ANALYSIS OF FISH FOREIGN TRADE IN EUROPEAN UNION

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Abstract
Given the fact that at the level of European Union, in 2022, 5.317 thousand tons of fish and seafood were produced, result that this sector is one very important in European Union and deserve to be investigated. The present paper aims to portray the current situation regarding the fish foreign trade in European Union (between 2003 and 2022). For this purpose, a descriptive research method was used to present the picture of imports, exports and trade balance of fish among all countries of the European Union. Research findings have highlighted that 7 out of the total number of countries members of European Union present a positive trade balance of fish in 2022. For a better understanding of this market, a bibliometric analysis was made using VOSviewer software, based on Web of Science database, query that revealed 12.297 scientific documents that contains the term "fish market". We consider that our paper is useful and brings an important status about the situation of fish foreign trade in European Union especially because it continues the investigations on this field, taking into account that, querying Web of Science database only 62 results that include the term "analysis of fish foreign trade" were found.

Keywords: *import, export, trade balance, fish market, European Union.*
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Introduction

Since 1976, fish is considered among the most necessary food commodities as well as a substitute for meat and poultry (Nawar, 1976), being an important source of micronutrients and essential fatty acids, and capture fisheries have potential to reduce dietary deficiencies (Nash et al., 2022).

Until the present, the fish foreign trade gained more and more importance especially with the help of such factors as: "liberalization policies, technological innovations, improvements in processing, packaging and transportation, as well as changes in distribution and marketing", (Bellmann, C., Tipping, A., & Sumaila, U. R., 2016).

At present, according to FAO, "Fish may not suffice to ensure global food security, but there will be no global food security without fish", so, it is very important that the indicators related to fish to be exposed and analyzed.

Starting from these aspects from above, the objectives of this paper were to determine the interest in the scientific research area on the field of fish market using Web of Science database and to inspect and analyze the trend of the values of imports, exports, and trade balance of fish and crustaceans, molluscs and other aquatic invertebrates among every country member of European Union, using data provided by Intracen.org. Therefore, a quantitative research method: a bibliometric analysis using VosViewer software were performed to cover the first objective of this paper.

The bibliometric analysis is very important in order to understand what are the interest of the authors regarding fish market, and in which countries. This analyze helped us to achieve an overview of specialty literature and to analyze the indicators presented in this paper.
In order to perform the second objective of the paper, in the 2nd chapter, the situation of fish market in European Union were presented using a descriptive research method. We used data available on FAO (for the period 2010-2021) for fish production in European Union and also, we used data from Intracen.org (for the period 2003-2022), in order to present the import, export and trade balance of fish among European Union.
The motivation of elaborating the present paper comes from importance of fish market in the whole world and also form the lack of written papers on the subject "analysis of fish foreign trade". Querying Web of Science database only 62 results that include this term were found, and we consider that it is a small number in relation with the importance of the subject**.**
Research findings have highlighted that an important quantity of articles, journals, books and other documents were published by American researchers, in cooperation with authors from India, Scotland, Spain etc. and that 7 out of the total number of countries members of European Union present a positive trade balance of fish and crustaceans, molluscs and other aquatic invertebrates in 2022.

1. Materials and Methods

This paper is composed by 2 main chapters. In the first chapter, "Literature review", are presented aspects from our search in the literature and a bibliometric analysis using VOSviewer version 1.6.19.
VOSviewer is a software tool that constructs and illustrates bibliometric networks, showcasing connections among various elements like journals, researchers, or specific publications present in Web of Science database. These networks are built using citation, bibliographic coupling, co-citation, or co-authorship relationships. Moreover, VOSviewer offers text mining capabilities to generate and visualize co-occurrence networks, revealing important terms extracted from scientific literature.
The paper's second chapter utilizes a descriptive research approach to outline the status of fish and seafood production within the European Union. It delves into the specifics of imports, exports, and trade balance for each individual country within the EU, using data provided by Intracen.org, for the period 2003-2022.

2. Literature review

For countless generations, people have been harvesting fish from rivers and nearby water sources for consumption and they become a symbol of food in life (Sarkar et al., 2023) "playing vital ecosystem roles, supporting considerable commercial, recreational, and artisanal fisheries, and delivering critical ecosystem goods and services for the world's human population" (Olden et al., 2020).
Foreign trade represents a very important part of every economy and its promotion help to the optimal allocation of fishery resources and accelerate economic development. (Wang, Y., Liu, J., Zhang, Y., Wang, Y., Zhou, S., Zhang, J., & Zhang, X., 2023), fishery presenting the most salient change in the global food sector over the years, especially due to its total share in production, consumption and trading. (Arısoy et al., 2021).
The fish market faces challenges and uncertainties, including those arising from climate change and unforeseen events. Moreover, its nature as a perishable food product necessitates immediate and careful handling post-harvesting, adding to these challenges. (Chea et al., 2023). All of these factors can conduct to a hard exploitation of fish and seafood and also can affect the food supply or the food security that is an important aspect considering the

increasing level of the total population (Ahmed, 2008). It will be increasingly imperative to oversee fisheries with a focus on food security. In this case, recommendation's entail reducing subsidies, limiting capital investment, adopting precautionary management to prevent ecosystem collapse risks, conserving existing resources, diversifying production and markets, and fostering more equitable contracts and distribution systems. (McClanahan et al., 2015).

Regarding the traceability of fishery industry, among EU, it has been developed international standards, industry guidelines, and legislation, and beginning with January 2005 (Moga et al., 2016). Traceability is increasingly crucial, serving both consumer protection and regulatory enforcement purposes. This is especially true concerning the detection and prevention of illegal, unreported, and unregulated (IUU) fishing activities. (Ogden, 2008).

An analysis of foreign trade must include indicators like: import, export and trade balance. Fish import represents the amount (value) of fish that comes into a country from another country, while export refers to the amount (value) of fish that leaves from one country to another. The balance of trade is named also commercial balance, or net exports (sometimes symbolized as NX), and represent the difference between exports and imports (Nuraini, P., 2019).

A bibliometric analysis is a popular method for exploring and analyzing large volumes of scientific data using different source of data and help to "unpack the evolutionary nuances of a specific field, while shedding light on the emerging areas in that field" (Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M., 2021).

Using the VOSviewer software, the analysis of the results of the Web of Science database were mapped in Figure 1 and Figure 2. Web of Science database query revealed 12.297 scientific documents in which the term "fish market" was found among the whole content of the documents, among them 86% being articles. For the bibliometric analysis only the first 2.500 documents were considered.

The map from the Figure 1 were made with the following specifications:

- Unit of analysis: Authors.
- Counting method: Full counting.
- Scientific documents with authors from more than 25 countries have been ignored when generating the map.
- Minimum number of scientific documents required for a country to appear on the map: ten.

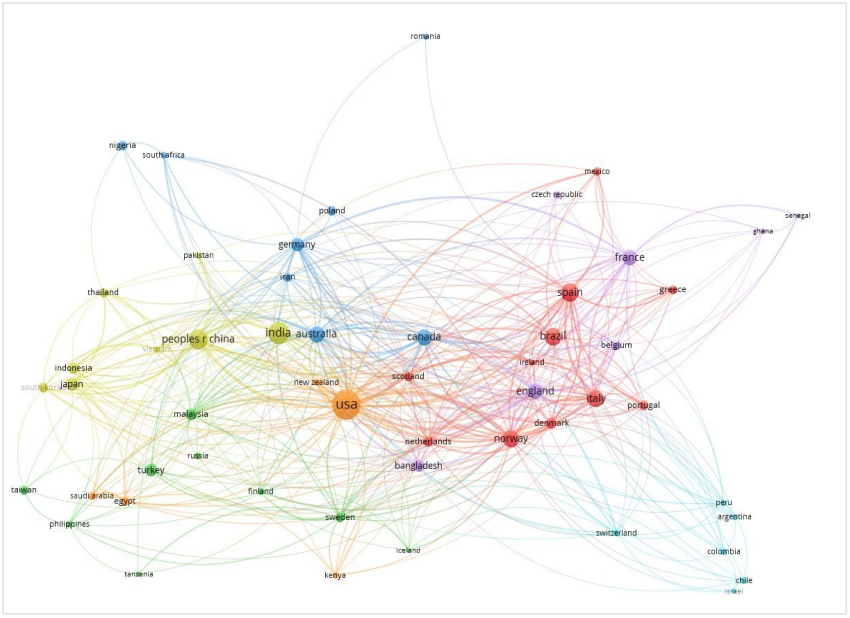

Figure 1. The link between scientific documents about "fish market" by Romanian authors and other foreign authors

Source: edited by the authors using VOSviewer

Because the analysis is about a market present in every country, the collaborations between authors is spread, as we can see in the Figure 1, in the mapped quantitative bibliometric analysis made using VOSviewer software. An important quantity of articles, journals, books and other documents were published by American researchers, in cooperation with authors from India, Scotland, Spain etc.

The map presented in Figure 2 were made with the following specifications:

- Unit of analysis: All keywords.
- Counting method: Full counting.
- Minimum number of scientific documents required for a country to appear on the map: twelve.

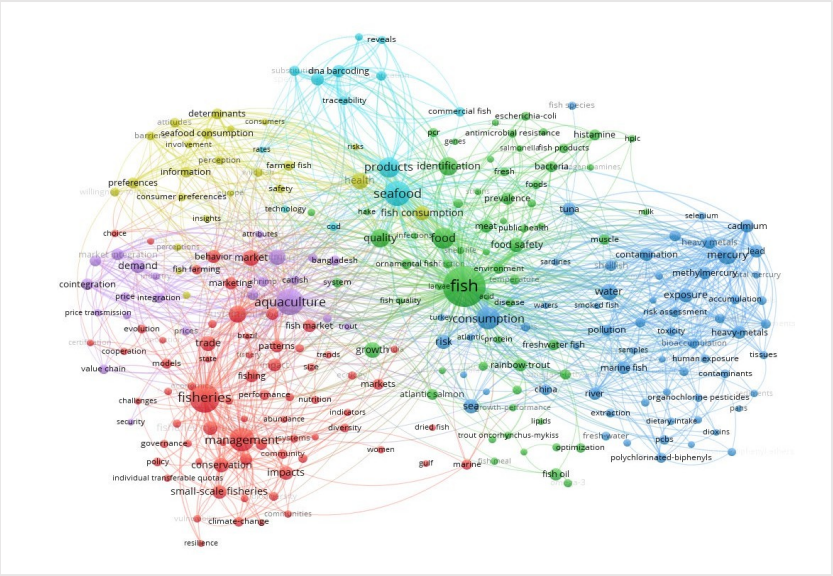

Figure 2. Links between fish and other related notions (clusters by topic)
Source: edited by the authors using VOS viewer

The research analyzed the interests in specific topics related to fish market, the preferred topics being related to aquaculture, fisheries, seafood, and consumption.

3. Fish foreign trade

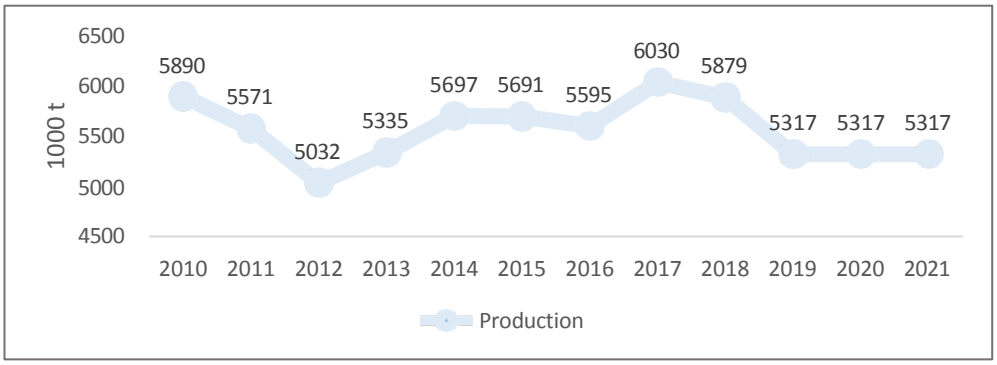

Figure 3. The production of fish and seafood in European Union (1000 tones)
Source: FAO, edited by the authors

Conform with the data available on FAO, the production of fish and seafood is stable in European Union (27 countries) in the last years. The biggest quantity of fish and seafood produced in 2017, when the production was 6.030 thousand tones. In the analyzed period (from 2010 to 2021) can be observed a decrease by almost 10% in European Union's production. In 2021 the production of fish and seafood was 5.317 thousand tons.
Foreign trade is made up of imports, exports and the trade balance, that were presented in the following subchapter of this chapter.

3.1 Imports of fish and crustaceans, molluscs and other aquatic invertebrates

In Romania, in 2021 the average annual consumption of fish, crustaceans, molluscs and other aquatic invertebrates reached 6,6 kg/year per capita from 4,9 kg/year per capita in 2014 (according to INS Food Balance Sheets). On the import side, Romania records an increase in the import of fish, crustaceans, molluscs and other aquatic invertebrates by approximately nine times in 2022 compared to 2003. Imports began to increase in Romania with the accession to the European Union when the markets were liberalized and large quantities of fish and fish products began to enter Romania.

Table 1. Imports of fish and crustaceans, molluscs and other aquatic invertebrates in European Union (euro thousand)

	2003	2008	2013	2018	2022
Romania	32.678	98.541	112.718	207.456	311.682
Spain	4.089.320	4.350.378	4.042.934	6.186.691	7.235.962
Italy	2.490.187	2.826.774	3.187.714	4.622.288	5.751.875
Greece	292.599	400.011	289.048	461.506	621.767
Bulgaria	13.376	34.779	50.828	85.935	124.279
France	2.563.119	3.007.509	3.796.413	4.733.212	6.224.643
Portugal	940.362	1.282.137	1.270.214	2.094.074	2.302.449
Sweden	736.440	1.621.321	3.084.871	4.406.819	5.479.165
Hungary	18.160	25.896	29.903	62.762	71.952
Netherlands	849.001	1.244.507	1.646.330	2.093.092	3.066.342
Slovenia	22.244	37.288	38.966	68.386	91.518
Poland	279.832	754.117	1.336.684	2.017.772	2.884.059
Malta	16.598	50.039	53.544	149.126	162.227
Luxemburg	42.695	50.785	68.182	94.658	105.401
Lithuania	78.410	165.279	292.879	497.275	627.952
Latvia	22.160	75.089	145.308	139.859	203.906
Ireland	50.904	96.950	124.852	191.539	209.843
Germany	1.629.400	2.394.916	3.178.930	3.703.583	4.402.801
Finland	88.399	132.789	254.894	414.277	520.245
Estonia	60.342	58.165	138.391	95.522	147.978
Denmark	995.251	1.019.987	1.268.899	1.757.573	2.781.388
Croatia	62.326	76.734	65.509	122.446	204.071
Cyprus	19.253	44.913	34.924	56.685	80.620
Czech Republic	45.868	89.912	142.162	222.281	339.443
Belgium	950.726	1.165.354	1.273.068	1.533.832	1.833.219
Austria	103.367	157.245	234.761	310.852	398.899
Slovakia	18.876	28.538	47.943	59.301	79.128
TOTAL	16.511.893	21.289.953	26.210.869	36.388.802	46.262.814

Source: Edited by the authors based on ITC data

Compared to Romania, Bulgaria registers a much lower value of imports, Bulgaria having a fish potential approximately similar to that of Romania. In Bulgaria, imports are at low values compared to Romania's imports because they manage to cover consumption from domestic production and keep imports at low values, but also in light of the fact that the number of inhabitants in Bulgaria is almost half of the number of inhabitants in Romania.

In first place, in terms of imports of fish, crustaceans, molluscs and other aquatic invertebrates, is Spain, a country with a tradition of consuming fish and other derivatives, registering a 77% increase in imports in 2022 vs. 2003. In second place is France, with a difference of 1,011,319 (euro thousand) compared to the first place, the value of imports being influenced by the large number of inhabitants and the fact that the French people are a large consumer of fish and fish products, imports registering a 243% increase in the period 2003-2022. The third place is occupied by Italy, a country with a delay in terms of the consumption of fish and fish products, registering an increase in imports in the period 2003-2022 of approximately 231%.

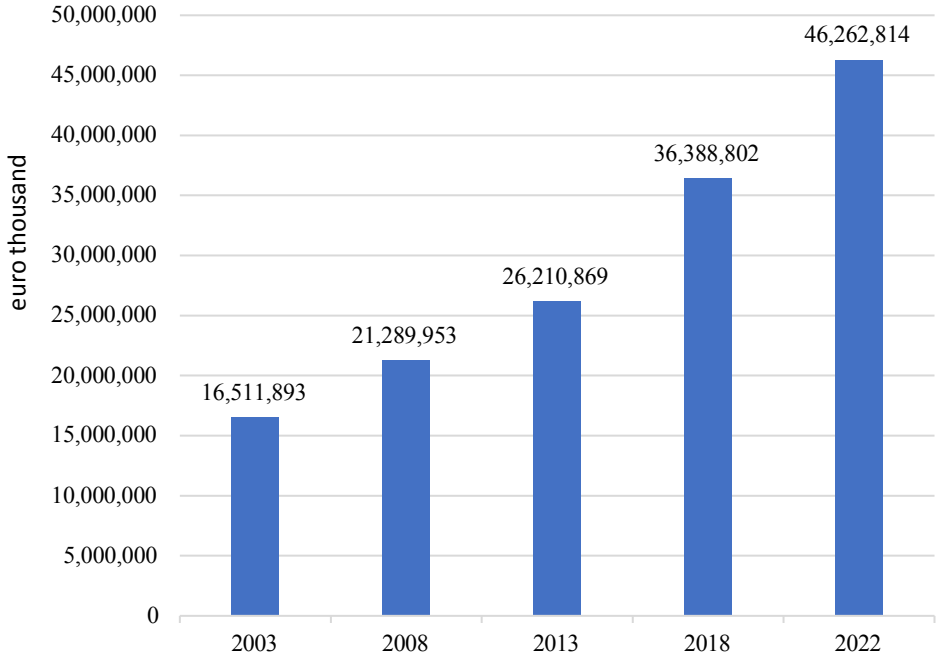

Figure 4. Imports of fish and crustaceans, molluscs and other aquatic invertebrates at the level of European Union (euro thousand)
Source: Edited by the authors based on ITC data

The total imports of fish, crustaceans, molluscs and other aquatic invertebrates at the level of the European Union (Figure 4) register an increase in 2022 by 280% compared to 2003. Mainly, according to the studies carried out, the increase in imports was largely influenced by the demand for these products on the community market.

3.2 Exports of fish and crustaceans, molluscs and other aquatic invertebrates

In Romania, the value of fish exports and fish products are continuously increasing in the period 2003-2022. It can be seen in the table above that in 2022, the export of fish, crustaceans, molluscs and other aquatic invertebrates reached a value approximately 16 times higher than the same period of 2022, this situation being mainly generated by the lack of domestic sales markets and a precarious legislation in this field, something that led to the valorization of the products on the markets of the European Union and beyond.

Table 2. Export of fish and crustaceans, molluscs and other aquatic invertebrates in European Union (euro thousand)

	2003	2008	2013	2018	2022
Romania	2.196	4.546	14.412	20.545	35.907
Spain	1.595.476	1.814.621	2.202.980	3.161.265	4.075.999
Italy	292.640	370.113	342.484	428.350	523.093
Greece	290.175	454.507	549.804	659.810	916.041
Bulgaria	7.267	12.404	22.383	35.309	44.044
France	944.903	1.080.243	1.119.761	1.261.747	1.686.710
Portugal	241.145	468.449	584.407	903.735	963.968
Sweden	529.210	1.170.457	2.564.028	3.968.274	4.928.749
Hungary	5.816	3.658	15.963	27.007	18.186
Netherlands	1.287.255	1.604.847	2.129.048	2.957.522	4.152.232
Slovenia	998	4.403	2.983	10.254	23.560
Poland	153.707	534.068	964.081	1.564.447	2.177.699
Malta	32.018	94.323	103.553	25.1106	27.2599
Luxemburg	5.985	10.170	9.626	12.373	14.139
Lithuania	55.199	87.769	248.133	455.402	547.135
Latvia	17.668	58.114	115.579	120.146	136.497
Ireland	324.974	287.380	439.579	509.119	558.027
Germany	497.287	940.804	1.206.514	1.500.249	1.604.204
Finland	9.408	24.201	41.071	169.810	273.387
Estonia	73.316	63.242	166.506	109.747	165.684
Denmark	1.593.520	1.606.939	1.847.811	2.420.517	3.447.545
Croatia	85.619	84.122	106.649	170.882	263.994
Cyprus	3.928	29.111	24.490	31.753	34.012
Czech Republic	36.773	49.573	90.084	134.709	204.692
Belgium	526.741	677.746	624.552	723.689	915.126
Austria	1.981	7.385	19.830	49.133	91.399
Slovakia	2.397	4.030	12.267	6.914	9.432
TOTAL	8.617.602	11.547.225	15.568.578	21.663.814	28.084.060

Source: Edited by the authors based on ITC data

Bulgaria, a country with an outlet to the Black Sea (an opening of approximately 354 km), the southern neighbor of Romania (with an opening of approximately 245 km), in 2022 exported approximately 6 times more than in 2003, the balance deficit trade in fish, crustaceans, molluscs and other aquatic invertebrates remaining at low values compared to Romania's trade balance in this sector, taking into account that from an operational point of view both countries have approximately the same production potential.

In 2022, from a value point of view, Sweden recorded the highest export value of fish, crustaceans, molluscs and other aquatic invertebrates, this being followed in the ranking by the Netherlands with a difference of 776,517 (euro thousand), Spain with a difference of 852,750 (euro thousand), Denmark with a difference of the first place of 1,481,204 (euro thousand). In the tenth place in terms of exports is Poland, with an export value of fish, crustaceans, molluscs and other aquatic invertebrates in the year 2022 in the amount of 2,177,699 (euro thousand), a country with a history in terms of fishing and with a hydrographic network rich in lakes, rivers, etc.

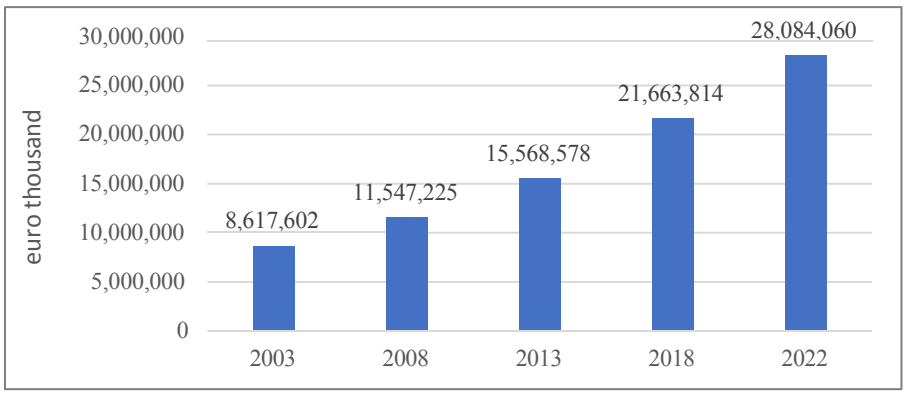

Figure 5. Exports of fish and crustaceans, molluscs and other aquatic invertebrates at the level of European Union (euro thousand)
Source: Edited by the authors based on ITC data

Total exports at the EU level (Figure 5) registered an increase of 326% in 2022 compared to 2003, an increase generated mainly by the development of the fishing sector through investments and the development of policies that facilitated the development of the sector. On the European level, a lot of emphasis is placed on the consumption of fish and seafood, being a source of food rich in nutrients and accessible to the consumer. Fish and seafood being a very important link in achieving food security at the EU level, because managed correctly, this resource can be inexhaustible. According to the European Council, an average of 24.4 kg/year of fish and seafood is consumed per capita in Europe, 75% of the fish and seafood consumed comes from wild fishing. As can be seen, the exports of fish and seafood from the 27 member states in the period 2003-2022 were analyzed below in value units, analyzing 5 periods of interest.

3.3 Trade balance of fish and crustaceans, molluscs and other aquatic invertebrates in European Union

Romania's trade balance of fish, crustaceans, molluscs and other aquatic invertebrates throughout the analyzed period 2003-2022 suffers from a continuous value deficit, so that from a deficit of only 30,482 euro thousand in 2003 to a deficit of 275,775 euro thousand in the year 2022. In Romania, after the year 2000, the consumption of fish per inhabitant started to increase and the offer on the domestic market of fish and fish products to be very low and poorly diversified, Romania looking throughout this period at the degradation of the sector fishing, the lack of investments and clear and concise policies in this field have made fishing no longer profitable among economic operators. The lack of profit caused most of the

companies that were active in this field to close, thus the domestic production of fish, molluscs and other aquatic invertebrates dropped drastically.

Table 3. Trade balance of fish and crustaceans, molluscs and other aquatic invertebrates in European Union (euro thousand)

	2003	2008	2013	2018	2022
Romania	-30.482	-93.995	-98.306	-186.911	-275.775
Spain	-2.493.844	-2.535.757	-1.839.954	-3.025.426	-3.159.963
Italy	-2.197.547	-2.456.661	-2.845.230	-4.193.938	-5.228.782
Greece	-2.424	54.496	260.756	198.304	294.274
Bulgaria	-6.109	-22.375	-28.445	-50.626	-80.235
France	-1.618.216	-1.927.266	-2.676.652	-3.471.465	-4.537.933
Portugal	-699.217	-813.688	-685.807	-1.190.339	-1.338.481
Sweden	-207.230	-450.864	-520.843	-438.545	-550.416
Hungary	-12.344	-22.238	-13.940	-35.755	-53.766
Netherlands	438.254	360.340	482.718	864.430	1.085.890
Slovenia	-21.246	-32.885	-35.983	-58.132	-67.958
Poland	-126.125	-220.049	-372.603	-453.325	-706.360
Malta	15.420	44.284	50.009	101.980	110.372
Luxemburg	-36.710	-40.615	-58.556	-82.285	-91.262
Lithuania	-23.211	-77.510	-44.746	-41.873	-80.817
Latvia	-4.492	-16.975	-29.729	-19.713	-67.409
Ireland	274.070	190.430	314.727	317.580	348.184
Germany	-1.132.113	-1.454.112	-1.972.416	-2.203.334	-2.798.597
Finland	-78.991	-108.588	-213.823	-244.467	-246.858
Estonia	12.974	5.077	28.115	14.225	17.706
Denmark	598.269	586.952	578.912	662.944	666.157
Croatia	23.293	7.388	41.140	48.436	59.923
Cyprus	-15.325	-15.802	-10.434	-24.932	-46.608
Czech Republic	-9.095	-40.339	-52.078	-87.572	-134.751
Belgium	-423.985	-487.608	-648.516	-810.143	-918.093
Austria	-101.386	-149.860	-214.931	-261.719	-307.500
Slovakia	-16.479	-24.508	-35.676	-52.387	-69.696
TOTAL	-7.894.291	-9.742.728	-10.642.291	-14.724.988	-18.178.754

Source: Edited by the authors based on ITC data

Bulgaria registers a trade balance deficit approximately three times smaller than that of Romania, Romania's neighbor managing to cover a good part of its fish consumption from domestic production.

At the EU level, out of a total of 27 countries, only 7 countries register a trade surplus in this sector, they manage to register a trade surplus over the entire analyzed period, namely: the Netherlands, Croatia, Denmark, Estonia, Ireland, Malta and Greece. The state with the largest surplus in the trade balance is the Netherlands (Netherlands), with a surplus of approximately 1.1 thousand euros in 2022, managing to export a significant number of fish and fish products on the community and world market, the Netherlands having a diversified hydrography, rich in rivers, lakes, deltas, this also having an exit to the North Sea. Denmark is in second place, with a trade balance surplus of 666,157 thousand euros in 2022, this registering an increase in the trade balance surplus of 11% in 2022 vs. 2003. In third place is Ireland, recording an increase in the surplus of the Community balance of 27% in 2022 compared to 2003. In fourth place is Greece, a country with a tradition in this field and with a tourism that promotes the consumption of fish, crustaceans, molluscs and other aquatic invertebrates, the value of the surplus of the trade balance being 294,274 thousand euros in 2022, the trade balance which at the end of 2003 recorded a deficit of -2,424.

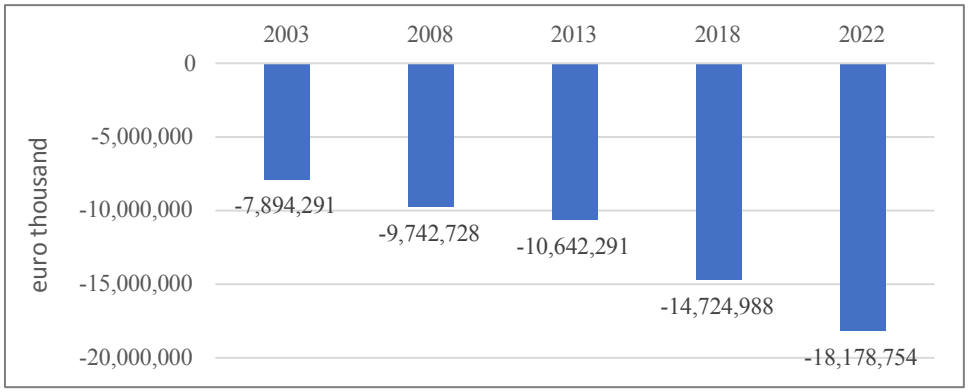

Figure 6. Trade balance of fish and crustaceans, molluscs and other aquatic invertebrates at the level of European Union (euro thousand)
Source: Edited by the authors based on ITC data

At EU 27 level, the trade balance in fish, crustaceans, molluscs and other aquatic invertebrates (Figure 6) is in deficit in all the analyzed years, in the period 2003-2022 the trade balance deficit in this sector it has almost tripled, a fact that shows that most states in the European Union imported a significant number of fish, crustaceans, molluscs and other aquatic invertebrates.

Conclusions

In the analyzed period (from 2010 to 2021) can be observed a decrease by almost 10% in European Union's production of fish and seafood, in 2021 the production being estimated at 5,317 thousand tons.

From 2.500 documents that contain "fish market" extracted and analyzed using VOSviewer software, it turns out that the most common topics linked with this are aquaculture, fisheries, seafood, and consumption. We found out also that import quantity of articles, journals, books and other documents were published by American researchers, in cooperation with authors from India, Scotland and Spain.

The total value of imports of fish, crustaceans, molluscs and other aquatic invertebrates at the level of the European Union register an increase in 2022 by 280% compared to 2003

while the total value of exports at the EU level registered an increase of 326% in the same period.
Only 7 out of the total number of countries members of European Union present a positive trade balance of fish and crustaceans, molluscs and other aquatic invertebrates in 2022.

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