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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

The current status and potential for the development of fishing in the Azov-Black Sea basin under conditions of mobilization economy

Mobilizasyon ekonomisi koşulları altında Azak-Karadeniz havzasında balıkçılığın mevcut durumu ve gelişme potansiyeli

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Abstract: The objective of the research is to characterize the current state of the fishery sector in the Azov-Black Sea Basin (ABSB) of the Russian Federation and to determine optimal directions for its development. An analysis was conducted of the structure of the ABSB fishery sector by main types of economic activity and the legal status of economic entities, as well as the state of the sector's production facilities and technical infrastructure. The research was performed as a case study. Optimal directions for the further development of the sector's enterprises were outlined. The imposition of restrictions on fishing in traditional areas, combined with the general technical and economic weakness of the productive forces, causes imbalances in the price and quality indicators of food products derived from ABSB hydrobionts. These factors complicate the marketing of produced food products in the fish markets of mainland Russia. Solving the tasks of modernizing and developing the material base of ABSB fishery enterprises is constrained, on the one hand, by the low profitability of capital investments, and on the other hand, by the shortage of internal financial resources within the sector's enterprises and the high cost of long-term borrowed funds. The specific characteristics of the Azov-Black Sea hydrobionts, which constitute the raw material base for the local fishing industry, create an objective necessity for their deep processing in the production of food products. This necessitates the creation of new organizational frameworks for the activities of local enterprises in this region.

Keywords: Food security, fishing industry, production potential, product quality, sustainable fisheries, fish cluster

Öz: Bu araştırmanın amacı, Rusya Federasyonu'nun Azak-Karadeniz Havzası'ndaki (ABSB) balıkçılık sektörünün mevcut durumunu değerlendirmek ve gelişimi için en uygun yönleri belirlemektir. ABSB balıkçılık sektörünün yapısı, ana ekonomik faaliyet türleri ve ekonomik kuruluşların yasal statüsü ile sektörün üretim tesisleri ve teknik altyapısının durumu açısından analiz edilmiştir. Araştırma bir vaka çalışması olarak gerçekleştirilmiştir. Sektör işletmelerinin daha da geliştirilmesi için en uygun yönler belirlenmiştir. Geleneksel bölgelerde balıkçılığa getirilen kısıtlamalar, üretici güçlerin genel teknik ve ekonomik zayıflığıyla birleşince, ABSB sucul canlılarından elde edilen gıda ürünlerinin fiyat ve kalite göstergelerinde dengesizliklere yol açmaktadır. Bu faktörler, üretilen gıda ürünlerinin Rusya anakarasındaki balık pazarlarında pazarlanmasını zorlaştırmaktadır. ABSB balıkçılık işletmelerinin maddi altyapısının modernizasyonu ve geliştirilmesi görevlerinin çözümü, bir yandan sermaye yatırımlarının düşük kârlılığı, diğer yandan sektör işletmelerindeki iç finansman kaynaklarının yetersizliği ve uzun vadeli borçlanma maliyetlerinin yüksek olması nedeniyle kısıtlanmaktadır. Yerel balıkçılık endüstrisinin hammadde kaynağını oluşturan Azak-Karadeniz su kaynaklarının kendine özgü özellikleri, gıda ürünlerinin üretiminde derinlemesine işlenmesi için nesnel bir zorunluluk yaratmaktadır. Bu durum, bölgedeki yerel işletmelerin faaliyetleri için yeni organizasyonel çerçevelerin oluşturulmasını gerektirmektedir.

Anahtar kelimeler: Gıda güvenliği, balıkçılık endüstrisi, üretim potansiyeli, ürün kalitesi, sürdürülebilir balıkçılık, balık kümesi

INTRODUCTION

Fishing organizations in the Southern Federal District (SFD) of the Russian Federation are unable to resume fishing activities for hydrobionts in the World Ocean due to the complexity of the global geopolitical and economic landscape that has developed in recent decades. An alternate supply of food items for this region can be found in the readily available fish stocks and mariculture resources from the Black Sea and Azov Sea, specifically within their coastal zones falling under the jurisdiction of the SFD.

The stock assessment models commonly employed typically utilize the growth parameters $L\infty$ (asymptotic length), K (growth coefficient), and t0 (theoretical age at zero length). However, against the backdrop of corresponding indicators for high-margin fish species, the specific consumer characteristics of products derived from local raw materials – such as small size, texture, and other attributes – diminish their competitiveness. Furthermore, the limited species diversity and overall stock volumes of commercially exploitable resources impede the scaling up of production volumes for the corresponding products.

The situation restrains the technical and economic development of the local fish processing enterprises since it complicates the promotion of their products to fish markets in other regions of the country, especially to international markets, limiting their sales to the region.

The export potential of local producers is further constrained by the requirements of the United Nations Global Compact. This framework mandates the restructuring of business operations based on the principles of corporate social responsibility (CSR), which entails increased investment in the technical modernization of production facilities. While

participation in the Compact is currently voluntary for Russian entrepreneurs, the prospect of such rising production costs has generated heightened apprehensions within the Russian business community. For instance, G. Gref, Sberbank CEO, has warned of a potential 14% decline in the income levels of the Russian population by 2035 if businesses fail to undergo ESG transformation (Gref, 2021).

Under these circumstances, the state faces at least two key tasks. The first is to supply enough high-quality food products in sufficient quantities to support a healthy lifestyle to every segment of the population at reasonable prices. The other is to set up food production in the import substitution mode, which involves using domestic internal resources preferentially to produce goods without sacrificing quality. The relevance of this topic is determined by the necessity of finding solutions to these issues.

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Although the Russian food security doctrine, approved by a special Decree of the President of the Russian Federation (Decree of the President of the Russian Federation, 2020), has significantly contributed to solving a number of problems in the fishing industry, the issues that impede the growth of fishing and the processing of hydrobionts in the Black and Azov Seas remain unresolved.

Combining regional productive forces into a single organizational structure—a fish cluster—may become a viable way to address this issue. In Murmansk and the Far East, the nation's primary hubs for the extraction and processing of aquatic organisms' raw materials, such structures have already demonstrated their efficacy (Fisenko and Saltykov, 2020). However, implementing this practice within enterprises of the Azov-Black Sea Basin necessitates significant adaptation to local conditions; this constitutes a key element of novelty in the present research.

The work of the renowned expert in development strategies, M.E. Porter, titled "Competition," is regarded as a classic in specialized literature on the subject under discussion (Porter, 2005). The idea of a "cluster", fundamental to contemporary economic science, is viewed in this work as an organizational tool for the growth and improvement of the competitiveness of businesses functioning within a particular system, including at the regional level.

Russian researchers predominantly analyze the cluster approach in theoretical terms, examining its application within the fisheries sector. This examination encompasses market promotion, environmental aspects, and aquaculture development (Alekhine and Kochemasov, 2015; Islankina et al., 2017; Kolomyts, 2018; Sirotkina and Lanskikh, 2011; Shiryakov, 2020). Within the context of the contemporary state of the Azov-Black Sea Basin's fishery sector, the cluster approach could emerge as an effective instrument for developing fishing enterprises and processing facilities under the current regional development conditions.

In the present study, the concept of food security is employed according to the formulation adopted in Decree No. 20 of the President of the Russian Federation dated January 21, 2020, "On Approval of the Food Security Doctrine of the Russian Federation": "The state of the country's socio-economic development wherein the food independence of the Russian Federation is ensured, and physical and economic accessibility of food products complying with mandatory requirements is guaranteed for every citizen of the country, in volumes not lower than the rational consumption norms necessary for an active and healthy lifestyle" (Decree of the President of the Russian Federation, 2020).

Food security indicators are being developed by Russian researchers (Belikova and Bogdanova, 2019; Nikulin et al., 2018; Zhiryaeva, 2020), who are also suggesting classification models, analytical techniques, and frameworks for monitoring Russia's situation.

In international practice, recent decades have witnessed growing interest in research and practical initiatives concerning industrial fisheries and aquaculture, which are no longer perceived solely as valuable food sources but also as significant activities for local communities.

The growing relevance of this topic has been precipitated by the fact that in countries where this economic sector has long played a significant role in national agri-food development, the fisheries sector now faces substantial challenges. These encompass environmental, economic, and geopolitical dimensions, alongside international mandates to reduce or eliminate fishing subsidies, creating an imperative for fisheries policy revision (Cheong, 2003; Kozinski Radomska et al., 2024; Saltykov and Obraztsova, 2002; Sun et al., 2024).

Among international studies concerning the fisheries economy of the Azov-Black Sea Basin, significant contributions include the studies of Knudsen (2015), O'Higgins et al. (2014) and the extensive research activities of Öztürk (2013). These scholars have examined constraints, including environmental limitations, and their impact on the Black Sea region's fishing industry. Research on catch volumes, processing, and product competitiveness in the Black Sea region, along with analyses of Black Sea aquaculture development, is presented in some studies (Massa et al., 2021; Yıldız and Karakulak, 2017; Yıldız et al. 2021; Emecan et al., 2023).

To support this sector, various programs and funds have been established, including those involving governmental institutions. For instance, the European Maritime and Fisheries Fund (EMFF) – one of five major European organizations – monitors and supports the development of fisheries and aquaculture (EMFF, 2025). Recent international research has concentrated on identifying innovative pathways and mechanisms to ensure stable seafood supplies while preserving biodiversity and integrating ecological considerations within region-specific contexts. Illustrating this

trend, studies by Chinese scholars extensively examine both the status of China's fisheries sector and its development policies, alongside the impact of modern technologies on the advancement of fisheries and aquaculture (Lin et al., 2019; Zhu et al., 2024; Zheng et al., 2021).

The study of the works of foreign scientists specializing in this issue, such as Alsaleh and Yang (2023) and Cheong (2003). Systematization of the conclusions made by them, as well as the analysis of objective data, we concluded that the state and prospects for the development of the fishing industry are determined by a range of factors, including pollution of the euphotic zone of the World Ocean, which contains up to 90% of marine biomass, conflicts of national interests in the field of food security, the depletion of stocks of world food marine bioresources and a decrease in their reproductive capacity due to the growing intensity of their extraction (which is caused by both the use of increasingly powerful fishing equipment and the egoistic features of the national policies of some countries in the areas of industrial fishing, active development of aquaculture, the consequences of the reclamation of coastal lands, etc.). These interconnected issues seriously jeopardize not only regional socioeconomic stability and human well-being but also the diversity of food sources and other resources found in the world oceans.

The scholarly interest in Russia's fishing industry has grown significantly, as demonstrated by the seminal works of Saltykov and Fisenko (2023), Saltykov and Krasova (2021), and Saltykov and Obraztsova (2019, 2022). These studies provide comprehensive analyses of industry competitiveness challenges, along with the structure and performance dynamics of the Russian Far East's fisheries economy. Particular attention has been devoted to fisheries cluster formation in research by Kiseleva and Chunina (2018), Lelyukhin (2013), and Lvov (2015), as well as in collaborative works by Saltykov and Obraztsova (2020), Saltykov and Krasova (2021) and Saltykov et al. (2022). These investigations examine the developmental potential of regional fishing-industrial clusters with explicit consideration of geographical specificities.

Previous scholarly investigations by our team have analyzed operational dynamics within Sevastopol's fisheries sector (Alesina et al., 2022a; Alesina et al., 2022b). Concurrently, regulatory approaches and cluster development strategies for Crimea's Azov-Black Sea fisheries complex were addressed in the work of Kolonchin et al. (2021). The outputs of our research have been operationally implemented in establishing subsidy allocation frameworks (cost standards) for fisheries sector initiatives by the Government of Sevastopol.

The objective of this study is to review the current state of the fishery sector within the Azov and Black Sea coastal zones that fall within Russia's Southern Federal District, and to identify optimal opportunities, development prospects, and strategic trajectories for the industry. The findings may provide a foundation for focused research across the spectrum of challenges in this domain.

MATERIALS AND METHODS

The study utilized a case study methodology to characterize the current operational status of the fishery sector within its functional context. The work was carried out by examining legislative and regulatory documents governing activities in this sphere, as well as by analyzing statistical data and other informational materials from open sources.

Data from Rosreestr, state statistics bodies for the Southern Federal District of the Russian Federation, and other sources, as well as materials from unified registers of official registration of legal entities and individual entrepreneurs specializing in this field of activity, formed the basis for the research.

The selection of data characterizing the status of specific economic entities was conducted according to the following criteria: primary economic activities; legal status; and the condition of the production and technical base.

The article employs the following specialized notations and terms established in the regulatory documents and legislation of the Russian Federation:

- ABSFB – Azov-Black Sea Fishery Basin

- ABR – Aquatic Biological Resources

- Cluster – a voluntary association of legal entities (enterprises, organizations, and institutions) specializing in one common or several related economic sectors. It is formed to achieve common goals (enhancing competitiveness, fostering innovation-driven development, and stimulating economic growth for both cluster participants and the region as a whole) without establishing a new legal entity (key regulatory instruments governing the creation and development of clusters; Federal Law No. 648, 2014; Order of the Ministry of Economic Development No. 172, 2020; Resolution of the Government of the Russian Federation No. 2410, 2020).

- Cooperative – a production cooperative is defined as a voluntary association of citizens based on membership, established for joint production or other economic activities (including production, processing, and marketing of industrial, agricultural, and other products; performing work; trade; consumer services; and provision of other services). This association is founded upon the personal labor and involvement of its members (participants) and the pooling of their property share contributions.

The law and the charter of a production cooperative may provide for the participation of legal entities in its activities. A production cooperative is a corporate commercial organization. Members of a production cooperative bear subsidiary liability for the cooperative's obligations to the extent and in the manner prescribed by the law on production cooperatives and the cooperative's charter (Civil Code of the Russian Federation, 2024, art.106.1).

- SME – Small and Medium-Sized Enterprises. This concept refers to organizations and individual entrepreneurs meeting established criteria for workforce size and annual revenue. The primary legislation governing SMEs is Federal Law No. 209-FZ of July 24, 2007, "On the Development of Small and Medium-Sized Enterprises in the Russian Federation".

- SEZ (Special Economic Zone) – a designated territory operating under a distinct regime for conducting economic activities, including preferential tax treatment and customs privileges, aimed at attracting investment and developing priority economic sectors. This framework is regulated by Federal Law No. 116-FZ of July 22, 2005, "On Special Economic Zones in the Russian Federation".

- Self-sufficiency – in this context, a component of the concept of food sovereignty, referring to a specific region's capacity to predominantly meet its own needs for staple agricultural products, raw materials, and food through domestic production within its territory (Decree of the President of the Russian Federation №20, 2020).

- SMO – a special military operation conducted by the Russian Federation, including within the Azov and Black Sea basins.

- Association (Union) – a self-regulating entity formed by legal entities and/or citizens, based on voluntary membership or, in cases prescribed by law, mandatory membership. It is established to represent and protect common (including professional) interests, achieve socially beneficial objectives, and pursue other lawful non-commercial goals—such as coordinating entrepreneurial activities (Civil Code of the Russian Federation, 2024, Article 106.1).

- Sustainable Fishing – the concept is defined in the report Our Common Future by the World Commission on Environment and Development (WCED, commonly known as the Brundtland Commission; Brundtland, 1987, Yurgens and Romov, 2023) as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

RESULTS

In terms of capture fisheries and aquaculture production volumes, the Russian Federation ranks seventh globally, representing approximately 2.5% of worldwide output. Notably, capture fisheries account for 95% of total production, while aquaculture contributes only 5%.

For several years, the development of the fishing industry demonstrated a lackluster pattern, contributing a mere 0.3% of the Russian Federation's GDP. To stimulate activity in this area, the State Program of the Russian Federation "Development of the Fisheries Complex", adopted in 2014, acknowledged the need to first raise the consumption level of fish products per capita annually to at least 25 kg, and then to increase the level of regional self-sufficiency in food products derived from hydrobionts to at least 85% (It should be noted that the concept of "self-sufficiency" encompasses gradual import substitution—the displacement of imported products by domestic Russian equivalents (Kolomyts, 2018).

The fulfillment of this task necessitates adapting proposed solutions to the specific characteristics of the resource base across various fishing regions; the condition of the technical infrastructure at relevant enterprises and the availability of sufficient financial and material resources required for optimizing the industry at the regional level.

Resource base

The fisheries industry in the Southern Federal District (SFD) currently consists predominantly of microbusinesses situated along the Azov Sea coast and partially along the Black Sea coast. These enterprises specialize in harvesting and processing locally sourced hydrobionts for human consumption. Table 1 presents recommended (permissible) catch volumes for principal commercial fish species in the Black and Azov Seas.

Table 1. Recommended catch volumes (limits) of the main commercial fish of the Azov-Black Sea basin for 2024, tons (based on data from Azov-Black Sea Territorial Administration of the Federal Agency for Fisheries [ABSTU], 2024)

Types of aquatic biological resources	Permissible production volume (limit)
Azov Sea	
Grass carp	19,207
Gobies	2342,875
European flounder	8,445
Black Sea turbot	499,392
Crucian carp	994,640
Whiting	3111,282
Common carp	176,06
Black Sea-Azov shad	204,097
Azov tyulka	11982,113
European anchovy	24032,113
Black Sea	
Red mullet	1702,918
Gobies	79,2545
Dusky grouper	23,455
European flounder	23,831
Black Sea turbot	481,764
Mullets	373,265
Bluefish	259,730
Whiting	492,110
Atlantic mackerel	2,000
Black Sea horse mackerel	2785,942
Azov tyulka	2007,000
European anchovy	14210,674
European sprat	16342,674

However, in 2022, 2023, and 2024, the established catch limits were not met. Due to circumstances objectively affecting sector enterprises, the northwestern part of the Black Sea, the zone near the entrance to the Kerch Strait, as well as fishing grounds traversed by fish migration routes during spawning runs, became inaccessible for fishing. This resulted in a sharp decline in catch volumes, reduced profitability of the fisheries sector, and created a threat of bankruptcy for many enterprises.

Structure of fisheries sector enterprises

After ocean fishing had been suspended, the characteristics of business entities operating within the ABSB fisheries sector have also changed. At the moment, the vast majority of these businesses are categorized as small-scale or even micro-entrepreneurship. Table 2 shows the structure of the regional fisheries complex by types of economic activity and the legal status of business entities.

Table 2. Characteristics of the structure of the fisheries complex of the Southern Federal District of the Russian Federation by main types of economic activity and legal status (calculated by the authors based on data from Federal Tax Service of Russia., 2025), %

Type of economic activity	Legal status					
	Legal entities			Sole proprietorship		
		Of these			Of these	
	Total registered in the Unified State Register of legal entities	Conduct operations within the designated sphere	Do not conduct operations within the designated sphere	Total registered in the Unified State Register of sole proprietorship	Conduct operations within the designated sphere	Do not conduct operations within the designated sphere
Extraction of aquatic biological resources	47.8	13.0	34.8	85.7	68.6	17.1
Processing of aquatic biological resources	8.7	8.7	-	8.6	8.6	-
Mariculture (growing oysters, mussels	13.0	8.7	4.3	-	-	-
Fish farming	28.3	17.4	10.9	2.8	2.8	-
Reproduction of aquatic biological resources	2.2	-	2.2	2.9	-	2.9
In total	100.0	47.8	52.2	100.0	80.0	20.0

Assessment of financial standing

Most fish farming businesses show positive financial results and have no budgetary debt. However, being SME entities, they are unable to independently raise the capital necessary to develop the material base of their production facilities. The insufficiency of collateral (or a high degree of depreciation) and high interest rates in local banks restrict the potential of using borrowed funds to address the renewal and development problem (according to Bank of Russia data, the key rate was 20% until July 25, 2025, and 18% from July 25, 2025; Bank of Russia, 2025). The state has established various benefits for officially registered SMEs to improve the situation. These benefits include reduced insurance premium rates, pension fund contributions, as well as some targeted measures of state support.

The data in Table 3 describe the composition of economic entities in the fishing industry of the Southern Federal District that have either tax benefits as members of the free economic zone (FEZ) or financial support from the state as part of programs for the development of meso- and micro-entrepreneurship.

Currently, six economic entities operating under preferential taxation regimes are in operation within the Southern Federal District (SFD), including four Special Economic Zones (SEZs) and two Free Economic Zones (FEZs) (FEZs; Rosstat, 2025).

The latter encompasses the full spectrum of potential activities within the fisheries industry. Nonetheless, it seems pointless to try to draw fishing associations to the SEZ, if only for the following reasons:

- Starting in 2021, the availability of tax benefits (such as lower insurance rates, etc.) for recently registered residents was made directly reliant on the amount of investments made, something that these businesses are unable to accomplish.

- The cost of diesel fuel, electricity, and other operating expenses increased by an average of 30 to 50% in 2022 and 2023; consequently, the government's support measures seem to be insufficient.

Consequently, 87.5% of all business entities with a focus on the fishing industry restricted their activities to registering with the unified register of SMEs.

Table 3. Registration as residents of the SEZ and the register of SMEs (from among business entities operating in the declared area, calculated by the authors based on data from the Federal Tax Service of Russia, 2025), %

Type of activity	SEZ residents	Registered in the unified register of SMEs			
		Total	Of these		
			micro	small	medium
Extraction of ABR	80,0	74,4	62,9	11,4	-
ABR Processing	20,0	8,6	8,6	-	-
Mariculture (growing oysters, mussels)	-	11,3	11,4	-	-
Fish farming	-	5,7	5,7	-	-
ABR reproduction	-	-	-	-	-
In total	100,0	100,0	88,6	11,4	-

The state of fixed assets in capture fisheries and hydrobiont processing sectors

Tables 2 and 3 indicate that all registered business entities fall under the micro-entrepreneurship category and that not all of them are involved in the declared business. The primary cause of this situation is the high rate of depreciation of fixed assets (Table 4), which necessitates raising expenses for both medium and major repairs as well as general operating costs.

Table 4. Average age of fishing vessels belonging to the ship owners in the Azov-Black Sea basin (compiled by the authors based on data from Russian Maritime Register of Shipping, 2025)

Types of vessels	Operating life (years)
vessels belonging to the "small fishing seiner" and "small fishing trawler" classes	34 - 48
"medium fishing freezer trawler" class of vessels	35 - 52

Since the fish resources of the Azov-Black Sea basin consist of small herring species, their marginality is significantly lower than that of fish caught in the Far Eastern or Northern basins. For this reason, local businesses limit their operations to repairing operational vessels and believe it is not profitable to expand the number of medium- and even small-tonnage fishing fleets. However, the cost of maintaining ship engines and other mechanisms is also high, which drives up the price of manufactured goods. Cooperation with leasing companies that are willing to provide capital to businesses for the establishment and growth of small fleets is futile for the same reasons.

Large fish processing plants were built in the 50s-80s of the 20th century in the industrial hubs of Novorossiysk, Temryuk, Berdyansk, and other places where the industry's productive forces were concentrated.

The production technology was originally designed for manufacturing food products from oceanic hydrobionts. Following the cessation of global ocean fisheries, the local fish processing industry shifted almost exclusively to producing food items from Azov-Black Sea raw materials – despite technological equipment wear reaching nearly 70%. Current output comprises smoked, dried, and salted fish (including spiced-cured, dry-salted, and semi-preserved products), alongside tomato-based preserves.

However, the aforementioned characteristics of traditional food products derived from Azov-Black Sea raw materials fail to meet Roskachestvo (Russian Quality System) standards (Roskachestvo, 2025) and are excluded from relevant quality ratings. Consequently, these products see negligible export volumes to foreign markets, while domestic shipments to other Russian regions remain minimal—merely 575.2 tonnes in 2024 (Federal Customs Service of Russian, 2025). This commodity group has not been subject to marketing research, necessitating that conclusions in this segment of the study rely substantially on producer assessments.

Stock assessment models typically utilize growth parameters $L\infty$ (asymptotic length), K (growth coefficient), and t0 (theoretical age at zero length). However, research has predominantly focused on commercially valuable species.

Consequently, locally produced fishery products are primarily marketed within the regional market. Despite this market's capacity expanding by 150–200% during recreational seasons, local fishers lack sufficient capital and resources to develop their businesses and advance the fisheries sector within the ABSB.

In compliance with the current legislation of the Russian Federation, all manufacturers specializing in the production of food products controlled by Rosselkhoznadzor, including those made from aquatic organisms, are required to register in the Federal State Information System "Mercury" (Ministry of Agriculture of the Russian Federation, 2015). This system controls laboratory analyses of raw materials at the place of their origin (catch), food products made from them, and all their transportation from the producer to the counter. Hence, to gain the status of a resident of the FEZ and inclusion in the register of SME entities, entities engaged in economic activity related to fishing must register in the Mercury system. These procedures are reasonably priced for small businesses: the SBIS Mercury license is 2,200 rubles, registration costs 4,000 rubles. Therefore, even for fish products produced in small batches, adequate quality control is ensured by the legal standards established in the Russian Federation.

However, by now the wear and tear of the material and technical base of coastal fish processing plants has already reached 70% (Order of the Federal Agency for Fisheries, 2009). Its further use is energy-intensive, increases the cost price, and impedes the development of new, non-traditional product categories. However, businesses are concentrating on producing more traditional products with fewer raw resources, which only allows for 30% of the production capacity to be used.

DISCUSSION

Therefore, the sustained operation and development of coastal enterprises within the ABSB objectively necessitate upgrading production processes to a new, higher technological level of product range and quality standards. However, addressing this imperative is constrained by the following primary factors:

- moral and physical deterioration of the material base of the fishing fleet and fish processing enterprises;

- lack of free own funds of fish product producers, sufficient for independent development of the material and technical base of enterprises;

- excessively high cost of banking services in terms of loans for production development.

As key fishing grounds in the Black Sea remain inaccessible, the total annual harvest of fish and non-fish biological resources in the ABSB has approached 33,000 tonnes over the past two years.

This volume yields a per capita consumption of fish food products of merely 2.1 kg in the Southern Federal District – failing to meet the targets established by either the *State Program* "Development of the Fisheries Complex" or (especially) the *Food Security Doctrine of the Russian Federation* (Decree of the President of the Russian Federation №20, 2020). The 2023 Presidential Decree imposing an embargo on food imports (Decree of the President of the Russian Federation №693, 2023), including fish products, was anticipated to stimulate demand for goods derived from Azov-Black Sea hydrobionts. However, this measure has proven ineffective in achieving desired outcomes. Consequently, the Ministry of Agriculture and the Federal Agency for Fisheries (Rosrybolovstvo) have formally removed the 25 kg annual per capita fish consumption target from the State Program.

Nevertheless, sustaining and developing the fisheries sector in the ABSB remains imperative due to its societal significance. Virtually all food products derived from Azov-Black Sea raw materials occupy lower price segments, targeting economically disadvantaged consumers. Consequently, Table 5 presents benchmark pricing indicators per kilogram of fish across major fishing zones.

Table 5. Retail prices per kilogram of frozen fish (Dikoed, 2024; Fishsev, 2024; Hamsa, 2025)

Fish Species	Price (₽)
Murmansk cod	480,0
Atlantic hake	498,0
Far Eastern capelin	690,0
Black Sea horse mackerel	250,0
Black Sea picarel	220,0
Black Sea anchovy	45,0 – 85,0

The trend of rising food prices has become pervasive in recent years, as documented by the Central Bank of Russia. Its reports specifically note accelerated annual food inflation in the Southern and North Caucasian Federal Districts, as well as nationwide (Central Bank of Russia, 2024a). Notably, according to the same source, Sevastopol recorded a 16.6% year-on-year increase in consumer food prices. Last year, the city led the Southern Federal District in annual inflation (up to 12.7%), a trend persisting in early 2025: Sevastopol registered Russia's highest annual inflation rate for the first two months at 11.77% (Central Bank of Russia, 2024b). Against this backdrop, the 102.7% year-on-year growth in household incomes reported in the Sevastopol Government (2024)'s performance report appears inadequate. Data for Sevastopol are presented here because the city operates a Special Economic Zone (SEZ) with 28 fish industry enterprises as participants; obtaining comparable metrics for other industry enterprise locations is not currently possible.

Amid constrained growth in household incomes, demand for fish exhibits high price elasticity. Furthermore, a substantial proportion of the SFD population resides in coastal areas, thereby positioning coastal fisheries as critical for employment sustainability. Similar conditions prevail in other Russian regions, consequently rendering social stability across significant territories of the Russian Federation contingent upon the viability of coastal fisheries.

Given the prevailing circumstances in the Black Sea basin and the inability to reliably forecast future developments, it would be advisable for local economic entities to concentrate efforts on advancing mariculture and aquaculture.

In recent years, researchers at Sevastopol State University (in collaboration with the authors) have been developing an organizational framework for consolidating ABSB fisheries enterprises. A cluster structure represents the optimal configuration for such consolidation. This model of integrating enterprises and organizations—regardless of ownership form or operational scale—has demonstrated efficacy in Russia's Far Eastern and Northern fishery basins; however, its implementation in the ABSB requires significant adaptation to local conditions, thereby introducing substantial scientific and practical innovation.

It is expected that establishing a cluster encompassing the full spectrum of participant activities will enable local enterprises to: (1) optimize utilization of collective technical infrastructure; (2) diversify product ranges; and (3) enhance consumer attributes of food products derived from Azov-Black Sea hydrobionts. Specifically, the cluster framework facilitates scaling cultivation of valued fish species (sturgeon, etc.) in marine farms and increasing output from oyster and mussel aquaculture operations.

Preliminary projections indicate that cluster-produced goods will likely achieve market competitiveness against products from Northern and Far Eastern fishery basins across Russian markets, based on superior production cost efficiency and enhanced consumer attributes. Moreover, sectoral cooperation within the cluster framework will enable integrated control over price formation mechanisms throughout the value chain – from primary production to final distribution.

Pricing mechanisms hold particular significance within this task framework. From 2014 to 2020, food prices in the Russian Federation increased by 51.7%, becoming the largest expenditure category in household consumption, while per capita income rose by only 34.3% (Maslova, 2022). In 2023, Rosrybolovstvo abolished the 15% discount on aquatic biological resources (ABR) fees while simultaneously implementing multifold increases in ABR utilization rates – for instance, the fee for high-demand species like pollock and herring surged by 720%. Under these conditions, the low marginal profitability of Azov-Black Sea raw materials combined with traditional processing methods, as evidenced empirically, negates competitive advantages for local producers in Russian fish markets. This disadvantage is compounded by transportation costs to central regions that frequently equal the cargo's value itself.

The cluster's post-establishment development strategy will be predicated on systematically implementing initiatives

proposed directly by participants through concrete investment and operational proposals. Key initiatives under consideration include: establishing a fish exchange (electronic trading platform); developing a unified brand and marketing strategy for promoting cluster products across mainland Russian markets; drafting parliamentary inquiries and corresponding legislative proposals to streamline state environmental review procedures for aquaculture enterprises; extending land allocation without tender requirements for projects establishing coastal fish processing facilities; among others.

Thus, cluster establishment is regarded by its founders and participants as the foundational phase for transitioning ABSB fisheries enterprises toward sustainable fishing practices (VNIRO, 2025) and creating prerequisites for implementing ESG principles at the local level.

However, the main goal of the cluster is to strengthen the competitive position of food products made from Azov-Black Sea raw materials in the markets of mainland Russia by expanding the product range and improving their consumer properties. The solution of this problem involves, first of all, financing modernization of the industry's technical base and developing technologies for deep processing of raw materials necessary for the production of competitive types of products, including pre-cooked food.

By definition, the cluster's functioning is based on attracting its members' funds to carry out collaborative projects. However, due to their limited financial resources, the cluster members will only be able to independently fund low-budget projects, such as public relations campaigns aimed at promoting the cluster products on the regional and other Russian Federation markets.

Therefore, it would seem reasonable to use target programmes of the Ministry of Industry and Trade to support joint projects of industrial clusters as a source of funding for projects of technical re-equipment of fish industry enterprises. The budgets of interested municipalities of the Southern Federal District may serve as an additional source of funding for these initiatives.

The strategy lists the following financial and organizational tasks to ensure the first stage of the fishery cluster functioning:

1. Financing joint projects of the cluster participants from the funds of the target programmes of the Ministry of Industry and Trade to support industrial clusters;

2. Subsidies to cluster participants for repayment of loan interest (including leasing) from local budgets;

3. Loan guarantees to cluster participants from the SME Guarantee Fund;

4. Simplify the procedure for allocating land and necessary coastal infrastructure facilities, as these are essential to the operation of aquaculture (including fish farming), as a subsector.

Of particular importance is the implementation of the measures envisaged in paragraph 4 of the above list. The unique bioresource potential of the sea coasts ensures the high attractiveness of the project to create a single complex for the cultivation of hydrobionts based on polymariculture technology (technology for the joint cultivation of various groups of fish and mollusks in industrial quantities). Apart from its purely economic aspect, this project would also be attractive from an innovative standpoint because it has no counterparts in the Russian fish industry.

The authors' financial viability assessments indicate a projected payback period of approximately three years, with an internal rate of return (IRR) exceeding prevailing lending rates by a factor of 1.5 to 2. This enables viable debt financing for project implementation. Developing mariculture along Azov-Black Sea coastlines would not only yield supplementary high-quality protein- and carbohydrate-rich food products and valuable raw materials for pharmaceutical, cosmetic, and industrial applications, but also generate employment opportunities and enhance the international standing of Russia's fisheries sector.

An additional funding source for cluster establishment and development may derive from well-established public-private partnership (PPP) frameworks with local legislative and executive authorities, operating under the specialized Federal Law№ 224 of July 13, 2015 (Federal Law № 224, 2015). This approach appears particularly promising given the cluster's function as an infrastructural component of the agro-industrial complex, which would simultaneously advance two strategic objectives: enhancing production of fish-based and other hydrobiont-derived food products while generating new employment opportunities within the sector.

According to the project developers and business entities who have agreed to become cluster members, the implementation of the measures provided for in the Strategy will create favorable conditions for the initial stage of its operation.

Undoubtedly, the efficiency of the cluster implementation, including in terms of competitive quality and affordable price of food products manufactured by its participants, will largely depend on the degree of interest of fishery enterprises in its creation and the number of proactive project participants. The fact that over 40% of businesses that specialize in the fishing sector have so far indicated their intention to join the cluster is positive in this regard.

CONCLUSION

International economic sanctions have a systemic and most likely long-term effect on the state and operations of businesses involved in the fishing industry of the Azov-Black Sea basin of the Russian Federation. Under the circumstances, accelerated development and modernization of the material and technical base of the fishing enterprises in this region, including both the fishing fleet and the coastal

production and infrastructure complex become highly relevant. The challenge at hand necessitates the creation of new organizational activities in this area as well as strategies for the state to support the industry and its associated businesses using resources at both the federal and regional (local) levels.

This study has enabled the identification of core problems impeding fisheries sector development in the Azov-Black Sea basin.

First of all, it was established that the fishing industry of the Southern Federal District of the Russian Federation consists of economic entities belonging exclusively to the categories of micro- and small businesses, with less than half of them presently carrying out actual operations in the designated area. As a result, these businesses do not fully utilize their available manufacturing capacities. This situation is partially attributable to fishing restrictions for hydrobionts in the central and western Black Sea, where maritime activities remain inaccessible due to ongoing special military operation.

Moral aging and the high level of wear and tear of fixed assets of fishery enterprises are among other constraining factors. The scenario necessitates a gradual increase in the cost of current, medium, and capital repairs for fishing vessels and equipment of fish-processing businesses. Correspondingly, this raises the production costs of the entire range of products, disturbs the balance of the price for food products made from Black Sea hydrobiont raw materials and their consumer properties, and, as a result, lowers the competitiveness of the product group when compared to products from other fishing regions.

However, the primary obstacles to the modernization and growth of fishing businesses are overly stringent terms of granting bank loans and the absence of free financial resources directly available to their owners.

Thus, consolidating existing production and ancillary resources within an organizational cluster framework appears advisable as the initial step toward restoring the operational capacity of the ABSB fisheries sector.

Establishing an integrated cluster system of enterprises along the ABSB coastline is thus posited as a mechanism to elevate production technologies for Azov-Black Sea hydrobiont-based food products toward unified, higher standards of product range and quality. This enhancement would bolster the competitiveness of local goods against mainland Russian producers while ensuring consistent accessibility for consumers within this price segment.

The forced limitation of fisheries to Black and Azov Sea resources has resulted in a narrowed product range and reduced competitiveness of raw materials, while the closure of several fishing grounds due to ongoing special military operation in Ukraine has precipitated a sharp decline in catch volumes. Market gap filling by other fishery basins has triggered substantial price increases for fish products in the regional retail market.

These represent the core challenges currently constraining local fisheries from addressing regional food security objectives, alongside potential pathways for resolution.

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AUTHORSHIP CONTRIBUTIONS

Natalia V. Alesina: Conceptualization, methodology, formal analysis, investigation, writing-original draft. Elena L. Grink: Investigation, data collection, validation, visualization, writing-reviewing and editing, supervision, project administration. Irina A. Semyonkina: Data curation, resources, translation, writing-reviewing and editing, validation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL APPROVAL

No specific ethical approval was necessary for the study.

DECLARATION OF AI USE

We have not used AI-assisted technologies in creating this article.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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