

# 8 Fish

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This chapter describes recent market developments and highlights the medium-term projections for world fish markets for the period 2024-33. Price, production, consumption and trade developments for fish from capture fisheries and aquaculture are discussed. The chapter concludes with a discussion of important risks and uncertainties that might affect world fish markets over the next ten years.

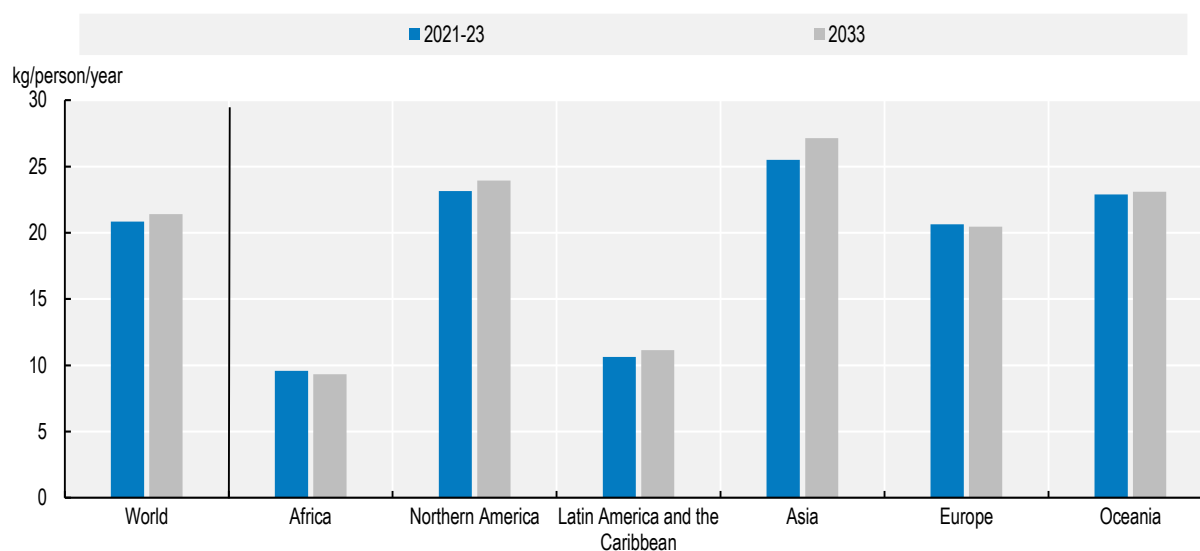
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## 8.1. Projection highlights

### *Slower growth ahead for fish production, consumption, and trade*

Food fish<sup>1</sup> consumption is expected to increase globally, although at a slower pace than in the previous decade. Asia is projected to account for 77% of the additional fish available for human consumption over the *Outlook* period, despite slower growth compared to the previous decade, followed by Africa (16%), and the Americas (8%). Contrastingly, fish food supply in Europe is expected to decline, albeit at a slower rate than in the previous decade. On a per capita basis, average global apparent food fish consumption is anticipated to be 21.4 kg (live weight equivalent) by 2033, up from 20.8 kg in the base period (average 2021-2023). Nonetheless, there is considerable variation in both level and trend of per capita fish consumption among countries and regions (Figure 8.1). Specifically, per capita fish consumption is projected to increase in all continents over the *Outlook* period, except in Europe and Africa. In the case of Africa, this decline is mainly due to population growing faster than supply and is expected to occur despite its already low level of per capita fish consumption. The major increase is expected in Asia with a further rise in its already high per capita fish consumption level. The proportion of fish utilised for food consumption in total fisheries and aquaculture production is projected to stay relatively constant at around 90% throughout the *Outlook* period. The remaining 10% of production will be allocated for non-food purposes, mainly for the production of fishmeal and fish oil.

**Figure 8.1. Per capita consumption of fish**



Note: Data are expressed in live weight equivalent.

Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

The prices of all product groups (aquaculture, capture fisheries, fish food traded, fishmeal and fish oil) are expected to fall over the *Outlook* period in real terms. The fish oil price is expected to experience the largest decline, falling 18% over the coming decade. The price of fish oil grew by 112% between 2021 and 2023 to reach exceptionally high levels, driven in part by the high price of vegetable oils and supply issues, and is expected to return to more normal levels in the early part of the next decade. While slower demand growth for fish and fish products, particularly in Asia, will drive declines in real prices for both capture and aquaculture sectors, slower productivity growth in aquaculture and limited growth of capture fisheries production will mitigate these impacts to some extent. Therefore, the real price declines are expected to be relatively modest over the *Outlook* period.

Global fish production is anticipated to rise over the *Outlook* period, reaching 206 Mt by 2033, an increase of 22 Mt from the base period (average 2021-2023). However, the pace of growth is expected to be slower compared to the previous decade. The rise in production is driven by the ongoing expansion of aquaculture, particularly in Asia. Over 85% of the additional projected production will stem from aquaculture, elevating its share in global fish production to 55%, up from 51% in the base period. The largest production increases are expected in China, India, and Indonesia, accounting for nearly 80% of the additional aquaculture output. Capture fisheries production is anticipated to grow modestly, with volumes ranging between 89 Mt in *El Niño*<sup>2</sup> years and 94 Mt. The fish projections explicitly factor in the *El Niño* phenomenon, acknowledging its significant impact on capture fisheries production and consequently on fishmeal production in Peru and other South American countries. World production of fishmeal and fish oil are projected to grow slightly faster than global fish production over the *Outlook* period. This growth represents a recovery from low levels observed during the base period, primarily due to restrictions in the anchoveta fishing season in Peru, in addition to a growing share of fishmeal and fish oil produced from fish waste.

Global exports of fish for human consumption are expected to keep growing over the *Outlook* period, although at a slower rate compared to the previous decade. This trend reflects both a long-term slowing of trade expansion and a short-term effect related to the COVID-19 pandemic. Traded quantities were particularly high during the base period, primarily due to the strong rebound in trade following the low levels seen in 2020 as a result of the COVID-19 pandemic's impact. Asia, led by China, will continue to be the main force behind the rise in exports, followed by the Americas. Conversely, exports from Africa and Oceania are expected to decline over the *Outlook* period. Africa and the Americas will absorb the majority of the import growth, while import levels for Asia and Europe are anticipated to decline over the *Outlook* period, as demand is increasingly met by domestic production in these regions and due to a lower per capita consumption in Europe.

Climate change is one of the main sources of uncertainty facing the capture fisheries sector over the next decade. In 2023, sea surface temperatures were the highest on record and the trend looks set to continue. Rising sea surface temperatures will have negative impacts on global capture fisheries production, but these impacts will be unevenly distributed. Improving fisheries management adopting proper adaptation methods and tools may also offset these impacts in some regions. Moreover, the conclusion of the next round of fisheries subsidy negotiations at the World Trade Organization (WTO) will also create uncertainty for global capture fisheries production. In aquaculture, policy reforms are the main source of uncertainty. Recent tax reforms in Norway will likely impact the production of farmed salmon, and the effects of policy reforms in China, the world's largest aquaculture producer, will become more apparent over the next decade.

## 8.2. Market situation

### *Return to pre-pandemic trends following strong recovery from COVID-19 pandemic*

Global fish production remained broadly stable in 2023 at 186 Mt, with a growth in aquaculture production while capture fisheries production decreased. The decline in capture fisheries production was particularly strong in Peru, where the fishing season was shortened to guarantee the sustainability of the anchoveta biomass, a species mainly used for the production of fishmeal and fish oil.

According to the FAO Fish Price Index,<sup>3</sup> international fish prices were 1.5% lower in 2023 compared to 2022, following a 19% rise in 2022. In 2023, following the surge in 2022, prices for aquaculture products experienced a decline. This drop in prices was primarily driven by lower prices for shrimps and prawns, and for farmed whitefish species such as tilapia. Conversely, prices for wild-caught species continued to rise throughout 2023, reflecting the lower production volumes.

Between 2020 and 2022, the global international trade landscape has been significantly influenced by the COVID-19 pandemic, and fish and fish products were no exception. Following a decline in 2020, global fish export volumes rebounded rapidly over 2021 and 2022 driven by a robust recovery in global demand. The recovery in value term, was even more pronounced driven by increasing prices. However, in 2023 global exports of fish for human consumption were down again reflecting a reduction in both quantities traded and prices.

## 8.3. Market projections

### 8.3.1. Consumption

Fish can be utilised in various forms for both food and non-food purposes. Those not consumed as food are processed into fishmeal and fish oil or utilized for other non-food purposes, such as ornamental fish, fingerlings and fry, bait, pharmaceutical inputs, and as direct feed for aquaculture, livestock, and other animals. The bulk of fisheries and aquaculture production is used for human consumption and this share is projected to remain broadly stable, reaching 90% by 2033. Overall, the fish available for human consumption is projected to increase by 21 Mt (live weight equivalent) by 2033, reaching 186 Mt. This represents an overall increase of 13% compared to the base period, which is a slower pace compared to the 25% growth experienced in the previous decade. This deceleration primarily reflects the smaller amount of additional production available, a deceleration in population growth and saturated demand in some countries, particularly high-income ones.

Growth in demand will stem mostly from low- and middle-income countries, which will be responsible for 95% of the increase in consumption and will consume 82% of the fish available for human consumption by 2033. In addition to growing populations, demand in low- and middle-income countries, will also be strengthened by income growth and urbanisation, which will increase the demand for animal proteins, including fish, at the expense of plant-based foods. Overall, in low- and middle-income countries the amount of fish food consumption will increase by 15% by 2033 compared with the base period, which is a much slower rate than the 33% observed over the previous decade. Conversely, in high-income countries, food fish consumption is expected to show little growth (+3.0% by 2033), mainly due to slowdowns in population and economic growth, together with ageing populations.

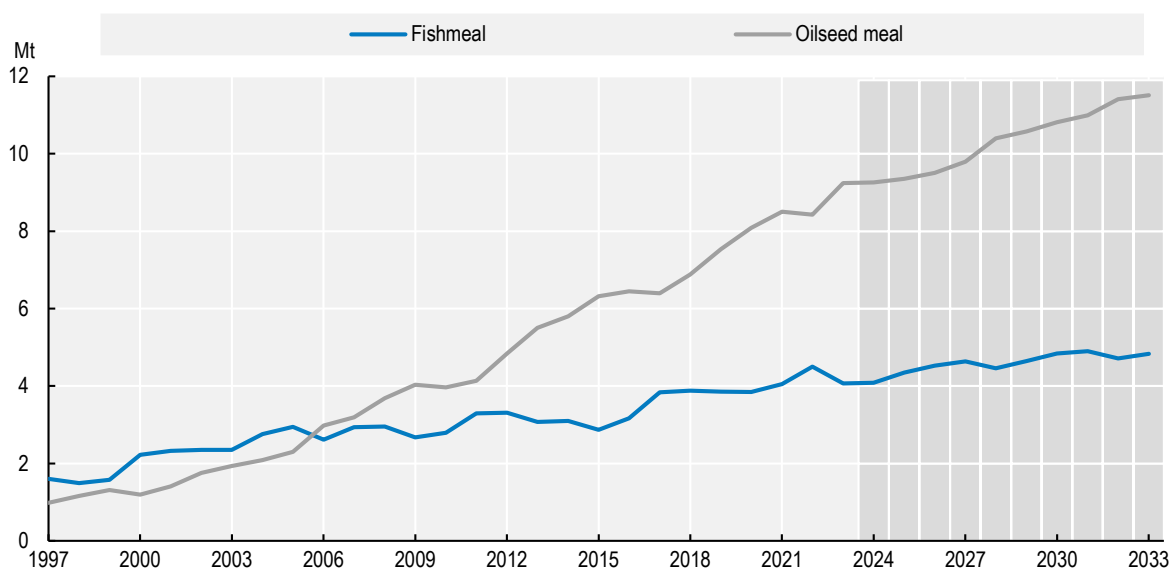
Fish available for human consumption is expected to increase on all continents, except in Europe, where it is expected to decrease by 2.2% by 2033. This decline is attributed to a slight reduction in fish consumption in the European Union, as observed in the previous decade, and a significant decline in fish food consumption in Russia, primarily due to higher exports combined with lower imports. Conversely, substantial growth is expected in Africa (+25%), followed by Oceania (+14%), Asia (+13%), and the Americas (+11%). Asia is anticipated to account for 77% of the additional amount of fish consumed by 2033, with China alone contributing 33% of that additional volume. The proportion of fish originating from aquaculture in the total amount of fish available for food is projected to continue increasing year after year. By 2033, 60% of the fish available for human consumption is projected to come from aquaculture, up from 57% in the base period.

On a per capita basis, apparent fish consumption is projected to be 21.4 kg in live weight equivalent in 2033, up 2.7% from 20.8 kg in the base period. This represents a lower increase than in previous decades. Per capita fish consumption is projected to increase in Asia, the Americas, and Oceania while it is expected to decline in Africa and Europe. In Africa, fish consumption per capita is projected to decrease to 9.3 kg live weight equivalent by 2033, down from 9.6 kg in the base period, mainly due to population growing faster than fish supply. While per capita fish consumption is expected to rise in North Africa, the decline is expected to be particularly sharp in Sub-Saharan Africa. This situation is of particular concern because the region has the highest prevalence of undernourishment in the world and because fish plays a major role

in the region, providing valuable micronutrients and protein, at higher levels than the world average in the case of protein.

Of the 21 Mt live weight equivalent of fish utilized for non-food uses in 2033, fishmeal and fish oil are projected to represent 85%. The rest will serve other non-food uses such as ornamental fish, fingerlings and fry, bait, pharmaceutical inputs, or as direct feed for farming. By 2033, it is projected that 83% of fishmeal and 70% of fish oil will be consumed as aquaculture feeds. Globally, since aquaculture production is growing faster than fishmeal production, a greater amount of oilseed meals is used in aquaculture feed rations (Figure 8.2) By 2033, the projected amount of oilseed meal used in aquaculture is expected to rise by 32% to reach 12 Mt, while the amount of fishmeal used in aquaculture is projected to reach 4.8 Mt, up 15% on the base period. China will continue to be the main consumer of fishmeal, with a projected share of 37% of the total by 2033. The consumption of fish oil is slightly less concentrated than for fishmeal with Norway, the European Union and Chile expected to account for 43% of total fish oil consumption by 2033.

**Figure 8.2. Quantities of fishmeal and oilseed meal used in aquaculture**



Note: data are expressed in product-weight equivalent.

Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

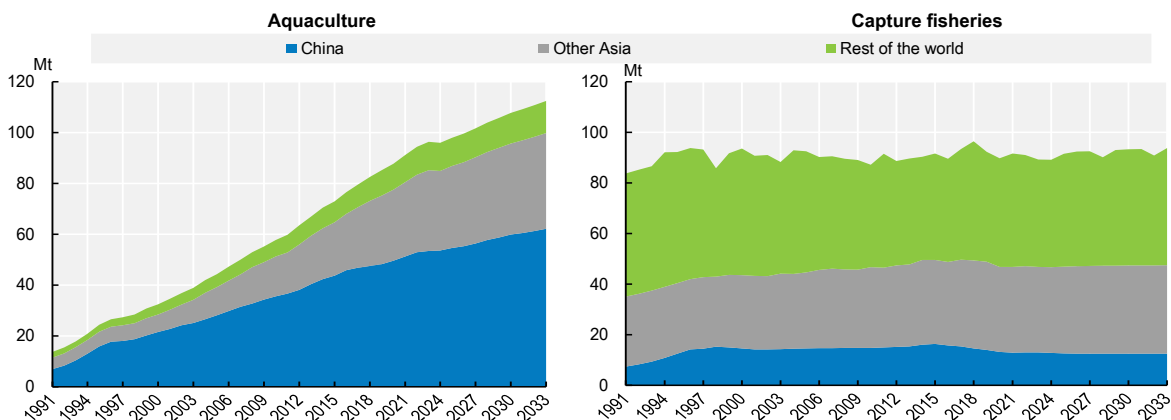
### 8.3.2. Production

Global fish production, encompassing both capture fisheries and aquaculture, is anticipated to rise from 185 Mt during the base period to 206 Mt by 2033. While the total quantity being produced continues to increase, both the rate and absolute level of growth continue to fall. Global fish production is expected to expand by 12% (or 22 Mt) over the next decade compared with 21% (or 32 Mt) during the previous decade. Aquaculture will drive the deceleration of growth, while still maintaining its role as the primary force of the overall expansion of global fish production. By 2033, aquaculture is expected to account for 55% of global fish production, compared with a share of 51% in the base period.

Aquaculture production is projected to be 112 Mt by 2033, an increase of 20% relative to the base period, compared with 52% in the previous decade. This lower aquaculture production growth is expected to result from the anticipated decrease in productivity gains at the world level, due to environmental regulations and a reduction in the availability of optimal production locations. China will remain the largest aquaculture producer, however its share of world aquaculture production is expected to stabilize at about 55%, which

reflects the anticipation for strong growth in aquaculture production in other countries such as India and Indonesia (Figure 8.3). Aquaculture production is expected to grow on all continents, and in nearly every country throughout the projection period. However, the distribution of aquaculture production will continue to remain unbalanced, with Asia projected to account for 89% of world aquaculture production by 2033, the Americas for 5%, Europe and Africa for 3% each, and a negligible share for Oceania.

**Figure 8.3. Aquaculture and capture fisheries production**



Note: Data are expressed in live-weight equivalent.

Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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At the level of species groups, all types of aquaculture production will continue to rise, albeit with varying rates of growth. Carp is projected to retain its position as the primary species group in terms of volumes, making up 33% of total aquaculture production by 2033. Nonetheless, its proportion of total aquaculture production is anticipated to decline further over the *Outlook* period. The downward trend reflects the increasing demand for a wider selection of aquatic species particularly in Asian countries, where carp is primarily consumed. Likewise, the share of salmonoids in total aquaculture production is set to decline marginally to 4% from 5% in the base period, reflecting slower growth than in other farmed species, mainly attributed to production constraints in Norway, the leading producer, as linked to the implementation of additional taxes (more information available in the risks and uncertainties sub-section). Molluscs will maintain a stable share, accounting for 20% of total aquaculture production, while shrimps and prawns (10%), tilapia (7%), and other freshwater fish such as catfish and pangas (16%) are projected to rise faster than the other species groups. This growth is anticipated to result in an increase in their share of total aquaculture production.

Capture fisheries production is projected to reach 94 Mt by 2033, an increase of 3.5% relative to the base period. While some of this rise is related to the particularly low anchoveta production in Peru in 2023 for stock management reasons, it does reflect rising production, particularly in Africa and the Americas over the *Outlook* period. The distribution of capture fisheries production across continents is expected to remain broadly unchanged over the *Outlook* period, with Asia accounting for just over half of world capture fisheries production by 2033, followed by the Americas (20%), Europe (15%), Africa (12%) and Oceania (2%). China will remain the top producing country, accounting for 13% of world capture fisheries production by 2033 (Figure 8.3).

The proportion of world capture fisheries production reduced to fishmeal and fish oil is expected to remain stable over the *Outlook* period, at about 19%. Nevertheless, the production of fishmeal and fish oil are

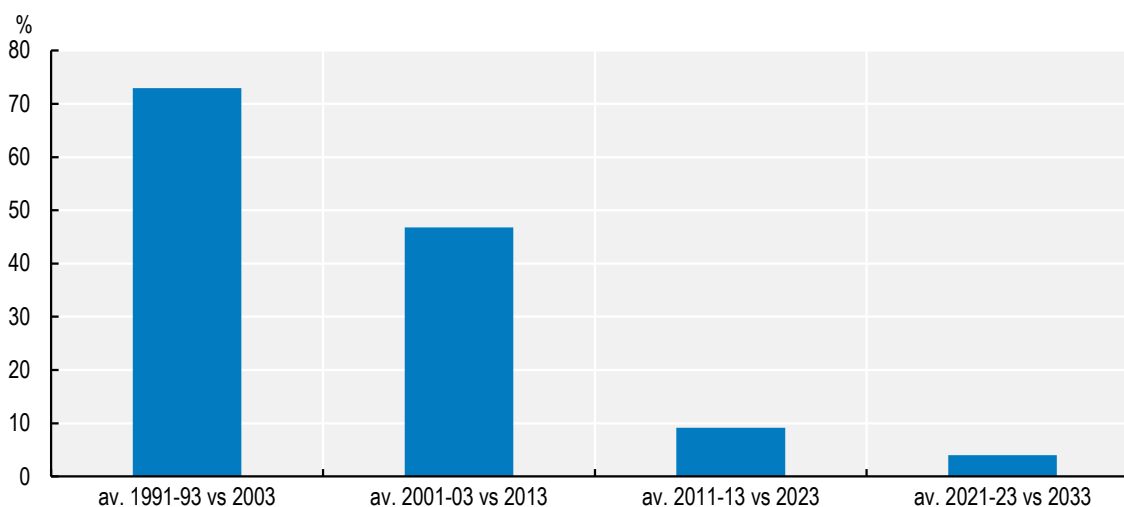
expected to grow by 15% and 17% respectively by 2033, reaching 6.0 Mt and 1.7 Mt in product weight. This rise predominantly reflects the increase in capture fisheries production over the *Outlook* period and the growing share of fishmeal obtained from fish waste. By 2033, the proportion of fishmeal being produced from fish offal is projected to increase from 29% in the base period to 30% by 2033, while for fish oil it is projected to stabilise at 58%. Peru will remain the top producer of fishmeal over the *Outlook* period, and Chile the top producer of fish oil.

### 8.3.3. Trade

Aquatic products will continue to be highly traded, boosted by increased consumption, improved storage, preservation, transportation and liberalization policies. Such trends have facilitated the emergence of complex supply chains in which fish and fish products often cross several national boundaries before final consumption. About 35% of total fisheries and aquaculture production is expected to enter international trade (31% excluding intra-EU trade) in the form of products for human consumption or for non-food purposes by 2033. A share of this trade consists of repeated trading of products in different processing stages among countries and regions.

World exports of fish for human consumption are projected to total 45 Mt live weight by 2033, up 4.0% (or 1.7 Mt) on the base period. However, this growth rate represents a slowdown compared to the 9.1% growth observed in the previous decade, influenced by both long-term and short-term factors (Figure 8.4). Trade growth has decelerated sharply since the 2010s, and this trend is expected to continue over the *Outlook* period, with short term factors further supporting this trend. Traded quantities were particularly high during the base period, calculated as an average of 2021 to 2023, which tends to lower the growth rate projected over the *Outlook* period. This high level of traded quantities in the base period primarily reflects the strong rebound in trade following the low levels seen in 2020 as a result of the COVID-19 pandemic.

**Figure 8.4. Growth rates in world exports of fish for human consumption**



Note: Growth rates calculated on world exports of fish for human consumption expressed in live weight equivalent.

Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

The bulk of the growth in fish exports for human consumption is projected to originate from Asian countries, which will account for 57% of the additional exports by 2033. Asian countries, being the main producers, are expected to remain the major exporters. By 2033, Asia is projected to account for nearly half of the world exports for human consumption. China will remain the largest exporter of fish for human

consumption, accounting for 19% of the total by 2033, compared with 17% in the base period. Strong growth is also expected from Russia and Ecuador, while strong decreases are expected in North African countries.

The European Union, the United States, China, and Japan are anticipated to maintain their positions as the primary importers of fish for human consumption. By 2033, these countries are projected to collectively represent 50% of global imports, a slight decrease from 52% in the base period. This decline in the share of the traditional importers reflects the increasing demand for fish food products from other regions worldwide. Africa is expected to witness the most substantial growth in imports (+38%) over the *Outlook* period. Import growth in Africa is predicted to surpass production growth, leading to a higher reliance on imports for fish for human consumption. The share of imports in Africa's fish food supply is projected to rise to 38% by 2033, compared with 34% in the base period.

Trade of fishmeal is projected to be rather stable throughout the projection period, with a limited growth of 4.0%, totalling 3.6 Mt product weight in 2033. Peru is expected to remain, by far, the main exporter of fishmeal, despite its exports nearly halving in 2023 due to the shortening of the fishing season. However, expectations are for the anchoveta stock to recover rapidly allowing for production and export volumes to rebound from 2024. The European Union, Viet Nam and Chile are anticipated to remain the other largest fishmeal exporters. China will remain the main fishmeal importer, accounting for nearly half of total imports by 2033, underscoring the significance of its aquaculture production, as fishmeal is a key ingredient in feed manufacturing. Driven by increased production, fish oil exports are projected to increase by 12% over the next decade reaching 1.1 Mt product weight in 2033. Norway and the European Union will remain the main importers with shares of global fish oil imports of 24% and 22% respectively by 2033.

#### **8.3.4. Prices**

*Prices are expected to decline across the Outlook period*

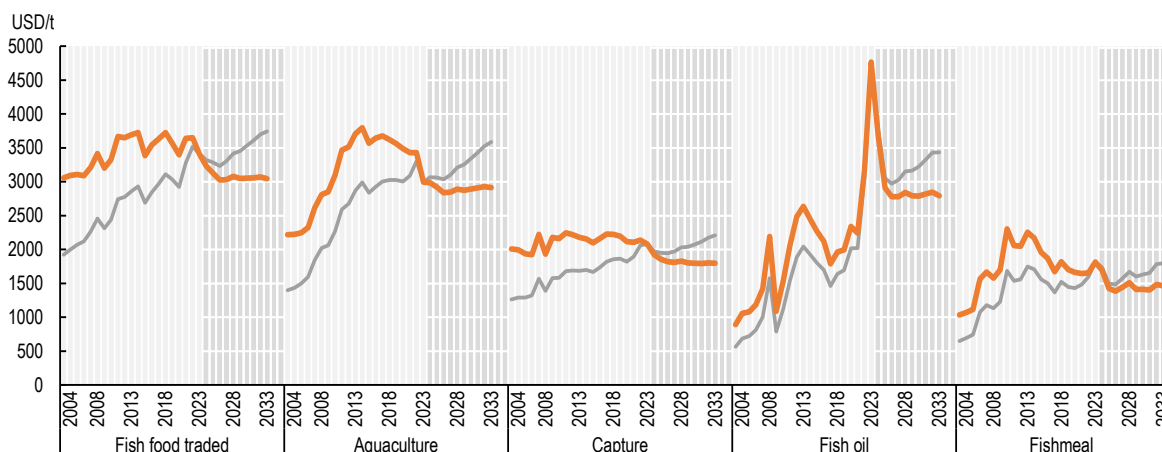
The prices of all product groups are expected to decline over the *Outlook* period in real terms. In 2023, the price of traded fish products declined following increases driven by the recovery from the COVID-19 pandemic and inflationary pressure. Across all product groups, fish prices are expected to fall in both nominal and real terms until 2025-27, before returning to slow growth. Fish oil prices are expected to remain high relative to historic values, but in the other product groups (fishmeal, aquaculture, capture and fish food traded) the prices will be slightly lower than historic levels. Overall, the price declines in the *Outlook* period are similar in size to the previous decade, except in the case of fish oil (Figure 8.5).

Prices of aquaculture and capture fisheries products will experience real term declines of 11% and 15% respectively. In both cases the declines are driven by increased competition from other protein sources, most notably poultry where prices are expected to decline by 20% over the *Outlook* period (driven by increased production). This softening of demand for fish and fish products is balanced by the limited production growth of capture fisheries and the slowing of aquaculture production growth, which will limit the impact of reduced demand in the second half of the production period.

In nominal terms, aquaculture prices are expected to grow by 15% (+2.0% p.a.) during the *Outlook* period, which equates to a real term decline of 11% (-0.0% p.a.). This is a larger nominal price growth than seen in the previous decade (+10.5% at +0.8% p.a.) and smaller real price decline (-16% at -1.8% p.a.). The smaller decline in real prices reflects the slower growth in production over the *Outlook* period when compared to the previous decade. While prices are expected to decline overall during the next decade, they are actually projected to increase from 2027 as demand catches up with and then exceeds production growth.



Figure 8.5. World fish prices



Note: Fish food traded: world unit value of trade (sum of exports and imports) of fish for human consumption. Aquaculture: FAO world unit value of aquaculture fisheries production (live weight basis). Capture: FAO estimated value of world ex-vessel value of capture fisheries production excluding for reduction. Fishmeal: 64-65% protein, Hamburg, Germany. Fish oil: N.W. Europe. Real price: US GDP deflator and base year = 2023.

Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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Capture fisheries prices in real terms are projected to decline by more in the *Outlook* period (-15% at -0.6% p.a.) than the previous decade (-6.1% at -0.3% p.a.). This difference is driven by the modest production increase that is expected during the *Outlook* period and the increased competition from cheaper sources of protein (e.g. poultry). Prices are expected to decline more rapidly until 2027 before stabilising for the rest of the *Outlook* period. The shape of the decline is the result of prices receding from the high point in the base period caused by the post COVID-19 pandemic inflationary pressure.

Fish oil prices experienced an exceptional 112% real price growth through 2022 and 2023. This was driven by several different factors including the cancellation of the 2023 anchovy season in Peru, one of the world's largest producers, and the exceptionally high prices of vegetable oil, again caused by supply chain issues. Consequently, the high prices in the base period mean fish oil prices are expected to decline 18% (-1.6% p.a.) over the *Outlook* period, compared to a 99% price increase (+5.8% p.a.) in the last decade. Fish oil prices are expected to experience a sharp decline until 2027 as supply returns to more normal levels. However, after 2027 prices are expected to begin increasing slowly, reflecting continued strong demand for both aquaculture feed and human consumption. In contrast to the other product groups, the price of fish oil is expected to remain high relative to historic levels.

Fishmeal prices are projected to experience a slower decline of 14% (-0.7% p.a.) in real terms when compared to the previous decade (-14% at -2.1% p.a.). Contrary to fish oil, the price of fishmeal had not increased as much as the price of oilseed meals in the aftermath of the COVID-19 pandemic. A return to a more normal level of substitution between fishmeal and oilseed meals combined to the lower catch of anchoveta in Peru in 2023 brought the price ratio closer to historical levels. In the first half of the *Outlook*, the fishmeal price will remain low compared to historical levels, due to expected low prices of oilseed meals, with small price rises expected in years of El Niño. Due to continued demand from the aquaculture sector, the fishmeal prices and the ratio with oilseed meal prices are expected to return to historical levels by the end of the *Outlook* period.

## 8.4. Risks and uncertainties

Climate change, regulatory changes and international negotiations on fisheries subsidies are among the largest sources of uncertainty facing the fisheries and aquaculture sectors. Climate change has become one of the most pressing stressors for aquatic life, including fisheries and aquaculture resources (Barange et al., 2018<sup>[1]</sup>). Last year was the hottest on record for sea surface temperatures (Copernicus, 2023<sup>[2]</sup>), and the trend looks set to continue in 2024. The increased sea surface temperatures will lead to a decline in overall fisheries catch potential and a redistribution of marine fisheries resources, with some regions benefitting while others lose. The distribution and productivity shifts challenge fisheries managers as they undermine the stationary assumptions of biological models which form the basis of management decisions. Aquaculture and freshwater fisheries are also facing pronounced climate stress, affecting their viability. Additionally, climate-driven extreme events (e.g. marine heatwaves, cyclones, droughts, floods) are increasing in frequency and severity, with impacts which are hard to predict, can occur quickly and have rapid and long-lasting impacts on both capture fisheries and aquaculture. Climate impacts and the outcomes of the adaptation strategies implemented to address them introduce significant sources of uncertainty to the projections.

Climate mitigation policies may also impact capture fisheries and aquaculture production in hard-to-predict ways. Technological responses and policies implemented to reduce the greenhouse gas emissions (GHG) from fisheries and aquaculture might change the way producers operate. On the one hand, improved fisheries management is an effective mitigation strategy for capture fisheries and could lead to increased production or reduced production in the short term, while on the other, strategies to move away from emissions intensive fishing methods might reduce production in some areas. In the case of aquaculture, mitigation policies could impact production growth and investment over the next decade. For both capture fisheries and aquaculture where and how these impacts will manifest is difficult to capture in projections. The OECD is currently working with countries to understand the challenges facing the sector and to identify policy best practices for climate change adaptation and mitigation in capture fisheries and aquaculture.

To help vulnerable states mitigate the often-devastating effects of climate change, the FAO Blue Transformation can provide a pathway for hunger reduction and sustainable management of oceans, seas, and marine resources through reconciling environmental sustainability, food security and livelihood priorities. The Blue Transformation takes a systemic approach that focuses on more efficient, resilient, sustainable and gender-responsive and inclusive fisheries and aquaculture promoted through improved policies and programmes for integrated science-based management, technological innovation, and private-sector engagement. The FAO Blue Transformation roadmap<sup>4</sup> provides a short summary of this initiative developed around three global objectives that reflect FAO's vision for what aquatic food systems transformation must achieve by 2030 and beyond, aligning its policies and priority actions accordingly.

Beyond climate change, the ongoing fisheries subsidies negotiations at the World Trade Organization (WTO) create uncertainty for the capture fisheries projections. The binding disciplines on fisheries subsidies that are currently being negotiated could have significant impacts for global fishing fleets, in particular the distant water fleets. However, countries failed to agree at the most recent round of negotiations at the WTO Ministerial meeting in February 2024, but did agree to continue discussions, meaning the timing and magnitude of such impacts is unclear. Further, the first WTO agreement on fisheries subsidies is likely to come into force during the *Outlook* period, with potential impacts on capture fisheries production despite the smaller scope of subsidies disciplines.

Regulatory changes also create uncertainty in the aquaculture projections. Shifting government policies, particularly related to environmental impacts could alter the distribution and rate of growth of aquaculture. In particular the 14<sup>th</sup> five-year plan in China (2021-2025), builds on the regulatory changes already made in the 13<sup>th</sup> five-year plan to improve the sustainability of the aquaculture sector, including by stabilising the aquaculture acreage, encouraging water recycling, better treating effluent and reducing the use of antibiotics in production. These regulations and the current economic turbulence in China are likely to

impact national production and have global level implications given the importance of China as both a producer and trader of fish and fish products. Outside of China, the resource tax on the profits of salmon farms in Norway (so-called “salmon tax”) implemented in 2023 is expected to reduce profitability and represents an additional source of uncertainty given Norway is the world’s largest producer of farmed salmon. The projections assume the elimination of the tax in 2026, leading to an 9% increase in Norwegian aquaculture production over the *Outlook* period compared to the base period. Alternatively, scenario analysis suggests that if the tax was to be maintained, Norwegian aquaculture production could potentially decrease by 8% by 2033. The variations between these scenarios effectively demonstrate the degree of uncertainty surrounding salmon production resulting from this tax.

## References

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- Copernicus (2023), *October 2023 - Exceptional temperature anomalies; 2023 virtually certain to be warmest year on record*, Copernicus Climate Bulletins Newsflash, European Commission, <https://climate.copernicus.eu/copernicus-october-2023-exceptional-temperature-anomalies-2023-virtually-certain-be-warmest-year>. [2]

## Notes

<sup>1</sup> In this chapter, the term “fish”, “seafood”, “fisheries and aquaculture production/products” or “aquatic animal products” are used to indicate fish, crustaceans, molluscs and other aquatic animals, but exclude aquatic mammals, crocodiles, caimans, alligators, seaweeds and aquatic plants. All quantities are expressed in live weight equivalent, except those of fishmeal and fish oil.

<sup>2</sup> The years of the *El Niño* are set in the model to occur in 2024, 2028 and 2032.

<sup>3</sup> Calculated in nominal terms and covering fisheries and aquaculture products.

<sup>4</sup>The FAO Blue Transformation roadmap is found at <https://www.fao.org/3/cc6646en/cc6646en.pdf>.