

Global Interdependencies in Seafood Trade: The Case of Bulgaria

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Abstract

The international trade in fish and fishery products has reached global dimensions during the past several decades. While the domestic demand for seafood in Bulgaria is modest compared to European and world levels, Bulgarian fish processing enterprises are part of international value chains. At the same time consumer preferences for certain types of seafood in foreign markets shape the activities of the Black Sea fishing fleet. The paper makes an attempt to reveal some of the linkages between the Bulgarian commercial fishing and processing, and the world market that have formed during the past years. It outlines the development of the fishing fleet, its economic performance, the type of catch for domestic consumption and for export, as well as the role of the processing sector. It illustrates an aspect of globalisation: the connection between the harvesting of marine living resources and the demand for them in the world market. The development of the world seafood market calls for a precautionary fishery management approach, which envisages the potential exploitation of new species for a particular water basin.

Keywords: seafood, fish production, aquaculture, international trade, fishery management

JEL Code: F14, F18, Q22, Q56

Introduction

Seafood is an umbrella term comprising a vast array of products with diverse characteristics, which share one common feature – aquatic origin. This includes fish and fishery products both from wild capture and from aquaculture. Capture production from marine and inland waters includes different types of species such as finfish, crustaceans (e.g. crabs and shrimps), molluscs (mussels, clams, snails, squids, octopuses, etc.), various other organisms like jellyfishes, sea cucumbers, sea urchins or algae. Aquaculture production targets also a large number of aquatic animals and seaweeds, and depending on the location of the farming systems is usually subdivided in inland (mostly freshwater), coastal and marine aquaculture.

Global production of aquatic animals reached 179 million tonnes in 2018 with an overall value of USD 401 billion at the point of first sale, of which 82 million tonnes, valued at USD 250 billion, originated from aquaculture production (FAO, 2020). For human consumption 156 million tonnes were used, equal to 20.5 kg per capita. The remaining 22 million tonnes have been processed for non-food uses like fishmeal and fish oil. While capture production has been hovering around 90 million tonnes for the past 35 years, aquaculture has experienced a steady growth. Its share in total production has grown from 15 percent in 1986–1995 to 46 percent in 2018 and makes up today 52 percent of all fish for human consumption.

The share of exports was 37.6 percent of the total production in terms of quantity in 2018, with a total value of USD 167 billion (FAO, 2021). The global seafood trade formed about 1 percent of the value of total merchandise trade and close to 11 percent of the export value of agricultural products. The exports of fish and fishery products for human consumption have surpassed the combined world trade of meat (chicken, pork, beef and mutton) by value since the mid-2010s (FAO, 2020).

The steady growth of seafood trade by 4 percent per year in real terms during the past four decades has created global markets, largely replacing the previous regional markets. As seafood is increasingly sourced globally, this has led to commoditisation – or blurring of distinctive product attributes – of many key segments. As a consequence, there is an increasing degree of substitutability within many species groups. The emergence of broader classes of seafood products has facilitated the entry of many production, transportation and marketing technologies, commonly used in advanced terrestrial food chains, into the seafood trade (Anderson, Asche and Garlock,

2018). Developments in freezing technology, which allow many product forms to be frozen twice, have also affected the seafood industry. Processing clusters located away from the regions where the fish is caught have emerged. They are based on competitive advantages and characterised with growing trade flows to and from them. The concentration of processing activities has additionally contributed to the commoditisation of seafood products.

Bulgarian seafood production and trade are very small compared to world or even European scales, yet they are thoroughly affected by the global trends in the sector. Thus, their development serves as a localised case study about the driving forces of the seafood market. The pressure of market forces on the local ecosystems and the need for sound fishery management policies also have many parallels around the world.

1. Seafood production

The production of seafood is usually represented as consisting of two major subsectors: capture fisheries and aquaculture. Both types of production have marine and freshwater components.

Wild catch is targeting around twenty Black Sea species out of a total of 134 fish species and over a dozen of freshwater species from more than 140 species reported in Bulgarian fresh and brackish waters (Stefanov, 2007). Commercial fishing is permitted in the Black Sea and in the Danube River. Following an amendment of the Law on fisheries and aquaculture from August 2012, commercial fishing in inland rivers and lakes – both natural and artificial – is prohibited.

A major marine commercial species is the rapa whelk (*Rapana venosa*) – a predatory sea snail introduced to the Black Sea in the 1940s from the Far East. The average live weight of landings for the period 2008–2020 is 3766 thousand tonnes per year, varying roughly between 2200 and 4800 thousand tonnes during the various years. This forms nearly half of the total Black Sea catch, and the rapa whelk is also a major seafood product for export. Its exploitation in Bulgaria started at the end of the last century, initially through scuba diving and collection by hand, but it soon evolved to bottom trawling by beam trawls.

Among the fish species sprat (*Sprattus sprattus*) is the most important. It forms around two thirds of the total catch of fish in the Bulgarian part of the Black Sea. The landings vary between 2300 and 4600 thousand tonnes during 2008–2020 with a mean value of 3298 thousand tonnes.

An example of a serious transformation of the capture sector, driven by international demand, is the harvesting of clams during the past decade. Under the same commercial name are reported bivalve molluscs like wedge clam or tellina (*Donax trunculus*), striped venus clam or vongola (*Chamelea gallina*), sand gaper (*Mya arenaria*) as well as the invasive ark clam (*Anadara kagoshimensis*). The clams inhabit coastal sea bottom sands at a depth from 0.5 to 15–20 m along the Bulgarian coast (Trayanova, 2015). There has been hardly any traditional harvesting of clams as there is no local consumption of these molluscs. The catch started from under one tonne in 2012 and grew in an explosive manner to 820 tonnes in 2017, with a subsequent decline to 462 tonnes in 2020, probably due to overexploitation of the stocks. The value of clam landings reached 3.4 million euro in the peak year 2017, equivalent to 40 percent of the total value of the annual catch. For comparison the value of the other two species subject to intensive fishing – rapa whelk and sprat – was estimated at 2 and 1.6 million euro.

Data about the catch of the main species of fish and other marine organisms from the Black Sea is presented in Table 1. The data is arranged in descending order according to the average live weight of landings for the period. Other species, not mentioned here, generate multiple times smaller landings compared to the first two positions. In this group are red mullet, bluefish, horse mackerel, anchovy, picked dogfish and turbot. The catch may fluctuate substantially from one year to another, especially for migratory species like anchovy or bonito.

The average catch for 2015–2020 was 8476 tonnes with visible fluctuations for the past two years. The reported peak in 2019 was mostly due to higher harvesting of rapa whelk and sprat,

while the sharp decrease in 2020 is attributed to suppressed demand and supply chain problems due to the Covid-19 pandemic. The average landings for 2008–2020 are in the same range as for the shorter more recent period, equalling to 8450 tonnes.

Table 1. Live weight and value of landings of Black Sea fish and other marine organisms, 2015–2020

Species	Live weight, tonnes					
	2015	2016	2017	2018	2019	2020
Rapa whelk (<i>Rapana spp.</i>)	4101	3435	3653	3515	4222	2746
European sprat (<i>Sprattus sprattus</i>)	3297	2295	3189	3188	4585	1623
Red mullet (<i>Mullus barbatus</i>)	636	880	375	595	554	319
Clams	124	581	819	601	508	462
Bluefish (<i>Pomatomus saltatrix</i>)	138	712	71	261	24	253
Horse mackerel (<i>Trachurus mediterraneus</i>)	87	166	153	197	102	109
European anchovy (<i>Engraulis encrasicolus</i>)	12	53	4	5	71	422
Piked dogfish (<i>Squalus acanthias</i>)	133	83	50	10	17	48
Turbot (<i>Psetta maxima</i>)	43	42	42	55	55	62
Gobies (<i>Gobiidae</i>)	48	64	40	25	31	34
Thornback ray (<i>Raja clavata</i>)	43	36	49	13	9	17
Mediterranean mussel (<i>Mytilus galloprovincialis</i>)	18	41	11	12	26	48
Atlantic bonito (<i>Sarda sarda</i>)	8	68	13	23	4	32
Silversides (<i>Atherina spp.</i>)	9	50	10	16	9	4
Pontic shad (<i>Alosa pontica</i>)	18	16	10	11	26	16
Whiting (<i>Merlangius merlangus</i>)	3	12	6	2	14	17
Other species	31	22	12	15	13	18
Total, tonnes	8749	8557	8507	8544	10269	6227
Value of landings, million euro	4.524	7.961	8.573	7.968	6.470	4.820

Source: STECF, 2021a

The Bulgarian Black Sea fishing fleet consisted of 1830 vessels in 2020. During the year 1233 vessels or around two thirds of all registered ones were active, and the remaining 597 were not engaged in fishing. The active fleet had a combined gross tonnage of 4895 tonnes and engine power of 40404 kW, while its average age was 23 years (STECF, 2021a). The overall trend has been towards reducing the size and capacity of the fleet, a development supported by the EU Common Fisheries Policy. The number of registered vessels diminished by 28 percent over the period 2008–2020, which led to the same reduction in tonnage and 19 percent decrease in engine power.

The majority of the vessels (91 percent) formed the small-scale fleet, which consists of boats with overall length of up to 12 m, using passive fishing gear and involved mostly in coastal and

seasonal operations. For most people engaged in this type of fishing this is a seasonal occupation and the catch is used either for private consumption or sold in their own restaurant. For some years during the past decade the overall economic performance of the segment is negative and the profitability is generally limited.

The large-scale fleet consisted of 106 vessels targeting different species in the Black Sea. While it comprised only 9 percent of the vessels, this segment was responsible for about three quarters of the total catch – a ratio that is consistent over the past years.

The Black Sea based capture sector employed 1619 people in 2019 corresponding to 938 full-time equivalents (FTEs). This included also unpaid labour – mainly owners of small vessels or their family members who go out fishing only occasionally¹. There were only three companies with more than five vessels and 93 with two to five vessels, while the remaining nearly 1600 enterprises in the sector had one vessel (STECF, 2021a).

The commercial catch from the Danube River is about two orders of magnitude smaller than that from the Black Sea. The live weight of landings fluctuated between 52 and 136 tonnes during 2007–2020 with an average value of 52 tonnes for the past five years. The most important species by catch weight are common barbel (*Barbus barbus*), common carp (*Cyprinus carpio*), bighead carp (*Aristichthys nobilis*), wels catfish (*Silurus glanis*) and common bream (*Aristichthys nobilis*). The Danube capture production is performed only by micro-enterprises with less than nine employees. The number of companies varied between 9 and 18 during 2009–2018, but probably only a small share of them was active (IRA-Strategema, 2020).

The capture production from inland waters varied between 1006 and 1323 tonnes per year during 2007–2012. After the prohibition of commercial fishing in inland rivers and lakes in 2012 all production from these basins is reported as aquaculture. Nevertheless, for some years after the legal change, registered aquaculture producers continued to report freshwater species, which are not subject to fish farming, as bycatch.

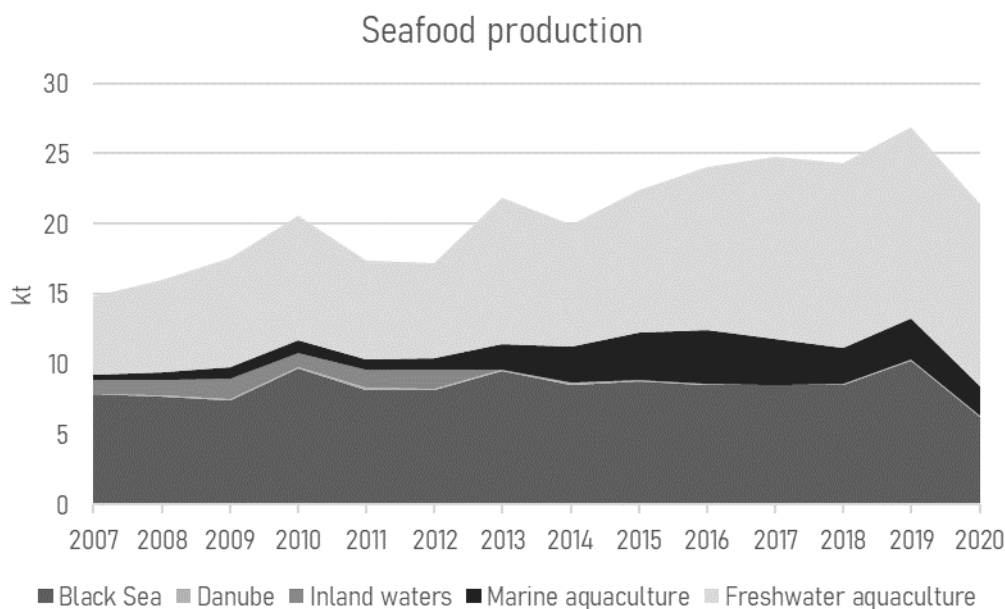


Figure 1. Bulgarian seafood production, thousand tonnes

Source: MZHG, 2021

¹ The occasional character of fishing for many small-scale fishermen is confirmed by the fact that 63 percent of all active vessels spent only between one and ten days at sea during the whole year, and another 15 percent had been between 11 and 20 days at sea in 2019.

The capture production has been dominated by the catch of wild fish in the Black Sea with relatively stable landings of around 8500 tonnes per year during 2007–2020 (Figure 1). Capture has been the leading contributor to seafood production at the beginning of the period. For the first time aquaculture produced over half of the seafood in 2013. Even if there were some double counting in the first years after the prohibition of fishing in inland waters, it is clear that from the mid-2010s marine and freshwater fish farming are the principal producers of seafood in Bulgaria.

The number of species reared in fish farms varied between 33 and 40 during the period 2013–2019 (IRA-Strategema, 2020). Traditionally more important is freshwater aquaculture, in which the leading species in the country are rainbow trout and common carp. Coastal mariculture, represented only by Mediterranean mussel, started growing in the first half of the past decade and stabilised at around 3000 tonnes during the last few years (Table 2). Freshwater aquaculture production peaked in 2019 at 13754 tonnes, followed by a slight decline in 2020, attributed to the market disturbances caused by the Covid-19 pandemic (MZHG, 2021).

Table 2. Aquaculture production by main species, 2015–2020

Species	Total production, tonnes					
	2015	2016	2017	2018	2019	2020
Rainbow trout (<i>Oncorhynchus mykiss</i>)	3349	4662	3228	4674	4157	5536
Common carp (<i>Cyprinus carpio</i>)	2674	3064	4373	4557	4848	3775
Mediterranean mussel (<i>Mytilus galloprovincialis</i>)	3373	3831	3292	2531	2929	2141
Bighead carp (<i>Hypophthalmichthys nobilis</i>)	1786	1823	2544	2042	2488	1643
North African catfish (<i>Clarias gariepinus</i>)	286	541	909	281	203	174
Grass carp (<i>Ctenopharyngodon idella</i>)	320	259	336	291	421	406
Silver carp (<i>Hypophthalmichthys molitrix</i>)	677	175	232	189	165	163
Prussian carp (<i>Carassius gibelio</i>)	215	232	427	224	274	226
Wels catfish (<i>Silurus glanis</i>)	159	222	215	245	318	178
Danube sturgeon (<i>Acipenser gueldenstaedtii</i>)	221	151	133	258	247	241
Siberian sturgeon (<i>Acipenser baerii</i>)	109	48	137	109	28	70
Mississippi paddlefish (<i>Polyodon spathula</i>)	6	55	70	66	143	100
Pike-perch (<i>Sander lucioperca</i>)	77	85	75	52	52	62
Other species	309	286	266	202	232	339
Total, tonnes	13561	15432	16237	15722	16503	15052
Value of landings, million euro	17.3	21.0	22.4	30.5	30.0	nd

Source: STECF, 2021b; MZHG, 2021

The aquaculture sector included 731 freshwater and 23 marine producers in 2020. In the latest year for which more detailed data is available, 2018, there were 627 registered aquaculture enterprises, however only 58 percent of them declared any economic activity. The majority of fish farms, 93 percent, had five or fewer employees, including those which had no employees and sales. Thirty enterprises employed between six and ten people, and 13 farms had more than ten employees

during the same 2018. The total number of employees was 1082, corresponding to 892 full-time equivalents, with mariculture employing 45 people or 43 FTEs (STECF, 2021b). While the sector consists of micro and small enterprises, it has exhibited robust economic performance with sales of 30.5 million euro in 2018 following cumulative annual growth rate of 10.7 percent during 2013–2018. Gross value added of aquaculture production reached 13.5 million euro growing on average by 6.6 percent over the same period.

Trout farms, which are less than one fifth of all aquaculture enterprises, exhibit the best results in terms of net profits and return on investment. Carp production, which is typical for about two thirds of all companies in the sector, had a more mixed performance with registered losses for the segment in 2014, 2016 and 2018 and practically no profit in 2015 and 2017. The farming of mussels done by 20–30 operators has a similar chequered history with negative profitability during the past years.

Almost half of production is done in tanks and raceways in freshwater, around a fourth is produced off bottom, both in fresh and seawater, and a fifth of production employs cages in freshwater. A small number of recirculation systems are used and this production method is still facing technological and economic hurdles. (EUMOFA, 2020)

Aquaculture production relies on introduced species to a larger extent than the capture of wild species. Over half of the total weight of farmed fish comes from introduced species: some well-established like rainbow trout and bighead carp, others more recent like North African catfish, paddlefish, barramundi and coho salmon (IRA-Strategema, 2020).

2. Seafood trade

The seafood supply chain includes various stages and participants (Figure 2). Supply is formed by local production and import of seafood. While some amount of domestic seafood products is directly sold by fishermen or fish farmers to consumers or restaurants, a substantial part enters wholesale trade and processing before reaching the retail sector. Exports are formed by a mix of domestic production and additionally processed imported seafood.

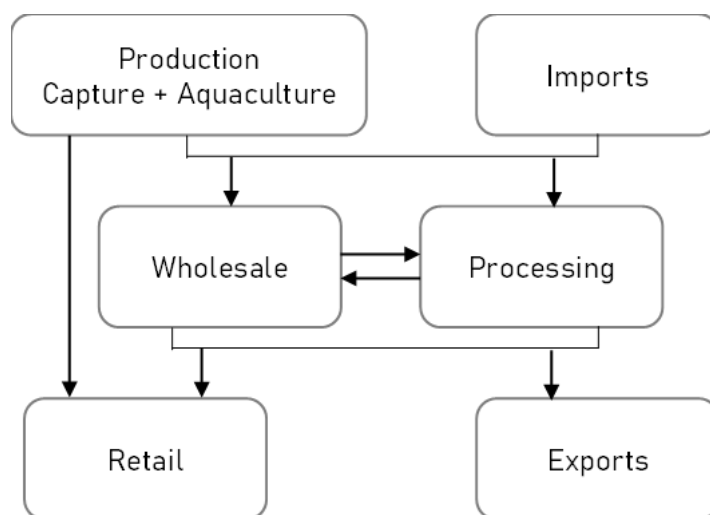


Figure 2. Supply chain of fisheries and aquaculture products in Bulgaria

The total supply of domestic production and imports in 2020 equalled 59 thousand tonnes, of which 44 thousand tonnes of seafood were consumed in the country and about 15 thousand tonnes were exported. These numbers mark a decline compared to the last pre-pandemic years, but in relative terms domestic production is responsible for about half of the consumption of seafood in Bulgaria during the past decade. In reality, more than half of the existing local demand is satisfied

through imports, as substantial parts of capture production (e.g. of molluscs) and fish farming are dedicated to exports.

Wholesale activities cover the middle stage of the distribution channel with bulk purchases and sales to retailers, processing units and foreign partners. There is one wholesale market for seafood in Bulgaria, situated in Burgas, and its operators are also involved in seafood processing for domestic and international trade.

Seafood processing covers activities from the moment fish or other aquatic organisms are caught until the final product is supplied to the customer. It does not matter whether the raw material is obtained by catch or is harvested from a fish farm for the processing and production of seafood products. The seafood processing sector in Bulgaria included 49 small and medium-sized enterprises employing 1715 workers in 2018 (Table 3). Enterprises may be subdivided into seven groups with regards to the used inputs: units processing Black Sea fish (sprat and other pelagic species); for crustaceans; for molluscs; for farmed freshwater fish; for black caviar and fish delicacies; and for canned fish (STECF, 2019).

Table 3. Seafood processing industry, main economic indicators for 2008–2018

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Enterprises	45	45	48	43	43	46	44	45	45	46	49
Employees	1704	1538	1917	1749	1650	1725	1879	1907	1904	1756	1715
Full-time equivalents	1651	1419	1821	1667	1565	1653	1744	1671	1618	1490	1427
Turnover*	53.9	53.4	59.3	55.7	52.2	64.4	68.7	85.3	78.1	85.0	82.9
Gross value added*	25.1	25.9	29.0	27.5	25.6	33.2	36.1	41.1	30.6	36.9	42.0
Net profit*	12.3	14.0	16.1	15.8	14.5	22.6	25.2	30.4	16.8	21.2	28.8

Source: STECF, 2019

* in million euro

While the number of companies has changed little over the period, the sector turnover has grown during 2015–2018 compared to previous years, and economic performance is robust. During the period 2008–2018 microenterprises with up to ten workers made up over a third of all companies. Most numerous were small enterprises with staff from 11 to 49 people and they made up 41 percent of the companies in the sector. Within the medium-sized enterprises with a staff of more than 50 employees, the largest reached a maximum of 80 workers. In all categories of enterprises, the majority of employees are women (57–61 percent).

The import of seafood satisfies the existing demand for fish and fishery products in the country and supplies input for the export-oriented processing industry. The value of imports reached 120 million euro in 2019, the highest level so far, and declined to 108 million euro in the following year. The exports reached 76 million in 2019 – below the highest point of 82 million in 2017 – and then shrank to 71 million euro in 2020 according to EUMOFA (2021). The trends in the volume of Bulgarian import and export of seafood products are represented in Figure 3. The trade with the other EU members forms around three quarters of the overall commercial exchange in both directions, in some years reaching up to 80 percent.

The most important fish species subject to import is mackerel (frozen) with a volume of 11.4 thousand tonnes in 2019. It satisfies mostly domestic consumption, and certain amounts are exported, prepared or smoked, to Romania and Serbia. Shrimps, almost entirely imported from Denmark and Canada, and with a comparable share of the value of imports as mackerel, pose a special case as less than half of the more than 4000 tonnes are sold domestically. The bulk of the imports is processed and further dispatched to Sweden, generating more than a quarter of the total value of exports in 2019. This processing activity, which started in 2014, is generating substantial

value added as the import prices were in the range of 3.29–3.39 EUR/kg, while the export price reached 10.29 EUR/kg in 2019 (Eurostat, 2021). Salmon and salmonids have enjoyed increasing demand in the past years and some of the imports are processed and directed to neighbouring countries like Romania and Serbia. The trade in tuna and tuna-like species follows a similar pattern, though in more modest terms. In Bulgaria, like in many other European countries, there is a growing demand for reared gilthead seabream and European seabass, which are imported from Greece and Turkey.

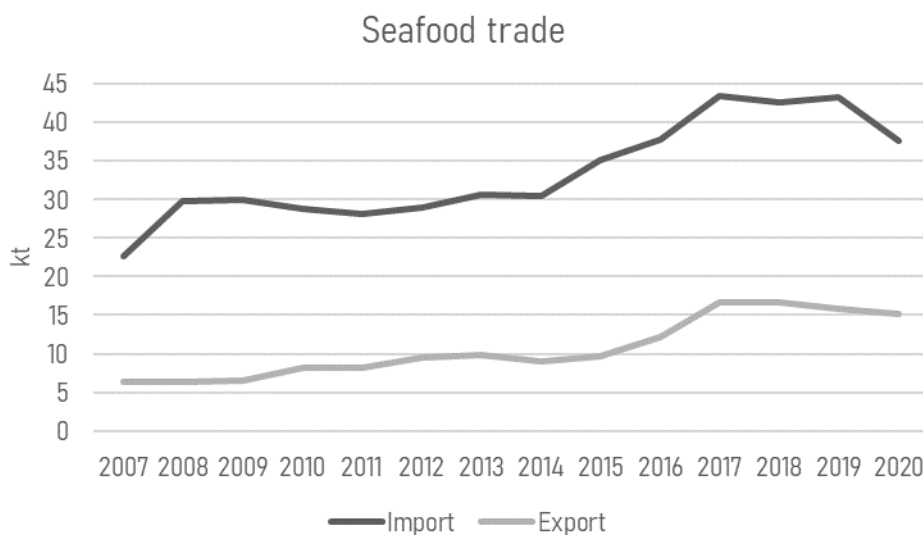


Figure 3. Bulgarian seafood trade, thousand tonnes

Source: MZHG, 2021

Main export destinations of the Bulgarian freshwater aquaculture, rainbow trout and carp, are Romania, Serbia and North Macedonia. Romania is also a major market for the most abundant Black Sea fish species – sprat. The demand for turbot is largely driven by the Turkish market. Thus, 38 tonnes of the total catch of 55 tonnes of this highly-priced species were exported to Turkey in 2019.²

The demand for molluscs harvested from the Black Sea is also entirely driven by foreign markets. Almost the whole catch of rapa whelk is processed and exported to Japan and Korea, contributing to between 13 and 17 percent of the total value of seafood export during the past five years. Another similar case are the clams, wedge clam and striped venus clam, which are not consumed domestically but are dispatched fresh or frozen to Spain, the Netherlands, Italy and Greece.

The domestic consumption of seafood products in Bulgaria is on average 5.3 kg per person over 2007–2020 according to the national statistics (MZHG, 2021). Another approach provides the concept of apparent consumption, which divides the sum of the seafood production (capture + aquaculture) and the net exports (exports – imports) by the population. According to this indicator the consumption of fishery and aquaculture products in Bulgaria was 7.5 kg per capita in 2019. This is around one third of the EU average – 24 kg per person per year³ (EUMOFA, 2021).

² In addition to its own catch in the Black Sea of 272 tonnes, Turkey imported a total of 124 tonnes from Ukraine, Bulgaria, Norway and Russia in the same year.

³ The consumption of seafood in Bulgaria is higher only compared with Czechia and Hungary and lower than in the other EU members. The highest apparent consumption of fishery and aquaculture products of 60 kg per person is reported by Portugal.

A Eurobarometer survey of consumer habits regarding fishery and aquaculture products reveals that 44 percent of Bulgarian consumers eat seafood at home at least once a month, compared to the average of 64 in the European Union (DG Communication, 2021). The consumption of seafood in restaurants at least several times a year is common for 38 percent of Bulgarians and for 51 percent of all EU respondents. The leading channel for purchase of fishery products are supermarkets or hypermarkets (75 percent of respondents); 45 percent buy from a fishmonger or specialist store. A higher share of Bulgarian consumers buy fish at a street market, 22 percent compared with the EU average of 15 percent. Directly from a fisherman or at a fish farm buy nine percent of respondents. No online purchases are reported. The consumption of seafood products has remained largely unaffected by the Covid-19 pandemic.

Leading motives for purchase of seafood are the cost of the product and its appearance with 69 and 66 percent of respondents respectively. The environmental, social or ethical impact are an important aspect for only 6 percent of Bulgarian respondents, compared to 15 percent on average in the EU. The biggest group of Bulgarian consumers, 39 percent, have no preference for wild or farmed products, and another 22 percent have no knowledge of the origin of seafood, while one fifth prefer clearly wild fish. The expected information on seafood products confirms that Bulgarian consumers see seafood predominantly in utilitarian terms, largely as a commodity safe for consumption. Characteristics such as whether the product is wild or farmed, where it comes from and under what conditions it has been produced are less relevant.

3. Implications for environmental management

Both fish farming and the catch of wild aquatic organisms have environmental implications. Potential negative effects of aquaculture include pollution of waters by organic matter, transmission and distribution of disease agents, biodiversity loss, habitats change and destruction, overfishing of other species for the production of fish meal and oil. In case of mismanagement, both large and small fish farms may have substantial negative impacts on sensitive water habitats.

The overfishing of wild fish stocks is well documented and it is among the main drivers for the switch towards aquaculture as a leading source of seafood worldwide. The drastic effects of overfishing in the Black Sea in the last quarter of the twentieth century have led to structural changes in the marine ecosystem (Daskalov *et al.*, 2007). This state of affairs imposes the need for sustainable management of the existing fish stocks.

Traditionally, management policy and measures have followed the commercial exploitation of wild species. Given the globalisation of seafood trade it seems necessary to take a more precautionary approach. The strong demand for certain species even in distant markets may cause havoc and severely disturb local fish populations and trigger additional side effects. Therefore, a national or regional management approach, which takes into account not only the current targeting of specific species, but also the potential demand for them on the world market, may be better suited to protect the long-term exploitation of existing populations in the contemporary state of the global seafood industry.

Although Bulgaria is only a minor player in the seafood trade with limited domestic production and processing, concentrated in small and medium enterprises, it however exhibits all the features of the globalisation and commoditisation of seafood trade. For instance, the import of frozen mackerel is bigger than the total live weight of the domestic wild catch. A substantial share of the local consumption is satisfied by the import of reared salmon, gilthead seabream and European seabass, in line with the developments in many other European markets. Nearly 30 percent of the value of seafood exports relies on imported and processed shrimps. The catch of

specific prized species with only limited consumption in Bulgaria is driven largely by demand in foreign markets, based on local preferences: turbot – Turkey, rapa whelk – Japan and Korea, clams – mostly Mediterranean countries.

While technical management measures, such as minimum allowed catch size by species, regulation of fishing gears, time and area restrictions are in place, the management response to pressure on specific species from market demand comes with a delay, often leading to overfishing.

For example, all sturgeon species are highly threatened or vulnerable to extinction, but a moratorium on the export of wild caviar from the entire Black Sea region came into effect only in 2007. Bulgaria has banned the catch of all sturgeon species in the Danube and the Black Sea since 2008 and the last five-year ban was renewed in 2020.

Bulgaria and Romania are implementing total allowable catches for turbot since their entry to the European Union in 2007, and the General Fisheries Commission for the Mediterranean (GFCM) reached a regional agreement for a multiannual management plan for turbot fisheries in the Black Sea in 2017. For another major species, exploited by the Bulgarian Black Sea fleet since the 1990s, the rapa whelk, GFCM adopted a recommendation on a regional research programme in 2018.

A recent example of belated management approach is the exploitation of clams. It started with very modest harvests at the beginning of the past decade, followed by explosive growth during 2013–2017 and subsequent decline (Figure 4). Recent observations confirm the deterioration of the population status of the commercially exploited clams (Gumus, Todorova and Panayotova, 2020). Severe declines of clam fisheries have been already witnessed in the Mediterranean (Baeta *et al.*, 2021), potentially serving as a driver for the increased harvesting efforts in the Black Sea.

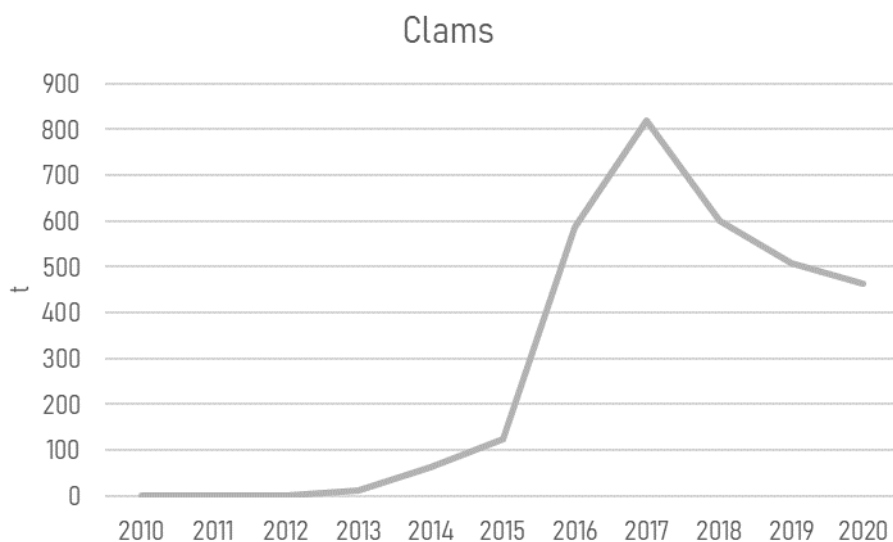


Figure 4. Harvested clams from Bulgarian coastal waters, tonnes

Source: STECF, 2021a

The first specific management measures related to wedge clam and striped venus clam, which included time restrictions for their harvesting, were introduced in 2019. Obviously, this came after the observed decline in landings. Even in 2021 there is still uncertainty about the necessary measures due to incomplete scientific research on the topic. This comes to confirm that global demand in the seafood market is able to start in a relatively short time span a whole supply chain,

consisting of small enterprises, and cause a population decline in the targeted species, before the research community and management authorities are able to provide guidance for the sustainable exploitation of the resource.

Based on the experience of Bulgaria, which is comparable to that of many other countries around the world, it is probably time to start thinking of fisheries management even before the exploitation of certain commercial species has started in a particular basin. In the case of existing demand for a particular seafood product, it is just a matter of time when the harvesting of the underlying resource will start, even if there is no local consumption of the species in concern.

Conclusion

Bulgaria is a minor producer of seafood, responsible for 0.01 percent of world production and 0.4 percent of EU fishery and aquaculture products in terms of volume (EUMOFA, 2020). The seafood industry contributes also a very small share of the Bulgarian economy, measured as revenue, value added and employment. However, the case of Bulgaria exhibits all major features characterising the global seafood production and trade. The transition in seafood production from wild catch to aquaculture occurring worldwide has taken place in Bulgaria around the middle of the 2010s. Commoditisation is affecting seafood production, trade and consumption also in Bulgaria. The majority of Bulgarian consumers distinguish types of seafood products rather than species, and for most of them the difference between wild and farmed fish is disappearing. Over half of the current demand for seafood products in Bulgaria is for non-domestic species, which are either imported or farmed as introduced species in the country.

A substantial part of the exports is dominated by molluscs: sea snails and clams, which have negligible domestic consumption. The harvesting of these organisms is driven by demand in other markets, and since the exploitation of this resource remains largely “invisible” to the public due to lack of domestic consumption, management efforts remain insufficient or inadequate. The globalisation of the seafood market requires concerted approaches at global, regional and national level that take into account the potential harvesting of commercial species in previously undisturbed populations. This is necessary both for the sustainable management of the existing aquatic living resources and for the ecosystem services they provide in their natural habitats.

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