



Current Status of the Sinop Fishing Industry

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Abstract: This study evaluated the current situation and future outlook of the aquaculture sector in Sinop Province. In addition to analyzing production quantities between 2019 and 2023, the aim was to develop robust predictions for the sector's future. As of the end of 2023, Sinop had 389 fishing vessels, 2,597 fishermen, 10 aquaculture cooperatives with 416 members, 5 fishing harbors, 10 fishing landing points, 30,933.5 tons of aquaculture production, and approximately 26,822.7 tons, including 126.66 tons from inland waters. The province also had 5 fishmeal and oil factories and 14 seafood processing and evaluation facilities. Sinop, which holds an important place in Türkiye's aquatic products production, is expected to experience significant growth: projections indicate that, by 2040, aquaculture production will increase by approximately 4.93 times and fishing production by 2.83 times compared with 2023.

Keywords: Sinop, fishing, aquaculture, sustainability, projection

Sinop Balıkçılık Sektörünün Mevcut Durumu

Özet: Çalışmada, Sinop İlinin balıkçılık sektörünün mevcut durumu değerlendirilmiştir. Sinop İlinin 2019-2023 yılları arasındaki su ürünleri üretim miktarlarının incelenmesinin yanında, sektörün geleceği ile ilgili sağlıklı öngörüler oluşturulması amaçlanmıştır. Sinop ilinde 2023 yılı sonu itibarıyla 389 adet balıkçı gemisi, 2.597 balıkçı, 10 su ürünleri kooperatifi, 416 kooperatif ortağı, 5 balıkçı barınağı, 10 balıkçılık karaya çıkış noktası, 30.933,5 ton su ürünleri avcılığı üretimi, 126,66 tonu iç sulardan olmak üzere yaklaşık 26.822,7 ton kültür balıkçılığı üretimi gerçekleştirilmiş olup, 5 adet balık unu ve yağı fabrikası, 14 adet su ürünleri işleme ve değerlendirme tesisi bulunmaktadır. Türkiye su ürünleri üretiminde önemli yere sahip olan Sinop ilinde geleceğe yönelik yapılan projeksiyonda; 2023 yılına göre yetiştiricilik üretimi 2040 yılında 4,93 kat, avcılık üretimi ise aynı dönemde 2,83 kat artacağı öngörülmektedir.

Anahtar Kelimeler: Sinop, su ürünleri avcılığı, kültür balıkçılığı, sürdürülebilirlik, projeksiyon

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1. Introduction

Awareness of healthy eating influences society's preferences for food sources. Animal products are essential components of adequate and balanced nutrition and are generally considered irreplaceable due to their high nutritional value (Ergün and Bayram, 2021). In developed countries, consumers increasingly demand healthy, high-quality, natural, and fresh fish products (Öz et al., 2017). Fish, with a protein content ranging from 19-24% (Gürer, 2021), is one of the primary food sources that meet human protein needs. Beyond their importance in human nutrition, aquatic products also constitute a strategic natural resource, providing a continuous source of investment for national economies (Arslan and Yıldız, 2021).

In line with these developments, global aquaculture production has increased rapidly, reaching 186,735,827 tons in 2022, with 94,415,401 tons originating from aquaculture (FAO, 2024). In recent years, advances in science and technology and the adoption of innovative applications have significantly contributed to the progress and expansion of the global aquaculture sector (Bostock, 2011).

In parallel with global developments, aquaculture production in Türkiye has also grown substantially, reaching 1,007,920 tons in 2023, a 15.1% increase compared to the previous year (Turkish Statistical Institute, 2024). In the same period, marine fishing increased by 21.2% and aquaculture by 7.5%. Thus, Türkiye's aquaculture sector is experiencing relatively rapid growth in both marine fishing and aquaculture.

Within Türkiye, the Black Sea ranks first in marine fish production (75.1%), followed by the Marmara Sea (12.5%), the Aegean Sea (9.3%), and the Mediterranean Sea (3.2%) (Turkish Statistical Institute, 2024). Aquaculture holds a significant share in the agricultural production of the Black Sea region, which accounts for approximately 75.2% of Türkiye's aquaculture production output. Like other provinces bordering the Black Sea coast, Sinop has significant potential in both fishing and aquaculture. In addition to long-established fishing activities, aquaculture in the province has expanded rapidly in recent years and now contributes significantly to the national economy.

This study presents the current status of the aquaculture sector in Sinop province, situated in the Black Sea Region. This region accounts for a significant share of Türkiye's aquaculture production and has gained prominence in recent years due to its dominance in sea cage aquaculture. Furthermore, the study evaluates the quantities produced.

2. Materials and Methods

Sinop is situated on the Boztepe Cape and Peninsula, between 41°12' and 42°06' north latitudes and 34°14' and 35°26' east longitudes. It is bordered by a border length of 475 km, including 175 km of coastline, covering an area of 5,862 km² (Figure 1). Within Sinop province, the Gökırmak, Ayancık, Çatalzeytin, Karasu, Kanlıçay (Güzelceçay), and Kabalı rivers are located. Additionally, substantial portions of the Boyabat Dam, covering 2,000 hectares, and the Altınkaya Dam, covering 2,300 hectares, are within the provincial boundaries. Apart from the Altınkaya and Boyabat Dams, there are 3 dams of varying sizes and 17 ponds covering a total area of 3,128.6 hectares.

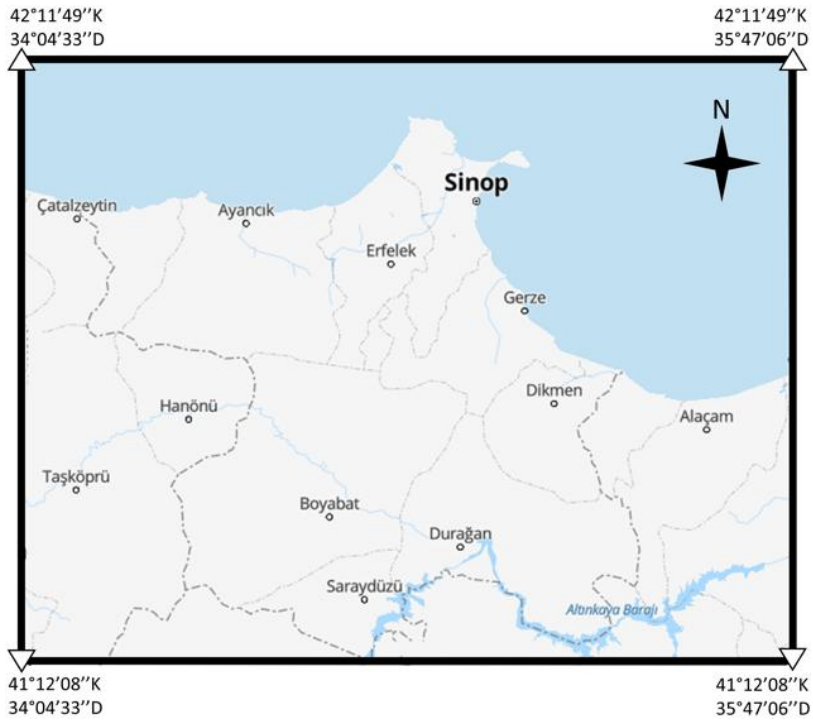
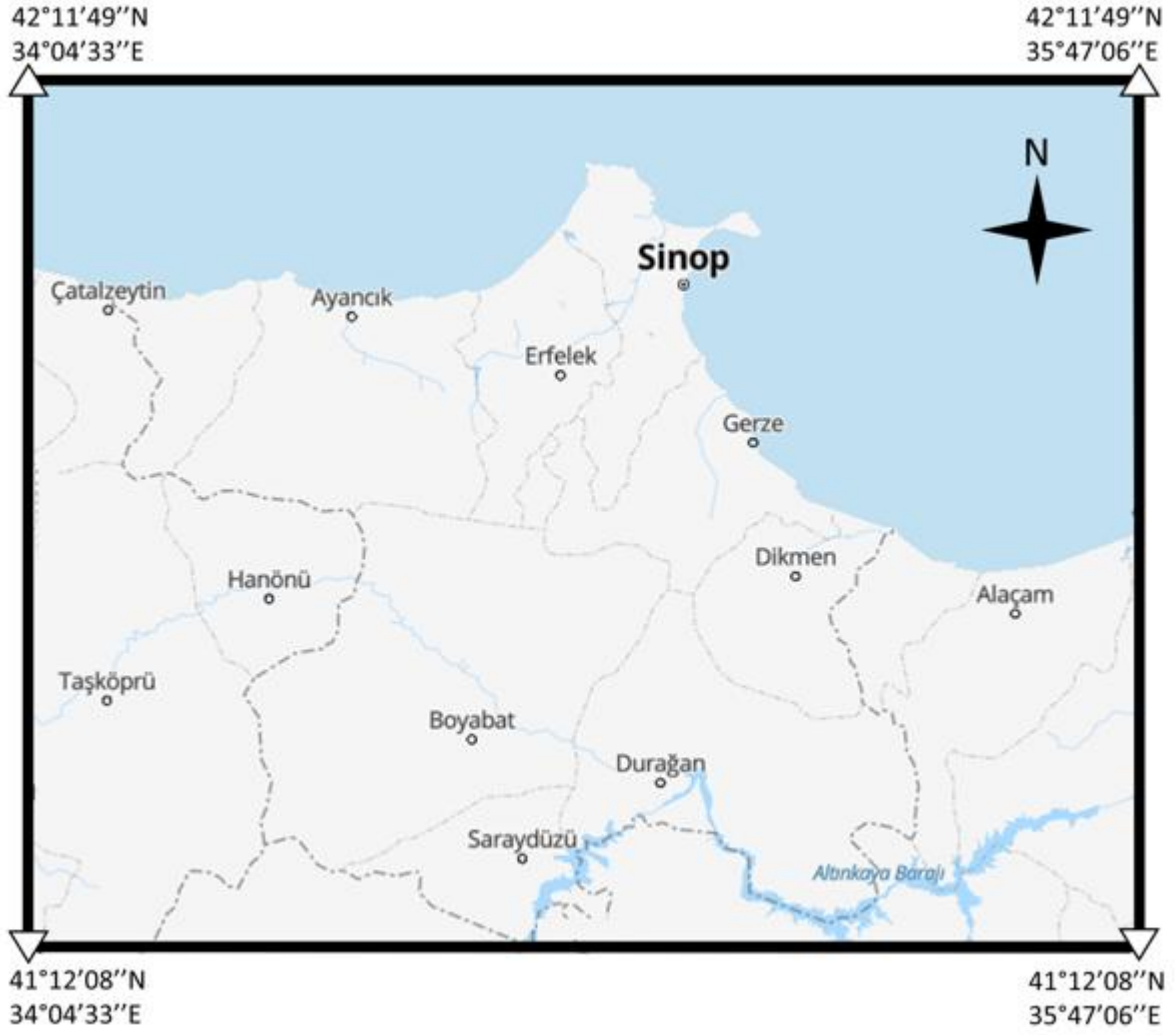


Figure 1. Working Area

This study evaluates the five-year aquaculture production figures (2019-2023) for Sinop province, located in the Black Sea Region, which accounts for a significant portion of Türkiye's aquaculture production.

Data from the Turkish Statistical Institute were used for this purpose. Descriptive statistics were employed to present the data. Subsequently, the data were analyzed using time-series and regression analyses after applying a logarithmic transformation.

3. Results

Sinop province is a region where the characteristics of the Black Sea climate are intertwined. Constant winds blow throughout the year, and the temperature difference between seasons are relatively insignificant. The Black Sea climate type generally prevails along the coast, while inland districts such as Dikmen, Durağan, and Saraydüzü exhibit a transition toward a continental climate. Generally, Sinop province is quite suitable for fishing and aquaculture activities in both marine and inland waters.

Almost all (98%) of the fishing vessels in Sinop province operate at sea, with 389 vessels contributing to aquaculture production (Table 1).

Table 1. Number of Fishing Vessels in the Fishing Fleet of Sinop Province

Year	Sea	Inland waters	Total
2019	438	6	444
2020	428	6	434
2021	421	0	421
2022	414	7	421
2023	383	6	389

According to official records of Sinop province, the total number of fishing vessels operating in marine and inland waters decreased from 444 in 2019 to 389 in 2023, representing a 12% decline over five years. This reduction may be influenced by various socio-economic factors; however, it can also be attributed in part to the fleet reduction policy implemented by the General Directorate of Fisheries and Aquaculture. There are 5 fishing harbors in the province, which are used by fishing vessels to transfer aquatic products from fishing activities and for sheltering and maintenance (Figure 2, Table 2).

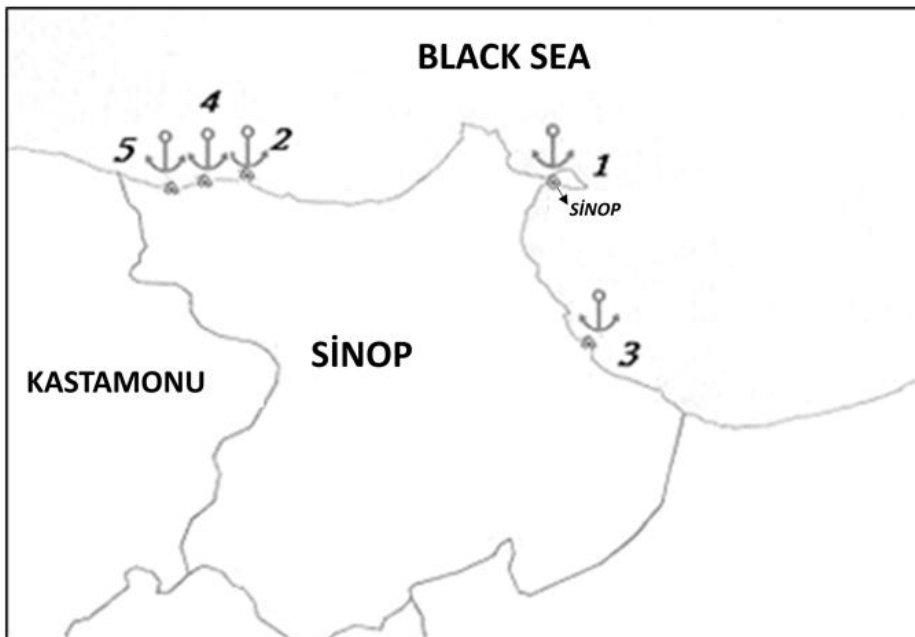


Figure 2. Locations of fishing harbors in Sinop province.

Table 2. Sinop Fishing Harbors

	One	Two	Three	Four	Five
Name of the Shelter	Centre	Ustaburnu	Gerze	Güzelkent (Helaldı)	Türkeli
Location	Centre	Ayancık	Gerze	Türkeli	Türkeli
Building Company	DLH Genel Müdürlüğü (Tarım sektörü ödeneğiyle)				
Date of Construction	Part 1:1967 Part 2:1979	1984	1992	1999	1994
Distance to the Nearest Shelter (Black Sea)	38 km-13 miles Gerze	25 km-5 miles Güzelkent	38 km-13 miles Sinop Merkez	12 km-5 miles Türkeli	12 km-5 miles Güzelkent
Distance from the District Center (km)	Centre	11	Centre	12	Centre
Highway Transportation Distance		12 km	0.5 km	2.2 km	
Main Breakwater Length (m)-	Part 1:220				
Secondary Breakwater Length (m)	Part 2: 330 Total:550	640-480	500-600	650-180	500-350
Infrastructure	Electricity - Water - Lighthouse - Boatyard	Electricity - Water - Lighthouse - Boatyard	Electricity - Water - Lighthouse - Boatyard	Electricity - Water - Lighthouse - Boatyard	Electricity - Water - Lighthouse - Boatyard
Superstructures			Ice Production Area		
Total number of boats in the harbor	306	40	70	7	10
Fisheries Cooperative	there is	there is	there is	there is	there is
Product Marketing	Through fishing cooperatives, at the auction in Sinop or at the Samsun Market.				

Approximately 75% of the fishing vessels utilizing existing harbors are based in the Sinop Central Fishing Harbor. Construction of the first phase of this harbor began in 1967 and was completed in 1969; it is the first harbor built in Sinop by the General Directorate of Railways and Maritime Affairs (DLH). In addition to the central harbor, fishing harbors have been constructed in the districts of Ayancık, Gerze, and Türkeli. In total,

there are 2,597 fishermen holding individual fishing licenses in Sinop province, 10 of whom are in inland waters (Table 3).

Table 3. Number of Fishermen with Licenses (For Individuals) in Sinop

Year	Sea	Inland water	Total
2019	2.466	10	2.476
2020	2.500	12	2.512
2021	2.633	10	2.643
2022	2.513	10	2.523
2023	2.587	10	2.597

An analysis of the number of licensed fishermen reveals that virtually all individuals holding fishing licenses and engaged in fishing as a profession participate in marine fishing. In the geographical region of Sinop province, fishing transcends mere subsistence, embodying a way of life. It is thought that the actual number of individuals involved in fishing in the province exceeds the official registration figures. Furthermore, those conducting fishing activities in Sinop province are organized under the auspices of 10 fisheries cooperatives (Table 4).

Table 4. Fisheries Cooperatives Operating in the Fisheries Sector of Sinop Province

District	Cooperative Name	Number of Members
Centre	S.S. Central Aquaculture Cooperative	59
"	S.S. Abalı Aquaculture Cooperative	82
"	S.S. Demirciköyü Fisheries Cooperative	15
"	S.S. Korucuk Aquaculture Cooperative	27
Ayancık	S.S. Çaylıoğlu Aquaculture Cooperative	23
"	S.S. Tarakçı Aquaculture Cooperative	23
Durağan	S.S. Durağan Aquaculture Cooperative	17
Gerze	S.S. Gerze Aquaculture Cooperative	48
Türkeli	S.S. Güzelkent Aquaculture Cooperative	78
"	S.S. Türkeli Fisheries Cooperative	44
Total		416

It has been determined that, among 2,597 fishermen engaged in fishing activities throughout the province, 416 are members of cooperatives. The cooperative with the most members is S.S. Abalı Fisheries Cooperative, with 82, while the cooperative with the fewest is S.S. Durağan Fisheries Cooperative, with 17. The economically valuable fish caught include anchovy, horse mackerel, bonito, whiting, and sprat. Sea fishing products are landed at 10 different locations in the province (Table 5).

Table 5. Landing points, fish species and quantities of marine catch products (2023)

Province/District	Starting Point	Fish Species	Quantity of catch (tons)
Sinop/Center	Sinop/Center	Horse mackerel, Bonito, Haddock	536,7
	Demirci	Anchovy, Horse mackerel, Bonito, Haddock	12.686,7
	Akliman	Sprat, Horse Mackerel, Bonito, Haddock	58,8
Ayancık	Denizciler	Horse Mackerel, Bonito, Haddock	8,7
	Gebelit	Horse Mackerel, Bonito, Haddock	-
	İstefan	Sprat, Horse Mackerel, Bonito, Haddock	704,7
Gerze	Töngel	Horse Mackerel, Bonito, Haddock	-
	Gerze	Anchovy, Horse Mackerel, Bonito, Haddock	956,4
Türkeli	Türkeli	Sprat, Horse Mackerel, Bonito, Haddock	1.083,8
	Güzelkent	Sprat, Hamsi, Horse Mackerel, Bonito, Haddock	12.551,5
Total			28.590,3

Table 5 shows that 94% of the total catch is landed at Türkeli and Sinop Center. Although Sinop province is primarily known for sea fishing, especially anchovy, there has been a marked increase in the production of kilogram-sized trout (Turkish salmon) in the Black Sea since 2012. This growth followed the identification of two potential aquaculture areas and the subsequent completion of major investments by businesses that enabled high-capacity production. Table 6 presents data on aquaculture activities in marine and inland waters in Sinop province.

Table 6. Aquaculture project capacities (tons) and actual production quantities (tons)

Years	Sea		Inland waters		Total (tons)
	Project Capacity (tons/year)	Production (tons)	Project Capacity (tons/year)	Production (tons)	
2019	13.750	1.380,08	31	8.65	1.388,73
2020	8.700	4.684,60	31	9.71	4.694,31
2021	21.870	5.473,04	24	3.69	5.476,73
2022	36.630	17.332,44	209	186.40	17.518,84
2023	38.880	26.695,99	1.209	126.66	26.822,65

In Sinop province's inland waters, capacity increased from 31 tons in 2019 to 1,209 tons in 2023 with the implementation of new project proposals, and production rose from 8.65 tons to 126.66 tons. In marine cage systems, production in 2019 (1,380.08 tons) was far below the project capacity of 13,750 tons, whereas in 2023, with a project capacity of 38,880 tons, production reached 26,695.99 tons.

Aquaculture, which forms the basis of the fisheries sector, is also an important source of economic income. While aquaculture production in Türkiye increased by approximately 36% in 2023 compared to the previous year, Sinop province recorded an increase of about 79% during the same period (Table 7).

Table 7. Fishing quantities (tons) for Türkiye and Sinop Province between 2019-2023.

Year	Türkiye	Sinop
2019	463 168	19 684
2020	364 400	2 591
2021	328 165	16 059
2022	335 003	17 107
2023	454 059	30 594

Products obtained through fishing and aquaculture are marketed to consumers after undergoing industrial seafood processing and evaluation. Approximately 56% of seafood processing and evaluation facilities are located in Sinop city center, and 80% of fish meal and oil factories operate within the borders of Dikmen district (Table 8).

Table 8. Number of Seafood Processing Facilities/Fish Meal and Oil Factories in Sinop Province

Year	Facilities	Location		Total
		Center	Dikmen	
2019	Seafood Processing and Reprocessing Facility	3	4	7
	Fish Meal and Oil Factory	1	3	4
2020	Seafood Processing and Reprocessing Facility	3	4	7
	Fish Meal and Oil Factory	1	3	4
2021	Seafood Processing and Reprocessing Facility	4	4	8
	Fish Meal and Oil Factory	1	3	4
2022	Seafood Processing and Reprocessing Facility, Fish Meal and Oil Factory	5	4	9
		1	3	4
2023	Seafood Processing and Reprocessing Facility, Fish Meal and Oil Factory	5	4	9
	Seafood Processing and Reprocessing Facility, Fish Meal and Oil Factory	1	4	5

In 2019, there were 7 seafood processing and evaluation facilities and 4 fish meal and oil factories operating at 2 locations in Sinop province. Following recent developments in the seafood sector, these numbers increased in 2023 to 9 seafood processing and evaluation facilities and 5 fish meal and oil factories. This information was compared with total seafood catch production in Türkiye and the catch production in Sinop province (Figure 3).

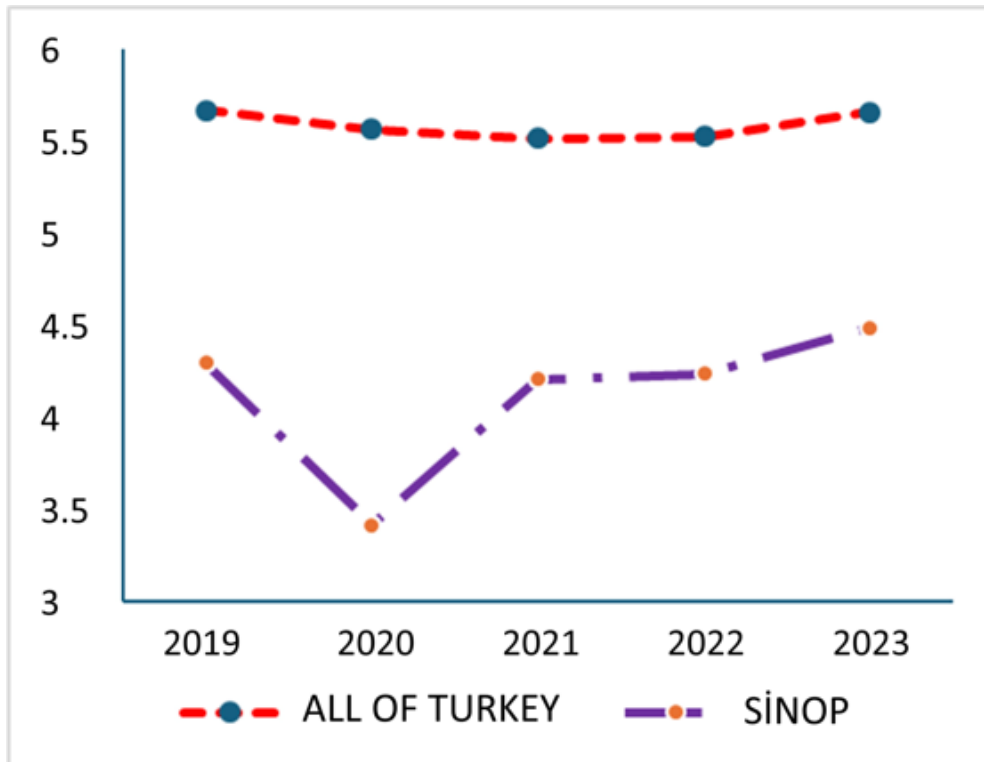


Figure 3. Fishing data for Türkiye as a whole and Sinop Province between 2019-2023 (log (ton))

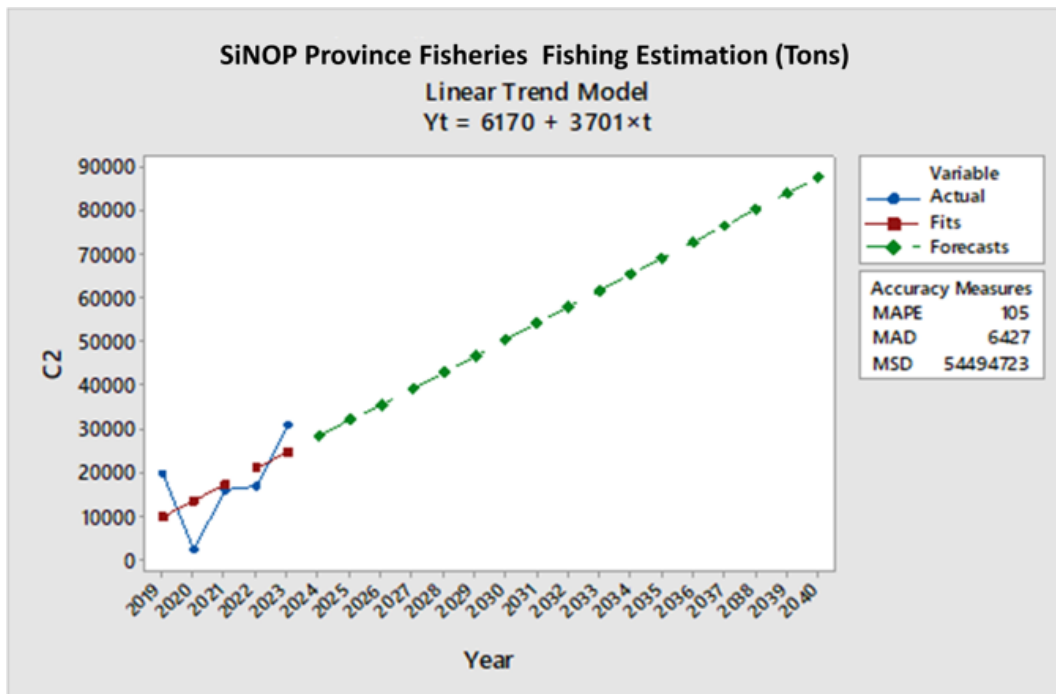


Figure 4. Estimated Fisheries Production in Sinop Province (tons)

As shown in Figure 4, fishing production in Sinop province declined noticeably in 2020 compared with other years. Based on data from 2019-2023, fishing production in the province is projected to reach approximately 69,095.9 tons/year in 2035, and 87,603.4 tons/year in 2040, representing about a 2.83-fold

increase compared to 2023. Similarly, estimates for aquaculture in Sinop province, derived from 2019-2023, indicate that production will reach approximately 100,000 tons/year in 2035 and 132,196.00 tons/year in 2040, representing an increase of approximately 4.93 times compared to 2023.

4. Discussion and Conclusion

This study examines aquaculture production and future expectations in Sinop province, one of Türkiye's important aquaculture centers. In this context, the study, in addition to examining aquaculture production, aims to develop robust projections for the sector's future. Aquaculture is widely considered a sector of the future in meeting the animal protein needs of a growing population. Aquaculture products, with their high protein content and nutritional value, are essential and generally irreplaceable basic food items for adequate and balanced nutrition (Ergün and Bayram, 2021; Gürer, 2021). Besides its importance in human nutrition, it is also significant as a natural resource that provides continuous investment input for national economies in the future (Arslan and Yıldız, 2021).

Considering the direct and indirect activities of the fishing industry in Türkiye, it is estimated to provide employment opportunities for approximately 100,000 households and to support the livelihoods of nearly 500,000 people (Sarıözkan, 2016). Although there are 2,597 licensed fishermen in Sinop province, the number of persons engaged in fishing is predominantly concentrated in coastal areas, and it is estimated that approximately 5,000 individuals in the province are involved in fishing.

Aquaculture, owing to its strategic significance due to the added value it generates and its contribution to employment, is rapidly developing in our country, paralleling global trends. Available data on the capture fishing indicate that the fishable stock size in Türkiye has generally reached its limit, similar to global trends. Therefore, increasing production through fishing is limited. Nevertheless, controlled production policies should be developed and implemented with an ecosystem-based approach to enhance capture fisheries production. Such policies are crucial to ensuring the transfer of existing aquaculture resources to future generations. The uncertainty in fishing production has made aquaculture indispensable for meeting the animal protein needs of the growing population. In this context, Türkiye, with its extensive seas and inland waters, holds a strong regional advantage in terms of both species' diversity in capture and aquaculture potential.

Sinop province, with its long-standing fishing culture, 175 km coastline, and a combination of artificial and natural harbors, is one of Türkiye's important centers for aquaculture production. 99% of aquaculture production comes from marine sources, and approximately 92% of the total landings consist of anchovies.

In a study conducted in Sinop province reported that fish stalls mostly contain anchovy (*Engraulis encrasicolus ponticus*), horse mackerel (*Trachurus trachurus*), blue fish (*Pomatomus saltatrix*), bonito (*Sarda sarda*), shad (*Alosa fallax nilotica*), garfish (*Belone belone*), gray mullet (*Mugil cephalus*), mullet (*Sciaenops ocellatus*), red snapper (*Trigla lucerna*), as well as other commercially valuable species such as turbot (*Psetta maxima*), mullet (*Mullus barbatus*), whiting (*Merlangius merlangus*), scorpion (*Scorpaena porcus*), minnow (*Umbra cirrosa*), bream (*Diplodus vulgaris*), sea bream (*Diplodus annularis*), butt (*Maena smaris*) and goby (*Gobius niger*). In total, 18 species of wild-caught fishery products were recorded as being sold (Yücel et al., 2017). In a similar study on farmed fish marketed in Sinop province, the following species were found to be sold: sea bream (*Sparus aurata*), sea bass (*Dicentrarchus labrax*), rainbow trout (*Oncorhynchus mykiss*) (portion and kilogram sizes), and salmon (*Salmo salar*) (imported) (Baki et al., 2017).

As of the end of 2023, Sinop province had 389 fishing vessels, 2,597 fishermen, 10 fisheries cooperatives with 416 members, 5 fishing harbors, and 10 fishing landing points, 30,933.5 tons of aquaculture production, and approximately 26,822.7 tons of farmed fish production, of which 126.66 tons were from inland waters. The province also hosted 5 fish meal and oil factories and 14 aquaculture processing and evaluation facilities. In Sinop, which occupies an important position in Türkiye's aquaculture production, projections indicate that aquaculture production will increase by 4.93 times and fishing production by 2.83 times by 2040, relative to 2023 levels.

Countries' social development models are realized not only through centralized policies, but through local economic empowerment. Sinop province has substantial aquaculture potential, which should be fully realized by mobilizing all local stakeholders. Recent growth in aquaculture production areas strongly supports this dynamic. In addition, sustainable fishing policies should be adopted, and high-capacity fishing fleets should be directed towards offshore fishing grounds. To prevent value loss in fishery products, coastal logistics infrastructure and cold storage facilities should be established to manage surplus production. A specialized, organized industrial zone for aquaculture, capable of serving the entire region, should be established as soon as possible. Given that organized structures can strengthen fishers, active membership in aquaculture cooperatives should be promoted, following successful international examples. Fish market and auction

practices should be digitalized, and modern technologies should be integrated into aquaculture marketing. Environmentally compatible aquaculture development and branding efforts for farmed fish are also essential. In parallel, fisheries policies should be designed and implemented at the ecosystem level to protect and ensure the sustainability of aquatic resources.

In conclusion, ensuring that the fisheries sector's contribution to the national economy and its role as a key source of healthy protein, a fundamental nutrient in human nutrition, remain as abundant and diverse as in the past is of paramount importance. In this context, protecting and developing small-scale fisheries, directing large-scale fleets to offshore grounds, strengthening cooperatives, modernizing coastal fishing infrastructure, increasing fisheries production and consumption, expanding sectoral employment, and creating industries that enhance the added value of products will all contribute significantly to the regional and national economic growth and social development.

5. Compliance with Ethical Standards

a) Authors Contributions: All authors have contributed equally to the article. All authors have read and approved the final article.

b) Conflict of Interest: The authors declare that there is no conflict of interest.

c) Animal Welfare Statement, Ethical Approval: Formal approval is not required for this type of study.

d) Human Rights Statement, Ethical Approval: Formal approval is not required for this type of study.

e) Declaration of Non-Use of Artificial Intelligence: The authors declare that they have not used any form of generative artificial intelligence in the writing of this article, or in the creation of visuals, graphs, tables, or their corresponding headings.

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