Chapter 1. Production trends in fisheries and aquaculture

This chapter provides an overview of recent trends in fisheries and aquaculture production. The continuing importance of aquaculture's contribution to total production is clear and the average rate of growth in aquaculture output has been 2.1% per year since 2011 for the OECD region. The value of OECD level aquaculture output has grown even faster, averaging 6% per year since 2006, driven by price increases of 4% per year as producers have focused on higher value species. Capture fisheries landings at the OECD level have continued following the long-observed trend of decline and are now at the lowest level observed since 1995. This is the result of both declining stocks and more restrictive fishing policies aimed at ensuring sustainable exploitation. The value of capture landings, which was historically supported by price increases as the quantity of landings fell, has also started to decline more recently as prices have also started falling. Following a long period of decline, recent evidence seems to indicate that the number of fishing vessels has been stabilising at the OECD level in recent years.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

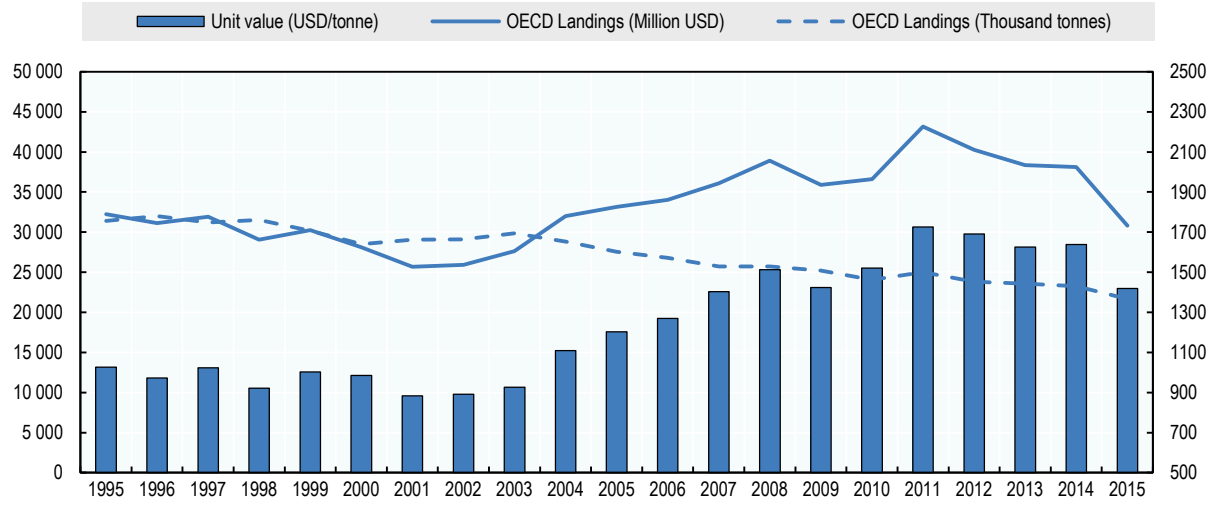
The value of fisheries landing is down from its 2011 peak

The fisheries reported for this *Review* represent approximately half of the global fisheries in terms of volume of landings. Collectively they have reported landings of 45 million tonnes of fish and seafood in the form of 1 092 different species from all parts of the globe, worth USD 74 billion.

Production of wild-caught fish in OECD countries is considerably below its peak in the late 1980s and continues to decline. Price movements, especially after the financial crisis of the mid-2000s, have acted to mitigate the economic impact of lower landings on the sector, and landing values have been essentially flat since 2006, but with a notable spike in values in 2011 (Figure 1.1).

Figure 1.1. OECD landings in value and volume, 1995-2015

USD millions and thousand tonnes (left axis), USD/tonne (right axis)



Note: Landings refers to the weight or value of the product at the time of landing, regardless of the state in which is landed (i.e. the fish may be whole, or gutted or filleted). Total OECD landings are constructed from the sum of all reported landings by OECD member countries participating in the Review. This is currently 35 countries and excludes mainly countries with no substantial marine fisheries (such as landlocked countries).
Source: OECD Fisheries Database.

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The current situation with respect to landings is the result of both declining stocks and more restrictive fishing policies aimed at ensuring more sustainable exploitation of fish stocks for the long term. While production continues to decline, there is some evidence that the number of fish stocks considered to be overfished is declining, as is the number of stocks where overfishing is taking place.

The countries and economies participating in this review collectively report 1 182 stocks with established targets or thresholds recently subject to quantitative assessment. The majority of these, 725 or 61%, have been assessed as meeting the stated management objectives. Of the stocks deemed to be meeting their objectives, which can vary across

countries and stocks, 45% of the determinations have been made on the combined basis of both biomass levels (B) and fishing mortality (F). The remaining determinations are reported to be based upon estimates associated with only one of these indicators, either biomass levels (54%) or fishing mortality (1%).

New Zealand reports stocks at target, below the precautionary and threshold limits as well as subject to overfishing, as a % of all stocks as well as by value and volume (The Status of New Zealand's Fisheries 2016). In terms of the numbers of stocks of known status, by the end of 2016 82% were below the 'overfishing threshold', and 71% were above their management targets. In terms of landings, 94% of assessed landings were made up of stocks that were considered to be meeting their management targets.

The **United States** reports stocks that are overfished and subject to overfishing as a share of all stocks in an annual report to congress that is mandated under the Magnuson-Stevens Fishery Conservation and Management Act (NOAA, 2017[1]). In 2016, 474 stocks and stock complexes managed by federal fisheries management plans were tracked. Of the 235 stocks with known stock status, 197 (84%) were not overfished by the end of 2016 and of the 316 stocks where fishing mortality was known 286 were not subject to overfishing. Of the 339 stocks for which at least an assessment of either F or B was available 167 (49%) were neither overfished nor subject to overfishing and 51 (15%) were either overfished, subject to overfishing, or both.

According to the EU Communication on the State of Play of the CFP and Consultation on Fishing opportunities for 2018, in 2015, 39 of 66 stocks in the North-East Atlantic were exploited within F_{MSY} (59%, up from 52% in the previous year). Median fishing mortality has stabilised at around 1 compared to F_{MSY} (down from 1.58 in 2003 and 1.29 in 2008). The percentage of stocks within safe biological limits is also increasing in the North-East Atlantic. In 2015, 68% of stocks were classified as being within safe biological limits (53% in 2014). The number of total allowable catches (TACs) set in line with maximum sustainable yield (MSY) advice increased to 44, representing 61% of all expected catches in that region, for 20% of the expected catches, there was not MSY advice. The average stock biomass in the North-East Atlantic increased by 35% between 2003 and 2015. In the Mediterranean, fishing mortality remains at levels two to three times higher than F_{MSY} and despite recent improvements, the status of many stocks remains unknown. Furthermore, average biomass declined by 20% between 2003 and 2014.

In the **European Union**, the Common Fisheries Policy (CFP) management objective for fish stocks is for spawning stock biomass (SSB) to attain or exceed the level required to achieve MSY ($B>B_{MSY}$, or its proxy) and for fishing mortality (F) to be at or below that required to achieve MSY ($F<F_{MSY}$).[1] The Scientific, Technical and Economic Committee for Fisheries (STECF) provides stock-level assessment information based on a combination of STECF, ICES and GFCM data (STECF-17-04). This covers 106 stocks from both the North-East Atlantic and the Mediterranean areas, the majority of assessments are with respect to 2015 and the remainder for 2014 and 2013. Of these, F is less than F_{MSY} for 45 of the 106 stocks and above for 61. For B, 26 stocks have $B>B_{pa}$ (within the safe biological limit), 14 are outside this limit and for 66 there is insufficient scientific information to determine the stock biomass size. As regards stocks within/outside CFP requirements, the STECF concludes that the required information is available for 41 stocks; of these 14 stocks are inside CFP requirements and 27 are outside.

Japan reports stocks as being at either "low", "moderate", or "high" levels, (MAFF, 2016[2]). By this method of reporting, out of 84 stocks, 41 were assessed as having a low

status, 29 moderate and 14 high in 2016. The stock trend is also reported on, and of the same 84 stocks 16 are increasing, 38 are stable and 30 are decreasing. When this information is combined, 35 of the 84 stocks are at a medium or high level and are either stable or increasing in trend.

Canada reports on both the status of its major fish stocks and on levels of harvest (Environment and Climate Change Canada, 2017[3]) (Environment and Climate Change Canada, 2017[4]; Fisheries And Oceans Canada, 2016[5]). With respect to status, of the 159 stocks that had their status assessed in 2015, 78 were considered healthy, 31 cautious, 19 critical, and for 31 the status was uncertain. With respect to level of harvest, 152 were considered to be harvested at sustainable levels and 7 stocks (4%) were harvested above approved levels. A total of 76 stocks were assessed as having both healthy status and a level of harvest that was at or below an approved level, whilst 52 stocks were known to be either not healthy (cautious or critical), harvested above the removal reference point, or both.

Iceland, through its Marine Research Institute, reports annually on fish stocks (Hafrannsóknastofnun, 2016[6]). The latest report discusses 36 fish stocks, 7 of which are managed on the basis of harvest control rules using quantitative targets and thresholds, and all of these are deemed to be in satisfactory condition.

Norway reported against the status of 75 stocks or stock complexes in 2016, 47 were considered to have been in good condition with respect to both stock status and fishing mortality, 8 to have had low fishing mortality but poor stock status, and 8 to have had both high fishing mortality and a poor stock status. Of the remaining 12 stocks, 5 had low fishing mortality but uncertain status, 1 had high mortality and uncertain status and 6 had both uncertain status and mortality.

Australia has recently started producing a more comprehensive online compendium of stock status assessments (FRDC, 2017[7]), which covers state managed fish stocks in addition to the nationally managed (Commonwealth) stocks that are covered in the Australian fishery status reports. For 2016 it reported against 298 stocks, assessed at the level of biological stocks (85), management units (56), or jurisdiction (34). From this 232 stock status classifications could be assigned and 175 (75%) were reported to have a sustainable status, 26 were transitional-depleting, 9 transitional-recovering, 17 overfished, 5 environmentally limited, 49 undefined. The remaining 13 stocks are considered 'negligible' stocks, as they combined account for only 0.01% of catch. The stocks covered account for approximately 90% of the value of Australia's wild caught fish and of the catch reported in the Status of Australian fish stocks reports 2016, 85% is from sustainable stocks.

Fisheries in some countries specialised on few species, others more diverse

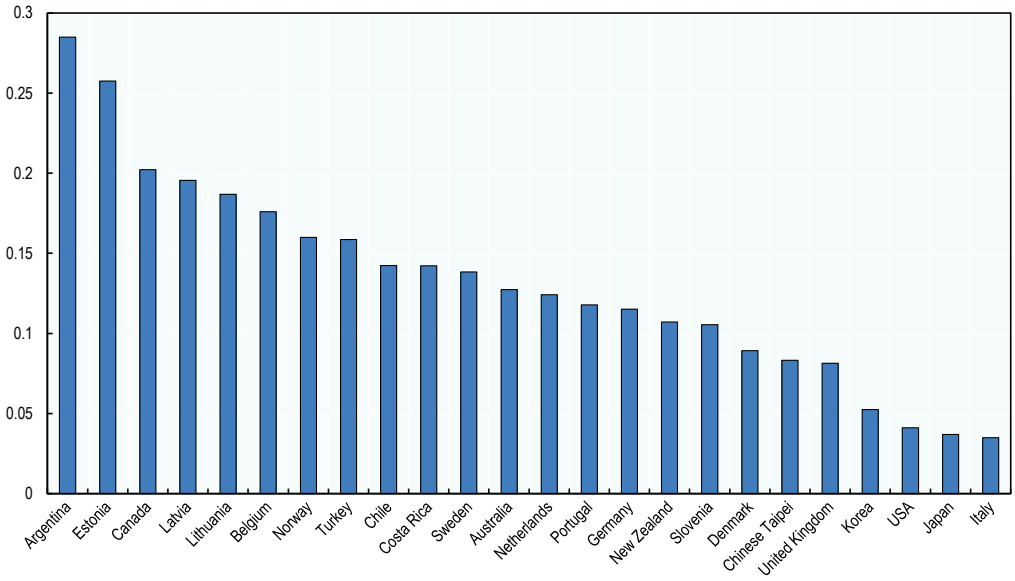
Some countries' fishers pursue a large number of stocks with a broad geographic dispersion, while others are more specialised or localised. This diversity of harvest can be measured using Simpson's diversity index, which measures the probability that two fish drawn at random from the total harvest will be of the same species. This varies from 0 (a very large amount of diversity) to 1 (only a single species is harvested). This index can be seen as a measure of the resilience of the fishing sector in terms of its dependence upon a small number of fish stocks for its revenue.

Using reported landings value data to construct this index, a wide variety of situations in the participating countries or economies is seen (Figure 1.2). In **Argentina,** shrimp hake

and squid together account for 75% of total landed value, while prawns represent more than half of all **Estonian** landings. **Canada** lands a good deal of lobster and crab. **Latvia** is also focused on crab and **Lithuania** targets mainly mackerel. On the other end of the scale, **Italy, Japan, United States** and **Korea** harvest a large number of different species, due to the greater diversity of species in their exclusive zones or significant distant water activities.

Figure 1.2. Index of diversity of landings, selected countries or participating economies, 2015

Lower value indicates greater variety of species harvested



Note: The index is constructed as $\sum \left(\frac{n}{N}\right)^2$ where n is the volume of landings of a particular species and N is the total volume of landings.
Source: OECD Fisheries Database.

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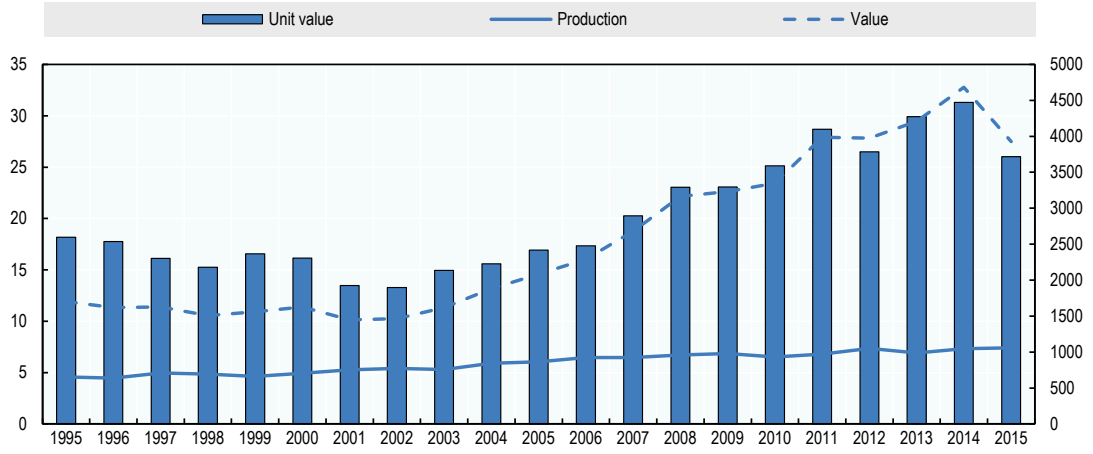
Aquaculture growth steady, focused on higher value species

Growth in aquaculture production has been famously rapid at the global scale. While it has been more modest on average within the OECD grouping, the rate of growth within this grouping has still averaged at more than 1.5% since 2006 and accelerated to 2.1% since 2011 (Figure 1.3). In value terms performance has been even better; total value has grown by 6% per year on average since 2006 with prices increasing by 4% per year.

While improvements in quality and consumer acceptance have helped improve the price of aquaculture products, at least some of this trend is due to a compositional effect where the production mix is shifting towards higher value species such as salmon and sea bass.

Figure 1.3. OECD aquaculture production in value and volume, 1995-2015

USD billions and thousand tonnes (left axis), USD/tonne (right axis)



Note: Aquaculture production is the outcome of aquatic organisms' farming. The OECD total is constructed from the sum of all reported landings by OECD member countries reporting landing data in the Review.
Source: OECD Fisheries Database.

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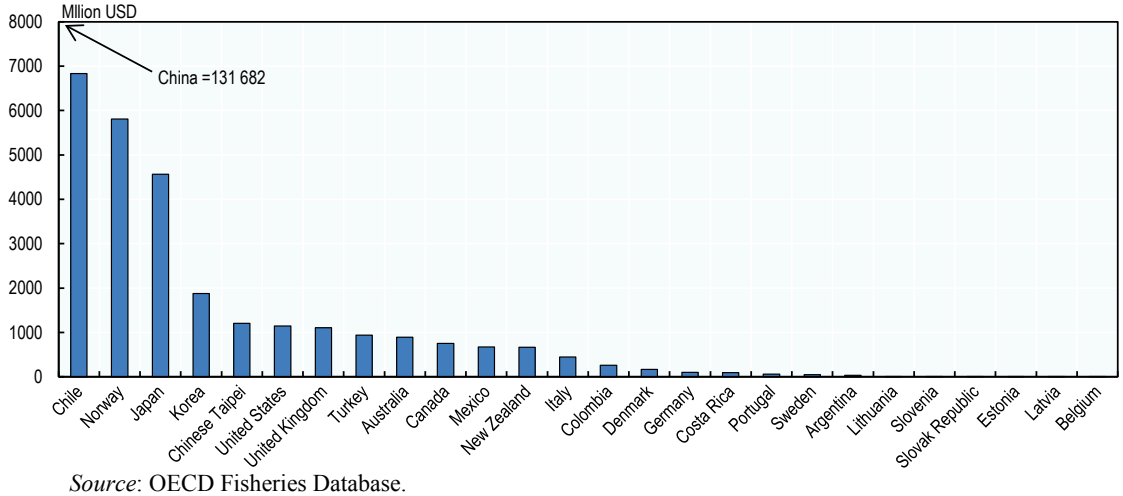
The People's Republic of China (hereafter "China") dominates global aquaculture production, with a total produced value in 2015 of USD 131.7 billion (EUR 119 billion). This is almost 20 times the value produced in **Chile**, the next highest of those participating in this Review[2]. Among OECD countries, **Chile**, **Norway** and **Japan** are the three largest producers (Figure 1.4).

Figure 1.4. Aquaculture value of production, selected countries and economies, 2015

USD Millions



Source: OECD Fisheries Database.

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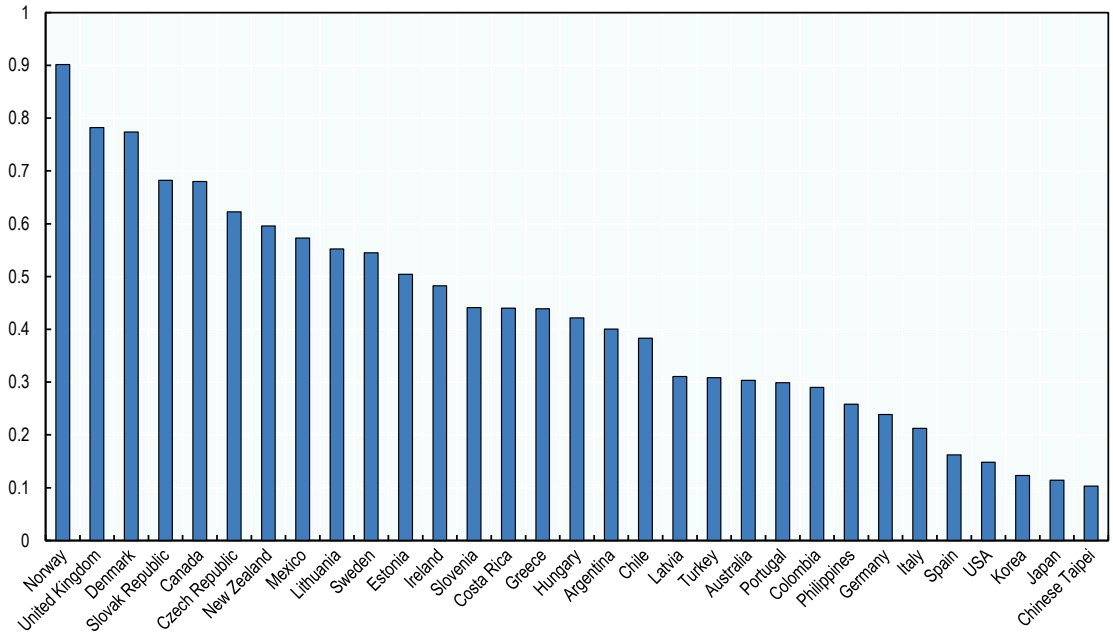
The same index of diversity of production that was presented for fisheries landings can be produced for aquaculture production. This provides an indication of the degree of specialisation of the aquaculture sector of a country as a whole (Figure 1.5). The results show that the three largest OECD producers have very different aquaculture sectors, representing both very specialised **(Norway)** and very diverse **(Japan)** production.

Figure 1.5. Index of diversity of aquaculture production, selected countries or participating economies, 2015

Lower value indicates greater variety of species produced



Source: OECD Fisheries Database.

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The most highly specialised sectors focus on salmon (**Norway**, **United Kingdom**, **Canada**), rainbow trout (**Denmark**), carp (**Czech Republic**) or a combination of these (**Slovak Republic**). **New Zealand** production is mainly shellfish; mussels, oysters and abalone with some salmon. Those with the most diverse aquaculture are also those who had the most diverse capture sectors, **Chinese Taipei**, **Japan**, **Korea**, **United States**, **Spain** and **Italy**. In **Chinese Taipei** ten species make up 90% of production (out of a total of 53 reported species), led by grouper (*Epinephelus spp*) and oysters (*Crassostrea gigas*). In the case of **Norway**, 95% of the value of production is from Atlantic salmon. The importance of the top ten aquaculture species in **Japan** is similar to Chinese Taipei, but with a smaller total number of species produced (26 reported in 2015).

The pace of decline in fleet sizes is moderating

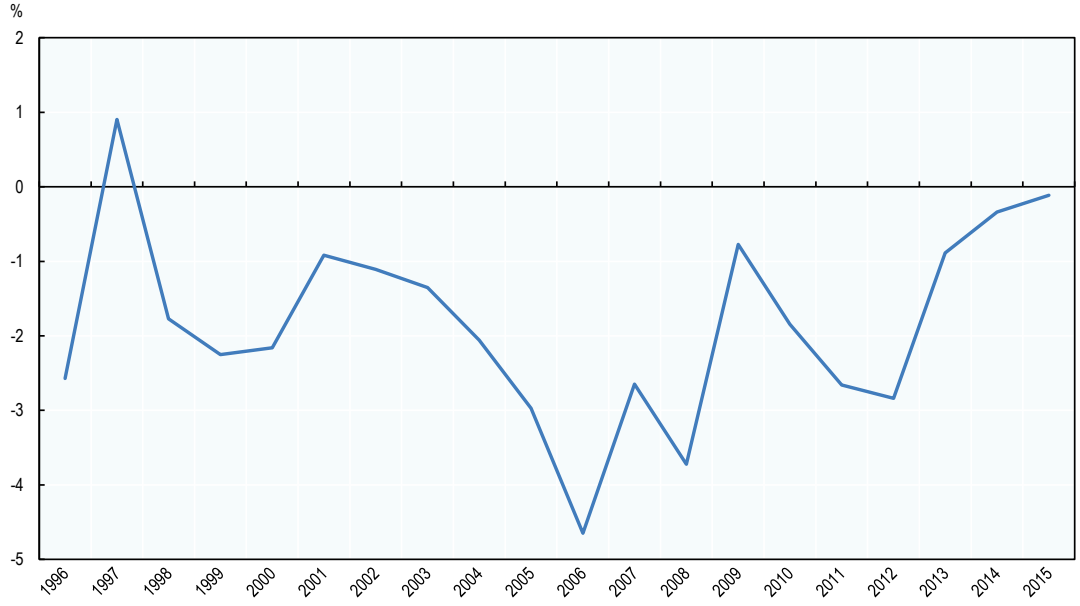
The size of the fishing fleet has been in general decline for some time as fleets adjust to available fishing opportunities. Of the 25 countries or economies reporting a time series long enough to make the calculation, 22 or 88% have shown a decline in the number of

vessels since 2011. This ratio increases to 92% for the time period between 2006 and 2015. The average change in number of vessels for countries or economies reporting data is -2% per year since 2006.

There is some evidence that the rate of decline in the number of fishing vessels is moderating (Figure 1.6). The average rate of decline in number of vessels has moderated since the mid-2000s and is approaching stability in 2013-15, with an average decline in numbers of 0.05% in that period.

Figure 1.6. Average change in number of fishing vessels, 1996-2015

Annual percent change from previous year, average of reporting countries or economies



Note: Not all participants have time series of equivalent length, so the average is not composed of the same number of countries or economies in different years. The reported number is the average of the change in each country, not the change in the total fleet.
Source: OECD Fisheries Database.

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Notes

[1] Article 2 the CFP Regulation (EU 1380/2013)

[2] This reported value of aquaculture production is substantially higher than that reported in the FAO. Value data for China can be difficult to estimate accurately as domestic prices of locally-consumed products are imperfectly known.

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