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THE STATE OF THE FISH INDUSTRY IN THE WORLD AND IN UKRAINE: DEVELOPMENT TRENDS AND GLOBAL CHALLENGES

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Food systems that use aquatic bioresources are increasingly in the spotlight because they can meet a significant proportion of humanity's nutritional and healthy food needs. It is a physically and financially accessible source of animal protein and trace elements.

The production and distribution of food products from aquatic bioresources is a process not without problems. It is impossible and/or insufficient to take into account serious long-term negative impacts on the fishing industry in strategies for creating healthy, sustainable and fair food systems, especially since Ukraine occupies an important place in the global food chain.

But the prioritization of the development of fisheries and aquaculture today is reflected in the development and implementation of new strategies and policies at the global, regional and national levels, in legislation on reforming food systems.

Climate change and the resulting environmental problems, the loss of biodiversity in natural ecosystems, the consequences of the COVID-19 pandemic, crises and other humanitarian emergencies, and the war in Ukraine pose additional challenges to the global economy.

A better understanding of the impacts of climate change and other natural and anthropogenic shocks may provide opportunities to secure food systems that use aquatic bioresources.

According to FAO forecasts, with proper support of the system of production of food products from aquatic bioresources, using the concept of “blue” transformation, it is possible to ensure a twenty-five percent increase in the consumption of products from aquatic bioresources per capita by 2050 on the basis of sustainability.

Keywords: aquatic bioresources, aquaculture, food security, food chain, “blue” transformation.

Introduction. The climate change and the resulting environmental problems, the loss of biodiversity in natural ecosystems, pose additional challenges to the global economy. There are the destruction of jobs, threats to the environment and food security. These problems have deepened over the past few years as a result of the COVID-19 pandemic, crises and other humanitarian emergencies, as well as the full-scale military invasion of russian troops on the territory of Ukraine. It should be noted that Ukraine occupies an important place in the world food chain.

Today, more than 810 million of the world's population suffer from hunger, and more than 3 billion do not have the opportunity to have healthy food [1]. Therefore, according to the experts of the Food and Agricultural Organization of the United Nations (FAO), the requirements for reformatting of agro-food systems in order to provide the world's population with affordable healthy, high-quality and safe food, to create food security under the condition of preserving natural resources and sources of livelihood, are ripe right now.

Products from aquatic bioresources are important products that ensure food security. It is a source of protein, omega-3 fatty acids and bioavailable trace elements. According to FAO forecasts, for the first time world aquaculture production will equal the volume of aquatic bioresources caught in 2023 [2].

Giving priority to the development of the fisheries and aquaculture industry today is reflected in the development and implementation of new strategies and policies at the regional and national levels, legislative acts on reforming food systems. Among them, the Concept of “blue” transformation, which was proposed in February 2021 at the thirty-fourth session of the FAO Committee on Fisheries and it is aimed at the sustainable expansion and development of food systems of food products from aquatic bioresources and providing the population with financially and physically accessible healthy nutrition, solving the issue population employment.

At the same time, with the implementation of conceptual approaches in solving problematic issues, the world community announced some actions as Decade of actions to achieve the Global Goals, Decade dedicated to ocean science for sustainable development, Decade of ecosystem restoration. In addition, FAO has declared 2022 as the International Year of Artisanal Fisheries and Aquaculture.

Over the past 5 years, Ukraine has observed a trend towards a decrease in the catch of aquatic biological resources, a decrease in the production of its own fish products, a decrease in the level of consumption of fish products per capita with a simultaneous increase in the import dependence of the market, which indicates the absence of a system of sustainable development and insufficient financial support for the fisheries in Ukraine. Regulated procedures, outdated legal framework, lack of equal, transparent and non-discretionary access to aquatic biological resources inhibit the development of the industry and do not contribute to improving its investment attractiveness. Global uncertainties (upheavals) caused by natural and anthropogenic phenomena only exacerbate these problems.

Materials and methods. The research was based on the learning of global reports and statistical data of the Food and Agriculture Organization of the United Nations, analysis of the state of the fisheries industry, which was carried out with the support of projects of European institutions, national and regional reports.

Results and discussions. Food systems that use aquatic bio-resources are increasingly in the spotlight as they can meet a significant proportion of human needs for nutritious and healthy food.

Food products from aquatic bioresources are a physically and financially accessible source of animal proteins and microelements; it plays a vital role in ensuring food security for the population, including its especially vulnerable segments.

Fisheries and aquaculture already provide 58.5 million jobs and income for 600 million people. Trade in products from aquatic bioresources is an important source of hard currency and income for countries and regions that export it.

Today, the contribution of global fisheries and aquaculture to food security and human nutrition is of increasing importance. To maintain this state of the industry in the future, it is necessary to change policies, management systems, use innovative approaches and attract investments. All this will contribute to the sustainable development of the industry.

The volume of world markets in 2020 was about 178 million tons of aquatic biological resources, which consisted of 51 percent of industrial fisheries products (90 million tons) and 49 percent of aquaculture products (88 million tons). This is slightly lower than its maximum value of 179 million tons, which was registered in 2018 (Fig. 1, Table 1).

One hundred and twelve million tons (63 % of the total production) were harvested from marine waters, with 70 % from industrial fisheries and 30 per-

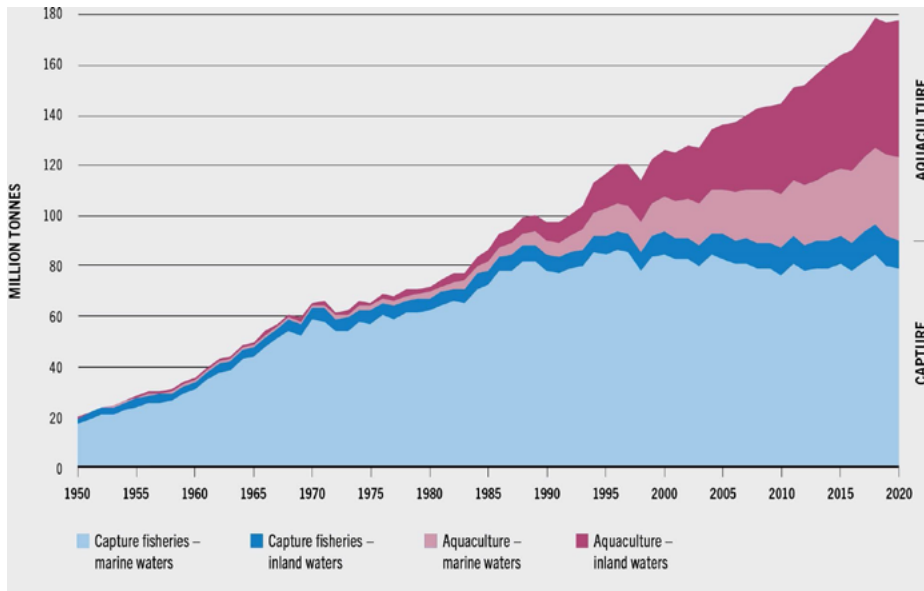


Fig. 1. World capture fisheries and aquaculture production [1]

cent from aquaculture. 66 million tons (37 percent) were harvested from inland waters, of which 83 percent are aquaculture products and 17 percent are industrial fisheries products. The total value of world production amounted to about \$406 billion, of which industrial fisheries production – \$141 billion, aquaculture products – \$265 billion.

Table 1. The world fisheries and aquaculture production, utilization and trade [1]

Country or territory	Production (average per year)				Production				Percentage of total, 2020
	1980s	1990s	2000s	2010s	2017	2018	2019	2020	
	<i>(million tonnes, live weight)</i>								
China	3.82	9.96	12.43	13.24	13.19	12.68	12.15	11.77	15
Indonesia	1.74	3.03	4.37	5.98	6.56	6.71	6.56	6.43	8
Peru (total)	4.14	8.10	8.07	5.13	4.13	7.15	4.80	5.61	7
<i>Peru (excluding anchoveta)</i>	<i>2.50</i>	<i>2.54</i>	<i>0.95</i>	<i>1.01</i>	<i>0.83</i>	<i>0.96</i>	<i>1.29</i>	<i>1.22</i>	
Russian Federation	1.51	4.72	3.20	4.28	4.59	4.84	4.72	4.79	6
United States of America	4.53	5.15	4.75	4.89	5.01	4.77	4.81	4.23	5
India	1.69	2.60	2.95	3.55	3.94	3.62	3.67	3.71	5
Viet Nam	0.53	0.94	1.72	2.70	3.15	3.19	3.29	3.27	4
Japan	10.59	6.72	4.41	3.48	3.19	3.26	3.16	3.13	4
Norway	2.21	2.43	2.52	2.30	2.39	2.49	2.31	2.45	3
Chile (total)	4.52	5.95	4.02	2.16	1.92	2.12	1.98	1.77	2
<i>Chile (excluding anchoveta)</i>	<i>4.00</i>	<i>4.45</i>	<i>2.75</i>	<i>1.40</i>	<i>1.29</i>	<i>1.27</i>	<i>1.23</i>	<i>1.27</i>	
Philippines	1.32	1.68	2.10	1.92	1.72	1.65	1.67	1.76	2
Thailand	2.08	2.70	2.38	1.46	1.30	1.39	1.41	1.52	2
Malaysia	0.76	1.08	1.31	1.46	1.47	1.45	1.46	1.38	2
Republic of Korea	2.18	2.25	1.78	1.56	1.35	1.39	1.41	1.36	2
Morocco	0.46	0.68	0.97	1.28	1.36	1.36	1.44	1.36	2
Mexico	1.21	1.18	1.31	1.42	1.46	1.47	1.42	1.35	2
Iceland	1.43	1.67	1.66	1.20	1.18	1.26	1.04	1.02	1
Myanmar	0.50	0.61	1.10	1.15	1.27	1.15	1.06	1.01	1
Argentina	0.41	0.99	0.94	0.79	0.81	0.82	0.80	0.82	1
Spain	1.21	1.13	0.92	0.96	0.94	0.93	0.88	0.80	1
Oman	0.11	0.12	0.15	0.29	0.35	0.55	0.58	0.79	1
Denmark	1.86	1.71	1.05	0.73	0.90	0.79	0.63	0.73	1
Canada	1.41	1.09	1.01	0.83	0.81	0.81	0.75	0.71	1
Iran (Islamic Republic of)	0.11	0.23	0.31	0.55	0.69	0.72	0.73	0.70	1
Bangladesh	0.18	0.28	0.46	0.61	0.64	0.65	0.66	0.67	1
Total 25 major producers	50.49	66.99	65.87	63.90	64.32	67.23	63.41	63.17	80
Total all other producers	21.61	14.86	15.72	15.89	17.16	17.27	16.69	15.62	20
World total	72.10	81.86	81.59	79.79	81.48	84.51	80.09	78.79	100

More than 157 million tons (89 percent) of harvested aquatic biological resources have been used in the global food chain to ensure food security. And only 20 million tons of bioresources were used for the production of non-food products, including fishmeal and fish oil (Fig. 2).

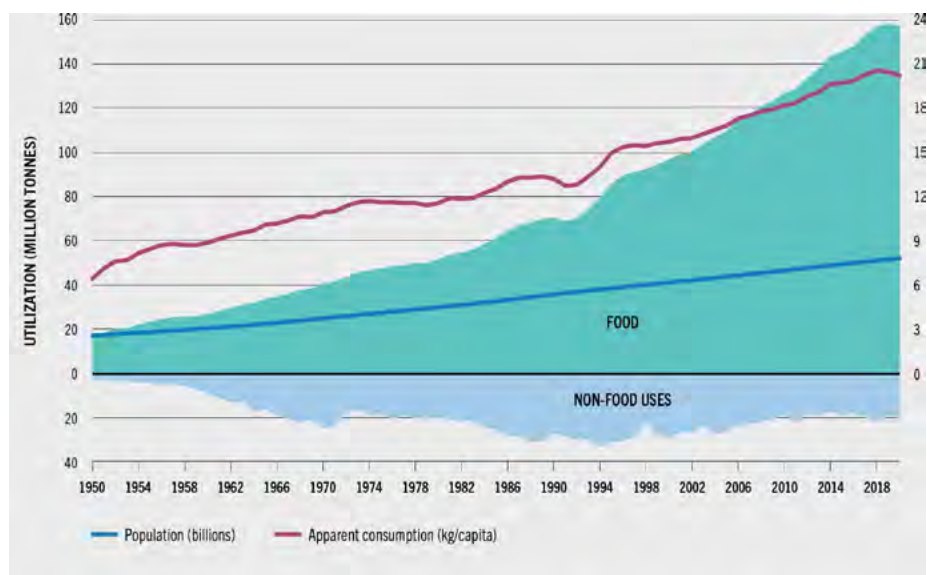


Fig. 2. The world fisheries and aquaculture production, utilization and apparent [1]

An analyzing of the volume of the world market for the consumption of food products from aquatic biological resources over the past fifty years, starting from the 70s of the last century and before the onset of the pandemic, we can note a steady increase in consumption, on average, up to 3 percent per year. During the same period, the world's annual population growth rate was almost half that, averaging about 1.6 percent per year. Consumption of food products from aquatic bioresources per capita grew by about 1.4 percent per year and increased from 9.0 kg (in the early 70s) to 20.5 kg (2019). In 2020, there was a slight decrease in this indicator, although the overall trend has not changed. The growth in the consumption of food products from aquatic biological resources per capita in recent decades is explained by the increased supply of these products, changes in consumer preferences and growth in incomes of the population, the introduction of innovations and new technologies.

Food products from aquatic biological resources are one of the most sought-after groups of food products in the world: in 2020 more than 225 states and territories had traded in fish and aquaculture products.

The volume of the world exports of fish products in 2020 amounted about 60 million tons worth \$151 billion) (Table 1). This is lower than the highest recorded in 2018 – 67 million tons (\$165 billion). Over the entire period have analyzed (1976–2020), the growth in the value of exported fish and aquaculture products was observed from 6.9 to 3.9 percent per year (adjusted for inflation).

Over the past 70 years, the total production of fisheries and aquaculture (excluding algae), as noted above, has grown significantly: from 19 million tons in 1950 to a maximum value of this indicator in 2018 – about 179 million tons. In 2019, production decreased by 1 percent compared to 2018, and in 2020 it slightly increased again and reached 178 million tons.

A slight drop in the industry over the past two years have due to a number of reasons, including the deterioration in the industrial fishing sector, the reduction in recent years of catches in China, the world leader in this industry, COVID-19 pandemic (early 2020).

However, over the same two years, the growth in aquaculture production continued, which ensured the growth of the total volume of the fisheries and aquaculture industry over the entire analyzed period, especially since the late 1980s. Although this happened with some fluctuations and even with a slowdown (up to more than 3 percent).

The slowdown in the growth of aquaculture production is also due to a number of factors. Among them are changes in industry development policies aimed at protecting the environment, sanitary measures and restrictions related to COVID-19, which also affected on the production for export markets and reduced access to labor, related materials and inputs (feed, planting material), there were violations of logistics, transport and trade links.

However, with the development of aquaculture in the past few decades, inland production has also increased. And, while during the 1950s–1980s, the share of fisheries and aquaculture production produced in inland waters remained relatively stable (about 12 percent), in the next few decades it increased significantly (in the 1990s – 18 percent, in the 2000s – 28 percent, and in the 2010s – 34 percent).

However, the main source of production and the main method of production of certain species remains industrial fisheries in marine waters. For several decades, the volume of marine industrial fisheries has steadily increased, and since the late 1980s has remained stable at about 80 million tons, although with slight fluctuations within 3–4 million tons per year.

The general trend of the industry and the total production of fisheries and aquaculture have increased significantly over the past few decades on all continents (Fig. 3).

But there are significant differences between continents, regions and countries. For example, in 2020, most products were produced in Asian countries.

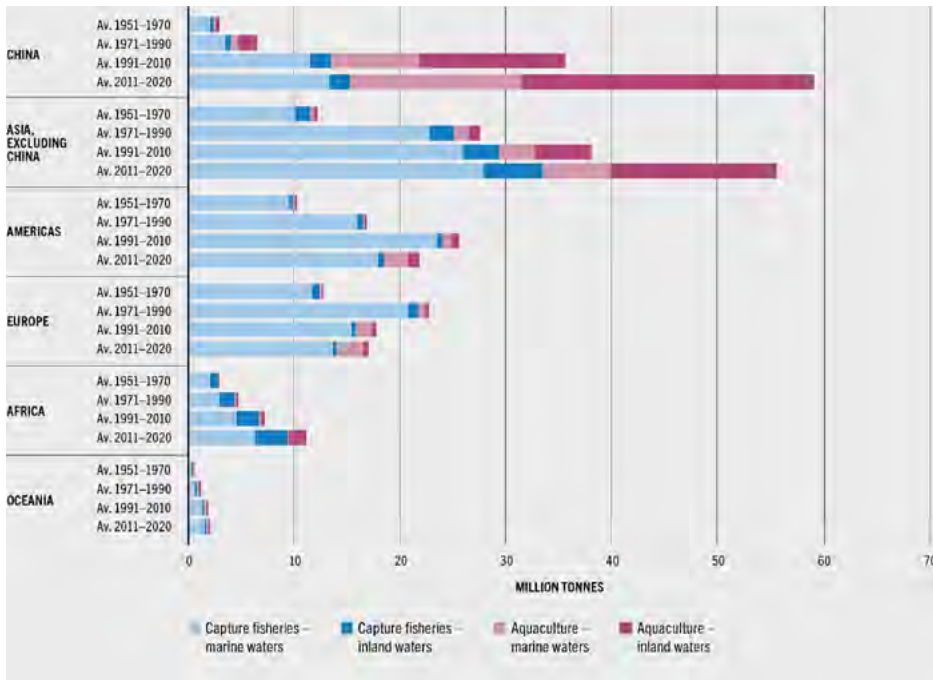


Fig. 3. Region's distribution of the global production of capture fisheries and aquaculture products [1]

They accounted about 70 percent of total fisheries and aquaculture production. Then there are the countries of North and South America (12 percent), Europe (10 percent), Africa (7 percent) and Oceania (1 percent).

In Europe, the volume of fisheries and aquaculture production has been gradually declining since the late 1980s, then growing at a modest pace for several years. Having reached a maximum in 2018, it began to decline again. In the Americas, volume peaked in the mid-1990s and then rose and fell several times. In Africa and Asia, this figure has almost doubled over the past 20 years.

In 2020, five countries accounted for about 58 percent of aquatic bioresources harvested from the global fisheries and aquaculture sector. China remained in first place in terms of production volume (35 percent of the total); it was followed by India (8 percent), Indonesia (7 percent), Viet Nam (5 percent) and Peru (3 percent).

Production volumes vary considerably between the various major fishing areas. This depends on various factors, including the level of development of the countries surrounding these areas, fisheries and aquaculture management measures in place, the amount of illegal and unregulated fishing, the status of fish stocks, the availability and quality of inland waters, and the species composition of the organisms harvested.

A large number of different fish species are caught each year, with numbers and species composition varying by region. Moreover, for example, in 2020, the volumes of aquatic biological resources caught in marine areas slightly exceeded the volumes of freshwater fish caught.

As noted earlier, China is the leader in the production of products from aquatic bioresources and retains the first place in the production of industrial fish products (Fig. 4). In 2020, it accounted for almost 15 percent of the catch, more than the countries, which are on the second and the third positions combined.

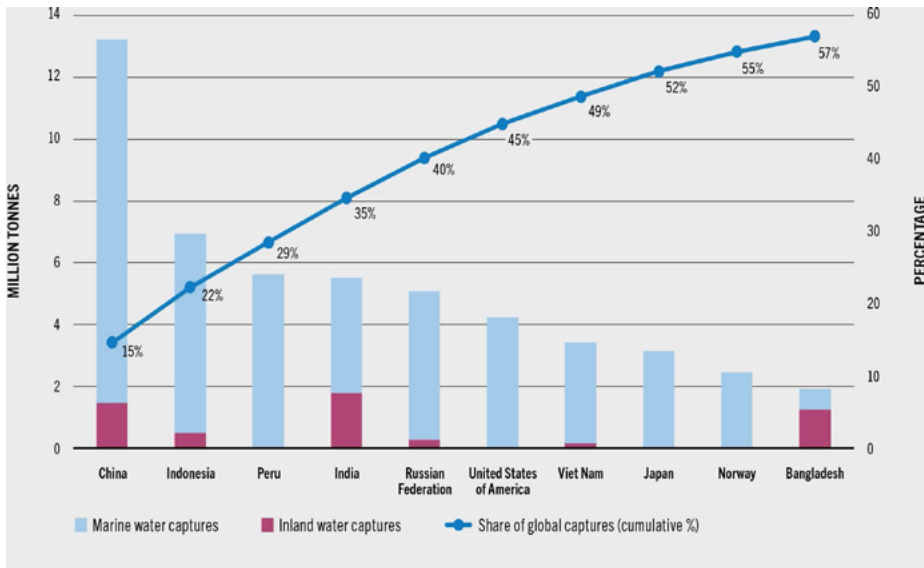


Fig. 4. TOP-10 countries with the highest production volume capture producers, 2020 [1]

The top seven manufacturers of industrial fishery products (China, Peru, the Russian Federation and the United States of America, Vietnam, Indonesia, and the United States of America) supplied almost 49 percent of their products to world markets, while the top 20 producers accounted for over 73 percent (Table 2).

Over the past ten years, several factors have negatively affected the development of the industry. The first major challenge for the worldwide industry was the pandemic COVID-19, which had an unprecedented impact. There has been a change and a decrease in consumer demand, disruption of logistics and trade chains, which were caused by failures associated with the tightening of measures. Failures were observed, both in production and in control, in order to prevent the spread of the virus: the closure of markets, shops, restrictions on movement, requirements to maintain certain physical distances, and others. The closure of retail facilities led to a decrease in consumer demand for fish

products and, as a result, a decrease in prices for it. Many business entities involved in the industry have had to suspend or reduce their activities. Difficulties in marketing products (listed above, plus increased transport costs) have reduced the production of fishery and aquaculture products for export compared to the production of products for the domestic consumer market, and increased feed costs.

Table 2. The major producing countries and territories in marine capture production

Country or territory	Production (average per year)				Production				Percentage of total, 2020
	1980s	1990s	2000s	2010s	2017	2018	2019	2020	
	<i>(million tonnes, live weight)</i>								
China	3.82	9.96	12.43	13.24	13.19	12.68	12.15	11.77	15
Indonesia	1.74	3.03	4.37	5.98	6.56	6.71	6.56	6.43	8
Peru (total)	4.14	8.10	8.07	5.13	4.13	7.15	4.80	5.61	7
<i>Peru (excluding anchoveta)</i>	2.50	2.54	0.95	1.01	0.83	0.96	1.29	1.22	
Russian Federation	1.51	4.72	3.20	4.28	4.59	4.84	4.72	4.79	6
United States of America	4.53	5.15	4.75	4.89	5.01	4.77	4.81	4.23	5
India	1.69	2.60	2.95	3.55	3.94	3.62	3.67	3.71	5
Viet Nam	0.53	0.94	1.72	2.70	3.15	3.19	3.29	3.27	4
Japan	10.59	6.72	4.41	3.48	3.19	3.26	3.16	3.13	4
Norway	2.21	2.43	2.52	2.30	2.39	2.49	2.31	2.45	3
Chile (total)	4.52	5.95	4.02	2.16	1.92	2.12	1.98	1.77	2
<i>Chile (excluding anchoveta)</i>	4.00	4.45	2.75	1.40	1.29	1.27	1.23	1.27	
Philippines	1.32	1.68	2.10	1.92	1.72	1.65	1.67	1.76	2
Thailand	2.08	2.70	2.38	1.46	1.30	1.39	1.41	1.52	2
Malaysia	0.76	1.08	1.31	1.46	1.47	1.45	1.46	1.38	2
Republic of Korea	2.18	2.25	1.78	1.56	1.35	1.39	1.41	1.36	2
Morocco	0.46	0.68	0.97	1.28	1.36	1.36	1.44	1.36	2
Mexico	1.21	1.18	1.31	1.42	1.46	1.47	1.42	1.35	2
Iceland	1.43	1.67	1.66	1.20	1.18	1.26	1.04	1.02	1
Myanmar	0.50	0.61	1.10	1.15	1.27	1.15	1.06	1.01	1
Argentina	0.41	0.99	0.94	0.79	0.81	0.82	0.80	0.82	1
Spain	1.21	1.13	0.92	0.96	0.94	0.93	0.88	0.80	1
Oman	0.11	0.12	0.15	0.29	0.35	0.55	0.58	0.79	1
Denmark	1.86	1.71	1.05	0.73	0.90	0.79	0.63	0.73	1
Canada	1.41	1.09	1.01	0.83	0.81	0.81	0.75	0.71	1
Iran (Islamic Republic of)	0.11	0.23	0.31	0.55	0.69	0.72	0.73	0.70	1
Bangladesh	0.18	0.28	0.46	0.61	0.64	0.65	0.66	0.67	1
Total 25 major producers	50.49	66.99	65.87	63.90	64.32	67.23	63.41	63.17	80
Total all other producers	21.61	14.86	15.72	15.89	17.16	17.27	16.69	15.62	20
World total	72.10	81.86	81.59	79.79	81.48	84.51	80.09	78.79	100

At the end of 2019 and the beginning of 2020 such challenges for the industry were especially tangible at the initial stage of the pandemic, when society was not ready for it.

The consequences caused by the pandemic have affected the development of the industry unevenly in different countries and even regions. Thus, in a number of countries, in the first months, the production of fish and aquaculture products declined sharply, but after a while the industry adapted to the current situation and its condition began to improve. The reduction in production was observed in the countries of Asia, Africa, Europe and Oceania. Even in some regions of the United States of America, catches have been reduced by up to 40 per cent. This was especially noticeable in the volumes of catches of those fish species that were intended for export.

In addition, the processes of control and monitoring of the activities of business entities, both public (state) and private companies, and the collection of operational and statistical data have become more complicated.

The next factor, no less tangible that influenced the development of the industry, was the processes associated with climate change. The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) confirms that global warming is accelerating and highlights that it has already led to irreversible changes [3].

The Glasgow Climate Pact, which was adopted at the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change [4], indicates the need for long-term and rapid action to mitigate and adapt to climate change in the fisheries and aquaculture sector. It is noted that climate change affects the characteristics of aquatic ecosystems that have a significant impact on fisheries and aquaculture (temperature increase, changes in precipitation patterns and oxygen levels in the water). Aquatic ecosystems have the ability to accumulate carbon in large quantities, which creates stress factors in the regulation of fisheries and the development of aquaculture.

Climate change is challenging the fisheries and aquaculture sector in a whole new format and prompting its participants to offer integrated innovative solutions focused on technical, political and market transformations. Among the sector adaptation recommendations developed by FAO are the actions carried out as part of the Blue Transformation.

With the assistance of FAO, projects are being implemented, information systems are being developed and implemented that are focused on early warning and reduction in the number of adverse events, prompt support in extreme situations, including, for example, the creation of ocean forecasting systems to help the maritime industries [1].

Fisheries and aquaculture account for only a small proportion of the world's carbon emissions. However, there are decarbonization technologies in the sec-

tor, including the entire value chain. This is especially important for small and medium-sized businesses that operate in the aquaculture sector. However, due to the high cost of decarbonization technologies, access to and scaling up of their use is possible with the introduction of financial schemes (affordable credit), incentive measures and policies that will promote the adoption of clean technologies and the use of clean energy sources in all segments of the value chains.

It should be noted that all recent decisions on climate change issues have clearly identified the place of fisheries and aquaculture and their contribution to global adaptation and mitigation efforts relevant to the sector. However, fresh-water fisheries and aquaculture have not received enough attention in international discussions of these issues.

Another, completely unexpected and unforeseen uncertainty (challenge) in global value chains and trade appeared in early 2022 with a full-scale russian military invasion of Ukraine.

Prices for energy and inputs, including feeds, have risen. Operating expenses increased, which led to higher prices for fisheries and aquaculture products. The disruption of transport and logistics links (flight cancellations and/or re-routing) has placed additional pressure on the cargo transportation system and led to disruptions in supply chains and delivery delays.

The system of international sanctions, geopolitical changes have affected trade relations between the participants in this sector, especially large ones (United States of America, Europe, China, russian federation) and, quite objectively, will have a serious impact on the fisheries and aquaculture sector.

Before the war, the total volume of fisheries and aquaculture production in Ukraine was 87.0 thousand tons, of which 26.7 thousand tons were harvested in inland waters, 41.9 thousand tons in sea waters and 18.5 thousand tons from aquaculture facilities.

Fishing was carried out in the Black and Azov Seas within the economic zone of Ukraine. And also, partially, in the waters of the Atlantic and Pacific (Antarctic part) oceans. Only in the internal waters of the Black and Azov Seas in 2020, about 21.0 thousand tons of products were caught [5].

According to the State Fisheries Agency of Ukraine, the catch was carried out by more than 1,300 vessels, more than 4,000 thousand business entities were registered. Moreover, most of them are small and medium-sized businesses.

Consumption of fish products by the population of Ukraine is far behind the world average and is about 12–13 kg per person per year. Moreover, this is ensured mainly by importing fish products from a number of European countries (up to 31 % of products come from Norway).

The first negative trends in the industry appeared after the annexation of the Crimea in 2014, as a number of enterprises were located in the occupied territory. By 2021 the volume of catches has decreased to 74 thousand

tons, the number of specialized enterprises has decreased to 300, including due to the impossibility of auctions. Imports of fish products in 2021 amounted to 435 thousand tons compared to 13 thousand tons of exports [6].

After the start of a full-scale military invasion of russia on the territory of Ukraine, most of the berths and ports were closed due to constant risks to the activities, health and life of fishermen. Fishing in sea waters was suspended. Inland fisheries have also suffered. Today catch volumes are only about 30 percent of pre-war volumes. In the Kherson and Zaporozhe regions, which are still partially occupied, fishing has been completely suspended. Due to the ongoing hostilities, there are interruptions in the provision of fish planting material, feed, energy resources, problems with water supply, and destruction of the infrastructure of enterprises, disruption of logistics and trade chains, and difficulty in importing fish products.

According to preliminary data, as of November 1, 2022, the Ukrainian fishing industry suffered a loss of \$ 47 million losses due to the aggression of the russian federation: \$ 21.6 million losses in aquaculture and \$ 25.4 million – on industrial fishing.

According to the Ministry of Agriculture Police in 2022 industrial fisheries in the country's reservoirs due to the armed aggression of the russian federation significantly decreased compared to 2021. During 2022 only 33.8 thousand tons of aquatic biological resources were extracted by the enterprises of the fishing industry of Ukraine, which is 46 % of the corresponding indicator of 2021. As mentioned, fishing in the Azov and Black Seas was actually blocked, with the exception of certain areas within Mykolaiv and Kherson regions.

As a result, in 2022 only 10,100 tons of aquatic bioresources were extracted by industrial fishermen in fisheries water bodies and on the continental shelf of Ukraine, which is three times less than the figure of the previous year. In particular, 9.95 thousand tons of biological resources were caught in internal reservoirs (a decrease of 44 %). In the Black Sea, only 76 tons were caught (0.9 % of the 2021 figure), and in the Azov Sea, which is now fully controlled by Russia, only 24 tons were caught before the occupation (0.5 % of last year's volume).

In turn, fishing outside the jurisdiction of Ukraine in the area of the Convention on the Conservation of Antarctic Marine Living Resources was prematurely stopped due to the introduction of martial law in Ukraine, which complicated the process of replacing the crew of the vessel [7].

The occupiers continue to destroy living conditions and the number of fish, violating the long-term results of large-scale stocking and measures to protect aquatic biological resources. At the beginning of January 2023, as a result of the shelling by the russian military of the coastal part of Kherson and the water area of the Dnipro River, a mass destruction of bighead seabream was recorded. The losses calculated by the fish guards amounted to approximately UAH 390 million.

In the middle of January, as a result of a significant decrease in the water level in the Kakhovsky Reservoir, aquatic biological resources were massively killed, which is a direct risk of disruption of spring spawning in this reservoir. The decrease in water levels occurred due to damage to the Kakhovka hydroelectric power plant as a result of shelling by the Russian army. Estimated losses caused to the fishing industry amount to about UAH 107 million.

The commercial catch of marine species (cod, goby, sprat, shrimp, etc.), which accounted for a significant share of the fisheries in previous years, decreased to a minimum in 2022.

According to preliminary analyzes of experts, the costs of the industry in the first year of the war alone amounted to over \$70 million. Although this figure does not reflect the costs that the industry still expects at the post-war stage of its recovery, and losses in the form of the export component of the budget. In addition to Ukraine, the Russian military intervention has caused significant damage to other countries engaged in marine fishing in the Black Sea due to the presence of dangerous explosives and unexploded mines and other projectiles. The system of control, monitoring, and scientific research has been disrupted.

It can be assumed that the ongoing invasion and hostilities will have long-term consequences in terms of trade, prices, logistics, production, investment, economic growth and livelihoods. This war will have a serious indirect impact on food security not only in Ukraine, but also in many other countries, and will have serious consequences for the fisheries and aquaculture sector.

Such countries, as Norway, Iceland, Canada, USA, that imported fish products to Ukraine, will have to look for additional markets for their products.

As already mentioned above, fish farming is an important element of food security, including in Ukraine. However, over the years, problems have accumulated in the regulation of the industry's activities, which prevent it from realizing its full potential. The development of aquaculture in Ukraine remains weak. In particular, in contrast to world trends, the production of aquaculture products in Ukraine does not exceed commercial fishing.

But we can talk about the restoration and development of fishing in Ukraine only after the end of the war and demining of the seas and coastal areas [8].

But already today, the state policy in the field of fisheries is aimed at ensuring the creation of prerequisites for the development of the industry, the introduction of innovative methods for state management in this area, as well as the reduction of corruption risks and the simplification of business conditions for subjects of the fishery [9].

Thus, in December 2022, during a meeting of the Committee of the Verkhovna Rada of Ukraine on Agrarian and Land Policy, the draft Law of Ukraine "On Attracting Investments in the Development of Fisheries Industry" was considered.

The implementation of this draft law will allow creating new investment legislation for the development of the fishing industry, introducing mechanisms of equal access to the resource, while attracting additional funds to the market for its development. The implementation of effective and rational use of aquatic biological resources in the relevant fisheries water bodies, increase of their fish productivity, preservation of the natural environment, as well as transparency, equality and competitiveness are foreseen.

The Food and Agricultural Organization of the United Nations introduced a special term – “culture based fisheries”. It means fisheries based on aquaculture, in other words – on stocking. It is in this direction that Ukraine can act as a leader, as a country producing valuable competitive fish products [10].

Despite global trends, in Ukraine, as in other countries of the world, there is some stagnation of production in the fishing industry. There are both objective and subjective reasons for this, including those discussed in this article. But, from the experience of successful countries, it is known that each country has certain resources and potential that allow it to effectively find its niche in the aquaculture sector and successfully compete in the conditions of globalization of production.

With the aim of implementing real steps in the development of the fishing industry of Ukraine and in the field of aquaculture, improving state regulation, conservation and rational use of aquatic biological resources, the above-mentioned draft law was submitted for consideration [11].

Conclusions. On the example of the factors discussed above, the production and distribution of food products from aquatic biological resources is a process that is not without problems. Strategies for healthy, sustainable and equitable food systems cannot and/or are not sufficient to take full account of the serious long-term negative impacts on the industry.

The FAO Committee on Fisheries (COFI) Declaration on Sustainable Fisheries and Aquaculture (2021) identified priority areas for further transformation of fisheries and aquaculture and set the vision for the sector in the 21st century. The vision is to transform water-based food systems from a problem area to a source of solutions for food security and nutrition, environmental and social well-being. This transformation has been associated with a “blue” transformation, which uses existing and new knowledge, tools and practices to ensure and maximize the contribution of food systems (both marine and inland) that use aquatic bioresources to food security, nutrition and affordable healthy diets.

A better understanding of the impacts of climate change and other natural and human-induced shocks can also create opportunities to secure food systems that rely on aquatic bioresources.

In the short term, the biggest challenges are related to the COVID-19 pandemic and its aftermath, as global value chains and trade have yet to fully recover, as well as the military actions in Ukraine by the Russian Federation.

In addition, the next decade is likely to see major changes in the environment, resource availability, international trade rules and market conditions that could affect production, markets and trade in the medium term, including the fish industry.

According to FAO forecasts, with the appropriate support of the aquatic food production system, using the concept of “blue” transformation, it is possible to achieve a twenty-five percent increase in the consumption of aquatic bioresources per capita by 2050 in a sustainable manner.

СТАН РИБНОЇ ГАЛУЗІ В СВІТІ ТА УКРАЇНІ: ТЕНДЕНЦІЇ РОЗВИТКУ ТА ГЛОБАЛЬНІ ВИКЛИКИ

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Продовольчі системи, в яких використовуються водні біоресурси, все частіше опиняються в центрі уваги, оскільки вони здатні задовольнити значну частку потреб людства у поживній та здоровій їжі. Це фізично та фінансово доступне джерело тваринного білку та мікроелементів.

Виробництво та розподіл харчової продукції з водних біоресурсів – процес, не позбавлений проблем. У стратегіях створення здорових, стійких та справедливих продовольчих систем неможливо та/або не достатньо в повному обсязі враховувати серйозні довгострокові негативні впливи на рибну галузь, тим більше, що Україна посідає важливе місце у світовому харчовому ланцюжку.

Але надання пріоритетності розвитку галузі риболовства та аквакультури сьогодні знайшло відображення у розробці та впровадженні нових стратегій і політик на глобальному, регіональному та національному рівнях, у законодавчих актів щодо реформування продовольчих систем.

Зміни клімату та викликані цим екологічні проблеми, втрата біорізноманіття в природних екосистемах, наслідки пандемії COVID-19, кризи та інші надзвичайні гуманітарні ситуації, війна в Україні несуть додаткові виклики світовій економіці. Більш глибоке розуміння впливу зміни клімату та інших природних та антропогенних потрясінь може створити можливості для забезпечення безпеки продовольчих систем, в яких використовуються водні біоресурси.

За прогнозами FAO, за належної підтримки системи виробництва харчової продукції з водних біоресурсів, з використанням концепції «блакитної» трансформації, можна забезпечити двадцятип'ятивідсоткове зростання споживання продукції з водних біоресурсів на душу населення до 2050 року на засадах стійкості.

Ключові слова: водні біоресурси, аквакультура, харчова безпека, харчовий ланцюжок, «блакитна» трансформація.

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