Scientific Papers. Series D. Animal Science. Vol. LXVIII, No. 1, 2025
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE IMPORTANCE OF COMMERCIAL FISHERIES IN THE ROMANIAN PART OF THE DANUBE RIVER, EVOLUTION AND CHALLENGES

Kety BALACI[1], Maria Desimira STROE[2], Angelica DOBRE[1, 2], Livia VIDU[1], Galin Yankov NIKOLOV[3], Carmen Georgeta NICOLAE[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania
[2]Research and Development Institute for Aquatic Ecology Fishing and Aquaculture, 54 Portului Street, Galati, Romania
[3]Trakia University, Agricultural Faculty, 6000, Stara Zagora, Bulgaria

Corresponding author email: kety_popa@yahoo.com.au

Abstract

In Romania, activities related to fishing, aquaculture, processing and trade in fish and fish products are widespread in all regions of the country. In some remote areas, such as the Danube Delta and Danube Plain, and the Danube Cluster, fishing is one of the main activities, providing jobs, income and food for the local population. In the context of increasing environmental and economic pressures on the Danube River, it is essential to adopt integrated measures to protect biodiversity and secure water and fish resources for local communities. While Romania ranked second in Europe in 2011 for inland fisheries according to the Institute for European Environmental Policy, by 2023 it had fallen to 17th place, as indicated by Eurostat data, reflecting significant changes in the sector. Given these considerations, the paper aims to present an analysis of the evolution of commercial fishing in the Romanian part of the Danube River in relation to other riparian countries and to highlight the challenges of this activity, challenges that can serve as the basis for a sustainable management strategy.

Key words*: effective public policies, fish management strategy, sustainability of aquatic ecosystems.*

INTRODUCTION

According to Law No. 176/2024 on Fisheries and the Protection of Living Aquatic Resources, commercial fishing is defined as "*Activities of extracting/harvesting living aquatic resources from natural aquatic habitats for commercial purposes*". In other words, commercial fishing, both freshwater and marine, is an important sector both economically and socially, playing an important role in ensuring food security and livelihoods for many communities (Sumaila et al., 2014; Pila et al., 2023), as fish constitutes one of the major sources of proteins (Holmlund & Hammer, 1999; Samofatova & Neveseliuk, 2024).

In 2022, the freshwater fishing industry registered a total capture of 695.398.700 TLW (tons live weight) globally (FAO, 2024), fully influenced by the growth of the global population and human fish consumption.

In Romania, this activity has a long-standing tradition, particularly in regions with access to rivers and lakes, where fish resources have been exploited over time for domestic consumption and trade. The Danube River, as the country's main hydrographic basin covering an area of 801,463 km² and hosting a population of 79 million people from 19 countries, plays a central role in the fishing industry, providing a diverse habitat for numerous commercially significant fish species.

However, over the past decades, the global commercial fishing industry, a multibillion-dollar sector operating on a multinational scale, has significantly contributed to the depletion of fish populations, pushing numerous species toward the brink of extinction. Scientists estimate that between 0.97 and 1.97 trillion wild fish are caught and killed annually worldwide (Wickens, 2023), further straining fragile aquatic ecosystems.

Challenges such as pollution from oil spills, agricultural runoff, vast amounts of waste, invasive species (Wong et al., 2007), overfishing, also degraded both marine and

freshwater habitats, exacerbating the challenges faced by fisheries (Winiwarter et al., 2013).

These global issues have been reflected in Romania's commercial fishing sector as well, particularly in the Danube, where fish stocks are declining due to IUU fishing (Illegal, Unreported and Unregulated), overfishing and environmental degradation (Kalikoski et al., 2018). This has placed significant pressure on local fishing communities, threatening their livelihoods and the economic sustainability of the sector and the river ecosystem. The decline in fish stocks in the Danube, caused by both overexploitation and ecosystem changes, has led to a significant decrease in catches, affecting the sector's economic sustainability. Additionally, competition with imported fish products and changes in fish demand have negatively impacted the local market, limiting development opportunities for traditional fishers (Neculita and Moga, 2015; Hodosan et al., 2023).

Beyond economic and environmental pressures, the sustainable management of commercial fishing in Romania also involves challenges related to public policies and regulatory enforcement. Discrepancies between national and European legislation, difficulties in implementing conservation measures, and the lack of integrated support strategies for fishing communities are aspects that require a comprehensive approach, and solutions tailored to local realities.

This paper aims to analyse the evolution of commercial fishing in the Romanian sector of the Danube, highlighting legislative factors on this economic activity. Furthermore, trends in Romania will be compared with those in other riparian countries to better understand the sector's position and prospects at a regional level. Finally, potential strategies for the sustainable management of fish resources will be discussed to ensure both biodiversity protection and the continuity of economic activities based on fishing.

MATERIALS AND METHODS

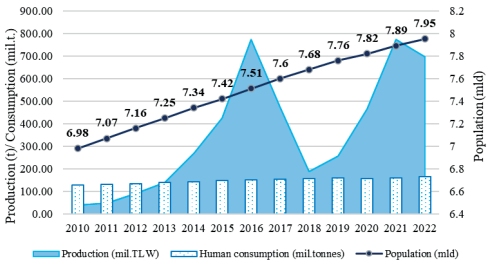
To identify the trend in the commercial freshwater fishing sector, data was processed from the Software for Fishery and Aquaculture Time-Series Statistics (FishStatJ_4.04.00) of the Food and Agriculture Organization of the United Nations (FAO), the Eurostat database, as well as commercial fishing data from the National Agency for Fisheries and Aquaculture (www.anpa.ro). Additionally, official data from the National Institute of Statistics (www.insse.ro), and the Federal Reserve Bank of St. Louis (www.stlouisfed.org) were used.

Furthermore, Romanian fisheries legislation was analyzed to identify strengths and weaknesses in this sector, providing a comprehensive perspective on the regulatory framework.

The data was statistically processed for normality using the Shapiro-Wilk Test (95% confidence interval). Correlations were determined by calculating the Pearson correlation coefficient.

RESULTS AND DISCUSSIONS

The fishing sector is vast and complex, based on many species, making the analysis of trends more difficult (Sumaila et al., 2014).



N.B. The *Production* Indicator only takes into account fish catch, excluding crustaceans, molluscs, and algae; The *Human Consumption* Indicator does not include imports, exports, stock variations, or non-use products.

Figure 1. Evolution of commercial fishing worldwide, 2010-2022 (Source: original)

Between 2010 and 2022 (Figure 1), global fish capture exhibited an oscillatory trend, with peak values recorded in 2016 (774.08 million TLW) and 2021 (772.29 million TLW). The lowest capture volume was observed in 2010, at 39.59 million TLW. This trend can be largely attributed to demographic growth (correlation coefficient: 0.742), increased consumer demand (correlation coefficient: 0.743), and rising global fish product prices. The Harmonized Index of Consumer Prices for Fish and Seafood (2015 = 100) increased from

88.82 in 2010 to 126.36 in 2022, reflecting a significant price escalation over the analysed period. These factors have strongly stimulated production in order to meet the growing market demands, driving a dynamic market response to the growing global demand for fish and fish-based products (Dobre et al., 2024).

Romania, a riparian country with a rich history in commercial fishing, has linked this activity to various historical periods, dating back to the Neolithic era (Tatulici, 2020), the Ottoman period, when fishing was administered through a 15% In-kind lease system (Belacurencu, 2006), and up to the first Romanian Fishing Law, introduced by Antipa in 1896, as a response to the sector's growing activity (Bulat et al., 2023). At that time, the fishery resources covered 700,000 hectares, with the Danube River being the primary fishing basin. The Danube Delta alone encompassed approximately 1,616 km² of natural aquatic basins, where fish stocks were highly sought after (Belacurencu, 2006).

Currently, Romania's hydrographic network spans 843,710 hectares, accounting for over 3.5% of the country's total surface area. Public water bodies include: 300,000 hectares of natural lakes and ponds, 98,000 hectares of reservoirs and polders, 47,000 km of lowland and hilly rivers, 19,000 km of mountain rivers, and 1,373 km of the Danube River.

According to Stanciu et al. (2015), Romania's fisheries sector experienced a significant decline between 1989 and 2015, primarily due to the depletion of domestic resources and the disappearance of the Romanian oceanic fishing fleet - a challenge that remains unresolved to this day.

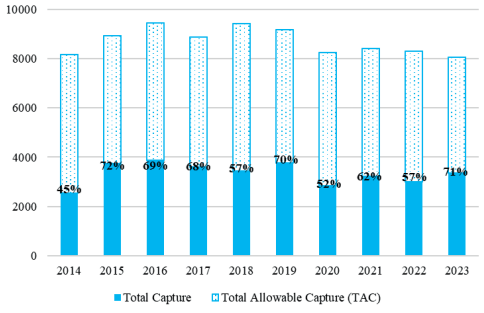


Figure 2. Evolution of the commercial fishing sector between 2014-2023 (Source: original)

Commercial fishing is one of the main sources of income for Romania, particularly in delta communities. In this context, total catches have seen a significant increase, from 2,540.9 tons in 2014 to 3,354.1 tons in 2023 (Figure 2). However, the demand for fish and fish products has not evolved as sharply, with per capita consumption rising modestly from 4.9 kg in 2014 to 6.5 kg in 2023, reflecting an average annual growth of only 3%, unlike in Ukraine, where the annual per capita fish consumption averages 13.2 kg (Samofatova & Neveseliuk, 2024).

This increase in demand, coupled with declining catches and new trade policies, has also affected the average price of fish products, which rose from 104.9 lei in 2014 to a peak of 133.92 lei in 2022 (Figure 3), reflecting an inflationary trend and market volatility. In other words, as consumption increases, catches should also grow at the same rate in order to control price increases. However, in 2023, the price experienced a sharp drop to 103.33 lei, suggesting a slight market stabilization, but not enough.

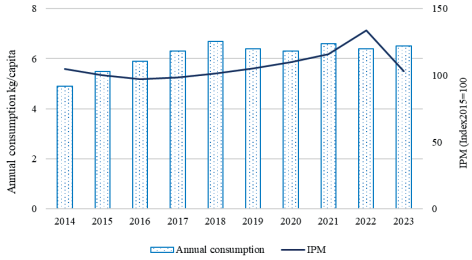


Figure 3. Evolution of market trends of the Romanian fishing sector 2014-2023 (Source: original)

However, given that the actual catch represents, on average, only 63% of the Allowable Catch, there is a significant untapped potential in the commercial fishing sector. This discrepancy may indicate either restrictions imposed to protect aquatic resources or logistical and economic challenges that prevent the full exploitation of available quotas, or unreported catches. Unreported catches or IUU fishing represent one of the biggest threats to fish stocks and have severe implications for the sustainability of the sector.

Additionally, considering that approximately 114,651 tons of fish and fish products are

imported annually, according to the FishStatJ platform, the market's dependence on imports to meet the demand not covered by domestic production can influence price fluctuations and industry stability, leading to increased economic vulnerability and potential market volatility depending on external factors such as currency fluctuations or changes in international trade policies. This situation was also highlighted by Stanciu et al. (2015). Moreover, according to Dima et al. (2021), the human demand for aquatic products will increase to 40 kg/capita until 2040. The issue is also relevant in Bulgaria (Todorov, 2020) and Ukraine (Samofatova & Neveseliuk, 2024), where high demand for fish and fish products has led to increased imports from the European community.

Commercial fishing, as defined by Law No. 176/2024 on Fisheries and the Protection of Living Aquatic Resources, refers to the exploitation of living aquatic resources from natural fishery habitats for economic purposes. On the Danube, this activity is carried out by professional fishermen and specialized companies using specific techniques and equipment for capturing and marketing fish. Strictly regulated by authorities, commercial fishing requires special licenses and permits to be legally practiced.

Fishery policy in Romania has evolved significantly over the past few decades, addressing issues related to the conservation of fish resources, the development of aquaculture, and the promotion of sustainable commercial fishing. However, there are challenges, and collaboration between authorities, fishermen, local communities and the private sector is essential to achieving the sustainable development goals of the fisheries sector.

Fisheries policy is a fundamental instrument in the sustainable management of aquatic resources, playing a direct role in biodiversity conservation and the economic development of the fishing sector. Through well-defined strategies and effective measures, this policy aims to maintain a balance between resource exploitation and ecosystem protection, ensuring long-term sustainability. Fisheries policy in Romania aligns with the Common Fisheries Policy (CFP), the legislative and regulatory framework adopted at the European Union level. Despite facing significant challenges, the CFP plays a crucial role in ensuring the responsible and sustainable use of aquatic resources in Europe.

Usually, the European Union sets the main framework through its policies, leaving each country the freedom to implement them according to their specific conditions. This happens because each country has its own economic, social, and ecological circumstances, which can influence how European regulations and directives are applied. For instance, in the field of fisheries and aquaculture, while the European Union adopts common strategies for managing aquatic resources and protecting biodiversity, each member state is responsible for adapting these policies to its own needs and particularities.

This flexibility allows countries to consider factors such as the freshwater species in their areas, specific climatic conditions, the structure of the domestic market, and cultural traditions related to fishing and aquaculture. It also enables national authorities to set specific measures to address local challenges, such as protecting certain aquatic habitats, reducing pollution, or supporting sustainable fishing. This process allows for a more nuanced and adaptable approach to managing aquatic resources and the fishing industry, contributing to the long-term sustainability of this essential sector.

Due to its geographical position and extensive network of rivers, lakes, Romania has significant fisheries potential. Its diverse ichthyofauna and rich aquatic ecosystems have led to the development of a fisheries policy focused on three main objectives: conserving and protecting fish species, stimulating fish production, and responsibly managing commercial fishing and aquaculture. Through current regulations, Romania seeks to minimize negative environmental impacts while supporting the economic development of communities dependent on this sector.

However, in recent years, fishery resources have been severely affected by numerous factors, leading to a decline in fish stocks and threatening the sustainability of commercial fishing. Climate change is one of the most significant threats to aquatic ecosystems, negatively impacting habitat quality and the

reproductive capacity of many species. Rising global temperatures affect water productivity, reducing food sources for fish and disrupting natural reproductive cycles. Additionally, climate change leads to decreased river flow, the reduction of wetland areas, and alterations in water chemistry, potentially causing species extinction and major imbalances in the aquatic food chain.

Another significant factor contributing to the degradation of fishery resources is water pollution, caused by industrial, agricultural, and urban activities. The discharge of toxic substances, excessive use of pesticides and fertilizers in agriculture, and the accumulation of household waste in rivers and lakes degrade water quality and endanger fish survival. Pollution with heavy metals and microplastics, increasingly present in freshwater and marine environments, can have devastating effects on ichthyofauna and, consequently, on the fishing industry. According to Raykov (2020), this situation is generally valid, not only for the Romanian waters, but also for the small-scale fisheries in Bulgaria.

Moreover, overexploitation through excessive fishing and poaching worsens the situation, drastically reducing fish populations and disrupting aquatic ecosystems. In many areas, catches exceed the natural regeneration capacity of fish populations, leading to severe declines in certain species and even their disappearance from specific habitats. The lack of strict monitoring and enforcement of responsible fishing regulations allows destructive practices to continue, harming both the environment and the economic sustainability of the fisheries sector.

Economic difficulties faced by commercial fishers further challenge the viability of the fishing industry. High costs of equipment, infrastructure, and fuel, combined with market fluctuations and competition from imported products, create major obstacles for local producers. In many cases, fishers are forced to scale down or even abandon their activities, leading to decreased production and a reduced contribution of the fisheries sector to the national economy.

The protection of fishery heritage involves a balanced management and sustainable administration of fishing activity, considering the aquatic resources as main element.

Authorities responsible for fisheries management have the duty to formulate the Total Allowable Catch Order (Order no. 75/874/2024) to monitor and enforce established catch limits for each commercial specie, imposing strict controls on fishing activities to ensure compliance. In contrast, the Bulgarian regulation for the TAC is set only for a few species from the Black Sea (Raykov, 2020).

Also, regulations regarding the ages of fish specimens are set and fishermen are required to report the quantities of fish caught and to adhere to regulations aimed at protecting and conserving fishery resources, thus ensuring their sustainable use. These limits are set based on species, geographical areas, and specific time periods, and are expressed either in terms of weight (tonnage) or the number of fish and ensure that will not be captured before reaching sexual maturity and reproduction. Typically, these limits are based on scientific studies and stock assessments to determine the number of fish that can be harvested without compromising the viability and regeneration of fish populations.

Additionally, authorities establish annual closed seasons and areas where fishing is partially or completely prohibited, to allow for the reproduction and regeneration of fish populations, thus contributing to the conservation of aquatic habitats and biodiversity. For example, the sturgeons are totally prohibited to be commercially fished in the Romanian sector of the Danube River, considering their status as an endangered species. Poaching and illegal sturgeon trafficking in the Lower Danube region pose a major threat to the survival of endangered sturgeon species. Their capture for meat and roe, highly valuable products on the black market, fuels an illegal circuit that contributes to the rapid decline of their populations. This situation jeopardizes not only the biodiversity of the region but also the aquatic ecosystems that depend on the presence of sturgeons, as they play an essential role in maintaining the ecological balance of the Danube. Furthermore, for local communities, poaching represents an economic risk, as the fishery resources in this

area are vital for sustainable fishing (WWF Romania, 2024).

To support the sustainable development of the fisheries sector, public policies must adapt to new realities by ensuring financial support for the development of the fishing sector.

In the context presented above, Table 1 highlights the main strengths, weaknesses, opportunities, and threats affecting the commercial fishing sector in Romania, reflecting both the challenges, such as climate change and pollution, as well as the opportunities for development and sustainability of the industry, in line with the existing legislative framework and policies.

Table 1. SWOT Analysis of the commercial fishing sector in Romania

STRENGHTS
Existence of fishery resources at an industrially exploitable level
Local knowledge and experience - Traditional fishermen have a deep understanding of habitats and species behaviour.
High biological diversity - Presence of valuable species and favourable habitats for various fish species
Tradition of fish consumption
High demand for aquatic products
Advantageous geographical position in relation to European markets
Existing legal framework for resource protection - There are regulations for the management and protection of fish stocks.
WEAKNESSES
Lack of accurate information on stock status
Absence of scientific research programs in the fisheries sector
Out-dated fishing boats, engines, and equipment
Poor cooperation between fishermen and authorities - Lack of effective dialogue between industry stakeholders and decision-makers
Dependence on weather conditions - Seasonal variations affect production and fish availability on the market
Poorly developed infrastructure
Traceability and certification issues - Difficulties in monitoring catches and implementing quality standards
Lack of incentives for young people - Aging workforce in the fisheries sector and low interest from new generations
Strict fishing regulations
High dependence on subsidies - Fishing is often reliant on financial support to remain profitable.
Low level of digitalization - Administrative procedures and catch monitoring are not sufficiently automated.
Lack of an efficient system for promoting fish products - Local products do not benefit from adequate marketing to compete on the international market.
OPPORTUNITIES
Large potential for absorption in the domestic market and expansion of export markets - Increasing demand for fish and fish products in international markets.
Promotion of traditional products and eco-certification (e.g., 'local product' or 'sustainable fishing') - Adding value through branding and certification.
Growing interest in healthy foods - Global trends toward healthy eating can boost demand for aquatic products.
Development of short supply chains - Direct sales from producer to consumer can increase fishermen's incomes.
Adapting to climate change through sustainable policies - Plans for resource protection and reducing environmental impact.
Investment in Research and Innovation - Funding for developing and implementing new, sustainable technologies and practices to increase efficiency, productivity, and sustainability
New technologies for stock monitoring - Use of drones, GPS, and artificial intelligence for more efficient management
Potential for developing related activities such as ecotourism and educational programs on environmental conservation.
Implementation of advanced modern technologies - Attracting younger generations to the sector
Access to European funds for modernization - Financing available for infrastructure, equipment, and sustainability initiatives
Development of sustainable aquaculture - Possibility of compensating for declining catches through fish farms
Protection and restoration of fish habitats - Environmental projects aimed at rehabilitating fish breeding areas
Digitalization of fishing activities - Implementation of online licensing and reporting systems
THREATS
Overexploitation of resources and poaching
Impact of climate change - Rising temperatures and changes in ecosystems, decreased water levels in rivers and lakes can negatively affect fish populations and the spread of diseases, while drought events can impact fish habitats and access to resources.

Invasive species - The spread of foreign species can disrupt ecosystem balance and affect valuable native species.
Increased competition from industrial aquaculture - Large fish farms may reduce demand for wild-caught fish.
Fishing bans or restrictions
Rising production costs
Difficult access to and bureaucratic procedures for obtaining fishing funds
Limited administrative capacity and excessive bureaucracy
Legislative instability
Pollution - Water pollution pose serious threats
Economic instability and price fluctuations - High fuel and equipment costs can affect the profitability of fishing.

Given the existing strengths of the industry (Table 1), such as high biological diversity and a strong tradition of fish consumption, it is important to capitalize on opportunities like expanding export markets, investing in research and innovation.

However, addressing the weaknesses, including outdated infrastructure, lack of digitalization, and poor cooperation between stakeholders, requires targeted policy interventions and modernization efforts.

Moreover, organizing the fishing sector, implementing concrete measures to protect aquatic resources, strengthening monitoring and control systems for fishing activities (Order 1369/2018), developing effective fish restocking programs with native species, reducing pollution, and promoting sustainable fishing practices are among the necessary solutions to secure the sector's future. These initiatives are particularly important in mitigating threats such as overexploitation, climate change.

Additionally, investments in education and professional training for fishers, as well as financial support during fishing bans, could contribute to enhancing the sustainability of commercial fishing in Romania. Encouraging young generations to enter the sector by providing incentives and modernizing fishing techniques would help counteract the aging workforce and declining interest in this profession.

Through marketing campaigns and supporting the establishment of direct sales platforms, the government and organizations in the fishing sector should promote the valorisation of Romanian fish products on both domestic and international markets, to help commercial fishermen access new markets and obtain better prices for their products. In 2019, the fish exchange in Tulcea was opened for the auction and commercialization of fish products obtained from the Danube Delta, with the aim of creating a competitive and functional market. However, at present, the platform is no longer operational (MADR, 2019), highlighting the need for sustained efforts to ensure its long-term success.

Furthermore, adapting fishing regulations according to the reproductive cycles of species, as well as considering geographical differences and target species, is essential for effective resource management (Order no. 23/297/2025). Aligning these regulations with EU policies and sustainable fishing practices will ensure a balance between economic viability and environmental conservation, securing the future of Romania's fisheries sector.

CONCLUSIONS

The commercial fishing sector in Romania benefits from rich natural resources. However, overfishing and water pollution pose major risks that threaten the sustainability of these resources.

Although Romania has significant potential for fish product production, there is a continued reliance on imports to meet domestic demands. This highlights the need to develop more efficient aquaculture methods and stimulate domestic production.

Climate change represents a significant threat to aquatic habitats and fish biodiversity. Rising water temperatures and changes in hydrological regimes can negatively affect fish stocks, and the fishing sector must adapt quickly to address these changes.

Poaching remains a serious problem in Romania's commercial fishing sector. Stricter control of fishing activities and increased sanctions can reduce this issue, helping to protect natural resources.

AKNOWLEGDEMENTS

This research work was carried out with the support of the Faculty of Animal Productions Engineering and Management, University of Agronomic Sciences and Veterinary Medicine of Bucharest and is part of the elaboration of the doctoral thesis.

REFERENCES

Belacurencu, T. (2006). Sustainable Utilization Model of Natural Resources in Danube Delta. *Theoretical and Applied Economics, 4,* 75-90.

Bulat, D., Şaptefraţi, N., Bulat, D., & Avornic, G. (2023). The evolution of regulations in the field of fishing, protection, and use of natural aquatic biological resources. *Studia Universitatis Moldaviae (Series of Real and Natural Sciences)*, *171*(1), 43-52. https://doi.org/10.59295/sum1(171)2023_06.

Dima, F. M., Patriche, N, Tenciu, M., Nistor, V., Mocanu, E. E., Stroe, M. D. (2021). *Romania Strategy Horizon 2020-2040 – The Romanian Economic Model in the European Union, Field: Aquaculture, Fisheries, and Processing of Fish and Other Living Aquatic Resources*. Cluj-Napoca, RO: Casa Cărții de Știință Publishing House.

Dobre A., Dediu, L., Stroe, M. D., Cretu, M., Dima, F. M. (2024). Advancing the Sustainability of Aquaculture through Ecosystem Services Monetization. *Scientific Paper. Series D. Animal Science, 67*(1), 651-662

FAO (2024). *The State of Food and Agriculture 2024 – Value-driven transformation of agrifood systems*. Rome, IT: FAO Publishing House. https://doi.org/10.4060/cd2616en.

Government of Romania (2008). *Government Emergency Ordinance No. 23/2008 regarding fishing and aquaculture*. Retrieved February 18, 2025, from https://legislatie.just.ro/Public/DetaliiDocumentAfis/90207.

Hodosan C., Nistor L., Suler A., Barbuica S. I., Hodosan R. I., & Negulei A. M. (2023). Research on the physico-chemical and microbiological quality of fast food products. *Scientific Papers. Series D. Animal Science, LXVI*(1), 399-404.

Holmlund, C. M., & Hammer, M. (1999). Ecosystem services generated by fish populations. *Ecological economics*, *29*(2), 253-268.

Kalikoski, D. C., Jentoft, S., Charles, A., Salazar, D., Herrera, K. C., Béné, C., & Allison, E. H. (2019). Understanding the impacts of climate change for fisheries and aquaculture: applying a poverty lens. *Impacts of climate change on fisheries and aquaculture, 19*, 1-21.

Ministry of Agriculture and Rural Development (MADR) (2018). *Order of the Ministry of Agriculture and Rural Development no. 1369/2018 regarding the technical characteristics, conditions for the use of fishing gear permitted for commercial fishing, and methods of commercial fishing in marine and inland waters*. Retrieved on February 25, 2025 from https://legislatie.just.ro/Public/DetaliiDocumentAfis/250993.

Ministry of Agriculture and Rural Development (MADR) (2019). *The electronic fish stock market has been launched (www.bursadepestetulcea.ro)*. Retrieved on October 18, 2024 from https://www.madr.ro/comunicare/5227-s-a-lansat-bursa-de-peste-electronica-www-bursadepestetulcea-ro.html

Ministry of Agriculture and Rural Development (2022). *Aquaculture and Fisheries Program 2021-2027 – version 1.1 (adopted by the European Commission on November 30, 2022).* Retrieved on February 18, 2025 from https://ampeste.ro/docs/PAP_/PAP_2021-2027/versiunea_1.1/PAP_versiunea_1.1.pdf.

Ministry of Agriculture and Rural Development (MADR) (2024). *Order no. 75/874/2024 regarding the approval of measures for regulating fishing effort and fishing quotas allocated for the year 2024, by species and zones*. Ministry of Agriculture and Rural Development (MADR). Official Monitor, Part I no. 399, on April 29, 2024. Retrieved on February 18, 2025 from https://lege5.ro/gratuit/ge2tcmjsgu3do/ordinul-nr-75-874-2024-privind-aprobarea-masurilor-de-reglementare-a-efortului-de-pescuit-si-a-cotelor-de-pescuit-alocate-pentru-anul-2024-pe-specii-si-zone.

Ministry of Agriculture and Rural Development (MADR) (2025). *Order no. 23/297/2025 regarding the establishment of fishing ban periods and areas, as well as protection and biological restoration zones for living aquatic resources in natural aquatic habitats.* Retrieved on February 18, 2025 from https://lege5.ro/gratuit/ge3dcnzyhe3dm/ordinul-nr-23-297-2025-privind-stabilirea-perioadelor-si-zonelor-de-prohibitie-a-pescuitului-precum-si-a-zonelor-de-protectie-si-refacere-biologica-a-resurselor-acvatice-vii-din-habitatele-acvatice-na

Neculita, M., & Moga, L. M. (2015). Analysis of Romanian fisheries and aquaculture in regional context. *The USV Annals of Economic and Public Administration, 15*(1), 127-132.

Pila, M., Stanciuc, N., & Stanciu, S. (2023). Fisheries and aquaculture in Romania. A global outlook on sustainable development. *Scientific Papers. Series Management, Economic Engineering in Agriculture & Rural Development, 23*(2), 517-522.

Raykov, V. (2020). Characteristics of the Bulgarian Small-Scale Fisheries. In: J., Pascual-Fernández, C., Pita, M., Bavinck, (Eds.), *Small-Scale Fisheries in Europe: Status, Resilience and Governance*. MARE Publication Series, vol 23. Cham, Switzerland: Springer. 10.1007/978-3-030-37371-9_4.

Samofatova, V., & Neveseliuk, V. (2020). Current state of fishing industry of Ukraine. *Food Industry Economics*, *12*(1), 38-45. DOI: 10.15673/fie.v12i2.1738.

Stanciu, S., Mihalcea, L., & Radu, I. (2014). The Romanian fishing sector in the community context. Retrieved on February 15, 2025 from http://www.prutinvest.ugal.ro/images/Sectorul_piscic

ol_rom%C3%A2nesc_%C3%AEn_context_comunitar.pdf
Sumaila, U. R., Bellmann, C., & Tipping, A. (2014). *Fishing for the future: Trends and issues in global fisheries trade*. Geneva, CH: International Centre for Trade and Sustainable Development Publishing House.
Parliament of Romania (2024). *The Law on Fisheries and the Protection of Living Aquatic Resources, Law No. 176/2024,* Official Gazette, Part I, No. 517 of June 3, 2024.
Tatulici, M. (2020). *Historical Study of Danube Fishing FLAG Giurgiu*. Retrieved on February 15, 2025 from https://www.pescuit-giurgiu.ro/assets/images/materiale-proiect/STUDIU_ISTORIC%20flag%20gr_final.pdf.
Todorov A (2020). GAIN report number BU2020-0021. Fish and seafood market brief - Bulgaria. Retrieved on February 18, 2025 from https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Fish%20and%20Seafood%20Market%20Brief%20-%20Bulgaria_Sofia_Bulgaria_4-11-2017.pdf.
Wickens S (2010). Worse things happen at sea: the welfare of wild-caught fish. *Animal Welfare*, *19*(4), 537-538. DOI:10.1017/S0962728600002001.
Winiwarter, V., Schmid, M., Hohensinner, S., & Haidvogl., G. (2013). The environmental history of the Danube River basin as an issue of long-term socio-ecological research. In S., Singh, H., Haberl, M., Chertow, M., Mirtl, M., Schmid (Eds.), *Long term socio-ecological research: studies in society-nature interactions across spatial and temporal scales* (pp. 103-122), Vol. 2. Dordrecht, England: Springer. https://doi.org/10.1007/978-94-007-1177-8_5
Wong, C. M., Williams, C. E., Pittock, J., Collier, U., & Schelle, P. (2007). *World's top 10 rivers at risk*. Gland, CH: WWF International Publishing House.
WWF Romania (2024). *Poaching and illegal trafficking – guilty of the disappearance of sturgeon species in the Lower Danube*. Retrieved on November 10, 2024 from https://wwf.ro/noutati/comunicate-de-presa/braconajul-si-traficul-ilegal-vinovate-pentru-disparitia-speciilor-de-sturioni-din-dunarea-de-jos/
https://ec.europa.eu/eurostat.
www.insse.ro
www.anpa.ro.
www.https://www.stlouisfed.org.