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Aquaculture market in the Black Sea: country profiles

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Preparation of this document

This publication was prepared by the Secretariat of the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the International Organisation for the Development of Fisheries and Aquaculture in Europe (Eurofish) and with the active contribution of representatives from Black Sea countries.

It provides key data insights on the state of aquaculture markets in the Black Sea region, and it is designed as a user-friendly and easy-to-read tool to inform key stakeholders, administrators, professionals and consumers about current and future challenges in the region and to provide decision-makers with useful data for policy development.

This document represents a first step towards improving the availability of market data on Black Sea aquaculture. It was prepared within the framework of the Black Sea Aquaculture Market Observatory, which is being established by the GFCM in order to enhance cooperation, improve the sharing of knowledge on aquaculture, foster the development of a market strategy for local aquaculture products and small-scale aquaculture, and promote a consistent approach for data collection and analysis in order to best provide comparable data across the region.

The data used for the analysis were mainly provided by the following administrations and institutes from the six Black Sea countries featured in the publication: Trakia University, Bulgaria; Ministry of Environment and Agriculture, Georgia; National Agency of Fisheries and Aquaculture, Romania; Research Institute of Fisheries and Oceanography, Russian Federation and Methodological and Technological Centre of Aquaculture, Ukraine. Information gathered through consultations with industry stakeholders, international organizations and fishing organizations, including an expert consultation on a methodology for aquaculture market studies carried out by the GFCM in 2019, complemented the figures used for this study.

Acknowledgements

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The editing, graphics, layout and publishing were coordinated by the GFCM, namely Dominique Bourdenet (Scientific Editor), with the valuable assistance of Alexandria Schutte (Junior Aquaculture Documentation Specialist), Ysé Bendjeddou (Documentation and Publications Specialist) and Antonia Bentel (Editing and Publications Intern). The graphic concept, design, infographics and layout were expertly created by Chiara Caproni.

Abbreviations and acronyms

ANPA	National Agency for Fisheries and Aquaculture (Romania)
BFSA	Bulgarian Food Safety Agency
BSGM	General Directorate of Fisheries and Aquaculture (Turkey)
DARG	State Fisheries Agency of Ukraine
EAFA	Executive Agency for Fisheries and Aquaculture (Bulgaria)
EIB	Aegean Exporters' Association
EUMOFA	European Market Observatory for fisheries and aquaculture
Eurofish	International Organisation for the Development of Fisheries and Aquaculture in Europe
FAO	Food and Agriculture Organization of the United Nations
FTE	full-time equivalent
GDP	gross domestic product
GEOSTAT	National Statistics Office of Georgia
GFCM	General Fisheries Commission for the Mediterranean
HoReCa	hotel, restaurant and catering
MADR	Ministry of Agriculture and Rural Development (Romania)
MAFF	Ministry of Agriculture, Food and Forestry (Bulgaria)
MEPA	Ministry of Environmental Protection and Agriculture of Georgia
NIS	National Institute of Statistics (Romania)
RAS	recirculating aquaculture systems
ROMFISH	Romanian Fish Farmers Association
Rosstat	Federal State Statistics Service of the Russian Federation
SDGs	Sustainable Development Goals
TURKSTAT	Turkish Statistical Institute
Urkstat	State Statistics Service of Ukraine

Executive summary

This publication provides an overview of the state of aquaculture markets in 2020 for the six countries surrounding the Black Sea: Bulgaria, Georgia, Romania, the Russian Federation, Turkey and Ukraine. This work presents a general analysis of the aquaculture sector in each country and illustrates the main features and trends of production, trade and marketing in the industry.

The analysis begins with a brief regional overview of the sector in the Black Sea. It is then subdivided into six country profiles. Each profile presents detailed information on aquaculture production by species; type of facility and capacity; trade patterns in terms of volume and value; product types; processing; distribution channels, including by type of product; prices; and marketing and promotion. The publication concludes with insights of the main impacts of COVID-19 on the aquaculture sector in each country.

The regional overview illustrates that from 2015 to 2019, the aquaculture market in the Black Sea remained stable and even exhibited moderate growth. The general sector was dominated by small- to medium-sized farms which, along with their larger counterparts, increased production of a wide variety of species and took advantage of the stable prices experienced during the period. Out of the six Black Sea countries, imports increased in four, largely in the form of frozen products. Exports increased in five of the six countries, despite differing methods of pre-processing and preservation between the countries. At the distribution level, traditional retailers, including fish shops and fish markets, dominated in each country.

The following sections provide analyses on a national scale, revealing varied patterns. In Bulgaria, the aquaculture market is promising; recent years have shown an increase in production, trade, prices as well as in the number of registered farms and the volume of processing. However, in 2020, the market was impacted by COVID-19, which led to a decline in sales. In contrast, the Georgian aquaculture market has been more restrained. While production has slightly increased in recent years and prices have remained stable, imports and exports have both declined and, although no comprehensive survey has yet been conducted to evaluate the effects of COVID-19, demand has likely decreased. Similarly, demand has also decreased in Romania as a consequence of COVID-19 restrictions, despite a relatively stable market prior to the pandemic. Indeed, between 2015 and 2019, Romanian production slowly increased, prices remained steady, imports showed stable growth and exports slightly increased, while the volume of processing declined. In the Russian Federation, the aquaculture market showed stable growth between 2015 and 2019. During that four-year period, there was an increase in production, imports, exports, and processing. In addition, despite decreasing demand, prices across the country nevertheless remained stable. Like the Russian Federation, Turkey exhibited growth in aquaculture production over the same period and had a substantial increase in exports. However, imports decreased slightly, despite processing remaining stable. As with other countries, Turkey experienced a decline in sales due to the drop in demand as a consequence of COVID-19 in 2020. Finally, Ukraine saw relatively stable markets in terms of production, processing, and prices, from 2015 to 2019. Additionally, imports showed steady growth and exports moderately increased, whereas sales of aquaculture products declined in 2020.

Introduction

For generations, aquaculture has economically, socially and culturally influenced the Black Sea. Today, the aquaculture sector continues to grow, becoming an increasingly important part of the Black Sea economy, reaching production volumes of over 700 000 tonnes in 2019. Within the region, aquaculture supplies nutritious farmed blue food for local and international consumption, employs thousands, and delivers social benefits to coastal communities. Both freshwater aquaculture and mariculture are practiced, though in most countries, mariculture remains underdeveloped. The largest share of producers is represented by small and medium farms which, along with their larger counterparts, produce a wide variety of species, including carp, trout, catfish and sturgeon. In terms of their distribution, aquatic products are mainly dispensed through traditional retail outlets including fish shops and fish markets.

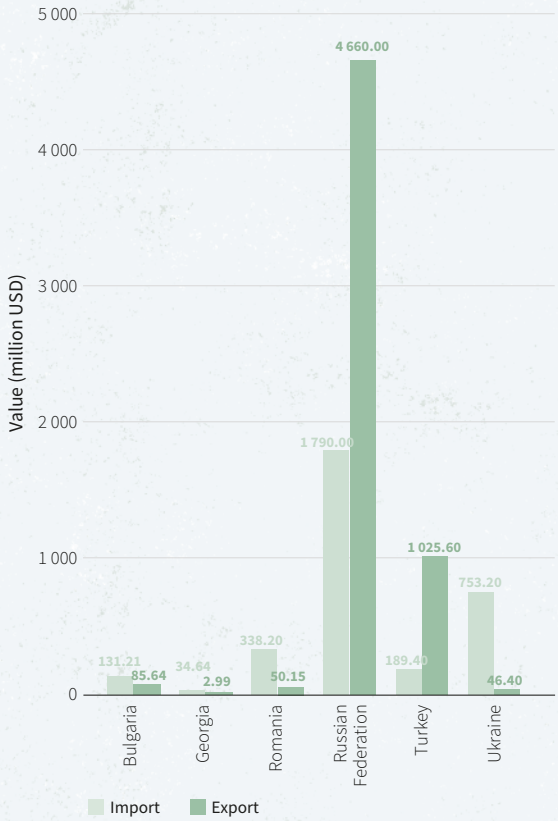
However, as the aquaculture sector is constantly evolving due to changes in demand, supply, environmental conditions but also crises, these market trends may change over time. In order to ensure the resilience and sustainability of aquaculture as a supplier of blue food, a provider of employment and livelihoods, and an instrument for economic growth, it is necessary to address these potential changes as well as the impacts of possible future crises when managing aquaculture markets in the region. Currently, the major focus has been addressing the impacts of the COVID-19 pandemic and, while to date, there have been diverse responses from governments and actors along the blue food value chain, further support is needed to build stronger food value chains that will endure future crises. This would uphold the blue transformation of aquaculture in the region, thus safeguarding sustainability, livelihoods and food security in order to meet the targets of the United Nations 2030 Sustainable Development Agenda and Sustainable Development Goals (SDGs), in particular SDG 2 “Zero Hunger”, SDG 14 “Life Below Water”, SDG 8 “Decent Work and Economic Growth” and SDG 12 “Responsible Consumption and Production”.

On this path, it is necessary that decision-makers have access to a plethora of up-to-date, high-quality data in order to support their work. The General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO) recognizes this need, specifically the importance of market data homogeneity as a tool for decision-making at all levels and has been working towards the standardization of data collection across the region. Within this framework, the GFCM has developed the Black Sea Aquaculture Market Observatory, a regional platform for sharing aquaculture data and information. Its aim is to allow decision-makers and stakeholders in each country to better understand how their market compares to others in the region and assist them in the development of appropriate market strategies by providing access to greater amounts of shared information and data.

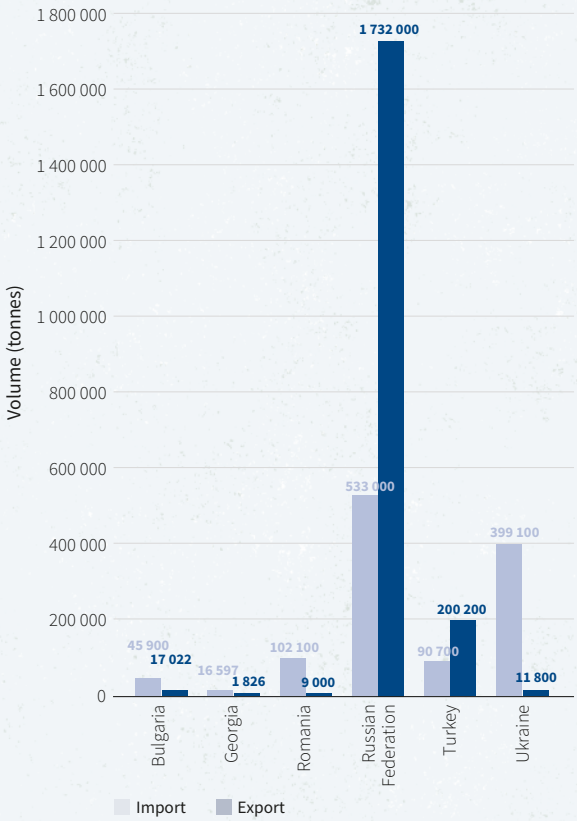
It is from this perspective that this publication was prepared. The information provided in each profile is the same, although it is presented in different ways depending on how the data are collected and analysed by each country. While there is still work to be done towards harmonizing data collection and analysis processes, this publication provides a unique insight into the aquaculture sector and markets in the Black Sea.

The Black Sea aquaculture market: a snapshot

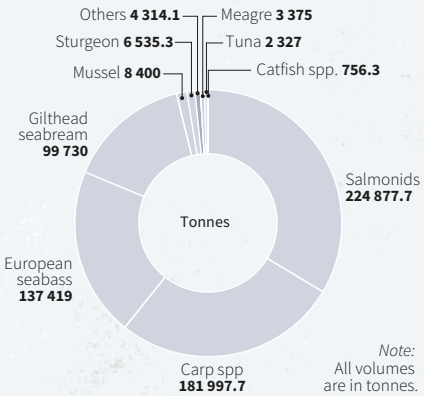
Value of imports and exports, 2019



Volume of imports and exports, 2019

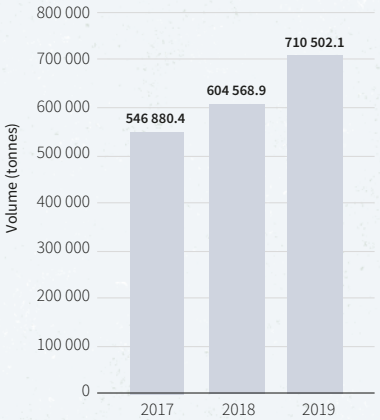


Main farmed species in terms of production volume



Note: All volumes are in tonnes.

Total aquaculture production

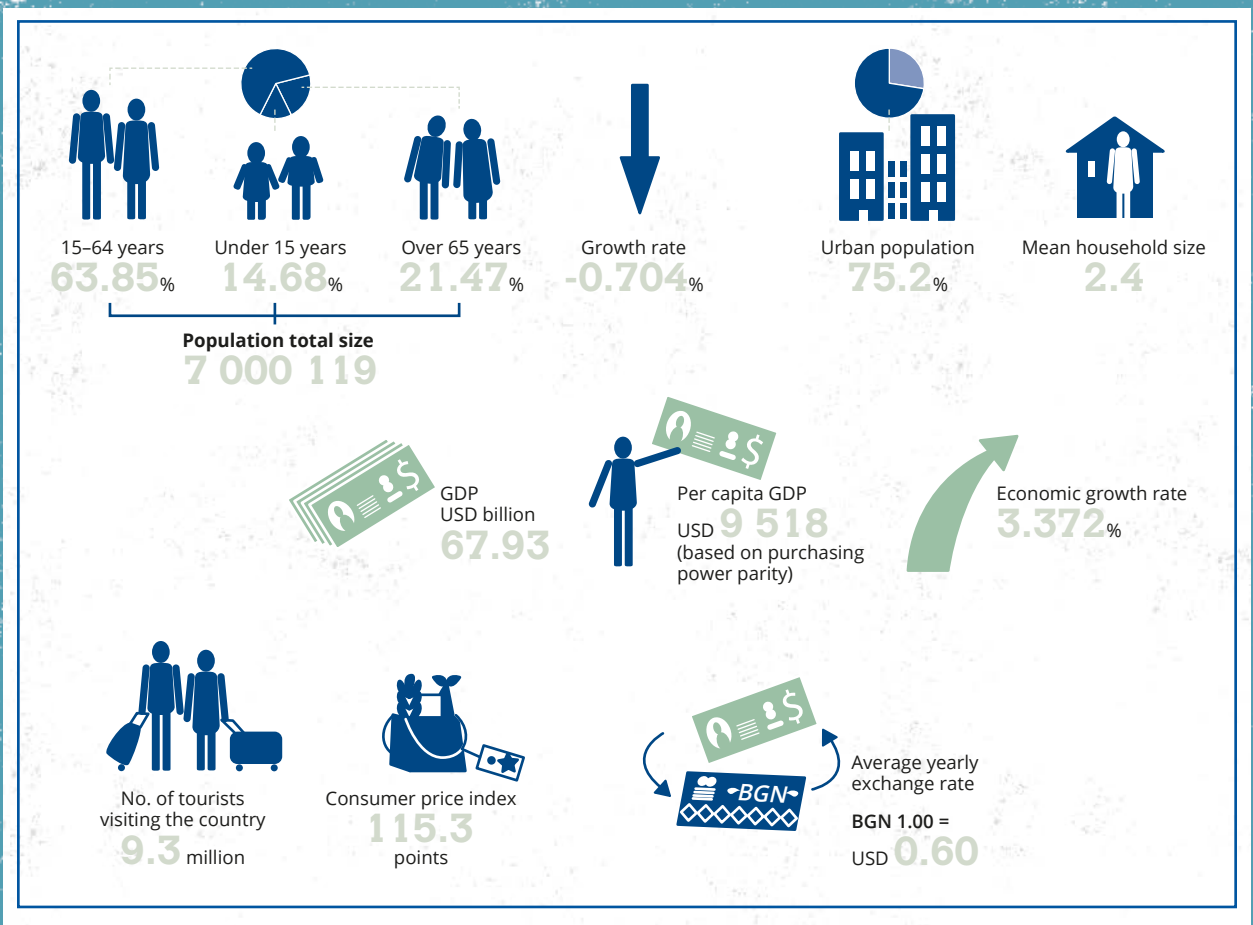


Number of registered aquaculture enterprises, 2019

* No data available in 2019.

This publication is dedicated to the memory of the late Aina Afanasjeva, Director of the International Organisation for the Development of Fisheries and Aquaculture in Europe (Eurofish) from May 2009 to March 2021. She was an active and committed member of the GFCM family. Under her leadership, Eurofish became an indispensable partner of the GFCM and greatly contributed to the sustainable development of the aquaculture sector in the region.

BULGARIA



Note: Figures represent 2019 values.

Source: Based on qualitative consultations with industry stakeholders.

BULGARIA

Despite accounting for only 4 percent of registered aquaculture farms in the country, mariculture has grown to represent 30 percent of total aquaculture production, altering the makeup of a sector that has been dominated by freshwater aquaculture since the eighteenth century.

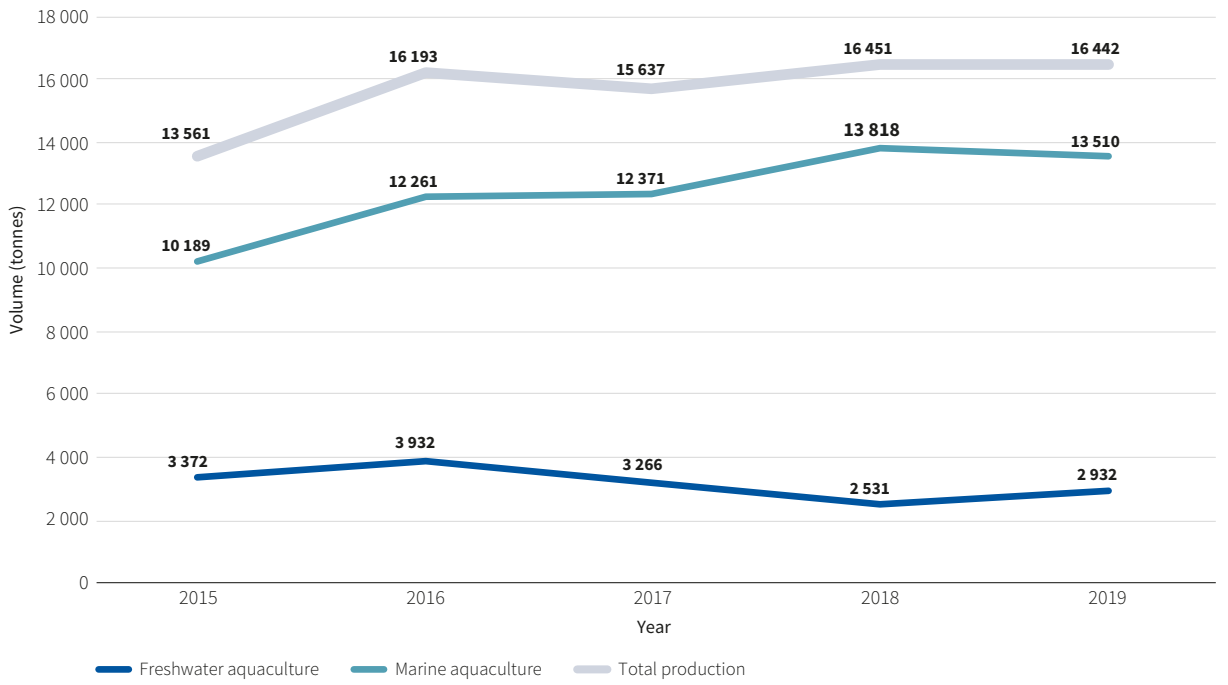
Bulgaria is a country with few lakes or large rivers, meaning that aquaculture largely takes place in the territorial coastal waters of the Black Sea as well in artificial water basins built in non-coastal parts of the country. The geographical, hydrological and climatic conditions of the Black Sea coast have also oriented the Bulgarian aquaculture sector towards freshwater aquaculture, as the development of marine aquaculture remains difficult or unprofitable at this stage. However, despite the scarcity of water resources and the limited development of marine aquaculture, the Bulgarian Ministry of Agriculture, Food and Forestry (MAFF) reported that from 2013 to 2019, the number of species raised in aquaculture varied between 33 and 40 and in 2019, total aquaculture production reached 16 442 tonnes (Figure 1).

In spite of difficult conditions, the cultivation of marine organisms to supplement freshwater production began in the 1980s, when the first Mediterranean mussel (*Mytilus galloprovincialis*) rope collectors were constructed. By 2007, there were 15 mussel farms producing a total of around 300 tonnes. Today, Mediterranean mussel production exceeds 3 000 tonnes and accounts for approximately 30 percent of total aquaculture production. The remaining 70 percent relates to freshwater aquaculture, which continues to dominate Bulgarian Black Sea operations in terms of the number of farms (96 percent), production volume (79 percent) and species diversity of cultivated organisms (95 percent).

Along with the increase in production volume, the value of production rose from USD 23.1 million in 2009 to USD 40.2 million in 2018; an increase of 74 percent. Most of this value comprises fish species that dominate Bulgarian aquaculture almost exclusively compared to other groups (molluscs, crustaceans, seaweed and amphibians).

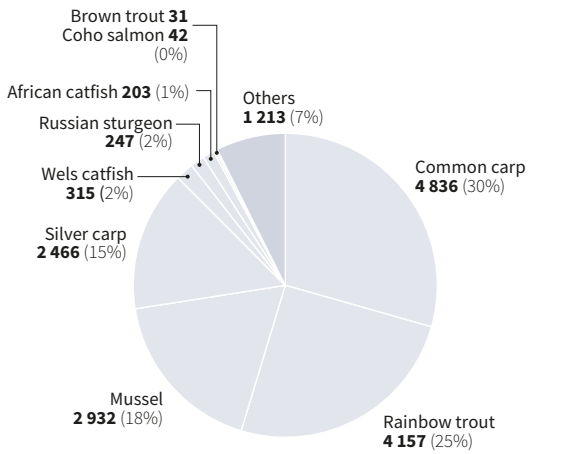
The species with the longest traditions in Bulgarian freshwater aquaculture are common carp (*Cyprinus carpio*), bighead carp (*Hypophthalmichthys nobilis*),

Figure 1. Total volume of freshwater and marine aquaculture production, 2015–2019



Source: MAFF and IRA-STRATEGMA, 2020; EAFA, 2020a.

Figure 2. Volume of aquaculture production by species, 2019



Source: MAFF, 2020; EAFA, 2020a. *Note:* all volumes are in tonnes.

silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), Wels catfish (*Silurus glanis*), northern pike (*Esox lucius*) and in recent years, Russian sturgeon (*Acipenser gueldenstaedtii*), Siberian sturgeon (*Acipenser baerii*), American paddlefish (*Polyodon spathula*), African catfish (*Clarias gariepinus*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*) and coho salmon (*Oncorhynchus kisutch*).

In terms of marine aquaculture, Mediterranean mussel is the primary farmed species.

Overall, the two most prominent families of fish in Bulgarian aquaculture are carp and trout (Figure 2). Carp account for more than 60 percent of total fish production, dominating due to their rich species composition and the volume of biomass produced, reaching 8 202 tonnes in 2019. The production volume of catfish and sturgeon has been on an upward trend; however, their overall production remains volatile.

Table 1. Number of registered aquaculture farms by type of farming facility, 2015–2019

Year	2015	2016	2017	2018	2019
Warmwater farms	298	357	394	462	535
Coldwater farms	51	57	63	72	78
Mixed	53	61	93	100	104
Marine farms	18	20	22	27	28
Total	**420**	**495**	**572**	**661**	**745**

Source: MAFF and IRA-STRATEGMA, 2020; EAFA, 2020b.

In Bulgaria, aquaculture farms are traditionally classified into two groups: warmwater and coldwater. There is a clear distinction between the groups, based on the temperature requirements of the species being farmed. Today, this method of classification is still in use. However, it does not reflect the entire production range of fish and other aquatic organisms. Farms that produce other species (mainly sturgeon) and fall outside these two groups are classified as mixed. The distribution of farms according to these criteria in 2019 was sorted as follows: 535 warmwater farms (72 percent of the total number), 78 coldwater farms (10 percent) and 104 mixed farms (14 percent) (Table 1). Out of this total, approximately 29 facilities (representing 4 percent) cultivated Mediterranean mussel.

The number of registered aquaculture farms in Bulgaria shows a steady upward trend. From 2013 to 2019, their number tripled, reaching 745 by the end of 2019. Of these, 446 farms (60 percent) reported activity during that year. Based on the production technology used, the largest share of farms was represented by ponds/dam/lakes, which totalled 282 units (63 percent). The number of farms using tanks and raceways for farming was 113 (25 percent of the total number of active farms). Cage farms amounted to 30 in 2019, representing 7 percent of all active farms. However, the number of recirculating aquaculture system units was only two, less than 1 percent of the total. In 2019, mussel farms totalled 15, comprising 3 percent of the total number of active aquaculture farms in the country.

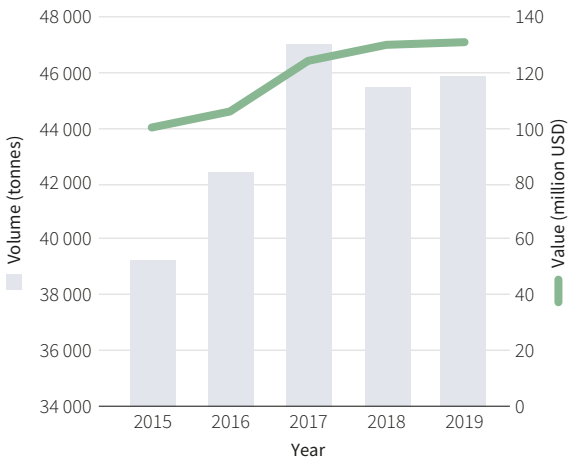
Trade

In 2018, the total supply (imports plus production) was 70 438 tonnes, the highest volume attained between 2009 and 2018. The gradual increase shown during this period can be attributed to aquaculture production, which doubled over the nine years.

IMPORTS

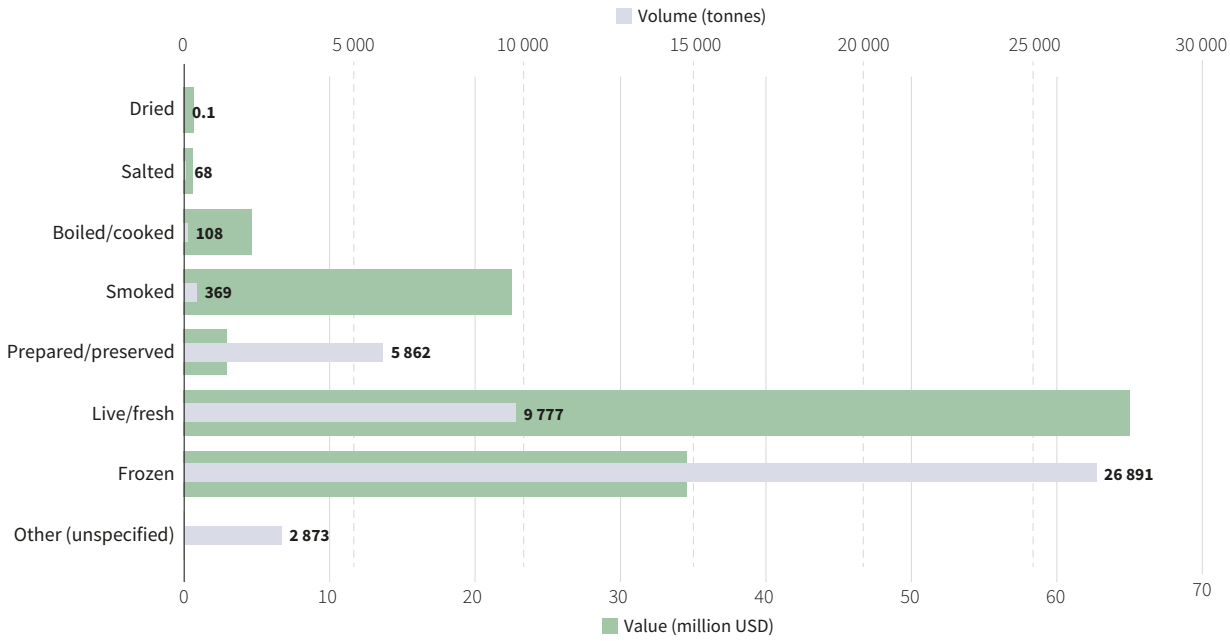
Following a decline in 2010–2014, Bulgarian imports of seafood have risen significantly. From 2015 to 2019, imports grew by 17 percent in volume and 29 percent in value to a total of 45 948 tonnes worth USD 131.2 million (Figure 3).

Figure 3. Volume and value of seafood imports, 2015–2019



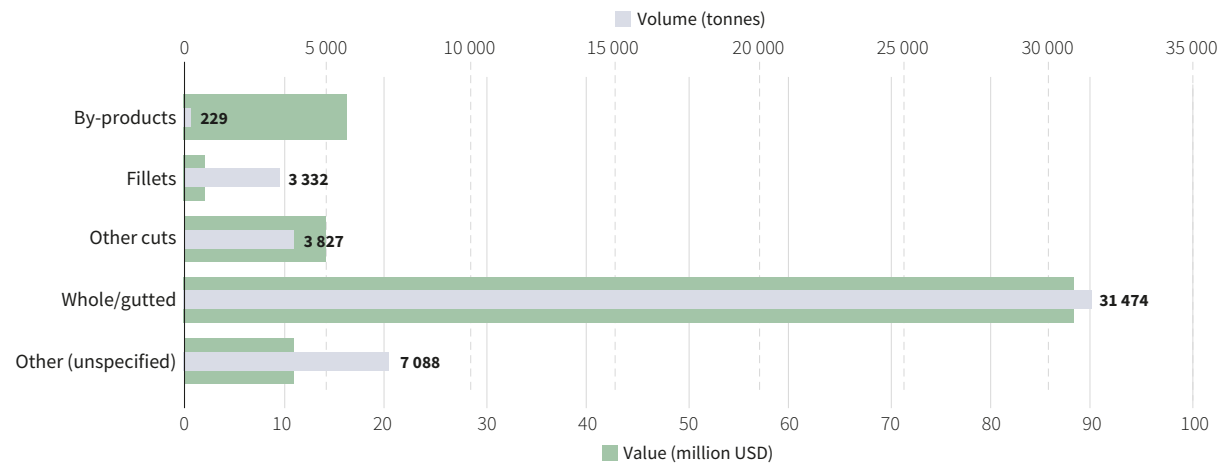
Source: EUMOFA, 2021.

Figure 4. Volume and value of seafood imports by type of preservation, 2019



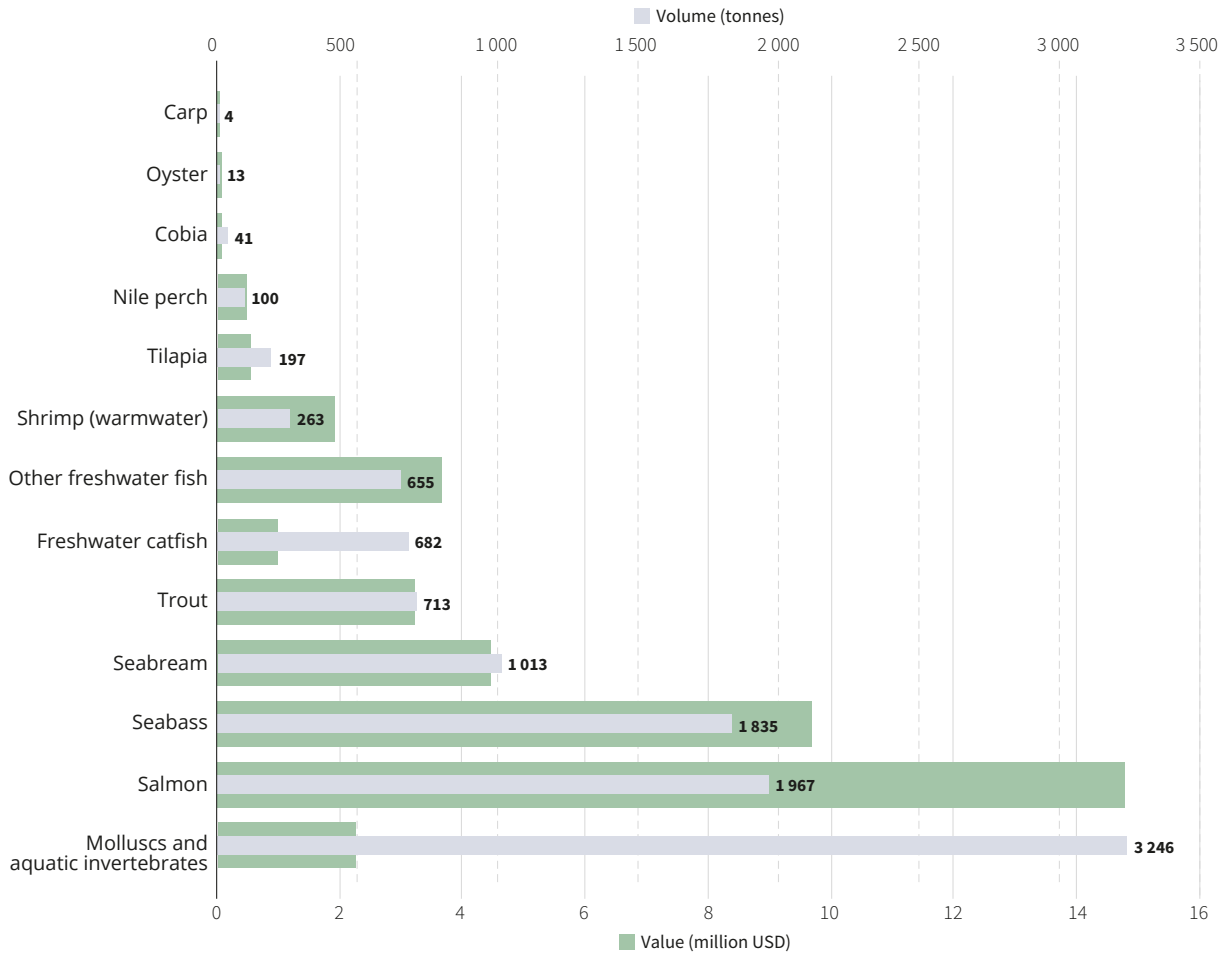
Source: EUMOFA, 2021.

Figure 5. Volume and value of fish imports by type of pre-processing, 2019



Source: EUMOFA, 2021.

Figure 6. Volume and value of imports of species that are also farmed, 2019



Source: EUMOFA, 2021.

The dominant imports in 2019 were coldwater shrimp, mackerel, salmon, seabass and seabream, tuna, hake, sea cucumber and herring, which accounted for nearly 60 percent of the total volume of seafood imports. Mackerel and tuna were the only species whose import shares remained relatively constant, while the rest significantly increased their shares compared to previous years.

In terms of product preservation, frozen products account for the largest share in the total volume of seafood imports; in 2019, that share amounted to almost 60 percent, while the second largest share belonged to live, fresh/chilled products, reaching over 20 percent (Figure 4).

By type of pre-processing, the highest import share belongs to frozen or fresh whole/gutted fish, accounting for 68 percent of the total import volume in 2019. In contrast, fresh and frozen fillets accounted for merely 7 percent of the total import volume (Figure 5).

According to European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) data, the most important exporters of seafood products

to Bulgaria in 2019 were Romania, Denmark, the Netherlands, Spain and Greece, which together delivered over 40 percent of the total import volume.

Imports of species that are also farmed in 2019 included salmon, seabass and seabream, trout, catfish, shrimp and tilapia (Figure 6), with the majority volumes originating from Sweden, Greece, Viet Nam, Turkey and the Czech Republic.

Today, salmon is becoming a salient import, satisfying not only the demand of the domestic market, but also feeding an increasingly significant share of the processing industry. In 2019, imports of salmon reached 1 967 tonnes, for a value of USD 14.8 million. Sweden exports the largest volumes of salmon, providing over 40 percent of the total import volumes of the fish, followed by Denmark and the Czech Republic. Salmon is predominantly imported into Bulgaria fresh (whole or gutted) and, to a lesser extent, frozen and prepared or preserved.

Recently, seabass and seabream have begun to represent significant portions of imports, which primarily satisfy the increasing demand from the domestic market. Small quantities are also reexported at prices close to those fetched for import. In 2019, 1 835 tonnes of seabass and 1 013 tonnes of seabream were imported into Bulgaria, with both species mainly supplied fresh (whole or gutted). Over 60 percent of seabass imports came from Greece, with the Czech Republic providing over 20 percent. Turkey, the third major supplier, delivered more than 15 percent of imports. Turkey and Greece were the largest suppliers of seabream, providing around 99 percent of the total seabream imports in almost equal shares.

The trout market includes small quantities of imports (713 tonnes in 2019) complementing Bulgarian production. Imports in 2019 mainly arrived from Spain, Turkey and Greece, almost in equal volumes. In addition to satisfying domestic consumption, trout also represents an important part of exports.

Imports of catfish species amounted to 681 tonnes in 2019 and 95 percent of that volume was represented by pangasius from Viet Nam. The registered import volume in 2019 doubled from the previous year and consisted entirely of frozen fillets.

From 2009 to 2019, shrimp became a significant item of import. In 2019, imports of warmwater shrimp reached 263 tonnes, for a value of USD 1.9 million, the highest recorded since 2015. The species is imported frozen mainly from Belgium and China, which delivered around 30 percent each in 2019.

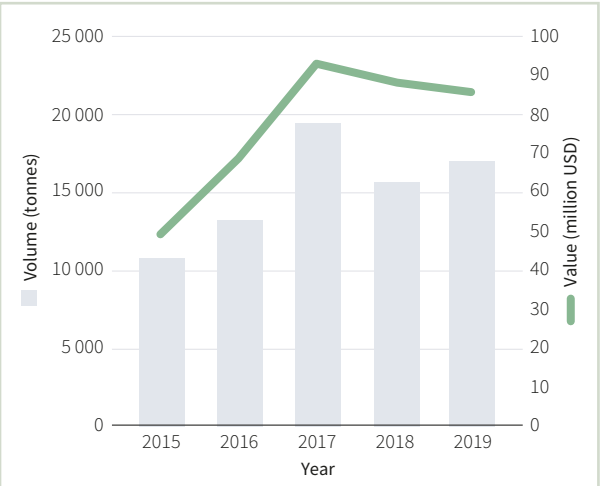
Imports of tilapia – mostly frozen fillets – have been moderately growing in recent years, reaching a total of 197 tonnes in 2019. Over 60 percent of the total volume of imported tilapia came from China, with smaller shares arriving from Poland and the Netherlands.

EXPORTS

After 2016, the volume of exports from Bulgaria increased significantly and reached 19 459 tonnes in 2017. In 2018 and 2019, there was a slight decrease from previous levels. However, exports remained higher than those in 2015 (Figure 7).

According to EUMOFA (2021), the most important destinations for Bulgaria's farmed and wild caught seafood products in 2019 were Greece, Japan, Romania, Serbia and Sweden. Together, these countries absorbed over 75 percent of the total export volume.

Figure 7. Volume and value of seafood exports, 2015–2019



Source: EUMOFA, 2021.

The dominant farmed and wild caught species exported in 2019 were shrimp, rapa whelk (*Rapana venosa*), salmon, rainbow trout, mackerel, caviar, tuna, anchovy and sardine, together composing over 70 percent of the total export value. Exports of rapa whelk, trout, mackerel and caviar remained relatively stable over the past few years, while the remaining dominant species' shares increased.

The stable export levels of rapa whelk and caviar, along with the growing exports of shrimp and anchovy are an indicator of development towards the export of processed products with higher added value.

Processed rapa whelk, mainly of Bulgarian catch, form the second largest share in the value of exports. Its volume has remained relatively constant for the last decade, though the intensive development of processing of other imports has reduced its share of total exports.

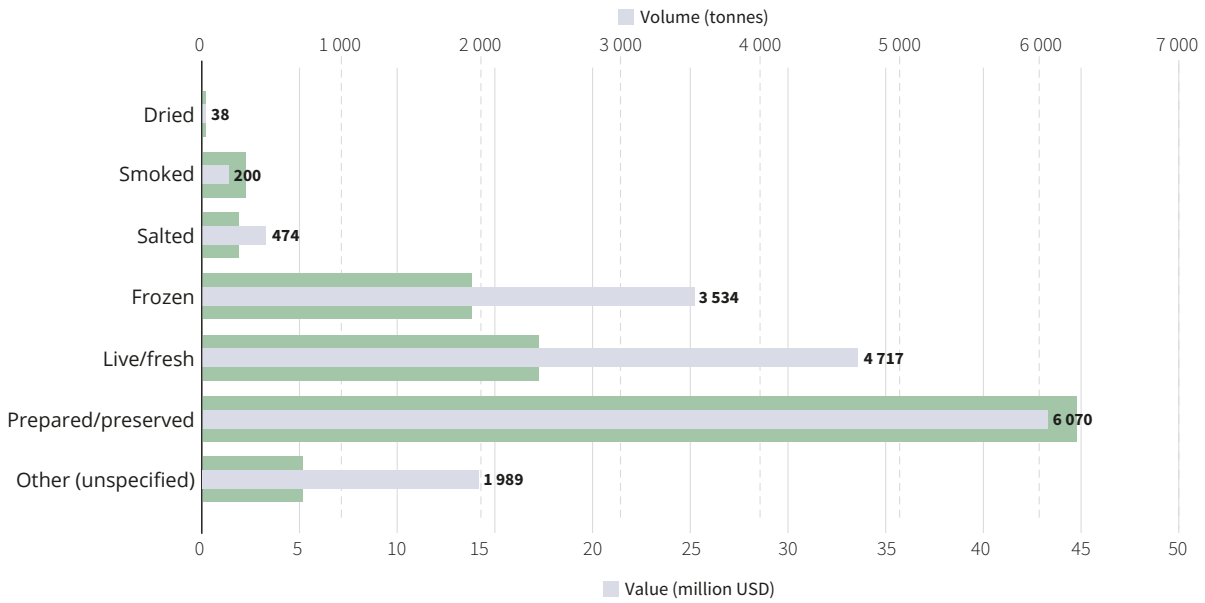
Black caviar has retained a constant share of the value of Bulgarian exports, although its unit price for the period of 2015–2019 varied considerably depending on how much of its processing takes place in the country.

Overall, in 2019, the export volume of prepared and preserved seafood products represented the highest share of exports by product preservation with 35 percent of the total. Live fish was the second largest, with a 28 percent share, followed by frozen products with a 21 percent share (Figure 8).

In terms of the type of pre-processing, whole, gutted fish remains the biggest segment in the structure of seafood exports from Bulgaria. In 2019, its share was 43 percent of the total, while exports of fish fillets comprised a relatively low 8 percent (Figure 9).

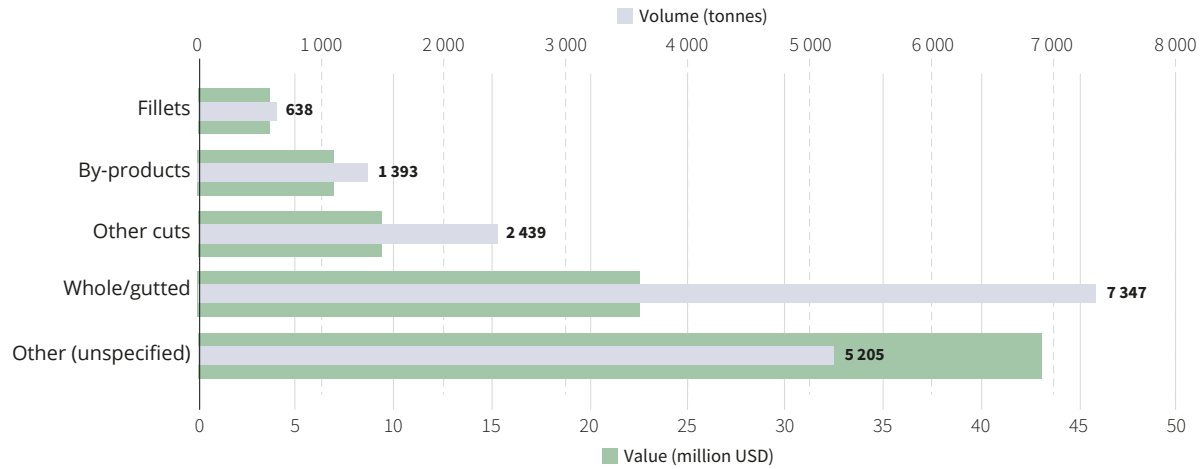
Among farmed fish and shellfish, shrimp generated the largest share of both volume and value of exports from 2015 to 2019 with significant value added from processing. In 2019, Bulgaria exported 2 147 tonnes of miscellaneous shrimp, of which nearly 100 percent of the export was sent to Sweden (Figure 10). The product was mostly exported prepared or preserved.

Figure 8. Volume and value of seafood exports by type of preservation, 2019



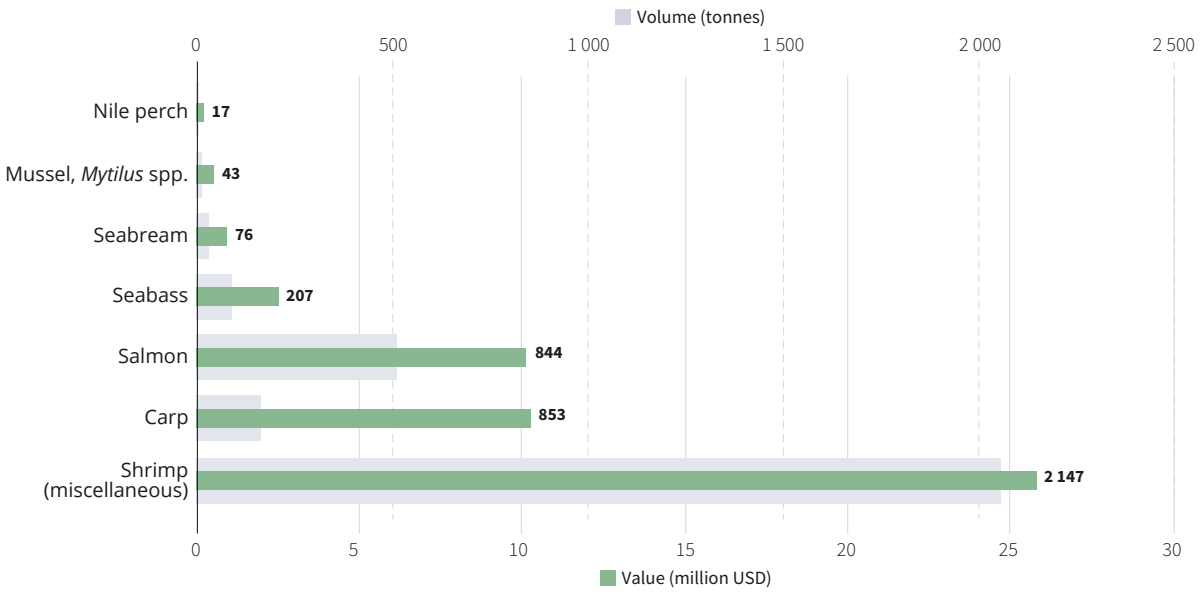
Source: EUMOFA, 2021.

Figure 9. Volume and value of seafood exports by type of pre-processing, 2019



Source: EUMOFA, 2021.

Figure 10. Volume and value of exports of species that are also farmed, 2019



Source: EUMOFA, 2021.

By volume, carp was the second largest exported farmed species. It accounted for 853 tonnes in 2019, a 20 percent decrease from the previous year. Approximately 75 percent was exported to Romania, followed by Serbia, which received around 20 percent of all exports. Generally, carp has been exported either live or fresh, with only 4 tonnes of frozen carp exported in 2019.

Salmon holds an increasingly significant share of the export sector and has been rising steadily in recent years. Exports of salmon in 2019 amounted to 844 tonnes, of which 42 percent was salted, 19 percent was smoked, 14 percent was live or fresh and the remaining share belonged mainly to frozen products. Romania was the major destination receiving over 55 percent of salmon exports, followed by Greece and Serbia.

Minimal quantities of seabass and seabream are re-exported at near import prices. In 2019, 207 tonnes of seabass and 76 tonnes of seabream were exported. Seabass was mainly exported to Serbia (45 percent), Poland (24 percent) and Lithuania (23 percent). Serbia was also the main importer of seabream coming from Bulgaria, receiving over 90 percent of the total volume. The species were exported mainly live or fresh.

Mussel exports accounted for 43 tonnes in 2019, of which 57 percent were exported frozen and the remainder was exported fresh. The only destinations were Romania (57 percent) and Greece (43 percent).

The same year, exports of Nile perch (*Lates niloticus*) were destined only for Poland, which received 16.9 tonnes of live fish and fresh fillets.

Processing

The total number of enterprises in Bulgaria's fish processing sector varied between 41 and 51 during the period from 2014 to 2018, with 41 enterprises in 2018. The medium-sized enterprises were the most sustainable, ranging between 14 and 19. During the same period, the ratio and number of small and micro-enterprises in the sector changed more dynamically and, in most years, micro-enterprises were slightly more numerous than small enterprises.

The volumes of processed seafood in the period of 2014–2018 showed stable growth resulting in a 47 percent increase by the end of 2018. Major growth was observed in the processed crustaceans and molluscs segment with an over 55 percent increase, followed by processed and preserved fish (excluding frozen products) with an increase of 41 percent.

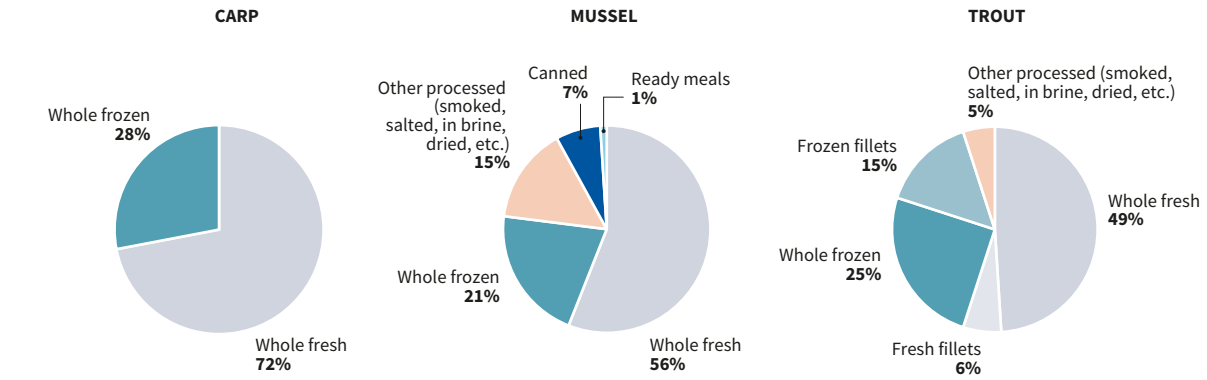
In 2014–2018, the production of ready meals, though still relatively low, showed an over two-fold increase by the end of the period, which can be attributed to the growing demand for convenience products among millennials across Europe (Table 2).

Table 2. Production volume of select processed seafood, 2014–2018

Year	2014	2015	2016	2017	2018
Crustaceans, molluscs, other aquatic invertebrates and algae, otherwise processed or preserved	2 082	3 053	3 176	3 260	3 252
Fish, otherwise processed or preserved, without prepared fish dishes	3 833	5 078	7 174	7 404	5 405
Frozen fish	3 159	3 674	2 310	2 903	3 973
Other aquatic invertebrates and algae, frozen, dried, salted or in brine	n/a	740	406	1 004	400
Total fish and other aquatic animals, excluding ready-made meals	**9 074**	**12 545**	**13 066**	**14 571**	**13 030**
Total ready-made fish dishes	**398**	**422**	**384**	**386**	**887**
Total processed fish and seafood	**9 472**	**12 967**	**13 450**	**14 957**	**13 917**

Source: MAFF and IRA-STRATEGMA, 2020 based on data from the National Statistical Institute.

Figure 11. Estimated production shares of domestically farmed species by type of pre-processing and preservation, 2019



Source: Based on qualitative consultations with industry stakeholders.

Among the main processed farmed species in Bulgaria is rainbow trout. According to the MAFF, based on data from the Bulgarian Food Safety Agency (BFSA), the volume for processed rainbow trout was the third highest (after wild caught European sprat and mackerel) for the period 2010–2019, with over 16 000 tonnes or nearly 13 percent of the volume of all processed products by species.

Salmon held the fourth highest processed volume for the period 2010–2019 with more than 6 000 tonnes or over 5 percent of the volume of processed products by species.

For carp and catfish, the BFSA reported total volumes of processed products of about 5 000 tonnes for carp and 1 800 tonnes for catfish during the period 2010–2019.

Processed production of shrimp totalled about 960 tonnes in 2019, according to the BFSA.

Most domestically farmed carp, trout and mussels in Bulgaria are sold to the final consumer in fresh, whole form, without significant value addition from processing. To some extent, this can be explained by traditional preferences held by consumers and a limited diversity of processed products offered by farmers/processors. Compared to carp, trout is more subject to value addition, mainly by filleting and smoking/salting (Figure 11).

Distribution and pricing

The trade of fish and fish products in Bulgaria is carried out through several different channels: large retail chains (supermarkets, hypermarkets); fishmongers and specialized shops; local farmers markets and direct sales from fish farms, fish markets and fishers.

According to a recent survey conducted by Eurobarometer, almost 70 percent of consumers in Bulgaria prefer to buy seafood from supermarkets, specialty shops and fishmongers. A quarter of the respondents also indicated that they prefer to catch the fish themselves (Table 3).

The official statistics do not allow extraction of data on the distribution of farmed species through different sales channels; however industry experts have been able to make estimations as illustrated in Figure 12.

Wholesale and retail prices of aquaculture products rose steadily over the period 2015–2019. Additionally, from 2014 to 2018, there was a gradual increase in

revenues from aquaculture from USD 1.51 per kilogram in 2014 to USD 2.39 per kilogram in 2018 and the average gross value per kilogram of aquaculture production increased from USD 1.84 per kilogram in 2014 to USD 2.28 per kilogram in 2017. However, despite the increase in prices and revenues, the profit per kilogram of farmed products remained minimal throughout 2014–2018 and in three years the losses ranged on average between 6 and 27 cents per kilogram.

In 2019, increases from wholesale to retail prices were observed, with average mark-ups of between 10 percent and 16 percent (Table 4).

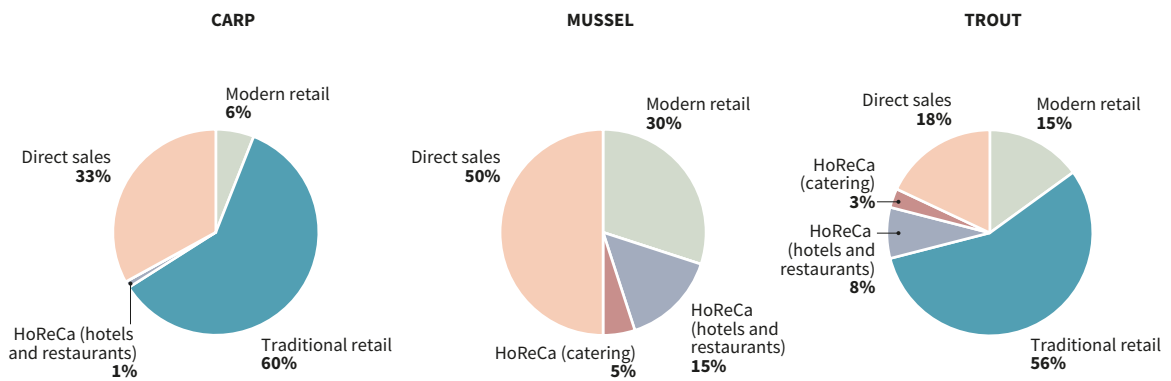
For some years, there have been lower wholesale prices than producers' unit income. According to the Executive Agency of Fisheries and Aquaculture (EAFA), this is likely attributable to the competitive presence of imported products in wholesale and retail trade.

Table 3. Sales channels for fish products by customer preference, 2019

Sales channel	%
Specialty stores for fish and fish products	68
Supermarkets, hypermarkets	68
Neighbourhood grocery stores	17
Local farmers markets	17
Recreational fishing (consumers catch fish for their own use)	25
Fishers	18
Fish markets	13

Source: MAFF and IRA–STRATEGMA, 2020.

Figure 12. Estimated sales channels for select domestically farmed species



Source: Based on qualitative consultations with industry stakeholders.

Table 4. Price per kilogram of domestically farmed products, 2019

Species	Wholesale price (USD/kg)	Retail (USD/kg)	Change
Carp	3.347305	3.660765	9%
Catfish	5.071335	5.899765	16%
Trout	5.19448	5.55272	7%

Source: MAFF and IRA-STRATEGMA, 2020.

Rainbow trout is offered as a fresh or chilled product with large volumes in the middle price range and has relatively high cultivation costs. This helps explain the low observed mark-up of wholesale over producer prices.

Carp has among the lowest breeding cost and is offered as a fresh/chilled product with large volumes in the middle/low price range, competing with other fresh products at higher prices. This leads to a relatively large increase between producer prices and wholesale prices.

Marketing activities

Marketing and promotional activities are organized at various levels, including activities at the national and regional levels, as well as private initiatives by companies. For example, the MAFF organizes a national promotional campaign titled "Fish Festival – tasty and healthy". In 2020, the third edition of the festival took place. The event is part of a promotional campaign that aims to shorten the supply chain for both distributors and consumers and give the producers the opportunity to offer their products directly to consumers.

Numerous exhibitions are presented during the festival along with a diverse programme of events including culinary demonstrations for adults and a children's corner featuring educational games related to fish. Throughout the festival, visitors have the opportunity to sample various fish products.

The promotional campaign "Fish Festival – tasty and useful" seeks to achieve a positive change in consumer behaviour and habits by increasing the consumption of fish and fish products. Events during the National Fish Festival usually take place in the cities of Sofia, Varna, Pazardzhik, Plovdiv, Burgas, Stara Zagora, Ruse, Veliko Tarnovo as well as other locations in Bulgaria.

In recent years, European Union funding has played an important role in the marketing activities related to fisheries and aquaculture in Bulgaria. With the support of the European Union's operational programmes, projects were conducted with the aim of increasing the consumption of local fishery and aquaculture products, developing new markets and new market niches and implementing a policy to increase the quality and value of fishery and aquaculture products.

On a slightly smaller scale, different municipalities in the country have organized promotional campaigns. For example, in 2019, the Shabla municipality organized an information campaign titled "The healthy benefits of fish and aquaculture products". The project aimed to raise public awareness about the fisheries and aquaculture sector and was directed to the citizens of the Shabla municipality, those employed in the fisheries sector as well as guests, tourists and visitors to the city. Among the activities included in the project were six seminars held in local schools and a one-day fish festival in the city park of Shabla. During the event, those employed in the fisheries sector had the opportunity to promote their local fish and other delicacies to guests, tourists and visitors to the city.

Similar activities were organized in the Sliven municipality. The organizers conducted an information campaign in various schools; distributed informational brochures and flyers; held an event titled "Fish Academy" directed at the professional restaurant business to promote the inclusion of fish and fish products on menus; and held a competition for the best recipe containing fish. In addition, a competition for the biggest caught fish was held, a children's drawing competition was organized and seminars were conducted on healthy living. For the purposes of the project, a documentary was prepared to demonstrate the diversity of fish and aquaculture in the region.

Common activities organized by other municipalities that were granted funds for promotional campaigns included a fair/exhibition for fishery and aquaculture products, culinary shows, a fishing competition and numerous competitions and campaigns for schools

Impacts of COVID-19 on the aquaculture sector in Bulgaria

Aquaculture has been among the sectors most directly affected by the COVID-19 crisis in 2020. Demand for fish has plummeted as retailers, restaurants, canteens and other large buyers are downsizing or temporarily shutting down. Though, despite COVID-19's negative effect on Bulgaria's restaurant sector, many are re-emerging and will continue to be an important end user of seafood in Bulgaria.

According to data from the Executive Agency of Fisheries and Aquaculture (EAFA), there was a significant decline in aquaculture sales for the period from 27 March 2020 to the end of April 2020 compared to the same period in 2019.

In addition to the observed decline in demand, the aquaculture sector has also been facing problems including falling prices, supply difficulties, deteriorating logistics at both the national and European levels, redundancies and reduced fishing activities. In response, the EAFA has taken immediate action to improve this situation that puts thousands of people at risk, especially in the coastal regions.

The fisheries and aquaculture sectors have been eligible for support under the new temporary framework for state aid: the Coronavirus Investment Initiative. In this regard, the agency has called on stakeholders in the fisheries sector to send up-to-date weekly information related to the difficulties they face as a result of the implementation of measures against the spread of COVID-19 including market restrictions, losses suffered, dismissed employees, lower prices, unsold production, difficulties in import/export and reduced production.

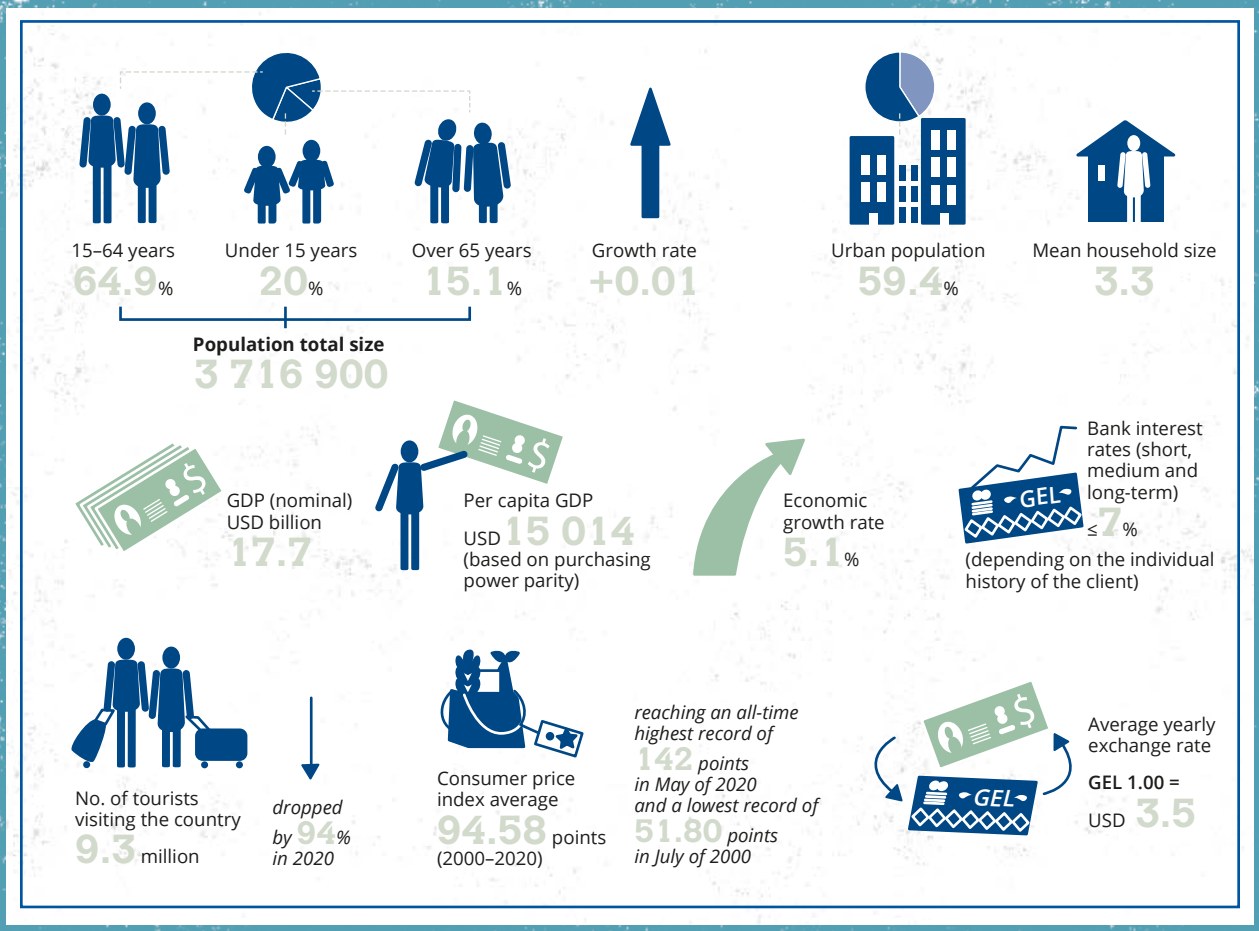
In April 2020, the National Employment Agency established a procedure for employers to apply for compensation until the end of the year under the 60/40 scheme for job retention in the sector. These measures were intended to support fisheries, aquaculture producers and producer organizations during the suspension period, as well as provide a more flexible allocation of financial resources and a simplified procedure for amending operational programmes.

Comparative trends in aquaculture product sales, March–April 2019 vs March–April 2020

	27/03/2019 – 30/04/2019	27/03/2020 – 30/04/2020	Decline in sales
Number of sales	1 614	557	66%
Total volume (tonnes)	**610**	**266**	**57%**

Source: Based on data from the Executive Agency of Fisheries and Aquaculture (EAFA).


GEORGIA



Note: Figures represent 2019 values.

Source: Based on data from the National Statistics Office of Georgia; World Bank, 2020.

GEORGIA

Georgian per capita seafood consumption is less than half the world average; nevertheless, capture fisheries and aquaculture only supply 10 to 15 percent of the country's total seafood consumption, leaving it reliant on imports. Recently, aquaculture has gained traction, potentially changing the situation.

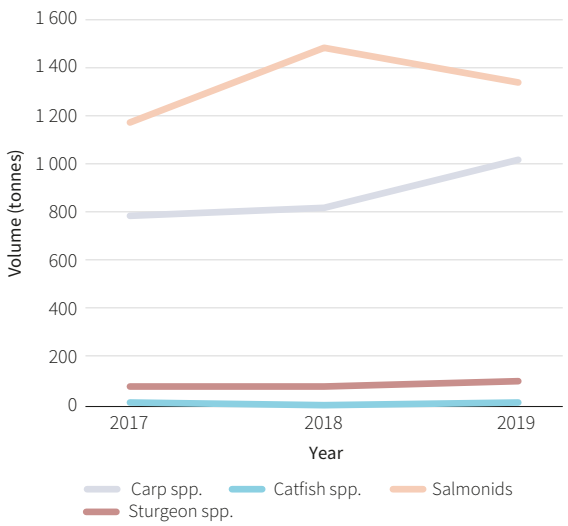
While the Georgian diet is renowned for its meat-heavy dishes, fish has always found its way onto dinner plates. With access to extensive water resources abundant with wild fish, including natural ponds, sea waters, 860 lakes and 54 768 km of rivers and streams (FAO, 2021a), generations of Georgian communities satisfied their demand for fish through wild catches. As no published studies of early development of the industry are currently available, detailing the history of aquaculture in Georgia is difficult. Some sources do claim, however, that fish farming has long existed on a small scale, with farmers eating their own catches and providing landlords with their own supply.

The development of aquaculture as a component of Georgia's nascent food industry began nearly a century ago with the aim of capitalizing on the natural resources available and diversifying the consumption of proteins. Since then, Georgian aquaculture experienced its ups and downs, until finally finding firm footing about a decade ago. Today, Georgia's 15 reservoirs and 20 lakes totalling 30 000 hectares of surface area offer good potential for even further development of the sector (FAO, 2021a).

Due to Georgia's landscape profile, with mountains and valleys, the freshwater aquaculture sector can be divided into two subsectors: warmwater in the plains and coldwater in the uplands. Warm waters are used for farming carp, sturgeon and catfish, while cold waters are utilized to farm trout.

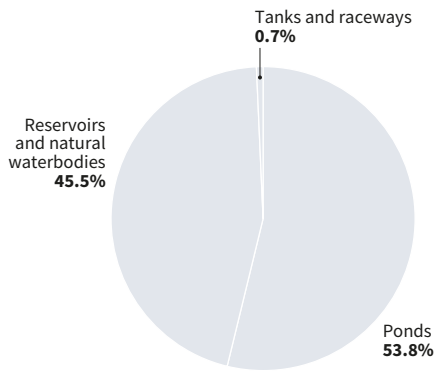
Over the past several years, freshwater aquaculture production in Georgia has remained fairly stable, showing a slight upward trend. In 2019, the total volume

Figure 1. Volume of freshwater aquaculture production by species, 2017–2019



Source: GEOSTAT, 2020.

Figure 2. Structure of the aquaculture sector by type of farming facility, 2019



Source: GEOSTAT, 2020.

produced reached almost 2 500 tonnes, exceeding the production in 2017 by 20 percent (Figure 1).

Salmonids are the most important species in Georgia's aquaculture and on average account for over half of the sector's total volume, with rainbow trout representing up to 99 percent of the annual production of salmonids.

Following salmonids, carps are the second most farmed species, of which common and mirror carp (*Cyprinus carpio*) yield over 47 percent of total carp production; silver carp (*Hypophthamichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) reach about 40 percent and grass carp (*Ctenopharyngodon idella*) provides 13 percent.

Though the production of sturgeons is not very high in terms of volume, this segment has been growing and in 2019 increased by almost 30 percent compared to the previous year.

The average annual volume of catfish farming for the period of 2017–2019 fluctuated around 13.3 tonnes and was represented mostly by wels catfish (*Silurus glanis*).

In Georgia, freshwater aquaculture remains dominant, however marine aquaculture has great potential, though it is still in its initial stages. Currently, there is only one farm with an annual capacity of 30 tonnes producing Mediterranean mussel (*Mytilus galloprovincialis*) in the Black Sea. For now, the farm is not running at full capacity.

According to the National Statistics Office of Georgia (GEOSTAT), at the end of 2019 the total area of waterbodies amounted to 4 500 hectares, of which ponds represented over half, followed by reservoirs and natural waterbodies (about 46 percent), with the rest consisting of flow-through systems (Figure 2).

According to the national authorities, in 2019 the aquaculture sector employed around 2 000 people. Registered aquaculture farms totalled 792, of which 425 were active. Most farms were family-run, with three to four employees and producing very small volumes. The Georgian Fish Farmers Union indicated that 129 small- to medium-sized farms accounted for around 90 percent of total aquaculture production (Table 1).

Table 1. Composition of aquaculture farms by production capacity and species, 2020

Species	Number of farms producing less than 30 tonnes	Share (%)	Number of farms producing 30–100 tonnes	Share (%)
Carp spp.	7	5	4	3
Sturgeon spp.	–	–	1	1
Trout spp.	103	80	14	11
Total	**110**	**85**	**19**	**15**

Source: Based on data from the Georgian Fish Farmers Union.

Trade

IMPORTS

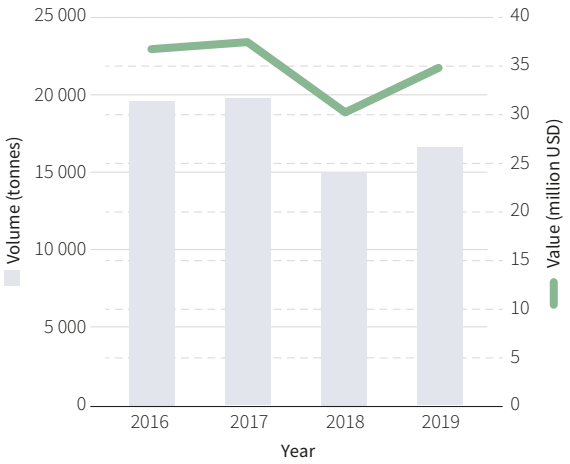
Due to their small scale and limited variety of species, capture fisheries and aquaculture in Georgia provide only 10 to 15 percent of the country's total seafood consumption, meaning imports are essential for overall seafood supply. The largest share of total import volume belongs to mackerel (up to 40 percent), followed by hake and herring.

Since 2016, import volumes have moderately fluctuated while shrinking by 15 percent overall across the four-year period, reaching 16 600 tonnes with a value of USD 34.6 million in 2019 (Figure 3). The biggest decline was observed for mackerel (down by 38 percent compared to 2016), whereas the herring supplies and hake imports each increased by nearly half.

Most of the fish imported into Georgia is frozen. In fact, in 2019, the share of frozen fish reached 88 percent of the total imported volumes. The second largest share in the import structure was represented by fish fillets, with 6 percent of the total imported volumes (Figure 4).

Though not as prominent as frozen fish, fresh/chilled fish also provided a fairly significant contribution to total imports in 2019. Since 2014, imports of fresh/chilled fish from Turkey grew, showing a six-fold increase by the end of 2019. However, over the same period, fresh or chilled fish imports from Norway declined, which resulted in a total decrease of 85 percent of Norwegian imports. The major reason for this trend is likely the difference in price; in general, Norwegian fish is more expensive than the fish imported from Turkey.

Figure 3. Volume and value of seafood imports, except canned products, 2016–2019



Source: GEOSTAT, 2021.

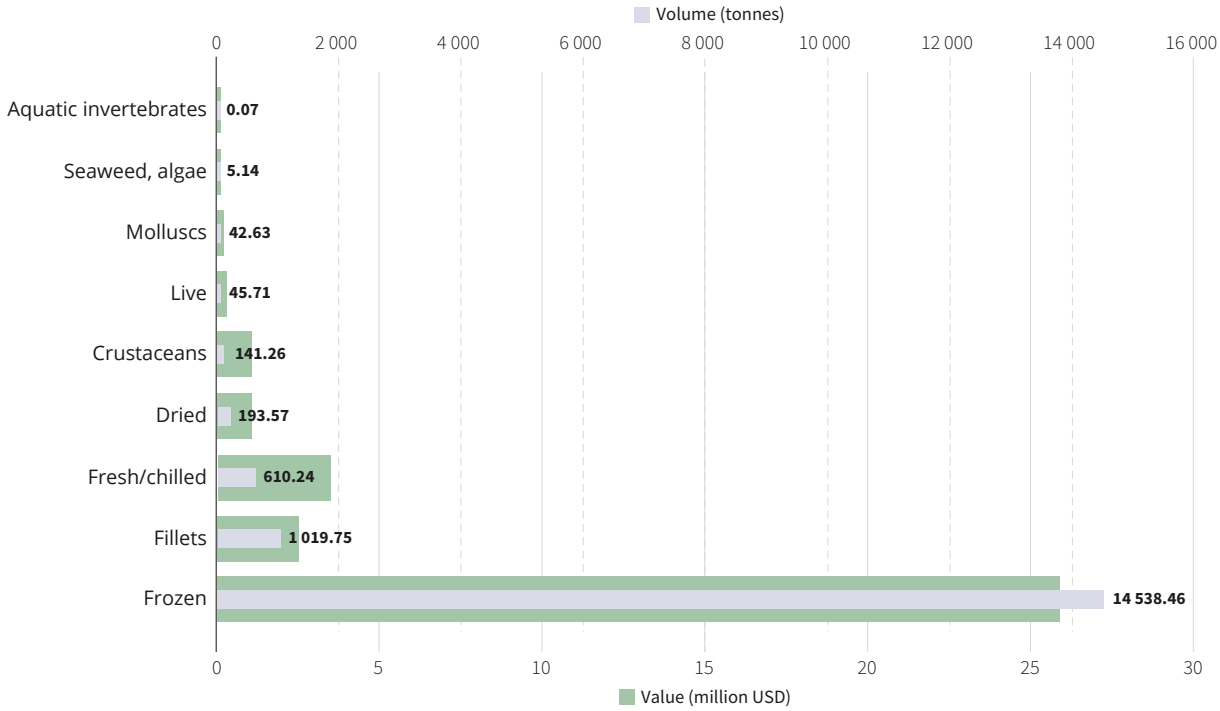
The most important countries exporting to Georgia in 2019 were Iceland, the Netherlands, Norway and China for mackerel; Spain, the Republic of Korea, the United States of America and Canada for hake; and Norway for herring.

In 2019, Iceland, Norway, Spain, the United States of America and Canada provided 54 percent of the total volumes of seafood imports into Georgia.

In terms of species that are also farmed, the highest volumes in 2019 were imported from Norway (salmonids), Viet Nam (pangasius), Turkey (seabass and seabream), China (tilapia) and Taiwan (Nile perch).

Atlantic salmon (*Salmo salar*) is the most important farmed species supplied to Georgia; in 2019, the volume

Figure 4. Volume and value of seafood imports by type of pre-processing, preservation and species, except canned products, 2019



Source: GEOSTAT, 2021.

totalled 889 tonnes, nearly breaking even with imported wild Pacific salmon (Figure 5). Supplies from Norway covered about 50 percent of the total imports of Atlantic salmon, while tthe United Kingdom of Great Britain and Northern Ireland, Lithuania and Estonia were the next biggest suppliers. About 90 percent was delivered frozen, while the rest was fresh/chilled. Some minor volumes of smoked, salted, or dried Atlantic salmon were also imported, however it is not possible to determine the share of total volumes from official statistics. Fillets, regardless of whether they were fresh or frozen, were not imported.

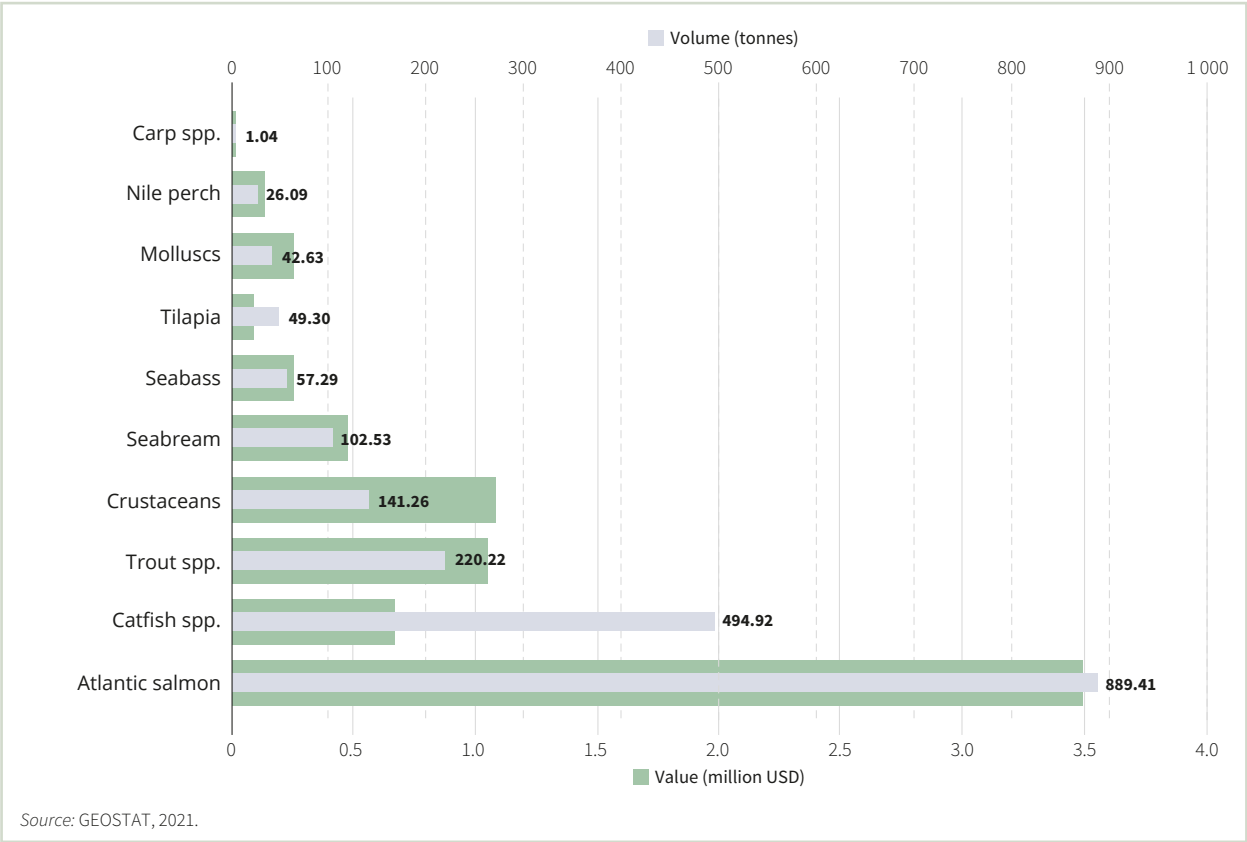
Following Atlantic salmon, catfish species are the second most important in the import structure of farmed species. In 2019, their volume reached 495 tonnes, of which over 93 percent corresponded to pangasius from Viet Nam in the form of whole frozen fish or frozen fillets.

Turkey led the suppliers of rainbow trout (*Oncorhynchus mykiss*), delivering over 60 percent of the total 220 tonnes of trout imported into Georgia in 2019. More than 60 percent of the trout from Turkey was supplied either fresh or chilled and about 30 percent was delivered frozen. The remaining percentage was comprised of live or cured/smoked trout.

Turkey is also the single largest supplier of seabass and seabream (*Dichentrarchus labrax*) to Georgia. In 2019, the volume of seabass supplies reached 57 tonnes and was primarily supplied frozen whereas seabream reached 103 tonnes and was mainly supplied chilled.

Tilapia imports amounted to 49 tonnes in 2019. Ninety-nine percent of the total volume was shipped from China in the form of frozen fillets. In contrast,

Figure 5. Volume and value of imports of species that are also farmed, except canned products, 2019



Source: GEOSTAT, 2021.

supplies of Nile perch (*Lates niloticus*) have been rather erratic. In 2019, Taiwan was the single biggest supplier of Nile perch, delivering 26 tonnes. In 2018, however, major suppliers were Kazakhstan, Norway and Viet Nam and import volumes were triple those from 2019. Traditionally, Nile perch is delivered frozen.

In 2019, carp imports into Georgia were insignificant, with only 1 000 tonnes arriving frozen from the Russian Federation.

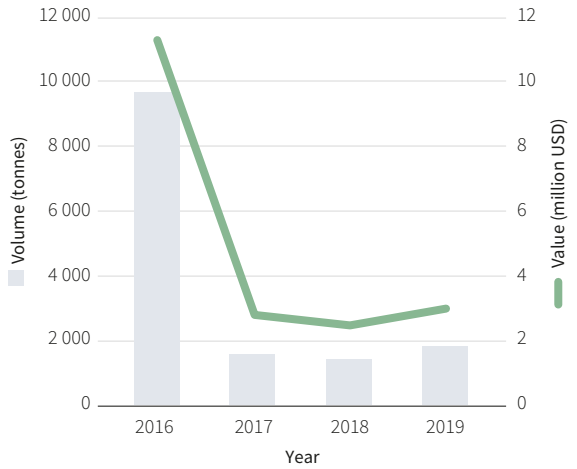
Of the 141 tonnes of crustaceans imported in 2019, over one half came in the form of warmwater shrimp and prawns. Frozen supplies primarily came from the Netherlands, Viet Nam and Belgium, whereas Turkey delivered cooked, smoked, or processed versions, comprising over 25 percent of imports. Small volumes of farmed bivalve molluscs were imported as well; however, official statistics do not distinguish between farmed and wild mollusc species.

EXPORTS

Exports of seafood from Georgia are considerably smaller than imports in terms of both volume and value. In 2019, the country's total fish exports amounted to 1 800 tonnes worth USD 3.0 million (Figure 6). Exports are not stable, as they are largely dependent on anchovy (Engraulis spp.) and the availability of their stocks. In 2016–2019, the share of anchovy in the total volume of exports varied from 16 percent in bad years to 89 percent during good ones.

In 2019, the major destinations for Georgian exports were neighbouring Turkey (67 percent), Armenia (13 percent) and Azerbaijan (7 percent), with fresh/chilled

Figure 6. Volume and value of seafood exports, except canned products, 2016–2019



Source: GEOSTAT, 2021.

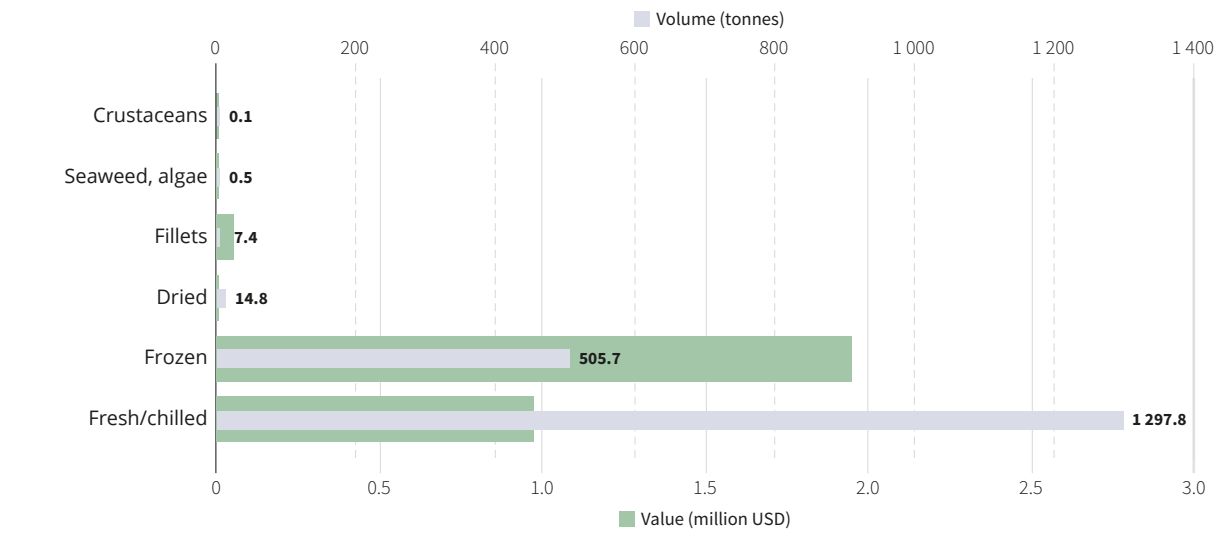
or frozen small pelagics dominating the volumes. Exports to Asia went primarily to Viet Nam (4 percent) in the form of frozen trout. Latvia and Lithuania were the primary export destinations in the European Union (3 percent total), with frozen fish and live roe comprising the majority of exported products.

Turkey remains the sole destination for Georgian anchovy year to year and receives 100 percent of the total export volumes of this fish, supplied exclusively as fresh or chilled. While anchovy stocks may migrate across the Black Sea, swimming in multiple nations' waters which cause Georgian harvests to vacillate in volume from year to year, Turkey nevertheless continues to purchase Georgia's total export supply.

Processed products (salted, dried, or smoked) accounted for only 2.6 percent of the total seafood export volumes in 2019 and were destined mainly for Armenia (Figure 7).

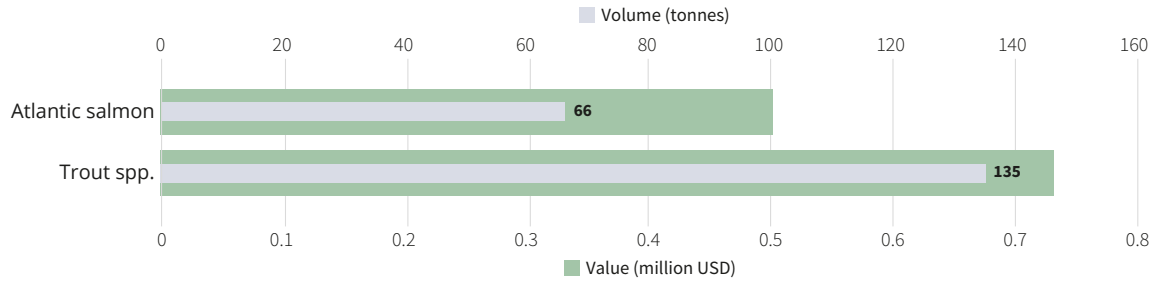
Most of Georgia's imported and domestically farmed fish products are consumed domestically, while a minor share is exported. In 2019, the main countries to which

Figure 7. Volume and value of seafood exports by type of pre-processing, preservation and species, except canned products, 2019



Source: GEOSTAT, 2021.

Figure 8. Volume and value of exports of species that are also farmed, except canned products, 2019



Source: GEOSTAT, 2021.

farmed fish products were exported were Armenia, Azerbaijan, the Russian Federation and Viet Nam. These exports were comprised solely of Atlantic salmon and rainbow trout, which accounted for 4 percent and 7 percent, respectively, of the total export volumes (Figure 8).

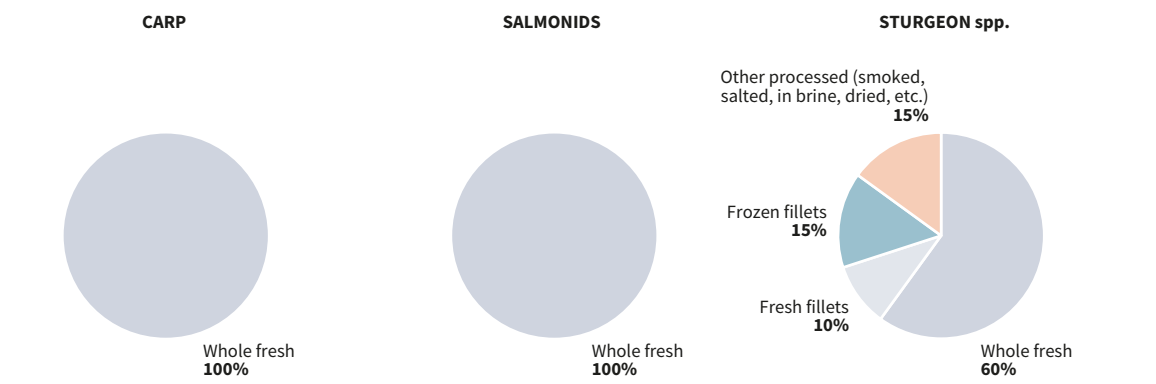
Official statistics do not allow for the determination of the share of total exports represented by domestically farmed trout. According to experts' opinions, this share is not significant.

Processing

Fish processing in Georgia mainly consists of fishmeal and fish oil production for non-human use. These products are mostly exported to Turkey, where they are further processed into animal feed before much of it is sent back to Georgia. According to experts' estimates, the share of the total annual volume of processed seafood represented by fishmeal and fish oil is up to 90 percent.

Processed seafood for human consumption includes chilled, frozen, salted, smoked and dry-cured products. There are a very few fish processing plants in the country

Figure 9. Estimated production shares of domestically farmed species by type of pre-processing and preservation



Source: Based on qualitative estimation through consultations with the Ministry of Environmental Protection and Agriculture of Georgia (MEPA).

and those in use have low capacity and are rarely used to their full potentials. This is also true of Georgia's canning sector, which is currently in its nascent stages. A small amount of processed seafood is made into traditional smoked and salted products by local wholesalers and retail shops.

Domestically farmed fish is mostly sold live while a small share is converted either into fresh and frozen fillets, or into smoked, dry-cured and salted products, though this kind of value-addition applies mainly to sturgeons (Figure 9).

In general, fish consumption in Georgia is low, with a per capita seafood consumption of 8.2 kg in 2016 compared to the world average of 19.6 kg. However, experts claim they have observed positive trends and attribute it to the improvement of general financial conditions. Additionally, consumer preferences have also started shifting from frozen to fresh/chilled products.

Distribution and pricing

Data regarding the distribution channels for farmed species in Georgia have not yet been collected and explored at the national level. However, estimates from industry experts shed light on the general routes of farmed fish from producer to end consumer (Table 2).

Since the majority of farms are those of small-scale producers and lack adequate resources to provide storage and, at times, even transportation, most of the harvested fish is either sold live to re-sellers, or the owners of the facilities bring the fish to the local open-air market themselves. On average, over half of the total production goes to intermediaries for further re-selling at farmers' markets, fishmonger trucks and so on. Additionally, about 20 percent of the total yield is sold ex-farm to neighbouring hotels, restaurants and cafés. Naturally, the hotel, restaurant and catering (HoReCa) sector obtains more of the expensive species including up to 30 percent of both trout and sturgeon. Supermarkets also account for 30 percent of trout and sturgeon production and sell these species, together with smaller volumes of carps, mainly fresh or chilled. Trout and sturgeons are available at supermarket counters in smoked/salted form as well and about 10 percent of the fishes' total volumes are sold via supermarket chains.

Compared to domestically farmed species, imported farmed species follow different channels of distribution. Salmonids, for example, are marketed in various forms such as fresh, filleted, smoked and salted through all channels including modern or traditional retail, hotels and restaurants. Seabass and seabream are sold in fresh/frozen whole form to restaurants and modern retail chains. Other species, including pangasius, Nile perch and tilapia, are marketed mainly in frozen form through modern retail chains.

Prices for domestically farmed fish remained relatively stable over the period 2017–2019, showing

Table 2. Estimated sales channels for domestically farmed species

Species	Scientific name	Retail		HoReCa	
		Modern	Traditional	Hotels & restaurants	Institutional catering
Common carp	*Cyprinus carpio*	5%	85%	10%	0%
Grass carp	*Ctenopharyngodon idella*	5%	90%	5%	0%
Rainbow trout	*Oncorhynchus mykiss*	30%	40%	30%	0%
Silver carp	*Hypophthalmichthys molitrix*	5%	90%	5%	0%
Sturgeon	*Acipenser* spp.	30%	40%	25%	5%

Source: Based on qualitative estimation through consultations with Ministry of Environmental Protection and Agriculture of Georgia (MEPA).

Table 3. Ex-farm prices for domestically farmed species, 2017–2019

Species	Price (USD/kg)		
	2017	2018	2019
Common carp and mirror carp	2.67	2.61	2.73
Grass carp	2.11	2.24	2.20
Rainbow trout	3.19	3.32	3.36
Russian sturgeon and Siberian sturgeon	7.89	9.44	8.71
Silver carp and bighead carp	1.22	1.42	1.40
Wels catfish	5.63	5.56	5.63

Source: GEOSTAT, 2020.

some seasonal deviations, particularly during the Christmas and New Year holidays, when prices increase not just for fish, but also for all other food products (Table 3).

Naturally, the prices of imported species that are also farmed are higher than the prices for domestically produced fish, varying greatly depending on the country of origin and the level of value addition.

Marketing activities

For the time being, no marketing campaigns to promote fisheries and aquaculture have been conducted at the national level. However, at the regional level, the outlook is more optimistic. For instance, the Adjara region has set a good example of how to promote the sector. The Fish and Seafood Festival, which was organized in the region's capital of Batumi for three consecutive years beginning in 2017, attracts many participants not only from Adjara, but from other regions as well. The event is organized by the association for the development of organic aquaculture, Poreji, with the support of the Government of Adjara, the Ministry of Agriculture of Adjara, the Ministry of Health and Social Affairs of Adjara, the Department of Tourism and Resorts of Adjara, the Batumi City Hall, the Agricultural Cooperatives Development Agency and the Batumi Student Youth Palace.

Each year, the festival includes master cooking classes, as well as tutorials on fish farming, the nutritional value of fish, sport and recreational fishing and other relevant topics. The festival is attended by both farmers and individuals involved in the trade of seafood, restaurants, vocational training colleges and more.

The Adjara region is Georgia's major coastal tourism hub. Its capital city, Batumi, is known as the country's primary gateway to the sea. From this perspective, efforts toward attracting more tourists to the area by arranging a fish festival cannot be underestimated.

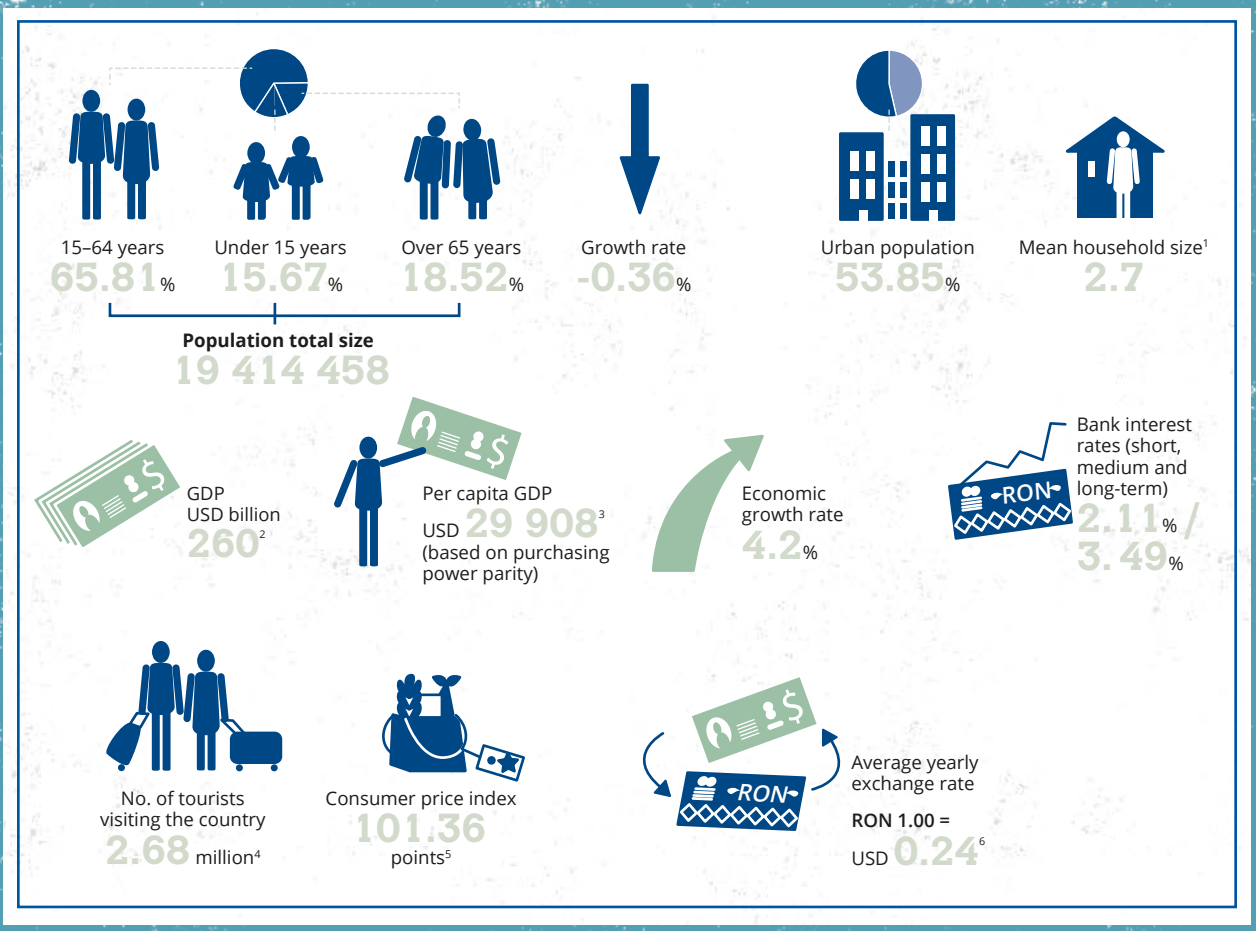
Marketing of seafood at the private level largely involves promotion through social media.

However, not all marketing efforts rely on social media. For example, the famous Batumi fish market, in agreement with a nearby restaurant, offers a "stall-to-plate" service, by which people can choose fish from the market and then bring it to the restaurant to have it cooked in a preferred way, before it is served and enjoyed. Some other markets and restaurants nationwide have similar arrangements which help to promote both the restaurant and the fish market and increase awareness about the seafood products offered in Georgia

Impacts of COVID-19 on the aquaculture sector in Georgia

No surveys regarding the impacts of COVID-19 on the aquaculture sector of Georgia have been conducted yet. However, the most visible effect the pandemic has had in 2020 has been the significant drop in demand. Restaurants and cafés that originally called for large amounts of produced seafood had to close for quarantine over extended periods in compliance with governmental requirements. During the lockdown, open-air markets in the country's biggest cities were also closed, including the fish market in Batumi. The demand has also seriously dropped due to the drastic decline in tourist flow. Only when a comprehensive survey is conducted will the true effects of the pandemic be revealed.


ROMANIA



Note: Figures represent 2019 values.

Source:
[1] ArcGIS, 2021;
[2] Focus Economics, 2021;
[3] World Bank, 2021;
[4] NIS, 2021;
[5] Trading Economics, 2021;
[6] European Central bank, 2021.

ROMANIA

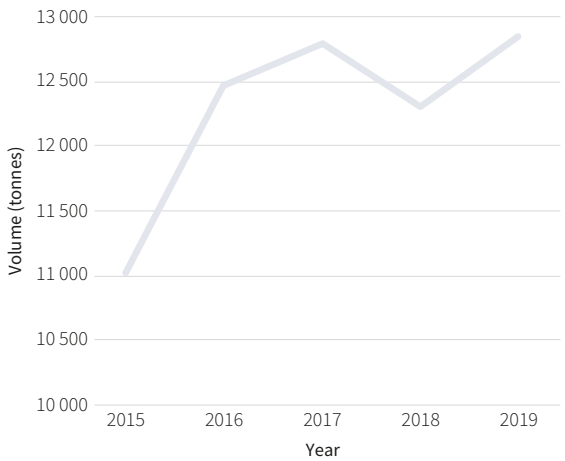
With a growing volume of sold aquaculture production, several Romanian fish farms have expanded to include services such as ecological tourism, recreational fishing and educational activities related to aquatic biodiversity, further increasing their steams of revenue.

The existence of fishponds in Romanian territory has been documented since the twelfth century. Additionally, the spread of Christianity in Romania played a major role in the establishment of new ponds as monastic communities built carp ponds which quickly became an element of local pride for the villagers and an important aspect of community life. In the hilly regions, these ponds were also used as a source of power for water mills. The spread of Christianity also aided in the development of the farming of local species, including freshwater species such as bream, tench (*Tinca tinca*), northern pike (*Esox lucius*) and wels catfish (*Siluris glanis*). However, it was the common carp (*Cyprinus carpio*) that would dominate Romanian and other European countries' fish farming for the next six centuries.

During the industrial revolution, the search for new arable lands and pastures was seen as more profitable than carp farming. The description of trout-controlled reproduction in the nineteenth century resulted in a decline of fish farming and the abandonment of the ponds. It was only in 1896 when Grigore Antipa, one of the most important European fish specialists, wrote a fishery law which provided for the establishment of fish farms to restock natural waters depleted by overexploitation and poaching. His vision for the entire fisheries, aquaculture, processing and market organization is a functional model even today. In his time, fishing and fish farming schools and faculty courses were developed and research institutes for the Black Sea, Danube Delta, inland water, carp farming and trout farming were created.

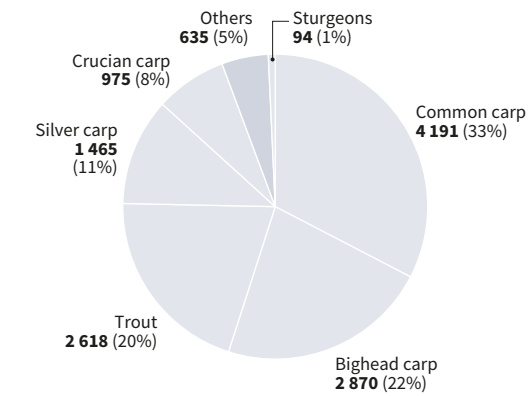
Later, in the 1970s, the fish farming infrastructure took the form we see today. The largest fish farming production was recorded in 1988 when 55 000 tonnes were produced in Romanian farms. After the political changes from the beginning of 1990, the production dropped to a historic low of 8 781 in 2010. In the last five years, farmed fish production has been slowly increasing with an average annual growth rate of 7 percent (Figure 1).

Figure 1. Total volume of sold aquaculture production, 2015–2019



Source: ANPA, 2019, 2021.

Figure 2. Volume of sold aquaculture production by species, 2019



Source: ANPA, 2021. *Note:* All volumes are in tonnes.

Freshwater aquaculture represents more than 99 percent of total production and the main volume comes from freshwater pond-based farms, relying on two groups of species, common carp and the associated species reared in polyculture – silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Hypophthalmichthys nobilis*), grass carp (*Ctenopharyingodon idella*), Crucian carp (*Carassius carassius*), sander (*Sander lucioperca*), northern pike and wels catfish, among others – and three species of trout farmed in raceways or tanks in monoculture – rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) (Figure 2). There are over 30 cultivated species, including Danube sturgeon (*Acipenser gueldenstaedtii*), paddlefish, African catfish (*Heterobranchus bidorsalis*), turbot (*Scophthalmus maximus*), European eel (*Anguilla Anguilla*), crayfish, bream and tench. Apart from the traditional fish farming methods, there are also recirculating aquaculture system farms for sturgeons, trout and turbot as well as freshwater floating cages for trout and common carp.

Aquaculture supplies 11.5 percent in volume of Romanian seafood consumption. According to the data from the National Agency for Fisheries and Aquaculture (ANPA) for 2019, 70 percent of the value and 79 percent of the volume of aquaculture production came from ponds and 25 percent of the value and 17 percent of the volume came from tanks and raceways (Table 1).

Marine aquaculture production is almost non-existent and far below the potential of the total surface available for aquaculture due to the lack of a strategy for developing this activity. It consists of one turbot farm, which is not yet functional, and some trials of oyster farming on ropes or longlines. To date, no significant subsidies have been provided apart from a small compensation

Table 1. Volume and value of aquaculture production by type of farming facility, 2019

Type of facility	Volume (tonnes)	Value (million USD)
Cages	555.6	1.3
Ponds	9 719.3	22.7
Tanks and raceways	2 573.7	6.0
Total	**12 848.6**	**30.0**

Source: Based on data from EUROSTAT, ANPA and ROMFISH.

for fuel consumption on farms granted by authorities in 2019 and there is a delay in additional investments that could be used for innovation. In recent years, there has been a desire to develop the marine aquaculture sector, and investors have expressed interest in farming Mediterranean mussel (*Mytilus galloprovincialis*), oysters and trout. Progress was made in 2020 when the process of Black Sea water quality classification was finalized and four areas that met the requirements of the Water Framework Directive[1] were identified. In the future, the number and variety of species should be improved and farmers should be given access to new technology.

Currently, there are no established allocated zones for marine aquaculture, though in 2021 there are some works set to take place, namely as a result of the Aquaculture Demonstrative Centres in Constanta, Romania for shellfish and in Trabzon, Turkey for finfish. Additionally, improvements to the national legislation are foreseen.

According to the National Institute of Statistics (NIS), in 2018 there were 504 entities involved in aquaculture, delivering 12 848.3 tonnes of farmed fish with a total number of employees of 2 231 full-time equivalent (FTE) jobs. Out of these entities, 87.5 percent had fewer than nine employees, 12.3 percent had between 10 and 49 employees and 0.2 percent had more than 50 employees but fewer than 249.

Data obtained from the NIS (2021) also state that in 2018, the total number of enterprises active in the fisheries sector (aquaculture, fishing and processing) was 711 out of which 72.9 percent were involved in aquaculture and 4.8 percent in fish processing. From a total of 3 908 FTE, 57.6 percent were working in aquaculture and 33.4 percent in processing.

Traditional pond-based farms with annual capacity below 30 tonnes per year represent the largest share in the total number of aquaculture facilities and the lowest share of production (Table 2).

Table 2. Composition of aquaculture farms by production capacity

Annual production (tonnes)	Share of enterprises	Share of production
< 30	79.0%	15.32%
30–100	14.3%	22.55%
100–250	4.1%	23.10%
250–500	1.7%	18.40%
> 500	1.0%	20.63%
Total	**100%**	**100%**

Source: Based on data from ROMFISH.

Apart from the aquaculture sector's socio-economic role in providing jobs and incomes in the rural areas, it is worth mentioning that pond fish farming has a major role as an ecosystem services net provider. Based on the results of the latest research, a pond farm could provide numerous provisioning services including natural fish yield, biomass production, feed for grazing livestock or firewood. Also, it could provide regulation and maintenance services to the ecosystem, including microclimate regulation, carbon and other nutrient sequestration and storage, air quality regulation and water quantity and quality regulation. Pond fish farming could also provide cultural ecosystem services such as cultural heritage/inspirational sources, opportunities for scientific research, opportunities for environmental education and recreation. From this point of view, this type of fish farming, even though it is considered barely profitable and labour intensive, could be deemed essential if one takes into account the non-monetary contribution to the welfare of society and the climate change objectives and biodiversity goals.

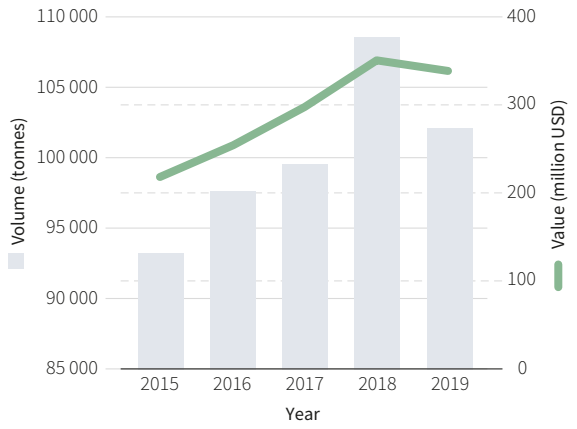
Trade

IMPORTS

Romania relies to a large extent on fish imports, which on average make up around 78 percent of the seafood consumed in the country. Since 2015, seafood imports into Romania have shown stable growth,

[1] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Figure 3. Volume and value of seafood imports, 2015–2019

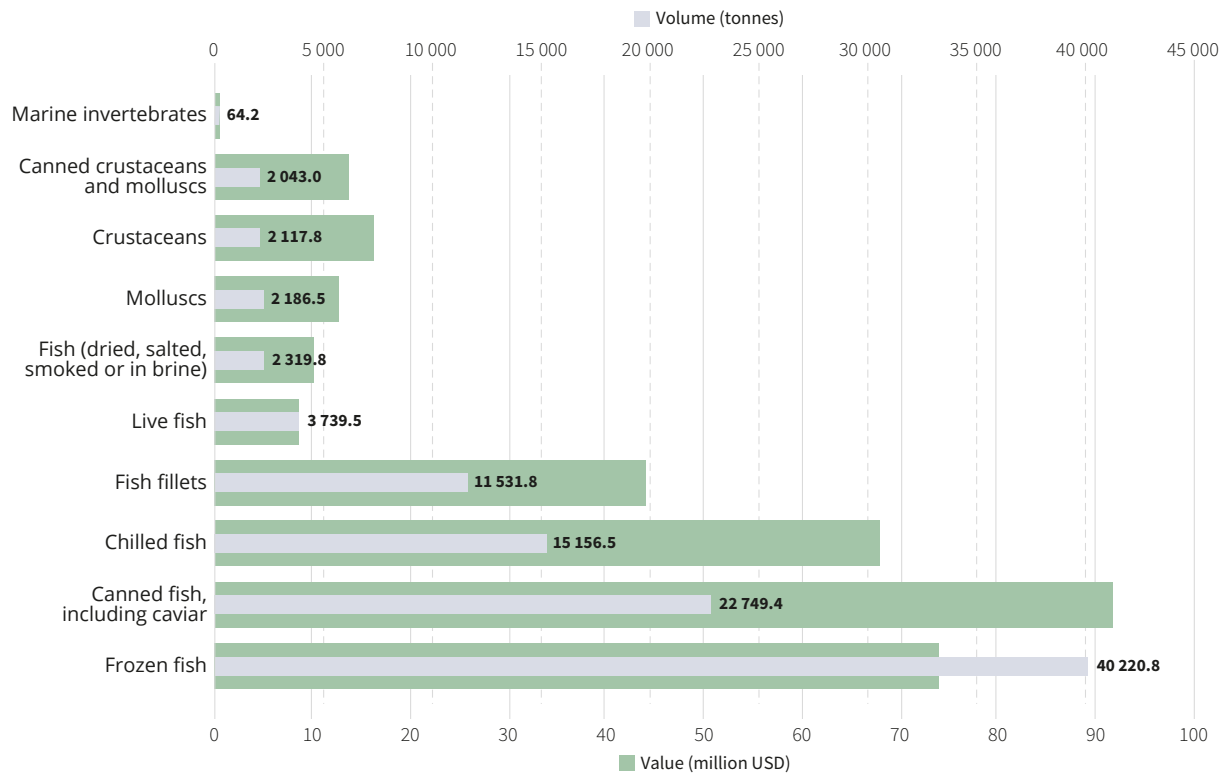


Source: UNSD, 2021.

reaching 102.1 thousand tonnes for a total value of USD 338.2 million in 2019 (Figure 3). Between 2015 and 2019, the most important increase in imported volumes was 274 percent for crustaceans, followed by 212 percent for prepared or preserved crustaceans, molluscs and other invertebrates and 202 percent for live fish. As for the imported value, the largest increase was 308 percent for crustaceans, molluscs and other invertebrates, followed by 232 percent for live fish and 208 percent for crustaceans. During this time, frozen fish imports decreased by 14 percent in volume but increased by 25 percent in value.

Despite this decrease in volume, frozen fish still dominated the volume of imports in 2019 composing 39 percent of the imported volume, followed by

Figure 4. Volume and value of seafood imports by type of pre-processing, preservation and species, 2019



Source: UNSD, 2021.

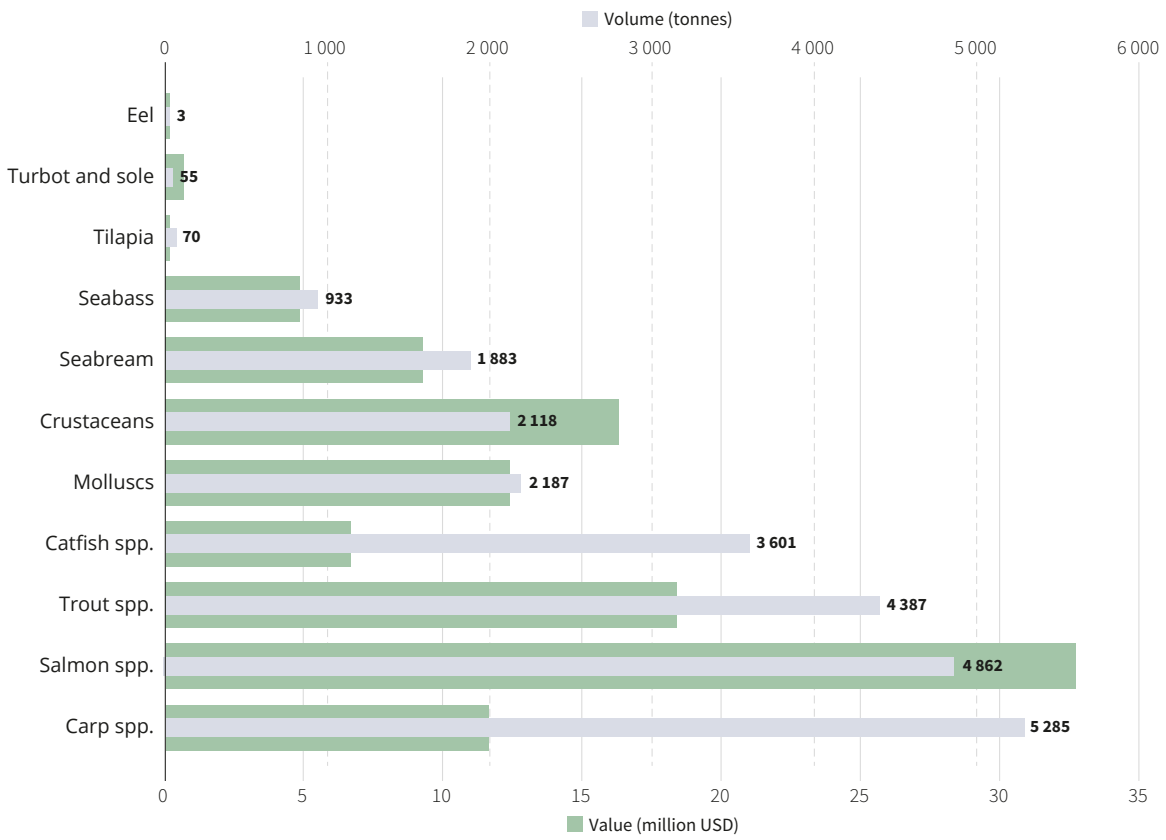
prepared or preserved fish with 22 percent and fresh or chilled fish with 15 percent. In terms of imported value, the prepared or preserved fish held a 27 percent share of the total, followed by frozen fish with a 22 percent share and fresh or chilled fish with 20 percent (Figure 4).

The most important exporters of seafood products to Romania are the Netherlands, Denmark and Spain, which together in 2019 accounted for 33.9 percent of the country's total import value. Other important exporters to Romania include the Czech Republic, Italy, Bulgaria, Greece, Sweden, Turkey and Poland.

For farmed species in 2019, the largest volumes for carp arrived from Hungary, the Czech Republic, and Greece, while the largest volumes for trout arrived from Italy, Bulgaria and Turkey. For the other cultivated species, the main suppliers were the Netherlands, France and Italy for crustaceans; Spain, Italy and the Netherlands for molluscs; France, Croatia and Greece for eels; Denmark, the Czech Republic and Sweden for salmon; Poland, Netherlands and Greece for tilapia; Greece, Turkey and Italy for seabream; Viet Nam, Italy and Hungary for catfish; Greece, Turkey and Italy for seabass.

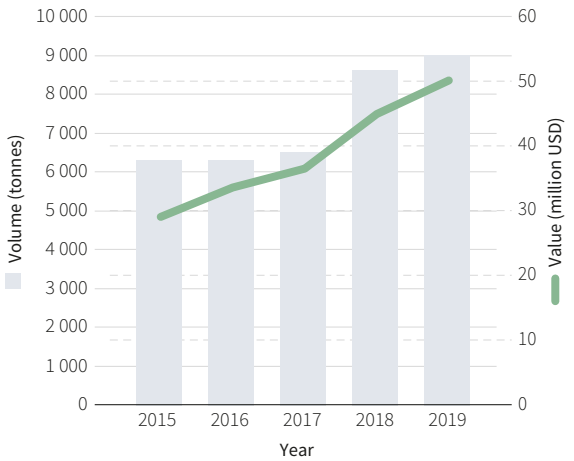
Carps are by far the most important group of farmed species imported into Romania, with 5 285 tonnes arriving in 2019, most of it coming live from Hungary. Salmon is the second most imported aquaculture produced species, arriving mainly fresh or frozen from Denmark, the Czech Republic and Sweden, or smoked from Germany, Poland

Figure 5. Volume and value of imports of species that are also farmed, except canned products, 2019



Source: UNSD, 2021.

Figure 6. Volume and value of seafood exports, 2015–2019

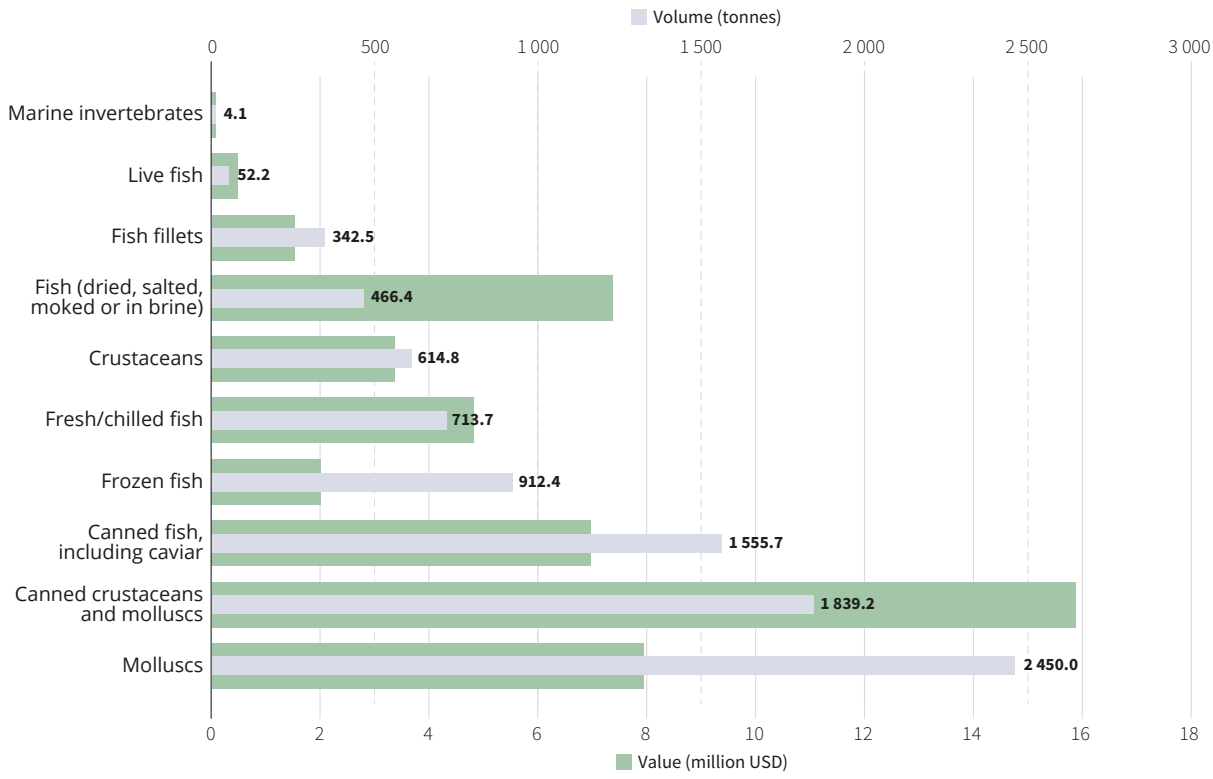


Source: UNSD, 2021.

and Denmark. Rainbow trout is the third most important farmed species imported into Romania; in 2019, most rainbow trout was imported fresh from Italy and Bulgaria or frozen from Turkey (Figure 5).

Though not as large as the volume of carp, sizeable quantities of catfish species were imported in 2019, mainly frozen pangasius fillets from Viet Nam. Trailing behind catfish imports were seabass and seabream which are building up their share in the Romanian market. In 2019, Romania imported about 2 815 tonnes of seabass and seabream, with Greece and Turkey supplying more than 90 percent of the entire volume. Half of the crustaceans imported into the country were supplied by the Netherlands, France and Italy. Of the total volume of imported molluscs, over half came from Spain, Italy and the Netherlands.

Figure 7. Volume and value of exports by type of pre-processing, preservation and species, 2019



Source: UNSD, 2021.

It is estimated that in 2019 the volume of seafood consumption was around 7.4 kg per capita.

EXPORTS

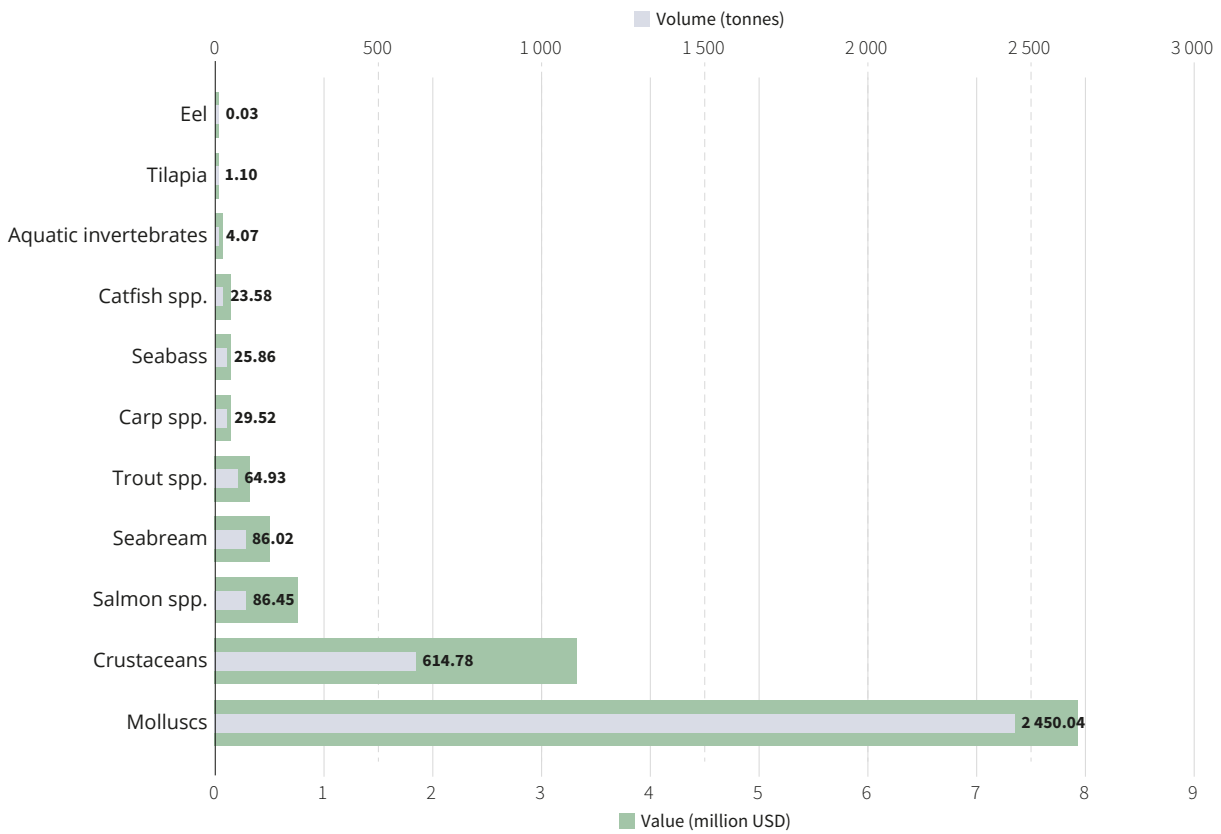
The volume of seafood exports from Romania remains very low despite an observed growth trend from 2015 to 2019 (Figure 6). This is largely due to the limited range of both species and processed seafood products on the market (FAO, 2021).

In 2019, major export destinations, in terms of value, were the Republic of Moldova, France, Bulgaria, Hungary, Italy, the Republic of Korea and the Czech Republic, which together accounted for 75 percent of the total exported value of seafood. In terms of volume, the main exported products were molluscs (primarily rapa whelk), followed by prepared or preserved fish. Together, fresh/chilled and frozen fish made up 18 percent of the total volume of exported seafood products (Figure 7).

By species, over 50 percent of the total export volumes in 2019 for species that are also farmed were molluscs (mainly rapa whelk), caught in the Black Sea and delivered mainly to Bulgaria, France, Hungary, the Republic of Korea and Italy (Figure 8).

Carps are exported mainly frozen to Hungary, Spain and the the United Kingdom of Great Britain and Northern Ireland or fresh to the Republic of Moldova. Trout is exported mainly fresh or chilled to the Republic of Moldova and frozen to Bulgaria, Hungary and United

Figure 8. Volume and value of exports of species that are also farmed, except canned products, 2019



Source: UNSD, 2021.

Kingdom. Salmon is exported mainly fresh, chilled, or frozen to the Republic of Moldova and smoked to Bulgaria, the Republic of Moldova, Hungary and Serbia. Catfish is exported mainly as fresh fillets to Hungary, the Republic of Moldova and Cyprus. Seabass and seabream are exported almost exclusively to the Republic of Moldova as fresh or chilled products. Tilapia fillets are exported fresh to the Republic of Moldova, Bulgaria and Hungary, while smoked fish (carp, catfish, tilapia or eel) is exported to Hungary, the United Kingdom and Ireland.

Processing

According to the NIS, production of processed fish products in 2019 totalled 22 533 tonnes, which is 11.3 percent lower than production in 2018. The share of roe-based salad, a very popular product in Romania, was the biggest, reaching 40 percent of the volume and 32.5 percent of the value.

Consistent growth in production volume has been observed for molluscs (rapa whelk), canned fish and caviar from farmed species (Table 3).

Processed fish products are largely made from imported raw materials – frozen fish or fillets of herring, mackerel, sardine, or European sprat. The total volume of raw material in 2019 was 12 477 tonnes with a value of USD 36.9 million. Only 23.5 percent in volume and 20.8 percent in value was indigenous raw material, while the rest was imported.

Based on the available data and qualitative estimations of industry stakeholders, it is evident that different farmed species are processed in different shares. For instance, by volume, carps are sold 50 percent live, 25 percent fresh or chilled whole, 15 percent as fresh portions and fillets and 10 percent smoked. As for trout, only 5 percent are sold live and 15 percent are sold fresh or chilled whole, 70 percent are sold fresh gutted or as fillets and 10 percent are smoked or used in fish salads. The processed sturgeon market counts mainly on fresh portions and fillets (85 percent) and only 10 percent are sold as fresh or chilled whole fish, with the remaining five percent sold live.

Table 3. Production volume and value of select aquaculture products, 2018–2019

Product group	2018		2019	
	Volume (tonnes)	Value (million USD)	Volume (tonnes)	Value (million USD)
Canned fish	88	0.58	403	2.04
Canned molluscs and crustaceans	20	0.23	364	3.46
Caviar	24	0.52	43	0.57
Marinated fish	2 305	10.52	2 530	12.64
Primary processed fish, fresh or chilled (scales off, gutted, head off, tail off, skinned, portioned, filleted)	3 291	17.84	2 268	12.86
Primary processed fish, frozen (scales off, gutted, head off, tail off, skinned, portioned, filleted)	6 727	16.56	4 763	15.04
Processed molluscs and crustaceans	1 614	12.33	302	2.08
Roe salad	6 456	29.95	9 000	33.56
Salted fish	380	0.71	136	0.67
Smoked fish	2 935	24.09	2 253	18.70
Other processed seafood	1 166	8.32	135	0.21
Other	383	2.22	337	1.35
Total	**25 389**	**123.88**	**22 534**	**103.18**

Source: Based on data from MADR and ROMFISH.

As for imported farmed fish, the estimated product shares in processing are as follows. Salmon sales are 60 percent fresh or chilled whole, 30 percent fresh portioned and fillets and 10 percent frozen fillets. Seabass and seabream are sold 10 percent frozen gutted, 60 percent fresh or chilled gutted and 30 percent fresh or chilled fillets. Another important group of farmed fish is catfish (pangasius, clarias, silurus and ictalurus) which is mainly sold as frozen fillets (85 percent), or fresh fillets (10 percent) imported from third (non-European Union) countries and fresh or chilled gutted (f5 percent) from local and Hungarian farms.

The volume sold of these various processed fish products also depends on consumers' seafood preferences which differ depending on regional traditions. The biggest markets are in the northeast and south of the country (Bucharest included) and some market studies have revealed that farmed fish (carp) is preferred live in the northeastern region and fresh/chilled in the southern part of Romania.

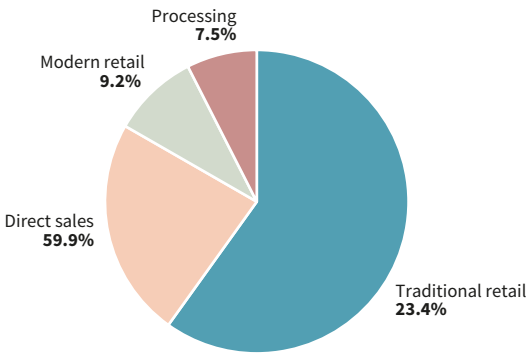
The number of companies involved in seafood processing was 34 in 2018 and 32 in 2019, though only one of these companies employed more than 250 people. Together, the number of employees in the processing industry in 2019 was 1 197 FTE, of which over half were women.

Distribution and pricing

The sales channels and their shares for aquaculture species are not available from the official statistics. However, stakeholders of the aquaculture producers' organizations, which deliver over 70 percent of Romania's total farmed production, were able to estimate the relative shares of volume by each sales channel for farmed species (Figure 9).

The traditional fishmongers' sector is the most important as it ensures a wide distribution outside big cities. Another important sales channel is direct sale from the farmers' own shops, which has three major advantages: it keeps the value added in farmers' accounts; it provides a fair cash flow; and it allows the consumer to get accurate information about the product itself, the method of production, environmental data and so on. Processing and modern retail are also important distribution channels, but they are more sensitive to acquisition prices and thus contract negotiation is often difficult.

Figure 9. Estimated sales channels for domestically farmed species



Source: Based on qualitative estimations by ROMFISH.

In contrast to domestically farmed species, imported farmed species rely more on hypermarket chains and processing as they are able to provide the high volumes and constant supply demanded by the hypermarket or processing facility.

Sales channels for domestic and imported farmed species differ according to the length of the value chain. Most of the domestically farmed fish is sold live (carps) or fresh (trout) and it is estimated that, for example, carps are sold 30 percent in modern retail (supermarkets, hypermarkets, discounters) and 65 percent in traditional retail (fish markets, fish mongers, direct sales) as the distance from carp farms to towns or cities is almost everywhere less than 50 km, which makes it easy for farmers to deliver their products (Table 4). The sturgeon meat market is not as important in Romania as it is in nearby countries.

Table 4. Estimated sales channels for species that are also farmed

Species	Modern retail (%)	Traditional retail (%)	Hotels & restaurants (%)	Catering (%)
Carp spp.	30	65	4	1
Trout spp.	60	15	15	10
Sturgeon spp.	60	20	19	1
Seabass and seabream	55	10	25	10
Salmon spp.	55	10	25	10
Catfish spp.	25	35	25	15

Source: Based on qualitative estimations and data from ROMFISH.

Table 5. Average prices before VAT for fish sold ex-farm and through the retail sector, 2019

Species	Live/chilled fish, whole, market size (kg)	Ex-farm (USD/kg)	Retail (USD/kg)	Catering (%)
Bighead carp	1.5–2.5	1.31	2.31	1
Common carp	1.5–2.5	2.36	3.57	10
European catfish	1.5–3.0	3.30	4.62	
Grass carp	1.5–2.5	2.24	3.16	
Northern pike	2.0–4.0	2.82	3.80	
Prussian carp	0.1–0.5	1.19	2.94	
Sander	1.5–2.5	3.53	5.26	
Silver carp	2.0–3.0	1.30	1.90	
Sturgeons/paddlefish	1.5–3.0	3.11	3.96	
Trout	0.3–0.5	4.05	4.63	

Source: Based on data from ROMFISH.

Prices for aquaculture products imported into Romania (salmon, trout, seabass and seabream and others) significantly exceed the prices for domestically produced fish (carps) (Table 5). Inhabitants of major cities are the primary consumers of these imported species, as city dwellers usually earn higher wages and thus can afford the higher prices.

Prices for domestic aquaculture products remained relatively stable in 2019.

Marketing activities

No studies on promotional activities were conducted in Romania from 2015 to 2019. However, it is known that steps to promote aquaculture products are often taken by the producers themselves at the local scale or sporadically at the regional level.

Moving forward, there is important information that must be delivered to the consumer regarding the Farm to Fork Strategy and the Biodiversity Strategy for pond fish farming as well as for future shellfish production in the Black Sea. It would be wise to develop marketing activities to promote the sustainability strengths of these production methods

Impacts of COVID-19 on the aquaculture sector in Romania

The effects of COVID-19 on Romanian aquaculture in 2020 mainly centre on problems with fish stocking, as well as with additional disruptions in sales.

The fish consumption pattern in Romania, mainly for live and domestically produced fresh fish, has, in the spring, a strong connection with Easter fasting habits (no consumption of meat). On this note, there are two important fish-eating days: 25 March and Palm Sunday (falling on 12 April in 2020). However, COVID-19 led to the declaration of an emergency status in the country on 16 March 2020. As a result, there was a 25 percent decrease in fish sales compared to March 2019. In April, farms succeeded in limiting their loss in sales to only 15 percent in volumes compared to April 2019. In terms of sales turnover, they managed to remain even with the same period in 2019 because they sold high value products (stocking material). In May 2020, recreational fishing on fish farms, an additional income source for some farmers, opened, allowing farmers to recover some revenues as fish is traditionally eaten every Wednesday and Friday for the entire month.

In the meantime, diminished March and April revenues which are usually intended for acquisition of feed and stocking material, affected the feed contracts and the movement of stocking material among the different types of farms.

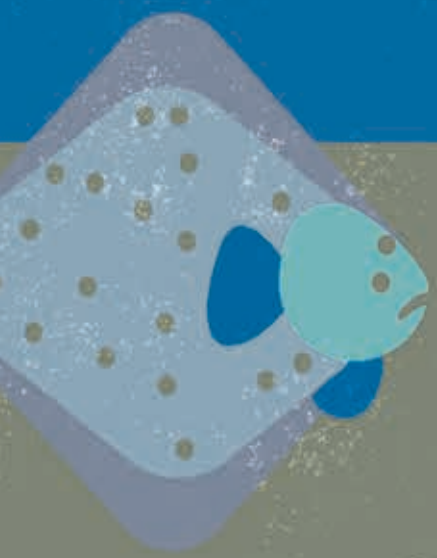
The pandemic crisis was overlapped by a very warm winter with little snow and by a severe spring and summer draught. For carp farming, the technological model in Romania is to harvest the fish late in the autumn and put it in special storage ponds (high depth and small surface, with additional aeration and waterflow) in order to have it at hand for the winter season deliveries (December–April/May). The storage of live fish provides the market with a constant supply during the winter and the spring but comes with additional costs and losses. Unfortunately, the warm winter and the subsequent draught led to problems with the storage of live fish, of which there were more than expected, in the months of March and April, when the carp were looking for food and returning to a normal metabolism.

Financial support could help mitigate the effects of the pandemic on farmers, one such example is the EUR 2.5 million in funds from the European Maritime and Fisheries Fund that were allocated in November 2020 for a support scheme for COVID-19 loss compensation covering March–May 2020.

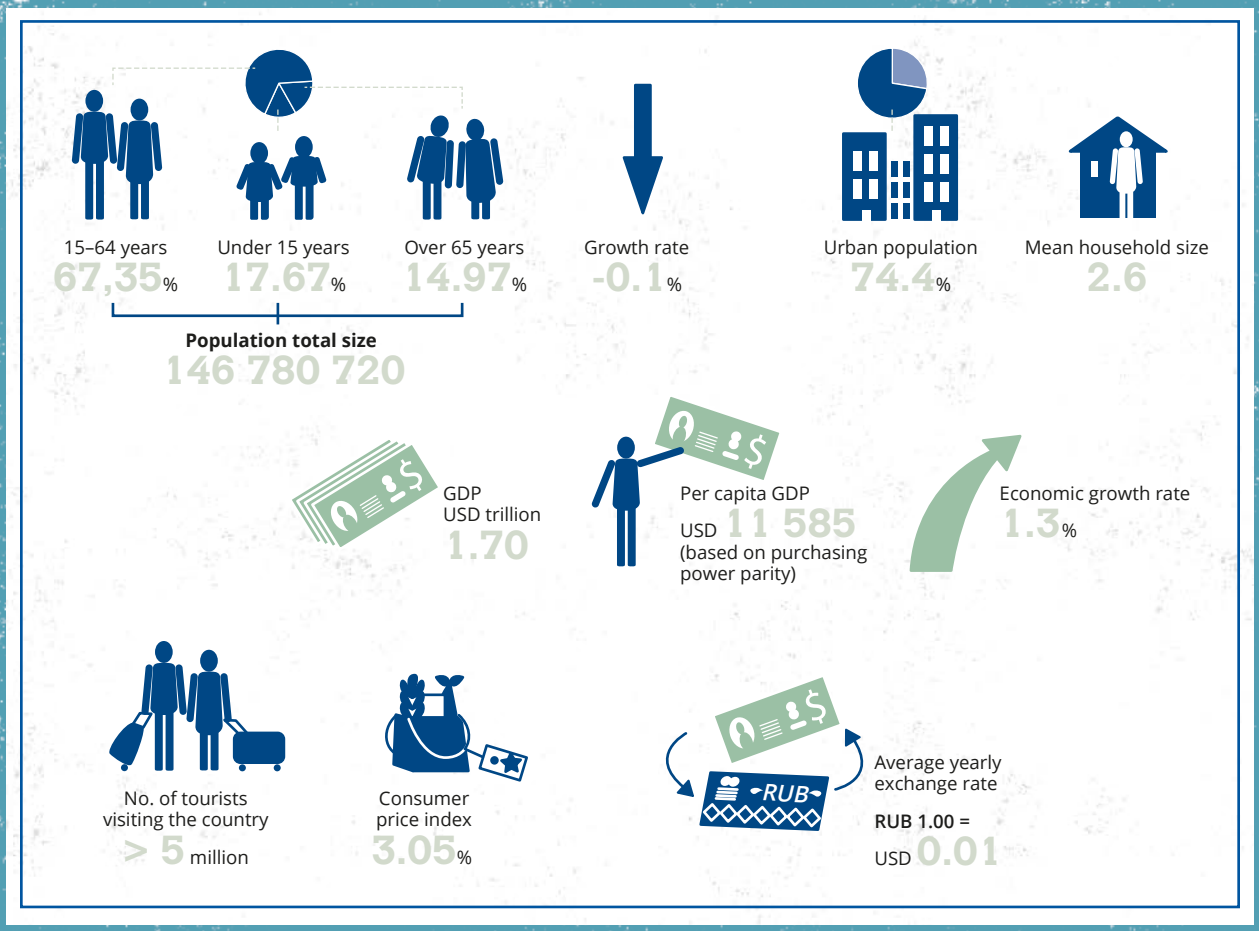
When it comes to market and liquidity failures, a rapid response is crucial, especially for live stocks where one missed day of feeding must be recovered by two additional days of feeding. Unfortunately, some farmers felt that the financial supports offered during COVID-19, including the state aid scheme "SME-Invest" that provided access to investment bank loans with 100 percent subsidised interest rates and 90 percent subsidised state guarantees, were slow. The process took in some cases three months and many farmers were unable to access this scheme due to low capitalization of the farms and market uncertainties during this pandemic period.

The most affected fish farms were those with low diversification selling channels or the ones dependent on the hypermarkets or the hotel, restaurant and catering (HoReCa) sector. Better results were obtained by farms using direct sales and fishmongers' sales.

To date, uncertainty continues to permeate the markets for both the stocking material needed for new production and for the market size fish.



RUSSIAN FEDERATION



Note: Figures represent 2019 values.

Source: Based on data from national statistical sources, the World Bank and the Organisation for Economic Cooperation and Development (OECD).

RUSSIAN FEDERATION

As the largest country by land mass in the world, the Russian Federation faces unique challenges when managing its aquaculture sector, including differing, country-wide fish consumption and production patterns, and varied processing and distribution operations.

Evidence of fish farming in the Russian Federation extends as far back as the twelfth century; archaeological excavations in the Novgorod Republic revealed the remnants of man-made ponds used for fish breeding. Four hundred years later, chronicles from the sixteenth century provide evidence that fish farming was prestigious and an important part of daily life. Indeed, Ivan the Terrible even founded a fish breeding school and rewarded his associates with fish ponds. Later, Peter the Great ordered the creation of a national pond register to calculate the total number of fish in all ponds, as well as the compilation of historical records regarding fish farming. Though these works were not completed, it was revealed that in the beginning of the eighteenth century, at least 49 species of fish were farmed in the country, with carp and trout topping the list of the most favoured species.

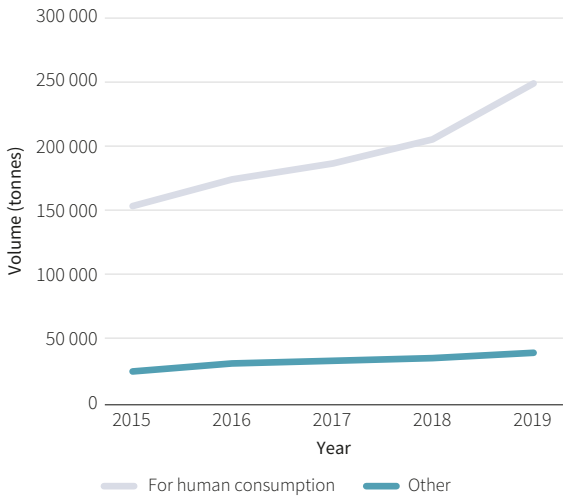
In the modern Russian Federation, aquaculture is seen as a priority sector of the fishery industry, itself a focal point of the country's economy. Adoption of the Federal law "on aquaculture (fish farming) and on amendments to certain legislative acts of the Russian Federation" in 2013 offered further possibilities for developing the sector's small and medium-sized farms, increasing the production of fish feed and farming equipment, as well as attracting investment.

According to the Federal State Statistics Service (Rosstat), the aquaculture sector showed stable growth from 2015 to 2019, reaching total volumes of 286.8 thousand tonnes. Farmed fish for human consumption constitutes, on average, just over 85 percent of the total volumes (Figure 1).

The general trend observed in the past several years shows that the production volumes of high-value species have been growing. Additionally, despite an increase in the production of species with lower value, their share in total production has been slowly declining.

Carp prevails in overall aquaculture production, though its share of total production has been gradually decreasing; in 2019, the volumes of carp were 50 percent

Figure 1. Volume of aquaculture production, 2015–2019



Source: Based on data from the Federal State Statistics Service.

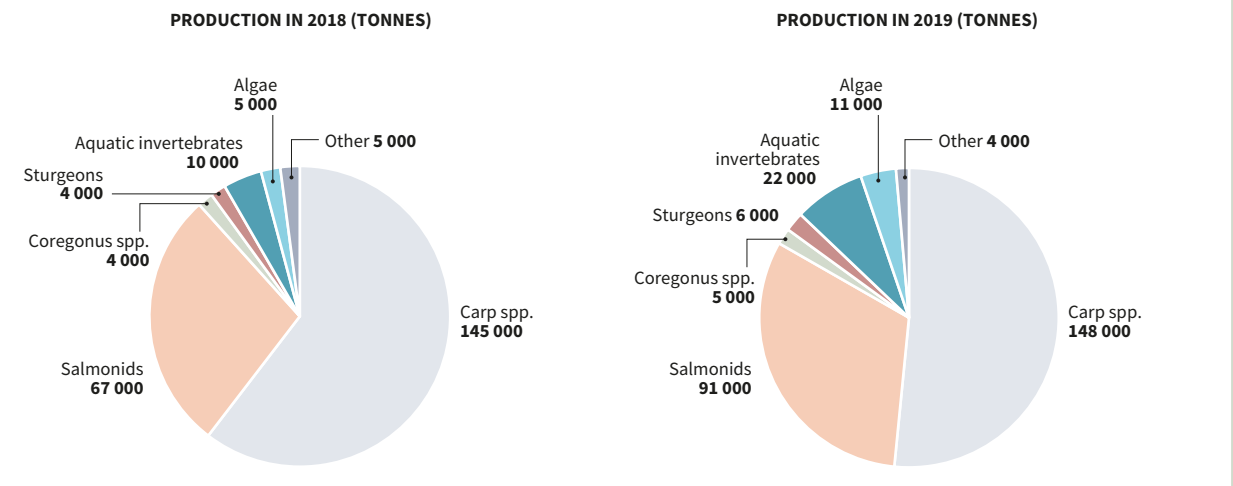
of the total production, or 148 000 tonnes. In that same year, the production of trout, Atlantic salmon (*Salmo salar*), and other salmonids increased by over 24 000 tonnes, compared to the previous year. Farmed aquatic invertebrates and algae (*Laminariales*) have shown to be rapidly growing segments, both displaying a 120 percent increase compared to figures from 2018 (Figure 2).

Over 90 percent of mollusc production takes place in the Russian Far East. In 2019, the volumes were 3 600 tonnes of sea cucumber; 2 300 tonnes of oysters; 1 600 tonnes of scallops; 1 300 tonnes of mussels; and 1 000 tonnes of sea urchins.

By the type of farming system, the Russian Federation's aquaculture facilities can be divided into five principal groups:

- pasturable aquaculture, including lakes, small water reservoirs and cooling reservoirs of power plants, used for the production of carp (*Cypridinae*), whitefish (*Coregodinae*), salmonids (*Salmonidae*), herbivorous species including silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*) as well as sturgeons (*Acipenseridae*);

Figure 2. Volume of aquaculture production by species, 2018–2019



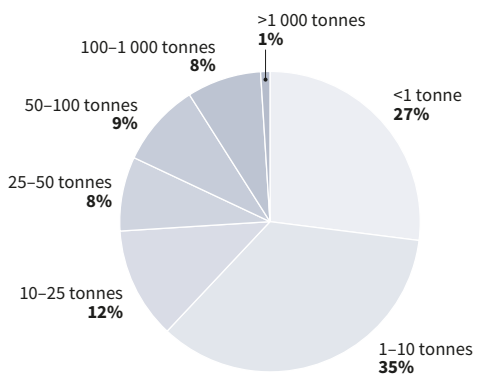
Source: Based on data from the Federal State Statistics Service.

- pond aquaculture for the production of carp and other herbivorous species;
- industrial aquaculture using cages, tanks, raceways, and recirculating aquaculture systems, mainly for the production of trout and sturgeons;
- marine aquaculture for the production of mussels, oysters, scallops, sea cucumbers, sea urchins, and algae; and
- recreational aquaculture, mainly small ponds for leisure fishing at a fee.

By the end of 2017, around 91 percent of the farming units in the Russian Federation were small farms producing less than 100 tonnes per year. Medium-sized farms with an annual production of up to 1 000 tonnes represented 8 percent, while only 1 percent belonged to the farms with over 1 000 tonnes capacity (Figure 3). Though the most recent statistics are not available, the structure of the farms has remained about the same.

According to the Federal Agency for Fishery, in 2017, the number of aquaculture farms in the Russian Federation amounted to 3 200, employing 13 200 people.

Figure 3. Composition of aquaculture farms by production capacity, 2017



Source: based on data from the Federal Agency for Fisheries.

Trade

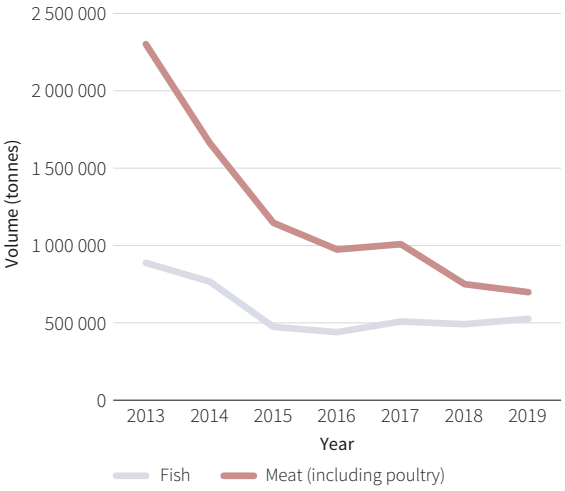
COMPARISON OF TRADE IN SEAFOOD AND IN MEAT

In 2014, the Russian Federation introduced an import ban, pushing the country towards import substitution. This interdiction has caused significant changes in the ways in which agricultural products are traded. Additionally, it has affected the volumes of both imports and exports and changed their geographic pattern.

Figure 4 and Figure 5 illustrate the comparison of trade volumes for fisheries products and their direct competitor, meat products, including poultry, as a source of protein. In general, seafood trade was less affected by the ban than meat trade.

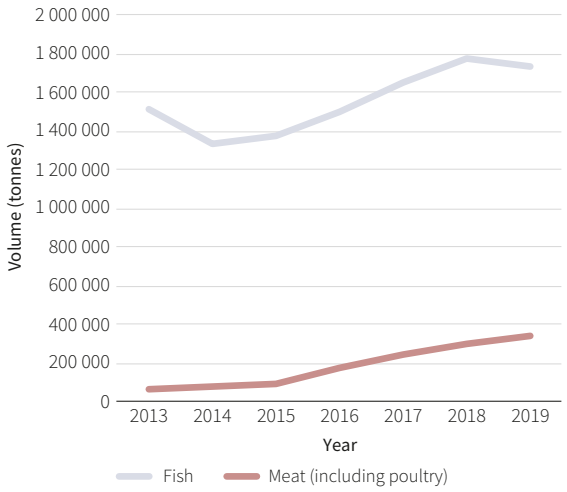
Before the introduction of the embargo, import volumes of meat were 160 percent higher than the volumes of seafood; as a result of the restriction, they were only 32 percent higher in 2019. The drop in meat import volumes during the period 2013–2019 was 70 percent, whereas it was only a 30 percent decrease for seafood (Figure 4).

Figure 4. Volume of fish and meat imports, 2013–2019



Source: Based on data from the Federal Customs Service.

Figure 5. Volume of fish and meat exports, 2013–2019



Source: Based on data from the Federal Customs Service.

Figure 6. Volume and value of seafood imports, except canned products, 2015–2019

Source: Based on data from the Federal Customs Service.

For many years, export volumes of seafood exceeded those of meat. During the period between 2013 and 2019, the volumes of exported seafood were at least 1.26 million tonnes higher than meat exports. However, while seafood volumes were growing moderately, the volumes of meat showed a more than five-fold increase (Figure 5).

IMPORTS

According to Rosstat, during the period 2015–2019, total imports of seafood (except canned products) remained stable, showing a small upward trend with minor annual deviations not exceeding 10 percent, reaching 533 000 tonnes in volume and USD 1.79 billion in value by the end of 2019 (Figure 6).

Traditionally, whole frozen fish represents over 60 percent of the total import volumes (Figure 7). The largest volumes of wild caught imported fish species are mackerel, herring, and sardine. Various species of crustaceans both wild and farmed are the second biggest import item in terms of volume, though the annual share does not exceed 10 percent.

Before 2015, the major suppliers of seafood to the Russian Federation were Norway, Chile, China, Iceland and the Faroe Islands, which in total provided about 70 percent of the total import values. As a result of trade ban, Norway stopped its seafood exports to the Russian Federation in August 2014, and since 2015, 70 percent of seafood import values have been coming from Chile, the Faroe Islands, China, Belarus and Viet Nam.

In terms of farmed species, Norway, Chile, the Faroe Islands, Viet Nam and Turkey were the major suppliers prior to 2015 and Chile became the dominant provider from 2015 onwards.

Atlantic salmon remains the most important farmed species imported into the Russian Federation. In 2019, total import volumes amounted to over 62 600 tonnes (Figure 8). Chile remains the major supplier of frozen salmon and the country's share of the total imports of Atlantic salmon has increased by over 10 percent compared to pre-2015 figures. The Faroe Islands became the major supplier of fresh Atlantic salmon in 2015, replacing Norway. Since then, the Faroe Islands have delivered about 90 percent of all fresh salmon imported to the Russian Federation. Belarus was the Russian

Federation's primary supplier of smoked salmon and since 2017, has been the country's sole supplier.

Trout is the second most valuable imported farmed fish species, with the total production volume reaching over 26 600 tonnes in 2019. Chile is the biggest supplier of frozen trout, providing over 60 percent in terms of value. After Norway exited the Russian Federation market in 2015, Armenia and Turkey have both become the two major suppliers of fresh trout, with both countries accounting for over 90 percent of the import value in almost even shares. Similar to the case of smoked salmon, Belarus has been the only supplier of smoked trout since 2017. In 2019, the volume of smoked trout imported to the Russian Federation from Belarus was more than double compared to that of smoked salmon.

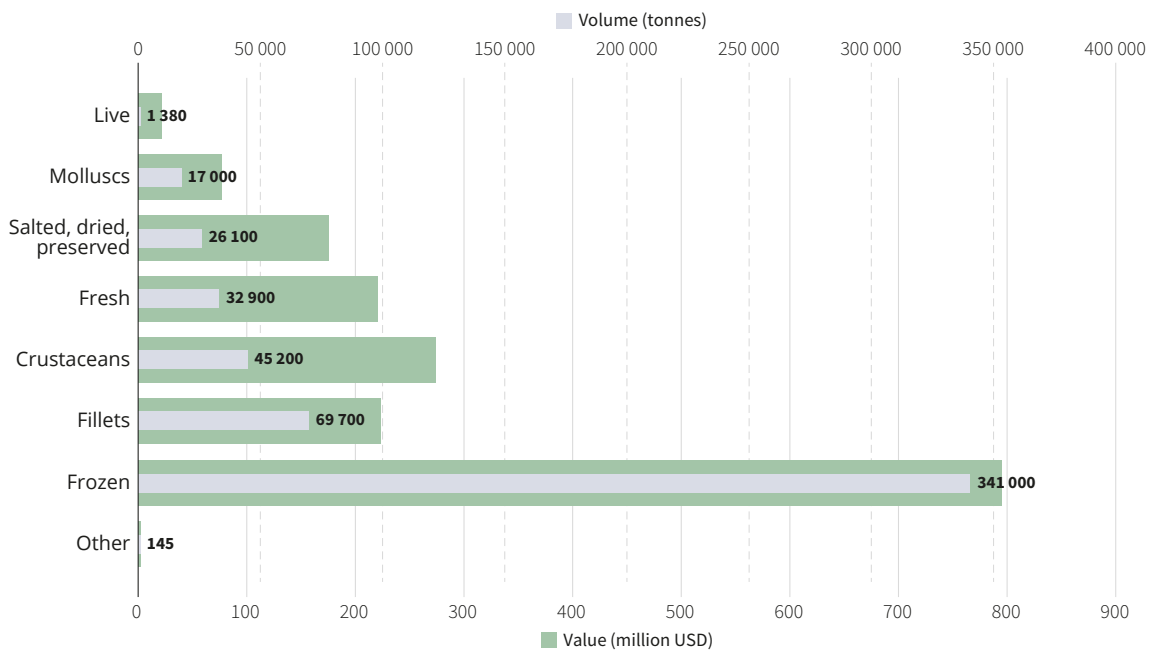
The total volume of pangasius in 2019 was imported frozen, amounting to 8 000 tonnes, 60 percent of which were fillets. Viet Nam was the single biggest supplier of pangasius, delivering over 99 percent in terms of value. China was the only exporter of tilapia to the Russian Federation that same year, supplying 6 700 tonnes of product, consisting mostly of frozen fillets.

In 2019, seabass imports exceeded 5 000 tonnes, 80 percent of which was whole fresh fish with the remaining 20 percent being frozen whole fish. Seabream imports amounted to 3 900 tonnes, comprised entirely of whole fresh fish. Turkey was the single biggest supplier of both species, providing over 97 percent of their total imports in terms of value.

The entire volume of carp in 2019 was delivered live from Belarus, totalling 270 tonnes. Turbot imports reached 39 tonnes, with Morocco as the largest supplier.

The total import volumes of mussels and oysters in 2019 reached a combined 1 650 tonnes. Eighty percent of this import was frozen mussels, with the remaining 20 percent being live/fresh oysters. Japan was the

Figure 7. Volume and value of seafood imports by type of pre-processing, preservation and species, except canned products, 2019



Source: Based on data from the Federal Customs Service.

largest supplier of oysters, New Zealand the second. New Zealand, too, was the primary supplier of mussels. Scallops were primarily supplied by China in low volumes amounting to merely 0.9 tonnes.

Imports of *Penaeidae* shrimp totalled 24 200 tonnes in 2019, all delivered in frozen form. India, China, and Viet Nam were the major suppliers.

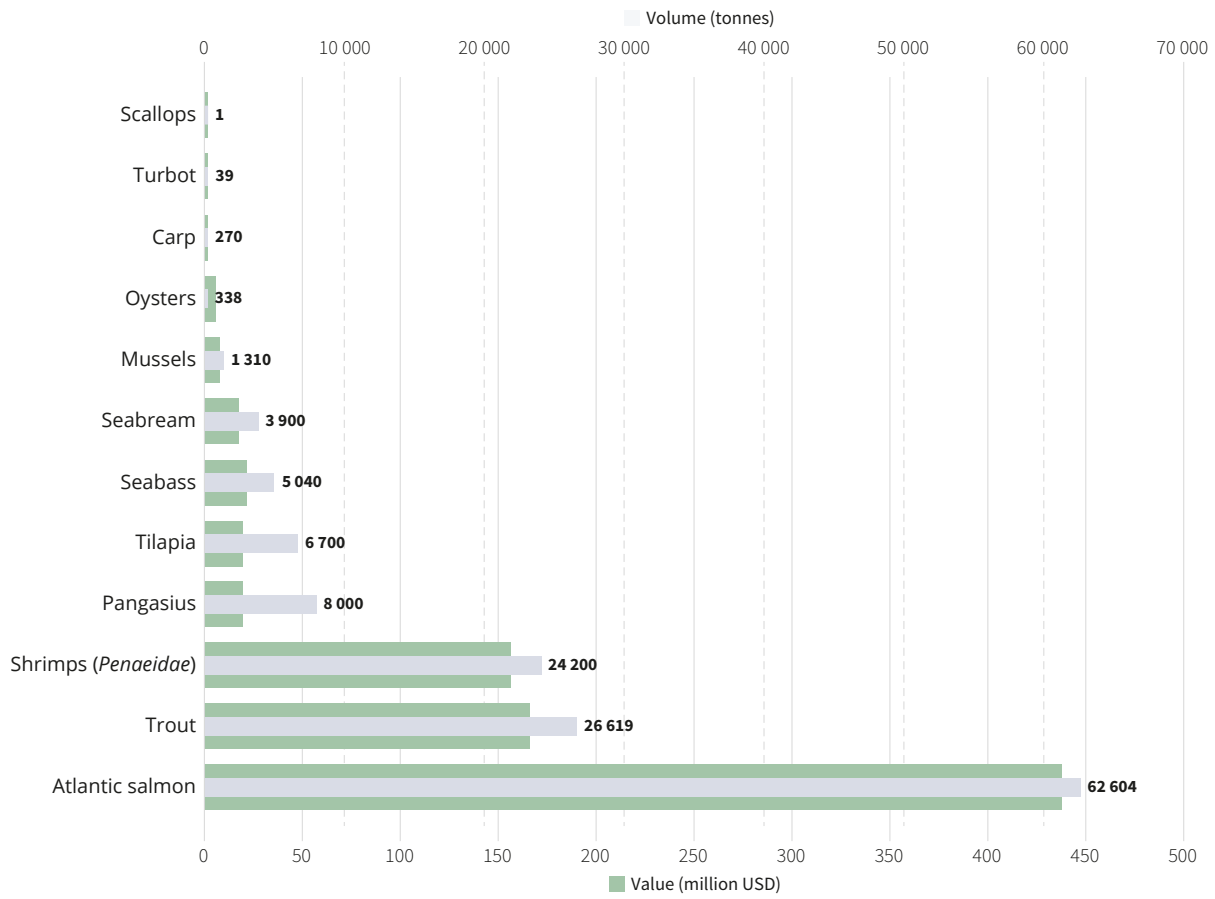
EXPORTS

The Russian Federation is a net exporter of seafood. The introduction of the 2014 food embargo has not affected fish exports nearly as much as it influenced the imports. Geographical patterns have undergone insignificant changes.

Excluding canned products, export volumes of seafood between 2015 and 2019 showed steady growth, resulting in a 30 percent increase and reaching over 1.78 million tonnes in volume and USD 4.7 billion in value by the end of 2019 (Figure 9). The top five importers of Russian Federation seafood products during the period of 2013–2019 remained unchanged: China, the Republic of Korea, the Netherlands, Japan and Belarus.

Frozen fish is the major export, with an average annual share above 85 percent (Figure 10). Overall, wild

Figure 8. Volume and value of imports of species that are also farmed, except canned products, 2019



Source: Based on data from the Federal Customs Service.

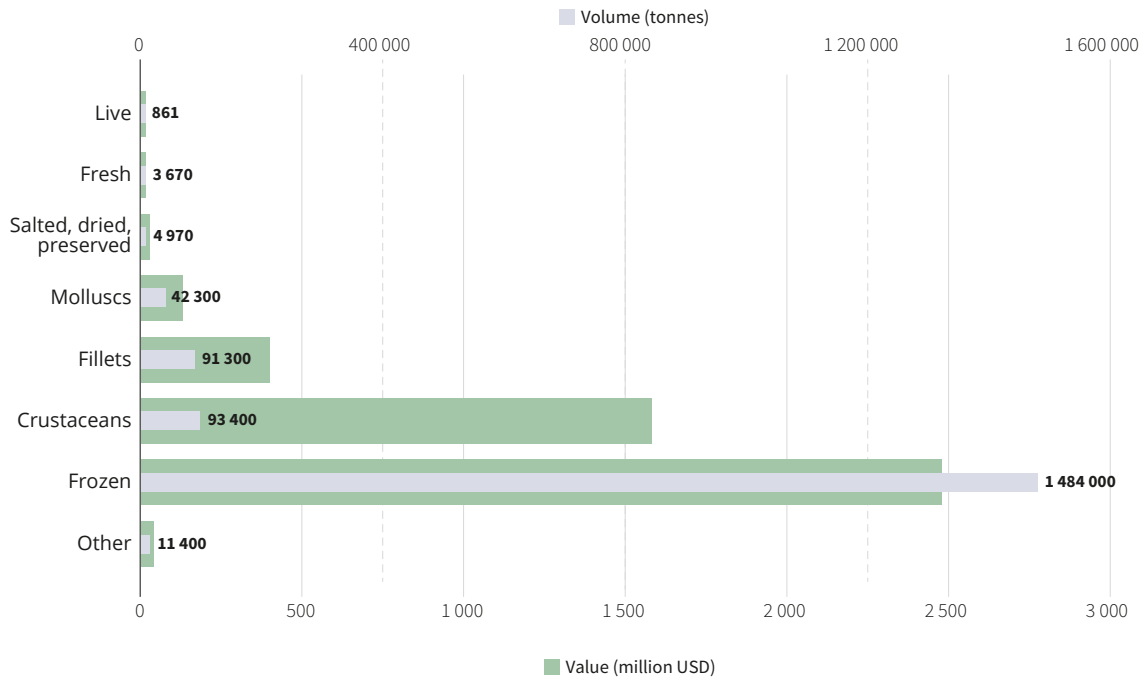
caught Alaska pollock and cod are the major exported frozen species. In 2019, pollock represented 85 percent of the total imports of frozen aquatic products, with cod making up the remaining 15 percent share. The major buyers of the Russian Federation's frozen fish are China, the Republic of Korea and Japan. Crustaceans were the second largest group of exported products in 2019, making up 5 percent of total seafood exports from the Russian Federation. On average, fresh and frozen wild crab species constitute up to 80 percent of the total volumes of exported crustaceans and are shipped mainly to the Republic of Korea, followed by the Netherlands and Japan.

In terms of volumes, carp is the largest farmed species exported from the Russian Federation, (Figure 11). In 2019, over 4 400 tonnes of domestically cultivated carp in live form were shipped to Belarus, its sole receiver.

Figure 9. Volume and value of seafood exports, except canned products, 2015–2019

Source: Based on data from the Federal Customs Service.

Figure 10. Volume and value of seafood exports by type of pre-processing, preservation and species, except canned products, 2019



Source: Based on data from the Federal Customs Service.

Atlantic salmon is the second biggest export, with volumes exceeding 1 860 tonnes in 2019. Out of this total, over 92 percent were frozen whole fish and frozen fillets destined for Kazakhstan, the Republic of Korea, and Belarus, and 6 percent was smoked salmon mainly exported to Belarus and Kazakhstan.

Frozen pangasius fillets represented 82 percent of total exported volume in 2019, which amounted to about 260 tonnes, with frozen whole pangasius comprising the remaining 18 percent. Key destinations for the fillets were Poland, Kazakhstan and Belarus, while Ukraine was the major receiver of the whole pangasius.

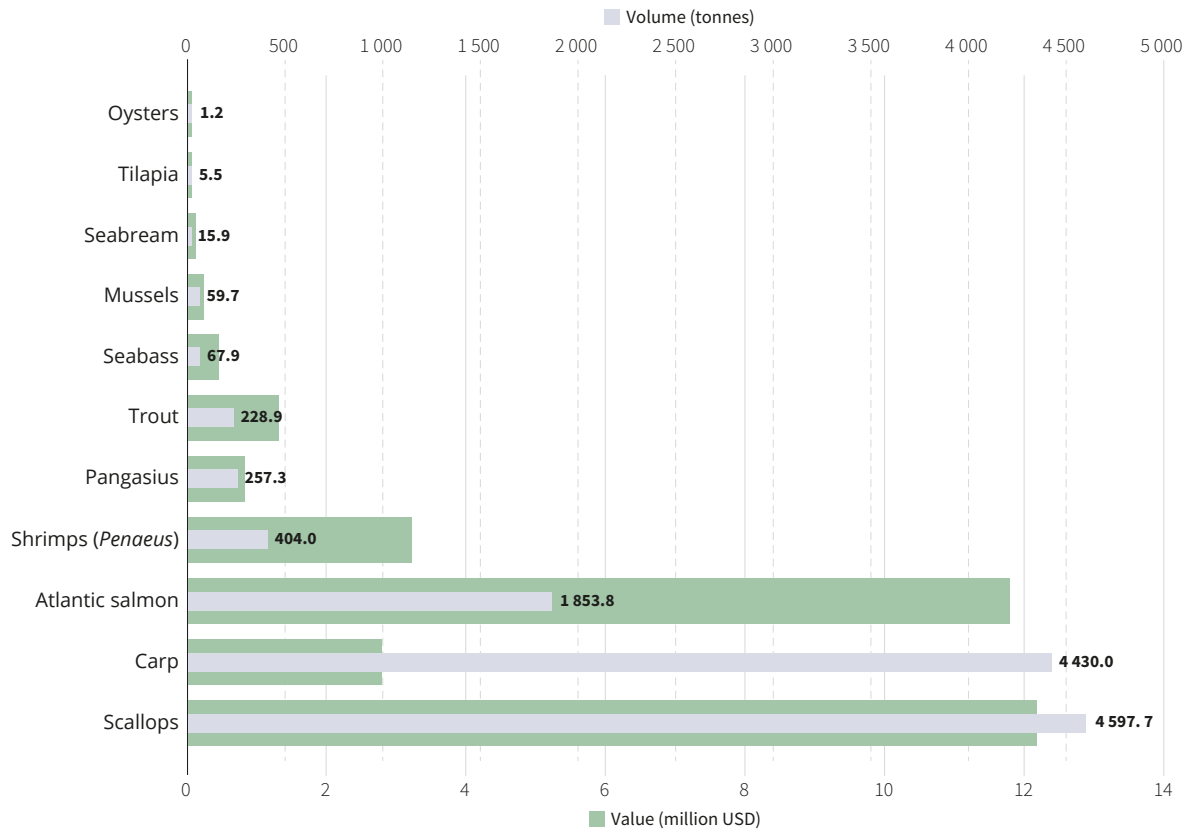
Exports of trout in 2019 amounted to about 230 tonnes of which over 60 percent was whole frozen, and 20 percent fresh. Major importing countries included Kazakhstan, Ukraine, and Belarus.

In 2019, seabass and seabream exports from the Russian Federation amounted to about 68 tonnes, and 16 tonnes respectively. Both species were destined mainly to Kazakhstan, Belarus, and to a lesser extent, Armenia. All seabream was exported entirely whole fresh, whereas 77 percent of seabass was exported whole frozen.

Belarus, Kazakhstan and Uzbekistan were the biggest importers of tilapia from the Russian Federation in 2019, receiving a total of 5.5 tonnes.

Together, exports of mussels, oysters, and scallops in 2019 amounted to 4 659 tonnes, with the largest share (99 percent) represented by scallops from the Russian

Figure 11. Volume and value of exports of species that are also farmed, except canned products, 2019



Source: Based on data from the Federal Customs Service.

Far East. These molluscs were firstly destined for China, followed by the Netherlands and the Republic of Korea.

Penaeidae shrimp exports amounted to 404 tonnes in 2019. They were previously imported frozen into the Russian Federation and later, after slight processing, exported in the same form mainly to Belarus, Kazakhstan, and Ukraine.

Processing

According to Rosstat, per capita fish consumption reached 21.9 kg in 2019, in line with the Ministry of Health's recommended yearly rate of consumption (i.e. 22 kg). However, fish consumption patterns are not homogenous throughout the country. Traditionally, per capita consumption is higher in coastal areas (especially in the Russian Far East), as well as in metropolitan areas, where incomes are greater and there is a larger variety of fish products available for purchase.

From 2015 to 2019, the production of processed seafood products in the Russian Federation showed a small upward trend with an increase in total volume of 11 percent to 4.24 million tonnes by the end of 2019 (Table 1).

On average, up to 70 percent of the total processed volumes (except canned) belong to frozen products: gutted/beheaded fish, fish fillets, and other processed seafood. Such a high share of frozen products can be explained, in large part, by the size of the country. Up to 80 percent of wild fish and aquatic invertebrates originate from the Russian Far East; the greatest volumes of seafood are consumed in the western part of the country. Therefore, the cost-effective, long-distance

Table 1. Production volume of fish (processed and canned), crustaceans and molluscs, for human consumption, 2015–2019

Total	2015	2016	2017	2018	2019
Volume (tonnes)	3 829 000	4 030 000	4 167 000	4 250 000	4 240 000

Source: Based on data from the Federal State Statistics Service.

Table 2. Estimated production shares of domestically farmed species by type of pre-processing and preservation

Species	Fresh		Frozen		Other processed	
	Whole	Fillets	Whole	Fillets	Smoked, salted, in brine, dried, etc.	Canned
Algae	–	–	–	–	100%	–
Atlantic salmon	30%	25%	10%	20%	15%	–
Common carp	70%	5%	20%	5%	–	–
Grass carp	10%	10%	30%	20%	20%	10%
Mussels	40%		50%	–	10%	–
Oysters	100%	–	–	–	–	–
Peled	–	–	–	100%	–	–
Rainbow trout	30%	25%	10%	20%	15%	–
Scallops	10%	–	90%	–	–	–
Silver carp	10%	10%	30%	20%	20%	10%
Sturgeon spp.	85%	–	10%	–	5%	–

Source: Based on qualitative consultations with industry stakeholders.

transportation of products with a short shelf life such as fish is hardly possible. Regarding select local farmed fish species such as carp or sturgeon, consumers choose either live fish or frozen products, which are then followed by salted, smoked, and dried products.

As outlined in Table 2, up to 70 percent of the production of domestically farmed common carp is live or fresh, with the remainder being whole frozen and fresh or frozen fillets. In contrast, grass and silver carp have more variety of product forms including not only whole (fresh or frozen) and fillets (fresh or frozen), but also smoked, salted and canned.

The total supply of peled (Coregonus spp.) is processed into frozen fillets, while the entire production volume of oysters is live/fresh, and all algae/laminaria are processed into salted, in brine, or dried products.

The majority of scallops and half of the volume of mussels are frozen, although mussels are also subject to value addition through smoking or brining.

Rainbow trout and Atlantic salmon have the same production patterns: up to one third is whole fresh, one quarter is fresh fillets, while frozen fillets are 20 percent. Smoked, salted or dry-cured trout and salmon represent 15 percent, and frozen fillets are 10 percent.

Sturgeons are mainly whole fresh (85 percent), or whole frozen (10 percent), while the rest is processed into smoked products.

Distribution and pricing

Seafood distribution channels in the Russian Federation include modern and traditional retail, direct sales, and the hotel, restaurant and catering sector (HoReCa). Modern retail includes hyper- and supermarkets, discount stores, and often smaller "round-the-corner" grocery stores, which can be part of larger, organized retail chains. In the past two decades, all these components of modern retail – including smaller grocery stores – have increased their shares in the overall structure of seafood distribution. The official statistics do not provide data regarding the split of seafood sales between different channels; however, industry experts estimate that modern retail accounts for up to 70 percent of total seafood sales. At the same time, the share held by traditional retail (i.e. fishmongers, farmers markets, fish trucks, live fish tanks and individual stores) and direct sales (i.e. ex farm) has been shrinking. Domestic wild fish and imported farmed seafood products are mostly sold through modern retail chains; however, the distribution pattern for domestically farmed species is different, as traditional sales channels normally play the most important role (Table 3).

The Russian Federation's HoReCa sector is focusing more on premium products, including salmon, trout, sturgeon, seabass and seabream, scallops and oysters. Recently, businesses within the sector have started to include domestically produced species on their menus – in particular as the signature dish in high-end restaurants. Such promotion of local species, which used to be typically only consumed at home, is a big change compared to the past, though the share of domestically farmed species in the HoReCa sector is still lower compared to that of both wild domestic and imported farmed species.

Most of the locally farmed carp is sold from live fish tanks and as whole fresh/chilled fish through traditional retail sales channels, such as traditional markets, farmers markets or traditional stores. A smaller share of carp products is sold directly from a farm's gate, including direct sales to end-consumers and to smaller processing units. The main reason for the dominance of sales in traditional retail is that entry into modern retail chains requires large and consistent volumes of

Table 3. Estimated sales channels for domestically farmed species

Distribution channel	%
Traditional retail	45
Direct sales	<25
Modern retail	20
HoReCa	>10

Source: Based on qualitative consultations with industry stakeholders.

products, while carp farms are mostly represented by separate (not united) small and medium enterprises that sell smaller volumes to traditional retail sales channels. The presence of carp species in the HoReCa sector is not very significant, though it is there to satisfy customers who enjoy traditional species on their plate.

Domestically farmed salmon and trout are mostly sold through traditional retail in either fresh or frozen whole form or as fresh/frozen fillets or "steaks". They can also be found in modern retail chains. However, imported farmed salmon and trout are largely sold in the modern retail sector. Smoked or salted salmon and trout are available in most of the modern retail stores, from supermarkets to small grocery shops. In general, salmonids are also very popular in the HoReCa sector.

Like salmon and trout, sturgeon is commonly found in both modern and traditional retail in mainly whole fresh form, with lesser shares being whole frozen or hot-smoked products.

Domestically farmed crustaceans and molluscs in different forms (fresh, frozen or prepared) are growing in popularity and are almost entirely sold through the HoReCa sector.

Algae, and laminaria in particular, are mainly sold through modern and traditional retail (up to 95 percent) in brine (either preserved or canned).

Imported species like pangasius and tilapia are marketed primarily through modern retail, with the exception of direct sales. Both species are mainly sold in the form of fillets, with pangasius sold frozen and tilapia sold fresh, defrosted or frozen. Seabass and seabream, both relatively new to the Russian Federation market, are mainly sold through modern retail and the HoReCa sector in whole fresh form, as the fish is suitable for grilling or baking.

A variety of factors make the evaluation of seafood prices at any market level in the Russian Federation difficult. The country is very large geographically, with many markets of many different kinds selling different products in different regions based on different local tastes. Therefore, the calculation of national averages is not feasible, though examples of prices for both

Table 4. Prices for farmed seafood at the Saint Petersburg wholesale market, December 2020

Product	Size (kg per fish unless otherwise stated)	Country of origin	Min. price (USD/kg)	Max. price (USD/kg)	Trend	Comment
Mussel meat (pcs/kg)	200–300	Chile	4.57	4.81	Stable	Active demand
Pangasius fillet (5% glazing)	–	Viet Nam	2.48	2.64	Stable	Lower demand
Salmon (frozen)	4–5	Chile	10.39	10.85	Declining	Stable demand
	5–6	Chile	10.54	11.01	Stable	–
	6–7	Chile	10.70	11.16	Stable	–
	7–8	Chile	10.70	11.47	Stable	–
	8–9	Chile	11.32	11.70	Stable	–
Tilapia fillet (5% glazing)	3–5	China	4.34	4.65	Declining	Lower demand
	5–7	China	4.50	4.88		
Trout (frozen)	2–4	Chile	8.84	9.61	Stable	Good demand
	4–6	Chile	9.07	9.84		
	6–9	Chile	9.77	10.46		
Trout (head-off, frozen)	1.8–2.7	Turkey	7.44	8.06	Stable	Active demand
	2.7–4.0	Turkey	8.06	8.68		

Source: Fishnet, 2020.

Table 5. Prices for farmed seafood at the Moscow wholesale market, December 2020

Products	Size (kg per fish)	Country of origin	Min. price incl. VAT (USD/kg)	Max. price incl. VAT (USD/kg)	Trend	Comment
Salmon (frozen)	5+	Chile	11.16	11.47	Stable	Small volumes
	6+	Chile	11.32	11.32	Stable	Stable prices
	5+	Faroe Islands	11.32	11.78	Stable	Stable prices
	4+	Murmansk/ Russian Federation	9.61	10.23	Stable	Increasing domestic production
Trout (fresh)	1.5+	Armenia	6.82	7.44	Stable	Low supply
	1.5+	Karelia/ Russian Federation	6.05	6.82	Stable	Increasing volumes in trout farms
	2+	Turkey	7.21	8.06	Stable	Stable prices
Trout (frozen)	2.7+	Chile	9.61	10.08	Stable	Stable prices
	2.7+	Turkey	8.06	8.22	Stable	Stable prices

Source: Fishnet, 2020.

domestic and imported farmed species at the wholesale markets in the major cities of Saint Petersburg and Moscow are provided in Table 4 and Table 5.

Marketing activities

The adoption of the 2013 Federal law "on aquaculture (fish farming) and on amendments to certain legislative acts of the Russian Federation" and the 2016 introduction of investment quotas both had a visible impact on the revitalisation of the entire fishery industry in the Russian Federation. Numerous steps to promote fish products from both wild catch and aquaculture are taken at different levels from national to federal, regional and private.

In general, the marketing mechanism can be described as follows: the Federal Agency for Fishery inspires, propels, and oversees the major industry events such as festivals, trade shows and forums both domestically and abroad; the regional bodies and commercial operators act as an arm of the Federal agency, doing the practical jobs of organising, attracting, promoting, managing and administering such events. For international events, the federal budget to support the regional participation of the businesses is distributed via the Russian Export Center and its various branches across the country. This helps to both facilitate and administer the participation of private businesses in the branches' respective regions. Over the past several years, international events where the Russian Federation has participated with either national or regional pavilions include the Seafood Expo Global in Brussels, the China Fisheries and Seafood Expo in Qingdao and fish international in Bremen. Local events such as Fishers Day, Seafood Week, Carp Day have taken place in big and small cities alike, with the support of local administrations and financing from private businesses.

One of the most recent industry events was the Global Fishery Forum and Seafood Expo in Saint Petersburg, which has already had three annual editions since 2017. The event is both a high-level professional conference and a tradeshow. It includes a one-day event, called "Aquaculture Day" that is dedicated solely to aquaculture. This event helps to emphasise the importance of the sector and its growth

Impacts of COVID-19 on the aquaculture sector in the Russian Federation

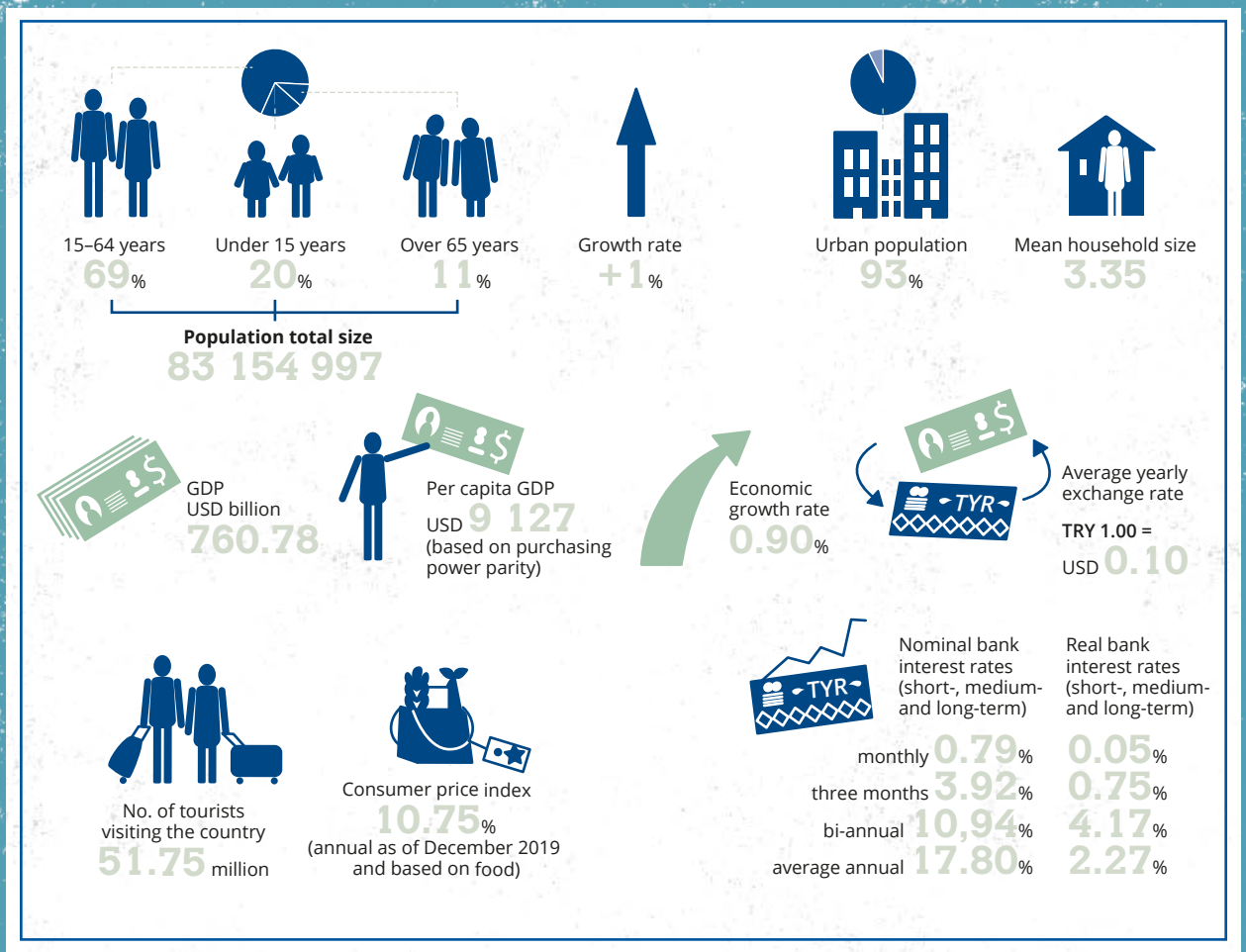
According to industry experts, it is too early to make conclusions regarding the effects of COVID-19 on the Russian Federation aquaculture sector in 2020. However, the Federal Agency for Fishery was able to report that the volumes from capture fisheries remain stable and even showed slow growth in the middle of 2020 compared to 2019. Indeed, with its long production cycle, the aquaculture secto has yet to show any significant changes caused by COVID-19 in terms of the production volumes. Tangible effects of the pandemic are the forced temporary closures of some fish farms and the "isolation mode" (i.e. limiting all external contact) practised by others.

Since the spending capacity of the population decreased during the pandemic, some fish farms have suffered sales losses due to shrinking demand. Although the introduction of quarantine restrictions created uncertainty among consumers which initially pushed them to create food reserves at home, thereby increasing the demand for canned and frozen seafood products, annual sales volumes of seafood through the end of March 2020 dropped by at least a quarter. With the gradual cancellation of restrictions in late 2020, the demand started to grow again. However, there remained a gap of about 20 percent compared to corresponding 2019 figures.

As in other countries, the Russian Federation's hotel, restaurant and catering (HoReCa) sector was affected the most by the pandemic, as the majority of restaurants and catering institutions were forced to either fully close or seriously limit their activities. This resulted in a 50 percent drop in sales on average, which in turn badly affected the production of premium seafood products, including fresh salmon, scallops, oysters, mussels, lobsters, octopus and squids. For example, the producers of farmed salmon and trout could not supply fresh salmon to restaurants any longer and were forced to freeze their harvests. This involved additional costs to sellers (e.g. storage of frozen product) while simultaneously driving down the price of the products, as frozen fish is priced lower than fresh in retail markets. While some of the restaurants and catering institutions were able to switch to providing take-away and food delivery services, these measures have not fully solved the problem for the HoReCa sector.

It is possible that some smaller fish farms will not survive the pandemic. For the larger ones, however, some experts believe that the trend towards digitalization is the solution. Indeed, digitalization is already growing in many industries including the aquaculture sector. Before the pandemic, the sector employed innovative technologies, therefore offering good opportunities to increase efficiency.

TURKEY



Note: Figures represent 2019 values.

Source: Based on data from national statistical sources, the World Bank and the Organisation for Economic Cooperation and Development (OECD).

TURKEY

Turkish marine aquaculture has begun to take the lead over freshwater aquaculture. Producing mainly seabass and seabream, this branch of aquaculture now represents 69 percent of production, which can be partially attributed to the rising number of large-scale vertically integrated enterprises.

The modern aquaculture sector in Turkey emerged in the mid-1970s, with the beginning of commercial freshwater farming of rainbow trout (*Oncorhynchus mykiss*). A decade later, in the mid-1980s, Turkey's first commercial seabass (*Dicentrarchus labrax*) and seabream (*Sparus aurata*) hatchery introduced the country to marine aquaculture.

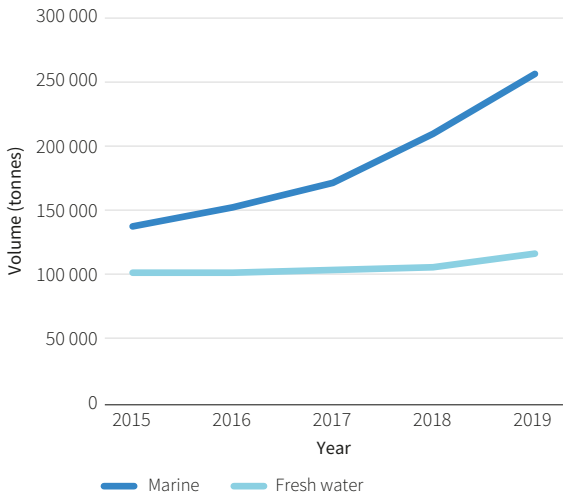
With the new millennium came a flourishing aquaculture sector, bolstered by the Turkish private sector's interest and policy makers' support of industry development. According to figures from the Turkish Statistical Institute (TURKSTAT), aquaculture production (both freshwater/inland and marine) rose in volume from 79 000 tonnes in 2000 to over 373 000 tonnes in 2019. Over the past two decades, these joint efforts made by the private sector and the government have made aquaculture "a rising star of the Turkish economy".

The aquaculture industry in Turkey is now a dynamic and competitive seafood production sector, well integrated into international seafood markets. The industry is also an important contributor to national food security, as well as a generator of income, employment and economic growth. Additionally, the expansion of Turkish Airlines has also significantly helped pave the way for the country's farmed fish to reach world markets.

With a population of 83 million people and as a major tourist destination in the Mediterranean and the Black Sea, Turkey represents a valuable market for aquaculture products and therefore the development of its aquaculture industry at large.

In recent years, production volumes have shown solid growth, rising by more than 55 percent between 2015 and 2019 (Figure 1). The most notable development during this period was the negative trend in the share of freshwater aquaculture output in total production of farmed species, which was mainly caused by a slowdown in production of portion-sized rainbow trout in inland waters. In 2019, marine farmed species constituted 69 percent of total aquaculture production in Turkey.

Figure 1. Volume of freshwater and marine aquaculture production, 2015–2019



Source: Turkish Statistical Institute, 2021.

Turkish aquaculture production is dominated by three species: rainbow trout, European seabass and gilthead seabream (Table 1). For many years freshwater aquaculture (i.e. farming of rainbow trout) was the backbone of the sector; however, more recently, marine aquaculture (mainly seabass and seabream) has begun to take the lead in farmed fish output. Along with the development of marine aquaculture along the Black Sea coast of Turkey, cage farming of large trout (*Salmo trutta labrax*) – marketed as Turkish salmon – is becoming one of the major components of the sector.

Nevertheless, it should be noted that rainbow trout farms are spread all over Turkey and significantly contribute to the socio-economic development of rural areas and that trout farming will likely remain as one of the main pillars of Turkish aquaculture.

Bivalve farming has also been developed in recent years. For example, in 2019, over 4 000 tonnes of Mediterranean mussel (*Mytilus galloprovincialis*) were produced. Additionally, some species of saltwater clams, such as *Ruditapes philippinarum*, *Ruditapes decussatus* and *Chamelea gallina*, seem to be promising candidates for commercial farming of bivalves in Turkey in the near future.

In terms of the distribution of aquaculture farms in Turkey, rainbow trout farms are spread all over the country with Muğla, Elâzığ and Kayseri serving as the top three regions for the production of portion-sized rainbow trout in inland waters. Muğla and İzmir are the two primary provinces for marine aquaculture (seabass and seabream farming).

Table 1. Volume of aquaculture production by species, 2015–2019

Species	Production (tonnes)				
	2015	2016	2017	2018	2019
Bluefin tuna	1 710	3 834	3 802	3 571	2 327
European seabass	75 164	80 847	99 971	116 915	137 419
Gilthead seabream	51 844	58 254	61 090	76 680	99 730
Meagre	2 801	2 463	697	1 486	3 375
Mussels	3	329	489	907	4 168
Rainbow trout (inland)	100 411	99 712	101 761	103 192	113 678
Rainbow trout (marine)	6 187	4 643	4 972	9 235	9 411
Salmon spp.	755	1 585	1 944	1 695	2 375
Other	774	655	796	481	592
Total	**239 649**	**252 322**	**275 522**	**314 162**	**373 075**

Source: Turkish Statistical Institute, 2021.

Table 2. Composition of marine aquaculture farms by production capacity, 2019

Annual production (tonnes)	Number of farms	Share (%)	Total licensed annual capacity (tonnes)	Share (%)
<50	154	36	3 540	1.2
51–100	18	4	1 535	0.5
101–250	15	3	2 594	0.8
251–500	59	14	19 976	6.5
501–1 000	88	20	77 514	25.0
>1 000	100	23	201 070	66.0
Total	**434**	**100**	**306 229**	**100**

Source: Based on data from the General Directorate of Fisheries and Aquaculture (BSGM).

Table 3. Composition of freshwater aquaculture farms by production capacity, 2019

Annual production (tonnes)	Number of farms	Share (%)	Total licensed annual capacity (tonnes)	Share (%)
<50	1 178	70.0	19 110	9
51–100	106	6.0	9 399	4
101–250	185	11.0	36 674	17
251–500	109	6.0	47 879	22
501–1 000	112	6.8	96 081	45
>1 000	3	0.2	7 400	3
Total	**1 693**	**100**	**216 543**	**100**

Source: Based on data from the General Directorate of Fisheries and Aquaculture (BSGM).

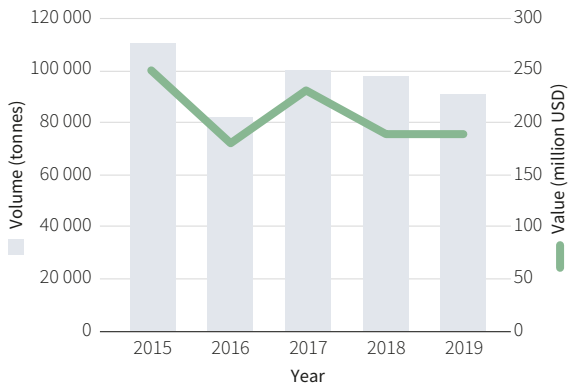
According to the Ministry of Agriculture and Forestry, there are 2 127 aquaculture farms in Turkey, of which 434 were involved in marine aquaculture – i.e. farming of seabass and seabream, meagre (*Argyrosomus regius*), Turkish salmon, bluefin tuna (*Thunnus thynnus*), mussels and others – in 2020. The breakdown of marine aquaculture farms based on production capacity is shown in Table 2.

In the past decade, the emergence of large-scale, vertically integrated enterprises has been a visible trend in the structure of the marine aquaculture sector. These enterprises are able to take advantage of economies of scale. Along with on-growing cage farms, these facilities also have their own feed manufacturing and processing units. Some also rely on their own hatcheries for fry and juveniles.

There are 100 marine cage farms with annual capacities over 1 000 tonnes composing 23 percent of the total number of farms and 66 percent of established production capacity. Small-scale farms (1–50 tonnes per year) are family run, land-based, on-growing farms using earthen ponds. These farms are concentrated near the coastline and have access to underground saline water (2–30 ppt) using pumps.

It is quite different, however, for freshwater aquaculture (mainly trout). Small-scale (below 50 tonnes) and middle-scale farms (51–500 tonnes) comprise 93 percent of the farms and 52 percent of the established licensed capacity (Table 3). There are a number of large-scale, vertically-integrated trout producing enterprises running their own feed and processing units. Farming of rainbow trout in cages in dam lakes is also common in Turkey; however, most trout farms are land-based units using raceways and spring water.

Figure 2. Volume and value of seafood imports, 2015–2019



Source: Based on data from the Turkish Statistical Institute.

Trade

Turkish aquaculture is an export-oriented sector well-integrated with international markets (e.g. the European Union, the United States of America, the Russian Federation). The sector prides itself in its continued compliance with international standards as well as certification requirements in terms of environment, safety, quality and traceability from a wide array of organizations.

IMPORTS

During the period between 2015 and 2019, seafood imported into Turkey remained relatively stable, showing only a slight downward trend. In 2019, Turkey imported

Table 4. Volume of imports by species, product type and main suppliers, 2019

Species	Product category	Volume (tonnes)	Main suppliers
Anchovy	Fresh/chilled	1 362	Georgia, Greece
Atlantic salmon	Fresh/chilled	5 156	Norway
Bluefin tuna	Live	874	Egypt, Libya, Morocco
Herring	Frozen fillets	259	Norway
Lobster	Live, fresh/chilled	33	Canada, United States of America
Mackerel	Frozen	26 453	Iceland, Morocco, Norway
Octopus	Frozen	7 342	Chile, Indonesia, Mauritania, Philippines, Tanzania
Other shrimp	Frozen	1 980	China, India, Viet Nam
Pangasius	Frozen	357	Uruguay, Viet Nam
	Frozen fillets	1 265	Viet Nam
Pollock	Frozen fillets	3 641	Iceland, Norway
Salmon (Pacific salmon and Atlantic salmon)	Fresh/chilled fillets	299	Norway
Squid	Frozen	3 105	India, Portugal, Spain, Thailand
	Dried/salted	226	China
Swordfish	Frozen	92	China, India
Tilapia	Frozen fillets	541	Viet Nam
Trout	Fresh/chilled	511	Norway
	Frozen fillets	335	Norway
Tuna	Frozen fillets	605	China, Viet Nam
	Canned	1 096	China, Peru
Turbot	Frozen	13	Ukraine

Source: Based on data from the Turkish Statistical Institute.

over 90 thousand tonnes (net weight) of both wild and farmed aquatic products, with a value exceeding USD 189 million (Figure 2).

Wild caught mackerel represented the major species in terms of volume, reaching almost 29 percent of the total volumes of imported seafood in 2019. Other imported wild species included pollock and squid, each delivering around 5 percent, anchovy and tuna with 2 percent each and lesser volumes of herring, octopus, swordfish (*Xiphias gladius*) and turbot (*Scophthalmus maximus*) (Table 4). The vast majority of wild species are supplied frozen except anchovy, which arrive fresh, and tuna, which is mainly canned.

Imports of farmed species are mainly represented by Atlantic salmon, with 6 percent of the total imports of seafood, and shrimp and pangasius, each accounting for 2 percent of the total. Other imported farmed fish are trout and tilapia, with less than one percent each. All Atlantic salmon and over half of all trout volumes are imported fresh/chilled, while the majority of other farmed fish arrive as frozen fillets. Shrimp, too, is imported frozen.

In terms of value, Norway is the major supplier of seafood to Turkey, accounting for over USD 66 million in 2019 of both wild and farmed species (Table 5). Atlantic salmon and trout are the major farmed species imported from Norway, which is the single largest supplier of these species, while Viet Nam is the major supplier of pangasius, and, together with India and China, a major supplier of farmed shrimp.

EXPORTS

Turkey is a net exporter of aquatic products. In 2019, the country exported over 200 thousand tonnes of either fresh/chilled or processed aquatic products, exceeding USD one billion in value (Figure 3). From 2015 to 2019, Turkish exports of aquatic products increased by nearly 40 percent.

Common carp and rapa whelk (*Rapana venosa*) are two major wild species exported from Turkey. As the production of farmed carp is very limited in Turkey (around 200 tonnes), exported carp are mainly wild carp harvested from dam lakes. Rapa whelk is the major wild species exported from the eastern Black Sea region.

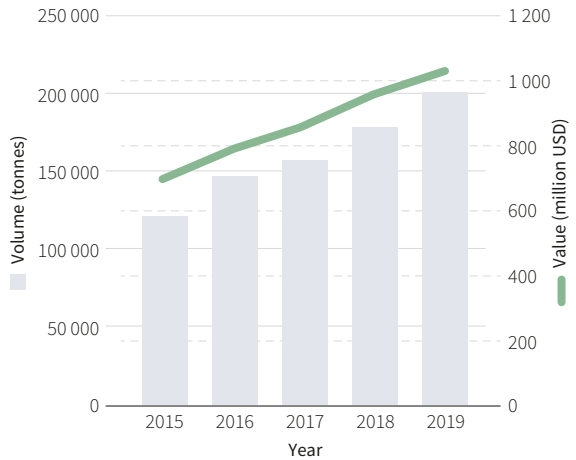
Peaking at 126 406 tonnes in 2019, farmed fish represented 63 percent of total Turkish exports of aquatic products. Seabass and seabream and rainbow trout are the top three Turkish exports of farmed species in terms of both volume and value, followed by bluefin tuna, meagre and, most recently, Turkish salmon (Table 6).

Table 5. Major exporters of seafood to Turkey, 2019

Country	Value (million USD)
Norway	67.1
Iceland	19.2
China	14.1
Morocco	14
Spain	13.6
India	8.4
Seychelles	7.6
Ukraine	5.4
Viet Nam	4.8

Source: Based on data from the Turkish Statistical Institute.

Figure 3. Volume and value of seafood exports, 2015–2019



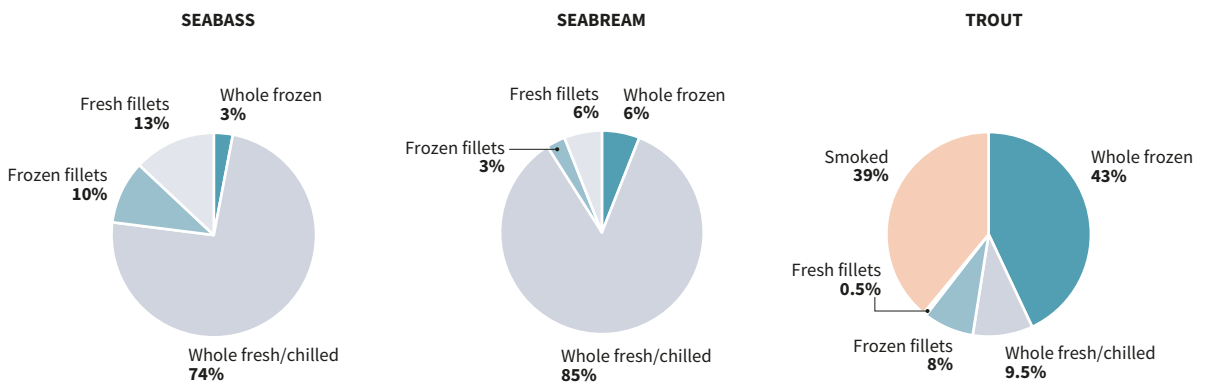
Source: Based on data from the Turkish Statistical Institute.

Table 6. Volume and value of farmed fish exports, 2015–2019

Species	2015		2016		2017		2018		2019	
	Volume (tonnes)	Value (million USD)	Volume (tonnes)	Value (million USD)	Volume (tonnes)	Value (million USD)	Volume (tonnes)	Value (million USD)	Volume (tonnes)	Value (million USD)
Turkish salmon	0	0	0	0	0	0	1 299	7.41	2 495	14.48
Bluefin tuna	627	11.86	1 506	20.09	1 826	26.06	2 704	38.34	3 130	39.59
Meagre	812	3.97	1 400	7.49	580	4.31	581	4.98	241	1.99
Rainbow trout	9 297	53.51	11 964	66.57	13 841	65.12	11 841	64.09	10 891	62.03
Seabass	33 917	252.26	36 822	280.83	41 658	289.00	48 667	295.74	55 925	292.67
Seabream	27 091	153.69	38 542	187.75	41 067	203.87	45 281	217.77	53 724	239.71

Source: Based on data from the Aegean Exporters' Association (EIB).

Figure 4. Share of exports of three of the main domestically farmed species by type of pre-processing and preservation, 2019



Source: Based on data from the Aegean Exporters' Association (EIB).

During the period between 2015 and 2019, exports of farmed species from Turkey grew by 76 percent in volume, reaching 126.4 thousand tonnes and amounting to USD 650.4 million by the end of 2019. Major growth was observed for exports of seabass showing an increase of 22 008 tonnes (65 percent) and seabream with an increase in volume of 26 663 tonnes (almost two-fold) (Table 6).

Seabass is Turkey's primary exported farmed product. In 2019, fresh/chilled whole fish and fresh fillets comprised 87 percent of total seabass exports. Seabream is the second most exported farmed fish, with exports that are mainly composed of fresh/chilled whole fish (85 percent). Large shares of rainbow trout exports included whole frozen fish (43 percent) and smoked products (39 percent). Fresh trout, either whole or filleted, constituted only 10 percent of trout exports, the lowest share of fresh products' exports when compared to those of seabass and seabream (Figure 4).

Table 7. Major export destinations for domestically farmed species, 2019

Country	Value (million USD)
Netherlands	142.0
Italy	111.4
Russian Federation	88.6
Greece	71.6
Germany	69.7
United Kingdom	65.0
Spain	43.4
United States of America	39.2
China	31.2

Source: Based on data from the Istanbul Exporters' Association.

In 2019, the Netherlands, Italy, the Russian Federation, Germany and Greece were the top five export destinations for Turkish farmed seafood (Table 7). While the Netherlands is a distribution hub for seafood, it is not a major consumer of farmed species from Turkey. Data on the final destinations of farmed fish exports from Turkey through the Netherlands are not readily available.

Export distribution patterns for rainbow trout differ from those for seabass and seabream, which are more or less the same for most of the importing countries (Table 8). The two top destinations for farmed Turkish rainbow trout, Germany and the Russian Federation, have rather different supply patterns. German consumers prefer pre-portioned trout in either whole, fillet, or smoked form, whereas Russian Federation consumers generally prefer large-sized fish. With the introduction of the Russian Federation's food import ban in 2014, the Atlantic salmon and rainbow trout supply to the Russian Federation stopped. The empty niche resulting from the ban (including Turkey not being subject to it), along with Turkey's geographical proximity to the Russian Federation, created immense advantages for Turkish producers of salmonids. Both the large rainbow trout and Turkish salmon destined for the Russian Federation market were even nicknamed "big red Turkish fish", reflecting consumer preferences for both the size of the fish and the intensity of its colour.

The growth of the Turkish commercial aviation industry has also created good opportunities for aquaculture farmers, allowing them to deliver fresh fish to countries in North America and Asia.

In general, the aquaculture sector in Turkey takes a very considered approach towards the needs of the consumer markets in different parts of the world.

Processing

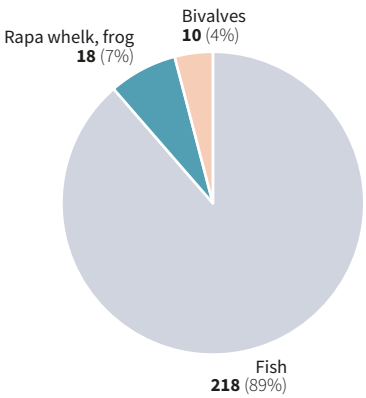
The domestic consumption of aquatic products in Turkey is around 6 to 9 kg per person, well below the world average of 20.5 kg (FAO, 2020). Moreover, market surveys carried out between 2016 and 2019 reveal that 82 to 90 percent of Turkish consumers prefer fresh products. Due to low domestic consumption

Table 8. Major export destinations for the three most important domestically farmed species

Trout	Seabass	Seabream
Germany	Netherlands	Netherlands
Russian Federation	Italy	Portugal
Serbia	United Kingdom	United Arab Emirates
Poland	Spain	Spain
Romania	Greece	Russian Federation
Ukraine	United States of America	Germany

Source: Based on data from the Aegean Exporters' Association (EIB).

Figure 5. Number of seafood processing enterprises by type of facility, 2020



Source: Based on data from the General Directorate of Food and Control of the Ministry of Agriculture and Forestry.

of processed aquatic products in Turkey, processing facilities are generally export-oriented.

There are currently 246 licensed processing facilities in Turkey engaged in the processing of aquatic products (Figure 5). These facilities are licensed and inspected regularly for seafood safety and hygiene by the General Directorate of Food and Control of the Ministry of Agriculture and Forestry. About 90 percent of the facilities process both wild and farmed species of fish, while the rest are involved in the processing of molluscs and other aquatic organisms.

Major product categories of the seafood processing sector in Turkey include:

- canned products (tuna, anchovy, sardine, mackerel);
- frozen products (whole fish, fish fillets, shrimp, rapa whelk, mussel);
- marinated seafood (anchovy, sardine, mackerel, herring, bonito);
- smoked products (trout, eel);
- breaded fish products (haddock); and
- mussel meat and prepared products (e.g. midye dolma – stuffed mussels).

Frozen and canned products are the most preferred processed products in the domestic market. The demand for value-added (e.g. ready to cook, pre-prepared) seafood products in major metropolitan areas (e.g. Istanbul, Ankara and İzmir) is on the rise and the recent incentive by the government for promoting the domestic consumption of processed aquatic products will further boost the development of the seafood processing sector in Turkey.

Following consumer preferences, domestically farmed species of fish including trout, seabass and seabream are sold mainly fresh unprocessed, as fresh fillets and, to a lesser extent, smoked. Farmed mussels are sold either unprocessed live, or pre-prepared as midye dolma, a traditional Turkish dish consisting of closed shells stuffed with a mixture of mussel meat, rice, and various herbs and spices.

Distribution and pricing

Traditional markets are the main distribution channel for aquatic products. Traditional outlets such as fish shops, mobile sellers and fish markets/bazaars, provide about 70 percent of total domestic sales. Thirty percent of the share is held by modern retail chains (i.e. supermarkets). This is in line with consumer preferences; in fact, market surveys conducted during the period between 2013 and 2015 indicated that 60 to 70 percent of Turkish consumers prefer to buy aquatic products from traditional markets, with the remaining 30 to 40 percent buying seafood from modern retailers.

Nevertheless, with the rapid expansion of supermarket chains in Turkey in recent years, the share of modern retail outlets in food sales is generally on the rise. This growth has already influenced the seafood purchasing behaviour of Turkish consumers, with supermarket chains becoming increasingly popular outlets for aquatic products.

The presence of domestically farmed species in various distribution channels differs from the general trend observed for the country's seafood sector. This can partly be explained by the continuous supply of these

Table 9. Estimated sales channels for select domestically farmed species, 2020

Species	Retail		HoReCa		Direct sales
	Modern	Traditional	Hotels & restaurants	Catering	
Seabass	45%	40%	5%	5%	3–5%
Seabream	45%	40%	5%	5%	3–5%
Trout	30%	45%	10%	10%	3–5%
Turkish salmon	10%	40%	20%	20%	3–5%

Source: Based on qualitative consultations with industry stakeholders.

species. Compared to some other countries in the Black Sea region, Turkey has a low (3 to 5 percent) share of direct ex-farm sales of the domestically farmed species, mainly due to the fact that the majority of freshwater farms are located in remote areas, while the marine farms are offshore (Table 9).

Despite the growth in the modern food market sector, traditional distribution channels such as markets or bazaars, continue to be the main selling grounds for domestically farmed species (i.e. trout, seabass and seabream); however, their role in supplying seafood to the Turkish population is slowly declining.

Imported Atlantic salmon is a popular product in Turkey, available in all major supermarket chains. It is mostly sold as sliced fish or fillets. Pangasius and tilapia fillets are items most in-demand by the hotel, restaurant and catering (HoReCa) sector. Imported live bluefin tuna is used as stocking material for on-growing (fattening) in tuna cage farms.

Table 10. Wholesale prices for select farmed species, 2019

Species	Min. price (USD/kg)	Max. price (USD/kg)
Atlantic salmon	5.81	10.57
Rainbow trout	2.47	3.00
Seabass	3.21	4.07
Seabream	3.16	4.17

Source: Based on price data from the Istanbul Fish Wholesale Market Hall, İstanbul Municipality.

The HoReCa sector in Turkey generally accommodates lesser volumes of seafood, including domestically farmed species, compared to meat and poultry. However, the share of seafood is higher in coastal areas due to the greater number of tourists and increased consumption among local consumers.

Systematic data collection schemes and time series for aquatic product retail prices are not available in Turkey. However, daily, monthly and yearly price (wholesale) time series are available through the data collection systems of wholesale market halls run by municipalities in major cities (Table 10).

A proxy for retail prices could be the profit margin in retail sales of farmed fish, which is about 20 to 30 percent depending on low and high seasons in domestic markets. In 2019, retail prices for Atlantic salmon fillets fluctuated around 15.1–16.8 USD/kg.

Marketing activities

Market surveys carried out by various researchers across Turkey between 2015 and 2019 revealed that consumers prefer wild to farmed fish. Anchovy, sardine, horse mackerel and bonito are the most favoured pelagic fish species by Turkish consumers.

Despite rainbow trout, seabass and seabream being the most popular farmed fish products among Turkish consumers, the general perception towards farmed products is poor. The aquaculture sector is aware of this weak perception towards farmed products. The sector also recognizes that the domestic market for farmed

products has yet to be fully exploited and has potential for future development. In recent years, aquaculture producers, producer organizations and public administration (Ministry of Agriculture and Forestry) have implemented domestic market promotional initiatives to boost the domestic demand for farmed products. These measures have included:

- organization of "grilled fish sandwich days" in schools;
- organization of nationwide market promotion campaigns for farmed fish through discounted sales in supermarket chains; and
- promotion of processed products through sales in discount grocery chains.

The fish and aquaculture sector of Turkey has immense international visibility. For example, the country has had its national pavilion at Seafood Expo Global in Brussels for 15 consecutive years since 2005, organized by industry associations and trade committees. Other trade shows in which Turkey was represented with its own national pavilion include Seafood Expo North America in Boston, Fish International in Bremen and Seafood Expo Russia in Saint Petersburg.

The promotion of the Turkish aquaculture sector takes place at all levels: international, national, regional and private

Impacts of COVID-19 on the aquaculture sector in Turkey

The export-oriented Turkish aquaculture sector was directly affected by developments in foreign markets and was thoroughly unprepared for the first wave of the COVID-19 pandemic. Industry experts agree that due to lockdowns in 2020, demand for fresh/chilled products decreased by 60 percent in export markets. Travel restrictions in many countries also caused both logistical problems for overland transport as well as a decrease in the availability of lorries and drivers. Cancellations of flights increased freight charges and interrupted exports to North American markets.

According to farmed fish export data published by Aegean Exporters' Association (EIB) for the period between April and October 2020, the most badly hit farmed species by COVID-19 in terms of volume were rainbow trout (pre-portion-sized) and bluefin tuna. In contrast, the same data indicate that exports of Turkish salmon were not affected by the pandemic. Exports of farmed seabass and seabream started to recover in November 2020.

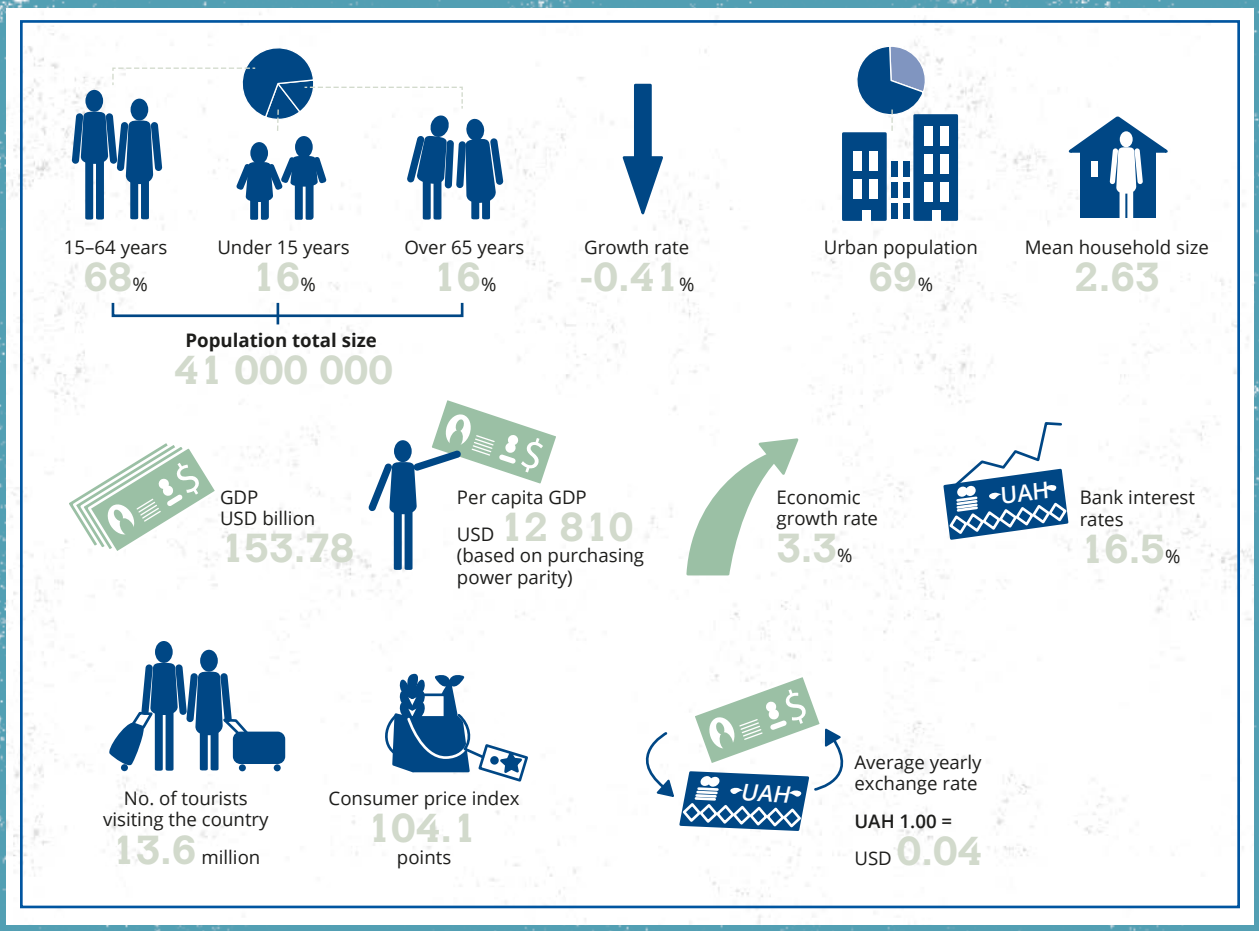
Consumption decreased by 50 percent in the domestic markets, but the organization of nationwide discounted seabass and seabream, portion-sized rainbow trout and Turkish salmon sales by producer organizations in domestic markets helped farmers to improve their cash flows.

The COVID-19 pandemic not only affected sales but also caused logistics problems with the import of fish feed ingredients in the early months of the pandemic, leading to a decline in feed quality.

On a positive note, the demand for frozen whole fish and fillets increased by 50 percent in European markets during the lockdown, boosting the sales for frozen products. This was a definite plus for fish processors.

With the gradual lifting of lockdowns in many countries beginning in the early summer of 2020, the re-opening of restaurants and the 2020 summer tourism season, sales increased again. Unfortunately, starting from November 2020 and the winter season, the second wave of the COVID-19 pandemic emerged, causing some footing to be lost. However, unlike with the first wave, the aquaculture sector was better prepared to cope with the challenges. With the COVID-19 pandemic still ongoing, uncertainty remains in the aquaculture sector, which necessitates that stakeholders be prepared to face new challenges.

UKRAINE



Note: Figures represent 2019 values.

Source: Based on qualitative consultations with industry stakeholders

UKRAINE

Ponds supply 90 percent of the 20 000 tonnes of total aquaculture production. However Ukrainian consumers' favourite species (herring, mackerel and salmon) are not included in this volume as it is not possible to fish or farm them in the country – in ponds or otherwise – leaving Ukraine reliant on imports.

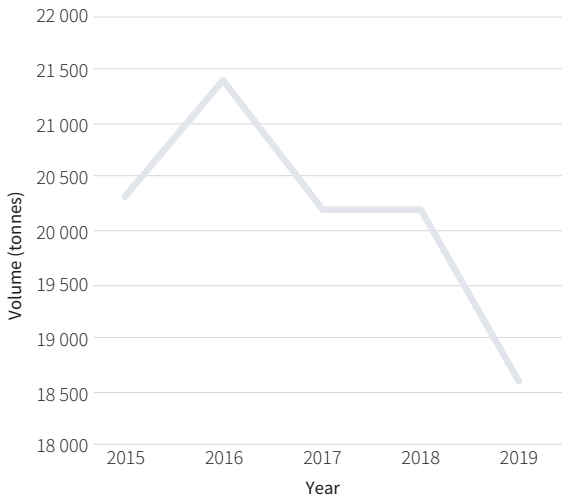
In what is now modern Ukraine, freshwater fish had played an important role in diets, traditions, and cultural practices for centuries. By the late 900s, demand for freshwater fish began to grow and as a result, so did the number of fish ponds constructed in the region. However, the intensive development of the aquaculture sector did not begin until almost a thousand years later, in the mid-1900s (FAO, 2021c). Since then, over 50 000 man-made ponds, large cooling reservoirs near the power stations of the Dnieper and Dniester river system of dams, and the estuarial ecosystems of the Black Sea and the Azov Sea have been constructed. Altogether, the system supports extensive output and represents huge production potential.

In 1990, aquaculture production peaked at 136 500 tonnes before sharply declining (FAO, 2021c). From 2015 to 2019, aquaculture production volumes have shown minor deviations, on average supplying around 20 000 tonnes per year of which around 80 percent is harvested for human consumption (Figure 1).

Traditionally, the majority of aquaculture facilities in Ukraine are freshwater pond-based farms for common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Hypophthalmichthys nobilis*), grass carp (C*tenopharyngodon idella*) and Prussian carp (*Carassius gibelio)*; they annually deliver around 90 percent of the total aquaculture production (Figure 2). Farming of other species – including European catfish and African catfish (*Clarias gariepinus*), pike, pike-perch (*Sander lucioperca*), trout, sturgeons and paddlefish – in pens, flow-through systems, recirculating aquaculture systems (RAS) and others has been growing slightly in recent years, however production still barely exceeds 10 percent of the total volume, leaving pond culture as the single most important source of farmed fish in Ukraine.

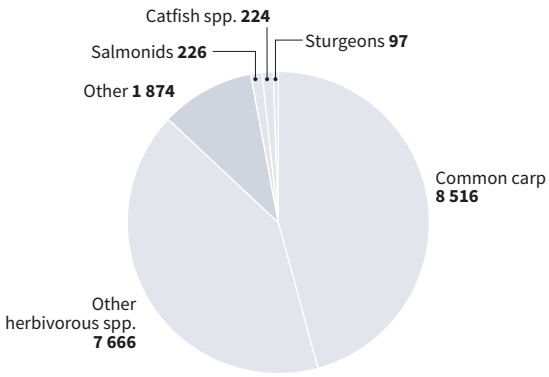
On average, the Ukrainian aquaculture sector delivers around 4 percent of the total seafood volumes

Figure 1. Total volume of aquaculture production, 2015–2019



Source: Based on data from the State Fisheries Agency of Ukraine.

Figure 2. Volume of aquaculture production by species, 2019



Source: Based on data from the State Fisheries Agency of Ukraine.

Note: All volumes are in tonnes.

consumed annually in the country, though some experts believe that the proportion may be higher.

To increase production volumes, Ukrainian scientists have been working on supporting the existing breeds of carp by developing modifications with higher survival rates and higher resistance to winter temperatures and diseases. This has resulted in two interbreeds of common carp: "Ukrainian framed" and "Ukrainian scaly", which possess the above-mentioned traits and also have a high rate of growth.

The development of marine aquaculture in Ukraine has been in the experimental stages for many years. Farming of Mediterranean mussel (*Mytilus galloprovincialis*) and to some extent oyster species, has good potential, though the yield is expected to be minor in the near future.

According to the State Fisheries Agency of Ukraine (DARG), in 2019 there were 4 000 entities involved in aquaculture, delivering 18 600 tonnes of farmed fish of which 15 thousand tonnes were harvested for human consumption while the rest was reserved for breeding future stocks (Table 1). A slight decrease in the total production volume (9.2 percent) compared to 2018 has been attributed in part to climate change.

Traditional pond-based farms with annual capacity below 30 tonnes per year represent the largest share in the total number of aquaculture facilities in Ukraine and it is expected that in the near future, the structure will remain unchanged (Figure 3).

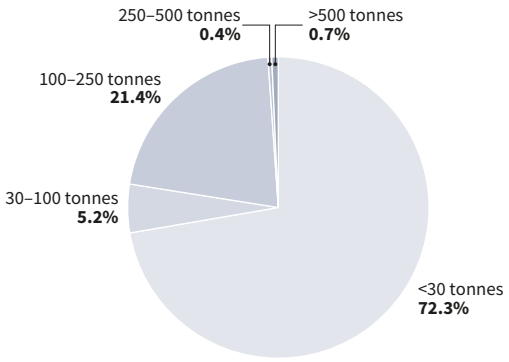
The aquaculture sector plays an important socio-economic role providing jobs and incomes in rural

Table 1. Structure of the aquaculture sector by type of farming facility, 2019

Type of facility	Total production (tonnes)	Production for human consumption (tonnes)
Pens	22.0	21.4
Ponds	16 391.0	13 544.0
Tanks and raceways	583.5	527.5
Other	1 607.2	866.9
Total	**18 603.7**	**14 959.8**

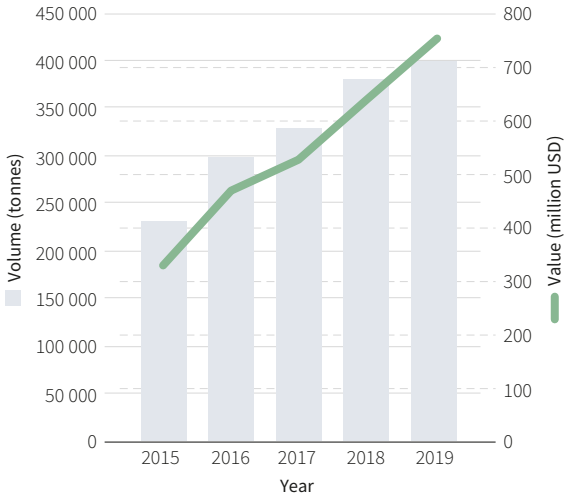
Source: Based on data from the State Fisheries Agency of Ukraine.

Figure 3. Composition of aquaculture farms by production capacity, 2019



Source: Based on data from the State Fisheries Agency of Ukraine.

Figure 4. Volume and value of seafood imports, 2015–2019



Source: Based on data from the State Statistics Service of Ukraine.

areas. According to the State Tax Service of Ukraine, about 23 000 people were employed in aquaculture in 2019, representing over 57 percent of the total number of people working in the fisheries sector of Ukraine. However, experts believe that the number of people involved in fish farming is actually higher due to the fact that most of the farms are micro-farms making use of unpaid family members' labour, including pensioners.

Trade

IMPORTS

Ukraine is largely dependent on fish imports. On average, around 80–90 percent of seafood consumed in the country is imported and for good reasons: most traditional and favourite species such as herring, mackerel, Alaska pollock (*Gadus chalcogrammus*), hake, salmon and horse mackerel cannot be caught in the Ukrainian exclusive economic zone or farmed domestically.

Since 2015, seafood imports into Ukraine have shown stable growth, resulting in an almost two-fold increase and reaching 399 100 tonnes for a total value of USD 753.2 million in 2019 (Figure 4). The largest growth was observed for frozen hake and mackerel, herring, Atlantic salmon and Alaskan pollock imports.

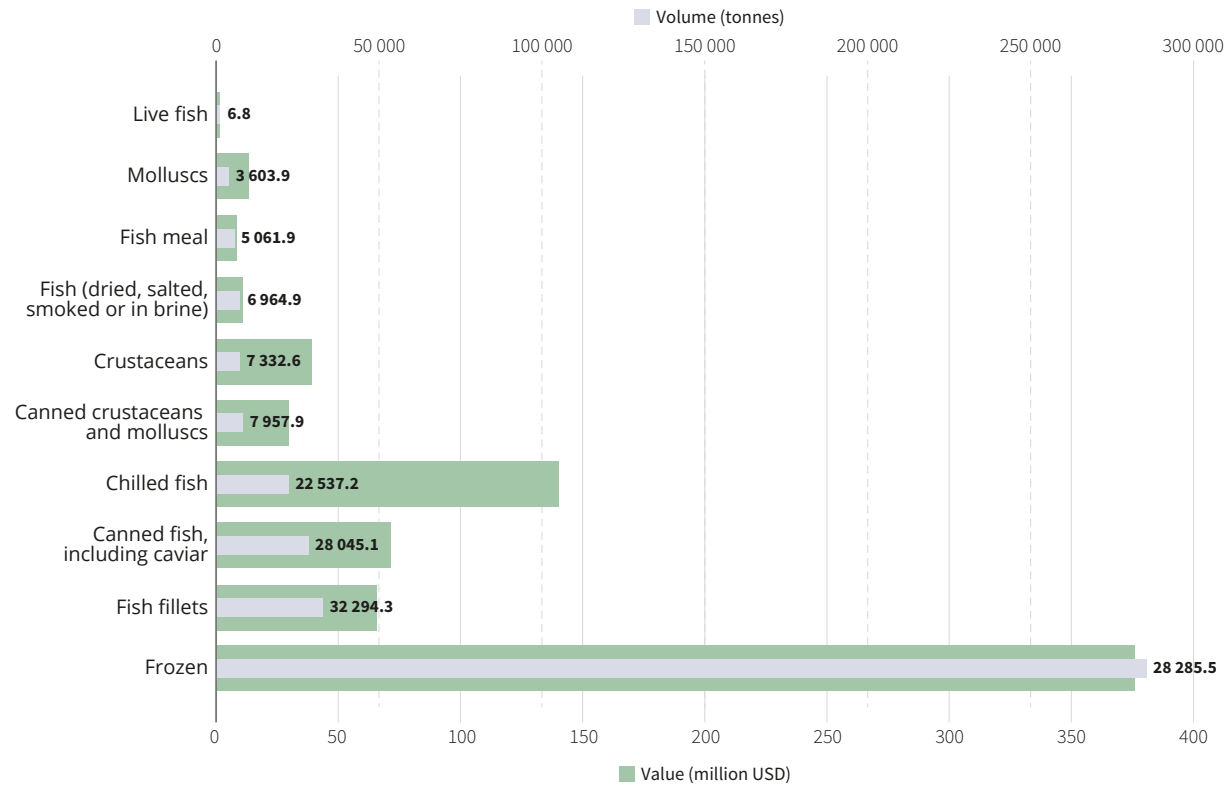
Traditionally, the highest import share belongs to frozen fish and fish fillets, which accounted for 85 percent of the total import volumes in 2019 (Figure 5).

The most important exporters of seafood products to Ukraine are Iceland, Norway and Estonia, which in 2019 accounted for 45.2 percent of the country's total import volumes. Other important exporters to Ukraine include the United States of America, Latvia, Canada, Spain, China and the United Kingdom of Great Britain and Northern Ireland.

For farmed species, the largest volumes in 2019 arrived from Norway, Viet Nam, Denmark, China and Turkey. The important species included salmonids, shrimp, bivalves, carp and sturgeon species, tilapia, several species of catfish including pangasius, seabass and seabream.

Salmon is by far the most important farmed species imported into Ukraine, with 29 300 tonnes imported in

Figure 5. Volume and value of seafood imports by type of pre-processing, preservation and species, 2019



Source: Based on data from the State Statistics Service of Ukraine.

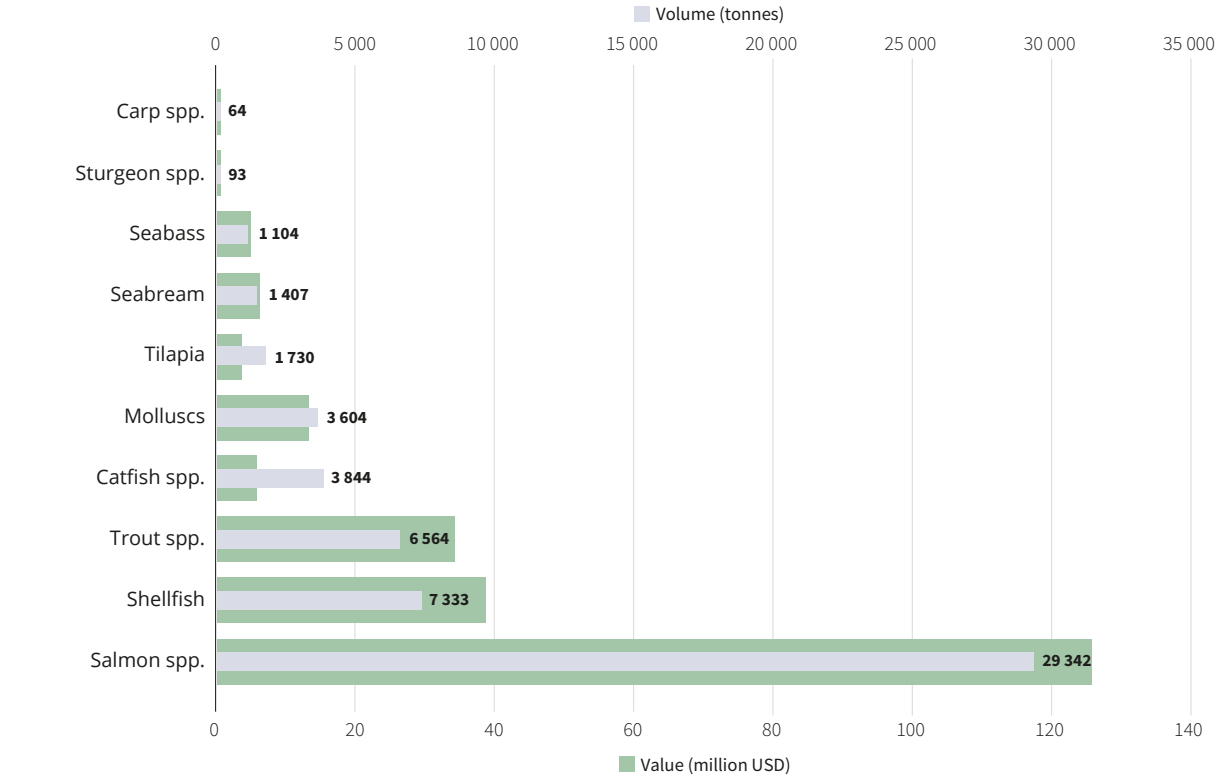
2019 (Figure 6). It is estimated that about 70 percent of this volume was fresh salmon imported directly from Norway with another substantial share imported from the United Kingdom. Rainbow trout is the second most important farmed species imported into Ukraine. In 2019, over 6 500 tonnes of trout were imported into the country, of which almost 80 percent were from Norway. Other trout supplying countries were Denmark and Turkey.

Import of catfish species amounted to almost 3 850 tonnes in 2019 and over 90 percent of the volume was pangasius from Viet Nam and unspecified catfish species from China. Seabass and seabream are relatively new species in the Ukrainian market with 2 500 tonnes having been imported in 2019 almost entirely from Turkey. For crustaceans, it is estimated that one-third of the imported volume of 7 333 tonnes was farmed shrimp coming from China, Ecuador and Viet Nam. Of the total volume of imported molluscs (3 604 tonnes), it is estimated that over half was farmed in China.

Import of sturgeons reached 93 tonnes in 2019 and the main deliveries came from Italy, France and China, primarily as fresh, chilled and frozen products. Carp species amounted to 64 tonnes, mostly supplied from Kazakhstan in frozen form.

A considerable increase in import volumes together with stable exports and an increased domestic harvest led to a growth in per capita fish consumption from 11.8 kg in 2018 to 12.9 kg in 2019, according to preliminary forecasts.

Figure 6. Volume and value of imports of species that are also farmed, except canned products, 2019



Source: Based on data from the State Statistics Service of Ukraine.

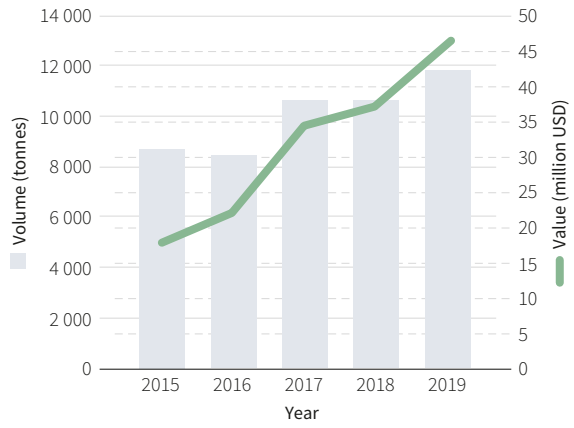
EXPORTS

The volume of seafood exports from Ukraine over the past five fiscal years has been moderately growing, reaching 11 800 tonnes, worth USD 46.4 million, in 2019 (Figure 7).

In 2019, major export destinations included: European Union countries (37 percent): Denmark, Germany, France, Lithuania and others; Commonwealth of Independent States countries (31 percent): Republic of Moldova, Azerbaijan, Belarus, Uzbekistan and Armenia; Asia (14 percent): the Republic of Korea, Israel, Taiwan, Viet Nam and others. Exports to Turkey exceeded 10 percent of the total export volumes.

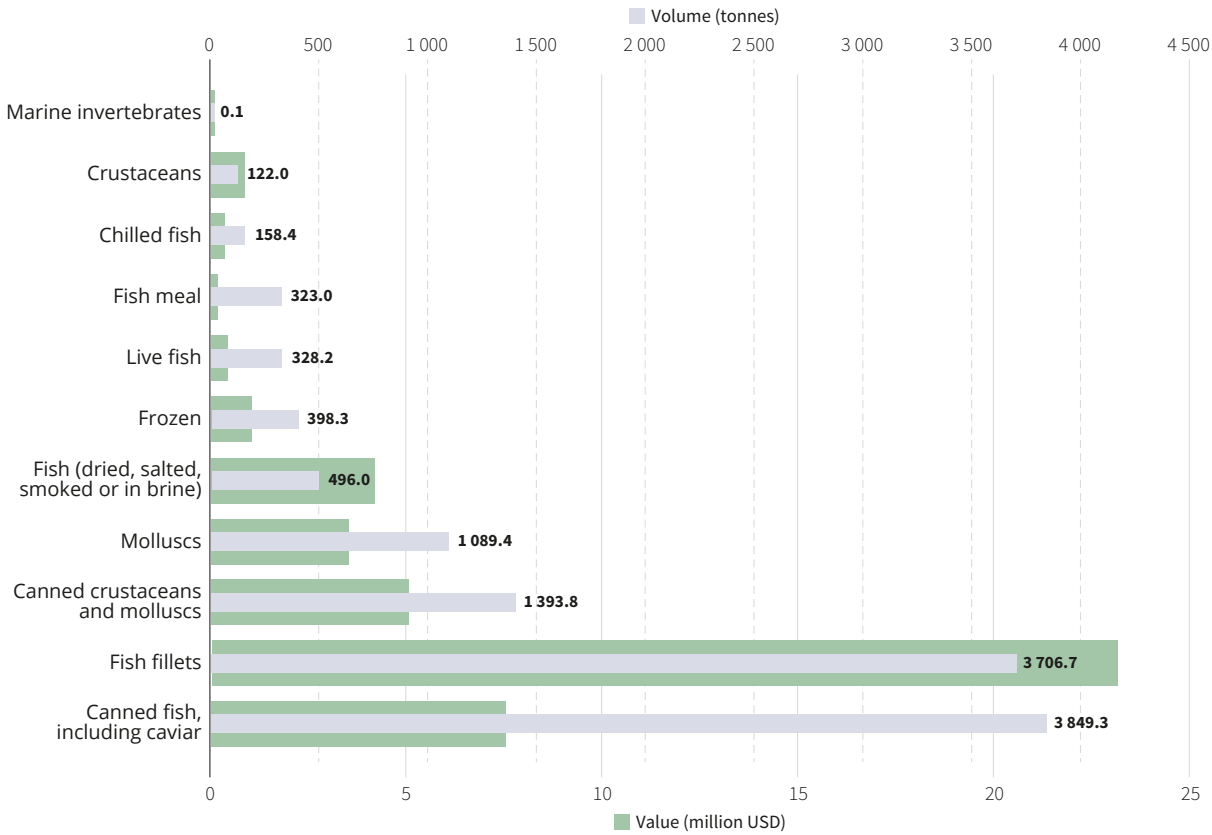
Over 44 percent of the exports in 2019 were canned and ready-to-eat products from sardine, sprats, sardinella,

Figure 7. Volume and value of seafood exports, 2015–2019



Source: Based on data from the State Statistics Service of Ukraine.

Figure 8. Volume and value of seafood exports by type of pre-processing, preservation and species, 2019



Source: Based on data from the State Statistics Service of Ukraine.

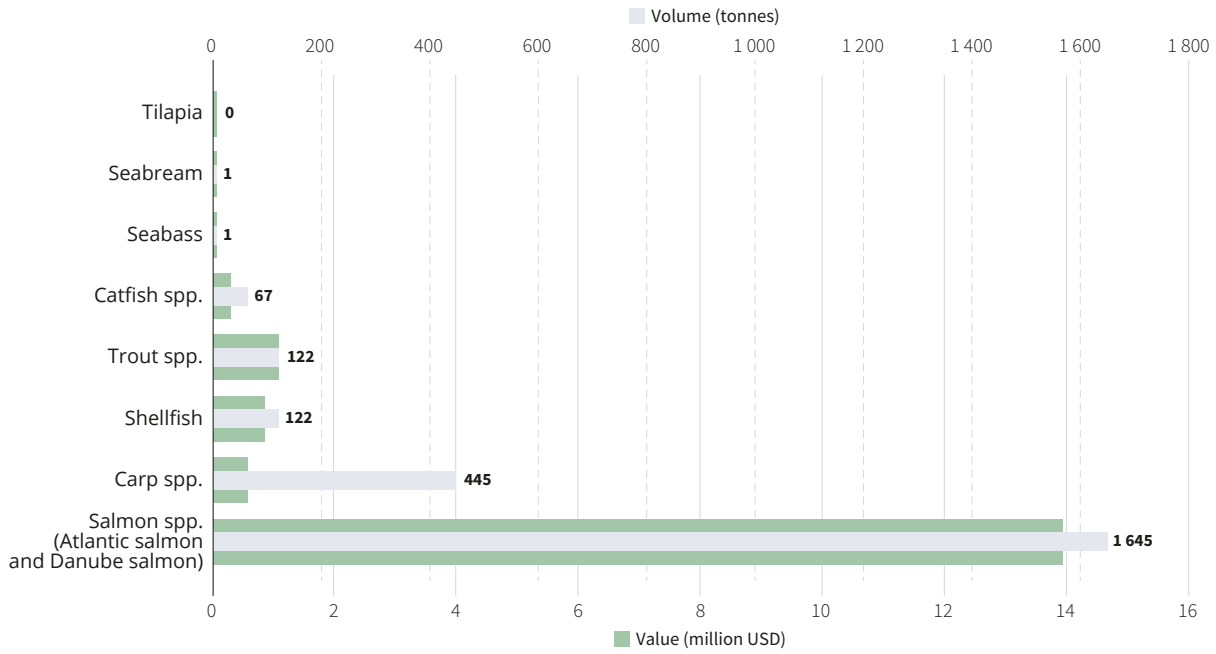
crustaceans and molluscs. Around 39 percent were fresh, chilled or frozen fish and fish fillets (salmon, cod, pike-perch), while the rest, 17 percent, consisted of dried, salted and smoked fish, ready products from surimi, crustaceans and molluscs and other products (Figure 8).

Most of the imported and domestically produced farmed fish products are consumed in the country, while a minor share is exported. In 2019, the main countries where farmed fish products were exported from Ukraine were the Republic of Moldova, Iraq, Hungary, Viet Nam and Singapore.

Salmon is the main species, among species that are also farmed, exported by Ukrainian companies (Figure 9). In 2019, about 1 645 tonnes of salmon products were exported from Ukraine, mainly to Germany, France, Denmark and Israel as fish fillets and smoked or salted products.

Carp is the second major farmed species group exported from Ukraine. In 2019, export of domestically produced carp amounted to 445 tonnes, destined primarily for the Republic of Moldova (live carp) as well as for Iraq (fresh and chilled carp) and Hungary (frozen carp). Export of rainbow trout includes mostly fillets processed by Ukrainian companies. In 2019, Ukraine exported 122 tonnes, mainly to the Netherlands and Germany. In the same year, exports of catfish

Figure 9. Volume and value of exports of species that are also farmed, except canned products, 2019



Source: Based on data from the State Statistics Service of Ukraine.

totalled 67 tonnes and over half of the volume was supplied to Hungary (as fillets), while another portion was exported to Viet Nam.

Processing

According to the State Statistics Service of Ukraine (Urkstat), production of processed fish products in 2019 totalled 67 800 tonnes, the same level as in 2018. However, growth has been observed for some product groups (Table 2). The share of canned fish products was the largest, reaching 49 percent or 33 300 tonnes of the total processed output. By the beginning of 2020, 29 fish processing units were certified for export to the European Union.

Processed fish products are largely made from imported raw materials – frozen fish or fillets of herring, mackerel, sardine, or European sprat. Products from domestic harvest include dried, dry-cured or smoked

Table 2. Production volume of select aquaculture products, 2018–2019

Product group	Volume (2019, tonnes)	Comparison with 2018 (%)
Canned fish (other)	14 250	14.8
Herring (salted)	3 512	1.9
Fish fillets (fresh or chilled)	3 452	34.8
Herring (canned)	3 272	13.4
Fish fillets (dried, salted or in brine)	1 549	51.8
Salmon (smoked, fillets inclusive)	627	23.9
Fish fillets (frozen)	293	6.9

Source: Based on data from the State Statistics Service of Ukraine.

marine fish like gobies (*Gobiidae* spp.), Black Sea sprat (*Clupeonella cultriventris*), anchovy (*Engraulis encrasicolus*) or European sprat (*Sprattus sprattus*) and freshwater species: bream, common roach (*Rutilus rutilus*), silver bream and others. Ukrainian consumers prefer local fish either fresh or frozen, without additional processing.

The vast majority of domestically farmed fish like carps, catfish spp. and others are bought by Ukrainian consumers unprocessed and whole. According to the experts' estimates, around 80–90 percent of domestically farmed fish is sold live, both in urban and rural areas.

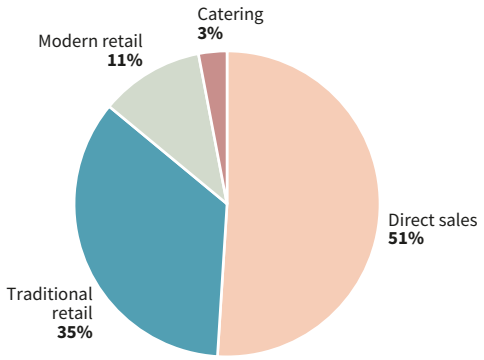
Distribution and pricing

The official statistics do not provide data regarding the distribution channels for aquaculture species. However, a recent survey from across Ukraine enabled the following estimates of the relative share of the volume of domestically produced aquaculture species held by each distribution channel (Figure 10).

Most of the domestically farmed fish is sold live and because the farmers often do not have the capability to transport and sell live fish themselves, over 50 percent of the total annual yield is sold directly from the farms to intermediaries before it reaches the retail sector. More than one-third of the farmers have direct agreements with traditional retail sector-selling points including farmers markets and fishmonger trucks. Over one-tenth of the farmers have direct contracts with supermarket chains, while some smaller volumes are sold by the producers directly to local restaurants and cafés.

In contrast with domestically farmed species, imported farmed species/species that are also farmed, have different distribution patterns. For example, salmonids are sold in various forms (fresh, frozen, smoked, salted, etc.) in all sales channels, including modern and traditional retail and hotels and restaurants. Seabass and seabream are sold in fresh and frozen forms in modern retail chains and restaurants. Pangasius and tilapia are sold by modern retail chains mainly in frozen form.

Figure 10. Estimated sales channels for domestically farmed fish



Source: Based on data from the Methodological and Technological Center for Aquaculture.

Prices for the aquaculture products imported into Ukraine (salmon, trout, seabass and seabream, and others) significantly exceed the prices for domestically produced fish (carps) (Table 3). Most of these imported species are consumed in big cities where people generally have higher incomes. Domestically produced carps are mainly sold and consumed in rural areas and their share in the consumption of seafood in these areas, according to the experts' estimates, may reach up to 15 percent compared to the 4 percent share held by the domestically farmed species in the country's total seafood consumption.

Prices for domestic aquaculture products remained relatively stable in 2019. Traditionally, farmed species can be divided into three segments: inexpensive (including Prussian carp and Chinese carp); moderately priced (such as common carp and African catfish); and expensive (including sturgeons and salmonids).

Table 3. Prices for fish sold ex-farm and through the retail sector, 2020

Species	Size (kg)	Retail min. price (USD/kg)	Retail max. price (USD/kg)	Direct sales min. price (USD/kg)	Direct sales max. price (USD/kg)
Acipenseridae	1–2	9.00	10.00	6.60	7.00
Common carp	1–1.5	2.50	2.70	1.50	1.50
Herbivorus (silver carp)	1–1.5	1.70	1.80	1.40	1.60
Salmonidae (trout)	1	17.71	20.20	12.86	14.29
Siluridae	1–2	4.60	5.00	2.40	2.90

Source: Based on data from the Methodological and Technological Center for Aquaculture.

Marketing activities

To date, no studies on promotional activities have been conducted in Ukraine and there is no official statistical data. However, it is known that steps to promote aquaculture products are often taken by the producers themselves. Moving forward, marketing activities could prove to be an important aspect of aquaculture as, for example, since 2014, when the Association Agreement between the European Union and Ukraine was signed, Ukrainian production of rainbow trout, tilapia and African catfish has been strong, but there have been no large marketing campaigns to reflect this increase in production. To increase the popularity of these species among consumers, promotion and advertising are vital. Currently, individual farmers do not have enough funds to carry out these activities and while producer associations could take promotion functions upon themselves, such associations in Ukraine are local and small in size.

However, there have been successful marketing initiatives in the private sector. One company from Rivne in western Ukraine who uses modern RAS facilities for breeding, farms species which are not native to Ukrainian waters – African catfish and red tilapia – and promotes them as Ukrainian with a plastic tag printed with the company's logo and with the slogan "Produced in Ukraine". This marketing campaign is simple but effective in advertising not only the company but also the advantage of the fish having been produced within the country. Another example of a successful promotional activity, this time on the regional scale, is the yushka (fish soup) festivals organized in the Kherson and Odessa regions and sponsored in part by regional governments aiming to popularize Ukrainian fish. The success of such efforts can induce other regions and the national government to organize additional activities to further promote Ukrainian fish products

Impacts of COVID-19 on the aquaculture sector in Ukraine

Specialists of the budget institution, Methodological and Technological Center for Aquaculture, conducted a survey of public and private farms on the effects of COVID-19 on aquaculture in Ukraine.

A total of 40 farms agreed to take part in the survey and geographically the participants covered almost all regions of Ukraine, and therefore the results of the survey can be considered to have a sufficiently high degree of reliability for the country as a whole. It should be noted that 90 percent of respondents were owners or managers of fish farms and 10 percent were other persons closely associated with fish farming.

The survey is important for understanding the situation of fish farms following quarantine restrictions due to COVID-19. The study gives an idea of the functioning of aquaculture business under the conditions of quarantine restrictions and indicates the factors that affect the production processes of aquaculture in general.

Participants of the survey were asked questions regarding the effects of quarantine restrictions in the spring of 2020, including the effects on key aspects of fish culture activities: production, sales, price fluctuations and increases in production costs.

The results of the study largely confirmed the forecasts from experts about a slight decline in aquaculture production, although in general, Ukrainian aquaculture was not significantly affected. Below are some of the key insights gained from the survey.

More than 55 percent of the respondents identified the following negative effects of COVID-19 on aquaculture: sales volumes of farms decreased due to the lack of regular customers (restaurants, shops) and the change in financial capacities of the population; fish feed prices increased slightly compared to the previous year due to the economic crisis caused by quarantine restrictions across the world.

Twenty-five percent of respondents also confirmed an increase in the price of aquaculture products, most likely due to a small shortage of certain products caused by border closures and limited movement in Ukraine, as well as an increase in feed prices.

Fifteen percent of respondents reported the emergence of new costs as a result of quarantine restrictions (mainly related to the costs of transporting employees to their work places during the lockdown) and 25 percent of respondents reported an increase in existing costs for the production of aquaculture products at their own farms. In the near future, this may lead to a slight increase in the price of live fish.

Producers of fish larvae were almost unaffected by quarantine restrictions due to the sale of products directly to aquaculture entities from the farm, rather than through distribution networks.

Overall, the greatest impact of COVID-19 on national aquaculture was observed in sales, while the impact on production processes was insignificant.

Glossary

Aquaculture: farming of aquatic organisms including fish, molluscs, crustaceans, other invertebrates, and aquatic plants.[1]

Cage: rearing facility enclosed at the bottom as well as at the sides by wooden, mesh or net screens and allowing natural water exchange through the lateral sides and, in most cases, through the bottom.[2]

Direct sales: products sold by the farmers directly to consumers in a non-retail setting.

Flow-through system: culture system in which the water is used only once and then discharged with or without primary treatment (depending on stocking density and waste output).[2]

Freshwater aquaculture: cultivation of aquatic organisms where the end product is raised in freshwater (ponds, reservoirs, rivers, lakes, canals, etc.) where the salinity does not normally exceed 0.5 percent. Earlier stages of the life cycle of these aquatic organisms may be spent in brackish or marine waters. [1]

Marine aquaculture: cultivation of the end product which takes place in seawater (fjords, inshore and open waters, inland seas, etc.) where salinity is generally high and is not subject to significant daily or seasonal variations. Earlier stages in the life cycle of these aquatic organisms may be spent in brackish water or freshwater.[1]

Modern retail: supermarkets, hypermarkets and large grocery chains.

Mussel rope collector: underwater device used to collect sticky eggs and settling larval stages of mussel spat.[2]

Natural waterbodies: waterbodies, such as lakes and rivers, that are not created by human activity.

Pen: fenced, netted structure fixed to the bottom substrate and allowing free water exchange; in the intertidal zone, it may be solid-walled; the bottom of the structure, however, is always formed by the natural bottom of the waterbody where it is built such as shallow lagoons in coastal zones or lakes and reservoirs in inland zones. A pen generally encloses a relatively large volume of water.[2]

Pond: relatively shallow and usually small body of still water or water with a low refreshment rate, most frequently artificially formed but also in some cases naturally formed (e.g. natural pool, tarn, mere or small lake).[2]

Raceway: structure, usually above ground, with a long, linear configuration featuring a high water turnover rate and a highly controlled environment. They are often terraced with water re-use.[2]

Recirculating aquaculture system: closed or partially closed system employed in aquaculture production where the effluent water from the system is treated to enable its re-use.[2]

Reservoir: pond, lake or basin, either natural or artificial, used for the collection, storage, regulation and control of water or for water use when required, e.g. for generating electricity or for irrigation. (Syn: artificial lake, man-made lake, dam).[2]

Small and medium enterprises: registered businesses with fewer than 300 employees.[3]

Species that are also farmed: species that may be farmed, but for which supporting data do not differentiate between wild-caught and farmed aquatic organisms and thus may not refer solely to farmed species (this definition applies to this publication only).

Tank: fish or water-holding structure, usually above ground, typically with a high water turnover rate and a highly controlled environment.[2]

Traditional retail: fishmongers, fish shops and fish markets.

[1] Adapted from Macias, J.C., Avila Zaragozá, P., Karakassis, I., Sanchez-Jerez, P., Massa, F., Fezzardi, D., Yücel Gier, G., Franičević, V., Borg, J.A., Chapela Pérez, R.M., Tomassetti, P., Angel, D.L., Marino, G., Nhhala, H., Hamza, H., Carmignac, C. & Fourdain, L. 2019. *Allocated zones for aquaculture: a guide for the establishment of coastal zones dedicated to aquaculture in the Mediterranean and the Black Sea*. General Fisheries Commission for the Mediterranean. Studies and Reviews. No. 97. Rome, FAO. 90 pp.

[2] Adapted from FAO. 2021. *FAO TERM PORTAL*. Cited 23 November 2021. Rome. https://www.fao.org/faoterm/en/

[3] Adapted from IFC. 2012. *Interpretation Note on Small and Medium Enterprises and Environmental and Social Risk Management*. Washington, DC, World Bank Group.

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Office of Communications – November 2020

Aquaculture market in the Black Sea: country profiles

Corrigendum

Updated on 17/03/2022

The following corrections were made to the PDF after it was published.

Page	Location	Text in previous PDF	Text in corrected PDF
19	Title	Georgian per capita seafood consumption is less than half the world average and low fishery and aquaculture production has left the country reliant on imports. Recently, aquaculture has gained traction, growing and diversifying into mariculture, potentially changing the situation moving forward.	Georgian per capita seafood consumption is less than half the world average; nevertheless, capture fisheries and aquaculture only supply 10 to 15 percent of the country's total seafood consumption, leaving it reliant on imports. Recently, aquaculture has gained traction, potentially changing the situation.

This publication provides an overview of the state of aquaculture markets in 2020 for the six countries surrounding the Black Sea: Bulgaria, Georgia, Romania, the Russian Federation, Turkey and Ukraine. General analyses of the sector in each country illustrate the main features, data and trends of aquaculture production, trade and marketing and also provide insight into the impacts of COVID-19 on the aquaculture sector in the region. Based on the latest figures, this snapshot of aquaculture markets in the Black Sea aims to inform key stakeholders throughout the region about current and future challenges and provides decision-makers with a useful tool for policy development.

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