer collateral requirements). For instance, loans could be available to help fishers diversify their sources of income, start-up support for young fishers (e.g. acquiring first fishing vessel) or investments on board aimed at increasing the energy efficiency of fishing vessels.

(2) Microcredits, which are smaller loans made to people who are otherwise excluded from access to finance, are often provided over a short term and with no or low collateral required. These include loans to fishers to purchase selective fishing gear, to improve the added value or quality of the fish caught, or projects in the framework of community-led local development strategies.

(3) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan.

(4) Equity, where capital is invested in return for total or partial ownership of a firm. Equity is more relevant for higher risk and potentially higher growth firms, for example those piloting innovative sustainable technologies in the fisheries sector.

The EIB lending activities are aligned to EU standards and priorities and can cover the whole fishery value chain, ranging from input and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improved or restored ecosystems, innovative solutions for current and future challenges in the sector, and/or the productive and sustainable use of by-products from food production.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

Demark has a tax exemption on fuel used for fishing (untaxed). The fuel price for the Danish fleet averaged around USD 0.44 per litre in 2016.

There is also a system with financial compensation for reduction of fishing effort, such as scrapping of fishing vessels. To ensure compliance with the landing obligation, EMFF funds also foresee measures for the investment in more selective fishing gears and for technical adjustments.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

The implementation of the landing obligation regulation has initiated various efforts aimed at improving gear selectivity. In parallel, there are initiatives for optimising the use of the fish previously not landed and initiatives aimed at creating more value of the current landings through improved production quality and development of products in the processing industry.

There is a focus on developing and testing innovative gear technologies that can improve energy efficiency, improve selectivity, etc. Researchers, managers and industry cooperate on several EU funded projects, such as FASTTRACK and DISCARDLESS, to develop new fishing gears that are better suited to comply with reforms under

the CFP and mitigate the effects of the landings obligation. These project have, among others, developed a gear catalogue of existing sea trials on innovative fishing technologies.

Potential opportunities for increased quality and earnings has been identified by improving the cuts and thus quality of fish on board vessels, as well as freezing the catch faster, thereby increasing the shelf life of fishery products. Furthermore, research on how to improve the utilization of species below the minimum reference size for non-consumption purposes could potentially lead to higher prices and income.

Such initiatives take time and an innovative approach, which draws on the combined expertise of fishers, processors, gear technologists and researchers in order to identify, test and implement the most promising ideas.

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that, from 2014, the fishing capacity of their fleet at no time exceeds the fishing ceilings in Annex II to Regulation (EU) No1380/2013. Denmark has complied with the entry-exit regime for tonnage as well as for engine power. In 2016, the fleet capacity was almost 25 percent in GT and more than 30 percent in kW below the ceiling.

The structure of the Danish fishing fleet has changed considerably since 2003, when the first ITQ regulation was implemented in the herring fishery. Since then, ITQs were gradually introduced in other pelagic fisheries. From 2007 vessel quota shares (VQS) were introduced in the demersal fisheries. These management changes are the major reason for the reductions in the fishing capacity of the Danish fishing fleet.

There are indications of a continuous restructuring of the fleet towards fewer, but on average larger, vessels. The cod fishery in the Baltic as well as the North Sea and surrounding areas is managed by restricting effort. The period 2003–2016 saw a significant decrease in capacity in the fleets operating in those areas.

The fleet management system in Denmark is based on an entry-exit regime. All fishing vessels have to be registered in the vessel register of The Danish Maritime Authority as well as the vessel register of the Danish AgriFish Agency (Order no. 175 of 25 February 2016 on vessels used for commercial fishery). A vessel is only allowed to enter the fishing fleet if one or more vessels has/have been re-moved from the above-mentioned registers. It is a precondition that tonnage and engine power of the vessel does not exceed the tonnage and engine power from that or those vessels, which were or are to be cancelled. It is forbidden to increase the tonnage, size or engine power of a vessel without the permission of the Danish AgriFish Agency. The Danish AgriFish Agency can only allow the increase in tonnage or engine power of a vessel if the owner of the vessel also withdraws the same quantity in the form of virtual capacity or as physical capacity from the fleet. Virtual capacity is defined as tonnage and engine power (measured in kW), which used to be connected to vessels now erased from the above-mentioned registers and as such virtual capacity is held by persons as a legal right and not in physical vessels. Virtual capacity can be sold. There is no virtual capacity for vessels that received any subsidy regarding final exit of the fleet.

The concept of virtual capacity means that the entitlement to capacity can be kept even when a vessel is scrapped (without economic aid) or sold outside the EU. Hence, it works as an incentive to keep unnecessary capacity out of the physical fleet. On the other hand, the possibility to increase the fleet is limited by the market-based system of fishing rights to the effect that holders of virtual capacity will only enter new capacity into the fleet if they have the fishing rights to keep the vessel active.

The current Danish management system is considered to be well functioning in order to secure a balance between fishing opportunities and capacity. Therefore, there are no current plans for changing this. There is however a plan to introduce a

new national rule to facilitate young fishers in obtaining a fishing vessel. The plan is to allocate a part of the Danish allocation of kW and GT in a reserve, which can be applied for on a temporary basis by young fishers wishing to buy their first vessel. This will make it easier for them, since they will not have to buy all of the needed capacity (kW and GT) at market prize. The new rules are to enter into force in July 2017.

Since permits for new capacity are only issued if there is a previous withdrawal of capacity, total physical capacity will never be higher than the ceilings. Since the system works with individual permits that can be held as virtual capacity, physical capacity tends to be well below the ceilings.

REFERENCES
EU. 2019. *Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06).* Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic

Report of Germany

National report of Germany

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

Jörg Berkenhagen
Johann Heinrich von Thünen Institute
Federal Research Institute for Rural Areas, Forestry and Fisheries
Braunschweig, Germany

1. OBJECTIVES AND CONTEXT

This fishing fleet assessment is part of a global assessment by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The German fishing fleet produced approximately 0.3 percent of the global capture fisheries production in 2016, and was therefore included in the global fishing fleet performance assessment of FAO. Germany is also one of the most important producers within the EU fishing fleet, ranking sixth in volume of seafood landed.

Germany has participated in all the previous FAO global studies on techno-economic performance of the main fishing fleets. The main fleets covered in the previous analysis included:

- 1995/1997: freezer trawlers, North Sea shrimp fisheries, North and Baltic Sea fishing vessels, Baltic Sea fishing vessels.
- 1999/2000: inshore fishing vessels 10–12 m, cutter trawlers of 15–20 m, 22–25 m and 28–32 m, shrimp trawlers 15–20 m; pelagic trawlers 60–90 m and groundfish trawlers 60–80 m.
- 2002/2003: coastal fishing vessels 10–15m; trawling cutters of 15–22 m and 22–30 m; shrimp trawlers 15–20 m; pelagic trawlers 90–120, groundfish trawlers 60–90 m

The information presented in this analysis was collected in 2018 by German national authorities under the EU Data Collection Framework Regulation.[1] The data were compiled and analysed during two Expert Working Group meetings convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the Annual Economic Report (AER) on the EU fishing fleet.

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN THE GERMANY

The marine capture fisheries production[2] in Germany decreased in the last 10 years from 293 037 tonnes in 2006 to 271 185 tonnes in 2016 (-1 percent compared to the 274 281 tonnes in 2008).

---

[1] Council Regulation (EC) No 2017/1004 of 17 May 2017
[2] As reported to FAO (i.e., covers landings by all vessels in German ports, irrespective of nationality of the vessel).

The volume (in live-weight equivalent) of seafood landed by the German national fleet[3] amounted to 228 244 tonnes in 2016, 12 percent less than in 2008 (257 992 tonnes). In 2017, the landings increased by 11 percent compared to 2016 to 252 835 tonnes. Overall, total production has followed an increasing trend from 2012 to 2018, with landings increasing from 198 480 tonnes to 261 214 tonnes.

At the same time, the number of active vessels decreased by 21 percent, from 1 348 in 2008 to 1 059 in 2016, falling a further 4 percent in 2017 to 1 012 vessels. The gross active tonnage and engine power in 2016 was 58 651 GT was 123 943 kW. There were 371 inactive vessels in 2016, down from 512 vessels in 2008, with a combined latent tonnage of 2 045 GT and a combined engine power of 11 840 kW. Overall, the total number of fishing vessels decreased by 23 percent, from 1 861 in 2008 to 1 430 in 2016. Fleet capacity in terms of GT and kW also decreased, 9 percent and 14 percent respectively.

The main species landed by the German fishing fleets are herring, cod, common (brown) shrimp, saithe and Greenland halibut. In terms of weight herring is by far the dominant species, whereas brown (common) shrimp generates the highest revenue.

TABLE 1
Overview of the German fishing fleet: number of vessels by main fishing gear and scale

Main fishing gear	Small-scale, coastal (<12 m)	Semi-industrial (12–18 m)	Industrial/ Semi-industrial (18–40 m)	Industrial (> 40 m)	German fleet	% over total
Drift and/or fixed netters		5	4		9	0.6
Demersal trawlers/demersal seiners	10	26	22	7	65	4.5
Pots and/or traps			2		2	0.1
Polyvalent passive gears only	776				776	54
Beam trawlers	10	111	71	1	193	13.5
Pelagic trawlers		2	7	5	14	1
Inactive vessels	355	7	9		371	26
Total number of vessels	**1 151**	**151**	**115**	**13**	**1 430**	
% over total	80.5	10.6	8	1		

The German fishing fleet contains a small number of large pelagic vessels owned mainly by one company.[4] These vessels operate predominantly in the North Sea and North Atlantic and target herring, mackerel and blue whiting. Combined, the pelagic fleet (14 vessels, ranging from less than 12 m to over 40 m LOA) accounted for 74 percent of the landed weight and 72 percent of the landed value in 2016.

Overall, the German non-pelagic fleet generated net profits since 2012. Its economic performance significantly improved until 2017, when the fleet again suffered net losses. This was almost exclusively due to developments in the high seas demersal trawler segment. Newly built trawlers replaced two older vessels, resulting in high transaction and capital costs and a temporary decrease in effort. Economic performance in 2018 was again positive.

As trawlers dominate the German fleet, fuel prices have a major impact on the overall economic performance. The relatively low fuel prices have helped improve performance over the last few years. Prices for brown shrimp also have a significant influence on the performance of the national fleet, as it is the most important species

---

[3]   As reported under the data collection framework (DCF), i.e., covers landings by German registered vessels.
[4]   Limited economic data are available for this fleet segment due to confidentiality issues.

in terms of value. In 2017, brown shrimp landings increased by 16 percent from a very low level and, although the average price per kg dropped (-11 percent), the total value increased again (+3 percent compared to 2016).

The socio-economically most important German fishing fleets are: (1) the industrial pelagic trawlers (>40 m LOA); (2) deep-sea trawlers >40 m; (3) deep-sea trawlers 24–40 m; (4) beam trawlers 18–24 m; (5) beam trawlers 12–18 m and (6) the small-scale coastal fleet <10 m.

The small-scale coastal fleet (<10 m) using pots and traps is the largest in terms of number of fishing vessels (718 vessels), while the pelagic fleet, with only 14 vessels, is the top producer, followed by the deep-sea trawlers (see Table 2).

TABLE 2
Overview of main fishing fleets, 2016

Fishing fleet	Number of vessels	Volume of landings (tonnes)	Value of landings (million USD)	Scale[5]	Main fishing areas
Pelagic trawlers >40 m	14	167 785	84.1	Industrial	North Sea, western British waters (ICES IV, VIa, VII), Mauritanian waters and waters off Western Sahara, Eastern Baltic Sea, Faeroe Island waters, and NEAFC areas
Deep-sea trawlers >40 m	7	22 602	51.6	Industrial	Southeast Greenland, Norwegian Sea, NAFO Division 21.1C, Eastern Arctic, Spitzbergen and Bear Island
Deep-sea trawlers 24–40 m	9	7 890	18.9	Industrial	Kagerrak and Kattegat, Baltic West of Bornholm, Southern Central Baltic, Belt Sea
Beam trawlers 18–24 m	63	4 114	30.0	Semi-industrial/ Industrial	Southern North Sea
Beam trawlers 12–18 m	111	3 868	29.4	Semi-industrial	Southern North Sea
Passive gears <10 m	718	4 835	6.7	Small-scale coastal	Baltic West of Bornholm and Southern Central Baltic – East

Table 3 lists the main species targeted by each fleet by volume. Atlantic herring, common (brown) shrimp, mackerel and cod are key to these fleets.

TABLE 3
Main species targeted by fishing fleet (importance within total landed volume in 2016)

Fleets/species targeted	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic herring	Atlantic mackerel	Blue whiting	European pilchard	European sprat
Deep-sea trawlers >40 m	Atlantic cod	Greenland halibut	Saithe	Atlantic redfish	Haddock
Deep-sea trawlers 24–40 m	Saithe	Atlantic cod	European plaice	European hake	Haddock
Beam trawlers 18–24 m	Common shrimp	European plaice	Norway lobster	Common sole	Turbot
Beam trawlers 12–18 m	Common shrimp	Atlantic cod	European plaice	Common dab	European flounder
Passive gears <10 m	Atlantic herring	Atlantic cod	Roach	European flounder	Northern pike

Table 4 lists the main species targeted by each fleet in value. In terms of commercial value generation, Atlantic herring, mackerel, common (brown) shrimp and Atlantic cod are key to these fleets.

---

[5] The scale categories applied within the FAO global review study are: Industrial, semi-industrial, or artisanal/small-scale.

TABLE 4
Main species targeted by fishing fleet (importance within total landed value in 2016)

Fleets/species targeted	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic herring	Atlantic mackerel	Blue whiting	European pilchard	Jack and horse mackerel
Deep-sea trawlers >40 m	Greenland halibut	Atlantic cod	Saithe	Atlantic redfish	Haddock
Deep-sea trawlers 24–40 m	Atlantic cod	Saithe	Norway lobster	European hake	European plaice
Beam trawlers 18–24 m	Common shrimp	Common sole	Norway lobster	European plaice	Turbot
Beam trawlers 12–18 m	Common shrimp	Atlantic cod	Common sole	European plaice	Common dab
Passive gears <10 m	Atlantic cod	Pike-perch	Atlantic herring	European eel	European perch

EU fisheries are managed within the framework of the Common Fisheries Policy (CFP), which aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with the Maximum Sustainable Yield (MSY)) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures are adopted (as appropriate), such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas).

German fisheries are predominantly managed though TACs and quota limits. For full-time fishers, individual quotas are assigned to the vessel, non-transferable and non-leasable. However, the quotas can be swapped within Producer Organisations (POs). Part-time fishers access a community quota, rationed monthly. Germany complies with the EU entry-exit scheme; hence, fishing capacity can only be added if at least the same amount of capacity is taken out of the national fleet. To join the industry, full-time new fishers need to purchase existing vessels to access fishing opportunities.

The limitation of annual quota changes to 15 percent within the CFP was regarded by fishers as positive for keeping prices stable. Effort restrictions due to management plans were regarded counter-productive in the case of the North Sea cod management plan; kW days-limitations for fisheries targeting cod and therefore using larger meshes were seen as a limiting factor. In order to fully exploit the cod quota, the cod fishery had to be continued as flatfish fishery with smaller meshes. According to the industry, this increased discards considerably.

Brown shrimp, the most important species for the German fleet, is not subject to a TAC regime. Catches depend mainly on abundance, effort and prices. While the 2015 catches were at an average level, catches were cut by more than half in 2016. This was overcompensated by very high market prices. Catches increased slightly in 2017 with prices remaining high, thus resulting in further increase in revenues of brown shrimp fishers.

Most stocks targeted by the German high seas fleet, e.g. Arctic and Greenland cod, Atlanto-Scandian herring, Arctic haddock and saithe, are managed at MSY level. Overall, the high seas industry regarded fisheries in both 2015 and 2016 as good.

The most relevant North Sea stocks (herring, saithe, plaice, haddock, sole and Nephrops) are also managed at MSY level. North Sea cod and herring quota increased by 15 percent in 2016, while quota for saithe and plaice remained stable. After a benchmarking of the North Sea saithe stock substantial quota uplifts were applied in 2017.

Both Eastern and Western Baltic cod quota further decreased. A substantial cut of more than 50 percent occurred in 2017 for the Western Baltic cod stock while the Eastern Baltic cod stock was only partly exploited. Fishes are in poor condition (malnutrition) and show an unfavourable length distribution, thus the fishery has

become less attractive. These stocks have contributed significantly to the income of coastal fisheries and the continuing decline of quota over the last years has caused a tense economic situation. Alternative fishing options, for example, on herring or freshwater species, are limited and do not fully compensate losses in the cod fishery. Moreover, quota for the Western Baltic herring was cut by 39 percent in 2018, thus aggravating the critical situation of the artisanal fishers. As the German quota on the Eastern cod stock can only be exploited by trawlers, it is not an alternative fishing opportunity for the small-scale fixed netters who suffer from decreased Western cod quota.

The landing obligation can be implemented with little extra effort in the pelagic fisheries as well as in the saithe fisheries as these traditionally have low bycatch rates. In the case of cod and flatfish fisheries, serious problems have been reported. In the Baltic Sea high amounts of undersized cod were observed. According to the industry no technical measures are available to solve this problem. In the case of the flatfish fisheries, high rates of undersized plaice are observed in the sole fishery. Again, the industry has found no technical solution to reduce bycatch of undersized fish thus far.

Fleet management in Germany is further characterised by the desire to uphold the tradition of fishing as a family-run side business, in part to also help prevent ports being abandoned and to encourage tourism. This type of fishing has acquired historical fishing rights that have to be taken into account when fishing opportunities are allocated under the German Marine Fisheries Act. It should be noted, that although fishing as a side business generally involves very low catches, maintaining them is a stated aim.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Pelagic trawlers

The German pelagic fleet can be characterised by an average length of 51 meters LOA, gross tonnage of 1 855 tonnes and engine power of 2 000 kW (see Table 5). This fleet is the largest producer for the German fishing fleet, landing over 167 785 tonnes (or 74 percent of the total volume) of seafood, valued at over USD 84 million in 2016. Overall, there were 14 active vessels in 2016, of which five constitute the deep-sea pelagic fisheries segment (total length of 40 metres or more). Although the number of vessels did not change in 2017, fishing capacity increased by 214 GT and 860 kW compared to 2016 due to vessel replacements.

These vessels operate in many different areas. In the North Sea and western British waters (ICES IV, VIa, VII), vessels target herring, blue whiting and mackerel, and to a lesser extent, sprat and jack mackerel.

Several fishing trips were carried out in Mauritanian waters and waters off Western Sahara (FAO areas 34–131 and 34–132), where the main catch is composed of pilchard sardine and anchovy. Further catches were made in the eastern Baltic Sea (sprat), Faeroe Island waters (blue whiting) and in North East Atlantic Fisheries Commission (NEAFC) areas (blue whiting, herring and mackerel).

The high seas pelagic fisheries in European waters targeting herring, mackerel, horse mackerel and blue whiting were overall regarded successful. While fisheries on blue whiting were considerably more successful due to quota exchanges, horse mackerel catches dropped compared to the successful season in 2015.

In 2017, fisheries in the South Pacific under an EU-wide quota pooling were performed without a German trawler. The pelagic industry is striving for EU membership in the North Pacific Fisheries Commission (NPFC) in order to complement fishing activities in the Southern Pacific with fishing activities in the Northern Pacific and to increase its overall efficiency.

In 2015, the landing obligation became effective for pelagic fisheries. As this fishery has always had low discard or bycatch rates, the landing obligation caused no major problem. The total weight of bycatch landed by the high seas fleet amounted to 37 tonnes in 2017.

Quota for 2018 remained stable for the pelagic sector. While quota were cut for Atlanto-Scandian herring (-33 percent) and mackerel (-20 percent), increases were had for herring in EU waters (+25 percent) and horse mackerel (+21 percent). Quota for 2019 decreased for some pelagic stocks, such as herring north of 53°30'N (-36 percent), mackerel (-20 percent) and blue whiting (-20 percent).

Due to confidentiality reasons, cost and earnings data for this fleet are unavailable.

German demersal trawlers[6]

The German deep-sea trawler fleet can be divided into: (1) high seas trawlers with LOA >45 m, targeting Greenland halibut, cod and redfish in the Eastern Arctic and Greenland waters; (2) large cutters with an LOA between 23 and 45 m, targeting saithe, cod, hake and haddock in the North Sea and Skagerrak; and (3) smaller cutters with LOA <23 m, operating almost exclusively in the Baltic Sea and which target cod, flatfish and – seasonally switch to pelagic gear to catch herring and sprat.

The large cutters and the eurocutters (vessels of around 24 m) also fish *Nephrops*. Some eurocutters shift temporarily to shrimp beam trawling or pelagic trawling for herring.

Overall, the deep-sea trawler fleet was profitable in 2016. Vessel profit figures used in the analysis are partly estimated based on internal prices, as these vessels are part of companies that also operate in fish processing. That means that the profit is not necessarily assigned to the vessel only but may be made partly at an advanced stage of the value chain as well. One new high seas demersal trawler entered the fleet in 2015 and two in 2017. Two newly built vessels of around 40 m LOA entered the fleet in 2018. This is a clear indication of profitable fisheries.

The medium sized demersal trawlers (18–24 m), which are a mix of North Sea and Baltic vessels were also profitable while vessels below 18 m suffered net losses. In both cases, the poor status of Western Baltic cod has a negative impact on vessel profitability.

Deep-sea demersal trawlers >40 m LOA

The industrial deep-sea trawler fleet can be characterised by an average length of 66 meters LOA, gross tonnage of 1 843 tonnes and engine power of 2 246 kW. The average number of days at sea per vessel in 2016 was 230 days, of which 186 were fishing days. The average number of fishing trips was 16, each averaging around 15 days (see Table 5).

The average crew size is 27 (21 FTE) and the main fishing gears carried include: bottom otter trawls (79 percent), otter twin trawls (10 percent) and bottom pair trawls (8 percent).

The fleet targets a variety of species, but in particular demersal species such as Greenland halibut, cod, saithe, haddock and redfish.

There were seven active vessels in 2016, landing over 22 600 tonnes of seafood valued at almost USD 52 million. On average, a vessel landed around 3 229 tonnes valued at USD 7.4 million.

These vessels operated in the North Atlantic (including Svalbard, the Barents Sea, Greenland; ICES I, II and XIV and NAFO 1). The main catches in the northern North Sea, in Norwegian waters and in the waters around Svalbard were cod and saithe. Good catches of halibut and redfish were made in Greenland waters and to some extent also in NEAFC areas.

---

6   The DCF length thresholds divide the demersal fleet into segments with heterogeneous fishing patterns and thus the performance indicators in most cases represent a mixture of different fisheries.

In 2016 and the fleet as a whole was profitable. In 2017, the high sea trawlers achieved positive results in the cod fishery in Norwegian waters, Svalbard and the Barents Sea. The saithe fishery in Norwegian waters took place from February to April and was regarded satisfactory. For the first time in several years, the high seas fleet also targeted saithe in the North Sea. Greenland halibut fisheries in Eastern and Western Greenland waters were highly efficient. The Greenland cod quota could be fully exploited. The 2017 season of pelagic redfish fishery in the Irminger Sea as well as the demersal redfish fisheries in Eastern Greenland waters were regarded successful as well. Fisheries agreements with Greenland and Norway remain a backbone for the performance of the German high seas demersal fleet.

Two vessels were replaced with new vessels. As a result, fishing capacity increased by 2 519 GT and 670 kW, although the number of vessels remained unchanged.

Deep-sea trawlers 24–40 m

The deep-sea trawler fleet can be characterised by an average length (LOA) of 30 meters, gross tonnage of 260 tonnes and engine power of 475 kW. The average number of days at sea per vessel in 2016 was 219 days, of which 190 were fishing days. The average number of fishing trips was 43, each averaging around 5 days (see Table 5).

The average crew size is five (4 FTE) and main fishing gears carried include: bottom otter trawls (59 percent), Scottish seines (40 percent) and beam trawl (1 percent).

The fleet targets a variety of species but in particular demersal species such as Atlantic cod, saithe, Norway lobster, European hake and plaice.

The nine vessels in the segment in 2016, landed over 7 890 tonnes of seafood valued at almost USD 19 million. On average, a vessel landed around 877 tonnes valued at USD 2.1 million in 2016.

The fleet as a whole was profitable in 2016 and 2017.

German beam trawlers

The German beam trawlers operate mainly in the North Sea. Vessels up to 27 metres LOA target almost exclusively brown shrimp. The few large beam trawlers over 27 meters target mainly flatfish.

The owners of the shrimp beam trawlers are usually also the skippers. They operate in coastal waters: smaller vessels with shallow draught can fish in the tide-ways and the Wadden sea area between the islands and the coast. These vessels depend on the tide and return to the port daily. They usually do not fish in winter as the target species migrates to deeper waters. Larger vessels operate at greater depths and fish year-round.

Shrimp prices and fuel costs are the crucial elements for the economic performance of shrimp beam trawlers and 2016 was regarded as satisfactory: the weight of landings increased slightly from a very low level while prices for brown shrimp remained almost stable. Thus, the total value of landings increased considerably. In addition, fuel prices decreased slightly and the profit increased.

Flatfish beam trawlers flying the German flag are owned and operated mainly by Dutch fishers. They target sole, plaice, and turbot and all are equipped with pulse gear. The catch was landed exclusively in the Netherlands. The weight of landings remained stable while the value of landings increased from 2015 to 2016. Moreover, fuel costs decreased by about 10 percent.

Beam trawlers 18–24 m

This segment of the beam trawler fleet can be characterised by an average length of 20 meters LOA, gross tonnage of 61 tonnes and engine power of 220 kW. The average number of days at sea per vessel in 2016 was 167 days. On average, vessels made 60 fishing trips, each averaging around 3 days (see Table 5).

The average crew size is three and main fishing gears carried include: beam trawls (96 percent) and bottom otter trawls (4 percent).

The 63 vessels landed over 4 113 tonnes of seafood valued at almost USD 30.0 million in 2016; an average of 65.3 tonnes and USD 475 000 per vessel.

The fleet targets a variety of demersal species such as common (brown) shrimp, common sole, Norway lobster, European plaice and turbot. In 2017, this segment caught almost exclusively common shrimp. There is no quota for this target species.

The fleet as a whole was profitable in 2016. In 2017 the German cutter fisheries were able to keep landings stable overall while product prices increased on average. Consequently, the economic situation was regarded as satisfactory. The recovery of important stocks was perceived as positive by the industry. However, the situation varied by fishery.

Brown shrimp, being the most important species for the German cutter fishery, is not managed by TAC. As there is no stock assessment, the abundance and thus the catches of brown shrimp cannot be properly forecasted. In previous years, revenues from the brown shrimp fisheries were at a sufficient level according to the industry. Changes in catch were compensated by price adjustments. In the 2018 autumn season, high catches were observed, thus giving a reason to assume higher catches in 2019 than in previous years. However, prices had dropped considerably from a very high level and the wholesalers reported fully stocked warehouses by end of 2018.

The 2016 class of Western Baltic cod was assessed very strong, thus giving hope for an improved quota situation when this class has achieved landing size.

The quotas for the main target species of the North Sea flatfish fishery (plaice, sole, turbot) were increased as stocks grew further. However, as in previous years the German plaice quota was only partly exploited (~ 50 percent) as some flatfish trawlers could switch to the more profitable *Nephrops* fishery thanks to extensive quota exchange. Flatfish beam trawlers are all equipped with pulse gear.

The North Sea saithe quota was increased substantially for 2017 (+53 percent) and 2018 (+6 percent). For North Sea cod, the sustainability target for the spawning stock biomass was reached and the quota was raised by 17 percent for 2017 and 10 percent for 2018. Prices were satisfactory, according to the industry. Two new cutters were commissioned in 2017 and entered the fishery in 2018.

In 2017, the brown shrimp fishery in the North Sea performed even more successfully than in preceding years. Landings recovered slightly from a very low level, but prices dropped only very slightly from a very high level so that total revenues were further increased. Thus, the fishery remained highly profitable.

Beam trawlers 12–18 m

This segment of the beam trawler fleet can be characterised by an average length of 16 meters LOA, gross tonnage of 31 tonnes and engine power of 195 kW. The average number of days at sea per vessel in 2016 was 134 days; on average vessels made 27 fishing trips, each averaging around 5.5 days. The average crew size is two (see Table 5) and vessels operate exclusively with beam trawls.

The 111 active vessels in the fleet segment landed over 3 868 tonnes of seafood valued at USD 29 million in 2016, an average of 38.8 tonnes and a value of nearly USD 265 000 per vessel.

The fleet targets a variety of demersal species such as common (brown) shrimp, Atlantic cod, European plaice and dab.

The fleet as a whole was profitable in 2016 and 2017. In 2017, the Baltic cod fishery suffered grossly from a 56 percent quota reduction on the Western Baltic stock. There is hardly any alternative fishery. Compensatory payments for temporary and permanent cessation were provided by the German authorities. A strong recruitment

of the 2016 age class gives hope for improvement of the stock situation in the near future. An 8-week closed season during the spawning season was introduced in 2016 for trawling on Western cod.

The quota for the Eastern Baltic stock was not a limiting factor for the participating fishers as the quota exploitation rate remained low. Due to the limited range of operation of the small-scale fleet, the Eastern cod stock is not an alternative source of income. It was also classified as data poor stock, which led to a withdrawal of the Marine Stewardship Council (MSC) certificate in 2015, impeding marketing of the catch.

The plaice stock in the Baltic Sea shows an increasing trend, the quota was fully exploited and fisheries were regarded satisfactory, though they could not compensate for the loss of cod quota.

Coastal herring fisheries in the Baltic were satisfactory due to stable prices.

Small-scale netters <12 m

This is the largest segment of the German fishing fleet and is made up of just over 1 000 small-scale coastal fishing vessels with a total length overall of less than 12 metres. These vessels mainly operate with static nets in the Baltic Sea. Over a third of the vessels are low activity vessels, operating in the context of a side business, mostly just for a few days a year, such as on weekends or seasonally for a few weeks. They are mostly vessels from Mecklenburg-Western Pomerania fishing almost exclusively for herring, cod or non-quota (freshwater) species such as perch, pike and zander in the Baltic bays. Despite their large number, these vessels play only a minor role in cod fisheries, with catches totalling a mere 90.9 tonnes in 2017. The total herring catches amounted to 816.9 tonnes. About a third of these vessels are also second or third vessels, meaning that they log very few sea days. Compared with 2016, there were 30 fewer vessels in 2017; engine power decreased by 459 kW and tonnage by 44 GT.

Polyvalent passive gears <10 m

The small-scale fleet using passive gears can be characterised by an average length of 6 meters, an average gross tonnage of 2 tonnes and engine power of 24 kW. The average crew size is one (see Table 5) and main fishing gears include: set gillnets (anchored) (90 percent), trammel nets (3 percent), stationary uncovered pound nets (3 percent), pots (2 percent) and set longlines (1 percent).

There were 718 active vessels in 2016, most of which are seasonal or low activity vessels. The average number of days at sea in 2016 was 83 days; on average vessels made 12 fishing trips. Collectively, these vessels landed 4 835 tonnes with a landed value of USD 6.7 million in 2016; an average of 6.7 tonnes per vessel valued at just over USD 9 000 per vessel.

These vessels operate almost exclusively in the coastal areas of the Baltic Sea. Main target species are cod, herring, and to some extent freshwater species in the brackish Bodden areas, which are not managed under a TAC regime. Vessels fishing in the Baltic Sea suffer from the decreasing TAC of Western Baltic cod.

This fleet segment as a whole was profitable.

TABLE 5
Basic information of each fleet

	Pelagic trawlers >40 m	Deep-sea trawlers >40 m	Deep-sea trawlers 24–40 m	Beam trawlers 18–24 m	Beam trawlers 12–18 m	Small-scale <10 m
Average vessel age	33	26	25	35	40	28
Average length overall (LOA)	51	66	30	20	16	6
Average gross tonnage (GT)	2 004	1 843	260	61	31	2
Average power of main engines in kilowatts (KW)	1 855	2 246	475	220	195	24
Average crew size (persons)		27	5	3	2	1
Average days at sea		230	219	167	134	83
Number of fishing trips		16	43	60	76	12

Table 6 presents the estimated number of full-time and part-time workers on each of the main fleets. Most workers on these vessels are full-time employees. Low activity vessels tend to be active seasonally or part-time, spending on average less than 30 days at sea. There are very few female fishers in the German fishing fleet.

Not much information is available on the age structure of the labour force of these fleets, but in contrast to most other EU fleets, aging seems not to be a major issue for the German fisherfolk population. Around 47 percent of the employed fishers are between 40–64 years old, 40 percent between 25–39 years old, 13 percent between 14–24 years old and 1 percent over 65 year olds. Of the 40–64 age group, only 88 fishers were older than 55 years.

Considering employment on-board activities only, crewmembers are almost solely male. The German labour agency (Bundesagentur für Arbeit) reported for 2017, 166 women out of 695 full-time insurable employments in marine fisheries. This corresponds to a share of 24 percent, and may predominately pertain to onshore roles, such as accounting and other administrative roles although there are some female deckhands – three female crew were reported on large-scale vessels in 2017.

Crewmembers are mostly German or EU nationals; 80 percent are German nationals, 16 percent from other EU Member states. Nearly 5 percent of the fishers are non-EU nationals and these work solely in the high sea fleet. Over 93 percent of the small-scale fishers are German nationals. Small-scale fisheries are strongly linked to one homeport and the local community. With increasing range and independence from one single homeport, the share of different nationalities increases: 12 percent of the large-scale fishers are of other EU-nationality. The high sea fleet contains the highest share of EU (45 percent) and non-EU nationals (28 percent) on-board. The main reasons behind this high internationality is that the German high sea fleet is owned by two non-German companies, Die Deutsche Fischfang Union as subsidiary of Samherji from Iceland and Parlevliet & Van der Plas from the Netherlands. Moreover, most of the activities of the large scale vessels fishing on the high seas are occurring in international fishing grounds.

TABLE 6
Labor Employed in Fishing and main socio-economic indicators

	Total employed	Full-time (FTE)	Average crew wage per FTE (EUR thousand)[7]	Labor productivity (GVA per FTE) (EUR thousand)
Deep-sea trawlers >40 m	189	147	113 502	214 348
Deep-sea trawlers 24–40 m	49	37	177 557	311 927
Beam trawlers 18–24 m	160	132	76 845	153 218
Beam trawlers 12–18 m	176	146	76 084	133 099
Passive gears <10 m	693	528	3 316	6 685

---

[7]   Exchange rate used, 1 EUR = 1.1069 USD (ECB reference exchange rate, US dollar/Euro, average of observations throughout 2016; Data Source in SDW: http://sdw.ecb.europa.eu/browse.do?node=9691296).

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF THE FLEET SEGMENTS
Deep-sea demersal trawlers >40 m LOA
Capital investments
The total tangible asset (replacement) value of the fleet was estimated at USD 54.5 million (or USD 7.8 million per vessel). Intangible asset value is not available as quotas are attached to vessels and can only be transferred alongside the vessel.

In-year investments in 2016 totalled USD 2.0 million; an average of USD 287 000 per vessel. In 2017, investments amounted to USD 91.7 million and the value of physical capital was estimated at USD 136 million.

Several factors influence the capital value of the fleet, including variations in investments from year to year. Significant investments have been made in the fleet in recent years: one new high seas demersal trawler entered the fleet in 2015, two in 2017 and a further two newly built vessels around 40 m entered the fleet in 2018.

Operating and owner costs
Total gross costs amounted to USD 37.1 million in 2016 (average of USD 5.3 million per vessel), with operating costs equating to 77 percent. The remaining 23 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 8.6 million.[8]

Among the operating costs, crew costs were highest at 59 percent of operating costs, followed by other variable costs (27 percent) and energy costs (14 percent). The highest owner related costs were made for repair and maintenance (58 percent of vessel costs) followed by other fixed costs (42 percent).

There are no fishing rights costs or income as quotas in Germany are publicly owned, non-transferable, and non-pleasable.

In 2016, on average a vessel spent USD 2.4 million on crew costs, USD 582 000 on fuel costs and USD 1.1 million on other variable costs. The average amount spent on repair and maintenance was USD 709 000 and USD 521 000 on other fixed costs.

Revenues
Revenue in 2016 was USD 51.9 million; an increase of 9 percent compared to 2015. The average revenue per vessel was over USD 7.4 million.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 14.8 million and a gross profit of USD 6.0 million. With a Gross Value Added (GVA) to revenue of 61 percent and net profit margin of 12 percent, profitability was reasonable.

Deep-sea demersal trawlers 24–40 m
Capital investments
The tangible asset (replacement) value of the fleet was estimated at USD 9.8 million (or almost USD 1.1 million per vessel). The intangible asset value is not available as quotas are attached to vessels and can only be transferred alongside the vessel. In 2016, in-year investments amounted to only USD 81 000; an average of nearly USD 9 000 per vessel. Investments amounted to USD 2.2 million in 2015 and USD 9.9 million in 2017.

Operating and owner costs
Total gross costs amounted to USD 13.8 million in 2016 (average of USD 1.5 million per vessel), with operating costs equating to 77 percent. The remaining 23 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental

---

8   Negative opportunity cost due to negative real interest rates in 2016.

payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 1.9 million.

Among the operating costs, crew costs were highest, equating to 60 percent of the operating costs, followed by energy costs (20 percent) and other variable costs (20 percent). The highest owner related costs were made for repair and maintenance (81 percent of owner costs), followed by other fixed costs (19 percent). There are no fishing rights costs or income as quotas are publicly owned, non-transferable, and non-leasable.

In 2016, the average vessel spent USD 703 000 on crew costs, USD 240 000 on fuel costs and USD 237 000 on other variable costs. The average amount spent on repair and maintenance was nearly USD 283 000 and USD 67 000 was spent on other fixed costs.

Revenues
Total income for the fleet in 2016 reached almost USD 19.0 million (a 14 percent decrease on 2015). The average revenue per vessel was over USD 2.1 million. In 2017, total fleet segment revenue increased slightly to USD 19.7 million.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 5.2 million and a gross profit of almost USD 3.3 million. Despite the loss in revenue, the fleet saw some improvement in the economic results due to lower costs. Profitability was good with a net profit margin of 17.5 percent. The fleet obtained a GVA to revenue of 61 percent and a RoFTA of 34 percent.

Beam trawlers 18–24 m
Capital investments
The total tangible asset (replacement) value of the 63 vessels in this fleet segment was estimated at USD 12.0 million (or approximately USD 190 000 per vessel). The intangible asset value is not available as quotas are attached to vessels and can only be transferred alongside the vessel. In-year investments in 2016 totalled USD 10.2 million; an average of USD 161 000 per vessel. In 2017, a further USD 12.6 million were invested in the fleet.

Operating and owner costs
Total gross costs amounted to USD 18.3 million in 2016, with operating costs contributing to 55 percent. The remaining 45 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 2.7 million.

Among the operating costs, crew costs were highest, equating to 68 percent of the operating costs, followed by energy costs (30 percent) and other variable costs (2 percent). The highest owner related costs were made for other fixed costs (51 percent of owner costs), followed by repair and maintenance (49 percent). There are no fishing rights costs or income as quotas are publicly owned, non-transferable, and non-leasable.

In 2016, the average vessel spent nearly USD 109 000 on crew costs, USD 48 000 on fuel costs and just over USD 3 000 on other variable costs. The average expenditures on repair and maintenance were nearly USD 64 000 and some USD 66 000 was spent on other fixed costs.

Revenues
Revenue in 2016 was USD 31.6 million; a 43 percent increase compared to 2015. The average revenue per vessel was over USD 502 000 in 2016.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 13.4 million and a gross profit of USD 10.6 million. With a GVA to revenue of 64 percent and net profit margin of 33.5 percent, profitability was high and the fleet saw improved performance compared to previous years.

Beam trawlers 12–18 m
Capital investments
The total tangible asset (replacement) value of the 111 vessels in the fleet was estimated at USD 10.2 million (or just over USD 92 000 per vessel). The intangible asset value is not available as quotas are attached to vessels and can only be transferred alongside the vessel. In-year investments in 2016 totalled USD 6.1 million; an average of USD 55 000 per vessel. Similar amounts were invested in the fleet in 2015 and in 2017.

Operating and owner costs
Total gross costs amounted to USD 17.2 million in 2016, with operating costs contributing to 55 percent. The remaining 45 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 2.5 million.

Among the operating costs, crew costs were highest, equating to 69 percent of the operating costs, followed by energy costs (28 percent) and then other variable costs (3 percent). The highest owner related costs were made for repair and maintenance (51 percent of owner costs), followed by other fixed costs (49 percent). There were no fishing rights costs or income as quotas are publicly owned, non-transferable, and non-leasable.

In 2016, the average vessel spent USD 58 000 on crew costs, nearly USD 24 000 on fuel costs and USD 3 000 on other variable costs. The average amount spent on repair and maintenance was around USD 36 000 and USD 35 000 on other fixed costs.

Revenues
Revenue in 2016 amounted to USD 30.2 million; a 16 percent increase on 2015. The average revenue per vessel was USD 272 000 in 2016.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 12.9 million and a gross profit of almost USD 10.4 million. With a rise in revenue and lower energy costs, the fleet saw improvement in the economic results. Profitability was high with a GVA to revenue of 64 percent and a net profit margin of 34 percent.

Small-scale coastal fleet <10 m
Capital investments
The total tangible asset (replacement) value of the 718 vessels that make up this fleet was estimated at USD 5.0 million (or USD 7 000 per vessel). The intangible asset value is not available as quotas are attached to vessels and can only be transferred alongside the vessel. In-year investments in 2016 totalled USD 1.4 million; an average of USD 2 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 4.4 million in 2016, with operating costs contributing to 46 percent. The remaining 54 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 1.1 million.

Among the operating costs, crew costs were highest, equating to 42 percent of the operating costs, followed by other variable costs (38 percent) and then energy costs (20 percent). The highest owner related costs were made for other fixed costs (70 percent of owner costs), followed by repair and maintenance (30 percent). There were no fishing rights costs or income as quotas are publicly owned, non-transferable, and non-leasable.

In 2016, the average vessel spent just over USD 1 000 on crew costs, USD 575 on fuel costs and USD 1 000 on other variable costs. The average amount spent on repair and maintenance was respectively around USD 1 000 and USD 2 000 on other fixed costs.

Revenues

Revenue in 2016 reached almost USD 7.1 million; a 5 percent increase on 2015. The average revenue per vessel was nearly USD 10 000 in 2016.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 2.7 million and a gross profit of almost USD 1.5 million. The fleet saw significant improvements in the economic results due to higher revenue and lower overall costs. Profitability was good with a GVA to revenue of 50 percent and a net profit margin of 21.7 percent.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES

Fishing vessel owners/fishing cooperatives and producer organisations in Germany have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national), USD 7 billion is EU contribution, for the period 2014–2020. The allocation for Germany is set at USD 315.0 million, with EU contribution of USD 243.0 million. USD 45.6 million is set to support a sustainable and innovative fishing sector.

Support from the EMFF can be provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include: (1) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms (e.g. with lower interest rates, longer repayment periods, or fewer collateral requirements); (2) Microcredits, which are smaller loans made to people sometimes excluded from access to finance, often provided over a short term and with no or low collateral required; (3) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan and (4) Equity, where capital is invested in return for total or partial ownership of a firm.

The EIB lending activities are aligned to EU standards and priorities and can cover the whole fishery value chain, ranging from input and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improved or restored ecosystems, innovative solutions for current and future challenges in the sector, and/or the productive and sustainable use of by products from food production.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

Germany has a tax exemption on fuel provided that the owner is licensed. Fuel price in 2016 for the German fleet averaged USD 0.39 per litre, increasing to USD 0.44 per litre in 2017.

There is also a system with financial compensation for reduction of fishing effort, such as scrapping of fishing vessels. To ensure compliance with the landing obligation, EMFF funds also foresee measures for the investment in more selective fishing gears and for technical adjustments.

To qualify for EMFF support, typically businesses must have achieved average annual profits of at least USD 10 000 or recorded more than 60 sea days a year on average over the past three years. This allows support to be targeted at profitable businesses, thereby raising the incentive to decommission unprofitable parts of the fleet.

Mecklenburg-Western Pomerania aims to promote certification according to Marine Stewardship Council (MSC) criteria for businesses engaged in herring fishing with static nets and pots in the western Baltic Sea. The procedure will result in the certification of around 30 percent of the German basic quota for Baltic herring and is expected to be completed in 2018. MSC certification is aimed at to guarantee sales and will likely raise income levels in this fleet segment.

Certification results generally in stable or higher prices. In several cases it has become a prerequisite for sales due to market requirements. For the high seas fisheries, the most important pelagic fisheries (North Sea herring, Atlanto-Scandian herring, mackerel, blue whiting) are MSC-certified. Cod, haddock and saithe fisheries in Norwegian waters and around Svalbard are certified as well as saithe fisheries in the North Sea. All annual audits were finalized successfully. The certification of cod, haddock and saithe fisheries in the Barents Sea was extended for five more years. The cutter fishery on brown shrimp was certified in 2017. The certification process of Greenland halibut fishery was initiated in 2018.

Several measures are being taken under the EMFF to also strengthen direct marketing by fisher and producer organisations in order to improve income levels. Funds are also made available under the EMFF for generic advertising aimed at improving the image of small-scale fisheries and encouraging consumers to pay higher prices.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

One high seas demersal trawler that had left the German fleet was replaced by a newly constructed trawler in 2015, equipped with the latest technology, including energy-efficient engines. Two more high seas demersal trawlers were replaced by new vessels in 2017. Two cutters of the 40 meters class were under construction (2018). This high level of investment observed in the sector in larger demersal vessels is unpreceded in the recent past. Modernisation of on-board equipment continues as in preceding years.

Overall, the cutter fleet is expecting increasing problems from an increasing number of overaged vessels. The oldest vessel in the German fleet turned 100 years of age in 2019. There has been almost no newly built cutter vessel introduced to the German fleet in recent years, in contrast to the high seas fleet where a substantial share of the fleet is undergoing a replacement. The investment in a new cutter appears to be unfeasible for the usually family-owned businesses. Further concerns of the cutter industry refer to the lack of successors and potential area closures.

With the landing obligation implemented in EU fisheries, the need for innovation and development of new types of gear technology has become crucial. Various different methods for reducing bycatch are being trialled.

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that, from 2014, the fishing capacity of their fleet at no time exceeds the fishing ceilings in Annex II to Regulation (EU) No1380/2013. Germany has been fully compliant with fleet ceilings since.

In Germany, compliance with the capacity ceilings is ensured by means of 'capacity assurance licences' ('Kapazitätssicherungslizenzen') allowing a vessel to leave the fleet temporarily and be put back into operation at a later date. Capacity reductions (withdrawals from the fleet with public support) in 2017 were 198 GT and 1 178 kW.

Capacity ceilings for Germany under Annex II to Regulation (EC) No 1380/2013:	71 117 GT	167 078 kW
Status of fleet as at 1 January 2003:	66 844 GT	161 045 kW
Status of fleet as at 31 December 2017:	64 558 GT	135 056 kW

REFERENCES

EU. 2019. *Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06).* Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic

© FAO/M. Guele

Report of France

© SAPMER

National report of France

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

Marie-Dominique Minne
Ministry of Agriculture and Food of France

1. OBJECTIVES AND CONTEXT

This fishing fleet assessment is part of a global assessment by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The French fleet produced approximately 0.6 percent of the global capture fisheries production in 2017 and is therefore included in the global fishing fleet performance assessment of FAO. It is also one of the most important EU Member State fishing fleets, ranking second in production value after Spain, and the fourth in volume terms.

The French fleet is also the largest EU fleet in terms of engine power (kW) and third in tonnage (GT) and one of the most diverse European fleets in terms of fishing activity, species landed, fishing gears and fishing areas.

France has participated in all the previous FAO global studies on techno-economic performance of the main fishing fleets. Overall, the fleets covered in these earlier studies included:
- handliners 8–10 m;
- gillnetters 10–12 m and 12–20 m;
- coastal seiners 15 m, 12–14 m and 14–16 m;
- coastal trawlers 15–17.5 m, 17–19 m, 19–20.5 m and 20.5–24 m;
- purse seiners Mediterranean Sea 27–33 m;
- deep-sea trawlers 17–19 m (Norway lobster), 19–20.5 m, 20.5–24 m, 28–33 m, 33–35 m, and 50–54 m.

The information presented in this analysis was collected in 2017/18 by the French national authorities under the EU Data Collection Framework Regulation.[1] These data were compiled and analysed by Expert Working Groups convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the Annual Economic Report (AER) on the EU fishing fleet.

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN FRANCE

The marine capture fisheries production[2] in France decreased in the last 10 years from 595 154 tonnes in 2006 to 561 173 tonnes in 2016 (-5.7 percent). However, if one compares to the 500 163 tonnes reported in 2008, then a production increase of 12 percent can be seen.

---

[1] Council Regulation (EC) No 2017/1004 of 17 May 2017

[2] As reported by FAO (i.e., covers landings by all vessels in French ports, irrespective of nationality).

The volume (in live-weight equivalent) of seafood landed by the French national fleet[3] amounted to 540 224 tonnes in 2016, which is 21 percent more than in 2008 (447 943 tonnes) and 3 percent less than in 2017 (555 891 tonnes).

At the same time, the number of active commercial fishing vessels decreased by 14 percent, from 6 605 in 2008 to 5 683 in 2016. Fleet capacity in terms of active GT and kW also decreased, 11 percent and 8 percent respectively between 2008 and 2016. Fleet engine power and gross tonnage rose in 2014 mainly due to the entry of five purse seiners based in Mayotte (overseas territory) adding over 10 000 tonnes to the national tonnage.

The main factors behind this decrease in GT and kW were vessel decommissioning schemes, entry barriers and natural wastage due to age. While the average vessel length showed a tendency to increase, the engine power and gross tonnage has remained relatively stable. Older vessels are generally replaced by larger new vessels.

Additionally, there were 1 152 inactive vessels in 2016, most of which were small-scale vessels under 12 m in length (98 percent). Most of these are found in the French overseas territories (68 percent), in particular Martinique and Guadeloupe, where inactive vessels represent up to 36 percent of the local fleets in number.

The French fleet generated in 2016 over 13 536 jobs, corresponding to 7 138 FTEs or 1.3 FTE per active vessel.

The French fishing fleet is nationally divided into:

(1) A small-scale coastal fleet comprising 4 124 active vessels (73 percent of the total number but only 9 percent of the GT) mainly made up of vessels less than 10 meters LOA. These vessels are distributed throughout the French regions: 40 percent based in the Outermost Regions;[4] 33 percent in the North East Atlantic and North Sea regions and 27 percent in the Mediterranean. Overall, the economic performance of this segment remained stable in 2016. Revenue increased compared to 2015. Thanks to a lower fuel dependency (energy costs represented 5.6 percent of revenue), operating profits were higher in 2016, reaching 20.6 percent, compared to 19.5 percent in 2015. GVA and gross profits were USD 205.7 million and USD 64.5 million respectively in 2016.

(2) A large-scale fleet (27 percent of total active vessels and 61 percent of the gross tonnage) made up of vessels using active gears, especially bottom trawlers and dredgers with lengths ranging from 12 m to over 40 m. Even though they are active in all the French regions, most of these vessels are based in the North East Atlantic and North Sea regions.

(3) A distant water fleet composed of 22 tropical purse seiners over 40 m, targeting tuna and tuna-like species in the South Atlantic and Indian Oceans. These 22 vessels generate approx. 12 percent of the national fleet's income.

Table 1 provides an overview of the French national fishing fleet in 2016 by number of vessels and main fishing technique.

Production in 2016 was 540 224 tonnes of seafood (live-weight equivalent) with a landed value of USD 1.35 billion. Production in 2017 increased 3 percent in volume (to 555 891 tonnes) and 11 percent in value (USD 1.49 billion).

Yellowfin tuna was the most important species, making up over 10 percent of the total landings of the national fleet in volume (55 740 tonnes), followed by skipjack tuna (53 019 tonnes) and hake (45 268 tonnes).

---

[3]   As reported under the DCF (i.e., covers landings by French registered vessels).
[4]   Guadeloupe, French Guiana, Réunion, Martinique, Mayotte and Saint-Martin

TABLE 1
Overview of the French fishing fleet: number of vessels by main fishing region, gear and size

Gear/fishing region vessel length class	Atlantic			Mediterranean			Other fishing regions			Total
	<12 m	12–24 m	>24 m	<12 m	12–24 m	>24 m	<12 m	12–24 m	>24 m	
Drift and fixed netters	454	102	18	626	20		248			**1 468**
Pots and traps	346	17		143			271	2		**779**
Hook and line	288		20	75			517	20		**920**
Polyvalent passive gears	265	-	-	277	-	-	614	-	-	**1 156**
Polyvatent active gears	216	21	-	24	-	-	-	-	-	**261**
Dredges	162	93		-						**255**
Demersal tawlers/seiners	267	287	67	-	32	32		15		**700**
Purse seiners		29		12		18	25		22	**106**
Pelagic trawlers		35	3							**38**
Total active fleet	**1 998**	**584**	**108**	**1 157**	**52**	**50**	**1 675**	**37**	**22**	**5 683**
INACTIVE	**160**	**4**	**4**	**190**	**6**	**4**	**775**	**9**		**1 152**
Total	**2 158**	**588**	**112**	**1 347**	**58**	**54**	**2 450**	**46**	**22**	**6 835**

In value, hake contributed to 10 percent (USD 139.5 million) to the total value landed, followed by monkfishes 8 percent (USD 111.5 million), yellowfin tuna 7 percent (USD 90.3 million). Other important species landed in 2016 included: Great Atlantic scallop (USD 87.5 million), common sole (USD 74.8 million) and skipjack tuna (USD 59.9 million).

In the Mediterranean region, the most important species include Atlantic bluefin tuna, European hake, common octopus and gilthead seabream in value, and anchovy in volume.

Brittany is the most important region in Metropolitan France for the fisheries sector, followed by Pas-de-Calais and Normandy. In 2016, France had 34 auctions sites authorized for the first-sale of seafood products. The top three species in terms of value sold in auctions, were monkfish, sole and European hake, representing around 28 percent of the total value sold. Some fishing operations, such as tuna freezer purse seiners targeting tropical tuna, do not sell directly in auctions.

The main ports where seafood is landed are: in the north, Le Guilvinec and Lorient in Brittany; Granville for shellfish in Normandy and Boulogne-sur-Mer in Pas-de-Calais. Main ports on the west coast include Les Sables, Oleron and St Jean de Luz, while in the Mediterranean the main ports are Le Grau du Roi and Sète (mostly for tuna).

A significant part of the French catch (mainly tuna and tuna-like species) is landed in the French Outermost Regions (OFR) and third countries. France is increasingly turning to its overseas territories for fish canning and packaging due to lower production costs.

The French national fleet as a whole was in a profit-making position in 2016 and improved on previous year's results. This improvement is largely attributed to high average prices across several important species and the continued low fuel prices. However, regional disparities were significant, with economic performance results differing between fleet segments and main fishing areas. In the Bay of Biscay, the Norway lobster season was particularly good, offering a regular supply to buyers throughout the year. In the Mediterranean, 2016 was marked by higher availability of some species, such as anchovy, and the market remained stable throughout the year.

Investment in new vessels becomes a key element for the fisheries sector to ensure the economic sustainability of the fleet. The number of new vessels built has increased in recent years thanks to better economic prospects, but access to funding or fishing rights becomes a major challenge for future investors, and often deters initiatives. On

the other hand, it remains difficult for many companies to recruit fishers. In some ports, the use of foreign labour is the only way to reach the required number of crew. Brexit is also a major cause for concern with the uncertainty of access to fishing areas.

The socio-economically most important fishing fleets in terms of jobs and production are: (1) the industrial purse seiners over 40 m in distant water fisheries; (2) deep–sea trawlers between 24–40 m; (3) deep-sea trawlers 18 to 24 m; (4) coastal trawlers 12 to 18 m; (5) gillnetters 10 to 12 m and (6) handliners under 10 m.

Combined, these fleets comprised 778 vessels (14 percent of the active French fishing fleet), 23 percent of the employment (3 087 engaged crew) and 44 percent of the landings in weight (236 922 tonnes) and value (USD 641 million) in 2016.

The small-scale coastal fleet (<10 m) using hand lines, is the largest in number (239 vessels), but produced only 1 percent of the total volume and 2 percent of the total landed value. Coastal gillnetters, with 173 vessels (3 percent of the active fleet), contributed to 2 percent of the volume and 4 percent to the value.

The coastal trawlers 12–18 m with 153 vessels, covered 3.5 percent of the volume and 7 percent of the value landed, followed by the semi-industrial trawlers 18–24 m, with 134 vessels and 9.5 percent of the volume and 12.6 percent of the value.

The industrial bottom trawler fleet with less than 1 percent of the fleet (57 vessels) in terms of number of vessels, landed 7 percent of the total volume and 8 percent of the value of seafood, while the 22 vessels in the industrial purse seine fleet, were responsible for 21 percent of the total volume and 12 percent of the value of seafood landed (see Table 2).

TABLE 2
Overview of main fishing fleets, 2016

Fleet segment	Main fishing region	Number of vessels	Volume of landings (tonnes)	Scale	Main fishing areas	Fishing gears
Handliners <10 m	Atlantic <10 m	239	3 364	Small-scale coastal	Bay of Biscay (69%) and English Channel (30%)	Set longlines, handlines and troll lines
Gillnetters 10–12 m	North Atlantic	173	10 089	Small-scale coastal	Bay of Biscay (48%), English Channel (42%) and southern North Sea (10%)	Trammel nets, set gillnets, pots, boat dredges and driftnets
Coastal trawlers 12–18 m	North Atlantic	153	18 713	semi-industrial	Bay of Biscay (76%), English Channel (22%), Celtic Sea (2%)	Bottom otter trawl, otter twin trawl, Boat dredges
Deep-sea trawlers 18–24 m	North Atlantic	134	51 410	Industrial/ semi-industrial	Bay of Biscay (35%), English and Bristol Channels (33%), Celtic Sea (27%), Southwest Ireland (2%)	Bottom otter trawl, otter twin trawl, bottom pair trawl, Danish seines and mid-water trawls
Deep-sea trawlers 24–40 m	North Atlantic	57	38 682		Bay of Biscay (35%), English and Bristol Channels (33%), Celtic Sea (27%) and southern North Sea (2%)	Bottom otter trawl, mid-water otter trawls and otter twin trawls
Purse seiners >40 m	Long distant-waters (OFR)	22	114 663	Industrial	Eastern central (area 34) and Southeast (area 47) Atlantic (49%) and Western Indian Ocean (51%)	Purse seines

The main species landed by each fleet segment in 2016 in volume are listed in Table 3.

TABLE 3
Main species targeted by fishing fleet (percentage of total landed volume in 2016)

Fleets/species targeted	Main fishing region	1	2	3	4	5
Handliners <10 m	North Atlantic	European conger (30%)	European seabass (17%)	Pollack (15%)	Whiting (9%)	Meagre (3%)
Gillnetters 10–12 m	North Atlantic	Spinous spider crab (15%)	Common sole (13%)	Monkfishes (10%)	Tangle (9%)	Common cuttlefish (5%)
Coastal trawlers 12–18 m	North Atlantic	Norway lobster (16%)	Great Atlantic scallop (13%)	Monkfishes (11%)	Common cuttlefish (8%)	European hake (5%)
Deep-sea trawlers 18–24 m	North Atlantic	Monkfishes (15%)	Whiting (12%)	Atlantic mackerel (6%)	Common cuttlefish (5%)	European hake (5%)
Deep-sea trawlers 24–40 m	North Atlantic	Monkfishes (23%)	Whiting (10%)	Atlantic herring (8%)	European hake (8%)	Haddock (6%)
Purse seiners >40 m	Long distant-waters (OFR)	Yellowfin tuna (48%)	Skipjack tuna (46%)	Bigeye tuna (4%)	Other (1%)	Albacore (<1%)

The main species landed (by value) by each fleet segment in 2016 are listed in Table 4. In terms of commercial value generation, yellowfin tuna, skipjack tuna, Atlantic bluefin tuna, European hake, common sole, monkfish and seabream are key to these fleets.

TABLE 4
Main species targeted by fishing fleet (percentage over total landed value in 2016)

Fleets/species targeted	Main fishing region	1	2	3	4	5
Handliners <10 m	North Atlantic	European seabass (47%)	Pollack (14%)	European conger (7%)	Whiting (5%)	Meagre (4%)
Gillnetters 10–12 m	North Atlantic	Common sole (36%)	Monkfishes (9%)	European seabass (6%)	Spinous spider crab (6%)	Turbot (5%)
Coastal trawlers 12–18 m	North Atlantic	Norway lobster (38%)	Monkfishes (10%)	Great Atlantic scallop (9%)	Common sole (7%)	Common cuttlefish (7%)
Deep-sea trawlers 18–24 m	North Atlantic	Monkfishes (21%)	Inshore squids (9%)	Common cuttlefish (6%)	Norway lobster (6%)	Whiting (6%)
Deep-sea trawlers 24–40 m	North Atlantic	Monkfishes (34%)	Megrims (7%)	European hake (6%)	John Dory (6%)	Whiting (6%)
Purse seiners >40 m	Long distant-waters (OFR)	Yellowfin tuna (58%)	Skipjack tuna (36%)	Bigeye tuna (4%)	Albacore (<1%)	Other (<1%)

Fisheries in the EU are managed within the framework of the Common Fisheries Policy (CFP), which aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with MSY) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures are adopted as appropriate, such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas).

The French fleet is managed through several management tools, such as fishing area and fish stocks based TACs and quotas, fishing licenses or multiannual management plans under national regulations. Each plan or fishing license (assigned to the vessel and owner) is species, or type of gear, or area specific. They license specifies the field of application and all the corresponding technical requirements, such as: gear type and dimensions (number of meshes and mesh seizes), vessel size, exemptions, and area or seasonal closures (e.g. spawning area for Eastern English Channel sole, spawning season for sole in Bay of Biscay or for the swordfish season in the Mediterranean Sea).

Almost all of the major stocks targeted by the Atlantic fleet are managed by means of TACs and quotas. Shellfish are not managed under quotas, nor are Mediterranean stocks, with the exception of bluefin tuna.

Quotas are non-transferable and non-leasable, although they can be transferred permanently via vessel sales or decommissioning when the track-record associated with the vessel also gets exchanged. Although quotas are non-transferable some measures are in place to provide flexibility in access. These flexibilities aim to ensure that quotas go to where they are needed and that the underutilisation of quota is minimised. Producer organizations (POs) can make in-year quota swaps with other POs following ministerial authorisation. Since 2015, when a vessel is sold 80 percent of its quota is transferred to the vessel/new owner, 14 percent goes to the PO reserve and 6 percent to the national reserve. When a vessel is removed from the industry, its associated quota is distributed 50:50 to the national and PO reserves. As quotas are treated as publicly controlled entities, they are not assigned a value or exchanged for a price, however, vessel prices tend to reflect the value of their associated track-record.

In the Mediterranean, only Bluefin tuna stocks are under a TAC regime. The overall TAC for the French fleet in 2017 was 395 000 tonnes, 5 percent increase (+ 20 000 tonnes) compared to 2016. There was another increase, yet to a lesser extent, in 2018 (+2.5 percent, i.e., + 10 000 tonnes).

TABLE 5
French quotas in 2016 and 2017, their variation and approximate value in million euros

Species	Quota 2016 (tonnes)	Quota 2017 (tonnes)	Variation	2017 economic value in million EUR (approx.)[5]
Anglerfish (ANF)	30 458	31 354	+3%	112
Bluefin tuna (BFT)	3 487	4 187	+20%	46
Cod (COD)	13 893	13 601	-2%	42
European Hake (HKE)	60 614	68 364	+13%	147
Mackerel (MAC)	24 486	25 643	+5%	48
Norway Lobster (NEP)	10 726	11 210	+5%	60
Saithe (POK)	17 829	29 937	+68%	24
Common Sole (SOL)	6 371	6 336	-1%	74
Blue Whiting (WHB)	15 013	13 844	-8%	21
Whiting (WHG)	17 992	22 923	+27%	24

Among the 126 stocks under TAC that are exploited by the French fleet in 2017, 11 stocks (8 species) presented a quota uptake greater than 90 percent and an adapted quota higher than 1 000 tonnes (fishing areas in brackets):
- Bluefin tuna (Atlantic)
- Sole (Bay of Biscay);
- Cod (I, IIb – Norwegian waters of I,II);
- Rays (VIa,b, VIIa-c, e-k – VIII, IX);
- Haddock (VIIb-k);
- Herring (IVa,b - IVc, VIId);
- Mackerel (IIa, IIIa,b,c, IV)
- Whiting (I to VIII, XII, XIV)

Concerning the Landing Obligation (LO) or discard ban, there is still high uncertainty regarding the impacts of this regulation on the sector in the medium term, even though the *de minimis* exemptions have been set to help offset some of the possible

---

[5] Exchange rate used, 1 EUR = 1.1069 USD (ECB reference exchange rate, USD/EUR, average of observations throughout 2016; Data Source in SDW: http://sdw.ecb.europa.eu/browse. do?node=9691296).

effects. Fishers fear that the discard ban may have a large impact on profitability, with loss of revenue due to low value species, higher operational costs (labour, storage, and ice), on-board storage and capacity limitations and choke species in mixed fisheries.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Industrial purse seiners >40 m LOA Long-distant fleet

The French industrial purse-seiner fleet in 2016 could be characterised by an average length of 78 meters (LOA), gross tonnage of 2 091 tonnes and engine power of 3 441 kW. On average vessels spent 194 days at sea in 2016, of which 97 were fishing days. The average crew size is 27 (see Table 6). Crew are both French nationals and foreigners, mainly from Africa. Fishing activity is carried out solely with purse seiners in the Indian and Atlantic oceans (see Table 7).

This industrial purse seine fleet segment consisted of 22 vessels in 2016, including five vessels registered in Mayotte. The fleet segment produced 21 percent to the total volume of seafood landed by the total French fishing fleet in 2016. This volume of fish equated to 12 percent of the total value of landings.

The majority of this fleet is made up of freezer tuna seiners operating in the Indian Ocean under IOTC (12 vessels) and Atlantic Ocean under ICCAT (ten vessels) management regimes. In 2016, the majority of the fishing days were deployed in the Southwest Indian Ocean (51 percent), followed by Eastern-central Atlantic (42 percent) and the Southeast Atlantic (7 percent).

The average age of these 22 vessels was 16 years in 2016; due to the entry of two new units and the exit of an older one, the average age decreased by almost two years compared to 2015. The average length was impacted by these changes, increasing from 77.8 m to 78.3 m.

In 2016, the volume of landings amounted to 114 663 tonnes, a 24 percent increase compared to 2015. Main tuna species caught were yellowfin tuna (48.2 percent of the total volume), skipjack tuna (46.2 percent), big eye tuna (4.1 percent) and albacore (0.3 percent). On average, a vessel landed around 5 212 tonnes valued at almost USD 7.5 million in 2016.

With a gross profit of USD 24.4 million, the fleet was profitable in 2016; improving significantly on the gross losses reported in 2015 (USD -5.8 million). Improved profitability was largely due to increases in yellowfin tuna and skipjack tuna landings. Landings of yellowfin tuna went up 15 percent in volume and 23 percent in value compared to 2015 while skipkjack tuna increased 31 percent in volume and 47 percent in value.

Yellowfin tuna is under quota in the Indian Ocean since 2017. Access to quota and to the territorial waters of coastal countries is a cause for concern. In addition to the control of the number of fish aggregating devices (FADs) used by purse seiners, some new rules also apply to the number of assistance vessels (supplies) for seiners. These new management measures may have an impact on the profitability of these vessels in the near future. Performance in 2017 remained rather stable, with landings at 114 350 tonnes valued at USD 179.2 million.

Industrial deep-sea trawlers 24–40 m - North Atlantic fleet

The industrial deep-sea trawler fleet can be characterised by an average length of 28 meters (LOA), gross tonnage of 241 tonnes and engine power of 628 kW. On average the vessels in this fleet segment made 58 fishing trips and spent 287 days at sea in 2016, of which 244 were fishing days. The average crew size is seven (see Table 6).

This segment of the fleet is made up of 57 vessels and responsible for 7 percent of the total volume and 8.7 percent of the value of seafood landed by the French fishing fleet in 2016.

These vessels operate mainly out of ports located in the north of France, targeting high-value demersal stocks in the Bay of Biscay (35 percent), English and Bristol Channels (33 percent), Celtic Sea (27 percent) and southern North Sea (2 percent), using bottom otter trawls, mid-water trawls and otter twin trawls (see Table 7).

The most important species landed include Monkfishes (34 percent of the value landed), megrims (7 percent), European hake (6 percent), John Dory (6 percent) and whiting (6 percent).

The fleet was profitable in 2016, generating a net cash flow of USD 20.8 million and improving significantly on previous year's results. Improvements were largely due to increased landings of monkfishes (+16.5 percent) and whiting (+8 percent in volume), which translated into a 10 percent and 11 percent increase in value of the landed fish, respectively. While landings of hake increased 14 percent in volume, the average price was lower and the overall value landed of this fish fell 6 percent compared to 2015.

Semi-industrial deep-sea trawlers 18–24 m - North Atlantic fleet

The semi-industrial deep-sea trawler fleet can be characterised by an average length of 22 meters (LOA), gross tonnage of 131 tonnes and engine power of 426 kW. On average vessels in this fleet segment made 70 fishing trips and spent 262 days at sea in 2016, of which 216 were fishing days. The average crew size is five (see Table 6).

In 2016, 134 vessels made up this segment, targeting a variety of demersal species in the Bay of Biscay (35 percent), English and Bristol Channels (33 percent), Celtic Sea (27 percent), Southwest Ireland (2 percent), using mainly bottom otter trawls, twin otter trawls, bottom pair trawls, Danish seines and mid-water otter trawls (see Table 7).

Important species landed included monkfishes (22 percent of the total values of landings), squids and common cuttlefish (respectively 9 percent and 6 percent). In landed volume, monkfishes and whiting represented respectively 16 percent and 12 percent of the total landings in 2016.

The fleet was profitable in 2016, generating a net cash flow of USD 29.3 million. Revenue increased by 5 percent compared to 2015. The improvement in profitability was largely due to lower operating costs. In fact, energy costs fell by 20 percent due to less effort deployed and lower average fuel prices.

Coastal deep-sea trawlers 12–18 m

The coastal deep-sea trawler fleet can be characterised by an average length of 15 meters (LOA), gross tonnage of 47 tonnes and engine power of 251 kW. On average vessels in this fleet segment made 141 fishing trips and spent 225 days at sea in 2016. The average crew size is three (see Table 6).

In 2016, 153 vessels made up this segment, targeting a variety of demersal species in the Bay of Biscay, English Channel and Celtic Sea, using bottom otter trawls, otter twin trawls and boat dredges (see Table 7). Important species landed included Norway lobster (38 percent of the value landed), monkfishes (10 percent), Great Atlantic scallop (9 percent), common sole (7 percent) and cuttlefish (7 percent).

The fleet was profitable in 2016, generating a net cash flow of USD 16.7 million. Revenue increased 10 percent, largely due to increased landings of Norway lobster (+ 22 percent in volume and +21 percent in value) and monkfishes (+10 percent in volume and +8 percent in value) compared to 2015. Lower energy costs (-18 percent) also contributed to higher profits in 2016.

Gillnetters 10–12 m - North Atlantic fleet

The coastal gillnetter fleet can be characterised by an average length of 12 meters (LOA), gross tonnage of 13 tonnes and engine power of 164 kW. On average vessels of

this fleet segment spent 168 days at sea in 2016 including 164 fishing days. The average crew size is three (see Table 6) and the main fishing gears used include: trammel nets, set gillnets, pots, dredges and driftnets (see Table 7).

In 2016, 173 vessels made up this segment, targeting a variety of demersal species in the Bay of Biscay (48 percent), English Channel (42 percent) and southern North Sea (10 percent). Important species landed included common sole (36 percent of the total value of landings), monkfishes (9 percent), European seabass (6 percent), spider crab (6 percent) and turbot (5 percent).

The fleet was profitable in 2016, generating a net cash flow of USD 11.5 million and a gross profit of USD 6.6 million.

Hook and line <10 m LOA North Atlantic fleet

This small-scale handline fleet can be characterised by an average length of 8 meters (LOA), gross tonnage of 4 tonnes and engine power of 96 kW. On average, the vessels of this fleet segment spent around 103 days at sea in 2016, with each fishing trip lasting one day or less. The average crew size is one (see Table 6) and the main fishing gears used include: set longlines, handlines and troll lines (see Table 7).

This segment was made up of 239 vessels in 2016 operating mainly in the Bay of Biscay and English Channel (with some minor activity in the southern North Sea). European seabass, pollack, European conger and whiting were the most important species, accounting for 71 percent of the total landings in weight and 73 percent in value in 2016.

The fleet was profitable in 2016, generating a net cash flow of USD 6.8 million and a gross profit of USD 6.6 million, up from USD 2.5 million in 2015.

Revenue increased by 29 percent compared to 2015, largely due to higher landing value for several species, such as pollack (+35 percent in value), European conger (+74 percent), whiting (+110 percent), common prawn (+87 percent) and blackspot seabream (+113 percent). Higher earnings and lower energy costs helped to improve profitability in 2016.

TABLE 6
Basic information of each fleet (average per vessel)

	Purse seiners >40 m	Deep-sea trawlers 24–40 m	Deep-sea trawlers 18–24 m	Coastal trawlers 12–18 m	Gillnetters 10–12 m	Handliners <10 m
Average vessel age	16	17	23	28	25	25
Average length overall (LOA)	78	28	22	15	12	8
Average power of main engines in kilowatts (KW)	3 441	628	426	251	164	96
Average gross tonnage (GT)	2 091	241	131	47	13	4
Average crew size (persons)	27	7	5	3	3	1
Average days at sea	194	287	262	225	168	103
Average number of fishing days	97	244	216	198	166	103

The main fishing methods / fishing gears employed by fishing fleet are presented in Table 7.

TABLE 7
Fishing methods employed as a percentage of landings weight

	Purse seiners >40 m – Long-distant fleet	Deep-sea trawlers 24–40 m	Deep-sea trawlers 18–24 m	Coastal trawlers 12–18 m	Gillnetters 10–12 m	Handliners <10 m
Purse seine	100%					
Bottom otter trawl		71%	54%	36%		
Otter twin trawl		9%	34%	47%		
Mid water (otter) trawl		11%	5%			
Danish seine		7%	4%			
Pelagic pair trawl		2%	6%			
Boat dredges				17%	3%	
Mechanised dredges					9%	
Trammel nets					53%	
Set gillnets					26%	
Driftnets					2%	
Set longlines						66%
Hand-lines						15%
Troll lines						8%
Pots and traps					6%	2%

Table 8 presents the estimated number of full-time and part-time workers on each of the main fleets.

Most crewmembers on the vessels in these fleet segments are full-time employees. Low activity vessels (with an annual turnover of less than USD 10 000) tend to be active seasonally or part-time only, spending on average less than 25 days at sea. There are very few female fishers (around 2 percent of the total). Women typically have onshore roles, such as in administration, accounting and logistics planning, although there are some female deckhands. In the Mediterranean region, female crew generally work on small-scale coastal vessels (between 6–12 m), while in the Outermost Regions, females tend to work on small-scale vessels less than 10 m. There are very few female crew on larger vessels. Only one female crewmember was reported on a freezer purse seine vessel operating the South Atlantic and Indian Ocean.

Not much information is available on the age structure of the fishers, but it is clear that the French fishing population is aging. The majority (59 percent) of fishers are between 40 and 64 years old, and an additional 5 percent are over 65 years old. Only 8 percent of the fishers are less than 24 and 28 percent are between 25 and 39 years.

The lack of knowledge transfer to the youth, hard working conditions and long absences from home and communities prevent young people from entering the fisheries sector. Adding to these social aspects, are challenges in accessing financial capital and resources (quota) for those who wish to become vessels owners.

In France, the retirement age in fisheries is 55 years old. Retired fishers receive a pension, but many continue to pay social security. It is unclear whether they continue their fishing activities to complement their pension income, because fishing is a way of life for them or to support their children and grandchildren in the sector.

Crewmembers on the French fishing fleets are mostly French (85 percent) or EU nationals (8 percent). A small part (4 percent) are from non-EU/European Economic Area (EEA) countries. In the North Atlantic fleet, around 14 percent of the crew are from other EU countries, such as Spain, Portugal and Poland and 26 percent are non-Europeans. In the Mediterranean, around 12 percent of the crew are non-European,

mostly from French speaking countries in North Africa, and are mainly employed on purse-seiners and trawlers. In the long-distant fleet, around 62 percent of the crew are non-Europeans, largely in accordance with protocols under the EU Sustainable Fisheries Partnership Agreements (SFPAs).

High income in French fisheries attracts crewmembers from other EU countries. The remuneration and social security contributions are the same for national, EU and non-EU citizens. The necessary payment of social security contributions may not be very attractive to non-Europeans. According to the collective conventions negotiated and signed by social partners, the remuneration of all persons working on-board fishing vessels is based on shares.

TABLE 8
Labor Employed in Fishing and main socio-economic indicators

	Purse seiners >40 m	Deep-sea trawlers 24–40 m	Deep-sea trawlers 18–24 m	Coastal trawlers 12–18 m	Gillnetters 10–12 m	Handliners <10 m	Total	As a % of national fleet
Total employed	603	412	687	518	553	314	**3 087**	**23**
Full-time (FTE)	603	401	649	452	354	137	**2 595**	**36**
Average crew wage per FTE (in USD)	83 078	89 734	92 938	91 873	82 319	85 600		
Labor productivity (GVA per FTE)	123 557	141 576	138 093	128 927	114 779	135 195		

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF THE FLEET SEGMENTS
Industrial purse seiners >40 m, long-distant fleet
Capital investments
Detailed data on capital investments in the industrial purse seine fleet were not available.

Operating and owner costs
Total gross costs of this fleet segment amounted to USD 139.9 million in 2016 (average of USD 6.3 million per vessel), with operating costs equating to 57 percent. The remaining 43 percent consist of vessel costs, such as repair and maintenance costs and other fixed costs.

Among the operating costs, crew costs were highest, equating to 50 percent of the operating costs, followed by energy costs (28 percent) and then other variable costs (9 percent).

The highest owner related costs were made for repair and maintenance (57 percent of vessel costs), followed by other fixed costs (43 percent).

In 2016, the average purse seine vessel spent almost USD 2.3 million on crew costs, USD 1.0 million on fuel costs and USD 314 000 on other variable costs. The average amount spent on repair and maintenance was USD 1.5 million and USD 1.2 million on other fixed costs.

Revenues
Total revenue of this fleet segment in 2016 added-up to almost USD 164.4 million, a 32 percent increase compared to 2015 (USD 124.3 million); amounting to an average per vessel of almost USD 7.5 million.

Economic and financial performance of fishing vessels
In 2016, this fleet segment presented a net cash flow of USD 24.4 million. Profitability was reasonable with a GVA to revenue of 45.3 percent.

Overall, 2016 was marked by an improvement in the economic performance of vessels in this fleet segment, largely due to the increase in prices of tropical tunas that rose sharply in 2016 (in particular yellowfin and skipjack tuna). This favourable market had a positive impact on the turnover and profitability of the firms, compared to 2015.

Additionally, operating costs decreased in 2016, in particular, energy costs as fuel prices remained low, generating a positive impact on the profitability for the vessels. Profitability improved further in 2017.

Industrial deep-sea trawlers 24–40 m - North Atlantic fleet
Capital investments
The total tangible asset (replacement) value of the 57 vessels that made up this fleet in 2016 was USD 85.5 million (or an average of USD 1.5 million per vessel). In-year investments totalled USD 177 000 in 2016; amounting to an average of USD 3 000 per vessel in 2016. The fleet underwent some disinvestment with five vessels leaving the fishing in 2016 (from 62 vessels in 2015).

Operating and owner costs
Total gross costs of this fleet segment added up to USD 97.6 million in 2016, with operating costs contributing to 74 percent. The remaining 26 percent consist of repair and maintenance costs and other fixed costs. Additionally, capital costs (annual depreciation and opportunity cost of capital) were estimated at USD 13.1 million. Annual depreciation amounted to 99 percent of capital costs.

   Among the operating costs, crew costs were highest, equating to 50 percent of the operating costs, followed by energy costs (29 percent) and other variable costs (21 percent).
   The highest owner related costs were made for other fixed costs (61 percent of vessel costs), followed by repair and maintenance (39 percent).
   In 2016, the average vessel spent USD 632 000 on crew costs, USD 372 000 on fuel costs and USD 266 000 on other variable costs. The average amount spent on repair and maintenance was USD 173 000 and on other fixed costs USD 270 000.

Revenues
Revenue of this fleet segment in 2016 added up to almost USD 118.4 million, a 19 percent increase compared to 2015; amounting to an average per vessel of almost USD 2.1 million. Revenue increased further in 2017.

Economic and financial performance of fishing vessels
In 2016, this fleet segment presented a net cash flow of USD 20.8 million and a gross profit of almost USD 7.8 million, improving significantly on previous year's results. The fleet went from a net loss in 2015 to posting net profits. Profitability was weak with a net profit margin of 6.5 percent. GVA to revenue was 48 percent and RoFTA 8.9 percent.

Semi-industrial deep-sea trawlers 18–24 - North Atlantic fleet
Capital investments
The total tangible asset (replacement) value of the 134 vessels that made up this fleet segment in 2016 amounted to USD 89.2 million; an average of USD 665 000 per vessel. Inyear investments in 2016 totalled USD 2.9 million; an average of nearly USD 22 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 144 million in 2016 (an average of almost USD 1.1 million per vessel), with operating costs equating to 79 percent. The remaining 21 percent consisted of repair and maintenance costs and other fixed costs. Additionally, capital costs (annual depreciation and opportunity cost of capital) were estimated at USD 15.6 million. Annual depreciation amounted to 99 percent of capital costs.

Among the operating costs, crew costs were highest at 53 percent of the operating costs, followed by other variable costs (24 percent) and then energy costs (23 percent).

The highest owner related costs were made for repair and maintenance (56 percent of owner costs), followed by other fixed costs (44 percent).

On average, a vessel spent USD 450 000 on crew costs in 2016, nearly USD 195 000 on fuel costs and USD 202 000 on other variable costs. The average amount spent on repair and maintenance was almost USD 128 000, on other fixed costs USD 100 000 and USD 115 000 on depreciation.

Revenues
Revenue of this fleet segment in 2016 summed up to USD 173.4 million, an improvement of almost USD 10 million compared to 2015; amounting to an average of USD 1.3 million per vessel. Revenue remained stable at USD 171 million in 2017.

Economic and financial performance of fishing vessels
In 2016, the fleet segment generated a net cash flow of USD 29.3 million, and after accounting for operating costs, posted a gross profit of USD 13.9 million. With a net profit margin of 7.9 percent, profitability was reasonable and the fleet saw some improvement compared to previous years. GVA to revenue was estimated at 52 percent and RoFTA at 15.4 percent.

Coastal deep-sea trawlers 12–18 m - North Atlantic fleet
Capital investments
The total tangible asset (replacement) value of the 153 vessels that made up this fleet segment in 2016 was estimated at USD 46.3 million; an average of nearly USD 303 000 per vessel. In-year investments amounted to almost USD 1.4 million; or on average around USD 9 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 85.0 million in 2016 (average of almost USD 556 000 per vessel), with operating costs equating to 79 percent. The remaining 21 percent consisted of repair and maintenance costs and other fixed costs. Additionally, capital costs (annual depreciation and opportunity cost of capital) were estimated USD 8.5 million. Annual depreciation amounted to 99 percent of capital costs.

Among the operating costs, crew costs were highest at 62 percent of the operating costs, followed by other variable costs (20 percent) and energy costs (18 percent). The highest owner related costs were made for repair and maintenance (57 percent of owner costs), followed by other fixed costs (43 percent).

On average, a vessel spent USD 271 000 on crew costs in 2016, nearly USD 81 000 on fuel costs and USD 87 000 on other variable costs. The average expenditure on repair and maintenance was USD 66 000, on other fixed costs USD 51 000 and USD 55 000 on annual depreciation costs.

Revenues
The fleet segment generated USD 101.7 million in revenue in 2016, up from USD 92.9 million in 2015; amounting to an average per vessel of USD 665 000.

Economic and financial performance of fishing vessels
In 2016, the fleet segment generated a net cash flow of USD 16.7 million, and after accounting for operating costs, posted a gross profit of USD 8.3 million. With a net profit margin of 8.1 percent, profitability was reasonable and the fleet saw improvement in profitability compared to previous years. GVA to revenue was estimated at 57.2 percent and RoFTA at 17.7 percent.

Coastal gillnetters 10–12 m - North Atlantic fleet
Capital investments
The total tangible asset (replacement) value of the 173 vessels that made up this fleet segment in 2016 was estimated at USD 27.9 million; an average of approximately USD 161 000 per vessel. In-year investments totalled USD 2.4 million; or on average nearly USD 14 000 per vessel.

Operating and owner costs
Total gross costs summed up to USD 51.5 million in 2016; averaging USD 298 000 per vessel, with operating costs equating to 77 percent. The remaining 23 percent consisted of repair and maintenance costs and other fixed costs. Additionally, capital costs (annual depreciation and opportunity cost of capital) were estimated at USD 4.9 million. Annual depreciation amounted to 99 percent of capital costs.

Among the operating costs, crew costs were highest at 74 percent of the operating costs, followed by other variable costs (19 percent) and energy costs (7 percent). The highest owner related costs were made for other fixed costs (73 percent of vessel costs), followed by repair and maintenance (27 percent).

The average small-scale gillnetter spent USD 168 000 on crew costs in 2016, almost USD 17 000 on fuel costs and USD 44 000 on other variable costs. The average amount spent on repair and maintenance was over USD 18 000, on other fixed costs USD 50 000 and the annual depreciation costs were nearly USD 29 000.

Revenues
The fleet segment generated USD 63.0 million in revenue in 2016, up from USD 55.6 million in 2015; amounting to an average per vessel of USD 364 000. Revenue fell to USD 47.1 million in 2017.

Economic and financial performance of fishing vessels
In 2016, the fleet segment generated a net cash flow of USD 11.5 million, and after accounting for operating costs, the segment posted a gross profit of USD 6.6 million, a slight deterioration on 2015 results. With a 10.3 percent net profit margin, profitability was reasonable. GVA to revenue was estimated at 64.9 percent and RoFTA at 23.4 percent.

Small-scale hook and lines <10 m - North Atlantic fleet
Capital investments
The total tangible asset (replacement) value of the 239 vessels that made up the fleet segment in 2016 was estimated at almost USD 11.3 million; an average of USD 47 000 per vessel. Inyear investments totalled USD 139 000, or some USD 582 per vessel.

Operating and owner costs
Total gross costs added up to USD 21.7 million in 2016; averaging USD 91 000 per vessel, with operating costs equating to 78 percent. The remaining 22 percent consisted of repair and maintenance costs and other fixed costs. Additionally, capital costs (annual depreciation and opportunity cost of capital) were estimated USD 1.8 million. Annual depreciation amounted to 99 percent of capital costs.

Among the operating costs, crew costs were highest at 69 percent of the operating costs, followed by other variable costs (22 percent) and then energy costs (9 percent). The highest owner related costs were made for other fixed costs (65 percent of vessel costs), followed by repair and maintenance (35 percent).

The average small-scale gillnetter spent USD 49 000 on crew costs in 2016, some USD 6 000 on fuel costs and nearly USD 16 000 on other variable costs. The average amount spent on repair and maintenance was USD 7 000, on other fixed costs USD 13 000 and the annual depreciation costs were nearly USD 8 000.

Revenues

This fleet segment generated USD 28.5 million in revenue in 2016, up from USD 22.3 million in 2015; amounting to an average per vessel of USD 119 000. Revenue remained stable at USD 28.2 million in 2017.

Economic and financial performance of fishing vessels

In 2016, the fleet segment generated a net cash flow of USD 6.8 million, and after accounting for operating costs, posted a gross profit of USD 4.9 million; an improvement on 2015 results. With a 17.2 percent net profit margin, profitability was good. GVA to revenue was estimated at 65 percent and RoFTA at 43.6 percent.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES

Fishing vessel owners/fishing cooperatives in France have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national contributions). The EU contribution is USD 7 billion for the period 2014-2020.

The allocation for France is set at USD 857 million, with an EU contribution of USD 650.8 million, i.e., co-funding of 76 percent. USD 167 million (25.7 percent of EMFF funding) is set to support a sustainable and balanced fishing fleet and sector.

France's focus is on balancing support for economic activities with better consideration of environmental issues. Innovation, energy savings and scientific knowledge are being emphasised.

Support from the EMFF can be provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include: (1) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms (e.g. with lower interest rates, longer repayment periods, or fewer collateral requirements); (2) Microcredits, often provided over a short term and with no or low collateral required, e.g. loans to fishers to purchase selective fishing gear, to improve the added value or quality of the fish caught, or projects in the framework of community-led local development strategies; (3) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan and (4) Equity, where capital is invested in return for total or partial ownership of a firm.

The EIB lending activities are aligned to EU standards and priorities and can cover the whole fishery value chain, ranging from input and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improved or restored ecosystems, innovative solutions for current and future challenges in the sector, and/or the productive and sustainable use of by-products from food production.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

France has a tax exemption on fuel provided that the owner is licensed. The fuel price in 2016 for the French fleet averaged around USD 0.44 per litre.

There is also a system that provides financial compensation for reduction of fishing effort, such as scrapping of fishing vessels. To ensure compliance with the landing obligation, EMFF funds also foresee measures for the investment in more selective fishing gears and for technical adjustments.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

The industrial tuna fleet has become increasingly efficient and dependent on technological developments in remote sensing and fishing gear. One of the ways they have become more efficient is through the use drifting fish aggregating devices (FADs) with to satellite location beacons. Apart from yellowfin tuna being under quota in Indian Ocean since 2017, the level of control on the number of fish aggregating devices (FADs) used by purse seiners has increased and some limitations have been set for the number of assistance vessels (supplies) for seiners. These new management measures may have an impact on the economic performance of the distant water purse seine fleet in the near future.

With the full implementation of the landing obligation in EU fisheries, the need for innovation and development of new types of gear technology is on-going and crucial. Various different methods for reducing bycatch, from mesh panels to strategically placed lights, are being tested. Investments in innovation are necessary for the sustainability of the industry, but the improvements should be balanced with the economic realities of many fishing vessel owners, which are currently unable to access the required capital.

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that, from 2014, the fishing capacity of their fleet at no time exceeds the fishing ceilings in Annex II to Regulation (EU) No1380/2013. The capacity ceilings in force for mainland France and its outermost regions were observed throughout the 2011–2016 period.

There are various types of management measures in force in France to reduce fishing effort in fisheries where such is necessary. These include:
- limits on fishing time: quotas (kW*days or days at sea),
- catch limits: by tonnage or maximum volume, percentage or quota,
- access restrictions: introduction of authorisation schemes,
- technical restrictions: by means of mesh size, selective devices,
- limits on space and time,
- aid for permanent or temporary cessation of activities.

Fishing effort adjustment measures implemented are aimed at limiting the maximum effort of the French fishing fleet. The fishing effort is no longer increasing following a restructuring of the fleet. The fleet size has reduced in size to adapt to the quotas in place for fishing effort and catches.

The impact of aid programmes for the permanent cessation of fishing activities has been effective in recent years, particularly where beneficiaries were highly dependent on the fisheries. Several fleet reduction plans supported by public aid have been implemented over the last decade, for example:

- 2007, 2008, 2009 – anchovy, 'thonaille', cod, sole, deep-water species, Mediterranean hake, eel and anglerfish fisheries;
- 2009 – bluefin tuna and tuna fisheries in Senegalese waters;
- 2010 – eel and porbeagle fisheries;
- 2011, 2012 – Mediterranean (trawl), bluefin tuna, cod and eel fisheries;
- 2012 – porbeagle, cod and Mediterranean eel fisheries;
- 2013 – Mediterranean trawl and European eel fisheries in the Mediterranean;
- 2016 – Mediterranean trawl fishery and gangui fishery on Posidonia beds in GSA734;
- 2017 – sole netters between 0 and 18 metres fishery in the Eastern Channel;
- 2017 – Mediterranean lobster trawler fishery in zone GSA8;
- 2017 – vessels 0–24 m fishing glass eel and yellow eel in the Atlantic;
- 2017 – netters 10–12 m in the Eastern Channel and North Sea.

As a consequence fishing effort has reduced significantly in the anchovy and bluefin tuna fisheries. The latest measure for these fisheries was deployed between 2016 and 2017. However, it will not be possible to gauge its impact until 2018, as vessels benefitting from it will be withdrawn in 2017 and 2018.

All vessel owners/operators wishing to enter a new fishing unit into the fleet or modify the technical characteristics of one of their vessels must apply for an operating permit. Furthermore, a distinction is drawn between operating permits requested:

- 'operating permit by right' – a shipwreck or any other type of incident at sea resulting in a fishing vessel being unseaworthy,
- 'operating permit other' – a new entry or active vessel upgrade without the exit of a vessel of equivalent capacity by the applicant,
- 'one-for-one permit' – new entry or an active vessel upgrade applications for operating permits submitted against the permanent exit from the fleet of one or more vessel(s).

Between 1 January 2011 and 31 December 2016, 776 fleet renewal or upgrade projects were implemented in mainland France. These projects consisted of fleet unit upgrades or entries of new fishing units into the fleet by constructing, importing or changing the activity of vessels.

Between 1 January 2010 and 31 December 2016, the French fishing fleet able to undertake fishing activities (declared active on the fishing vessel register) remained stable overall. More vessels exited than entered the mainland fleet segment during 2011–2015. However, this trend is beginning to reverse, with tonnage and power increasing in 2016 due to new construction projects and fleet entries associated with safety and improvement of on-board working conditions.

REFERENCES

EU. 2019. *Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06).* Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic

Report of Italy

National report of Italy

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

Rosaria Sabatella
NISEA Società cooperativa
Salerno, Italy

1. OBJECTIVES AND CONTEXT

The current fleet assessment is part of a global assessment by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The Italian fleet produced approximately 0.2 percent of the global capture fisheries production in 2017. It is one of the main fishing nations in the Mediterranean region and the fourth largest EU fishing fleet in terms of revenue generated from fishing. Therefore the country was included in this global fishing fleet performance assessment of FAO.

This is the first time Italian fishing fleets are included in the FAO global studies on techno-economic performance of the main fishing fleets.

The information presented in this analysis was collected in 2018 by Italian national authorities under the EU Data Collection Framework Regulation.[1] The data were compiled and analysed during two Expert Working Groups convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the 2019 Annual Economic Report (AER) on the EU fishing fleet.

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN ITALY

The marine capture fisheries production[2] in Italy decreased significantly (-37.7 percent) from 317 853 tonnes in 2006 to 198 130 tonnes in 2016 (and -16.6 percent compared to the 237 620 tonnes in 2008).

The volume (in live-weight equivalent) of seafood landed by the whole Italian fishing fleet[3] amounted to 192 356 tonnes in 2016, 15.3 percent less than in 2008 (226 922 tonnes). At the same time, the number of active commercial fishing vessels decreased by 8.8 percent, from 12 356 in 2008 to 11 269 vessels in 2016.

In 2016, Italy had the second largest EU fishing fleet in terms of vessel numbers and engine power (kW) and the fourth in gross tonnage (GT) terms. Fleet capacity in GT and kW also decreased, 22.5 percent and 14.4 percent respectively between 2008 and 2016. Additionally, there were 1 041 inactive vessels in 2016, most of which are small-scale vessels under 10 m in length, which represented around 9 percent of the number of vessels and 5 percent of the fleets' GT and kW.

---

[1] Council Regulation (EC) No 2017/1004 of 17 May 2017.
[2] As reported by FAO (i.e., covers landings by all vessels in Italian ports, irrespective of nationality).
[3] As reported under the DCF (i.e., covers landings by registered vessels in Italy)

Small-scale vessels using passive gears dominate the Italian national fleet in number of vessels number (63 percent of the fleet), followed by demersal trawlers/seiners (18 percent), which in turn dominate in terms of size (56 percent of the GT and 44 percent of kW). The demersal trawlers/seiners also yield the largest share of landings in value and volume (see Table 1).

TABLE 1
Overview of the Italian fishing fleet: number of vessels by main fishing gear and scale

Main fishing gear	Fleet capacity			Landings		
	Vessels	GT (thousand tonnes)	kW (thousand kW)	Weight (thousand tonnes)	Value (million USD)	Average price (USD/kg)
Polyvalent passive gears	7 715 (62.7%)	18.9 (12.0%)	265.8 (26.7%)	31.9 (16.6%)	270.7 (27.0%)	8.5
Polyvalent active gears only	39 (0.3%)	0.4 (0.3%)	4.2 (0.4%)	0.7 (0.3%)	4.4 (0.4%)	6.6
Vessels using hooks	161 (1.3%)	4.7 (3.0%)	31.4 (3.2%)	4.1 (2.1%)	27.3 (2.7%)	6.7
Purse seiners	311 (2.5%)	13.9 (8.9%)	61.4 (6.2%)	30.0 (15.6%)	80.3 (8.0%)	2.6
Pelagic trawlers	126 (1.0%)	8.5 (5.4%)	43.3 (4.4%)	45.9 (23.9%)	51.3 (5.1%)	1.1
Dredgers	683 (5.5%)	9.0 (5.7%)	74.1 (7.5%)	17.8 (9.2%)	52.0 (5.2%)	2.8
Demersal trawlers/seiners	2 180 (17.7%)	89.7 (56.9%)	439.3 (44.2%)	58.3 (30.3%)	494.5 (49.2%)	8.5
Beam trawlers	54 (0.4%)	4.4 (2.8%)	20.9 (2.1%)	3.7 (1.9%)	23.5 (2.3%)	6.3
Inactive vessels	1 041 (8.5%)	8.1 (5.2%)	53.5 (5.4%)			
Total fleet	**12 310**	**157 690**	**993 719**	**192.4**	**1 099**	

The Italian fleet lands over 170 different species, the top ten of which accounts for over half of the total landings in volume.

The main species (in volume) are anchovies and sardines (35 percent of landings weight), swordfish (13 percent), striped venus (8 percent) and six demersal species (European hake, deep-water rose shrimp, common cuttlefish, red mullet, spottail mantis squillid, giant red shrimp). More than 160 different fish species make up the remaining 50 percent of landings.

Production is concentrated in fishing areas in the North Adriatic and Strait of Sicily. Landings in Sicily and Apulia account for 40 percent of the total value of landings due to their large share of high-value demersal species, such as hake, shrimp and red mullet.

A large part of the Italian fishing fleet is concentrated in the Northern Adriatic (GSA[4] 17). With more than 3 000 vessels, this region accounts for 25 percent of the fleet in vessel numbers and 31 percent in GT and engine power terms. On the opposite coast, the Tyrrhenian Sea region fleet (GSA 9 and 10) comprises 2 542 vessels (21 percent of the fleet in number, 11.5 percent in GT and 14 percent in engine power). The fleet in the South of Sicily region (GSA 16), numbers 1 175 vessels while covering 21 percent of Italy's GT (size of an average vessel in this fleet is 27 GT; which is more than double the national average) and 14 percent of the kW of the national fishing fleet.

The small-scale coastal fleet (under 12 m) is widely distributed along the entire Italian coastline and targets a wide range of stocks, mostly demersal high value species, such as cuttlefish, hake, octopus, mullets and spiny lobster.

The semi-industrial and industrial fleet (over 12 m) is largely composed of demersal trawlers, purse seiners and beam trawlers. The demersal trawlers mainly operate in the Adriatic Sea and Strait of Sicily, while the pelagic fleet mostly operates in the North Adriatic (pelagic trawlers) and Tyrrhenian Sea (purse seiners).

---

[4] GFCM GSA - Geographical subareas (GSAs) of the General Fisheries Commission for the Mediterranean (GFCM)

The Italian fleet was profitable in 2016. Yet, the fleet was severely impacted by the economic and financial crisis over the period 2010–2013, showing signs of recovery only in 2014. High fuel prices and the continued poor status of many stocks in the Mediterranean Sea also contributed to low profitability levels. Reduced fleet capacity, lower fuel prices together with higher average fish prices are the main driving forces behind the overall improved profitability of the national fleet in 2015 and 2016 but performance levels have still not reached 2009 results.

Four fleet segments were selected for detailed review, based on their socio-economic importance to the Italian fisheries sector. These fleets are the following:

1. The **small-scale coastal fleet** using **passive gears 6–12 m LOA**. This fleet segment comprises around 45 percent of the total number of fishing vessels in Italy, employs 36.5 percent of the fishers and generates 18.5 percent of the total revenue[5] (USD 187.5 million).

2. The **semi-industrial demersal trawlers 12–18 m LOA.** This fleet segment includes 10 percent of the Italian fishing vessels, provides 13 percent of the fisheries employment and contributes 19 percent of the total fishing fleet revenue in (USD 192.6 million).

3. The **industrial/semi-industrial demersal trawlers/seiners 18–24 m LOA.** This fleet segment holds 5 percent of the number of vessels. It employs 9.5 percent of the fishers in Italy and generates 19 percent of the total fishing fleet revenue (USD 191.5 million).

4. The **industrial purse seiners over 40 m LOA**. This fleet segment consists of only 11 vessels (0.1 percent of the fleet), contributes 2.5 percent (USD 25.0 million) to the total revenue and operates at high profit margins.

TABLE 2
Overview of main fishing fleets - 2016

Fishing fleet	Number of vessels	Scale[6]	FAO fishing area	Main fishing ports
Passive gears 6–12 m	5 144	Small-scale coastal	GSA 10, 19, 17, 9 and 11	Northern Sicily and Sardinia
Demersal trawlers 12–18 m	1 232	Semi-industrial	GSA 18, 19, 17 and 10	Apulia (31%) and Sicily (16%) regions
Demersal trawlers 18–24 m	633	Industrial/Semi-industrial	GSA 17, 9, 16 and 10	Sicily, Apulia, Marche and Lazio
Purse seines >40 m	11	Industrial	GSA 10 and 16	Sicily

The main species landed by each fleet in volume terms are listed in Table 3. In terms of production, deep-water rose shrimp, European hake, red mullet, spottail mantis squillid and common cuttlefish are key to these four fleet segments.

TABLE 3
Main species landed by fishing fleet (percentage over total landed volume in 2016)

Fleets/species landed	1	2	3	4	5
Passive gears 6–12 m	Common cuttlefish (10%)	Changeable nassa (9%)	Common octopus (6%)	Swordfish (5%)	European hake (5%)
Demersal trawlers 12–18 m	Deep-water rose shrimp (12%)	Red mullet (11%)	Spottail mantis squillid MTS (10%)	European hake (9.5%)	Common cuttlefish (5%)
Demersal trawlers 18–24 m	Deep-water rose shrimp (15%)	European hake (12%)	Red mullet (95%)	Spottail mantis squillid (6%)	Musky octopus (5%)
Purse seines >40 m	Atlantic bluefin tuna (68%)	European anchovy (24%)	Little tunny (5%)	Frigate and bullet tunas (2%)	Atlantic chub mackerel (<1%)

---

[5] Revenue = income from landings + other income
[6] The scale categories applied within the FAO global review study are: Industrial, semi-industrial, or artisanal/small-scale.

The main species landed by each fleet in value terms are listed in Table 4. In terms of commercial value, European hake, common cuttlefish, deep-water rose shrimp, red mullet, spottail mantis squillid are most important to these fleet segments, along with Norway lobster and Atlantic bluefin tuna.

TABLE 4
Main species landed by fishing fleet (percentage over total landed value in 2016)

Fleets/species landed	1	2	3	4	5
Passive gears 6–12 m	Common cuttlefish (13%)	European hake (7%)	Swordfish (6%)	Common octopus (6%)	Surmullet (5%)
Demersal trawlers 12–18 m	European hake (10%)	Deep-water rose shrimp (9.5%)	Red mullet (8.5%)	Giant red shrimp (8.5%)	Spottail mantis squillid (8%)
Demersal trawlers 18–24 m	European hake (13%)	Deep-water rose shrimp (12%)	Norway lobster (7%)	Red mullet (7%)	Common cuttlefish (5%)
Purse seines >40 m	Atlantic bluefin tuna (91%)	European anchovy (6%)	Little tunny (2%)	Frigate and bullet tunas (1%)	Atlantic chub mackerel (<1%)

Fisheries in the EU are managed within the framework of the Common Fisheries Policy (CFP). The CFP aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with MSY) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures are adopted as appropriate, such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas).

Italian fisheries are chiefly managed through fishing effort regimes (input control measures), such as restrictions on access to fishing areas and on the number of fishing days (individual effort quotas), as well as technical measures to regulate gear usage and fleet capacity. Further measures are being enforced for small pelagic fisheries to comply with the CFP, including catch limits and spatial-temporal closures for anchovy and sardine in the Adriatic Sea.

As with most other EU countries, Italy has a compulsory licensing system for its commercial fisheries and complies with the EU's entry-exit scheme, which prevents increasing capacity in the commercial fishing sector.

A fishing licence provides a fisher with a permit to fish with a certain vessel and enters them also on the Sea Workers register. The fishing permits usually specify the gear used, the fishing area and type of fishing. There are four types of licences:
(1) Coastal fishing license for vessels under 18 m, fishing within 6 nautical miles (nm) from the coast,
(2) Offshore fishing license for vessels under 24 m, fishing up to 20 nm,
(3) Mediterranean fishing license for vessels over 24 m, without a territorial limit and,
(4) High seas fishing licence for operating outside of the Mediterranean.

EU Regulation 1967/2006 established that Mediterranean Member States need to implement management plans for major gear types to improve stock conservation. Management plans are used to limit fishing effort with the objective of reaching sustainable fisheries. These plans are made at community (international), national and local levels – as appropriate for the stock(s) in question.

The MAP for demersal stocks in the western Mediterranean Sea was adopted in 2019. The plan covers the Northern Alboran Sea, the Gulf of Lion and the Tyrrhenian Sea, including the Balearic archipelago and the islands of Corsica and Sardinia and concerns mainly France, Italy and Spain. MAPs for demersal stocks in other GSAs and the MAP for small pelagic stocks in the Adriatic are still to be implemented. The

overall objective of these multi annual management plans is to ensure the recovery of the stocks to safe biological limits by 2020, in accordance with Regulation (EU) No 1380/2013.

Spatio-temporal closures to protect fish nursery and spawning areas have been approved in the last years. The Pomo/Jabuka Pit in the Adriatic Sea, which is an important nursery area for European hake and hosts a resident population of Norway lobster, is closed to trawl fisheries since 2015. In 2019, three Fisheries Restricted Areas (FRAs) were introduced in the Strait of Sicily.

Only two fisheries – the bluefin tuna and swordfish fisheries, are managed through TACs and quotas in Italy. Currently there is a Multiannual recovery plan for bluefin tuna in the eastern Atlantic and the Mediterranean. Bluefin tuna is under a quota system with the International Commission for the Conservation of Atlantic Tunas (ICCAT). Italy receives a share of the TAC for Bluefin tuna and determines how to allocate it amongst its fleet. The quotas allocated are transferable within fleets using the same fishing-technique. It is not possible for new fishers to get access to bluefin tuna quotas without approval by the ministry.

As part of the reformed CFP, catches of quota species or stocks listed in Annex III of Regulation (EU) No 1967/2006 may no longer be discarded; all of the catch must be landed and counted against the quota. This discard ban, or Landing Obligation, was fully implemented in January 2019 and applies to all species subject to catch limits (TAC species) or to a minimum reference size (in the Mediterranean).

Various commercial strategies aimed primarily at improving the traceability and quality of local seafood are being implemented in Italy. Local operators are adopting quality brands or certification schemes and Producer Organizations (POs) play an important role in matching supplies with market demands and creating added value.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Small-scale coastal fleet using passive gears 6–12 m LOA

This small-scale coastal fleet can be characterised by an average length of 7.8 meters (LOA), gross tonnage of 2.3 tonnes and engine power of 37.1 kW. On average, these vessels made 132 fishing trips, each trip lasting around one day (132 days at sea) in 2016. The average crew size is 2 (see Table 5) and the main fishing gears used include: trammel nets, set gillnets (anchored), pots, drifting and set longlines (see Table 6).

This fleet segment was made up of 5 144 vessels and was responsible for 11 percent of the total volume of seafood landed by the Italian fishing fleet in 2016. This value of seafood landed equated to 18.4 percent of the total value of landings of the Italian fleet.

The small-scale coastal fleet was profitable in 2016, and has been consistently profitable apart from suffering net losses in 2013. Net profit margins have increased steadily since 2013, but have not yet reached 2008/09 levels.

These vessels are widely distributed along the Italian coastline, but operate mainly out of ports in Northern Sicily, Sardinia and Marche (on the Adriatic coast), targeting a wide range of stocks in the Ligurian and Tyrrhenian seas (GSA 9 and 10), Western Ionian Sea (GSA 19), Northern Adriatic (GSA 17) and Western Sardinia (GSA 11). The small-scale coastal fleet predominately targets high-value demersal species, such as cuttlefish, hake, octopus, mullets and spiny lobster as well as swordfish.

Common cuttlefish, European hake and swordfish were the most important species, accounting for 20 percent of the total landings in weight and 26 percent in value in 2016. At USD 10.4 per kg, cuttlefish prices were at a record high in 2016 while prices for swordfish have fallen steadily, from USD 14.5 per kg in 2008 to USD 10.3 per kg in 2016. The average price of other target species, including European hake, remained relatively stable over the period 2008–2016.

Semi-industrial demersal trawlers 12–18 m LOA

This semi-industrial demersal trawler fleet can be characterised by an average length of 14.3 meters (LOA), gross tonnage of 18.7 tonnes and engine power of 138 kW. On average vessels made 137 fishing trips and spent 142 days at sea in 2016, i.e., each fishing trip lasting around one day. The average crew size is 3 (see Table 5) and the main fishing gears used include bottom otter trawls. A few vessels use beam trawls or drifting longlines (see Table 6).

This segment comprised 1 232 vessels and contributed to 12.4 percent of the total volume of seafood landed by the Italian fishing fleet in 2016. This value of seafood landed equated to 19.2 percent of the total value of landings by the Italian fleet.

The fleet was profitable in 2016 and has been consistently profitable since 2008, generating a record high net profit margin in 2016. As with most segments, this fleet reached its lowest level of performance in 2013, but has since recovered.

These vessels operate mainly out of ports located in Apulia and Sicily, catching a wide range of species in the North Tyrrhenian Sea (GSA 10), Western Ionian Sea (GSA 19) and Adriatic Sea (GSA 17 and 18).

The fleet targets high-value demersal stocks, such as deep-water rose shrimp, European hake, red mullet, giant red shrimp, spottail mantis squillid, common cuttlefish and Norway lobster. Combined, these seven species make up 58 percent of the total value of landings. At USD 10.4/kg, cuttlefish prices were at a record high in 2016, while prices of the other target species have remained relatively stable over the period 2008-2016.

Industrial/semi-industrial demersal trawlers 18–24 m LOA

The semi-industrial/industrial demersal trawler-seiner fleet can be characterised by an average length of 21.0 meters (LOA), gross tonnage of 62.5 tonnes and engine power of 282 kW. On average vessels made 140 fishing trips and spent 155 days at sea in 2016. The average crew size is 3 (see Table 5) and the main fishing gears used are bottom otter trawls. Some of the vessels use however, purse seine, drifting longlines or beam trawls (see Table 6).

This segment of the fleet was made up of 633 vessels and responsible for 12.6 percent of the total volume of seafood landed by the Italian fishing fleet in 2016. This value of fish landed equated to 18.9 percent of the total value of landings of the Italian fleet.

This fleet segment was profitable in 2016. It suffered net losses between 2011–2104. It recovered in 2015, almost reaching 2009 profitability results.

These vessels operate mainly out of ports located in Sicily, Apulia, Marche and Lazio, targeting high-value demersal stocks in the Northern Adriatic Sea (GSA 17), Ligurian and Tyrrhenian seas (GSA 9 and 10) and Southern Sicily (GSA 16).

The most important species targeted include European hake, deep-water rose shrimp, Norway lobster, red mullet and common cuttlefish. Combined, these five species made up 43 percent of the total value of landings of this fleet in 2016.

Industrial purse seiners >40 m LOA

The Italian industrial purse-seiner fleet can be characterised by an average length of 43 meters (LOA), gross tonnage of 244 tonnes and engine power of 682 kW. The average crew size is 15 (see Table 5) and fishing activity is carried out solely with purse seiners (see Table 6). This segment consisted of vessels authorised to exploit bluefin tuna.

This segment comprised 11 vessels and produced 1.4 percent to the total volume of seafood landed by the Italian fishing fleet in 2016. This value of fish landed equated to 2.5 percent of the total value of landings by the Italian fleet.

These vessels operate mainly out of ports located in Sicily targeting Atlantic bluefin tuna in the Tyrrhenian Sea (GSA 10) and Southern Sicily (GSA 16). Bluefin tuna catches make up over 90 percent of the fleet's landings in value (68 percent in volume) and European anchovy a further 6 percent (24 percent in volume).

The fleet suffered net losses between 2008 and 2011, but has since been profitable.

Table 5 provides an overview of the main characteristcis of the vessels in the main fishing fleets, presented as averages.

On the whole, the Italian fishing fleet is old. Trawler vessels in the industrial pelagic purse seine fleet are relatively younger, with an average age of 25 years. In contrast, vessels in the small-scale coastal fleet are generally older and the majority of these vessels need modernisation. Yet, the overall level of investment is low (less than USD 14 000 per vessel in 2016) as small-scale vessel owners generally have limited access to credit and insufficient financial resources for investing in new equipment and technologies.

TABLE 5
Basic information of each fishing fleet (average of the fleet segment)

	Passive gears 6–12 m	**Demersal trawlers 12–18 m**	**Demersal trawlers 18–24 m**	**Purse seines >40 m**
Vessel age	32	28	31	25
Length overall (LOA)	8	14	21	43
Gross tonnage (GT)	2.3	18.7	62.5	244
Power of main engines (kW)	37	138	281	682
Crew size (persons)	2	3	4	15
Employment in FTE	1.4	2.6	3.9	10.2
Days at sea	132	142	155	unknown
Number of fishing trips	132	137	140	30

The main fishing methods/gears employed by fleet segment are presented in Table 6.

TABLE 6
Fishing methods/gears used by main fleet segment (as a percentage of fishing effort)

	Passive gears 6–12 m	**Demersal trawlers 12–18 m**	**Demersal trawlers 18–24 m**	**Purse seines >40 m**
Trammel nets	38%			
Set gillnets (anchored)	27%			
Pots	6%			
Drifting longlines	5.8%	0.6%	2.0%	
Set longlines	5.6%	0.1%		
Fyke nets	5%			
Purse seines	3.5%		2%	100%
Handlines and pole-lines	1%			
Beach seines	0.7%			
Bottom otter trawl	0.5%	98.5%	94%	
Beam trawl		0.5%	1.2%	
Pelagic pair trawl		0.2%		
Midwater otter trawl			0.3%	
undefined	7%			

Table 7 presents the total number of employed persons (paid and unpaid labour) and employment in full-time equivalents (FTE) in each of the fishing fleet segments, as well as other socio-economic indicators, such as average wage, gross value added (GVA) and GVA per FTE.

Most workers on these fishing vessels are full-time employees and male. There are very few female fishers. The few female fishers can generally be found in the small-scale fleet working as unpaid family members. On the larger vessels over 99 percent of the total employees are males.

Not much information is currently available on the age structure of the labour force of these fleets, but around three-quarters of the crew on small-scale vessels are 40 years or older. In general, the small-scale fishing fleet is characterized by a low generational handover due to poor profit margins even in traditional fishing areas, such as the Adriatic region. When a small-scale vessel has more than one crewmember, the second fisher is usually a family member.

On the contrary, the large-scale fleet is characterized by a relatively younger and more skilled labour force. In some fishing ports, such as Mazara del Vallo in Sicily, 20–30 percent of the fishers are immigrants, originating mainly from North Africa and Sri Lanka. Another recent trend, becoming increasingly pronounced, in the large-scale fishery is that many vessels owners are selling their quotas to cooperatives or private companies and remaining on as skipper.

Average wage and labour productivity are lowest in the small-scale coastal fishing fleet segment, increasing with vessel length and capital investment. Fishers employed in the industrial purse-seiner fleet receive on average the highest wages and are by far the most productive (see Table 7).

TABLE 7
Labour Employed in Fishing and main socio-economic indicators

	Total employed	**Full-time (FTE)**	**Average crew wage**	**GVA (USD million)**	**Labor productivity (GVA per FTE, USD)[7]**
Passive gears 6–12 m	9 469	7 270	4 166	138.1	18 990
Demersal trawlers 12–18 m	3 272	3 236	15 359	113.8	35 190
Demersal trawlers 18–24 m	2 453	2 453	19 826	103.4	42 160
Purse seines >40 m	165	113	80 333	20.6	183 220
Total	**15 359**	**13 072**		**375.9**	

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Small-scale coastal vessels using passive gears - polyvalent 6–12 m

Capital investments

The total tangible asset (replacement) value of this fleet segment was estimated at USD 128.2 million (or USD 24 930 per vessel). In-year investments in 2016 added up to USD 7.2 million (-13.8 percent compared to 2015); on average the capital investment was around just over USD 1 000 per vessel.

Operating and owner costs

Total gross costs of this fleet segment amounted to USD 79.7 million in 2016 (average of USD 15 500 per vessel), with operating costs equating to 77 percent. The remaining 23 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 34.8 million, nearly USD 7 000 per vessel. Annual depreciation amounted to 94 percent of capital costs. The fleet had no fishing rights costs.

---

[7]   Exchange rate used euro to dollar: 1 EUR = 1.1069 USD (ECB reference exchange rate, USD/EUR, average of observations throughout 2016; Data Source in SDW: http://sdw.ecb.europa.eu/browse. do?node=9691296)

Among the operating costs, crew costs were highest at 49 percent of the operating costs, followed by energy costs (31 percent) and then other variable costs (20 percent). The highest owner related costs were made for repair and maintenance (53 percent of owner costs), followed by other fixed costs (47 percent).

In 2016, the average vessel spent nearly USD 6 000 on crew costs, almost USD 4 000 on fuel costs and over USD 2 000 on other variable costs. The average amount spent on repair and maintenance was USD 2 000 and a slightly lower amount on other fixed costs.

Revenues
Total revenue for this fleet segment in 2016 was USD 187.5 million (slightly less than the USD 188.7 million in 2015); summing up to an average per vessel of over USD 36 000. This fleet segment contributed to 18.4 percent to the total revenue generated by the Italian fishing fleet.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 107.7 million and posted a gross profit of USD 74.9 million. With a net profit margin of 39 percent, profitability was high. Despite less revenue the fleet saw a profitability improvement compared to 2015 (gross costs were 8 percent less than in 2015). GVA to revenue was estimated at 74 percent and RoFTA at 56 percent.

Demersal trawlers 12–18 m
Capital investments
The tangible asset (replacement) value of this fleet segment was estimated at USD 79.3 million, equating to more than USD 64 000 per vessel. In-year investments amounted to USD 4.1 million in 2016 (a 15 percent increase on the USD 3.6 million invested in 2015); an average of just over USD 3 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 128.8 million in 2016 (average of USD 105 000 per vessel), with operating costs equating to 89 percent. The remaining 11 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 20.2 million, which equals around USD 16 000 per vessel. Annual depreciation amounted to 94 percent of capital costs. The fleet had no fishing rights costs.

Among the operating costs, crew costs were highest at 43 percent of the operating costs, followed by energy costs (42 percent) and other variable costs (15 percent). The highest owner related costs were made for repair and maintenance (58 percent of owner costs), followed by other fixed costs (42 percent).

In 2016, the average vessel spent USD 40 000 on crew costs, USD 39 000 on fuel costs and nearly USD 14 000 on other variable costs. The average amount spent on repair and maintenance was almost USD 7 000 and USD 5 000 on other fixed costs.

Revenues
Total revenue for the fleet in 2016 was to USD 193.0 million (stable relative to the USD 194 million in 2015); amounting to an average per vessel of USD 157 000. In 2016, fleet contributed to 19 percent of the total national fishing fleet revenue.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 64.1 million and a gross profit of USD 45.1 million. With a net profit margin of 23 percent and profitability

was high. This fleet segment saw some improvement compared to previous years, largely due to lower energy costs (-12 percent compared to 2015). GVA to revenue was estimated at 59 percent and RoFTA at 55.4 percent.

Demersal trawlers 18–24 m

Capital investments

The tangible asset (replacement) value of the fleet in 2016 was estimated at USD 151.9 million (or USD 239 965 per vessel). In-year investments amounted to USD 4.2 million (a substantial increase on the USD 1.8 million invested in 2015); on average nearly USD 7 000 per vessel.

Operating and owner costs

Total gross costs amounted to USD 136.8 million in 2016 (average of USD 216 120 per vessel), with operating costs equating to 89 percent. The remaining 11 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 39.2 million, which is around USD 62 000 per vessel.

Among the operating costs, energy costs were highest at 46 percent of the operating costs, followed by crew costs (40 percent) and then other variable costs (14 percent).

The highest owner related costs were made for repair and maintenance (55 percent of owner costs), followed by other fixed costs (45 percent). In 2016, the average vessel in this fleet segment spent USD 77 000 on crew costs, USD 89 000 on fuel costs and USD 26 000 on other variable costs. The average expenditures on repair and maintenance were USD 13 000 and nearly USD 11 000 was spent on other fixed costs per vessel in 2016.

Revenues

Total revenue for the fleet in 2016 was USD 191.6 million (a 6 percent increase on 2015); amounting to an average revenue per vessel of nearly USD 303 000.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of almost USD 54.8 million and posted a gross profit of USD 17.9 million. With a net profit margin of 8 percent, profitability was weak but the fleet saw some major improvement compared to previous years. GVA to revenue was estimated at USD 54 percent (up from 48 percent in 2015) and RoFTA at 10 percent (up from 2.9 percent in 2015).

Purse seines >40 m

Capital investments

The tangible asset (replacement) value of the purse seine fleet was estimated at USD 16.2 million, which is around USD 1.47 million per vessel. Investment data were unavailable for 2016.

Operating and owner costs

Total gross costs amounted to USD 13.5 million in 2016 (average of USD 1.2 million per vessel), with operating costs equating to 85 percent. The remaining 15 percent consisted of repair and maintenance costs and other fixed costs. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 3.7 million.

Among the operating costs, crew costs were highest at 79 percent of the operating costs, followed by energy costs (11 percent) and other variable costs (10 percent). The highest owner related costs were made for repair and maintenance (51 percent of owner costs), followed by other fixed costs (49 percent).

In 2016, the average vessel expenditures were USD 822 000 on crew costs, USD 116 000 on fuel and USD 109 000 on other variable costs. The average amount spent on repair and maintenance was nearly USD 93 000 and USD 88 000 was spent on other fixed costs per vessel in this fleet segment in 2016.

Revenues

Total revenue for the fleet in 2016 was to USD 25.1 million (a 42 percent increase on the USD 17.6 million revenue in 2015). The average revenue per vessel was USD 2.3 million in 2016, entirely coming from the sale of fish.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 11.6 million and posted a gross profit of USD 8.1 million. With a net profit margin of 31 percent, profitability was high and the fleet saw improvements compared to 2015. GVA to revenue was estimated at 82 percent and RoFTA at 48 percent.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES

Fishing vessel owners and fishing cooperatives in Italy have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national) including USD 7 billion EU contribution, for the period 2014–2020.

The allocation for Italy is set at USD 1 billion, with an EU contribution of USD 594 million, i.e., co-funding of 55 percent. USD 383 million is allocated to support a sustainable and innovative fishing sector.

Support from the EMFF can be provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include: (1) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms (e.g. with lower interest rates, longer repayment periods, or fewer collateral requirements); (2) Microcredits, which are smaller loans made to people sometimes excluded from access to finance, often provided over a short term and with no or low collateral required; (3) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan and (4) Equity, where capital is invested in return for total or partial ownership of a firm. Equity is more relevant for higher risk and potentially higher growth firms, for example those piloting innovative sustainable technologies in the fisheries sector.

As stated in the Italian Operational Programme for Fisheries and Maritime 2014–2020, 34.5 percent of the total programme allocation aims to promote fisheries through supporting investment in the modernization of fishing fleets and providing support to small-scale coastal fishing. In addition, 8.7 percent of the total programme allocation has the objective to promoting economic and social sustainability through the creation of jobs in fishing communities and the diversification and the implementation of local development strategies.

The European Investment Bank (EIB) lending activities are aligned to the EU standards and priorities and cover the whole fishery value chain, ranging from input- and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improvement or restoration of ecosystems, innovative solutions for addressing current and future challenges in the sector, and the

productive and sustainable use of by-products from food production. The small size of most Italian fishing enterprises and the economic crisis have limited the investments in fisheries and access to credit and loans in the last years.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

In Italy, there is a tax exemption on fuel for fishing vessels; accessible if the owner is licensed.

There also exists a system with financial compensation for reduction of fishing effort, including scrapping of fishing vessels and temporary cessation of fishing activities. The scrapping of fishing vessels with public aid was in force until 2017; a premium was paid to a vessel owner that scrapped a fishing vessel. The decommissioning of vessels with public aid was outlined in an Action Plan enclosed in an annual report describing the effort made by Italy in 2016 to find a sustainable balance between fishing capacity and resources, as envisaged by Regulation (EU) No 1380/2013 (art. 22). The Action Plan envisaged an 8 percent reduction of current capacity for the trawler fleet and purse seiners. Around 200 vessels were scrapped by the end of 2017.

Temporary cessation has been used as a management tool in Italian fisheries since 1988. Since then, each year a temporary closure for trawling has been applied, as specified in the Italian Management Plan for demersal fisheries (art.19 Regulation (EC) No 1967/2006). Financial support is granted to owners by EMFF for a duration of 30–45 days per vessel. During the temporary cessation fishers concerned receive a social assistance benefit.

To ensure compliance with the landing obligation, EMFF funds also foresee measures for investment in more selective fishing gears and for technical adjustments.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

In Italy, investments in the fishing fleet added up to around USD 29.9 million in 2017, which is a recovery after years of low investments. The EMFF funds support investments by the fishing fleet to improve selectivity of the gears and for technical adjustments. In 2018, the first projects under EMFF have been funded by national and regional authorities. These projects focused on improving hygiene, health, safety and working conditions for fishers, limitation of the impact of fishing on the marine environment, and replacement or modernisation of engines.

Some of the main technological innovations that have had an impact on the fishing fleet economic performance since 2000 in Italy are presented in the following table. The table also specifies how these changes impacted the economic performance of the fishing fleet.

Category	Specific innovations introduced	How these affect economic performance of the fleet
Cost reductions and energy savings	Fuel and engine performance monitoring system: allows for performance evaluation, energy management and fuel consumption monitoring. The system can track one or more vessels in order to compare energy performance and fuel consumption. Efficient fishing gears (e.g. reduced gear drag) Improvement in propulsion systems (such as "Blue Drive" system, "3Nergy" system) (Sala, 2013)	Comparing the actual state of the art of marine diesel engines with those installed 20 years ago (the average life of a good and well maintained engine) many improvements were achieved to reduce fuel consumption (the amount of fuel needed to produce the same power) and NOx emissions. Reduction in specific fuel consumption estimated at around 10%, for new engines (Sala, 2013).
Increasing fishing efficiency	Radar often combined with other navigational equipment, such as electronic chart display information systems (ECDIS) and global positioning systems (GPS)	Reduction in the time spent on fishing activities, reduction in fuel consumption/fuel costs

Category	Specific innovations introduced	How these affect economic performance of the fleet
Reducing the environmental/ ecological impact	As a result of the implementation of the landing obligation, several national and EU projects have been financed to reduce bycatch, discards and damage to sensitive marine species and habitats through technology and alternative fishing practices. Ongoing projects include testing modified standard commercial bottom trawl nets by incorporating sorting grid separators and separator panels in shellfish fisheries; experimental surveys using the DeepVision system to gather real time information on species and size composition in order to minimize the pre-catch losses/mortality (H2020 project MINOUW).	Accadia et al. (2018) simulated the short-term economic impact of changing the primary fishing gear from trawl to trammel nets in two case studies: demersal fleets operating in the Ligurian and North Tyrrhenian seas (GSA 9) and in the Strait of Sicily (GSA 16). Results indicate a change in fishing gear would produce a 65% relative loss in gross profits in GSA 9 and 60% in GSA 16. Losses would be greater for larger and more modern vessels, reaching 80% in GSA 9 and 70% in GSA 16. Gross profit reduction less than 50% is expected for just 6% in GSA 9 and 1% in GSA 16 of the vessels included in the study. Even though benefits on the stocks and consequently on vessels profitability would be expected in the long-term from improvements in selectivity, the short-term costs associated to these measures make them disagreeable to fishers.
Improving safety at sea and working conditions of fishers	Vessel monitoring devices and systems: e.g. GPS, vessel monitoring systems (VMS), and automatic identification system (AIS). VMS devices transmit the location of a fishing vessel during a fishing trip. AIS is generally more affordable. AIS contributes to safe navigation, and the data are public.	VMS is recognized to be a crucial aspect for monitoring control and surveillance (MCS) at national and international levels.
	A Fishery and Oceanography Observing System (FOOS) can be adapted to fit specific research needs in terms of real time monitoring of fishing activities. This device transforms fishing vessels into monitoring systems able to gather a large range of environmental and fishery information (Patti et al., 2016).	FOOSs have been used by the Italian research council (CNR) both in the Adriatic Sea and in the Strait of Sicily on several fishing vessels to gather spatial data on their fishing activity. The FOOS was designed to be networked through satellite and/or General Packet Radio Service (GPRS) or Universal Mobile Telecommunications System (UMTS) modems depending on the distance from the coast and to be able to receive and transmit data in real time to a land-based station (Patti et al., 2016).

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Since 2004, the Italian fishing fleet has significantly reduced in size, from almost 15 000 vessels to 12 295 vessels in 2016 (a reduction of over 2 600 vessels and 50 000 GT). In 2017, 200 vessels were scrapped in accordance with the Italian "Action plan for 2015-17 to reach a balance between the Italian fishing fleet's capacity and the fish resources". Further reductions are foreseen in the coming years.

This major downsizing of the fleet is in line with measures laid down in the CFP, which supports and encourages the reduction of fleet capacity/fishing effort through specific temporary and permanent cessation measures.

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that, from 2014, the fishing capacity of their fleet at no time exceeds the fishing ceilings in Annex II to Regulation (EU) No1380/2013. In addition, according to Article 22, Member States are to identify overcapacity and to adjust the size and nature of their fishing fleets to their fishing opportunities. Member States are required to report annually to the European Commission on the balance between the capacity of their fleets and their fishing opportunities, providing action plans for fleets that show signs of overcapacity.

REFERENCES

Accadia P., Pinello D., Sabatella E., Maynou F. 2018., Deliverable 2.18, *Reports on the Cost/Benefit of technological solutions*. MINOUW Project. Available at: http://minouw-project.eu

EU. 2019. *Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06).* Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic

Patti, B., Martinelli, M., Aronica, S., Belardinelli, A., Penna, P., Bonanno, A., Basilone, G., Fontana, I., Giacalone, G., Gabriele Gallì, N., Sorgente, R., Angileri, I.V.M., Croci, C., Domenichetti, F., Bonura, D., Santojanni, A., Sparnocchia, S., D'Adamo, R., Marini, M., Fiorentino, F., Mazzola, S. 2016. *The fishery and oceanography observing system (FOOS): A tool for oceanography and fisheries science*. Journal of Operational Oceanography, 9:s99-s118.

Sala A., Notti E., Martinsohn J., Damalas D. 2013. *Information Collection in Energy Efficiency for Fisheries (ICEEF2012) Tender specifications IPSC/2011/04/01/NC |* Service Contract No. 256660 | Final Report

Report of Norway

National report of Norway

VESSELS, EMPLOYMENT AND FINANCIAL RESULTS
by
Terje Vassdal,
Professor Emeritus of The Arctic University of Norway
Tromsø, Norway

SUMMARY
Norway has in place a comprehensive system for collecting fisheries data. The legal authority for fisheries data collection is provided in the "Law on Managing Wild Life Marine Resources" (*Lov om forvalting av viltlevande marine ressursar,*) from 2008. This law requires fishers and owners to provide information about the operation of fishing and hunting vessels, incorporates the duty to electronically report position and catch by Norwegian fishing and hunting vessels and the duty to establish and report landings- and final contract notes between fishers (seller) and any buyer. All fishing vessels must be registered with a detailed description of their physical properties (year of building, motor, length, depth, breadth, tonnage, building materials etc.). All licenses and permits related to every vessel are registered, both permanent permits and licences/permits acquired through commercial transactions. The Norwegian laws also specify that only active fishers can own fishing vessels and related licenses/permits. There are conditions for exemptions to this main rule stated in the laws. Processing companies own a large part of the large demersal trawler fleet. Descendants and families of formerly active fishers own other large vessels in pelagic sector.

Databases belonging to the Norwegian Directorate of Fisheries and Statistics Norway are sources for the preparation of this national report. Much of the information is annually collected and published as averages.

Statistics for the number of fishers date back almost 100 years. The total number of fishers peaked at about 120 000 around 1940. The present number is about 10 000. The population is split into two groups according to time used for fishing. The groups are a) main occupation fishers and b) fishers having fisheries as their secondary occupation. Both groups have declined and the group consisting of secondary occupation fishers declined relatively most. Presently fishers with fishing as their primary occupation add up to about 9 000 fishers and this is around 80 percent of the total number of registered fishers.

Statistics for the number of fishing vessels also date back almost 100 years. The number of fishing vessels peaked at about 41 000 in 1960, and was in 2017 reduced to around 6 000. The largest reduction in the fleet was for vessels less than 10 m in length overall (LOA). The smallest vessels are mainly open vessels. Modern small fishing vessels between 10 and 15 m are still popular and this group has been stable at about 2 000–2 500 over the last 20 years. The group of largest vessels (larger than 28 m) has declined slightly over the last 20 years from more than 300 to about 250. The group of largest vessels is presently rather stable.

The average age of fishing vessels in Norway was in 2017 about 27.6 years, an increase with nearly 10 years from 17.8 years in 1980. For vessels larger than 28 meters, the average age is now 19.6 years, whereas for vessels of 15–21 m the average age is 36.6 years. All other length groups have now average vessel ages of 27–30 years.

Not surprisingly, the largest vessels take the majority of catch. About 90 percent of total catch is landed by vessels 21 m and larger. As an example, vessels larger than 28 m land more than half of herring and the rest is landed by vessels in the 21–28 m length category. For shrimp catches in the Norwegian Exclusive Economic Zone (EEZ), all vessel groups report landings with the largest catches taking place by vessels of 11–15 m. Outside the Norwegian EEZ, however, all shrimp catches are made with vessels 28 m and above.

The total catch by Norwegian fishing vessels, including catch outside the Norwegian EEZ, has been remarkable stable over the last 20 years at around 2.5 million tonnes. For this period, the catches of herring have varied with a factor of three and those of cod have varied with a factor of two. Catches of other species have shown relatively large variations as well, but the variation in catch for individual species seems to be surprisingly uncorrelated. This observation may explain the stability in total catches.

Not all species are equally valuable. When studying the value of total catches by species considerable variation can be observed. Catches of cod, one of the most valuable species per kg, have been increasing since 2009, and this is the main reason for the increased value of the total fish landings over the last 4–5 years. The general lift in market prices of fish have further added to the increase in total catch value. Cod quotas have declined after 2017, and unit prices increased. The combined effect on total value is still unclear.

Gear types in use for the Norwegian fisheries are handline, longline, Danish seine, purse seine, bottom trawl and pelagic trawl. Purse seine and bottom trawl are by far the two most important gear types used in the Norwegian fishing fleet with a combined catch of 70–80 percent of the total landings. The use of purse seine is illegal for cod fisheries. Here gillnet, Danish seine and demersal trawl are the three gear types with the largest catch. Handline fishing, operating from the smallest vessels close to shore contribute about 5 percent to the total landings of cod.

This report presents financial results from the period 2003–2016. Over time, the discrepancy between what vessel owners, as registered business entities, reported to tax authorities, Statistic Norway and others, and what the Directorate of Fisheries asked for, became increasingly large. The Directorate of Fisheries decided to simplify its own data collection, and from 2009 onwards agreed to use common financial accounting information, with some extra information on fuel, bait etc. Earlier published statistics were recalculated to the new reporting requirements. For the profit and loss account, the changes were minor with exception for the item "Depreciations". The balance sheet was recalculated to 2003. This makes comparison before and after 2003 difficult. Published reports now use standard accounting terminology as used by financial analysts. Profitability measures in fisheries are thus comparable with any other commercial sector in Norway. What has been lost is some specific terminology used in economic analysis.

Norwegian fishing fleet revenue has increased by about 50 percent over the last 4 years (2013–2016). The largest vessels (>28 m) make more than 50 percent of operating revenue. Gross profit for 2016 is the largest for the period 2003–2016. Net profit (before taxes) was negative in 2000, 2003 and 2008 and positive in all other years for the period we have studied. There is a large variation in net profit from year to year. Average return on total assets is about 5-6 percent, but shows a large variation between vessel groups.

DATA SOURCES

The legislative basis for collecting financial accounting information from vessel owners is provided in Law No. 37 from 6 June 2008: Law on Managing Wild Life Marine Resources (*Lov om forvalting av viltlevande marine ressursar*, in short:

Havressursloven), and specifically in its paragraph 57. This paragraph authorizes *Provision No. 547 from 26 May 2015: Provision regulating the duty to forward information about the operation of fishing and hunting vessels.*

All data related to the catch of fish and related activities from relevant vessels are collected under paragraph 36 of the same Law. This paragraph forms the basis for different provisions regarding reporting, tracking and journals. Of most importance for Norwegian vessels is *Provision No. 1743 from 21 December 2009: Provision about the duty to electronically report position and catch for Norwegian fishing and hunting vessels.*

Reporting of landings of catches (through landings- and contract notes) is compulsory. The legal authority for collecting such data is based on paragraph 39 of the same Law, which authorizes *Provision No. 607 from 6 May 2014: On establishing and reporting landings and final contract notes between fishers (seller) and any buyer.*

In addition to the legal provisions mentioned above, the Directorate of Fisheries, located in Bergen, Norway, maintains two central registries for fishing vessels. First, The Central Fishing Vessel Registry, in which every commercial fishing vessel is registered. A license number visibly placed on the hull uniquely identifies every commercial fishing vessel. The unique license number gives information about the county, local municipality within the county, and a serial number for each county/ municipality combination. The registry contains a full technical description of every licensed vessel. Second, The Directorate of Fisheries maintains a registry of every fishing license and permit. The content of the two registries is in the public domain. Financial information reported to the Directorate on an annual basis for a specific vessel is not publicly available. Only averages are made publicly available.

Fishing licenses are generally of two types. The first license type is a base license issued by the Ministry of Trade, Industry and Fisheries at the time the vessel is new and entering fisheries for the first time. In addition, each vessel owner may acquire other licenses/permits through commercial transactions of licenses between fishers. Transactions with licenses are not free. The Norwegian system of transferring licenses does not adhere to the common concept of ITQ (Individual Transferable Quotas). Descriptions on the details of the Norwegian system for transferring quotas can be found in various scientific publications, see for example Johnsen and Jentoft (2018). This report will not elaborate on the details of the Norwegian licensing system.

REPRESENTATIVENESS OF DATA

The registries for fishing vessels in Norway are complete. Without a legal license, a fishing vessel cannot take part in commercial fisheries on quota-limited species.

A sample approach collects information on activities and financial results for the vessels. The argument for using a sample approach rather than a total tally is a practical one, taking into consideration the burden for fishing vessel owners to file information and adhere to reporting requirements. Different vessels report every year. The down-side of the sample approach for collecting primary financial data, seen from a researchers point of view, is the fact that variation in results from year to year may have two sources. One source is the actual changes in revenue, income and costs. The other one is caused by changes due to sampling. Vessels are not homogeneous, and the sample effect will, to some extent, influence reported average results. Statistics Norway advises The Directorate of Fisheries on sample size and selections procedures. Statistics Norway subsequently publishes in aggregate form much of the data collected by The Directorate of Fisheries.

As for annual accounting information, Annex – Table 1 presents the sample size relative to total vessel population within each group for the major fleet segments. It is worth noting that largest vessels have highest relative sample size at around 80 percent. Smaller vessels, being more numerous, have the smallest relative sample size, as low as 15 percent. The middle group of vessels when ranked according to length has sample size in the interval 35–50 percent. Norwegian *Kroner* (NOK) is the price and value nomination for all primary data for this report.[1]

FINANCIAL RESULTS FOR SEAGOING VERSUS COASTAL FISHING VESSELS

In this section aggregate financial figures for the Norwegian fisheries are used. The fishing vessels are divided into two groups, smaller and larger than 28 m LOA. For the seven most important vessel groups, more detailed analysis is presented in the next section. The next section will also only present average financial results per vessel.

Time-series for annual financial data are publicly available from the early 1980s. This report mainly presents data for the period 2003 to 2016. Former publications from FAO cover Norwegian fleet information from the 1990s. A complicating factor for long time-series are changes in variable definitions. Relevant to financial results trend reporting is the fact that The Norwegian Directorate of Fisheries abolished the calculation of "economic results" in 2009 because of the termination of the former earning support scheme (i.e. subsidies in the form of cost compensation and price support schemes). From 2009 onwards, common financial reporting has become the norm. Pre-2009 statistics have been recalculated back to 1994, based on the new reporting norm. However, it was only possible to recalculate the balance sheet back to 2003. Among other problems, the accounting item "Intangible Assets" was not collected before 2003. This item is for fishing vessels mainly the book value of acquired licenses and quotas. Consequently, relative profitability numbers involving information from the balance (i.e. Return on Assets, Return on Equity) before and after 2003 are not completely comparable. Although data may exist from 1994–2002, this report starts with 2003 for most of the financial time series.

Revenue has increased markedly the last four years, by as much as 50 percent. Revenue for 2016 showed the largest annual revenue within the period 2003–2016. Revenues presented in this report are nominal. Prices have generally increased from 2003 to 2016 due to change in the general domestic price levels.[2] By deflating for general price changes, (using for example a broad consumer price index) revenues and costs could have been re-calculated relative to a base year. In this report all prices and values are nominal.

Figure 1 illustrates development over time and the sharing of operating revenue among vessels below and above 28 m LOA. Vessels above 28 m are considered sea-going vessels, meaning that these vessels as a rule operate outside sheltered coastal areas, but inside Norway's EEZ.

Figure 1 shows the operating revenues in USD for the period 2003–2016. The data on which Figure 1 is based can be found in Annex – Table 2.

---

[1] All NOK values and prices are converted to US dollars (USD). For the period 2003-16 the average exchange rate of 1 USD = 6.5 NOK. This conversion rate is applied consistently throughout this report, although there has been exchange rate variations during the period. After 2016 and until the middle of 2019, the exchange rate of NOK relative to USD has changed to an average rate of 8.33. For historical exchange rate for NOK relative to USD, consult Bank of Norway (www.norges-bank.no/tema/ Statistikk/Valutakurser/?tab=currency&id=USD) or similar sources.

[2] The Norwegian Consumer Price Index, with basis 1998=100, was 112.8 in 2003 and 144.3 in 2016. Source: Statistics Norway, Consumer Price Index, historical indices (1998=100)

FIGURE 1
Revenue for vessels below and above 28 meters, 2003–2016

Total operating revenue; coastal vs sea -going vessels
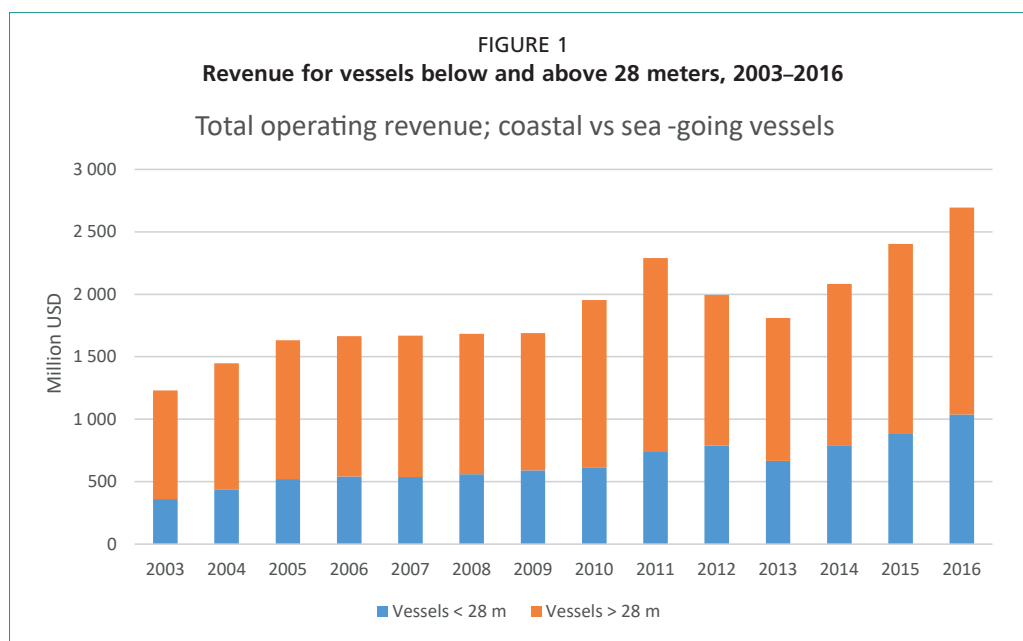
There are several ways to define financial returns, including the net cash flow from fishing. This is revenue less all operating expenses, but not including depreciations and amortizations, which are costs but not cash expenses. Cash flow from fishing shall cover interests, repayment of debt and reinvestment. It is common to compare cash flow to total debt. Experienced bankers will always compare debt with available cash flow when assessing the risk of a loan. Figure 2 shows the total cashflow or earnings before interest, taxes, depreciation and amortization (EBITDA) for two categories of fishing vessels.

FIGURE 2
Cash flow for vessels below and above 28 m LOA
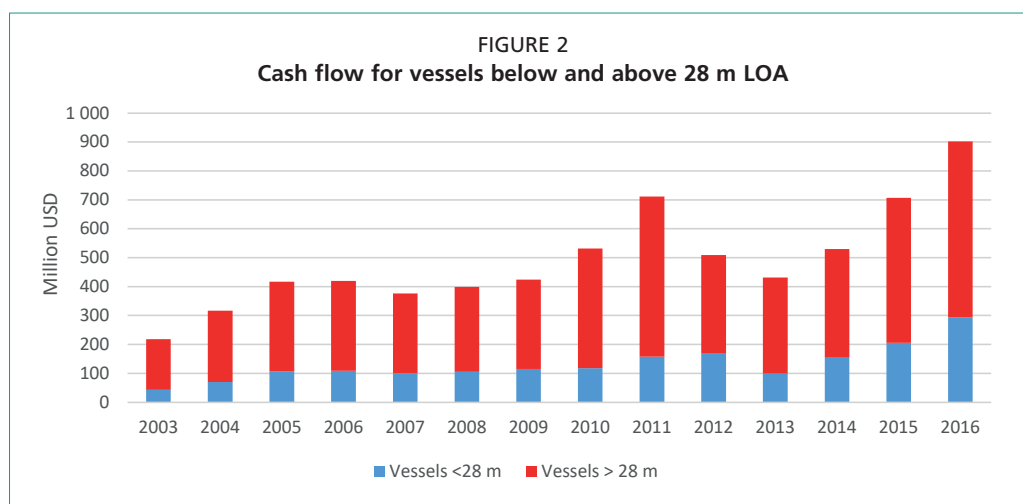
Secondly, gross profit (EBIT – Earning before Interests and Taxes) are reported. Figure 3 presents the aggregated gross (operating) profit.

FIGURE 3
Gross profit for vessels below and above 28 meters LOA, 2003–2016
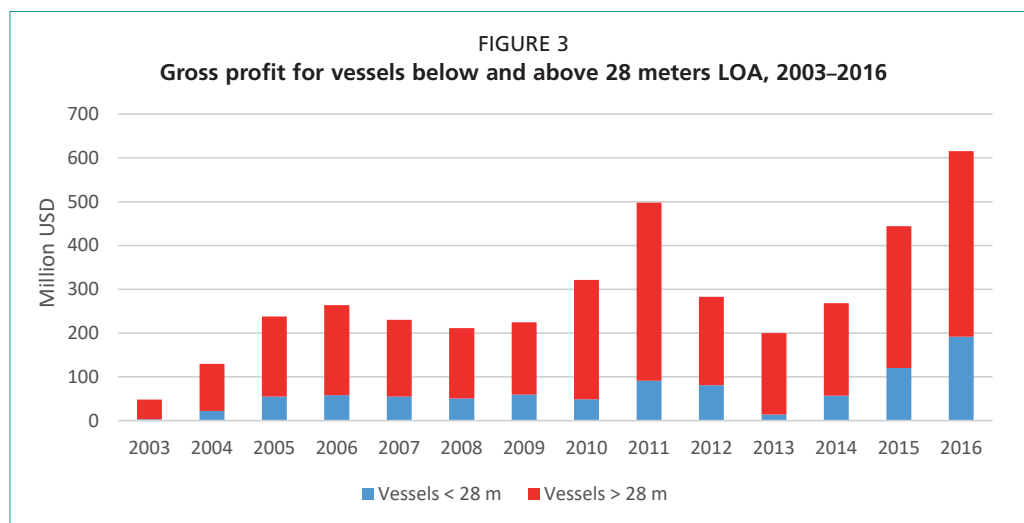
Gross profit minus depreciation and amortization shows more variability than revenues. This is as could be expected. Depreciation, maintenance and insurance are relatively stable and may be defined as fixed costs relative to fishing activity within a year. Both the price and volume of fish landed influences the revenue. The volume of landed fish will largely be positively correlated with fishing effort and with the variable costs of fishing effort. Fish price changes will generally be negative correlated with landings, as when supply increases and demand remains relatively stable the market price generally reduces. Negative correlation between price and aggregated quotas (TAC's) is the case for North-East Atlantic cod, herring, blue whiting and capelin, but not for mackerel. From a fisher's point of view, unit prices may look rather random. Operating costs are more predictable and linked to fishing effort.

Vessels above 28 m generate relative more cash flow (EBITDA) and gross profit (EBIT) relative to revenue than vessels below 28 m. Different input intensities may explain the observed differences. Smaller vessels are relatively labor intensive, larger vessels are more capital intensive. Only a part of the capital costs is included within the operating costs, whereas all labor costs are included.

An interesting year for the Norwegian fishing fleet was 2013. This year was a normal (average) year for pelagic fishing vessels catching species like herring, mackerel, and capelin. However, for vessels catching cod 2013 was very special. That year saw the largest TAC for North East Atlantic cod for many decades. In the same year, the unit price of cod in Norway was the lowest on record since 1980, when corrected for nominal price changes. For smaller vessels, traditionally concentrating on cod fisheries, the combination of high quotas, resulting in large fishing effort and higher than normal fishing costs, did not balance well with revenue, the latter influenced by a low unit price of cod. After 2013, quotas for cod have declined, marked prices for cod have rebounded, and gross profit has increased.

Net Profit[3] before taxes is an important profit indicator to analyze. Normally, a combination of loans and owner's capital constitutes the financing mixture used by commercial companies. Modern fishing vessels are no exception. Large fishing vessels

---

[3]   Net profit is what remains of profit for owners (before taxes). Residual calculated capital belonging to owners is by definition called "Equity". Net profit relative to book value of equity (ROE) is return on equity (before taxes).

are very expensive, as these vessels normally also invest large amounts in intangibles in the form of quotas and licenses.[4] Figure 4 illustrates Net Profit before taxes.[5]

FIGURE 4
Profit before taxes of vessels below and above 28 m 2003–2016
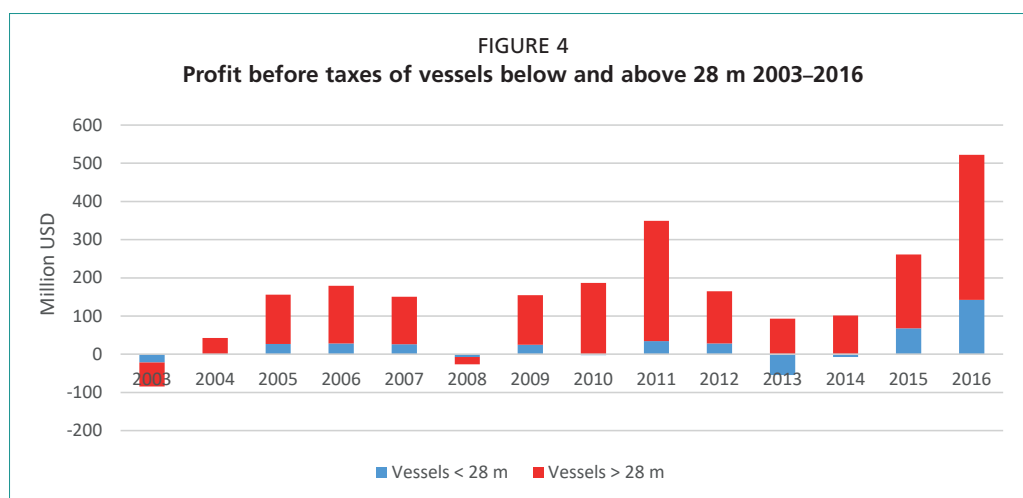
Figure 4 shows that total Net Profit before income taxes is clearly skewed to the benefit of large seagoing vessels. Both vessel groups showed net losses (negative profit) in 2003 and 2008. Vessels of less than 28 m LOA generally also experienced net losses in 2013 and 2014.

Figure 5 below shows the return on total assets (ROA). For the period 2010–2016 larger vessels show for every year larger returns on total assets than smaller vessels.

FIGURE 5
Return on assets of vessels under and above 28 m LOA

Gross profit on total assets

---
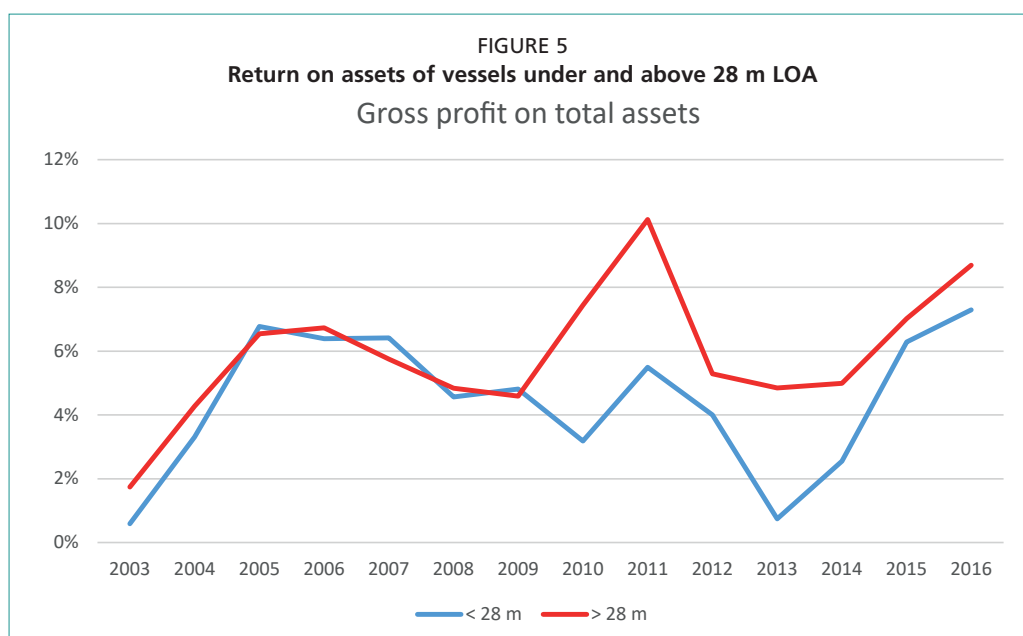
4   More on the recent ascent of investment in intangibles for fishing vessels to follow in later sections of this report.

5   For many decades, company profit tax rate in Norway was 27%. Starting in 2015, the tax rate was reduced annually by 1% to 22% for 2019. Further reductions have not been announced. Actual tax cost each year for a company may be influenced by previous accumulated deficits, sales of assets (vessels and/or quotas), financial transactions, etc. Therefore reported net profit <u>before</u> taxes would be the most stable indicator of profit.

In earlier FAO techno-economic fleet performance reports, FAO calculated the fraction of Net Profit (before taxes) relative to total assets. This definition is different from the indicator "return on assets" (ROA) presented above, and will normally give a smaller number for return on assets. Net profit will on average always be less than or equal to gross profit (the difference is interest cost). Total assets are the same in both formulas. This report presents both versions, mostly for the sake of comparison of longer time series. However, gross profit (before or after taxes) is the standard profit measure for ROA. Figure 6 presents the ROA using the methodology applied by FAO in earlier reports.

FIGURE 6
Net profit before taxes relative to total assets for vessels below and above 28 m
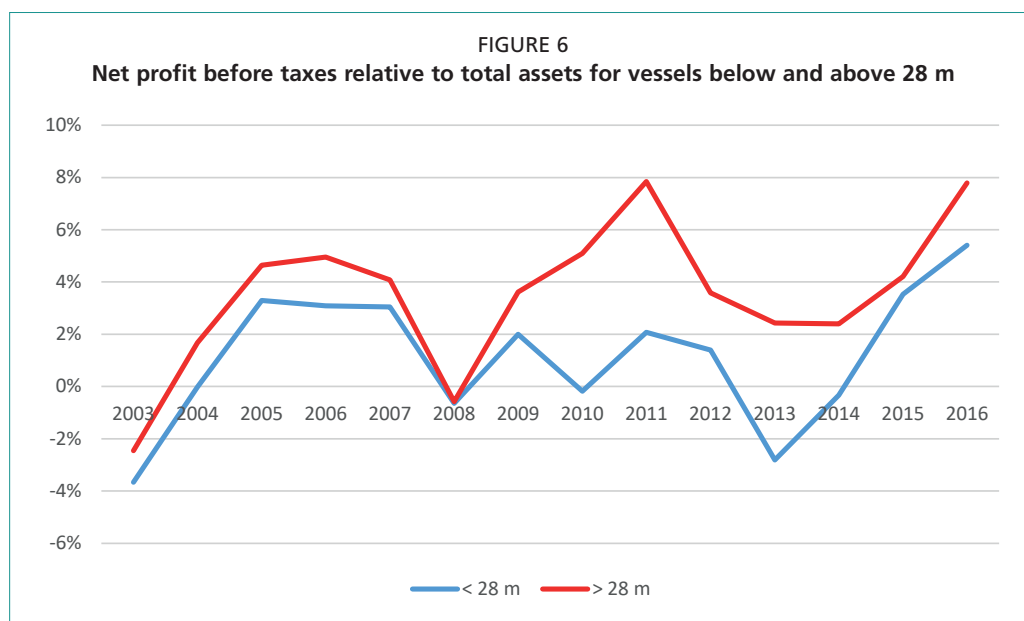
An interesting aspect in Norwegian fisheries is the development over time of intangible assets (investment in quotas and licenses) compared to the investment in vessels. Book values of both are known from 2003 onwards. Vessels decline in value over time due to wear and tear, and annual depreciation shall account for that. Thus, many old vessels have low book values. In addition, intangible assets amortize (depreciate) also over the duration of the license/quota. Investment in intangible assets is a relatively recent phenomenon and thus the intangible assets are on average newer than the comparable vessel age. For recently built vessels, the cost price of quotas may be comparable in value to the price of a new vessel. In Figure 7 below, the book value of intangibles is compared with the book value of the vessels.

Large vessels started buying intangibles earlier than smaller vessels. Accumulation of quotas for large vessels reached a top around 2010–11. Vessels under 28 m LOA are still accumulating licenses and quotas, and the book values of licenses has reached a point that it is now higher than the value of vessels.

FIGURE 7
Book value of intangibles relative to book value of vessels
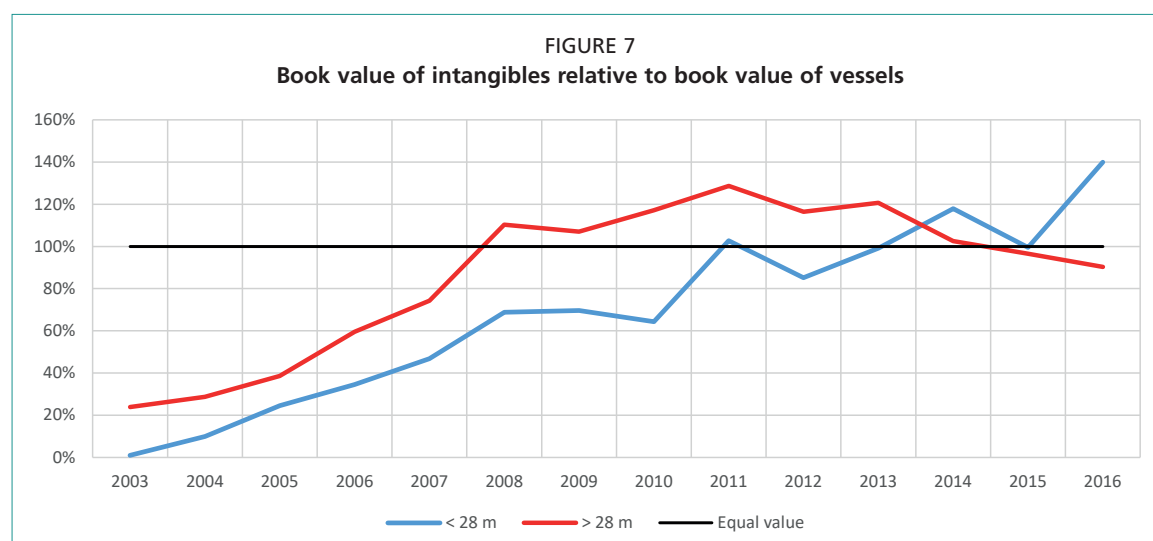
AVERAGE FINANCIAL RESULTS FOR EACH OF THE 7 MOST IMPORTANT FISHING FLEET SEGMENTS

This section focuses on the seven most important fishing fleet segments. Table provides an overview of the number of vessels in the main segments included in this review, as well as the value and volume of landed seafood by these vessel segments in 2016.

TABLE 1
Vessel numbers and landed seafood values and volumes in 2016 for the seven largest fishing fleet segments

	Total number of vessels 2016	Total catch value (1 000 USD)	Total volume in tonnes (met weight)
Conventional coastal vessels	1 242	700 178	345 188
Conventional seagoing vessels	19	180 845	69 242
Cod trawlers (demersal)	36	652 526	282 043
Coastal shrimp trawlers	103	77 145	18 723
Coastal purse seiners	136	213 806	164 337
Large seagoing purse seiners	73	636 044	690 076
Pelagic trawlers	14	83 713	140 619
Total	**1 623**	**2 544 257**	**1 710 228**

In terms of the numbers of vessels the convential coastal vessels fleet segment was largest with 1 242 vessels in 2016 and the pelagic trawler vessel segment was smallest with 14 vessels. Some fourty percent of the volume landed by the seven largest fleet segments in Norway in 2016 originated from the large seagoing purseseine fleet.

Table 2 reports gross (operating) revenue for fleet segments to illustrate relative financial importance of the chosen fleet segments.

TABLE 2
Average annual revenue 2012–16 for the seven largest fishing fleet segments

	Average 2012–2016 (million NOK)	Average 2012–2016 (million USD)	Percentage of total annual revenue
Large seagoing purse seiners	3 605	555	25%
Cod trawlers (demersal)	3 520	542	25%
Conventional coastal vessels	3 509	540	25%
Coastal purse seine	1 485	228	10%
Conventional seagoing vessels	1 160	178	8%
Pelagic trawlers	495	76	3%
Coastal shrimp trawlers	420	65	3%
Total	**14 195**	**2 184**	**100%**

The three largest fleet segments measured by operating revenue count for ¾ of total revenue (value of catch). The sea-going large purse seiners and the sea-going demersal cod trawlers contributed together almost exactly 50 percent of total revenue. The two fleet segments together consist of about 120 vessels. The total number of fishing vessels in Norway was about 6 000 in 2016.

This section presents information on the average vessel results by fleet segment. Data used originate from Income Statement and Balance for each fleet segment. The format for presentation is vessel average.

Annex – Table 8 to Annex – Table 14 document detailed Financial Indicators for each of the fishing fleet segments.

Figure 8 below presents revenue for an average vessel in each fleet segment. Annex – Table 15 provides the data used to produce Figure 8.

FIGURE 8
Revenue per vessel for the 7 most important fishing fleet segments
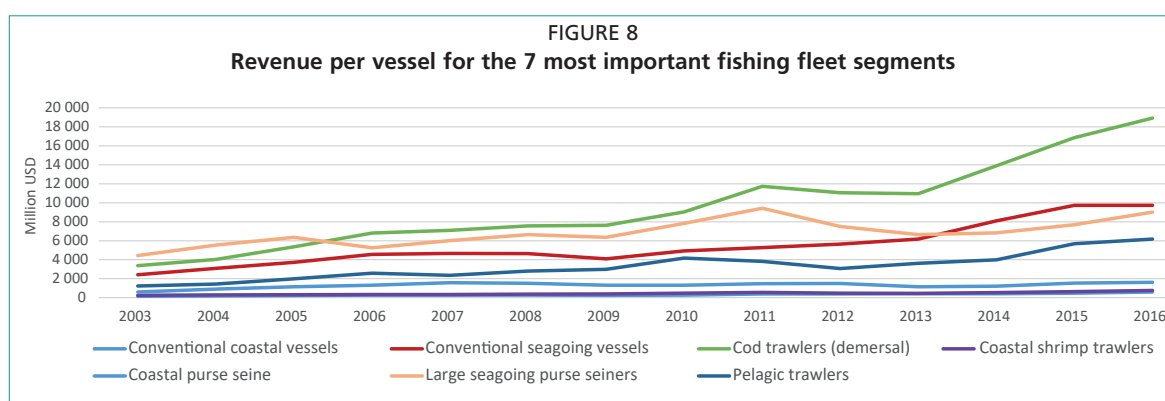
Demersal cod trawlers showed the largest average annual revenue. The steep increase after 2013 is due to increasing market prices for cod. The same explanation is valid for conventional seagoing vessels, mainly long-liners, which saw prices for its catches increase. Figure 9 shows the average revenues per vessel for the three coastal fishing fleet segments separately.

FIGURE 9
Average annual revenue per vessel of the three coastal fishing fleet segments
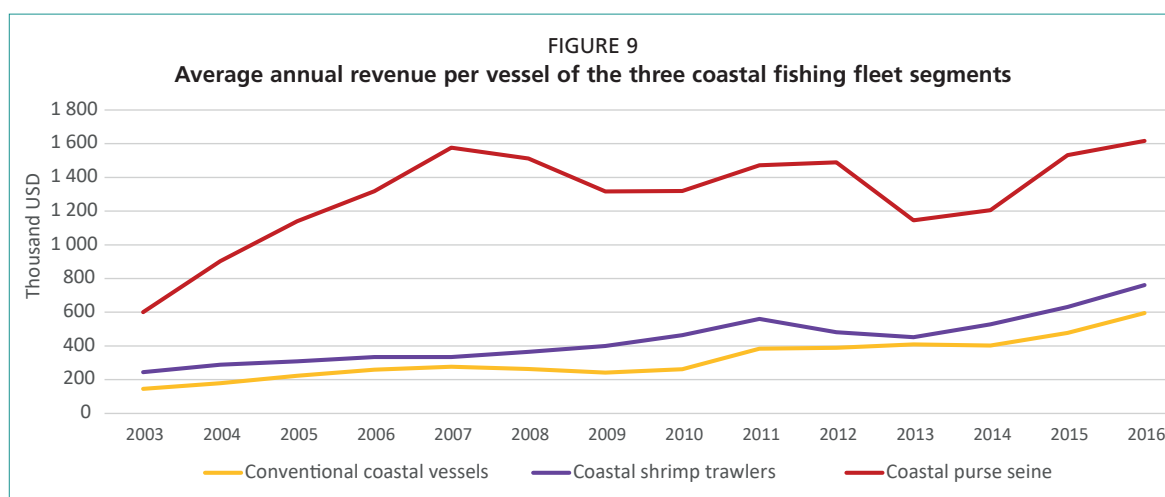
Generally, for all fleet segments, vessel revenues have increased over the period studied. Fish prices have increased, with an exception of a temporary decline during the height of the financial crisis 2008–9. There are presently no large changes in quotas for the main species. Cod quotas encountered some decline after 2013, but the reduction in TAC seems to be compensated by price increases.

Figure 10 shows the relative cost composition as part of total operating revenue. Operating profit is also included as part of the operating revenue. Thus, cost components and operating profit will sum to 100 percent of the gross operating revenue. Annex – Table 16 presents the numbers behind Figure 10.

FIGURE 10
Relative cost composition and operating profit as percentage of operating revenue
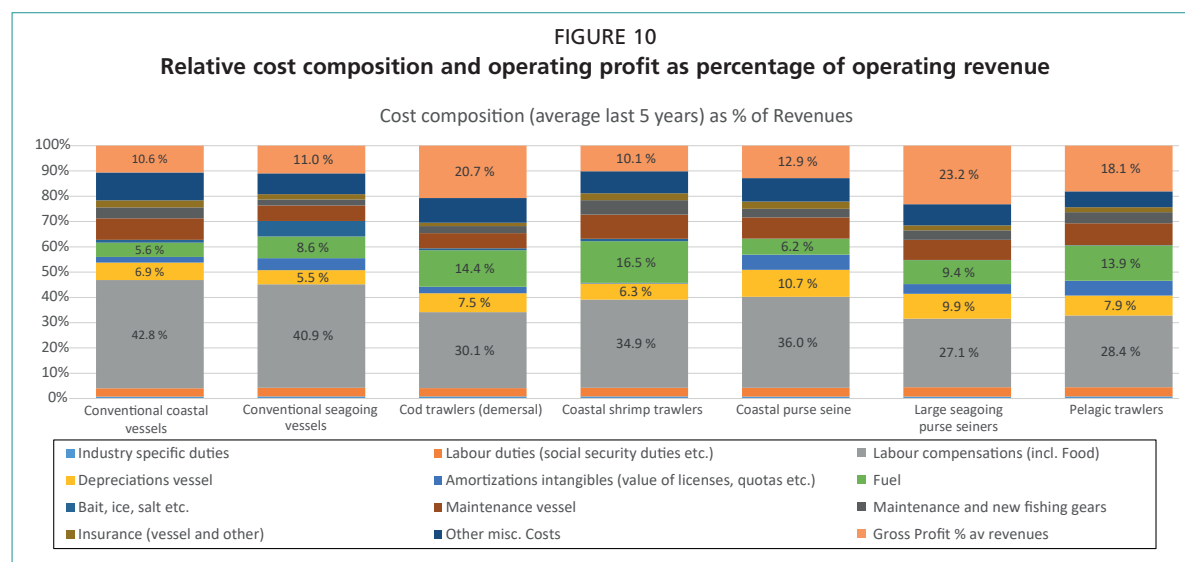
The percentages presented in the figure are averages for the period 2012–16. On average fishing vessels in every fleet segment show a positive operating profit. The largest vessels, demersal cod trawlers and large seagoing purse seiners, both have operating profits in excess of 20 percent. Conventional coastal vessels, being the largest fleet segment in terms of number of vessels have operating profits around 10 percent. The same applies for the much smaller group of Coastal Shrimp Trawlers.

FAO Technical paper 482 (from 2005) presented a more aggregated cost structure. Total cost included all operating cost included depreciations plus interest expenses. Thus, also capital cost related to external financing is included. Labour costs are labour compensations (incl. food) and labour duties (incl. social security duties etc.). Running costs contained the cost items of fuel, bait, salt, etc., and vessel costs included insurance for vessels and gear, maintenance of vessel and gear and new fishing gear. Capital costs included depreciation on vessels and amortization of intangibles (licenses etc.) plus financial expenses (interests). Some cost items, called miscellaneous costs, may not clearly fall into one of the above categories. These miscellaneous costs are mainly administrative expenses, leasing cost, hired non-fishing labour, harbour costs etc. Rather than somewhat arbitrarily distribute these costs among the above cost categories they are mentioned here separately, as is the case in the Norwegian data sources. If needed these miscellaneous costs could be added to vessel costs.

Figure 11 presents the average cost distribution per vessel segment over the period 2012–16 (five year average). The data presented in the figure can be found in Annex – Table 17, which also contains average vessels costs in USD.

FIGURE 11
Major cost components by fleet segment (average figures for the period 2012–16)

	Running costs	Vessel cost	Capital cost	Labour cost	Misc. Cost
Pelagic trawlers	15.0 %	16.0 %	27.2 %	34.1 %	7.7 %
Large seagoing purse seiners	11.0 %	15.7 %	27.2 %	35.5 %	10.5 %
Coastal purse seine	6.2 %	14.4 %	30.4 %	39.0 %	9.9 %
Coastal shrimp trawlers	18.6 %	19.2 %	11.1 %	40.8 %	10.2 %
Cod trawlers (demersal)	17.4 %	11.6 %	20.5 %	38.3 %	12.2 %
Conventional seagoing vessels	14.5 %	10.5 %	22.3 %	43.7 %	8.9 %
Conventional coastal vessels	7.1 %	16.4 %	15.9 %	48.3 %	12.4 %

By far the largest cost item is labour costs. Most fishers are paid "shared catch value". In this respect, two tariff agreements exist in Norway. One, by the Norwegian Fishermen's Association, generally covering vessels below 28 m LOA. Another tariff agreement generally covers vessels above 28 m. "Shared catch value" is calculated according these agreements.[6] From total revenue, some "shared" cost items are deducted when calculating "shared catch value".

Within the running costs the fuel costs are another considerable cost item, particularly for trawlers. Trawlers use proportionally about twice as much fuel as conventional coastal fishing vessels. Purse seiners, both coastal and seagoing, use relatively little fuel.

Three return measures are applied in the analysis of the Norwegian fishing fleets here. These are a) Return on Investment, b) Operating Margin and 3) Return on Equity. The numbers presented are 5-year averages for the period 2012–16. Operating Profit as percentage of Total revenue also is presented indirectly in Figure 10 above. Annex – Table 18 presents the numbers for Figure 12.

The return measures used in Figure 12 are widely used. Return on total assets (ROA) is normally calculated as Gross Profit, including depreciation and amortization, divided by book value of total assets. Sometimes financial income is included in the gross profit when calculating ROA.

Operating margin (OM) is another standard measure of return. Definition of OM is gross (operating) income divided by revenue (R). OM can be derived from the definition of ROA. ROA is OP/A (Gross profit (GP) divided by total assets (A)). By simple arithmetic, the following formula can be derived ROA= GP/A = (GP/R)·(R/A). The first part is gross profit divided by revenues and is called Operating margin (OM). The second part is revenue divided by total assets and is called asset turnover.

Return on Equity (ROE) is commonly calculated before taxes. A problem in the study of fisheries is a lack of market value information of the equity involved. Using statistics based on the book value of equity may sometimes give misleading values for ROE. However, book value of equity is often the only data available from published statistics, including Norwegian statistics. In Norway, not any fishing vessel company trades on a stock exchange. It is therefore reasonable to infer, from trade in the less liquid second hand market for fishing vessels with quotas, that market value of equity is higher than the book value of equity.

---

[6] The most recent tariff agreement published by The Norwegian Fishermen's Association (in Norwegian only): www.fiskarlaget.no/index.php/tariffseksjoner/mannskapsseksjonen/dokumenter-mannskapsseksjonen?task=document.viewdoc&id=115. A similar tariff applies for members of the union representing the largest seagoing fishing vessels, see: https://fiskebat.no/artikler/for-medlemmer .

FIGURE 12
Return on total assets, operating margin, and return on equity by fleet segment
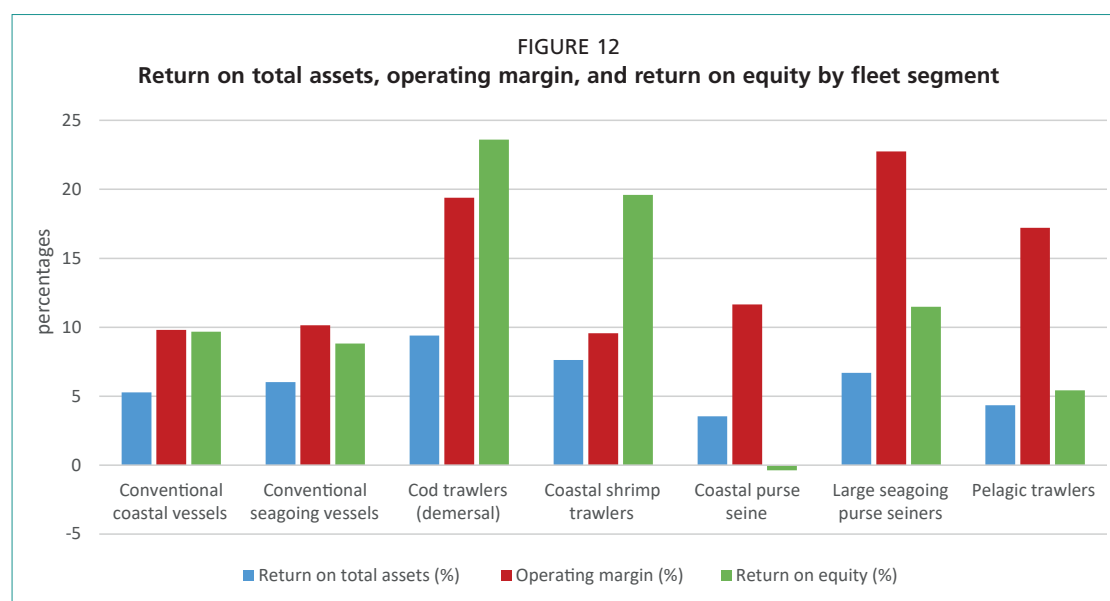
Return on total assets[7] is generally 5–10 percent for the fishing fleet segments. Due to financial gearing[8] the return on book value of equity is larger; sometimes much larger. The operating margins are around 10 percent for four of the seven fleet segments. It is above 20 percent for large seagoing purse seiners, and about 19 percent for demersal cod trawlers.

VALUE ADDITION AND VALUE DISTRIBUTION

Value addition is an important concept in any commercial sector study. The total economic value created by private- and public sectors adds up to the Gross National Product (GNP). The calculations of value addition are generally made before taxes. The incomes before taxes of fishers and owners is therefore used in the calculation of value addition. There is one exemption to this rule: profit tax at the firm level is included as a separate item. Naturally, there will be tax paid by input suppliers to fishing vessels and fishers pay income taxes. In Norway, fishers have different tax regimes compared to normal wage earners. Deductions for expenses related to the fishing operations are more generous, and payment for social securities, which may also be considered a tax, is calculated differently for a fisher than for a wage earner.

The gross value approach taken here implies that depreciations of vessel and gear as well as amortization of intangible assets are included in the Gross Value Added.

---

[7]   Return on total assets will generally be slightly different from the FAO applied concept of Return on Investment (ROI). Capital invested according to FAO is depreciated replacement value of the vessel + estimated value of fishing rights when they are tradeable and have a market value. Depreciated replacement value may be difficult to guess. Here depreciated historical value, which is probably somewhat smaller, is used. On the other hand, current assets are included as part of operating invested capital. Current assets is on average 20% of the book value of long-term assets (vessels, gear and fishing rights). The two "deviations" relative to the elsewhere FAO applied concept will, to some extent, countervail each other. The net difference between the standard ROA and the FAO ROI concept may be small. For that reason, the standard definition of ROA is used here.

[8]   Financial gearing is a concept whereby taking on debt under certain circumstances will increase the return on equity. Using financial gearing will likely increase the risk related to return on equity. The risk comes in the form of greater variability. According to modern finance theory, risk is a cost that shall be incorporated in the cost of capital. It is disputed whether risk-adjusted return improves by using the methods of financial gearing.

The operational definition of Gross Value added at the firm level is:

    Gross profit
    + Amortizations of intangibles
    + Depreciations of vessel and gear
    + Labour compensation (incl. food)
    + Labour duties (i.e. social security duties etc.)

FIGURE 13
Gross value added by the 7 main fishing fleet segments, 2003–2016
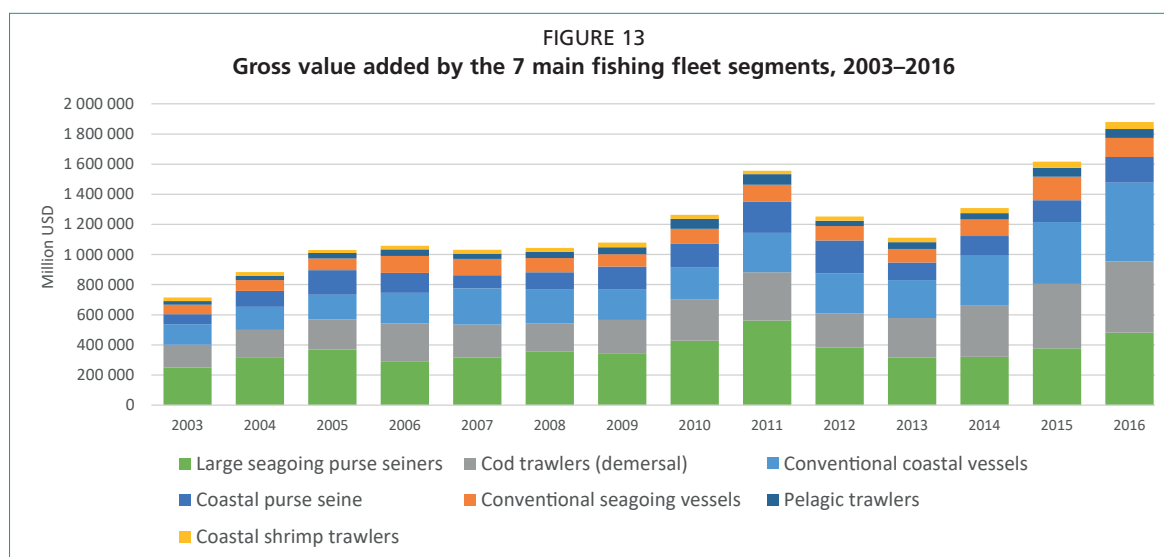
Figure 13 gives a summary of the gross value added by fishing fleet segment over the period 2003–2016. The figure is based on data of Annex – Table 20.

Three fleet segments generate most of the value added in the Norwegian fisheries: large seagoing purse seiners, demersal cod trawlers and conventional coastal vessels.

The total value added figures do not reveal how much added value is created per unit of operating revenue. Figure 14 shows that all trawlers create least, and the purse seiners, both large and coastal, and conventional coastal vessels create most per opeating revenue. It can be argued that more value will be created if smaller vessels with relatively high labour costs relative to other costs are given priority over demersal trawlers.

FIGURE 14
Average value added by vessel group (fleet) as percentage of gross operating revenue over the period 2003-2016
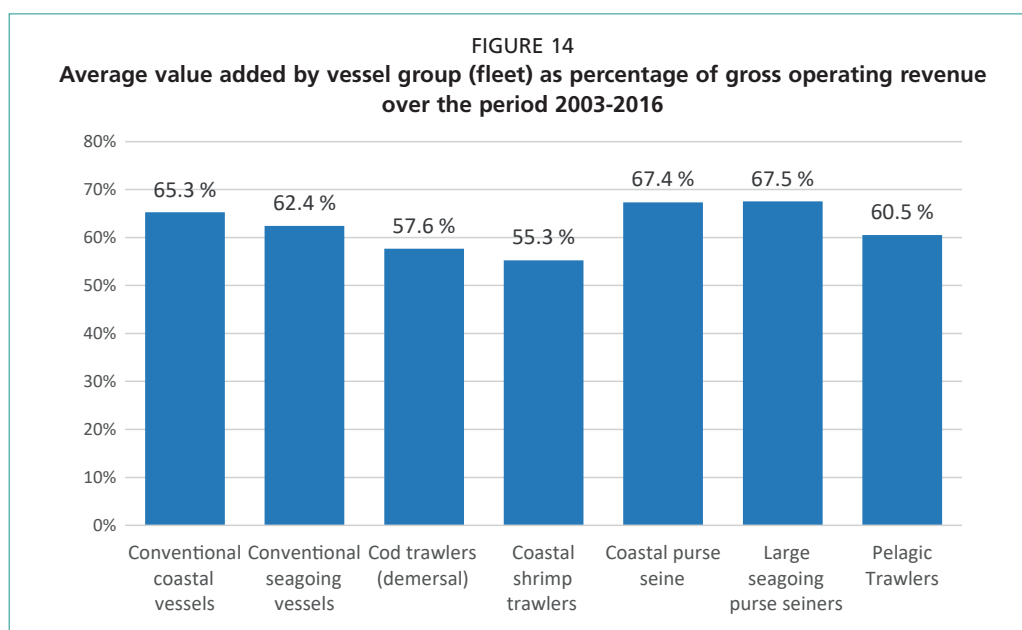
The weighted average value added relative to gross operating revenue for the period 2003–2016 is 64.3 percent. The small group of coastal shrimp trawlers present relatively the smallest value added. More interestingly, the large group of demersal cod trawlers also have a relative low value creation. Coastal Purse Seine, large seagoing purse seiners and conventional coastal vessels (the most numerous group) have a relative large added value. 2016 showed the highest average value added relative to revenues. Annex – Table 21 presents the detailed data per year.

POPULATION OF FISHERS

Published statistics for the fisher population in Norway date back to 1924. The fisher population reached a maximum around 1940 when about 122 000 persons registered as employed in the fisheries sector. The fisher population in 2017 has reduced to 11 000 persons. The statistics separate "Main occupation fishers" from "Secondary occupation fishers". Income from fisheries separates the two groups, when also taking into consideration income from other non-fishing activities. The criteria for deciding to which group a fisher belongs have changed over time, and are presently oriented towards the main income derived from fisheries or from other activities. Formerly the criteria were more oriented towards time used for fishing and other activities.[9]

FIGURE 15
Total number of registered fishers 1924–2017
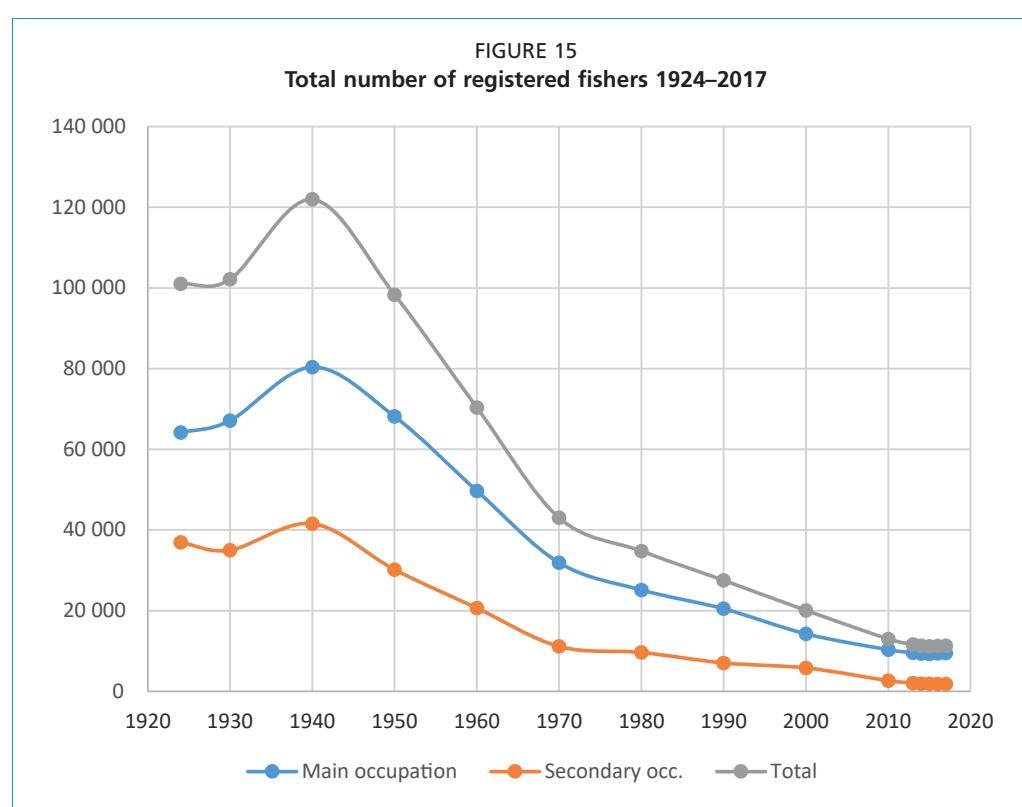
Figure 15 shows the trend in employment in fisheries in Norway over the period 1924–2017. Annex Table 22 provides detailed numbers. The group of fishers whose main occupation is fisheries has always been larger than the group with fisheries as secondary occupation. Before 1940, the population of secondary fishers was about 50–55 percent of primary occupation fishers. The relative proportion of fishers with fishing as secondary occupation has declined from 25 percent of the total in 2000 to less

---

[9] The present rules (in Norwegian) are found here: www.fiskeridir.no/Yrkesfiske/Statistikk-yrkesfiske/ Fiskere-fartoey-og-tillatelser/Om-statistikken-Fiskermanntallet

than 20 percent in 2017. This is an indication that fisheries presently is an occupation that can provide competitive earnings for fishers. For most fishers, income from commercial fishing is adequate as sole source of income. The former combination of seasonal fishing in combination with subsistence farming is less popular nowadays.

Figure 16 presents the age distribution of primary occupation fishers.

FIGURE 16
Relative age distribution of primary occupation fishers 1983–2017
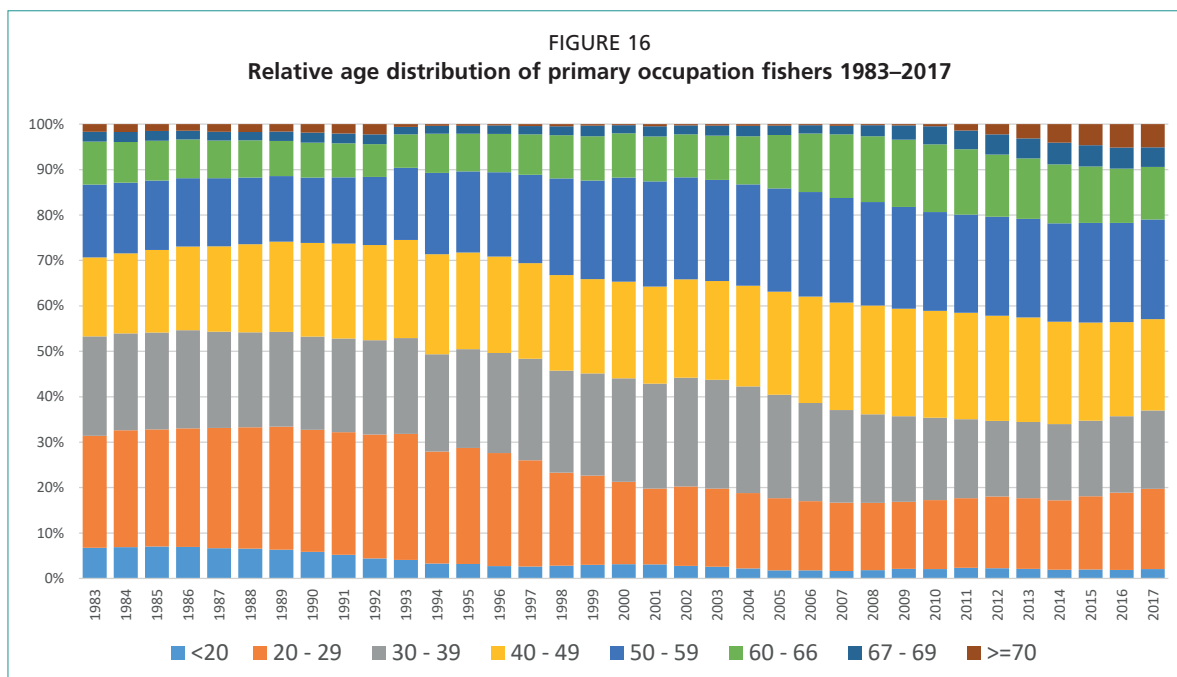
Up to 1995 fishers between 20–29 years constituted the largest group within the fishers population. Since 1994, the age groups 30–39, 40–49 and 50–59 have been almost equally large. The relative proportion of fishers aged over 60 increased somewhat over time, but the absolute numbers are stable.

FIGURE 17
Number of fishers in different age groups 1983–2017

Fishermen by age: primary occupation

FIGURE 18
Estimated average age for primary and secondary occupations fishers 1983–2017

Sources: Author's estimate.
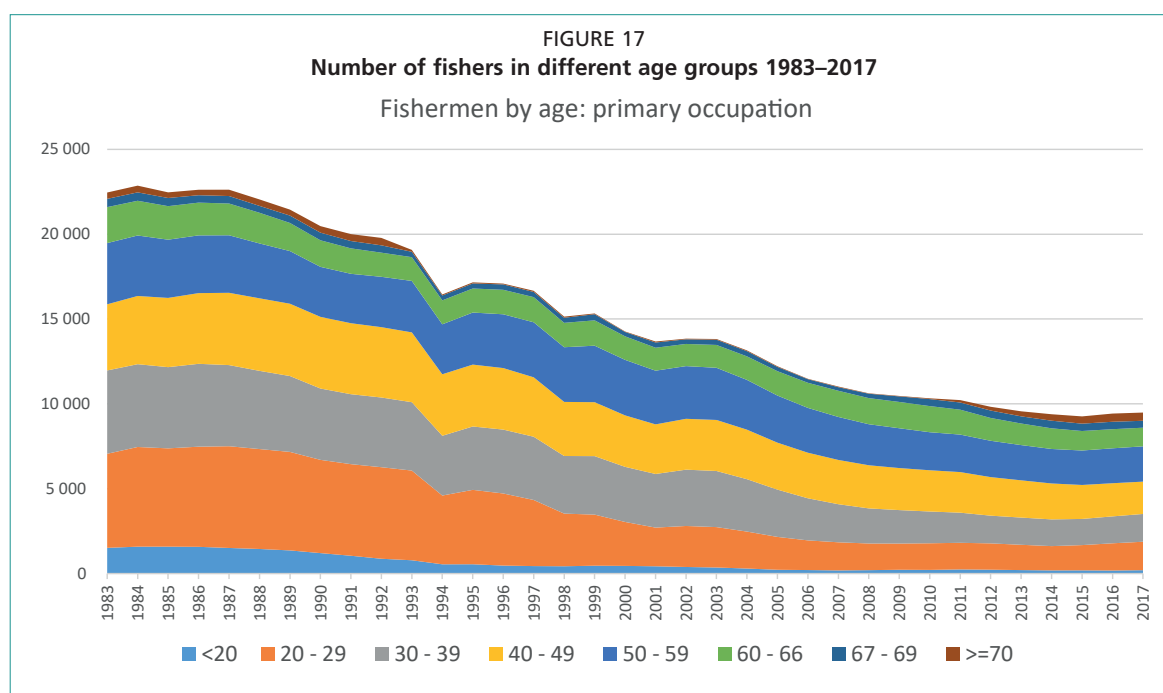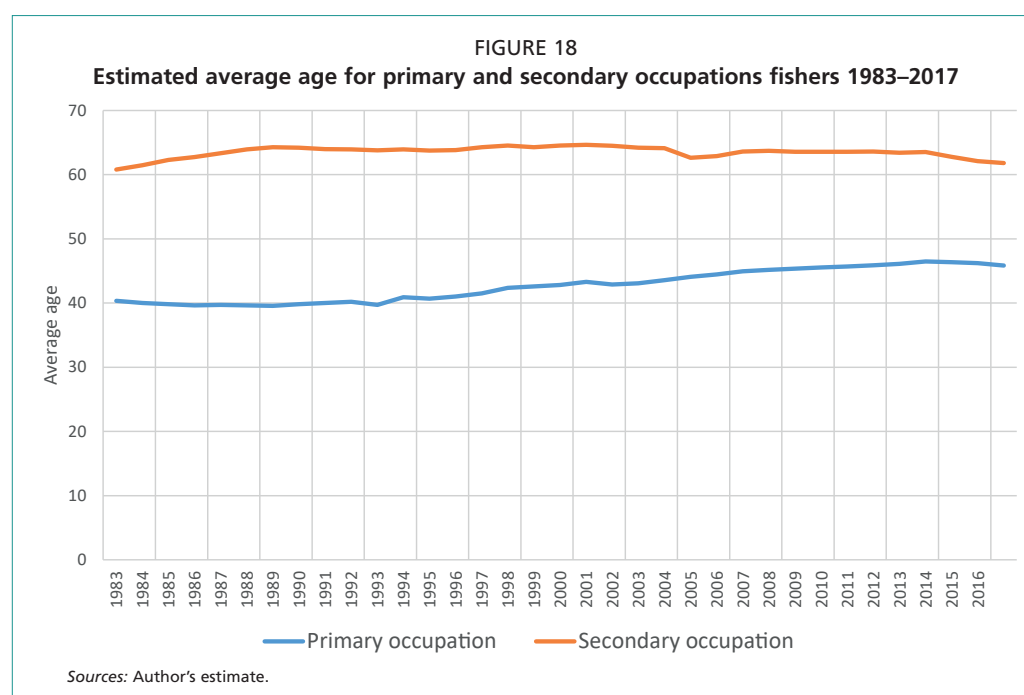
Figure 18 shows that the average age of primary occupation fishers was around 40 years in the period 1980 to 1995, but has since increased to around 46 years. The average age of secondary occupation fishers has been remarkably higher for the last 35 years and fluctuates between 60 and 65 years. In fact, for secondary occupation fishers the single largest age group consists of fishers of 70 year and above. The second largest group are fishers between 60–69 years.[10] Annex Table 23 provides detailed information on the fishers age groups.

FISHING VESSELS; NUMBERS, AGE AND LENGTH

The number of fishing vessels in Norway declined since the 1960s. The decline seems to have abated during the last ten years. Figure 19 below shows the trend in the total number of fishing vessels between 1925 and 2017.

FIGURE 19
Number of fishing vessels 1925–2017

---
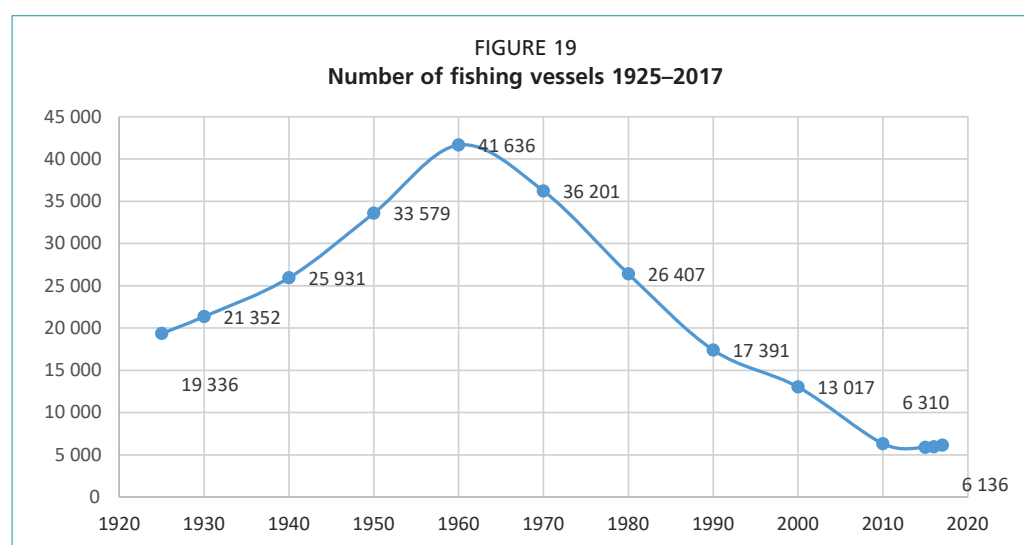
[10] For ages 60 -69 the statistics split into two groups; 60 -66, and 67 – 69. For comparison, we have added the groups.

The number of fishing vessels reached a top of nearly 42 000 vessels in 1960. Thereafter the number has fallen sharply and was in 2017 just over 6 000. The reduction in fishers and vessels shows a parallel trend from the early 1970s.

FIGURE 20
Trends in the number of fishing vessels and fishers in Norway: 1925 to 2017
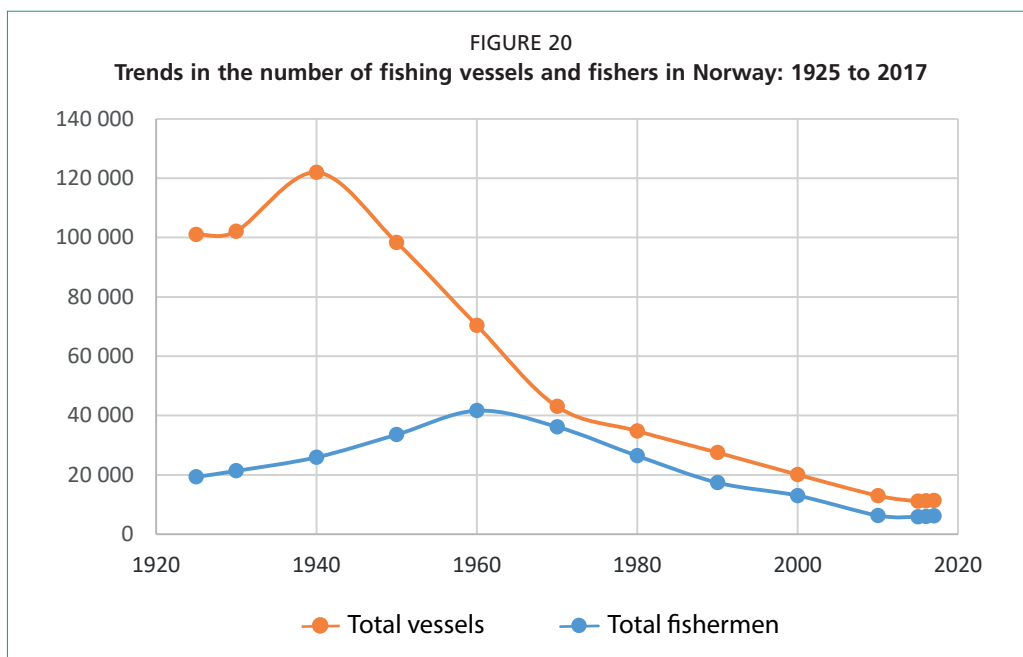
Figure 20, which combines vessels and fishers, shows the effect of mechanization in certain parts of fishing operations. Before 1970, and particularly before 1960, purse seining and gillnet fishing were labour intensive. On each vessel, a large crew was needed to haul the seines and gillnets. Then, after the introduction of modern hydraulic winches and modern power-blocs, the fishing operations became more mechanized and less labour intensive. After 1970, technology improvements have been incremental. The data used for Figures 19 and 20 is provided in Annex Table 24. The reduction in the number of vessels has not been equal for all vessel length groups.

FIGURE 21
Trends in the number of fishing vessels of various length groups, 2002–2017
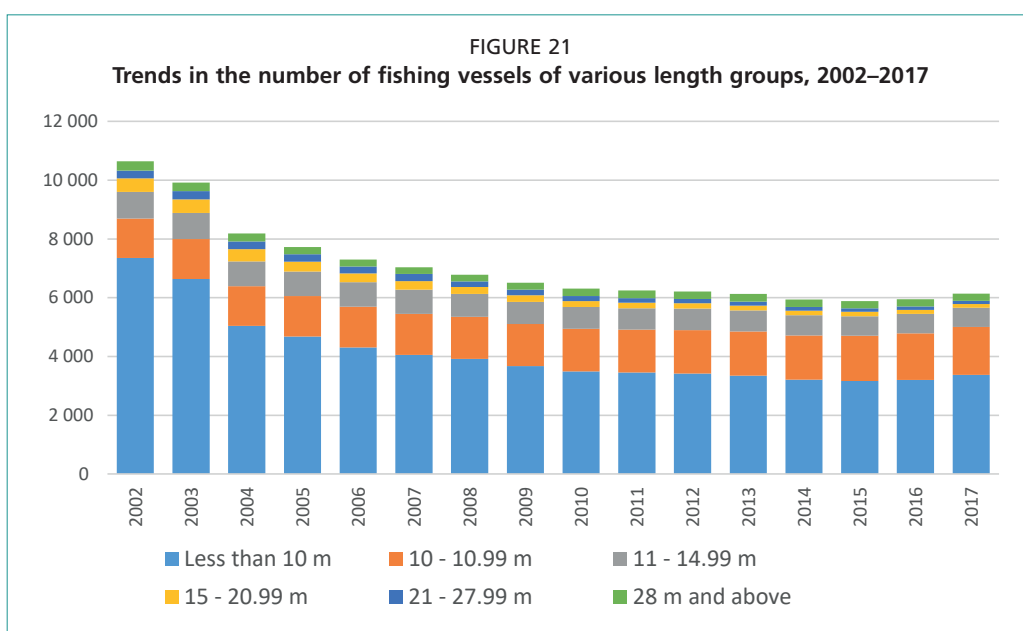
Figure 21 shows that from 2013 onwards, the total number of vessels have been relatively stable. Small vessels below 10 m LOA have seen the largest decline in absolute numbers. The group of "intermediate" length vessels between 10 and 15 m LOA has been very stable throughout the period 2002–2017. The relative share of vessels ranging 10–11 m LOA has grown. This increase balances a small reduction for vessels 11–15 m LOA. In the group of vessels with a length of 28 m and above there has been a remarkable stability since 2005, where vessel numbers stabilized around 250 vessels. The number of vessels in the length group of 21–27.99 m LOA has been reduced by half during the same period. Vessels with a length of 15–20.99 m LOA have been reduced by 2/3 during the same period. The absolute reduction in the number of vessels is smaller for the intermediate and large vessels than for the smallest vessels below 10 m LOA.

Detailed statistics on the number of fishing vessels relative to length in 2018 is presented in Figures 22 and 23 below. Due to scaling, the numbers are presented in two separate Figures, for less than 28 m and above 28 m LOA.

FIGURE 22
Number of vessels less than 28 m

FIGURE 23
Number of vessels above 28 m
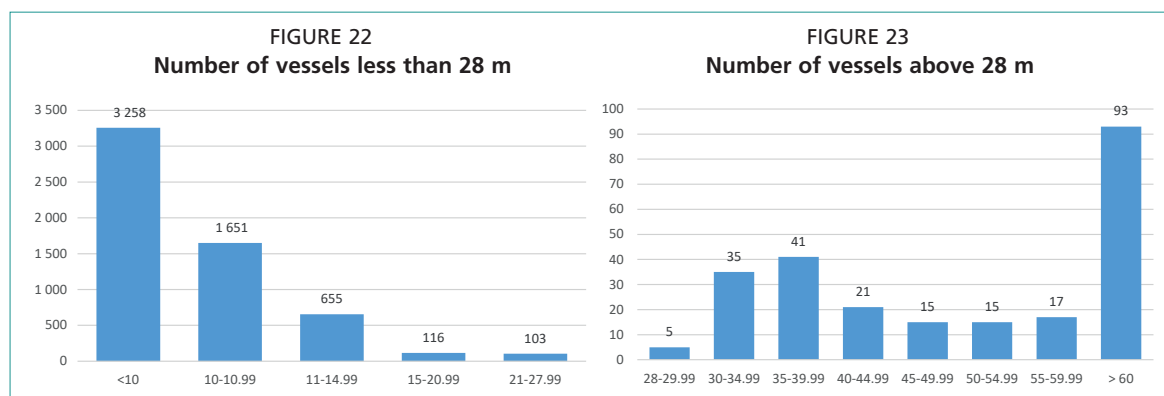
Figure 22 demonstrates that more than half of the Norwegian fishing fleet of 6 136 vessels in 2018 consisted of vessels of less than 10 m length. However, only a fraction of total catch was attributed to this fleet. Figure 23 shows that the largest group of vessels over 28 m LOA is actually larger than 60 m LOA.

FIGURE 24
Average building year by length of vessel (2018)
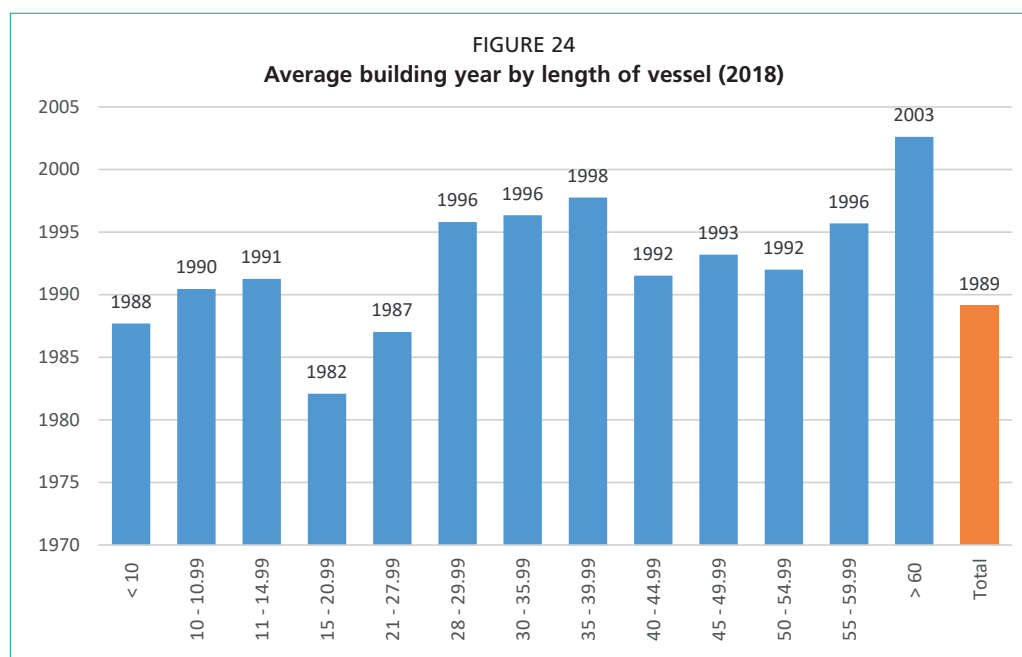
The average building year for all vessels divided by the same length groups is presented in Figure 24. The overall average vessel building year in 2018 was 1989 for the entire Norwegian fishing fleeet, indicating an average age of 29 years. The relatively newest fishing vessels can be found in the fleet segment of vessels larger than 60 m. For these vessels the average age is around 15 years. In general, the smaller vessels are older than the larger vessels. The large number of small vessels influences strongly the average age of the fishing fleet. Please see Annex Table 26 for more details.

The average vessel age was only 18 years in the 1980s and increased by almost half a year every calendar year between 1980 and 2000. After 2000, the age is still increasing, but clearly at a slower pace. Statistics for 2017 even show a slight decline in average age. Vessels above 28 m LOA consist of the most modern fleet. The group of vessels of 15–20.99 m LOA is the group with clearly the highest average age.

The average engine power in horsepower by vessel length group is presented in Figure 25.

FIGURE 25
Average engine power (in HP) by fishing vessel length group
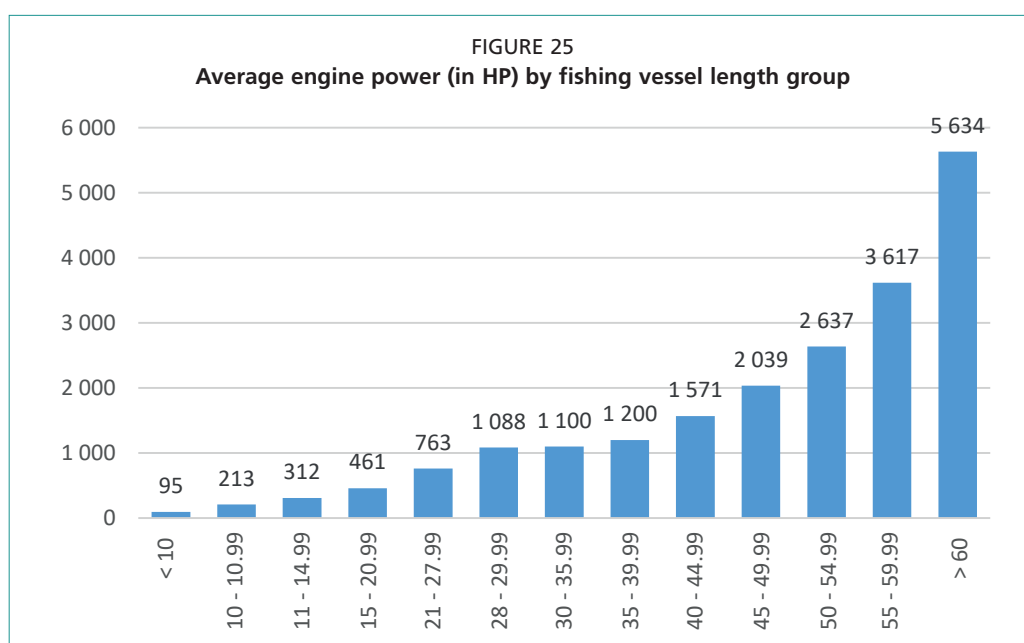
The fishing vessel engine power increases with length of the vessel. The engine power is also related to gear type (demersal trawling demands high pulling power) and demand for transportation (some purse-seiners are constructed for relative high-speed transportation from fishing areas to port). The smallest vessels of less than 10 m have relatively modest engines.

REFERENCES

Johnsen, J. P; Jentoft, S. 2018. *Transferable quotas in Norwegian fisheries.* In Fisheries, quota management and quota transfer: Rationalization through bio-economics, ed. Gordon M. Winder, 121–139. Cham: Springer International Publishing.

Report of Spain

National report of Spain

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

Carmen Martín Franco
Ministry of Agriculture, Food and Environment
Madrid, Spain

1. OBJECTIVES AND CONTEXT

This fishing fleet assessment is part of a global assessment by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The Spanish fleet produced approximately one percent of the global capture fisheries production in 2017 and is therefore included in the global fishing fleet performance assessment of FAO. It is also the most important EU Member State fishing fleets in terms of production, ranking first within the EU in both landed volume and value of fish landed.

The Spanish fleet is also one of the largest EU fleets in terms of number of vessels, gross tonnage and engine power, and the most diverse fleet in terms of fishing activity, species landed, fishing gears and fishing areas.

Spain participated in the FAO global studies on techno-economic performance of the main fishing fleets in 1999/2000. The fleets covered in the previous analysis included: semi-industrial/industrial deep-sea trawlers (20–35 m, 25–35 m and 30–45 m), industrial (oceanic) tuna purse seiners (56 m, 64 m and 70 m) and semi-industrial pole and line (18 m and 24 m).

The information presented in this analysis was collected in 2018 by Spanish national authorities under the EU Data Collection Framework Regulation.[1] These data were compiled and analysed during two Expert Working Groups convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the 2019 Annual Economic Report (AER) on the EU fishing fleet.

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN SPAIN

The marine capture fisheries production[2] in Spain decreased by 5 percent in the last 10 years, from 962 036 tonnes in 2006 to 915 137 tonnes in 2016 (however, when comparing to 2008 when the production was some 923 447 tonnes the reduction was just one percent).

The volume (in live-weight equivalent) of seafood landed by the Spanish national fleet[3] amounted to 897 693 tonnes of seafood in 2016, 16 percent more than the 775 941 tonnes landed in 2008, while the landed value increased with 12 percent to USD 2.3 billion in this period.

At the same time, the number of active commercial fishing vessels decreased from 9 803 in 2008 to 8 354 in 2016, a change of 15 percent. These vessels had a combined gross tonnage of 325 478 tonnes and 753 669 kW in engine power. Additionally, there were 1 105 inactive vessels in 2016, with a combined latent gross tonnage of

---

[1] Council Regulation (EC) No 2017/1004 of 17 May 2017
[2] As reported by FAO (i.e., covers landings by all vessels in Spanish ports, irrespective of nationality)
[3] As reported under the DCF (i.e., covers landings by Spanish registered vessels)

18 451 tonnes and engine power of 49 092 kW. Inactive vessels represented 11.6 percent of the Spanish fleet in 2016, down from 25 percent in 2008. Almost 90 percent of the inactive vessels are small coastal vessels of less than 12m in length.

The Spanish fleet can be largely characterised as an artisanal fleet with 73 percent of the vessels being less than 12 m LOA, 20 percent of the vessels between 12 m and 24 m and less than 8 percent are over 24 m. Most of the fleet is concentrated in the Galicia region, with almost 50 percent of all registered vessels, followed by Andalucía (16 percent), Catalonia (8 percent), and the Canary Islands (8 percent).

Around 48 percent of the active vessel population can be labelled multipurpose artisanal vessels; 22 percent are dredges; 11 percent are bottom trawlers/seiners, 7 percent hooks, including surface longliners, 7 percent purse seiners and 5 percent are netters, mainly gillnetters.

Around 66 percent of this active fleet is regarded as professional, i.e., operating more than 90 days a year. Fishing provided employment to roughly 31 600 people in 2016, corresponding to 29 400 FTE.

The most important species for the Spanish fleet are highly migratory fish species, such as yellowfin tuna, swordfish, skipjack tuna, bigeye tuna (caught mainly by the 26 tuna purse seiners) and small pelagic species, such as European anchovy and European pilchard, which are mainly fished by purse seiners in the North Atlantic and Mediterranean Spanish waters.

Vessels operating in Other Fishing Regions (OFR), which covered 9 percent of the total number of vessels in the Spanish fleet in 2016, contributed to half of the total landed volume and value. Vessels operating predominately in the North Atlantic fishing areas (67 percent of the fleet in number) landed 38 percent of the volume and 36 percent of the value while the Mediterranean fleet (24 percent of the fleet in number) landed the remaining 9 percent of the volume and 15 percent of the total value.

The top producers in the Mediterranean fleet are the bottom trawlers, with 27 percent of the volume and 46 percent of the landed value, followed by the purse seiners with 54 percent of the volume and 25 percent of the value. In the North Atlantic fleet, bottom trawlers also dominate the landings (33 percent of the volume and 36 percent of the value), followed by purse seiners (also contributing 33 percent of the volume and 15 percent of the value). The Canary fleet is mainly composed of coastal artisanal vessels targeting small-pelagics, demersal species and tuna; freezer trawlers targeting cephalopods off the coast of Africa, and high seas tuna vessels.

Spanish activity outside EU waters in Other Fishing Regions is dominated by purse seiners (49 percent of the volume and 56 percent of the value landed), followed by demersal trawlers/seiners (32 percent of the volume and 22 percent of the value) and then the hook and lines vessels (18 percent of the volume and 21 percent of the value).

The main fishing harbours and landings sites are Vigo, A Coruña, Burela and Cillero in Galicia, Pasajes in the Basque Country, Cadiz in Andalucía and, Tenerife and Las Palmas (La Luz Port) in the Canary Islands.

There are an estimated 201 fish auction sites operating in Spain: 102 are located along the Bay of Biscay and Iberian coast; 69 in the Mediterranean and 30 in the Canary Islands. The top three auction sites represent around 20 percent of the volume and 23 percent of value of all the landings in Spain.

At the Port of Vigo, the biggest fishing port in Spain and the world, the main commercial species landed include monkfish, megrim and hake. In Pasajes, the second largest auction site in Spain, the main species include hake, monkfish and mackerel and in Burela, the third largest auction site, the main species landed are hake, albacore and mackerel. In the Canaries, most of the fresh seafood production is landed in Tenerife, in particular pelagics and crustaceans. Gran Canary is very significant for landings of demersal fish and molluscs. In Lanzarote pelagic landings dominate, whereas La Palma and El Hierro are important ports for crustaceans.

TABLE 1
Overview of the Spanish fishing fleet in 2016: number of vessels by main fishing gear and scale

Main fishing gear	Small-scale, coastal (<12 m)	Semi-industrial (12–18 m)	Industrial/ semi-industrial (18–24 m)	Industrial (24–40 m)	Industrial (> 40 m)	Spanish fleet	Pecentage over active total
Drift and/or fixed netters	190	199	23			412	4.9
Dredgers	1 763	98				1 861	22.3
Demersal trawlers/seiners	19	213	375	277	47	931	11.1
Pots and/or traps	87	80				167	1.9
Hooks, including longliners	165	182	77	172	23	619	7.4
Polyvalent passive gears				56		56	0.7
Polyvalent active gears	3 681	79				3 760	45.0
Purse seiners	40	215	185	82	26	548	6.6
Total number of active vessels	5 945	1 066	660	587	96	8 354	100
Percentage over total active	**71.2%**	**12.7%**	**7.9%**	**7.0%**	**1.1%**	**100%**	
Inactive vessels	974	74	11	40	6	1 105	12
Total number of vessels	**6 919**	**1 140**	**671**	**627**	**102**	**9 459**	**100**
Percentage over total	**73.1**	**12.1**	**7.1**	**6.6**	**1.1**	**100**	

The Spanish national fleet as a whole was in a profit-making position in 2016 and improved on previous year's results. This improvement was largely due to higher average first-sale prices across several species groups and the continued low fuel prices and interest rates. Overall, the cost structure has remained relatively constant over the years even with variations in landings and fuel price influencing crew and energy costs respectively. Overall, fleet performance deteriorated slightly in 2017 due to a fall in revenue and higher operating costs.

For the present study similar vessel types were selected for comparison with the previous studies, which were also amongst the top five fleet segments in terms of volume and value landed in 2016. These are listed below and highlighted in grey in Table 2, which also contains some basic information on similar Spanish fleets based in other fishing regions.

1. **Industrial (freezer) tuna purse seiners >40 m,** with only 26 vessels (0.3 percent of the fleet in number), produced almost 26 percent of the landed volume and 28 percent of the landed value.
2. **Industrial deep-sea trawl/seiner fleet >40 m,** with 30 vessels in 2016 and 33 in 2017, contributed to 13.5 percent of the landed volume and 7 percent of the landed value.
3. **Industrial deep-sea trawl/seiners 24–40 m,** operating mainly in the North Atlantic, these 107 vessels (1.3 percent of the fleet) contributed to 7 percent of the landed volume and 6.5 percent of the landed value.
4. **Semi-industrial tuna purse seine fleet 18–24 m,** operating mainly in the North Atlantic, these 99 vessels (1.2 percent of the fleet in number), produced 5 percent of the volume and 2 percent of the value landed.
5. **Industrial surface longliner fleet 24–40 m,** with less than 1 percent of the vessels, contributed 5 percent to the volume and value landed.

TABLE 2
Overview of main fishing fleets covered, 2016

	Fishing segment	Fishing region	Number of vessels	Volume of landings (tonnes)	Percentage over total volume (%)	Scale[4]
Purse seiners	Purse seiners >40 m	Distant-water	26	230 355	25.7	Industrial
	Purse seiners 24–40 m	North Atlantic	57	34 961	3.9	Industrial
	Purse seiners 18–24 m	North Atlantic	99	46 071	5.1	Industrial/ semi-industrial
	Purse seiners 18–24 m	Mediterranean	86	23 353	2.6	Industrial/ semi-industrial
Demersal trawlers	Deep-sea trawlers >40 m	Distant-water	30	121 341	13.5	Industrial
	Deep-sea trawlers >40 m	North Atlantic	17	36 351	4.0	Industrial
	Deep-sea trawlers 24–40 m	North Atlantic	107	64 928	7.2	Industrial
	Deep-sea trawlers 24–40 m	Distant-water	40	29 344	3.3	Industrial
Hook and lines	Surface longliners >40 m	Distant-water	23	18 939	2.1	Industrial
	Surface longliners 24–40 m	Distant-water	64	44 414	4.9	Industrial
	Pole and line 24–40 m	North Atlantic	50	20 400	2.3	Industrial
	Pole and line 24–40 m	Distant-water	33	19 980	2.2	Industrial

TABLE 3
Fishing regions of the selected fishing fleets, 2016

Fishing segment	Main fishing areas
Purse seiners >40 m – distant water fleet	West Indian Ocean area 51 (52%), Central Atlantic area 34 (24%), Pacific eastern central area 77 (9%)
Purse seiners 18-24 m – North Atlantic fleet	Bay of Biscay (52%), Portuguese waters 27.9 (47%)
Deep-sea trawlers >40 m – distant water fleet	Southwest Atlantic area 41.3 (83%), Southeast Atlantic 47.1 (8.5%), Atlantic Eastern-Central 34.3.1.3 (7%)
Deep-sea trawlers 24–40 m North Atlantic fleet	Spanish territorial waters in the Bay of Biscay (63%, of which 53% in 27.8.c, 7% in 27.8.b, and 3% in 27.8.a); Portuguese territorial waters in 27.9.a (21%). Some activity in South West of Ireland in 27.7.j (9%).
Surface longliners 24–40 m – distant water fleet	Central Atlantic area 34 (34%), Southwest Atlantic area 41 (13%), Southeast Atlantic area 47 (18%), Pacific Ocean, area 87.1 and 87.2 (16%), West Indian Ocean area 51 (11%), Northeast Atlantic (3%), Northwest Atlantic (3%)

The main species landed by each fleet in volume are listed in Table 4.

TABLE 4
Main species landed by the selected fleets (importance within total landed volume in 2016)

Fleets/species landed	1	2	3	4	5
Purse seiners >40 m – distant water fleet	Skipjack tuna (50%)	Yellowfin tuna (38%)	Bigeye tuna (10%)	Frigate tuna (1%)	Little tunny (<1%)
Purse seiners 18–24 m – North Atlantic fleet	Chub mackerel (35%)	Jack and horse mackerel (17%)	European anchovy (14%)	Bogue (14%)	European pilchard (11%)
Deep-sea trawlers >40 m – distant water fleet	Argentine hake (43%)	Longtail southern cod (8.5%)	Patagonian grenadier (7%)	Patagonian squid (5%)	Atlantic horse mackerel (4%)
Deep-sea trawlers 24–40 m North Atlantic fleet	Blue whiting (32%)	Jack and horse mackerel (12.5%)	Atlantic mackerel (12%)	European hake (12%)	Anglefishes (7%)
Surface longliners 24–40 m – distant water fleet	Blue shark (61%)	Swordfish (26%)	Shortfin mako (6%)	Bigeye tuna (2%)	Atlantic pomfret (1%)

The main species landed by each fleet in value are listed in Table 5. In terms of commercial value generation, mackerel, herring, *Nephrops,* European lobster and Atlantic cod were key species to these selected fishing fleets.

---

[4] The scale categories used in this report are: Industrial, semi-industrial, or artisanal/small-scale.

TABLE 5
Main species landed by the selected fleet (importance within total landed value in 2016)

Fleets/Species landed	1	2	3	4	5
Purse seiners >40 m – distant water fleet	Yellowfin tuna (63%)	Skipjack tuna (19%)	Bigeye tuna (17.5%)	Frigate tuna (0.4%)	Little tunny (0.3%)
Purse seiners 18-24 m – North Atlantic fleet	European anchovy (26%)	Chub mackerel (22%)	European pilchard (15%)	Jack and horse mackerel (13%)	Bogue (5.6%)
Deep-sea trawlers >40 m – distant water fleet	Argentine hake (31%)	Patagonian squid (17.5%)	European squid (6%)	Cape hakes (6%)	Patagonian grenadier (6%)
Deep-sea trawlers 24-40 m North Atlantic fleet	European hake (22%)	Anglerfishes (19%)	Megrims (14%)	Blue whiting (14%)	Atlantic mackerel (5%)
Surface longliners 24-40 m – distant water fleet	Swordfish (61%)	Blue shark (24%)	Shortfin mako (7%)	Bigeye tuna (3%)	Atlantic pomfret (1%)

Fisheries in the EU are managed within the framework of the Common Fisheries Policy (CFP), which aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with MSY) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures are adopted as appropriate, such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas).

In line with the CFP, the Spanish fleet is managed through several management tools, such as fishing licensing, engine power limitations, time at sea restrictions, TACs and quotas related to the area and fishing stock.

Almost all major stocks and fisheries targeted by the Spanish fleet are managed by means of a Multiannual (management or recovery) Plan, which typically combines a suite of different management tools and specific control rules. Some management or recovery plans also have an effort/capacity reduction objective that is funded by the European Maritime and Fisheries Fund (EMFF).

The recovery plan for Mediterranean swordfish, which began in 2017 introduced a Total Allowable Catch (with gradual reduction over the years) and increased the minimum size to protect juveniles. This plan mainly affects the longliner fleet, but also some trawlers and netters that catch swordfish in Mediterranean waters. Financial aid was given to permanently remove vessels from fisheries that were found to be out of balance with their fishing opportunities.

Spain has fishing quotas in national and international waters and in fishing areas within the EEZ of third countries regulated under the framework of EU sustainable fisheries partnership agreements (SFPAs) and through the EU´s membership in RFMOs, such as NAFO, NEAFC, ICCAT, CGFM, IOTTC and WCPFC. Spain also has several private agreements/direct authorisations between fishing operators and third countries.

Spain's fisheries law (Law 3/2001) allows quotas but not licences to be transferred independently from the vessels. In practice, formal markets and frequent trading in quotas occur only for a few fisheries, including bluefin tuna, swordfish, and for NEAFC managed stocks such as hake, *Nephrops*, ling, whiting, anglerfish and pollack.

Currently, the highest profile regulation is the Landing Obligation (LO), which has being phased in over a number of years, and was fully implemented from January 2019 onwards. It applies to all species subject to catch limits (TAC/quota species) or to a minimum reference size (in the Mediterranean).

The number of fleets under the Landing Obligation (LO) Regulation increased in 2017. Spain is taking measures to full comply with the regulation. The big challenge for 2018 was to meet the problem of choke species. Practical solutions will have to be found so that vessels are not forced to stop fishing activities due to the lack of quota for some species.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Purse seiners >40 m – distant water fleet

The long-distant industrial (freezer) tuna purse seiners >40 m fleet can be characterised by an average age of 20 years, average length of 87 meters LOA, average gross tonnage of 2 714 tonnes and engine power of 3 853 kW. The average crew size is 40, corresponding to 56 FTE (see Table 6) and the main fishing gears used are purse seiners (99 percent) and encircling gillnets (<1 percent) (see Table 7).

The average number of days-at-sea per vessel in 2016 was 320 days, of which 268 are fishing days. The average number of fishing trips was 12, each averaging around 26 days.

This fleet consisted of 26 vessels (0.3 percent of the total fleet) and contributed 26 percent (230 355 tonnes) of the total volume of seafood landed by the Spanish fishing fleet in 2016, equating to 28 percent of the total value of landings (USD 642.6 million). On average, each vessel landed 8 860 tonnes valued at USD 24.7 million.

Yellowfin, skipjack and bigeye tuna are the main targeted species, collectively accounting for 99 percent of the fleet's total landings in 2016.

Purse seiners 18–24 m – North Atlantic fleet

The semi-industrial purse seiner fleet can be characterised by an average length of 21 meters LOA, average gross tonnage of 57 tonnes and engine power of 210 kW. The average age of the vessels is 17 years. The average crew size is 11 (see Table 6) and the main fishing gear used are purse seiners (94 percent) (see Table 7).

The average number of days at sea per vessel in 2016 was 189 days, of which 130 were fishing days. The number of fishing trips averaged 130, with each lasting around 1.5 days.

The fleet was made up of 99 vessels (1.2 percent of the total number of vessels) and responsible for 5 percent (46 070 tonnes) of the total volume of seafood landed by Spanish fishing fleet in 2016. This volume of fish equated to 2 percent of the total value of landings (USD 47.9 million). On average, each vessel landed 465 tonnes valued at nearly USD 49 000.

European anchovy, chub mackerel and European pilchard (sardine) are the main target species, accounting for around 60 percent of this fleet's total landings in 2016. Other important species include jack and horse mackerel (13 percent) and bogue (6 percent).

European anchovy ex-vessel prices were at a record high in 2012 but have since fallen and stabilised at around USD 1.9 to USD 2.0 per kg. In 2016, the average first-sale price for European pilchard was USD 1.5 per kg, 10 percent higher than in 2015, which contributed to the fleet's improved profitability. Conversely, the average price of chub mackerel decreased, from USD 0.8 per kg in 2012 to USD 0.71 per kg in 2015 and to USD 0.66 per kg in 2016.

Deep-sea trawlers >40 m – distant water fleet

The industrial demersal trawler fleet can be characterised by an average length of 57 meters LOA, a gross tonnage of 1 067 tonnes and average engine power of 1 216 kW. The average crew size is 28 (see Table 6) and the main fishing gears carried include: bottom otter trawls (96 percent) mid-water otter trawls (4 percent) (see Table 7).

The average number of days at sea per vessel in 2016 was 382 days, of which 360 were fishing days. The number of fishing trips averaged 16, each lasting around 24 days.

Overall, this fleet represents around 0.4 percent (30 vessels) of the total Spanish fishing fleet. In 2016, this segment landed 13.5 percent (121 341 tonnes) of the total volume and 7 percent (USD 161.6 million) of the total value of landings of the Spanish fishing fleet.

The main target species were Argentine hake and Patagonian squid, accounting for 48 percent of the landings volume and 49 percent of the landings value in 2016.

Deep-sea trawlers 24–40 m – North Atlantic fleet

The industrial/semi-industrial demersal trawler fleet can be characterised by an average length of 30 meters LOA and an average gross tonnage of 256 tonnes and engine power of 385 kW. The average crew size is eight (see Table 6) and the main fishing gear used is bottom otter trawls (98 percent) (see Table 7).

The average number of days at sea per vessel in 2016 was 258 days, of which 235 were fishing days. The number of fishing trips averaged 133, with each trip lasting around 2 days.

Overall, this fleet represents around 1.3 percent (107 vessels) of the total Spanish fishing fleet. In 2016, this segment landed 7 percent (64 928 tonnes) of the total volume and 6.5 percent (USD 150 million) of the total value of landings.

The fleet targets a variety of species, but in particular demersal species such as European hake, anglerfish and megrims, together accounting for 55 percent of the value landed. Other important species include blue whiting (14 percent) and Atlantic mackerel (5 percent).

Surface longliners 24–40 m – distant water fleet

The industrial/semi-industrial surface longliner fleet 24–40 m operating in long-distance fisheries can be characterised by an average length of 31 meters LOA, a gross tonnage of 278 tonnes and an average engine power of 382 kW. The average crew size is 14 (see Table 6) and the main fishing gear used is drifting longlines (98 percent) (see Table 7).

The average number of days at sea per vessel in 2016 was 302 days, of which 245 were fishing days. The number of fishing trips averaged six, each lasting around 50 days.

This fleet, with 64 vessels represents around 0.8 percent of the total Spanish fishing fleet. In 2016, this segment landed 5 percent (44 414 tonnes) of the total volume and 5 percent (USD 118.3 million) of the total value of landings.

The fleet targets a variety of species, but mainly large pelagic species such as swordfish and blue shark, together accounting for 85 percent of the value landed in 2016. Other important species include Shortfin mako (7 percent) and bigeye tuna (3 percent).

Table 6 presents the basic information on selected fleets as averages.

The average vessel age in the Spanish national fleet is 31 years, with the small-scale fleet being the oldest (35 years of age). For vessels between 12 and 24 m, the average age is 21 years, and for vessels over 24 meters, the average vessel age is 18 years.

TABLE 6
Basic information of each fleet (average per vessel)

	Purse seiners >40 m	Purse seiners 18–24 m	Deep-sea trawlers >40 m	Deep-sea trawlers 24–40 m	Surface longliners 24–40 m
Average vessel age	20	17	19	15	18
Average length overall (LOA)	87	21	57	30	31
Average gross tonnage (GT)	2 714	57	1 067	256	278
Average power of main engines in kilowatts (KW)	3 853	210	1 216	385	382
Average crew size (persons)	40	11	28	8	14
Average crew size (FTE)	56	11	38	9	17
Average days at sea	320	189	271	258	302
Average days fishing at sea	269	154	237	235	245
Average number of fishing trips	12	130	6	133	6
Average fishing trip (days)	26	1.5	44	2	50

The average age of the fleet tended to increase until 2012; it has since slowed down and currently maintains the 2012 average age of 31 years. As the economic situation of the sector recovers from the crisis, more replacements are being made, with newer vessels replacing older ones. Of the selected fleets, the deep-sea trawlers 24–40 m are the youngest with an average age of 15 years while the purse seiners are the oldest at 20 years.

The main fishing methods/fishing gears employed by fishing fleet are presented in Table 7.

TABLE 7
Fishing methods employed as a percentage of landings

	Purse seiners >40 m	Purse seiners 18–24 m	Deep-sea trawlers >40 m	Deep-sea trawlers 24–40 m	Surface longliners 2–40 m
Purse seine	99%	94%			
Encircling nets	1%				
Bottom otter trawl			96%	98%	
Mid water (otter) trawl			4%		
Drifting longlines					98%

Table 8 presents the estimated number of full-time and part-time workers on each of the main fleets. Most workers on these vessels are full-time employees.

Around 25 percent of the workforce is employed on the fishing fleets in the Mediterranean, 60.5 percent in the North Atlantic and 14.5 percent in the other fishing regions (distant-water fleet) (the outermost region of the Canaries and the Spanish fleet working in Morocco are included in the N Atlantic). These regional differences are linked to the North Atlantic fleet being much larger in size as well as the relevance of the sector in these regions, such as Galicia, which is the most important fishing region in Spain. The long-distant fleet employs 4 965 persons, with a FTE of 6 051.[5]

Not much information is available on the age structure, but it is clear that the fishermen population is aging. A large share (49 percent) of the fishers are between 40 and 64 years old, 34 percent are between 25 and 39 years and only 4 percent of the fishers are less than 24 years old.[6] The Mediterranean fleet has a slightly older workforce, with 58 percent of fishers being over 40 years and young people (from 15 to 24) represent only 5 percent of the fishers.

In general, there are very few female fishers, accounting for around 3.6 percent of the total employed and 3 percent of the FTE. Women typically have onshore roles, such as in accounting and other administrative roles although there are some female deckhands. Around 8 percent of the unpaid labour in fisheries are females. There are some regional differences; less than 2 percent of the crew in the Mediterranean fleet are females, while they represent 4 percent in the Atlantic fleet. In the case of the other fishing regions, the percentage of the women in the activity is also relatively low, around 3 percent of the total employment.

Crewmembers are mostly Spanish nationals (71 percent). Around 14 percent are non-EU/EEA nationals while only 1 percent are other EU nationals.

The workforce in the Mediterranean fisheries is mostly made up of Spanish nationals (71 percent), but with a notable presence of non-EU/EEA. More than half of the non-EU/EEA workforce (around 1 212 persons) is employed in the purse seine fisheries (665), as this seems to require large crews in which local fishers are frequently reluctant to engage.

---

[5] FTE is higher than the number of persons employed due to longer working hours and number of days at sea

[6] The remaining 13% were either over 64 years or age was not reported in the survey (unknown)

In the Atlantic fleet, the proportion of non-EU/EEA fishers is lower than in the Mediterranean, (9 percent non-EU/EEA) and again they are mostly linked to purse seiners. The non-EU/EEA workforce is more relevant in the long-distant fleet, often surpassing Spanish nationals. As with the other fleets, the number of other EU nationals is low (only 51 persons in this case).

TABLE 8
Labor Employed in Fishing and main socio-economic indicators

	Total employed	Full-time (FTE)	Average wage per FTE (USD)[7]	Labor productivity (GVA per FTE) (USD)
Purse seiners >40 m – distant water fleet	1 038	1 466	55 918	159 950
Purse seiners 18-24 m -North Atlantic fleet	1 126	1 066	23 500	33 580
Deep-sea trawlers >40 m – distant water fleet	832	1 136	29 661	56 638
Deep-sea trawlers 24-40 m – North Atlantic fleet	826	915	43 524	69 243
Surface longliners 24-40 m – distant water fleet	877	1 079	20 425	34 798

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF THE FLEET SEGMENTS
Purse seiners >40 m – distant water fleet
Capital investments
The total asset value of the 26 vessels in this fleet segment (down from 30 in 2015) amounted to around USD 150.2 million in 2016; with tangible assets valued at USD 150 million and intangible assets (quota and fishing rights) estimated at USD 163 202. This amounted to an average of USD 5.78 million per vessel; USD 5.7 million in tangible assets and USD 6 277 in intangible assets.

In-year investments in 2016 totalled USD 25.6 million, 19 percent less than in 2015 (USD 35.1 million), amounting to an average of USD 984 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 313.5 million in 2016 (average of USD 12 million per vessel), with operating costs equating to 79 percent. The remaining 21 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 35.6 million. Annual depreciation amounted to 93 percent of the capital costs.

Among the operating costs, other variable costs were highest, equating to 55 percent of the operating costs, followed by crew costs (25 percent) and energy costs (20 percent). The highest owner related costs were made for other fixed costs (58 percent of owner costs), followed by repair and maintenance (41 percent) and the leasing/rental of quota (1 percent).

In 2016, on average a vessel spent USD 2.3 million on crew costs, USD 1.9 million on fuel costs and USD 5.2 million on other variable costs. The average amount spent on repair and maintenance was USD 1.0 million, on other fixed costs USD 1.5 million and expenses on quotas were about USD 21 000.

Revenues
Revenue in 2016 totalled almost USD 438.7 million, an increase of 23 percent compared to 2015; amounting to an average per vessel of USD 16.9 million. This fleet segment contributed to 28 percent of the total Spanish fleet revenue in 2016.

---

[7] exchange rate used, 1 EUR = 1.1069 USD (ECB reference exchange rate, USD/EUR, average of observations throughout 2016; Data Source in SDW: http://sdw.ecb.europa.eu/browse. do?node=9691296).

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 125.2 million and a gross profit of USD 91.6 million. On average, this amounted to a net cash flow of USD 4.8 million and a gross profit of USD 3.5 million per vessel. The fleet saw an improvement in the economic performance; profitability was high with a net profit margin of 20.3 percent. The fleet obtained a GVA to revenue of 42 percent and a RoFTA of 59 percent.

Purse seiners 18–24 m – North Atlantic fleet

Capital investments

The tangible asset (replacement) value of the 99 vessels in this fleet segment (up from 93 in 2015) amounted to around USD 11.7 million in 2016 with an average of USD 118 000 per vessel.

In-year investments in 2016 totalled USD 180 000, amounting to an average of less than two 000 USD per vessel; a significant drop from the total investment made in this fleet of USD 3 million in 2015.

Operating and owner costs

Total gross costs amounted to USD 36.6 million in 2016 (average of nearly USD 370 000 per vessel), with operating costs equating to 81 percent. The remaining 19 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 218 000 per vessel.

Among the operating costs, crew costs were highest, equating to 79 percent of the operating costs, followed by other variable costs (12 percent) and then energy costs (10 percent). The highest owner related costs were made for repair and maintenance (68 percent of owner costs), followed by other fixed costs (32 percent) and then the leasing/rental of quota (<1 percent).

In 2016, on average a vessel spent USD 236 000 on crew costs, USD 29 000 on fuel costs and USD 35 000 on other variable costs. The average amount spent on repair and maintenance was USD 47 000 and other fixed costs added on average up to USD 22 000.

Revenues

Revenue in 2016 totalled almost USD 47.1 million, slight decrease on 2015; amounting to an average per vessel of USD 476 000. This fleet segment contributed to 2 percent of the total Spanish fleet revenue in 2016.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 10.5 million and a net profit of USD 10.3 million. On average, this amounted to a net cash flow of USD 106 000 and a net profit of USD 104 000 per vessel. The fleet saw an improvement in performance compared to previous years; profitability was high with a net profit margin of 22 percent and a GVA to revenue of 72 percent.

Deep-sea trawlers >40 m – distant water fleet

Capital investments

The total asset value of the 30 vessels in this fleet segment (down from 33 vessels in 2015) amounted to around USD 12.9 million in 2016; with tangible assets valued at USD 11.0 million and intangible assets (quota and fishing rights) estimated at USD 1.9 million. The average asset value of a vessel in this fleet was USD 431 000, consisting of around USD 368 000 in tangible assets and nearly USD 64 000 in intangible assets.

In-year investments in 2016 in this fleet segment totalled USD 420 000, which is 41 percent less than in 2015 (USD 714 000). Per vessel investments amounted to an average of USD 14 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 140.4 million in 2016 (average of USD 4.7 million per vessel), with operating costs equating to 81 percent. The remaining 19 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 6.2 million.

Among the operating costs, other variable costs were highest, equating to 49 percent of the operating costs, followed by crew costs (32 percent) and energy costs (19 percent). The highest owner related costs were made for other fixed costs (52 percent of owner costs), followed by repair and maintenance (40 percent) and then the leasing/rental of quota (7 percent).

In 2016, on average a vessel spent USD 1.2 million on crew costs, USD 711 000 on fuel costs and USD 1.8 million on other variable costs. The average expenses on repair and maintenance were USD 355 000 while other fixed costs added up to nearly USD 460 000 per vessel.

Revenues
Revenue in 2016 totalled almost USD 162.3 million (a 36 percent decrease compared to 2015); amounting to an average per vessel of USD 5.4 million. This fleet segment contributed to 7 percent of the total Spanish fleet revenue in 2016.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 21.9 million and a gross profit of USD 13.6 million. On average, this amounted to a net cash flow of USD 731 000 and a profit of USD 453 000 per vessel. The fleet saw an improvement in performance compared to previous years; profitability was reasonable with a net profit margin of 8.3 percent and a GVA to revenue of 36 percent.

The fleet made significant improvements on previous years 2012–13 results, rebounding from net losses in 2013 to record high profits in 2014. High profits in 2014 were mainly the result of a substantial increase in landings value and low fuel prices. Landed value decreased in 2015 and 2016, affecting profitability. Results for 2017 saw an improvement on 2016.

Deep-sea trawlers 24–40 m – North Atlantic fleet
Capital investments
The total asset value of the 107 vessels in this fleet segment (down from 126 vessels in 2015) amounted to around USD 85.1 million in 2016; with tangible assets valued at USD 39.4 million and intangible assets (quota and fishing rights) estimated at USD 45.6 million. The average asset value per vessel was some USD 795 000, consisting of USD 368 000 in tangible assets and USD 426 000 in intangible assets.

In-year investments in 2016 totalled USD 572 000, which is 90 percent less than the USD 5.5 million invested in 2015. The investment per vessel in 2016 was on average just USD 5 000.

Operating and owner costs
Total gross costs amounted to USD 82.9 million in 2016 (average of USD 775 074 per vessel), with operating costs equating to 77 percent. The remaining 23 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for

quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 3.8 million.

Among the operating costs, crew costs were highest, equating to 56 percent of the operating costs, followed by energy costs (26 percent) and other variable costs (18 percent). The highest owner related costs were made for repair and maintenance (52 percent of owner costs), followed by other fixed costs (46 percent) and the leasing/rental of quota (2 percent).

In 2016, on average a vessel in this fleet spent USD 336 000 on crew costs, USD 158 000 on fuel and USD 106 000 on other variable costs. The average amount spent on repair and maintenance was nearly USD 92 000 and expenses on other fixed costs added up to around USD 80 000.

Revenues
Revenue in 2016 totalled almost USD 114.3 million (a 24 percent decrease on 2015); amounting to an average per vessel of almost USD 1.1 million. This fleet segment contributed to 7 percent of the total Spanish fleet revenue in 2016.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 31.3 million and a gross profit of USD 27.0 million. On average, this amounted to a net cash flow of USD 293 000 and a gross profit of USD 253 000 per vessel.

Profitability of the fleet was high, with a net profit margin of 23 percent. The fleet made significant improvements in 2016 on previous years' results, rebounding from net losses in 2013. Record high profits were obtained in 2016, mainly the result of low fuel prices and a reduction in the number of vessels. Fourteen vessels left this fleet segment in 2014/15 and a further 19 vessels left in 2015/16.

Surface longliners 24–40 m – distant water fleet
Capital investments
The total asset value of the 64 vessels in this fleet segment (up from 62 vessels in 2015) amounted to around USD 25.0 million in 2016; with tangible assets valued at USD 18.4 million and intangible assets (quota and fishing rights) estimated at USD 6.6 million. The asset value per vessel in this fleet segment amounted to an average of USD 390 000, consisting of USD 287 000 in tangible assets and USD 103 000 in intangible assets.

In-year investments in 2016 totalled USD 371 000, significantly less than the USD 2.0 million invested in 2015. In 2016 per vessel investments were less than USD 6 000.

Operating and owner costs
Total gross costs amounted to USD 93.3 million in 2016 (on average USD 1.4 million per vessel), with operating costs contributing to 84 percent and the remaining 16 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 4.6 million.

Among the operating costs, other variable costs were highest, equating to 58 percent of the operating costs, followed by crew costs (26 percent) and then energy costs (17 percent). The highest owner related costs were made for repair and maintenance (62 percent of owner costs), followed by other fixed costs (37 percent) and then the leasing/rental of quota (1 percent).

In 2016, on average a vessel spent USD 316 000 on crew costs, USD 206 000 on fuel costs and USD 708 000 on other variable costs. The average expenses on repair and maintenance were USD 143 000 and on other fixed costs around USD 84 000 per vessel.

Revenues

Revenue in 2016 totalled almost USD 115.4 million (an 11 percent increase compared to 2015); amounting to an average per vessel of almost USD 1.8 million. This fleet segment contributed to 5 percent of the total Spanish fleet revenue in 2016.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 22.0 million and a gross profit of USD 17.5 million. On average, this amounted to a net cash flow of USD 344 000 and a gross profit of USD 274 000 per vessel. Profitability of the fleet was good, with a net profit margin of 15 percent. GVA to revenue was 37 percent. Results for 2017 showed some improvement on 2016.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES

Fishing vessel owners/fishing cooperatives and producer organisations in Spain have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national), including USD 7 billion is EU contribution, for the period 2014-2020. The allocation for Spain is set at USD 1.7 billion, with an EU contribution of USD 1.28 billion, i.e., co-funding of 75.6 percent. USD 390 million is specifically allocated to support a sustainable and balanced fishing fleet and sector.

EMFF funding mainly supports the Spanish fleet in a combined effort to boost competitiveness of its fishing sector and adapt its fleet to the new CFP regulatory obligations. Competitiveness improvements are expected from investments on board, which will improve the quality and value added of fisheries products, and an increase in investments in ports. Measures also include diversification of fishery and fishery-related activities, promoting entrepreneurship, especially through support to young fishers, improving the added value and use of unwanted catches, and enhancing safety on board. A third of the funding will focus on the protection of aquatic biodiversity and ecosystems. This is a radical change compared to the EFF period, where almost 40 percent of the Spanish allocation under EFF was channelled towards permanent and temporary cessations.

Support from the EMFF is provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include: (i) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms (e.g. with lower interest rates, longer repayment periods, or fewer collateral requirements); (ii) Microcredits, smaller sums than loans made to people sometimes excluded from access to finance, often provided over a short term and with no or low collateral required; (iii) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan and (iv) Equity, where capital is invested in return for total or partial ownership of a firm.

The EIB lending activities are aligned to EU standards and priorities and can cover the whole fishery value chain, ranging from input and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improved or restored ecosystems, innovative solutions for current and future challenges in the sector, and/or the productive and sustainable use of by-products from fisheries production.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

Spain has a tax exemption for fuel used in fisheries. The fuel price in 2016 for the fishing fleet averaged around USD 0.41 per litre.

There is also a system with financial compensation for reduction of fishing effort, such as scrapping of fishing vessels. To ensure compliance with the landing obligation, EMFF funds also foresee measures for the investment in more selective fishing gears and for technical adjustments.

Spain also benefits from a substantial amount of EMFF funding which was set aside for EU Sustainable Fisheries Partnership Agreements (SFPAs) with non-EU countries. There are currently around 12 SFPAs (mixed and tuna agreements) that offer fishing opportunities to some 250 Spanish-flagged vessels.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

Spain has adopted the so-called Strategic Plan for Innovation and Technological Development in Fisheries and Aquaculture, covering the period from 2014 to 2020. Its main objective is to increase the competitiveness of Spanish fisheries and aquaculture sectors through innovation and technological development, optimizing resources in the context of the EU and considering economic, social, environmental and health requirements.

As regards to fishing technologies, priorities and specific strategic objectives were established, including:

-   innovation in more selective fishing gears, in order to avoid and reduce bycatch and particularly bycatch of protected species and to reduce the environmental impacts of fishing;
-   promotion of energy audits, to increase energy savings, design of energy efficient fishing gear, automation of fishing practices and adaptation of fuel cells for marine use.

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that, from 2014, the fishing capacity of their fleet at no time exceeds the fishing ceilings in Annex II to Regulation (EU) No1380/2013. Spain has been fully compliant with fleet ceilings since then.

In 2017, a total of 208 vessels were permanently removed from the register, most of which were small-scale vessels or vessels using bottom trawls, while 43 vessels were added. Overall, this represented a reduction in capacity of 4 534 GT and 11 686 kW.

However, although the number of vessels and corresponding tonnage and engine power have decreased year on year, the volume of catches by the Spanish fleet has increased, indicating that less efficient vessels are being removed and that controlling the engine power (limitation of kW) and vessel tonnage (limitation of GT) of the fleet may reduce fishing effort, but does not contribute to catch reduction. It is therefore necessary to use alternative measures or methods for controlling fishing effort, such as TAC and quotas, restrictions on days of activity, temporary closed seasons, etc.

REFERENCES

EU. 2019. *Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06).* Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic

©NISEA

Report of Turkey

©FAO/M. Dagtekin

National report of Turkey

Murat Dağtekin
Head of Agricultural Economy Department
Central Fisheries Research Institute
Trabzon, Turkey

1. GENERAL INFORMATION ABOUT FISHERIES IN TURKEY

Turkey's annual capture fisheries production showed significant fluctuations in recent years. In the period 2010–2018 the annual capture fishery production ranged between 537 000 tonnes and 704 000 tonnes. Similarly, as in many other countries in the world the aquaculture production continued to increase and the share of aquaculture in the total production increased (Table 1).

The total aquaculture and fisheries production in Turkey in 2018 was 628 631 tonnes. Some 35 percent of the production was comprised of marine fishes. Other seafood production added 10 percent to the total, while 5 percent was originating from inland capture fisheries and 50 percent of the total production were aquaculture products. The production by capture fisheries was 314 094 tonnes, while the aquaculture production added up to 314 537 tonnes. (Table 1).

According to data of the Turkey Statistical Institute (TURKSTAT), the production from marine capture fisheries showed considerable fluctuation since 1989 and in general has decreased over the last 20 years. In recent years, capture fisheries production exhibited some more stability.

Within the total capture fisheries production in Turkey, marine fisheries is most important. In 2018, some 90 percent of the total capture fisheries production was obtained from marine waters and 71 percent of the species landed were fish species.

A large majority of the marine capture production consists of lower value small pelagics, such as anchovy, sprat and sardine.[1] The small-pelagics production is important for fishing communities' livelihoods and domestic food security in Turkey. Other important marine products include baby clam and sea snail. Inland fisheries target species that are important include tarek (*Alburnus tarichi*), Mediterranean sand smelt (*Atherina hepsetus*) and Prussian carp (*Carassius gibelio*). The total landed value of marine capture fisheries products was lower than the total off-farm aquaculture product value in Turkey in 2018. The aquaculture sector in Turkey is dominated by the production of three species: rainbow trout, sea bass and sea bream. The combined production of trout, sea bass, sea bream and mussels in aquaculture adds up to 98 percent of total aquaculture production in Turkey.

---

[1] Scientific names can be found in Tables 8 and 9.

TABLE 1
Fisheries and aquaculture production of Turkey in tonnes: 2010–2018

Years	Capture fisheries			Aquaculture			Total FI & AQ production
	Marine	**Inland**	**Total**	**Marine**	**Inland**	**Total**	
2010	445 680	40 259	485 939	88 573	78 568	167 141	653 080
2011	477 658	37 097	514 755	88 344	100 446	188 790	703 545
2012	396 322	36 120	432 442	100 853	111 557	212 410	644 852
2013	339 047	35 074	374 121	110 375	123 019	233 394	607 515
2014	266 078	36 134	302 212	126 894	108 239	235 133	537 345
2015	397 731	34 176	431 907	138 879	101 455	240 334	672 241
2016	301 464	33 856	335 320	151 794	101 601	253 395	588 715
2017	322 173	32 145	354 318	172 492	104 010	276 502	630 820
2018	283 955	30 139	314 094	209 370	105 167	314 537	628 631

Source: TURKSTAT, 2019a.

2. DEMOGRAPHICS AND SOCIO-ECONOMIC DATA

The population of Turkey, which was 30 million in the 1960s, reached nearly 81 million people in 2017 with a 1–2 percent percent growth rate per year. Individuals in the working age range of 15 to 64 years account for 68 percent of the total population. (Table 2). In terms of geographical distribution of the population, the majority of the population resides in urban/provincial centers. The percentage of the population living in urban centers was 92 percent in 2017.

Turkey's gross domestic product (GDP) value was more than USD 850 billion in 2017. Per capita GDP was USD 10 000 in 2017. The average household size in Turkey is 3.4 persons (Table 2). The largest expense item of the household expenditures is housing and rent on which nearly 25 percent of the total household expenditures are made. Other important expenditure items consisted of food and non-alcoholic beverages and transportation (Table 3).

TABLE 2
Demographic and socioeconomic data (2017)

Indicator/parameter	
Population size	80 810 525
Age structure (%) under 15	23.6
15–64	67.9
over 65	8.5
Population growth rate	1.24
% urban Population	92.3
Mean household size	3.4
GDP (billion USD)	851
Per capita GDP (based on purchasing power parity)	10 098
Economic growth rate	7.4
No of tourist visiting the country (million)	32
Consumer price index	11.92
Average yearly exchange rate for Euro (€)	4.12

*Source:*TURKSTAT (2019 b).

TABLE 3
Distribution of household consumption expenditures in 2017

Expenditure category	Share (%)
Housing and rent	24.7
Food and non-alcoholic beverages	19.7
Transportation	18.7
Furniture, houses appliances and home care services	6.3
Restaurant and hotels	6.2
Clothing	5.0
Others	19.4
Total	**100**

*Source:*TURKSTAT (2019 b).

3. NATIONAL FLEET

The Turkish fishing fleet is largely dominated by small-scale fishing vessels. In 2016 there were 15 663 fishing vessels in total and only 1 501 (some 10 percent) were larger than 12 meters. Since 2012, the number of fishing vessels has been decreasing because of the buyback programmes for fishing vessels larger than 10 meters initiated by the Directorate General - Fisheries and Aquaculture (DG-Fish). So far, three programs were conducted, which finalized in 2012, 2013 and 2014. The fourth buyback program started in 2016. Thanks to the buyback programmes, a total of 1 011 vessels were decommissioned by the end of the 2016. The 2016 buyback program realized in 2017 a removal of 224 vessels from the fleet (general fleet information is presented in Table 4).

TABLE 4
Turkish fishing fleet

		2016	Average per vessel
Fleet and output	Fleet - number of vessels (in activity)	15 663	
	Days at sea	1 895 000	121
	Volume of landings (tonnes)	301 474	19.2
	LPUE (Kg/day at the sea)		159.0
Employment	Total employment in the fishing fleet	32 586	2.1
	Number of fulltime fisheries jobs (FTE)	14 164	0.9
	Remuneration per fisher (FTE) (thousand USD)	5.2	5.2
	Labour productivity (thousand USD)	16.2	16.2
Economic performance	Revenues (thousand USD)	385 605	24.6
	Gross value added (thousand USD)	229 319	14.6
	Gross cash flow (thousand USD)	156 025	10.0
	Fuel efficiency of seafood landings (tonnes)		2.9

Source: TURKSTA, Ministry of Agriculture and Forestry, and Üstündağ and Kanyılmaz, 2018.

3.1 Bottom trawlers (>12 meters)

There were three types of trawlers in operation in 2016 in Turkey. These were bottom, pelagic, and beam trawlers. Bottom trawlers represented about 2.8 percent of the total fishing fleet in terms of numbers. In 2016, a total of 448 bottom trawlers fished in Turkish waters, except in the Marmara Sea where there was an annual prohibition for trawl fishing in place. Total landed volume by this fleet segment was 10 726 tonnes and the total value of landings was approx. USD 94 million. The bottom trawler fleet employed 2 291 people and provided 1 748 FTE in 2016 (Table 5).

TABLE 5
Bottom trawlers (>12 meters)

		2016	Average per vessel
Fleet and output	Fleet - number of vessels (active)	448	-
	Days at sea	68 730	153
	Volume of landings (tonnes)	10 726	23.9
	LPUE (Kg landed/day at sea)		156.1
Employment	Total employed crew	2 291	5.1
	Full-time employed crew (FTE)	1 748	3.9
	Remuneration per fisher (FTE) (thousand USD)	-	-
Economic performance	Revenues (thousand USD)	93 662	209.1
	Gross value added (thousand USD)	-	-
	Gross cash flow (thousand USD)	38 581	86.1
	Fuel efficiency of seafood landings (t)	NA	NA

Source: TURKSTAT and Ministry of Agriculture and Forestry.

Main species targeted by the bottom trawler fleet are whiting, red mullet, turbot, horse mackerel, and bluefish. For the bottom trawler fleets there were various management plans and measures in place in Turkey in 2016:

Area closures: Bottom trawling was prohibited in waters between a) Sinop city. İnceburun (42° 05.959' N-34° 56.695' E) and Samsun city Çayağzı cape (41° 41.040' N-35° 25.193' E), b) Ordu city; Ünye. Taşkana cape (41° 08.725' N-37° 17.531' E) and Georgia border. Furthermore, it is also banned within 2 miles from land between Zonguldak city; Ereğli. Baba cape (41° 17.342' N-31° 23.937' E) and Bartın city; Amasra. Tekke cape (41° 43.485' N-32° 19.258' E). In other areas open to trawling this was allowed to a distance of 3 miles.

Time closures: In open areas, red mullet fishery with bottom trawling was banned between 15 April and 1 September.

Mesh size limitations: Cod end mesh size smaller than 40 mm in bottom trawl nets was prohibited.

Minimum legal catch size: A minimum legal size (total length) was determined for whiting *(Merlangius merlangus)* and red mullet (*Mullus barbatus*) (13 cm), turbot (*Psetta maxima*) (45 cm), bluefish (*Pomatomus saltatrix*) (18 cm) and horse mackerel (*Trachurus mediterraneus*) (13 cm).

3.2 Pelagic trawlers

Pelagic trawlers began to operate in the Black Sea fisheries from the mid-1990s. This type of fishing is performed by a double vessel operation in the Turkish territorial waters. In recent years, pelagic trawlers have been used especially for sprat fishing. In 2016, there were 146 pelagic trawlers providing full-time employment (FTE) for 473 fishers. The fleet landed almost 55 000 tonnes, valued at approximately USD 25 million in 2016 (Table 6).

Main species targeted by the pelagic trawler fleet are anchovy, sprat, horse mackerel, bluefish, atlantic bonito and other species. Fisheries management measures and regulations for pelagic trawlers included the following:

Fishing area: Sprat fishery by pelagic trawls were conducted only along the Samsun shelf area. The coordinates of this area were specified. The fishery was allowed for anchovy, horse mackerel and bluefish along other trawling areas in Black Sea.

Size limits: Minimum legal sizes (total length) were determined for anchovy (9 cm), bluefish (18 cm) and horse mackerel (13 cm).

TABLE 6
Pelagic trawlers

		2016	Average per vessel
Fleet and output	Fleet - number of vessels (active)	146	-
	Days at sea	21 900	150
	Volume of landings (tonnes)	55 019	376.8
	LPUE (Kg landed/day at the sea)		2 512.3
Employment	Total employed crew	791	5.4
	Full-time employed crew (FTE)	473	3.2
	Remuneration per fisher (FTE) (thousand USD)	-	-
Economic performance	Revenues (thousand USD)	24 512	167.9
	Gross value added (thousand USD)	-	-
	Gross cash flow (thousand USD)	10 004	68.5
	Fuel efficiency of seafood landings (t)	NA	NA

Source: TURKSTAT and Ministry of Agriculture and Forestry.

3.3 Purse seiners (>12 meters)

In 2016, a total of 453 purse seiners operated in Turkish waters and they employed together 5 216 crew on board, providing 4 506 FTE. The mean Landing Per Unit Effort (LPUE) was 944 kg. The length of vessels in this segment ranges from 12 to 62 meters. Vessels larger than 30 meters employ generally 25-30 crews while small size purse seiners employ 6–10 crews. On average, a purse seiner was 173 days at the sea in 2016 and the purse seine fleet landed almost 74 000 tonnes of fish in 2016 (Table 7).

TABLE 7
Purse seine fleet (>12 meters)

		2016	Average per vessel
Fleet and output	Fleet - number of vessels (in activity)	453	-
	Days at sea	78 240	173
	Volume of landings (tonnes)	73 866	163.1
	LPUE (Kg landed/day at the sea)		944
Employment	Total employed crew	5 216	11.5
	Full-time employed crew (FTE)	4 506	11.5
	Remuneration per fisher (FTE) (thousand USD)	-	-
Economic performance	Revenues (thousand USD)	113 010	249.5
	Gross value added (thousand USD)	-	-
	Gross cash flow (thousand USD)	45 122	99.6
	Fuel efficiency of seafood landings (t)	NA	NA

Source: TURKSTAT and Ministry of Agriculture and Forestry.

The main species targeted by the purse seine fleet are: anchovy (Anchovy (*Engraulis encrasicolus*), Atlantic bonito (*Sarda sarda*), horse mackerel (*Trachurus mediterraneus*), bluefish, Grey Mullet (*Liza aurata*) and other species. In terms of fisheries management measures there were some closed areas for trawl and purse seine fisheries in the Black Sea in 2016. Purse seining was prohibited in waters with a depth of less than 24 m. There was an annual closed season for purse seining from 15 April to 31 August. Fishing operations by the purse seine fleet in the Marmara and Black Sea were allowed between 16:00 and 08:00.

4. CHARACTERISTICS OF THE FISHING FLEETS INCLUDED IN THIS REVIEW

The Turkish fishing fleet is largely characterized by industrial and semi-industrial fishing operations carried out by purse seine, mid-water trawl and bottom trawl vessels. In this study, the technical and economic performance of these three fleets in 2018 was evaluated. The purse seine fishing fleet is split in two groups, ≥40 m in length overall (LOA) and <40 m, as the operational differences between vessels of these sizes are significant. Some of the purse seine fishing vessels also have quotas for tuna fishing. These quotas are determined by draw. The sampled boats did not have tuna fishing quotas for 2018. The fishing fleet in Turkey benefits from a special consumption tax exemption for fuel only. The fishing vessels were exempt from the special consumption tax on fuel, and the special excise tax is not levied to fishers either. The real interest rate applied in 2018 was 13 percent for Turkey, a figure that is also used as opportunity cost of capital in this study.

  An overview of the fishing fleets surveyed in this study is presented in Table 8.

TABLE 8
Overview of fishing fleets

Fishing fleet Listed by gear name	Number of vessels	Scale	FAO fishing area	Main fishing ports
Purse seine ≥40 m	72	Industrial	37	Zonguldak, Bartın, ,İnebolu, Giresun, Ordu Trabzon, Poti (Georgia) Sinop-Hopa, Western Part Georgia waters (GSA29)
Purse seine < 40 m	356	Semi-Industrial	37	Zonguldak, Bartın, ,İnebolu, Giresun, Ordu Trabzon (GSA29)
Pelagic trawl	195	Semi-Industrial	37	Samsun, Sinop, Ereğli, Kefken (GSA29)
Bottom trawl	418	Semi-Industrial	37	Samsun, Sinop, Ereğli, Kefken, Şile (GSA29)

  Tables 9 and 10 present the 5 main targeted and commonly caught species and those discarded at sea by the fleet segments included in this study.

TABLE 9
Main species targeted and commonly caught by fishing fleet segments (ranked from 1 to 5)

Fleets/ species targeted	1	2	3	4	5
Purse seine ≥40 m LOA	Anchovy *(Engraulis encrasicolus)*	Atlantic Bonito *(Sarda sarda)*	Bluefish *(Pomatomus saltatrix)*	Horse mackerel *(Trachurus mediterraneus)*	Grey Mullet *(Liza aurata)*
Purse seine <40 m LOA	Anchovy *(Engraulis encrasicolus)*	Atlantic Bonito *(Sarda sarda)*	Bluefish *(Pomatomus saltatrix)*	Horse mackerel *(Trachurus mediterraneus)*	Grey Mullet *(Liza aurata)*
Pelagic trawl	Sprat *(Sprattus sprattus)*	Anchovy *(Engraulis encrasicolus)*	Horse mackerel *(Trachurus mediterraneus)*	Bluefish/Shad *Pomatomus saltatrix/Alosa immaculata*	Atlantic bonit *(Sarda sarda)* /Bluefish *(Pomatomus saltatrix)*
Bottom trawl	Whiting *(Merlangius merlangus)*	Red mulet *(Mullus barbatus)*	Turbot *(Psetta maxima)*	Horse mackerel *(Trachurus mediterraneus)*	Bluefish/Shad *Pomatomus saltatrix/Alosa immaculata*

TABLE 10
Main species discarded at sea by fleet segment (ranked from 1 to 5)

Fleets/species discarded at sea	1	2	3	4	5
Purse seine >=40 m LOA	Stargazer *(Uranoscopus scaber)*	Thornback ray *(Raja clavata)*	Common stingray *(Dasyatis pastinaca)*	Picked dogfish *(Squalus acanthias)*	Sturgeon *(Acipencer sp.)*
Purse seine <40 m LOA	Stargazer *(Uranoscopus scaber)*	Thornback ray *(Raja clavata)*	Common stingray *(Dasyatis pastinaca)*	Picked dogfish *(Squalus acanthias)*	Red mulet *(Mullus barbatus)*
Pelagic trawl	*Horse mackerel* under legal size TL<13 cm	Shad *(Alosa immaculate)*	Round goby *(Neogobius melanustomus)*	Greater weever *(Trachinus draco)*	*Sprat *(Sprattus sprattus)*
Bottom trawl	Whiting *(Merlangius merlangus)* under legal size TL<13 cm	Liocarcinus depurator	Red mulet *(Mullus barbatus)* under legal size TL<13 cm	Mussels *(Mytilus galloprovincialis)*	Rapa whelk and Thornback ray *(Raja clavata)* Rapana venosa/*(Raja clavata)*

Note:* In fisheries targeting horse mackerel and bluefish, the sprat is commonly discarded at sea. Sprat landings are not landed and sold to the fish meal processors due to low volumes of the byctach of sprat.

Of each of the fleet segments 4 or 5 vessels were surveyed for the study. The basic information (averages) by fleet segment are presented in Table 11.

TABLE 11
Basic information of the fishing vessels surveyed by fleet segment

	Purse seine ≥40 m LOA	Purse seine <40 m LOA	Pelagic trawlers	Bottom trawlers
Length overall (LOA)	46	30	25	18
Gross tonnage (GT)	311 (range 280–858)	107 (range 49–179)	Generally >50	65 GT (range 50–80)
Total power of main engines in kilowatts (KW)	2465 (range 1108–3850)	910 (range 810–1171)	683 (range 250–1450)	456 (range 220–720)
On-board storage facilities (m³)	74 m³ (range 10–150)	33 m³ 15–45 m³	31 m³ (Range 20–35 m³)	15 m³ (Range 10–20 m³)
Fishing gear	Purse seine nets for specific species	Purse seine	Pelagic trawl (75%) & bottom/demersal trawl (25%)	Bottom trawl (75%) & pelagic trawl (25%)
Crew size (persons)	38	27	5	4
Ownership	shared	shared	shared	shared
Total days fishing at sea	170	175	200	136
Number of fishing trips	595	700	800	544
Fishing season (months)	7.4	7.5	8.5	7.5

Fishing gears employed by the fleets

The purse seine vessels only use purse seine nets. The pelagic trawlers use pelagic trawl nets (75 percent) and bottom or demersal trawl nets (25 percent). For the bottom trawlers, the gear utilization is the opposite from the pelagic trawlers, thus bottom trawls (75 percent) and pelagic/midwater trawls (25 percent).

4.1 Developments and operations of the four fleet segments
Purse Seine ≥40 m LOA

The large-scale purse seine vessels are catching in different regions. Since their engine power is large it is possible for these vessels to reach the fishing area in a short time. Vessels in this group are also catching tuna in the Mediterranean if they have been allocated a quota. They are also catching in the Georgian waters under a licensing agreement. Georgian quota holder fishery enterprises hire Turkish purse seiners (plus their carriers and auxiliary skiffs) each year. Turkish purse seiners hired by the

Georgian enterprises only travel to Georgia once catches in Turkish waters decline to an unprofitable level, which usually coincides with the end of the calendar year (Gücü *et al.*, 2017). The main landing ports vary according to the target species.

Atlantic bonito and anchovies are the most important target species for fishers in Turkey. Therefore, the migration of these stocks during the year determines the ports used for their operations. Anchovy fishing in 2018 largely took place in the Western Region of Turkey (Eregli-Inebolu). The target species of the large purse seine vessels are: anchovy, Atlantic bonito, bluefish, horse mackerel and mullet. The abundance of species is dependent on the amount of prey available in different areas during the year. Purse seine boats separate from their target catch the large non-target species found in their nets at sea. Species that are prohibited to land are discarded at sea. The main discarded species by purse seine boats are: *Uranoscopus scaber, Raja clavata, Dasyatis pastinaca, Squalus acanthias, Acipencer sp.* Purse seine vessels have on average 38 crew. The vessel ownership type is usually shared (in family). The total number of fishing days in 2018 was 170 days per vessel.

Purse Seine <40 m LOA

Vessels larger than 12 m can be permitted to carry out purse seine fishing in Turkey. In terms of competition it has become clear in recent years that smaller purse seine vessels are less profitable than the larger vessels. Recently some purse seine vessels in this segment went bankrupt and some other vessels were withdrawn from the fleet under the vessel buyback programmes. In recent years, the number of purse seiners in the Black Sea <30 m LOA has become very small. Some of the small purse seine vessels have changed to multi-gear vessels.

Pelagic Trawlers (Mid-water trawl)

The historical development of the Turkish trawl fleet has its origin in demersal trawl fisheries in the Black Sea. The pelagic trawler fleet started its operations in the second half of the 1950s, primarily in the Samsun shelf area. By the end of the 1990s, the fishing capacity of the fleet grew to a size that the stocks of targeted demersal fish species could no longer sustain. The use of paired vessels in pelagic trawling along Yeşilırmak-Kızılırmak shelf area in southern Black Sea gained importance in the 1990s and became widespread by the early 2000s. At present nearly 60 pairs of vessels are operating in the area.

The main gears used for sprat fishery in Turkey (fishing mainly near the city of Samsun) are pelagic pair trawls working in the spring season at 20–40 m depth and in autumn in deeper waters of 40–80 m depth. At the same time the Turkish pair-trawl fishers target horse mackerel, bluefish, anchovy, bluefish and shad in the same area. Sprat is largely used as raw material for fish meal and fish oil factories. There are no discards at sea during sprat fishing. Horse mackerel, anchovy, bluefish and Atlantic bonito are caught for human consumption. Pelagic fish caught that are under the legal size limit are discarded at sea. Pelagic trawl vessels have an average of 5 crew. The ownership type is usually shared (within the family).

Bottom Trawlers

There has been a big decrease in the number of vessels engaged in bottom trawling in recent years. Various vessels have changed to different gears, such as pelagic trawls and hydraulic dredges. The percentage of bottom trawl vessels that only use bottom trawl is 75 percent. Some 25 percent of the bottom trawlers also apply pelagic trawl gears during the high seasons for sprat and anchovy fishing.

5. FINANCIAL AND ECONOMIC CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Capital investments

The initial investments in the fishing vessels (hull, main engine, propulsion, equipment, gears and electronic devices) were a challenge to investigate, because some of the vessels were built long ago. Moreover, some vessels had changes in the engines and/or propulsion systems and have seen various gear replacements since their construction.

The bottom trawl vessels were built (on average) some 17 years ago, while engines are generally some 9 years old. The initial investment in a vessel (hull, engine, and equipment) was USD 284 000 (Table 12). The hull investment was generally approximately 72 percent of the total investment, while electronics accounted for 15 percent, the trawl system for 6 percent and the engine for 6 percent. These type of vessels were expected to operate for at least 20 years. Therefore, a depreciation rate of around 5 percent is applied on the combined investments in the hull, engine and major equipment.

The current average value of the investment made in a pelagic trawler and related equipment of vessels in this fleet is estimated at slightly more than USD 300 000. The average age of the hull is 22 years, and engine and main on-board equipment are generally about 10 years old. In terms of original investment in the pelagic trawlers, the main investments are generally made in the hull 68 percent, followed by investment in electronics with 17 percent. A pelagic trawler is expected to be in operation for more than 20 years.

TABLE 12
Average investments in USD made in fishing vessels of the four fleet segments

Item	Bottom trawler	Pelagic trawler	Purse seine >40	Purse seine <40
Vessel (hull)	268 979	205 551	628 800	278 027
Main engine(s)	3 429	15 942	182 800	63 044
Equipment on deck (e.g. cranes, beams)	0	8 319	595 257	47 007
Equipment below deck (e.g. cold storage, ice making, freezers)	408	4 081	36 527	49 075
Fishing gears with a lifespan of 3 years or more	2 816	15 869	472 000	277 483
Electronic devices (navigation, fish finding and communication)	8 449	50 380	613 900	257 687
Other items	0	0	23 245	5 400
Total investment in USD	284 081	300 142	2 552 529	977 723

The large purse seine vessels ≥ 40 m LOA in use in Turkey accounted with initial investments of around USD 2.6 million. The largest investment items were respectively the hull, electronics and fishing gears (mainly FADs) with respectively 25 percent, 24 percent and 18 percent of the total initial investment costs. The annual depreciation of the vessel and its equipment is estimated at USD 167 000, which would be 6.5 percent of the initial investment. This would generally mean that a vessel of this type is expected to be in operation for some 16 years. The average age of vessels in this fleet is around 16 years, while engines are around 5 years old and other equipment and gears vary between 3 and 0 years. The relatively high depreciation rate is caused by the fishing gears (e.g. FADs) and electronic devices that last not very long and need frequent replacement.

The smaller purse seine vessels <40 m LOA in use in Turkey have generally cost nearly USD 1 million in capital investments. The largest investment items were respectively the hull, fishing gears (mainly FADs) and electronics with respectively

28 percent, 28 percent and 26 percent of the total initial investment. The annual depreciation of the vessel and its equipment is estimated at USD 68 000, which would be 7 percent of the initial investment. This would generally mean that a vessel of this type is expected to be in operation for some 15 years. However, most of the vessels in this fleet are relatively young with 1 to 5 years.

Operating and owner costs

The total annual operating costs of an average **bottom trawl vessel** added up in 2018 to some USD 82 000 (Table 13). Around 38 percent of these costs were made for fuel while taxes added up to nearly 15 percent. The wages and labor share of the crew were rather small with 8 percent, because of the fact that most crew are family members. Some 58 percent of the total operating costs were general operating costs and 42 percent was attributed to the owner in 2018.

For vessels in the **pelagic trawl** fleet the annual operating costs amounted to USD 225 000, of which 22 percent was used to cover fish selling related costs, 18 percent for fuel costs and 17 percent for wages and labor shares of the crew. Owner costs were around 25 percent of the total annual operating costs.

The annual operating costs of a **large purse seine** vessel ≥ 40 m LOA were nearly USD 1.3 million in 2018. The owner costs were around 37 percent. The fuel and labor share wages added up to respectively 21 percent and 20 percent of the total operating costs.

The vessel owner costs for **smaller purse seine vessels of <40 m LOA** owner were around 32 percent of the total operating costs of USD 615 000 per annum. The most important cost items were the labor share/wages of 28 percent and the fuel costs of 17 percent.

TABLE 13
Average operational costs and earnings of the four fleet segments in USD (2018)

Category	Item	Bottom trawler (USD)	Pelagic trawler (USD)	Large purse seine (USD)	Small purse seine (USD)
Earnings (=revenue)	Total fishing revenue	151 980	305 505	2 117 286	830 563
Operating costs	Fuel	31 265	41 224	276 327	104 558
	Lubricants/oil/filters	1592	5 429	18 939	32 517
	Harbour dues and levies	273	1 520	5 188	3 527
	Ice	514	286	6 531	0
	Food, stores and other provisions	257	3 918	40 878	29 252
	Fish selling costs (auction commission, etc.)	241	50 694	58 224	31 950
	Materials (packaging, boxes)	3 388	18 367	104 082	37 828
	Other operating costs	3 143	6 914	27 912	7 401
	Labor share and wages	6 571	38 979	270 349	171 224
Vessel owner costs	Fishing license fees, permits and quota	0	0	5 844	0
	Insurance fees	0	2 412	7 045	0
	1Gear replacements, repairs & maintenance	2 673	4 694	37 143	22 571
	Vessel repairs & maintenance	3 673	9 265	34 592	21 295
	Other fixed costs	1 053	4 211	11 890	7 007
	Depreciation (vessel, engine, equipment, and gears that last more than 3 years)	8 692	11 540	146 214	54 590
	Interest	6 500	4 145	21 122	13 326
	Investments	0	16 830	62 734	37 806
	Taxes on profits	12 158	4 988	156 583	39 867
Total operating costs		**81 993**	**225 416**	**1 291 597**	**614 719**

6. ECONOMIC AND FINANCIAL PERFORMANCE OF FISHING VESSELS

The economic and financial performance of the fishing fleets covered in this report is based on the average vessel costs and earnings information as presented above. Of each fleet four or five vessels were randomly selected and surveyed to obtain these average values. This means that the information presented only reflects the average economic performance of the specific fleet, and that individual vessels might have indicator values well above or below the figures presented in Table 14.

TABLE 14
Financial and economic indicators per fleet segment in 2018 in USD

Financial indicators	Code	Bottom trawlers (USD)	Pelagic trawlers (USD)	Purse seiners <40 LOA (USD)	Purse seiners >40 LOA (USD)
Revenue from landings	A	151 980	305 505	830 564	2 117 286
Labour costs	B	22 699	42 898	200 476	311 227
Running costs	C	44 927	124 434	217 781	497 203
Vessel costs	D	7 400	21 082	50 873	96 514
Total gross cost (E) = B + C + D	E	75 026	188 414	469 130	904 944
Net cash flow (F) = A - E	F	76 954	117 092	361 434	1 212 342
Depreciation	G	8 692	11 540	54 590	146 214
Amortization	H	0	0	0	0
Gross profit (I) = F - G - H	I	68 262	105 552	306 844	1 066 128
Interest	J	6 500	4 145	13 326	21 122
Net profit before taxes (K) = I - J	K	61 763	101 407	293 518	1 045 006
Net profit margin (L) = K/A	L	41%	33%	35%	49%
Value of tangible assets[2]	M	284 081	300 142	972 893	2 552 529
ROFTA (N) = K/M	N	22%	34%	30%	41%
Value of intangible assets	O	0	0	0	0
ROI (P) = K/(M + O)	P	22%	34%	30%	41%
GVA (Q) = F + B	Q	99 653	159 989	561 910	1 523 569
GVA to revenue (R) = Q/A	R	66%	52%	68%	72%

Purse seine vessels ≥40 m

The average gross profit of vessels in the larger purse seiner fleet in 2018 was USD 1.06 million. Net profit of a vessel in this fleet was still above USD 1 million in the same year. The ratio of net profit to total revenue (net profit margin) was 49 percent, which is very high. This means that for every dollar generated some 49 cents is kept as profit. The return on investment (ROI) is good for this fleet with 41 percent. The gross value added of a vessel in this fleet was more than USD 1.5 million.

Purse seine vessels <40 m

The average gross profit of smaller purse seine vessels in Turkey in 2018 was USD 307 000. Net profit of a vessel in this fleet was USD 294 000 in the same year. The net profit margin was 35 percent, which is very good. The gross value added of a vessel in this fleet was over USD 560 000. The return on investment (ROI) of vessels in this fleet segment was good with 30 percent.

Pelagic trawlers

The average gross profit of pelagic trawlers in Turkey in 2018 was USD 106 000. Net profit of a vessel in this fleet was over USD 100 000 in the same year. The net profit margin was 33 percent, which is good, however there is substantial variation

---

[2] The total original capital investment cost was used for the value of tangible assets, given that no replacement value information was available. This has consequences for the ROFTA (N) and the ROI (P).

in profitability in this fleet segment. The gross value added of a vessel in the pelagic trawler fleet was around USD 160 000 in 2018. The return on investment (ROI) of vessels in this fleet segment was good with 34 percent.

Bottom trawlers
The average gross profit of the bottom trawlers in Turkey in 2018 was USD 68 000. Net profit of a vessel in this fleet was on average some USD 62 000 in the same year. The net profit margin was 41 percent, which is very good. This fleet is however considered the least profitable of the main fishing fleets in Turkey, which is also reflected in the number of vessels offered for buyback programme and in the number of bankruptcies. The gross value added of a vessel in the bottom trawler fleet was around USD 100 000 in 2018. The return on investment (ROI) of vessels in this fleet segment was lower than for the other fleet segments with 22 percent in 2018.

7. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES
The fishing vessel owners and fishing cooperatives in Turkey have access to credit lines established by the government. The purpose of the credit supplied varies, but the loans are mainly for purchase and/or replacement of vessels, engines, on-board equipment, gears, cold storage, and to cover operational costs. The maximum loan sizes are around USD 1 million and loan periods are often between 3 and 5 years. Common interest rates charged by the credit providers are around 7 percent per year. In addition, fishers get advances from fish meal and fish oil factories and fish wholesalers. During the year they repay their loans in fish to these businesses to reduce their debts.

8. SUBSIDIES AND SUPPORT TO THE SECTOR
The fishing vessels owners and fishing cooperatives do neither have access to specific subsidies for the purchase of vessels, engines or gears, nor subsidies for fuel, lubricants and ice. In 2018, there was not any import tax exemption or duty free exemption for fisheries related equipment in place either.

There exists however a system in Turkey which provides financial compensation for reduction of fishing capacity, such as through scrapping of fishing vessels. Since 2012, the number of fishing vessels has been decreasing, because of the buyback programs for fishing vessels larger than 10 meters. These programmes were initiated by the Directorate General -Fisheries and Aquaculture (DG-Fish) of the Ministry of Agriculture and Forestry. Large scale purse seiners engaged in industrial fishing have not benefited from this incentive so far. The programmes focused on old and less profitable bottom trawlers.

9. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE
The main technological innovations that have had an impact on the fishing fleet economic performance since 2000 in Turkey are presented in the following table. The table also specifies how these changes impacted the economic fleet performance.

Category	Specific innovations	How these affected economic performance of the fleet
Cost reductions and energy savings	The engine power of the vessels in the various fleets has increased overall. At the same time the size of the vessels used (in GT) increased.	Fishers saw increased operational and fixed costs. Especially, fuel (energy) costs increased.
Increasing fishing efficiency	Equipment was developed and introduced to find the schools of fish (fish finders etc.). There have been many innovations in the equipment of vessels to increase the catch per unit of effort.	The earnings of some vessels increased. However, there has been no significant change in the total volume of fish landed. There have been oscillations due to the fact that pelagic fish present the majority of the landed fish. Some vessels that could not keep up with the fleet innovations went bankrupt.
Reducing the environmental/ ecological impact	Although technologies have emerged to reduce greenhouse gas (GHG) emissions, the Turkish fishing fleet has not made progress in this direction.	No effects on the economic performance.
Improving fish handling, product quality and food safety	All of the new vessels built possess cold chains at various capacities. Some vessels made investments in quick freezing (IQF) directly at sea.	Through innovations in the cold chain the fish can be supplied to consumer year-round. For example, anchovy fishing in the Black Sea lasts an average of 60 days. The consumer can however always find anchovies in the market. Seafood quality and food safety have developed through new technology, and this has had a positive effect on off-vessel seafood prices paid to fishers.
Improving safety at sea and working conditions of fishers	The working conditions of the people working on large-scale vessels have improved. However, the progress towards improving safety at sea on small boats is minimal. The use of hydraulic cranes and introduction of emergency stops have increased in the fleet.	It may not be possible to see the effect of safety improvements concretely. However, the improvements on the large scale vessels have resulted in positive effects on work performance and quality of the work carried out.

10. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

The Ministry of Agriculture and Forestry aims to conserve fish stocks and their habitats. Another target of the ministry is to ensure sustainability of the fisheries sector by creating an effective system of monitoring, control and surveillance (MCS). To increase the income and welfare of fishers is another important pillar of the policy and planning of the ministry. Turkey continues to implement plans and programmes that limit or reduce the fishing fleet capacity.

REFERENCES

Gücü, A. C., Genç, Y., Dağtekin, M., Sakınan, S., Ak, O., Ok, M., & Aydın, İ. 2017. *On black sea anchovy and its fishery*. Reviews in Fisheries Science & Aquaculture, 25(3), 230 244.

TURKSTAT. 2019a. https://biruni.tuik.gov.tr/medas/?kn=97&locale=tr

TURKSTAT. 2019b.http://tuik.gov.tr/UstMenu.do?metod=temelist

Üstündağ E., and Kanyılmaz M. 2018. A Sub-Regıonal Analysıs of The Socıo-Economıc Sıtuatıon Of The Eastern Medıterranean Fisherıes, FAO EastMed Technical Documents (not published).

© Seafish

Report of United Kingdom of Great Britain and Northern Ireland

© Seafish

National report of United Kingdom of Great Britain and Northern Ireland

Natacha Carvalho
European Commission Joint Research Centre (JRC)
Ispra, Italy

Steve Lawrence
Seafish Authority
Edinburg, United Kingdom of Great Britain and Northern Ireland

1. OBJECTIVES AND CONTEXT

The current fleet assessment is part of a global assessment by FAO and aims to compare the financial and economic performance between fleets and over time within fleets, where possible.

The United Kingdom of Great Britain and Northern Ireland (UK) fleet produced approximately 0.8 percent of the global capture fisheries production in 2016 and was therefore included in the global fishing fleet performance assessment of FAO. It is also one of the most important producers in the EU fishing fleet, ranking second (2016) after Denmark in landed volume, and fifth in value terms.

This is the first time the UK participates in the FAO global studies on techno-economic performance of the main fishing fleets.

The information presented in this analysis was collected in 2018 by UK national authorities under the EU Data Collection Framework Regulation.[1] These data were compiled and analysed during two Expert Working Groups convened by the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce the 2019 Annual Economic Report (AER) on the EU fishing fleet.[2]

2. CHARACTERISTICS OF FISHING FLEETS OPERATING IN THE UNITED KINGDOM

The marine capture fisheries production[3] in the UK increased in the last 10 years from 624 684 tonnes in 2006 to 702 405 tonnes in 2016 (and +18 percent compared to the 595 993 tonnes in 2008).

The volume (in live-weight equivalent) of seafood landed by the UK national fleet[4] amounted to 700 614 tonnes in 2016, 22 percent more than in 2008 (575 003 tonnes). In 2017, landings increased to 726 366 tonnes.

---

[1] Council Regulation (EC) No 2017/1004 of 17 May 2017
[2] Scientific, Technical and Economic Committee for Fisheries (STECF) – The 2019 Annual Economic Report on the EU Fishing Fleet (STECF-19-06). Publications Office of the European Union, Luxembourg, 2019, JRC117567, ISBN 978-92-76-09517-0, doi:10.2760/911768 https://stecf.jrc.ec.europa.eu/reports/economic
[3] As reported by FAO (i.e., covers landings by all vessels in UK ports, irrespective of nationality)
[4] As reported under the DCF (i.e., covers landings by UK registered vessels)

At the same time, the number of active commercial fishing vessels decreased by 5.3 percent, from 4 899 in 2008 to 4 637 in 2016. Fleet capacity in terms of GT and kW also decreased, 8.6 percent and 7.8 percent respectively. Additionally, there were 1 667 inactive vessels, most of which were small-scale vessels under 10 m in length.

In 2016, the UK had the sixth largest EU fishing fleet in terms of vessel numbers, second in gross tonnage (GT) and the fourth most powerful fleet in engine power (kW) terms. The fleet generated over 11 757 jobs, corresponding to 8 888 FTEs or 1.9 FTE per active vessel.

The UK fleet is highly diversified with a broad range of vessel types targeting different species predominantly in the North Sea, West of Scotland, English Channel and Irish Sea.

Fleet structure varies substantially across the country, mainly as a result of the available fishing opportunities in the different areas. For example, key elements of the Scottish fleet engage in fisheries that are high volume, but lower priced, such as herring and mackerel in the North Sea and West of Scotland. For economic viability, the fleet has moved towards higher capacity vessels that cover large sea areas and can catch several hundred tonnes of seafood per trip. On the other hand, a significant proportion of the English and Welsh fleets have remained small-scale, operating in coastal waters and remaining economically viable by catching smaller quantities of more valuable seafood, such as sole and plaice in the Channel.

TABLE 1
Overview of the UK fishing fleet: number of vessels by main fishing gear and scale

Main fishing gear	Small-scale, coastal (<12 m)	Semi-industrial (12–18 m)	Industrial/ semi-industrial (18–40 m)	Industrial (> 40 m)	UK fleet	Percentage over total (%)
Drift and/or fixed netters	606		14		620	9.8
Dredgers	143	111	54		308	4.9
Demersal trawlers/demersal seiners	322	201	254	9	786	12.5
Pots and/or traps	1 992	80	15		2 087	33.1
Hooks	560		14		574	9.1
Polyvalent active gears only	16	14			30	0.5
Polyvalent passive gears only	99				99	1.6
Beam trawlers	31	24	50		105	1.7
Pelagic trawlers				28	28	0.4
Inactive vessels	1 593	37	33	4	1 667	26.4
Total number of vessels	**5 362**	**467**	**434**	**41**	**6 304**	**100**
Percentage over total	85	7.4	6.9	0.7	100	

Atlantic mackerel is by far the most important species for the national fishing fleet, making up over 30 percent of the total landings of the fleet in weight and 20 percent of the value in 2016. Other important species include *Nephrops,* Great Atlantic scallop, anglerfishes, herring, cod, haddock and blue whiting.

The main fishing harbours where the seafood is landed are Peterhead and Lerwick in Scotland, Newlyn and Brixham in England, Belfast and Kilkeel in Northern Ireland and Holyhead in Wales. Landings abroad are mainly in Norway, Denmark, the Netherlands and Ireland.

Production in 2016 was 700 614 tonnes of seafood (live-weight equivalent) with a landed value of USD 1.25 billion.

The UK national fleet as a whole was in a profit-making position in 2016 and improved on previous years' results. This improvement is largely attributed to high average prices across species groups and the continued decrease in energy costs. Overall, the cost structure has remained relatively constant over the years with variations in fuel prices.

The three economically most important fishing fleets in terms of volume of seafood landed are: (1) the industrial pelagic trawlers (>40 m LOA); (2) the industrial/semi-industrial demersal trawlers (18 to 40 m) and (3) the small-scale coastal fleet using pots and traps (<12 m).

The small-scale coastal fleet (<12 m) using pots and traps was the largest in terms of number of fishing vessels (1 992 vessels) and provided 6 percent of the total volume landed, followed by the industrial/semi-industrial demersal trawler fleet with 254 vessels, landing 18 percent of the total seafood. The industrial pelagic trawler fleet comprised only 28 vessels in 2016, but was responsible for 51 percent of the total volume of seafood landed and 27 percent of the value (see Table 2).

TABLE 2
Overview of main fishing fleets, 2016

Fishing fleet	Number of vessels	Volume of landings (tonnes)	Value of landings (USD million)	Scale[5]	Main fishing areas
Pelagic trawlers >40 m	28	354 753	336 179	Industrial	Northern North Sea (IVa); West of Scotland (VIa) and the Porcupine bank (VIIc)
Demersal trawlers 24–40 m	87	79 914	195 353	industrial/semi-Industrial	North Sea (IVa/b); West of Scotland (VIa) and the Irish Sea (VIIa)
Demersal trawlers 18–24 m	167	43 212	125 338	Semi-Industrial	
Pots and traps 10–12 m	178	11 349	31 945	Small-scale	Territorial waters West of Scotland (VIa); North Sea (IVa/b); Irish Sea (VIIa); English Channel (VIId/e)
Pots and traps <10 m	1 814	28 213	94 528	Small-scale coastal	

The main species landed by each fleet in volume are listed in Table 3.

TABLE 3
Main species landed by fishing fleet (percentage over total landed volume in 2016)

Fleets/species landed	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic mackerel MAC (61%)	Atlantic herring HER (26%)	Blue whiting WHB (11%)	Jack and horse mackerels JAX (2%)	European pilchard PIL (1%)
Demersal trawlers 18–40 m	Haddock HAD (26%)	Atlantic cod COD (13%)	Norway lobster NEP (11%)	Anglerfishes ANF (11%)	Saithe POK (8%)
Pots and traps <12 m	Whelk WHE (39%)	Edible crab CRE (38%)	European lobster LBE (7%)	Velvet swimcrab LIO (5%)	Norway lobster NEP (4%)

The main species landed by each fleet in value are listed in Table 4. In terms of commercial value generation, mackerel, herring, *Nephrops,* European lobster and Atlantic cod are most important to these fleets.

TABLE 4
Main species landed by fishing fleet (percentage over total landed value in 2016)

Fleets/species landed	1	2	3	4	5
Pelagic trawlers >40 m	Atlantic mackerel MAC (73%)	Atlantic herring HER (22%)	Blue whiting WHB (3%)	Jack and horse mackerels JAX (1%)	European pilchard PIL (0.3%)
Demersal trawlers 18–40 m	*Nephrops* NEP (19%)	Haddock HAD (18%)	Anglerfishes ANF (16%)	Atlantic cod COD (14%)	Megrims LEZ (5)
Pots and traps <12 m	European lobster LBE (34%)	Edible crab CRE (21%)	Whelk WHE (17%)	*Nephrops* NEP (15%)	Velvet swimcrab LIO (5%)

---

[5] Fleets are categorised as industrial-, semi-industrial, or artisanal/small-scale.

Fisheries in the EU are managed within the framework of the Common Fisheries Policy (CFP), which aims to ensure high long-term fishing yields for all stocks (fishing exploitation rates consistent with MSY) and contribute to an economically viable and competitive fisheries and aquaculture industry. To achieve these objectives, a number of management measures have been adopted, such as multi-annual plans (MAPs), technical measures, setting and allocation of fishing opportunities (TACs and quotas).

Almost all major stocks and fisheries targeted by the UK fleet are managed by means of a multi-annual plan (management or recovery plan), which typically combines a suite of different management tools and specific control rules.

The UK fleet is managed mainly through TACs and quotas, together with a range of input controls. The UK quota system covers around 77 percent of the UK's landings and involves producer organisations (POs) and the four UK administrations in managing fishing access. Additionally, local inshore authorities manage non-quota stocks in territorial waters. Fixed quota allocations (FQAs) are attached to vessel licences, but are managed by POs for vessels in the sector. For inshore and non-sector vessels, quotas are held by each of the four regional governments in a pool. Sector fishers can easily lease and temporarily swap quotas via their POs. Permanent transfers can also be made with the sale of the vessel and to a limited extent, independently. Inshore and non-sector quotas cannot be leased or transferred.

Currently, the highest profile regulation is the landing obligation, which is being phased in over a number of years. As part of the reformed CFP, catches of quota species may no longer be discarded; all of the catch must be landed and counted against the quota. The discard ban (i.e. landing obligation) was fully implemented in January 2019 and applies to all species subject to catch limits (TAC species) or to a minimum reference size (in the Mediterranean).

There has been no obvious economic impact of the landing obligation observed in the first two years of phased implementation (2015–2016). In general, the pelagic fishery was not expected to be affected too much, as in most of the cases fish is not sorted at sea and usually landed directly to processing plants where sorting takes place. Due to the phasing of the landing obligation in demersal fisheries there has not been any major issues recorded yet, but this may change when it starts to include the main potential choke stocks.

Restrictions on effort have been set in certain areas with the introduction of a number of marine conservation zones in England, Wales and Northern Ireland and marine protected areas in Scotland. In addition, sole and cod recovery zones, as well as limitations to activity in the Western Waters, are in place since the early years of the 21st century.

Although it will not significantly impact on 2016 results it should be noted that the effort controls of the cod recovery zone were repealed in November 2016 by EU Parliament and Council Regulation No 2016/2094. Under this amended regulation individual vessels' effort with regulated gears is unlimited, but the combined engine power capacity of the fleet is capped at 2006 or 2007 levels in each of the four management areas. In July 2017, North Sea Cod was certified as sustainably fished by the Marine Stewardship Council.

The increase in average price per tonne has impacted on the activities in the UK fish processing sector. With perceived increased competition between companies for raw materials many have acted to secure their supply by either strengthening relationships with vessel owners to outright purchasing fishing vessels. This can be a mutually beneficial relationship as it both secures supply for the processor and provides security for the fishers when they come to sell their catch.

3. TECHNO-ECONOMIC AND OPERATIONAL CHARACTERISTICS OF INDIVIDUAL FISHING UNITS

Pelagic trawlers >40 m LOA

The industrial pelagic trawler fleet can be characterised by an average length of 66 meters (LOA), a gross tonnage of 2 020 tonnes and engine power of 4 694 kW. The average crew size is 12 (see Table 5) and the main fishing gears carried are mid-water otter trawls and pelagic pair trawls (see Table 6).

The average number of days at sea per vessel in 2016 was 68 days, of which 33 were fishing days. The average number of fishing trips was 16, each averaging around 4 days.

The UK large pelagic trawler fleet is made up of 28 vessels and responsible for more than half of the total volume of seafood landed by the UK fishing fleet in 2016. This value of fish landed equated to 27 percent of the total value of seafood landings by the UK fleet.

The fleet was profitable, generating a net profit of USD 123.8 million in 2016. This segment has been consistently profitable and in 2016 profit margins increased significantly, as revenues increased despite a decrease in the volume of landings and costs decreased.

These vessels generally operate out of Scottish ports and target pelagic species in the Northern North Sea (IVa) and West of Scotland (VIa), using midwater otter trawls and pelagic pair trawls.

Mackerel and herring are the two main targeted species, accounting for 87 percent by weight and 95 percent by value of this fleet's total landings in 2016.

Mackerel prices were at a record high in 2011, but have since fallen and stabilised at around USD 1.1 per kg. In 2016, the average price for mackerel was 15 percent higher than in 2015 contributing to the fleet's improved profitability. The average price of herring also increased in 2016 and while the total volume of landings decreased (1.6 percent) slightly compared to 2015, at USD 0.82 per kg. The total value of herring landed increased 50 percent compared to 2015, which also contributed to higher profits in 2016.

More than half of the pelagic species caught by the UK fishing fleet are landed abroad, with Norway and the Netherlands being the main destinations.

Demersal trawlers and seiners 24–40 m LOA

The industrial demersal trawler fleet can be characterised by an average length of 28 meters (LOA) and a gross tonnage of 276 tonnes and engine power of 598 kW. The average crew size is 9 (see Table 5) and the main fishing gears carried include: bottom otter trawls, otter twin trawls and bottom pair trawls (see Table 6).

The average number of days at sea per vessel in 2016 was 208 days, of which 177 were fishing days. The average number of fishing trips was 40.

In 2016, this segment landed 11 percent (79 913 tonnes) of the total volume and 16.5 percent (USD 195.3 million) of the total value of landings of the UK fishing fleet.

The fleet targets a variety of species but in particular demersal species such as monkfish, cod, haddock, whiting and Norway lobster.

The fleet was profitable in 2016, while in 2015 it was making losses.

There were significant differences in the economic performance of vessels in this fleet operating in different areas of UK waters. For example, the *Nephrops* trawlers operating mainly in Area VIIa, North Sea and the West of Scotland all saw profitability increase in 2016. On average, the net profit of those mainly fishing in the North Sea was significantly higher than those fishing in other areas.

The demersal whitefish fleet followed the same trend with vessels operating mainly in the North Sea recording on average greater net profits. Vessels operating mainly in Area VIIa had a higher profit margin than those operating primarily in the North Sea or on the west coast of Scotland.

Demersal trawlers and seiners 18–24 m LOA

The industrial/semi-industrial demersal trawler fleet can be characterised by an average length of 20 meters (LOA) and a gross tonnage of 138 tonnes and engine power of 389 kW. The average crew size is 6 (see Table 5) and the main fishing gears carried include: bottom otter trawls, otter twin trawls and bottom pair trawls (see Table 6).

The average number of days at sea per vessel in 2016 was 176 days, of which 146 were fishing days. The average number of fishing trips was 55.

In 2016, this segment landed 6 percent (43 212 tonnes) of the total volume and 11 percent (USD 125.3 million) of the total value of landings of the UK fishing fleet.

The fleet targets a variety of species but in particular demersal species such as monkfish, cod, haddock, whiting and Norway lobster.

With higher prices for several species, revenue increased slightly and the fleet was profitable in 2016 while losses were made in 2015.

Pot and traps 10–12 m LOA

The small-scale pots and trap fleet can be characterised by an average length of 11 meters (LOA) and a gross tonnage of 16 tonnes and engine power of 138 kW. The average crew size is 3 (see Table 5) and main fishing gears carried include: pots, set gillnets and handlines (see Table 6).

The average number of days at sea per vessel in 2016 was 150 days, of which 128 were fishing days. The average number of fishing trips was 89. An average fishing trip would take around 2 days.

In 2016, this segment landed 1.6 percent (11 349 tonnes) of the total volume landed and 2.7 percent (USD 31.9 million) of the total value of landings of the UK fishing fleet.

The fleet as a whole was profitable in 2016, improving slightly on 2015 results.

Pot and traps <10 m LOA

The small-scale pots and trap fleet can be characterised by an average length of 7 meters (LOA) and an average gross tonnage of 4 tonnes and engine power of 61 kW. The average crew size is two (see Table 5) and main fishing gears carried include: pots, set gillnets and handlines (see Table 6).

The average number of days at sea per vessel in 2016 was 89 days, of which 49 were fishing days. The average number of fishing trips was 41, each with a duration of less than 2 days.

This fleet is the main employer for the UK fishing fleet with 1 235 FTEs in 2016. There are 1 814 vessels in the segment. Some 725 of these vessels could be regarded as low activity vessels (with annual landings of less than GBP 10 000).

Whelks account for the majority of the weight of landings, however higher priced lobster species are more important to the fleet in terms of value. Lobsters showed some of the highest average prices of all species landed by the UK fleet in 2016.

The fleet as a whole was profitable, improving on 2015 results. Landings weight and value both increased by 10 percent. If low activity vessels are excluded from the calculations, then net profit margin increases further.

TABLE 5
Basic information of each fleet

	Pelagic trawlers (>40 m)	Demersal trawlers (24–40 m)	Demersal trawlers (18–24 m)	Pots and traps (10–12 m)	Pots and traps (<10 m)
Average vessel age	13	23	29	28	23
Average length overall (LOA)	66	28	20	11	7
Average gross tonnage (GT)	2 020	276	138	16	4
Average power of main engines in kilowatts (KW)	4 694	598	389	138	61
Average crew size (persons)	12	9	6	3	2
Average days at sea	68	208	176	150	89
Average days fishing at sea	33	177	146	128	49
Number of fishing trips	16	40	55	89	41

The main fishing methods/fishing gears employed by fishing fleet are presented in Table 6.

TABLE 6
Fishing methods employed by percentage of fishing effort (fishing days)[6]

	Pelagic trawlers >40 m	Demersal trawlers 18–40 m	Pots and traps <12 m
Pots			94 %
Set gillnets (anchored)			2.5%
Handlines			1.5%
Demersal trawl (bottom otter trawl)		70%	
Otter twin trawl		12%	
Bottom pair trawl		10%	
Mid water (otter) trawl	68%		
Pelagic (pair) trawl	31%		
Seine nets		5% (Scottish seines)	

Table 7 presents the estimated number of full-time and part-time workers on each of the main fleets. Most workers on these vessels are full-time employees. Low activity vessels (with an annual turnover of less than GBP 10 000) tend to be active seasonally or part-time, spending on average less than 25 days at sea. There are very few female fishers. Women typically have onshore roles, such as accounting and other administrative roles although there are some female deckhands.

Not much information is available on the age structure of the labour force of these fleets, but it is said to be an aging industry. Despite a large proportion of fishers aged 65 or over, the average age is 42 years, which is comparable with the average in the UK labour force. The small-scale fleet, being a popular activity amongst retired fishers that worked on larger vessels, has the largest proportion of workers 65 years or older. However, the same fleet also comprises the largest proportion of youngsters between 15 and 24 years.

One of the major challenges faced by fishing firms is recruiting and retaining reliable and skilled crew, particularly in some rural communities where population growth is slower than urban areas. In some cases skippers and vessel owners are forced to postpone or cancel fishing trips, losing days at sea and fishing income, because they have been unable to recruit enough crew. Sometimes shortages can be compensated by hiring crew from non-EEA countries, such as the Philippines, on special seafarers, transit visas. Under this arrangement, however, vessels must operate outside territorial waters.

Crewmembers are generally UK or EU nationals. EU nationals active on the UK vessels are mainly originating from Latvia, Lithuania, Romania and Poland. They are usually employed as deckhands on large-scale vessels, although some also hold

---

[6] Percentages do not add up to 100 percent, because some vessel information was not available.

positions as engineers, skippers or first mates. Less than 10 percent of the fishing crews consist of non-EU/EEA nationals, originating mainly from the Philippines, Ghana and India. The non-EU/EEA crewmembers work chiefly as deckhands in the Scottish or Northern Irish demersal trawl sector.

It can be challenging for newcomers to join the fishing industry without having fishing rights. Many fishing firms are inherited. Newcomers need to make a significant financial investment to join the industry and access to credit may be a challenge as well. Fishers in the UK are generally compensated on a share basis and new recruits typically get a lower share than a fully trained and experienced crewmember. Remuneration is closely linked to vessel performance and poor catches could deter new recruits from staying with a vessel.

TABLE 7
Labor Employed in Fishing and main socio-economic indicators

	Total employed	Full-time (FTE)	Average crew wage per FTE (EUR thousand)[7]	Labor productivity (GVA per FTE) (EUR thousand)
Pelagic trawlers >40 m LOA	334	103	640.3	1 979.2
Demersal trawlers 18–40 m LOA	1 794	2 276	32.8	75 500
Pots and traps (<10 m)	3 016	1 235	19.9	42 280
Total	5 144	3 614		

4. FINANCIAL AND ECONOMIC CHARACTERISTICS OF THE FLEET SEGMENTS
Pelagic trawlers >40 m
Capital investments
The total asset value of the 28 vessels in this fleet segment amounted to around USD 923.5 million in 2016; with tangible assets valued at USD 179.9 million and intangible assets (quota and fishing rights) estimated at USD 743.5 million. The average asset value per vessel was around USD 33 million, consisting of USD 6.4 million in tangible assets and USD 26.6 million in intangible assets.

In-year investments in 2016 added-up to just USD 502 000, a decrease of 89 percent compared to 2015 (USD 4.0 million). The average investment in 2016 was some USD 18 000 per vessel.

Several factors influence the capital value of the fleet, including variations in investments from year to year, in some cases dis-investments, as well as variations in the value of fishing rights.

Operating and owner costs
Total gross costs of this pelagic trawler fleet segment amounted to USD 194 million in 2016 (average of USD 6.9 million per vessel), with operating costs equating to 65 percent. The remaining 35 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Estimated capital costs (annual depreciation and opportunity cost of capital) were USD 20.8 million.

Among the operating costs, crew costs were highest, equating to 58 percent of the operating costs, followed by other variable costs (28 percent) and energy costs (15 percent). The highest owner related costs were made for repair and maintenance (80 percent of owner costs), followed by other fixed costs (15 percent) and the leasing/rental of quota (5 percent).

In 2016, on average a vessel in this fleet segment spent USD 2.6 million on crew costs, USD 654 000 on fuel costs and USD 1.2 million on other variable costs. The

---

[7] Exchange rates can affect trend analysis (pound to euro to dollar). Between 2014 and 2016 there were substantial changes in the exchange rate which would certainly impact this analysis. Exchange rate used: 1 EUR = 1.1069 USD (average of 2016)

average expenditures on repair and maintenance were USD 1.9 million, USD 353 000 on other fixed costs and USD 125 000 on quota.

Revenues

Revenue of this fleet segment in 2016 added up to almost USD 342.6 million, an increase of nearly 11 percent compared to 2015. The average revenue per vessel was around USD 12.2 million in 2016.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 148.6 million and a gross profit of USD 124.7 million. On average, this amounted to a net cash flow of USD 5.3 million and a gross profit of USD 4.4 million per vessel. The fleet saw an improvement in the economic results compared to 2015. Profitability was high with a net profit margin of 36 percent. The fleet obtained a GVA to revenue of 65 percent and a RoFTA of 68 percent. RoI was estimated at 13.4 percent.

Demersal trawlers 24–40 m

Capital investments

The total asset value of the 87 vessels in this fleet segment amounted to around USD 167.5 million in 2016, with tangible assets valued at USD 48.1 million and intangible assets (quota and fishing rights) estimated at USD 119.4 million. The average asset value per vessel was around USD 1.9 million, including USD 553 000 in tangible assets and USD 1.4 million in intangible assets.

In-year investments in 2016 were some USD 11 million, which represents an increase of over 72 percent compared to 2015 (USD 5.8 million). The average in-year investment per vessel was USD 127 000.

Several factors influence the capital value of the fleet, including variations in investments from year to year, in some cases dis-investments, as well as variations in the value of fishing rights.

Operating and owner costs

Total gross costs of this fleet segment added up to USD 160 million in 2016 (average of USD 1.8 million per vessel), with operating costs equating to 67 percent. The remaining 31 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Estimated capital costs (annual depreciation and opportunity cost of capital) were USD 5.9 million.

Among the operating costs, crew costs were highest, equating to 45 percent of the operating costs, followed by other variable costs (35 percent) and energy costs (20 percent). The highest owner related costs were made for the leasing/rental of quota (49 percent of owner costs), followed by repair and maintenance (34 percent) and other fixed costs (17 percent).

In 2016, on average a vessel spent USD 562 000 on crew costs, USD 244 000 on fuel costs and USD 434 000 on other variable costs. The average expenditures on repair and maintenance were USD 202 000, on other fixed costs USD 103 000 and USD 294 000 on quota.

Revenues

Revenue of this fleet segment in 2016 reached almost USD 204.8 million, an increase of 8 percent compared to 2015. The average revenue per vessel was USD 2.35 million.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 44.8 million and a gross profit of USD 12.7 million. On average, this amounted to a net cash flow of USD 515 000

and a gross profit of USD 146 000 per vessel. The fleet saw improvement in economic performance results, moving from net losses in 2015 to posting profits in 2016. Profitability was reasonable with a GVA to revenue of 46 percent and a net profit margin of 6 percent. RoFTA was estimated at 25.8 percent and RoI at 7.4 percent.

Demersal trawlers 18–24 m
Capital investments
The total asset value of the 167 vessels in this fleet segment added up to around USD 170.8 million in 2016, with tangible assets valued at USD 65.4 million and intangible assets (quota and fishing rights) estimated at USD 105.4 million. The average asset value was around USD one million per vessel, including USD 392 000 in tangible assets and USD 631 000 in intangible assets.

In-year investments in 2016 summed-up to USD 7.8 million, which represents a decrease of 85 percent compared to 2015 (USD 17.8 million). The average in-year investments were USD 47 000 per vessel.

Operating and owner costs
Total gross costs amounted to USD 106.3 million in 2016 (i.e. an average of USD 637 000 per vessel), with operating costs equating to 69 percent. The remaining 31 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) of this fleet segment were USD 6.1 million.

Among the operating costs of USD 73.8 million the crew costs were highest in 2016, equating to 45 percent of the operating costs, followed by other variable costs (32 percent) and energy costs (23 percent).

The owner related costs were USD 32.5 million for this fleet segment and the highest costs within this category were made for repair and maintenance (41 percent of owner costs), followed by the leasing/rental of quota (33 percent) and other fixed costs (26 percent).

In 2016, on average a vessel spent USD 198 000 on crew costs, USD 100 000 on fuel costs and USD 144 000 on other variable costs. The average expenditures on repair and maintenance were USD 80 000, on other fixed costs USD 50 000 and on quota USD 64 000.

Revenues
Revenue of this fleet segment in 2016 added up to almost USD 131.3 million, which represents an increase of almost 5 percent compared to 2015. The average revenue per vessel was around USD 787 000.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 25 million and a gross profit of USD 7.3 million. On average, a net cash flow of USD 150 000 and a gross profit of USD 44 000 per vessel was realized. The fleet saw an improvement in its economic results, moving from net losses in 2015 to posting profits in 2016. Profitability was reasonable in 2016 with a GVA to revenue of 44 percent and a net profit margin of 5.3 percent. RoFTA was estimated at 10.6 percent and RoI at 4.1 percent.

Pots and traps 10–12 m
Capital investments
The total asset value of the 178 vessels in this fleet segment amounted to around USD 29.3 million in 2016, with tangible assets valued at USD 14.3 million and intangible assets (quota and fishing rights) estimated at USD 14.9 million. The average asset value was approximately USD 164 000 per vessel, including USD 80 000 in tangible assets and some USD 84 000 in intangible assets.

In-year investments by this fleet segment in 2016 totalled USD 763 000, a 50 percent decrease compared to 2015 (USD 1.5 million). The average in-year investment per vessel was just over USD 4 000.

Operating and owner costs

Total gross costs added up to USD 22.1 million in 2016 (i.e. some USD 124 000 per vessel), with operating costs equating to 82 percent. The remaining 18 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) were USD 1.5 million.

Among the operating costs of USD 18.1 million of this fleet segment, other variable costs were highest, equating to 46 percent of the operating costs, followed by crew costs (44 percent) and energy costs (10 percent).

The owner related costs were USD 3.9 million. Within this category the highest costs were made for other fixed costs (68 percent of owner costs), followed by repair and maintenance (32 percent) and the leasing/rental of quota (<1 percent).

In 2016, on average a vessel in this fleet segment spent USD 45 000 on crew costs, USD 11 000 on fuel costs and USD 47 000 on other variable costs. The average expenditure on repair and maintenance were USD 7 000 and on other fixed costs USD 15 000.

Revenues

Revenue of this fleet segment in 2016 summed up to almost USD 33.1 million, an 11.5 percent increase compared to 2015. The average revenue per vessel was USD 186 000 in 2016.

Economic and financial performance of fishing vessels

In 2016, this fleet segment generated a net cash flow of USD 10.9 million (up from 9.9 million in 2015) and a gross profit of USD 9.5 million. On average, a net cash flow of USD 62 000 and a gross profit of USD 54 000 per vessel was generated. The fleet made some improvements on previous years. Profitability was high with a GVA to revenue of 57 percent and a net profit margin of 28.6 percent. RoFTA was estimated at 66.2 percent and RoI at 32.3 percent.

Pots and traps <10 m

Capital investments

The total asset value of the 1 814 vessels in the fleet segment amounted to around USD 96.9 million in 2016, with tangible assets valued at USD 52.6 million and intangible assets (quota and fishing rights) estimated at USD 44.3 million. The average asset value per vessel was USD 53 000, including USD 29 000 in tangible assets and USD 24 000 in intangible assets.

In-year investments in 2016 totalled USD 7.6 million, a 40 percent increase compared to 2015 (USD 5.5 million). The average in-year investment per vessel was around USD 4 000.

Operating and owner costs

Total gross costs amounted to USD 69.7 million in 2016 (i.e. an average of USD 38 000 per vessel), with operating costs equating to 80 percent. The remaining 20 percent consisted of repair and maintenance costs, other fixed costs and the lease/rental payments for quota. Additionally, estimated capital costs (annual depreciation and opportunity cost of capital) for this fleet segment were USD 5.3 million.

Among the operating costs of USD 55.7 million the crew costs were highest, equating to 49 percent, followed by other variable costs (35 percent) and energy costs (17 percent). The owner related costs of USD 14 million were made on other fixed costs

(57 percent of owner costs), followed by repair and maintenance (43 percent) and only a minor sum for leasing/rental of quota (<1 percent).

In 2016, an average vessel in this segment spent USD 15 000 on crew costs, USD 5 000 on fuel costs and approximately USD 11 000 on other variable costs. The average expenditures on repair and maintenance were just over USD 3 000 and USD 4 000 on other fixed costs.

Revenues
Revenue of this fleet segment in 2016 added up to almost USD 100 million, which represents a 14 percent increase compared to 2015. The average revenue per vessel was around USD 55 000.

Economic and financial performance of fishing vessels
In 2016, this fleet segment generated a net cash flow of USD 30.5 million (up from 15.9 million in 2015) and a gross profit of USD 25.5 million. On average, a net cash flow of nearly USD 17 000 and a gross profit of USD 14 000 were generated per vessel. The fleet improved on previous years' results. Profitability was high with a GVA to revenue of 58 percent and a net profit margin of 25 percent. RoFTA was estimated at 48 percent and RoI at 26 percent.

5. FINANCIAL SERVICES AVAILABLE TO THE FISHERIES SECTOR INCLUDING INSTITUTIONAL CREDIT PROGRAMMES
Fishing vessel owners/fishing cooperatives and producer organisations in the UK have access to credit from the European Maritime Fisheries Fund (EMFF) and European Investment Bank (EIB).

The EMFF supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy. The EMFF has an overall budget of over USD 9.5 billion (EU + national contributions) for the period 2014-2020, of which USD 7 billion is the EU contribution. The allocation for the UK is set at USD 343 million, with an EU contribution of USD 269.1 million (i.e., co-funding of 78 percent). Of this allocation, USD 74.7 million is allocated to support a sustainable and innovative fishing sector.

Support from the EMFF can be provided through grants and financial instruments. Financial instruments are available to all kinds of recipients within the fishery and aquaculture sectors undertaking revenue-generating projects. The broad range of EMFF-supported financial instruments include: (i) Loans, which may be available where none are offered commercially (e.g. from banks), or on better terms; (ii) Microcredits, which are smaller loans made to people sometimes excluded from access to finance, often provided over a short term and with no or low collateral required; (iii) Guarantees, where assurance is given to a lender that their capital will be repaid if a borrower defaults on a loan, and (iv) Equity, where capital is invested in return for total or partial ownership of a firm.

The lending activities by the European Investment Bank (EIB) are aligned to EU standards and priorities and can cover the whole fishery value chain, ranging from input and equipment supply to wholesale and retail networks. In particular, the EIB provides financing for investments in fisheries that make a significant contribution to more resource efficient food production, improved or restored ecosystems, innovative solutions for current and future challenges in the sector, and the productive and sustainable use of by-products from food production.

6. SUBSIDIES AND SUPPORT TO THE SECTOR

The UK provides a tax exemption on fuel for fishing vessel owners who are licensed. The fuel price in 2016 for the UK fleet averaged around EUR 0.5 per litre.

The UK also has a system that provides financial compensation for reduction of fishing effort, such as scrapping of fishing vessels. To ensure compliance with the landing obligation, EMFF funds also foresee measures for the investment in more selective fishing gears and for technical adjustments.

7. TECHNOLOGICAL INNOVATIONS IN GEARS, EQUIPMENT AND VESSELS THAT IMPACT FISHING VESSEL ECONOMIC PERFORMANCE

With the landing obligation being implemented in EU fisheries, the need for innovation and development of new types of gear technology has become crucial. Various methods for reducing bycatch, from mesh panels to strategically placed lights, are being trialled. Investing in innovation is necessary for the continued survival of the industry, but achieving these improvements requires a balanced approach which takes into account the economic realities of many vessel owners which are unable to access the required capital for these investments.

Gear approval by the government can be a lengthy process and (depending on the scale of alterations) could incur significant costs. So far, the four national governments have supported a number of projects including the Scottish industry-led Gear Innovation and Technology Advisory Group, a two-year gear trial project in Northern Ireland and the fully documented fishing scheme.

The current uncertainties around Brexit, accompanied with changes in regulations make long-term planning a challenge. The focus on short-term day-to-day operations, whilst necessary for the survival of a large number of vessels, can hinder innovation and development in the fleet.

8. SUMMARY DESCRIPTION OF NATIONAL PLANS AND POLICIES FOR ADJUSTMENT OF FLEET CAPACITIES

Article 22 of the CFP (EC Regulation 1380/2013) stipulates that Member States must ensure that from 2014 onwards the fishing capacity of their fleet at no time exceeds the fishing ceilings outlined in Annex II to Regulation (EU) No1380/2013. The UK has been fully compliant with fleet ceilings since.

The UK has operated several decommissioning schemes from the mid-1990s, through to the most recent scheme operated in 2010/11, which limited or reduced the fleet capacity. The emphasis in the UK in recent years has been on the use of alternative management measures, such as quota limits and licencing controls to manage fleet activity and capacity.

An Entry/Exit regime has been in place since 1993 as part of the UK licensing system, so that a new vessel can only be brought into the fleet if another vessel's exit has already occurred. Exits funded with public aid, through official decommissioning schemes, occurred in 2003 and 2004 (related to the need to reduce fishing effort under the Cod Recovery regime), in 2007 (focussed on reducing effort related to Western Channel sole), and in 2008/9 (focussed on the English inshore fleet).

The number and capacity of demersal trawlers and seiners has been declining since 2008 and this trend continued in 2015 and 2016. This has resulted in a reduced fishing fleet in UK demersal fisheries, particularly in the Cod Recovery Zone. The number and capacity of pelagic trawlers has declined since 2012. In 2016 the pelagic trawler fleet contained seven vessels less than in 2012.

Annexes

Overview of fishing fleet information by major fleet segment, including basic technological data, costs, earnings and financial indicators

Annex 1 – Denmark

Denmark 2016	Unit	Pelagic trawlers >40 m	Demersal trawlers >40 m	Demersal trawlers 24–40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Small-scale passive gears <10 m	Selected fleets, total
Number of vessels	number	22	10	34	49	116	774	1 005
Total vessel power	kW	52 528	13 299	21 282	14 993	22 141	25 749	149 993
Total vessel tonnage	GT	27 738	6 232	10 200	5 263	4 413	2 161	56 008
Mean age of vessels	year	22	34	26	31	40	32	185
Mean LOA of vessels	meter	56	46	31	21	15	7	176
Engaged crew	number	130	46	150	154	221	180	882
FTE national	number	197	64	303	236	249	132	1 181
Unpaid labour	number	1	3	5	17	94	138	258
Live weight of landings	Kg	363 359 393	85 850 050	50 167 308	47 712 790	19 553 759	4 122 863	570 766 164
Value of landings	USD	204 841 696	34 160 614	80 973 323	54 512 782	43 582 885	13 820 074	431 891 374
Gross value of landings	USD	204 289 692	33 774 897	80 974 718	54 513 335	43 572 700	13 942 300	431 067 642
Other income	USD	5 391 249	802 839	531 874	-	-	345 436	7 071 398
Income from leasing out quota	USD	17 203 864	1 550 603	793 867	1 872 260	1 256 847	490 533	23 167 974
Operating subsidies	USD	-	-	-	-	-	-	-
Total income	USD	226 884 806	36 128 338	82 300 459	56 385 595	44 829 547	14 778 268.31	461 307 013
Personnel costs	USD	26 665 239	5 087 214	20 824 059	14 609 544	9 567 051	1 763 059	78 516 166
Value of unpaid labour	USD	4 621 853	1 358 186	3 524 058	3 639 072	7 025 644	7 126 880	27 295 693
Energy costs	USD	12 253 504	3 552 045	8 906 210	4 250 837	3 836 552	588 706	33 387 854
Other variable costs	USD	5 971 668	2 125 511	7 731 603	6 584 674	5 156 161	2 110 771	29 680 388
Repair & maintenance costs	USD	14 001 675	4 412 374	8 266 123	6 450 849	5 780 526	2 880 815	41 792 362
Other non-variable costs	USD	6 738 763	1 133 267	2 719 365	2 516 193	2 666 284	1 726 826	17 500 698
Lease/rental payments for quota	USD	15 208 329	4 556 483	4 592 316	2 066 425	1 834 248	619 689	28 877 490
Consumption of fixed capital	USD	47 950 573	3 627 762	11 506 743	7 616 446	5 203 646	1 841 863	77 747 033
Opportunity cost of capital	USD	1 229 670	81 178	244 186	166 271	150 315	57 978	1 929 597

Denmark 2016	Unit	Pelagic trawlers >40 m	Demersal trawlers >40 m	Demersal trawlers 24–40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Small-scale passive gears <10 m	Selected fleets, total
Investments	USD	118 742 844	17 054 597	22 306 397	-7 795 355	-6 566 352	- 183 841	143 558 290
Long/short debt	USD	755 948 764	52 155 977	191 915 054	136 890 724	109 762 352	17 722 901	1 264 395 772
Total assets	USD	1 300 163 566	107 636 013	355 992 602	277 308 905	205 323 840	31 958 944	2 278 383 869
Value of physical capital	USD	384 271 833	25 368 029	76 308 073	51 959 694	46 973 343	18 117 997	602 998 970
Value of quota and other fishing rights	USD	837 325 577	68 850 070	248 631 451	237 529 913	171 236 943	14 302 526	1 577 876 479
Revenue	USD	209 680 941	34 577 736	81 506 592	54 513 335	43 572 700	14 287 736	438 139 039
Total gross cost	**USD**	**80 839 178**	**20 866 894**	**53 039 676**	**36 478 521**	**28 840 822**	**9 689 866**	**229 754 957**
Net cash flow	USD	128 841 763	13 710 842	28 466 916	18 034 814	14 731 878	4 597 870	208 384 083
Gross profit	USD	48 478 996	3 975 995	11 573 990	6 479 682	6 437 138	1 645 785	78 591 586
Net profit before taxes	USD	47 249 326	3 894 818	11 329 804	6 313 411	6 286 823	1 587 807	76 661 989
Net profit margin	%	22.5%	11.3%	13.9%	11.6%	14.4%	11.1%	17.5%
RoFTA	%	12.3%	15.4%	14.8%	12.2%	13.4%	8.8%	12.7%
RoI	%	3.9%	4.1%	3.5%	2.2%	2.9%	4.9%	3.5%
GVA	USD	155 507 002	18 798 056	49 290 975	32 644 357	24 298 929	6 360 929	286 900 248
GVA to revenue	%	74.2%	54.4%	60.5%	59.9%	55.8%	44.5%	65 5%

Annex 2 – France

France 2016	Unit	Purse seiners >40 m Long-distant fleet	Demersal trawlers 24–40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Gillnetters 10–12 m	Hook and line <10 m	Selected fleets, total
Number of vessels	number	22	57	134	153	173	239	778
Total vessel power	kW	75 692	35 780	57 039	38 333	28 393	23 020	258 257
Total vessel tonnage	GT	46 003	13 729	17 529	7 178	2 202	1 001	87 642
Mean age of vessels	year	16	17	23	28	25	25	135
Mean LOA of vessels	meter	78	28	22	15	12	8	163
Engaged crew	number	603	412	687	518	553	314	3 087
FTE national	number	603	401	649	452	354	137	2 595
Unpaid labour	number	-	-	-	-	-	-	-
Live weight of landings	Kg	114 663 481	38 682 478	51 409 657	18 713 184	10 089 476	3 364 069	236 922 345
Value of landings	USD	164 368 372	118 353 450	166 571 859	95 998 111	50 802 181	24 811 019	620 904 992
Gross value of landings	USD	164 368 371	117 801 280	170 344 666	99 141 096	61 557 721	28 326 996	641 540 129
Other income	USD	-	627 661	3 014 293	2 605 155	1 451 742	169 917	7 868 767
Income from leasing out quota	USD	-	-	-	-	-	-	-
Operating subsidies	USD	-	467 137	1 650 378	1 384 059	643 922	287 177	4 432 672
Total income	USD	164 368 371	118 896 077	175 009 337	103 130 310	63 653 384	28 784 089.40	653 841 569
Personnel costs	USD	50 095 865	36 006 478	60 309 580	41 481 285	29 148 907	11 701 493	228 743 607
Value of unpaid labour	USD	-	-	-	-	-	-	-
Energy costs	USD	22 281 568	21 206 732	26 084 269	12 379 866	2 901 621	1 518 173	86 372 230
Other variable costs	USD	6 915 196	15 178 457	27 113 953	13 318 197	7 591 094	3 716 580	73 833 477
Repair & maintenance costs	USD	34 360 890	9 870 138	17 090 544	10 089 348	3 196 450	1 687 636	76 295 006
Other non-variable costs	USD	26 305 561	15 365 045	13 457 902	7 746 799	8 677 361	3 093 362	74 646 030
Lease/rental payments for quota	USD	-	-	-	-	-	-	-
Consumption of fixed capital	USD	-	13 009 730	15 417 144	8 438 323	4 931 361	1 846 639	43 643 196
Opportunity cost of capital	USD	-	145 024	151 141	78 536	47 268	19 090	441 059

France 2016	Unit	Purse seiners >40 m Long-distant fleet	Demersal trawlers 24–40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Gillnetters 10–12 m	Hook and line <10 m	Selected fleets, total
Investments	USD	-	177 122	2 904 937	1 377 682	2 403 559	139 074	7 002 375
Long/short debt	USD	-	-	-	-	-	-	-
Total assets	USD	-	-	-	-	-	-	-
Value of physical capital	USD	-	85 564 287	89 173 046	46 336 185	27 888 216	11 263 126	260 224 860
Value of quota and other fishing rights	USD	-	-	-	-	-	-	-
Revenue	USD	164 368 371	118 428 940	173 358 959	101 746 251	63 009 462	28 496 913	649 408 896
Total gross cost	**USD**	**139 959 079**	**97 626 850**	**144 056 247**	**85 015 496**	**51 515 432**	**21 717 245**	**539 890 350**
Net cash flow	USD	24 409 292	20 802 090	29 302 712	16 730 755	11 494 030	6 779 667	109 518 547
Gross profit	USD	24 409 292	7 792 361	13 885 568	8 292 432	6 562 669	4 933 029	65 875 351
Net profit before taxes	USD	24 409 292	7 647 337	13 734 428	8 213 896	6 515 401	4 913 939	65 434 292
Net profit margin	%	14.9%	6.5%	7.9%	8.1%	10.3%	17.2%	10.1%
RoFTA	%		8.9%	15.4%	17.7%	23.4%	43.6%	25.1%
RoI	%		8.9%	15.4%	17.7%	23.4%	43.6%	25.1%
GVA	USD	74 505 157	56 808 568	89 612 292	58 212 040	40 642 937	18 481 161	338 262 154
GVA to revenue	%	45.3%	48.0%	51.7%	57.2%	64.5%	64.9%	52.1%

Annex 3 – Germany

Germany 2016	Unit	Deep-sea trawlers >40 m	Deep-sea trawlers 24–40 m	Beam trawlers 18–24 m	Beam trawlers 12–18 m	Passive gears <10 m	Pelagic trawlers >40 m	Selected fleets, total
Number of vessels	number	7	9	63	111	718	14	922
Total vessel power	kW	15 724	4 275	13 836	21 671	16 999	25 963	98 468
Total vessel tonnage	GT	12 898	2 343	3 860	3 479	1 514	28 053	52 147
Mean age of vessels	year	26	25	35	40	28	33	187
Mean LOA of vessels	meter	66	30	20	16	6	51	189
Engaged crew	number	189	49	160	176	693	-	1 267
FTE national	number	147	37	132	146	528	-	990
Unpaid labour	number	-	-	-	-	-	-	-
Live weight of landings	Kg	22 601 798	7 890 157	4 113 777	3 868 436	4 835 655	167 784 868	211 094 691
Value of landings	USD	51 613 512	18 968 686	29 953 213	29 382 726	6 699 034	84 065 369	220 682 541
Gross value of landings	USD	51 613 512	18 969 131	29 953 213	29 382 726	6 699 034	-	136 617 615
Other income	USD	291 545	8 550	1 691 145	811 692	386 128	-	3 189 059
Income from leasing out quota	USD	-	-	-	-	-	-	-
Operating subsidies	USD	-	-	16 965	8 711	295 117	-	320 793
Total income	USD	51 905 057	18 977 680	31 661 323	30 203 128	7 380 279	-	140 127 467
Personnel costs	USD	16 684 826	6 329 484	6 857 901	6 471 963	857 192	-	37 201 366
Value of unpaid labour	USD	-	240 122	3 285 674	4 636 362	893 789	-	9 055 947
Energy costs	USD	4 073 517	2 156 247	2 997 001	2 636 555	412 714	-	12 276 034
Other variable costs	USD	7 715 921	2 134 058	215 302	320 534	778 855	-	11 164 670
Repair & maintenance costs	USD	4 960 425	2 546 740	4 024 065	3 947 265	697 882	-	16 176 377
Other non-variable costs	USD	3 645 980	599 350	4 183 268	3 857 586	1 666 277	-	13 952 461
Lease/rental payments for quota	USD	-	-	-	-	-	-	-
Consumption of fixed capital	USD	8 823 951	1 917 849	2 792 335	2 562 812	1 152 239	-	17 249 185
Opportunity cost of capital	USD	-168 321	-30 199	-37 106	-31 653	-15 554	-	(282 834)

Germany 2016	Unit	Deep-sea trawlers >40 m	Deep-sea trawlers 24–40 m	Beam trawlers 18–24 m	Beam trawlers 12–18 m	Passive gears <10 m	Pelagic trawlers >40 m	Selected fleets, total
Investments	USD	2 008 349	80 560	10 160 576	6 110 526	1 442 531	-	19 802 541
Long/short debt	USD	-	-	-	-		-	-
Total assets	USD	-	-	-	-	-	-	-
Value of physical capital	USD	54 514 356	9 780 503	12 017 599	10 251 627	5 037 595	-	91 601 680
Value of quota and other fishing rights	USD	-	-	-	-	-	-	-
Revenue	USD	51 905 057	18 977 680	31 644 358	30 194 417	7 085 162		139 806 675
Total gross cost	**USD**	**37 080 668**	**13 765 878**	**18 277 539**	**17 233 903**	**4 412 919**	**-**	**90 770 907**
Net cash flow	USD	14 824 389	5 211 802	13 366 820	12 960 515	2 672 243	-	49 035 768
Gross profit	USD	6 000 438	3 293 954	10 574 485	10 397 703	1 520 004	-	31 786 583
Net profit before taxes	USD	6 168 759	3 324 152	10 611 591	10 429 356	1 535 558	-	32 069 417
Net profit margin	%	11.9%	17.5%	33.5%	34.5%	21.7%		22.9%
RoFTA	%	11.3%	34.0%	88.3%	101.7%	30.5%		35.0%
RoI	%	11.3%	34.0%	88.3%	101.7%	30.5%		35.0%
GVA	USD	31 509 215	11 541 286	20 224 721	19 432 477	3 529 434		86 237 134
GVA to revenue	%	60.7%	60.8%	63.9%	64.4%	49.8%		61.7%

Annex 4 – Italy

Italy 2016	Unit	Purse seiners >40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Passive gears 6–12 m	Selected fleets, total
Number of vessels	number	11	633	1 232	5 144	7 020
Total vessel power	kW	7 503	178 472	170 275	190 663	546 913
Total vessel tonnage	GT	2 684	39 532	23 075	11 637	76 928
Mean age of vessels	year	25	31	28	32	116
Mean LOA of vessels	meter	43	21	14	8	86
Engaged crew	number	165	2 453	3 272	9 469	15 359
FTE national	number	113	2 453	3 236	7 270	13 071
Unpaid labour	number	-	-	-	-	-
Live weight of landings	Kg	2 765 460	24 144 406	23 840 876	21 059 018	71 809 760
Value of landings	USD	25 066 331	189 519 092	192 914 979	185 111 207	592 611 610
Gross value of landings	USD	25 066 331	189 519 092	192 914 979	185 111 207	592 611 610
Other income	USD	-	2 066 425	116 309	2 365 221	4 547 955
Income from leasing out quota	USD	-	-	-	-	-
Operating subsidies	USD	-	-	-	-	-
Total income	USD	25 066 331	191 585 517	193 031 288	187 476 429	597 159 565
Personnel costs	USD	9 038 963	48 633 343	49 701 151	30 288 611	137 662 068
Value of unpaid labour	USD	-	-	-	46 571 329	46 571 329
Energy costs	USD	1 273 999	56 531 954	47 602 637	18 830 972	124 239 561
Other variable costs	USD	1 194 925	16 429 082	16 930 264	12 336 320	46 890 590
Repair & maintenance costs	USD	1 018 765	8 381 837	8 453 989	9 597 728	27 452 320
Other non-variable costs	USD	963 083	6 828 464	6 173 917	8 654 625	22 620 089
Lease/rental payments for quota	USD	-	-	-	-	-
Consumption of fixed capital	USD	3 499 177	36 815 899	19 002 323	32 790 099	92 107 499
Opportunity cost of capital	USD	257 574	2 417 596	1 261 592	2 040 936	5 977 698
Investments	USD	-	4 224 079	4 130 738	7 228 799	15 583 616

Italy 2016	Unit	Purse seiners >40 m	Demersal trawlers 18–24 m	Demersal trawlers 12–18 m	Passive gears 6–12 m	Selected fleets, total
Long/short debt	USD	-	-	-	-	-
Total assets	USD	16 183 418	151 898 020	79 266 040	128 232 400	375 579 878
Value of physical capital	USD	16 183 418	151 898 020	79 266 040	128 232 400	375 579 878
Value of quota and other fishing rights	USD	-	-	-	-	-
Revenue	USD	25 066 331	191 585 517	193 031 288	187 476 429	597 159 565
Total gross cost	**USD**	**13 489 735**	**136 804 680**	**128 861 957**	**79 708 256**	**358 864 628**
Net cash flow	USD	11 576 596	54 780 837	64 169 331	107 768 173	238 294 937
Gross profit	USD	8 077 419	17 964 939	45 167 008	74 978 074	146 187 439
Net profit before taxes	USD	7 819 845	15 547 342	43 905 416	72 937 138	140 209 741
Net profit margin	%	31.2%	8.1%	22.7%	38.9%	23.5%
RoFTA	%	48.3%	10.2%	55.4%	56.9%	37.3%
RoI	%	48.3%	10.2%	55.4%	56.9%	37.3%
GVA	USD	20 615 559	103 414 181	113 870 482	138 056 784	375 957 006
GVA to revenue	%	82.2%	54.0%	59.0%	73.6%	63.0%

Annex 5 – Spain

Spain 2016	Unit	Purse seiners >40 m long-distant fleet	Purse seiners 18–24 m North Atlantic fleet	Demersal trawlers >40 m long-distant fleet	Demersal trawlers 24–40 m North Atlantic fleet	Surface longliners 24–40 m long-distant fleet	Selected fleets, total
Number of vessels	number	26	99	30	107	64	326
Total vessel power	kW	100 188	20 781	36 474	41 229	24 465	223 137
Total vessel tonnage	GT	70 554	5 676	32 001	27 388	17 771	153 389
Mean age of vessels	year	20	17	19	15	18	89
Mean LOA of vessels	meter	87	21	57	30	31	226
Engaged crew	number	1 038	1 126	832	826	877	4 699
FTE national	number	1 466	1 066	1 136	915	1 079	5 661
Unpaid labour	number	-	-	-	-	-	-
Live weight of landings	Kg	230 354 737	46 070 964	121 341 179	64 927 670	44 414 039	507 108 589
Value of landings	USD	642 621 037	47 910 910	161 562 738	149 956 157	118 263 736	1 120 314 576
Gross value of landings	USD	438 498 712	47 062 694	154 146 150	112 790 533	115 084 824	867 582 913
Other income	USD	241 067	42 523	8 206 238	1 478 061	292 894	10 260 784
Income from leasing out quota	USD	-	-	384 465	788 791	30 120	1 203 376
Operating subsidies	USD	864 122	-	59 856	116 317	2 225	1 042 520
Total income	USD	439 603 900	47 105 218	162 796 710	115 173 702	115 410 062	880 089 592
Personnel costs	USD	60 806 613	23 366 020	36 571 393	36 000 454	20 217 762	176 962 242
Value of unpaid labour	USD	-	864 685	-	19 271	42 079	926 035
Energy costs	USD	50 080 805	2 893 285	21 331 655	16 861 238	13 173 268	104 340 252
Other variable costs	USD	136 343 323	3 483 102	56 191 283	11 362 914	45 293 354	252 673 977
Repair & maintenance costs	USD	27 247 880	4 681 234	10 636 604	9 797 767	9 162 010	61 525 495
Other non-variable costs	USD	38 477 284	2 171 241	13 797 410	8 586 035	5 397 281	68 429 251
Lease/rental payments for quota	USD	554 646	-	1 886 595	324 532	108 747	2 874 520
Consumption of fixed capital	USD	33 062 622	18 727	6 075 920	3 162 533	4 323 865	46 643 668

Spain 2016	Unit	Purse seiners >40 m long-distant fleet	Purse seiners 18–24 m North Atlantic fleet	Demersal trawlers >40 m long-distant fleet	Demersal trawlers 24–40 m North Atlantic fleet	Surface longliners 24–40 m long-distant fleet	Selected fleets, total
Opportunity cost of capital	USD	2 544 048	198 807	186 897	668 244	311 582	3 909 579
Investments	USD	25 580 118	180 483	419 813	572 386	370 877	27 123 676
Long/short debt	USD	6 172 058	4 159 828	7 185 140	11 063 425	3 888 456	32 468 907
Total assets	USD	150 246 968	11 728 463	12 935 891	85 057 345	24 959 992	284 928 659
Value of physical capital	USD	150 083 766	11 728 463	11 025 835	39 422 426	18 381 522	230 642 012
Value of quota and other fishing rights	USD	163 202	-	1 910 056	45 634 919	6 578 470	54 286 647
Revenue	USD	438 739 778	47 105 218	162 352 389	114 268 595	115 377 718	877 843 697
Total gross cost	**USD**	**313 510 550**	**36 594 883**	**140 414 940**	**82 932 940**	**93 352 423**	**666 805 736**
Net cash flow	USD	125 229 228	10 510 335	21 937 449	31 335 655	22 025 295	211 037 961
Gross profit	USD	91 611 960	10 491 607	13 590 469	27 059 799	17 562 562	160 316 397
Net profit before taxes	USD	89 067 912	10 292 800	13 403 572	26 391 555	17 250 980	156 406 819
Net profit margin	%	20.3%	21.9%	8.3%	23.1%	15.0%	17.8%
RoFTA	%	59.3%	87.8%	121.6%	66.9%	93.8%	67.8%
RoI	%	59.3%	87.8%	103.6%	31.0%	69.1%	54.9%
GVA	USD	186 035 841	33 876 355	58 508 841	67 336 109	42 243 057	388 000 203
GVA to revenue	%	42.4%	71.9%	36.0%	58.9%	36.6%	44.2%

Annex 6 – United Kingdom of Great Britain and Northern Ireland

United Kingdom 2016	Unit	Pelagic trawlers >40 m	Demersal trawlers 24-40 m	Demersal trawlers 18-24 m	Pots and traps 10-12 m	Pots and traps <10 m	Selected fleets, total
Number of vessels	number	28	87	167	178	1 814	2 274
Total vessel power	kW	131 438	51 984	64 883	24 571	111 366	384 242
Total vessel tonnage	GT	56 571	23 986	23 050	2 869	6 504	112 979
Mean age of vessels	year	13	23	29	28	23	116
Mean LOA of vessels	meter	66	28	20	11	7	132
Engaged crew	number	334	787	1 008	537	3 016	5 681
FTE national	number	103	1 099	1 177	420	1 235	4 034
Unpaid labour	number	-	-	-	-	-	-
Live weight of landings	Kg	354 752 642	79 913 515	43 212 372	11 349 266	28 213 381	517 441 175
Value of landings	USD	336 178 594	195 352 597	125 337 971	31 945 492	94 527 982	783 342 636
Gross value of landings	USD	340 795 463	195 356 417	125 338 085	31 947 480	94 531 740	787 969 185
Other income	USD	1 819 722	9 480 110	6 025 587	1 171 633	5 767 597	24 264 649
Income from leasing out quota	USD	562 036	810 781	1 125 872	41 291	1 552	2 541 533
Operating subsidies	USD	-	-	-	-	-	-
Total income	USD	343 177 220	205 647 308	132 489 544	33 160 404	100 300 889	814 775 366
Personnel costs	USD	72 727 555	48 903 608	33 127 193	7 979 292	27 260 595	189 998 243
Value of unpaid labour	USD	-	-	-	-	9 976 778	9 976 778
Energy costs	USD	18 298 117	21 256 708	16 695 174	1 877 553	9 198 996	67 326 548
Other variable costs	USD	35 149 771	37 729 945	24 040 594	8 282 741	19 283 347	124 486 398
Repair & maintenance costs	USD	54 457 182	17 565 561	13 299 923	1 290 764	6 072 988	92 686 418
Other non-variable costs	USD	9 889 557	8 942 560	8 422 112	2 700 644	7 928 356	37 883 229
Lease/rental payments for quota	USD	3 488 172	25 608 950	10 767 758	2 697	4 366	39 871 942
Consumption of fixed capital	USD	19 838 675	5 748 197	5 832 097	1 406 946	5 075 671	37 901 587
Opportunity cost of capital	USD	929 320	248 220	337 728	73 852	271 559	1 860 679

United Kingdom 2016	Unit	Pelagic trawlers >40 m	Demersal trawlers 24-40 m	Demersal trawlers 18-24 m	Pots and traps 10-12 m	Pots and traps <10 m	Selected fleets, total
Investments	USD	501 840	11 057 377	7 846 282	762 832	7 645 988	27 814 319
Long/short debt	USD	-	-	-	-	-	-
Total assets	USD	923 479 341	167 489 627	170 842 923	29 255 417	96 944 642	1 388 011 950
Value of physical capital	USD	179 966 444	48 068 824	65 402 255	14 301 641	52 588 431	360 327 595
Value of quota and other fishing rights	USD	743 512 897	119 420 803	105 440 668	14 953 776	44 356 211	1 027 684 355
Revenue	USD	342 615 184	204 836 527	131 363 672	33 119 113	100 299 337	812 233 833
Total gross cost	**USD**	**194 010 353**	**160 007 332**	**106 352 754**	**22 133 692**	**69 748 648**	**552 252 779**
Net cash flow	USD	148 604 831	44 829 195	25 010 918	10 985 421	30 550 689	259 981 054
Gross profit	USD	124 715 947	12 661 267	7 285 191	9 534 487	25 469 100	179 665 993
Net profit before taxes	USD	123 786 627	12 413 047	6 947 464	9 460 635	25 197 541	177 805 314
Net profit margin	%	36.1%	6.1%	5.3%	28.6%	25.1%	21.9%
RoFTA	%	68.8%	25.8%	10.6%	66.2%	47.9%	49.3%
RoI	%	13.4%	7.4%	4.1%	32.3%	26.0%	12.8%
GVA	USD	221 332 386	93 732 803	58 138 111	18 964 713	57 811 284	449 979 297
GVA to revenue	%	64.6%	45.8%	44.3%	57.3%	57.6%	55.4%

Annex 7 – Norway

TABLE 1
Sample size and population size by fishing fleet segment: 2010–2016

Fleet segment	2010	2011	2012	2013	2014	2015	2016
Purse seiners >28 m	84.6%	81.3%	77.3%	78.1%	82.2%	78.4%	83.6%
Cod trawlers (all >28 m)	76.5%	81.4%	83.8%	75.0%	85.0%	81.1%	80.6%
Traditional >28 m	47.1%	37.1%	48.4%	70.8%	81.0%	63.6%	73.7%
Pelagic trawlers	45.8%	33.3%	31.6%	45.0%	47.1%	58.8%	57.1%
Traditional 21–27.99 m	34.3%	37.8%	41.9%	35.9%	45.2%	43.8%	54.1%
Traditional 15–20.99 m	20.8%	26.4%	26.8%	33.9%	31.0%	35.8%	44.2%
Coastal purse seiners >21 m	51.4%	41.9%	56.3%	45.5%	40.0%	34.9%	43.2%
Coastal purse seiners 11–21 m	29.0%	24.7%	27.8%	22.1%	18.2%	30.6%	25.5%
Coastal shrimp trawlers	15.3%	20.0%	13.3%	20.3%	18.3%	16.7%	20.4%
Traditional 11–14.99 m	8.5%	11.6%	13.7%	15.6%	15.8%	15.8%	15.9%

TABLE 2
Total operating revenue by group of vessels in million USD: 2003–2016

Total operating revenues (million USD)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	361	438	521	541	537	560	591	615	744	790	666	791	881	1.037
Vessels >28 m	870	1.009	1.110	1.124	1.133	1.124	1.098	1.340	1.546	1.204	1.144	1.292	1.522	1.657

TABLE 3
Gross profit by group of vessels in million USD: 2003–2016

Gross profit (million USD)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	3	22	55	58	55	51	60	49	91	81	14	57	121	192
Vessels >28 m	45	108	183	205	175	161	165	272	407	202	185	211	323	424

TABLE 4
Net profit before taxes by group of vessels in million USD: 2003–2016

Net profit before taxes (million USD)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	-21	0	27	28	26	-7	25	-3	34	28	-54	-7	68	142
Vessels >28 m	-63	42	130	151	125	-19	130	187	315	137	93	101	194	380

TABLE 5
Operating margin by group of vessels: 2003–2016

Operating margin	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	1.0%	5.1%	10.6%	10.8%	10.3%	9.0%	10.1%	8.0%	12.3%	10.2%	2.2%	7.2%	13.7%	18.5%
Vessels >28 m	5.1%	10.7%	16.5%	18.3%	15.5%	14.3%	15.0%	20.3%	26.3%	16.8%	16.2%	16.3%	21.3%	25.6%

TABLE 6
Return on total assets by group of vessels: 2003–2016

Return on total assets	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	1.48%	3.65%	7.04%	6.73%	7.04%	5.40%	5.88%	3.73%	5.79%	4.60%	1.11%	2.96%	6.59%	7.75%
Vessels >28 m	2.40%	4.98%	7.25%	7.83%	7.66%	6.41%	6.91%	8.47%	11.05%	6.46%	5.60%	5.76%	8.00%	9.88%

TABLE 7
Intangible assets as percentage of book value of vessels by group of vessels: 2003–2016

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vessels <28 m	1.0%	9.9%	24.5%	34.5%	46.7%	68.7%	69.6%	64.3%	102.8%	85.2%	99.2%	117.9%	99.5%	139.9%
Vessels >28 m	23.8%	28.7%	38.6%	59.5%	74.3%	110.3%	107.0%	117.1%	128.7%	116.4%	120.7%	102.5%	96.6%	90.3%

TABLE 8
Large seagoing purse seiners: Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	6 017	6 638	6 353	7 831	9 418	7 494	6 644	6 837	7 682	9 017
Labour costs (B)	1 922	2 058	2 031	2 440	2 855	2 301	2 067	2 119	2 335	2 776
Running costs (C)	787	839	655	758	745	825	744	864	820	642
Vessel costs (D)	1 344	1 331	1 389	1 595	1 652	1 588	1 576	1 586	1 762	1 774
Total gross cost (E) = B + C + D	4 052	4 228	4 076	4 793	5 252	4 714	4 387	4 569	4 917	5 193
Net cash flow (F) = A - E (=EBITDA)	1 965	2 410	2 278	3 038	4 166	2 780	2 257	2 268	2 765	3 824
Depreciations (G)	667	682	713	617	649	708	674	740	781	817
Amortizations (H)	7	221	236	245	225	249	279	270	319	323
Gross profit (I) = F - G - H (=EBIT)	1 291	1 506	1 329	2 176	3 292	1 822	1 305	1 258	1 664	2 684
Interest (Net) (J)	38	886	116	272	438	393	533	464	609	234
Net profit before taxes (K) = I - J	1 252	621	1 213	1 904	2 854	1 429	772	794	1 055	2 449
Net profit margin (L) = K/A	20.8%	9.3%	19.1%	24.3%	30.3%	19.1%	11.6%	11.6%	13.7%	27.2%
Value of tangible assets (M)	14 628	14 213	15 235	15 853	17 584	17 863	17 471	19 697	20 370	24 113
ROFTA(N) = K/M	8.6%	4.4%	8.0%	12.0%	16.2%	8.0%	4.4%	4.0%	5.2%	10.2%
Value of intangible assets (O)	4 522	7 676	7 305	6 877	8 268	10 388	10 185	10 125	10 993	10 205
ROI _FAO variant (P) = K/(M+O)	6.5%	2.8%	5.4%	8.4%	11.0%	5.1%	2.8%	2.7%	3.4%	7.1%
GVA (Q) = F + B	3 886	4 468	4 309	5 478	7 022	5 081	4 325	4 387	5 100	6 600
GVA to revenue (R) = Q/A	64.6%	67.3%	67.8%	70.0%	74.6%	67.8%	65.1%	64.2%	66.4%	73.2%
Gross profit margin (S) = I/A	21.4%	22.7%	20.9%	27.8%	35.0%	24.3%	19.6%	18.4%	21.7%	29.8%
Asset turnover (T) = A/(M+O)	31.4%	30.3%	28.2%	34.5%	36.4%	26.5%	24.0%	22.9%	24.5%	26.3%
Alternative ROI (U) = I/(M+O)	6.7%	6.9%	5.9%	9.6%	12.7%	6.5%	4.7%	4.2%	5.3%	7.8%
Debt (V)	13 537	15 701	15 793	14 801	16 407	17 402	18 475	19 291	20 156	21 347
Book value of equity (W)	5 612	6 188	6 747	7 928	9 445	10 849	9 182	10 530	11 207	12 971
Return on equity (X) = K/W	22.3%	10.0%	18.0%	24.0%	30.2%	13.2%	8.4%	7.5%	9.4%	18.9%
Rate: Debt/cash flow (Y) = V/F	6.89	6.51	6.93	4.87	3.94	6.26	8.18	8.51	7.29	5.58
Rate: GVA/labour (Z) = Q/B	2.02	2.17	2.12	2.24	2.46	2.21	2.09	2.07	2.18	2.38

TABLE 9
Cod trawlers (demersal): Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	7 101	7 558	7 628	9 043	11 735	11 058	10 960	13 895	16 853	18 918
Labour costs (B)	2 527	2 690	2 746	3 144	3 956	3 766	3 627	4 707	5 694	6 113
Running costs (C)	1 504	1 968	1 317	1 451	2 026	2 295	2 028	2 564	2 372	2 227
Vessel costs (D)	1 872	1 817	1 904	2 164	2 265	2 622	2 378	2 733	2 940	3 595
Total gross cost (E) = B + C + D	5 904	6 475	5 967	6 758	8 247	8 682	8 033	10 004	11 006	11 935
Net cash flow (F) = A - E (=EBITDA)	1 197	1 083	1 661	2 284	3 488	2 375	2 927	3 891	5 847	6 983
Depreciations (G)	501	615	673	772	860	880	960	1 107	1 226	1 178
Amortizations (H)	0	112	159	175	212	203	293	413	463	460
Gross profit (I) = F - G - H (=EBIT)	696	356	830	1 338	2 416	1 292	1 673	2 371	4 159	5 346
Interest (Net) (J)	427	1 231	280	598	574	521	690	1 149	1 388	492
Net profit before taxes (K) = I - J	270	-876	550	740	1 842	771	983	1 222	2 771	4 853
Net profit margin (L) = K/A	3.8%	-11.6%	7.2%	8.2%	15.7%	7.0%	9.0%	8.8%	16.4%	25.7%
Value of tangible assets (M)	11 142	12 583	13 990	13 251	15 407	16 482	15 999	21 453	26 955	29 450
ROFTA (N) = K/M	2.4%	-7.0%	3.9%	5.6%	12.0%	4.7%	6.1%	5.7%	10.3%	16.5%
Value of intangible assets (O)	4 954	7 257	7 662	8 884	10 962	10 364	11 064	10 553	10 266	11 201
ROI _FAO variant (P) = K/(M+O)	1.7%	-4.4%	2.5%	3.3%	7.0%	2.9%	3.6%	3.8%	7.4%	11.9%
GVA (Q) = F + B	3 724	3 772	4 407	5 428	7 443	6 141	6 554	8 598	11 541	13 096
GVA to revenue (R) = Q/A	52.4%	49.9%	57.8%	60.0%	63.4%	55.5%	59.8%	61.9%	68.5%	69.2%
Gross profit margin (S) = I/A	9.8%	4.7%	10.9%	14.8%	20.6%	11.7%	15.3%	17.1%	24.7%	28.3%
Asset turnover (T) = A/(M+O)	44.1%	38.1%	35.2%	40.9%	44.5%	41.2%	40.5%	43.4%	45.3%	46.5%
Alternative ROI (U) = I/(M+O)	4.3%	1.8%	3.8%	6.0%	9.2%	4.8%	6.2%	7.4%	11.2%	13.2%
Debt (V)	13 208	16 400	17 419	17 972	20 953	20 194	20 193	24 074	28 350	29 985
Book value of equity (W)	2 888	3 441	4 232	4 163	5 415	6 652	6 870	7 932	8 871	10 665
Return on equity (X) = K/W	9.3%	-25.5%	13.0%	17.8%	34.0%	11.6%	14.3%	15.4%	31.2%	45.5%
Rate: Debt/cash flow (Y) = V/F	11.03	15.15	10.48	7.87	6.01	8.50	6.90	6.19	4.85	4.29
Rate: GVA/labour (Z) = Q/B	1.47	1.40	1.61	1.73	1.88	1.63	1.81	1.83	2.03	2.14

TABLE 10
Conventional seagoing vessels: Average financial indicators per vessel in thousands of USD (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	4 659	4 639	4 091	4 918	5 284	5 640	6 181	8 089	9 725	9 738
Labour costs (B)	2 178	2 012	1 794	2 130	2 245	2 254	2 562	3 634	4 581	4 431
Running costs (C)	661	774	689	832	1 005	1 233	1 168	1 259	1 211	1 263
Vessel costs (D)	913	1 017	939	1 152	1 101	1 310	1 237	1 589	1 444	1 831
Total gross cost (E) = B + C + D	3 752	3 803	3 421	4 114	4 351	4 796	4 968	6 481	7 236	7 526
Net cash flow (F) = A - E (=EBITDA)	908	837	670	804	934	844	1 213	1 608	2 488	2 212
Depreciations (G)	268	288	301	309	355	372	414	413	468	511
Amortizations (H)	24	145	184	151	198	193	367	360	490	464
Gross profit (I) = F - G - H (=EBIT)	616	404	184	345	380	278	432	835	1 530	1 237
Interest (Net) (J)	371	1 096	47	679	597	345	710	908	1 006	-7
Net profit before taxes (K) = I - J	245	-692	137	-334	-216	-67	-278	-73	524	1 244
Net profit margin (L) = K/A	5.3%	-14.9%	3.4%	-6.8%	-4.1%	-1.2%	-4.5%	-0.9%	5.4%	12.8%
Value of tangible assets (M)	5 746	5 994	6 813	6 274	7 733	9 672	10 205	9 233	13 953	15 786
ROFTA (N) = K/M	4.3%	-11.6%	2.0%	-5.3%	-2.8%	-0.7%	-2.7%	-0.8%	3.8%	7.9%
Value of intangible assets (O)	3 513	4 402	5 487	3 933	5 196	5 745	8 201	7 225	9 054	8 373
ROI _FAO variant (P) = K/(M+O)	2.6%	-6.7%	1.1%	-3.3%	-1.7%	-0.4%	-1.5%	-0.4%	2.3%	5.2%
GVA (Q) = F + B	3 085	2 848	2 464	2 934	3 179	3 098	3 775	5 242	7 069	6 643
GVA to revenue (R) = Q/A	66.2%	61.4%	60.2%	59.7%	60.2%	54.9%	61.1%	64.8%	72.7%	68.2%
Gross profit margin(S) = I/A	13.2%	8.7%	4.5%	7.0%	7.2%	4.9%	7.0%	10.3%	15.7%	12.7%
Asset turnover (T) = A/(M+O)	50.3%	44.6%	33.3%	48.2%	40.9%	36.6%	33.6%	49.1%	42.3%	40.3%
Alternative ROI (U) = I/(M+O)	6.7%	3.9%	1.5%	3.4%	2.9%	1.8%	2.3%	5.1%	6.6%	5.1%
Debt (V)	8 631	9 726	10 651	10 299	12 301	13 973	17 847	16 578	21 981	20 931
Book value of equity (W)	628	671	1 649	-92	628	1 444	559	-120	1 026	3 228
Return on equity(X) = K/W	39.0%	-103.2%	8.3%	364.4%	-34.4%	-4.6%	-49.8%	60.9%	51.1%	38.6%
Rate: Debt/cash flow (Y) = V/F	9.51	11.63	15.91	12.81	13.17	16.56	14.71	10.31	8.83	9.46
Rate: GVA/labour (Z) = Q/B	1.42	1.42	1.37	1.38	1.42	1.37	1.47	1.44	1.54	1.50

TABLE 11
Conventional coastal vessels: Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	276	263	241	262	384	389	409	403	477	595
Labour costs (B)	140	134	126	131	185	180	194	183	224	266
Running costs (C)	17	18	15	19	28	34	36	36	32	34
Vessel costs (D)	73	69	69	76	110	111	120	115	121	138
Total gross cost (E) = B + C + D	230	221	211	226	322	325	349	335	377	438
Net cash flow (F) = A - E (=EBITDA)	47	42	30	36	62	64	60	68	100	157
Depreciations (G)	20	21	15	20	26	29	34	31	30	33
Amortizations (H)	0	3	3	5	7	8	7	8	10	18
Gross profit (I) = F - G - H (=EBIT)	27	18	13	11	29	27	19	29	60	106
Interest (Net) (J)	10	18	11	14	25	23	25	23	22	29
Net profit before taxes(K) = I - J	17	0	2	-3	4	3	-6	6	38	77
Net profit margin (L) = K/A	6.1%	0.1%	0.9%	-1.0%	1.1%	0.9%	-1.6%	1.6%	7.9%	13.0%
Value of tangible assets (M)	257	298	233	337	462	499	589	519	517	743
ROFTA (N) = K/M	6.5%	0.1%	0.9%	-0.8%	0.9%	0.7%	-1.1%	1.2%	7.3%	10.4%
Value of intangible assets (O)	60	117	111	160	243	247	283	296	314	553
ROI _FAO variant (P) = K/(M+O)	5.3%	0.1%	0.6%	-0.5%	0.6%	0.5%	-0.7%	0.8%	4.5%	6.0%
GVA (Q) = F + B	186	175	157	167	246	244	254	251	324	422
GVA to revenue (R) = Q/A	67.5%	66.7%	65.0%	63.8%	64.1%	62.7%	62.0%	62.3%	68.0%	71.0%
Gross profit margin (S) = I/A	9.7%	7.0%	5.4%	4.3%	7.5%	6.9%	4.6%	7.3%	12.5%	17.8%
Asset turnover (T) = A/(M+O)	87.1%	63.3%	70.0%	52.7%	54.4%	52.1%	46.9%	49.5%	57.4%	45.9%
Alternative ROI (U) = I/(M+O)	8.4%	4.4%	3.8%	2.3%	4.1%	3.6%	2.2%	3.6%	7.2%	8.2%
Debt (V)	238	324	272	370	589	602	686	629	630	1 013
Book value of equity (W)	79	91	72	127	116	144	187	185	201	283
Return on equity (X) = K/W	21.2%	0.3%	3.0%	-2.1%	3.5%	2.3%	-3.5%	3.4%	18.8%	27.4%
Rate: Debt/cash flow (Y) = V/F	5.11	7.78	8.92	10.18	9.55	9.42	11.45	9.22	6.31	6.46
Rate: GVA/labour (Z) = Q/B	1.33	1.31	1.24	1.28	1.33	1.35	1.31	1.37	1.45	1.59

TABLE 12
Coastal shrimp trawlers: Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	334	365	400	465	560	481	452	528	632	761
Labour costs (B)	140	152	175	180	237	203	167	188	256	279
Running costs (C)	50	74	57	83	123	101	99	124	90	108
Vessel costs (D)	86	104	101	145	144	118	119	137	183	206
Total gross cost (E) = B + C + D	276	331	332	408	504	422	385	449	529	593
Net cash flow (F) = A - E (=EBITDA)	58	34	68	57	56	60	67	79	103	168
Depreciations (G)	24	21	27	31	30	28	27	45	25	56
Amortizations (H)	0	0	2	2	1	1	0	1	1	4
Gross profit (I) = F - G - H (=EBIT)	34	13	39	24	26	31	39	33	76	108
Interest (Net) (J)	13	13	24	18	14	23	16	23	16	24
Net profit before taxes (K) = I - J	21	-1	15	6	11	8	24	10	60	84
Net Profit margin (L) = K/A	6.1%	-0.2%	3.7%	1.3%	2.0%	1.7%	5.2%	2.0%	9.6%	11.1%
Value of tangible assets (M)	368	369	435	481	427	616	436	730	577	1 058
ROFTA (N) = K/M	5.6%	-0.2%	3.4%	1.2%	2.6%	1.4%	5.4%	1.4%	10.5%	8.0%
Value of intangible assets (O)	32	29	94	65	46	58	74	79	79	137
ROI _FAO variant (P) = K/(M+O)	5.1%	-0.2%	2.8%	1.1%	2.4%	1.2%	4.7%	1.3%	9.2%	7.1%
GVA (Q) = F + B	199	186	242	237	293	262	234	267	359	447
GVA to revenue (R) = Q/A	59.4%	51.1%	60.6%	51.0%	52.4%	54.5%	51.8%	50.5%	56.8%	58.8%
Gross profit margin (S) = I/A	10.2%	3.5%	9.7%	5.2%	4.6%	6.5%	8.7%	6.3%	12.1%	14.2%
Asset turnover (T) = A/(M+O)	83.6%	91.6%	75.6%	85.2%	118.6%	71.3%	88.7%	65.3%	96.3%	63.7%
Alternative ROI (U) = I/(M+O)	8.5%	3.2%	7.3%	4.4%	5.4%	4.6%	7.7%	4.1%	11.6%	9.1%
Debt (V)	299	275	579	473	375	599	427	595	465	806
Book value of equity (W)	101	123	-50	73	98	75	83	213	191	388
Return on equity (X) = K/W	20.3%	-0.7%	-29.3%	8.1%	11.4%	11.1%	28.7%	4.8%	31.6%	21.7%
Rate: Debt/cash flow (Y) = V/F	5.13	8.04	8.55	8.34	6.67	10.06	6.36	7.51	4.53	4.80
Rate: GVA/labour (Z) = Q/B	1.41	1.22	1.39	1.31	1.24	1.29	1.40	1.42	1.40	1.60

TABLE 13
Coastal purse seiners: Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	1 576	1 513	1 317	1 320	1 471	1 490	1 145	1 206	1 533	1 617
Labour costs (B)	632	595	495	525	613	587	485	460	583	644
Running costs (C)	135	122	92	99	94	112	111	88	114	72
Vessel costs (D)	427	380	343	322	321	348	376	322	328	295
Total gross cost (E) = B + C + D	1 194	1 097	930	946	1 028	1 046	972	870	1 025	1 011
Net cash flow (F) = A - E (=EBITDA)	382	416	387	374	443	443	174	335	508	605
Depreciations (G)	172	158	139	160	103	169	147	134	175	119
Amortizations (H)	23	35	29	33	45	46	79	111	61	125
Gross profit (I) = F - G - H (=EBIT)	187	222	219	181	295	228	-53	90	272	361
Interest (Net) (J)	166	286	103	182	148	116	233	193	175	87
Net profit before taxes (K) = I - J	22	-63	116	0	147	112	-286	-103	97	274
Net profit margin (L) = K/A	1.4%	-4.2%	8.8%	0.0%	10.0%	7.5%	-25.0%	-8.5%	6.4%	16.9%
Value of tangible assets (M)	3 231	3 047	2 778	3 461	2 363	3 406	3 071	3 209	3 227	3 608
ROFTA (N) = K/M	0.7%	-2.1%	4.2%	0.0%	6.2%	3.3%	-9.3%	-3.2%	3.0%	7.6%
Value of intangible assets (O)	1 366	1 521	1 446	1 396	2 049	1 948	2 574	3 374	2 708	2 993
ROI _FAO variant (P) = K/(M+O)	0.5%	-1.4%	2.7%	0.0%	3.3%	2.1%	-5.1%	-1.6%	1.6%	4.1%
GVA (Q) = F + B	1 014	1 011	882	899	1 057	1 030	659	795	1 091	1 250
GVA to revenue (R) = Q/A	64.3%	66.8%	67.0%	68.1%	71.8%	69.2%	57.5%	65.9%	71.2%	77.3%
Gross profit margin (S)= I/A	11.9%	14.7%	16.6%	13.7%	20.1%	15.3%	-4.6%	7.5%	17.8%	22.3%
Asset turnover (T) = A/(M+O)	34.3%	33.1%	31.2%	27.2%	33.4%	27.8%	20.3%	18.3%	25.8%	24.5%
Alternative ROI (U) = I/(M+O)	4.1%	4.9%	5.2%	3.7%	6.7%	4.3%	-0.9%	1.4%	4.6%	5.5%
Debt (V)	3 762	3 967	3 633	4 087	3 640	3 692	4 586	5 121	4 973	4 803
Book value of equity (W)	834	601	592	770	771	1 662	1 059	1 463	962	1 798
Return on equity (X) = K/W	2.6%	-10.6%	19.6%	0.0%	19.1%	6.7%	-27.0%	-7.0%	10.1%	15.2%
Rate: Debt/cash flow (Y) = V/F	9.84	9.54	9.39	10.94	8.21	8.33	26.40	15.27	9.79	7.93
Rate: GVA/labour (Z) = Q/B	1.60	1.70	1.78	1.71	1.72	1.76	1.36	1.73	1.87	1.94

TABLE 14
Pelagic trawlers; Average financial indicators per vessel (2007–2016)

Financial indicators (per vessel 1000 USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue from landings (A)	2 346	2 794	2 985	4 180	3 832	3 065	3 618	3 978	5 677	6170
Labour costs (B)	753	869	1 037	1 345	1 180	1 039	1 139	1 264	1 753	2004
Running costs (C)	496	559	394	545	503	439	676	637	816	788
Vessel costs (D)	576	587	650	922	753	741	716	851	1 352	1131
Total gross cost (E) = B + C + D	1 826	2 016	2 080	2 812	2 435	2 219	2 532	2 752	3 921	3922
Net cash flow (F) = A - E (=EBITDA)	521	778	905	1 368	1 397	846	1 086	1 226	1 756	2248
Depreciations (G)	215	266	272	313	307	267	322	481	342	364
Amortizations (H)	4	141	169	108	126	117	118	354	258	473
Gross profit(I) = F - G - H (=EBIT)	303	371	464	947	964	463	646	391	1 156	1410
Interest (Net) (J)	355	501	418	456	404	299	437	627	538	587.9
Net profit before taxes (K) = I - J	-52	-130	46	491	560	164	209	-235	619	822.4
Net profit margin (L) = K/A	-2.2%	-4.6%	1.5%	11.7%	14.6%	5.4%	5.8%	-5.9%	10.9%	13.3%
Value of tangible assets (M)	4 519	5 061	5 720	9 158	6 206	7 968	6 246	10 931	6 786	10941
ROFTA (N) = K/M	-1.2%	-2.6%	0.8%	5.4%	9.0%	2.1%	3.3%	-2.2%	9.1%	7.5%
Value of intangible assets (O)	3 810	4 997	6 406	8 139	7 128	3 928	8 144	13 739	13 661	16133
ROI _FAO variant (P) = K/(M+O)	-0.6%	-1.3%	0.4%	2.8%	4.2%	1.4%	1.4%	-1.0%	3.0%	3.0%
GVA (Q) = F + B	1 274	1 647	1 941	2 714	2 577	1 885	2 225	2 489	3 509	4251
GVA to revenue(R) = Q/A	54.3%	59.0%	65.0%	64.9%	67.2%	61.5%	61.5%	62.6%	61.8%	68.9%
Gross profit margin (S)= I/A	12.9%	13.3%	15.5%	22.7%	25.1%	15.1%	17.8%	9.8%	20.4%	22.9%
Asset turnover (T) = A/(M+O)	28.2%	27.8%	24.6%	24.2%	28.7%	25.8%	25.1%	16.1%	27.8%	22.8%
Alternative ROI (U) = I/(M+O)	3.6%	3.7%	3.8%	5.5%	7.2%	3.9%	4.5%	1.6%	5.7%	5.2%
Debt (V)	7 826	8 938	11 043	12 133	10 039	9 119	10 667	20 761	14 312	19974
Book value of equity (W)	503	1 120	1 082	5 164	3 296	2 778	3 722	3 908	6 135	7100
Return on equity (X) = K/W	-10.3%	-11.6%	4.3%	9.5%	17.0%	5.9%	5.6%	-6.0%	10.1%	11.6%
Rate: Debt/cash flow (Y) = V/F	15.03	11.49	12.21	8.87	7.19	10.77	9.82	16.94	8.15	8.89
Rate: GVA/labour(Z) = Q/B	1.69	1.90	1.87	2.02	2.18	1.81	1.95	1.97	2.00	2.12

TABLE 15
Operating revenue of the seven most important fishing fleet segments (2003–2016)

Operating revenue (1000 USD) per vessel	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Conventional coastal vessels	145	179	223	259	276	263	241	262	384	389	409	403	477	595
Conventional seagoing vessels	2 422	3 099	3 726	4 568	4 659	4 639	4 091	4 918	5 284	5 640	6 180	8 089	9 725	9 738
Cod trawlers (demersal)	3 366	4 036	5 356	6 808	7 101	7 558	7 628	9 043	11 735	11 058	10 960	13 895	16 853	18 918
Coastal shrimp trawlers	245	288	309	334	334	365	400	465	560	481	452	528	632	761
Coastal purse seine	600	903	1 140	1 319	1 576	1 513	1 317	1 320	1 472	1 490	1 145	1 206	1 533	1 617
Large seagoing purse seiners	4 429	5 543	6 351	5 246	6 017	6 638	6 353	7 831	9 418	7 494	6 644	6 837	7 682	9 017
Pelagic trawlers	1 229	1 442	1 995	2 580	2 346	2 794	2 985	4 180	3 832	3 065	3 618	3 978	5 677	6 170

TABLE 16
Relative cost composition for the sevent most important fishing fleet segments

	Conventional coastal vessels	Conventional seagoing vessels	Cod trawlers (demersal)	Coastal shrimp trawlers	Coastal purse seine	Large seagoing purse seiners	Pelagic trawlers
Industry specific duties	0.8%	0.9%	0.9%	0.9%	0.8%	0.8%	0.9%
Labour duties (social security duties etc.)	3.3%	3.4%	3.3%	3.4%	3.5%	3.7%	3.6%
Labour compensations (incl. Food)	42.8%	40.9%	30.1%	34.9%	36.0%	27.1%	28.4%
Depreciations vessel	6.9%	5.5%	7.5%	6.3%	10.7%	9.9%	7.9%
Amortizations intangibles (value of licenses. quotas etc.)	2.3%	4.8%	2.6%	0.3%	6.0%	3.8%	5.9%
Fuel	5.6%	8.6%	14.4%	16.5%	6.2%	9.4%	13.9%
Bait. ice. salt etc.	1.1%	6.1%	0.7%	0.9%	0.1%	0.1%	0.1%
Maintenance vessel	8.5%	6.2%	6.1%	9.6%	8.4%	8.0%	8.7%
Maintenance and new fishing gears	4.4%	2.3%	2.8%	5.7%	3.4%	3.7%	4.4%
Insurance (vessel and other)	2.8%	2.1%	1.3%	2.7%	2.8%	2.0%	1.9%
Other misc. Costs	11.0%	8.2%	9.8%	8.7%	9.3%	8.3%	6.3%
Total operating costs	**89.4%**	**89.0%**	**79.3%**	**89.9%**	**87.1%**	**76.8%**	**81.9%**
Operating profit	10.6%	11.0%	20.7%	10.1%	12.9%	23.2%	18.1%

TABLE 17
Relative costs per fishing fleet segment in percentages of total and in thousand of USD

FAO cost components

(Relative. Average last 5 years)	Conventional coastal vessels	Conventional seagoing vessels	Cod trawlers (demersal)	Coastal shrimp trawlers	Coastal purse seine	Large seagoing purse seiners	Pelagic trawlers
Running costs	7.1%	14.5%	17.4%	18.6%	6.2%	11.0%	15.0%
Vessel cost	16.4%	10.5%	11.6%	19.2%	14.4%	15.7%	16.0%
Capital cost	15.9%	22.3%	20.5%	11.1%	30.4%	27.2%	27.2%
Labour cost	48.3%	43.7%	38.3%	40.8%	39.0%	35.5%	34.1%
Misc. Cost	12.4%	8.9%	12.2%	10.2%	9.9%	10.5%	7.7%
Total costs incl interest	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

FAO cost components

Annual 1000 USD. Average per vessel	Conventional coastal vessels	Conventional seagoing vessels	Cod trawlers (demersal)	Coastal shrimp trawlers	Coastal purse seine	Large seagoing purse seiners	Pelagic trawlers
Running costs	31	1 159	2 174	99	88	719	631
Vessel cost	71	836	1 449	103	204	1 029	676
Capital cost	69	1 783	2 563	59	430	1 780	1 148
Labour cost	209	3 492	4 781	218	552	2 320	1 440
Misc. Cost	54	714	1 528	55	141	688	323
Total costs incl interest	**434**	**7 985**	**12 495**	**535**	**1 415**	**6 536**	**4 217**

TABLE 18

Return on total assets. operating margin. and return on equity by fishing fleet segment

Return on total assets before taxes (average last 5 years)	Conventional coastal vessels	Conventional seagoing vessels	Cod trawlers (demersal)	Coastal shrimp trawlers	Coastal purse seine	Large seagoing purse seiners	Pelagic trawlers
Return on total assets (%)	5.27	6.02	9.39	7.63	3.54	6.69	4.33
Operating margin (%)	9.82	10.13	19.39	9.56	11.66	22.76	17.21
Return on equity (%)	9.68	8.82	23.61	19.59	-0.38	11.48	5.43

TABLE 19

Vessel sample size and number of vessels per fleet segment (2003–2016)

		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Conventional coastal vessels	S	279	321	306	317	359	323	122	122	135	143	157	161	159	171
	P	1 441	1 342	1 131	1 165	1 290	1 276	1 284	1 250	1 062	1 085	993	1 307	1 269	1 242
Conventional seagoing vessels	S	36	32	30	31	24	29	19	16	13	15	17	17	14	14
	P	45	38	35	37	35	33	33	34	35	31	24	21	22	19
Cod trawlers (demersal)	S	68	63	48	50	42	36	35	39	35	31	30	34	30	29
	P	94	88	71	65	59	49	51	51	43	37	40	40	37	36
Coastal shrimp trawlers	S	53	51	46	49	47	56	20	18	16	14	25	23	19	21
	P	157	145	124	123	130	138	131	118	80	105	123	126	114	103
Coastal purse seine	S	53	51	46	49	47	56	20	18	16	14	25	23	19	21
	P	157	145	124	123	130	138	131	118	80	105	123	126	114	103
Large seagoing purse seiners	S	74	66	72	63	61	70	65	66	65	58	57	60	58	61
	P	89	86	85	84	81	80	79	78	80	75	73	73	74	73
Pelagic trawlers	S	26	27	21	23	21	16	9	11	9	6	9	8	10	8
	P	41	41	30	28	27	25	24	24	27	19	20	17	17	14

TABLE 20
Gross value added before taxes in thousand of USD per fishing fleet segment (2003–2016)

Gross value added before taxes (thousand USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Conventional coastal vessels	135 972	152 385	163 690	202 310	240 365	223 937	201 321	208 859	261 458	264 838	251 944	328 261	411 524	524 515
Conventional seagoing vessels	63 029	71 051	78 160	112 602	107 981	93 996	81 296	99 766	111 252	96 030	90 591	110 078	155 523	126 226
Cod trawlers (demersal)	151 816	181 528	200 265	251 429	219 711	184 845	224 781	276 831	320 060	227 211	262 142	343 909	427 034	471 469
Coastal shrimp trawlers	22 648	24 552	20 203	23 276	25 807	25 732	31 750	27 949	23 461	27 521	28 786	33 632	40 891	46 037
Coastal purse seine	66 442	106 230	162 767	131 680	88 239	116 263	153 475	158 203	209 231	219 470	117 236	130 360	145 081	169 943
Large seagoing purse seiners	249 300	318 598	369 395	291 982	314 778	357 466	340 381	427 286	561 730	381 074	315 704	320 256	377 387	481 812
Pelagic trawlers	24 954	29 404	35 667	44 541	34 392	41 184	46 593	65 125	69 568	35 818	44 508	42 321	59 655	59 516
Grand total	714 161	883 749	1 030 148	1 057 820	1 031 273	1 043 423	1 079 596	1 264 019	1 556 760	1 251 960	1 110 911	1 308 817	1 617 095	1 879 518

TABLE 21
Gross value creation as percentage of gross operating revenue by fishing fleet segment (2003–2016)

% of gross operating income	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Conventional coastal vessels	65.0%	63.4%	64.9%	67.0%	67.5%	66.7%	65.0%	63.8%	64.1%	62.7%	62.0%	62.3%	68.0%	71.0%
Conventional seagoing vessels	57.8%	60.3%	59.9%	66.6%	66.2%	61.4%	60.2%	59.7%	60.2%	54.9%	61.1%	64.8%	72.7%	68.2%
Cod trawlers (demersal)	48.0%	51.1%	52.7%	56.8%	52.4%	49.9%	57.8%	60.0%	63.4%	55.5%	59.8%	61.9%	68.5%	69.2%
Coastal shrimp trawlers	59.0%	58.7%	52.7%	56.7%	59.4%	51.1%	60.6%	51.0%	52.4%	54.5%	51.8%	50.5%	56.8%	58.8%
Coastal purse seine	58.6%	68.0%	70.6%	66.6%	64.3%	66.8%	67.0%	68.1%	71.8%	69.2%	57.5%	65.9%	71.2%	77.3%
Large seagoing purse seiners	63.2%	66.8%	68.4%	66.3%	64.6%	67.3%	67.8%	70.0%	74.6%	67.8%	65.1%	64.2%	66.4%	73.2%
Pelagic trawlers	49.5%	49.7%	59.6%	61.7%	54.3%	59.0%	65.0%	64.9%	67.2%	61.5%	61.5%	62.6%	61.8%	68.9%
Weighted average	58.0%	61.1%	63.1%	63.5%	61.8%	62.0%	63.9%	64.7%	68.0%	62.8%	61.4%	62.8%	67.8%	71.0%

TABLE 22
Total number of fishers for which fishing is the primary or a secondary occupation (1924–2017)

	Main occupation	Secondary occupation	Total
1924	64 128	36 911	101 039
1930	67 114	35 009	102 123
1940	80 387	41 574	121 961
1950	68 149	30 175	98 324
1960	49 720	20 655	70 375
1970	31 884	11 134	43 018
1980	25 140	9 649	34 789
1990	20 475	7 043	27 518
2000	14 264	5 811	20 075
2010	10 325	2 668	12 993
2013	9 559	2 052	11 611
2014	9 386	1 915	11 301
2015	9 259	1 871	11 130
2016	9 426	1 810	11 236
2017	9 486	1 834	11 320

TABLE 23
Primary occupation fishers and age (1983–2017)

Primary occupation	<20	20–29	30–39	40–49	50–59	60–66	67–69	>=70	Total
1983	1 511	5 544	4 913	3 899	3 608	2 121	486	374	22 456
1984	1 580	5 876	4 880	4 021	3 565	2 047	495	397	22 861
1985	1 581	5 794	4 787	4 081	3 433	1 976	481	332	22 465
1986	1 571	5 903	4 884	4 168	3 403	1 931	436	323	22 619
1987	1 504	5 997	4 782	4 261	3 391	1 872	441	374	22 622
1988	1 444	5 890	4 609	4 277	3 234	1 808	405	381	22 048
1989	1 360	5 805	4 473	4 262	3 103	1 658	435	352	21 448
1990	1 201	5 496	4 205	4 224	2 948	1 565	451	385	20 475
1991	1 045	5 399	4 123	4 185	2 912	1 500	432	408	20 004
1992	868	5 396	4 109	4 146	2 968	1 423	432	438	19 780
1993	779	5 287	4 030	4 115	3 033	1 401	316	112	19 073
1994	541	4 053	3 523	3 625	2 945	1 411	287	61	16 446
1995	544	4 385	3 735	3 648	3 068	1 418	298	64	17 160
1996	465	4 251	3 765	3 627	3 170	1 443	318	48	17 087
1997	436	3 896	3 728	3 503	3 243	1 484	303	70	16 663
1998	426	3 103	3 396	3 188	3 223	1 438	300	66	15 140
1999	458	3 011	3 448	3 180	3 330	1 494	359	47	15 327
2000	447	2 590	3 248	3 033	3 273	1 388	256	29	14 264
2001	424	2 280	3 161	2 924	3 165	1 353	307	60	13 674
2002	383	2 417	3 319	2 998	3 106	1 307	272	39	13 841
2003	353	2 381	3 307	3 008	3 075	1 347	307	43	13 821
2004	291	2 179	3 088	2 919	2 933	1 388	305	47	13 150
2005	218	1 938	2 787	2 768	2 777	1 437	251	40	12 216
2006	202	1 749	2 481	2 686	2 642	1 480	211	24	11 475
2007	181	1 657	2 245	2 609	2 534	1 544	210	38	11 018
2008	196	1 571	2 069	2 543	2 418	1 540	258	24	10 619
2009	219	1 545	1 972	2 478	2 346	1 551	326	28	10 465
2010	211	1 569	1 873	2 431	2 242	1 540	413	46	10 325
2011	238	1 570	1 776	2 393	2 210	1 468	424	141	10 220
2012	223	1 551	1 634	2 272	2 142	1 344	438	221	9 825
2013	200	1 491	1 604	2 196	2 077	1 272	422	297	9 559
2014	182	1 431	1 575	2 118	2 033	1 217	450	380	9 386
2015	184	1 489	1 542	2 002	2 031	1 150	433	428	9 259
2016	175	1 604	1 586	1 955	2 058	1 127	438	483	9 426
2017	194	1 677	1 637	1 906	2 080	1 099	408	485	9 486

TABLE 24
Total numbers of fishers and vessels: 1925–2017

	1925	1930	1940	1950	1960	1970	1980	1990	2000	2010	2015	2016	2017
Total vessels	19 336	21 352	25 931	33 579	41 636	36 201	26 407	17 391	13 017	6 310	5 884	5 947	6 136
Total fishers	101 039	102 123	121 961	98 324	70 375	43 018	34 789	27 518	20 075	12 993	11 130	11 236	11 320

TABLE 25
Number of fishing vessels grouped according to length category (2002–2017)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Vessels	10 641	9 915	8 189	7 722	7 300	7 038	6 785	6 506	6 310	6 250	6 211	6 126	5 939	5 884	5 947	6 136
Less than 10 m	7 353	6 636	5 043	4 682	4 310	4 053	3 922	3 672	3 493	3 455	3 418	3 345	3 208	3 163	3 201	3 370
10-10.99 m	1 346	1 362	1 352	1 375	1 383	1 401	1 431	1 431	1 447	1 456	1 483	1 503	1 510	1 539	1 583	1 633
11-14.99 m	901	888	841	835	833	825	772	759	741	727	729	719	689	667	662	657
15-20.99 m	463	458	413	338	299	290	238	218	203	192	178	167	150	149	140	126
21-27.99 m	261	280	267	247	234	237	197	191	175	155	147	137	131	121	119	109
28 m and above	317	291	273	245	241	232	225	235	251	265	256	255	251	245	242	241

TABLE 26
Average age of fishing vessels by vessel length category (1980–2017)

	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	17.8	18.3	19.7	21.6	24.1	24.3	24.3	24.6	24.7	25.1	25.4	25.8	25.5	25.9	26.2	26.4	26.8	27.3	27.6	27.8	28	27.6
< 10 m	15.9	16.82	19	20.7	23.7	24	24.1	24.4	24.8	25.3	25.7	26.2	26.4	26.8	27.3	27.5	27.9	28.4	28.9	28.9	28.8	27.9
10-10.99 m	15.4	16.5	16.4	18.7	21.6	21.8	21.7	21.7	21.8	22.5	23.1	23.1	22.9	23.4	23.9	24.3	24.8	25.5	26.2	26.7	27	27.4
11-14.99 m	34.5	33.5	27.1	27.6	26.7	26.3	26.4	26.5	26.1	26.4	26.4	26.8	25.8	25.6	25.9	26.2	26.5	27	26.5	26.6	26.9	26.8
15-20.99 m	31.8	30.5	28.6	32.2	35.3	35.2	35.3	35.9	36	35.9	35.9	36.5	33.9	34.5	34.9	35.3	35.6	35.7	36.2	36.6	37.3	36.6
21-27.99 m	25.7	24.1	23.6	25.8	24.6	24.5	24.5	25.2	24.2	23.9	24.3	25.1	23.4	23.9	24.9	26.5	27.4	28.5	28.5	29.2	30.2	30.2
>= 28 m	18.6	20.1	20.1	23.1	21.5	20.4	19.5	19.0	18.3	18.0	18.2	19.2	18.2	19.0	19.9	19.2	19.2	18.8	18.7	18.7	19.4	19.6

This techno-economic performance review of selected fishing fleets in Europe presents the findings of European country level studies of fishing fleets of Denmark, France, Germany, Italy, Norway, Spain, Turkey and the United Kingdom of Great Britain and Northern Ireland. The review includes financial and economic information of 42 fishing fleet segments, including demersal trawlers, purse seiners, pelagic trawlers, long-liners, coastal fishing vessels using passive gears, pots and traps fishing vessels and small-scale hand-liners.

Analysis of the costs and earnings data of 42 of the main fishing fleet segments in Europe in 2016 showed that all types of vessels had a positive gross cash flow. The average net profit margin of the 41 fishing fleet segments analysed was very good with 20 percent. Eighty-five percent of the fleet segments presented positive return on fixed tangible assets (ROFTAs) of 10 percent and higher. However, 38 percent of the fleet segments demonstrated return on investment (ROI) percentages lower than 10 percent.

Comparing the 2016 financial and economic performance results with those of some of the same fleet segments included in the 2002-03 review study, it is clear that general fishing fleet performance in Europe improved. All eight countries together saw a decrease in the number of fishing vessels between 2008 and 2016 of 10 percent, from nearly 60 000 to less than 54 000 vessels. Each of the countries also saw a reduction in total fleet capacity in gross tonnage (GT) and kilowatts (kW). The vessel age structure showed an increasing trend for most of the fishing fleet segments.