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Production Trends and Volatility Analysis in Non-Fish Marine Capture Fisheries in Türkiye (2016-2025)

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Abstract: The aim of this study was to statistically examine the production trends and annual fluctuations of major non-fish marine capture groups in Türkiye during 2016–2025. The research was designed as a descriptive trend analysis based on secondary data published by the Turkish Statistical Institute (TurkStat). Annual growth rates, Compound Annual Growth Rate (CAGR), standard deviation, coefficient of variation, and simple linear regression models were used to evaluate production dynamics. The findings indicated an average annual contraction of 1.85% in the total catch of non-fish marine products during the study period. However, the linear trend model for total production was not statistically significant at the 5% level ($p=0.062$; $R^2=0.370$). A more pronounced decline was observed in sea snail production (CAGR: -5.00%), and the corresponding model was statistically significant ($p=0.032$; $R^2=0.458$). In contrast, the octopus–squid–shrimp composite group exhibited relatively low production variability (CV: 7.09%) and a non-significant linear trend ($p=0.737$). In conclusion, non-fish marine capture fisheries in Türkiye show an overall downward tendency at the aggregate level; however, clear differences exist among species groups in terms of contraction, growth, and production volatility. These findings suggest that the sector should be monitored not only through total production levels but also through species-specific assessments.

Keywords: Fisheries statistics, CAGR, linear trend analysis, coefficient of variation, crustaceans, molluscs..

Türkiye'de Balık Dışı Deniz Ürünleri Avcılığında Üretim Eğilimleri ve Oynaklık Analizi (2016-2025)

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Öz: Bu çalışmanın amacı, Türkiye'de 2016–2025 döneminde balık dışı deniz ürünleri avcılığında yer alan başlıca tür gruplarının üretim eğilimlerini ve yıllık dalgalanmalarını istatistiksel olarak incelemektir. Araştırma, Türkiye İstatistik Kurumu (TÜİK) tarafından yayımlanan ikincil verilere dayalı tanımlayıcı bir eğilim analizi olarak tasarlanmıştır. Üretim dinamiklerini değerlendirmek amacıyla yıllık büyüme oranları, Yıllık Bileşik Büyüme Oranı (Compound Annual Growth Rate, CAGR), standart sapma, varyasyon katsayısı ve basit doğrusal regresyon modelleri kullanılmıştır. Bulgular, incelenen dönemde toplam balık dışı deniz ürünleri av miktarında yıllık ortalama %1,85'lik bir daralma eğilimi olduğunu göstermektedir. Bununla birlikte, toplam üretim için kurulan doğrusal trend modeli %5 anlamlılık düzeyinde istatistiksel olarak anlamlı bulunmamıştır ($p=0,062$; $R^2=0,370$). Deniz salyangozu üretiminde daha belirgin bir daralma saptanmış (CAGR: -%5,00) ve bu tür için kurulan model anlamlı bulunmuştur ($p=0,032$; $R^2=0,458$). Ahtapot, kalamar ve karides alt türlerinden oluşturulan bileşik grupta ise göreli olarak düşük üretim oynaklığı (CV: %7,09) ve istatistiksel olarak anlamlı olmayan bir doğrusal trend ($p=0,737$) belirlenmiştir. Sonuç olarak, Türkiye'de balık dışı deniz ürünleri avcılığında toplam düzeyde azalma yönlü bir eğilim bulunmakta; ancak türler arasında büyüme/daralma yönü ve oynaklık düzeyi bakımından belirgin farklılıklar görülmektedir. Bu bulgular, sektörün toplam üretim göstergelerinin yanı sıra tür bazında da düzenli olarak izlenmesi gerektiğini göstermektedir.

Anahtar kelimeler: Su ürünleri istatistikleri, CAGR, doğrusal trend analizi, varyasyon katsayısı, kabuklular, yumuşakçalar.

INTRODUCTION

Fisheries constitute the third major sub-branch of the agricultural sector in terms of production value, following crop production and livestock husbandry. The high potential of Türkiye's existing aquatic resources elevates this strategic field to a much more critical economic position. The fisheries sector plays a primary role in ensuring national food security, sustaining employment opportunities in coastal regions, and increasing export revenues at the macroeconomic level (Doğan, 2002; Ukav, 2023).

Türkiye occupies an important position on a global scale in terms of the number of enterprises, export capacity, and production volume in the fishing industry (Duman &

Cengizler, 2022). However, statistical evaluations of fisheries production in Türkiye have mostly focused on total production, aquaculture activities, or fish species with high economic value (Demir & Sönmez, 2012; Yavuzcan et al., 2015; Şahinöz et al., 2017; Candemir & Dağtekin, 2019; Gün & Kızak, 2019; Arslan & Yıldız, 2021; Şakıma & Çevrimli, 2021; Ukav, 2022; Sarıca & Aktar, 2025).

In contrast, non-fish marine products such as crustaceans (Crustacea) and molluscs (Mollusca), although appearing more limited in terms of total production volume, deserve separate evaluation because of their commercial value, export potential, and critical roles in coastal ecosystems. Indeed, these organisms, which have been regarded as an important food source worldwide since prehistoric times (Başçınar, 2007), constitute some of the most valuable groups consumed as food after fish in marine environments. In particular, bivalve molluscs, which play a significant role in the economies of many countries, cannot be sufficiently integrated into the economy in Türkiye due to legal gaps and planning deficiencies in this field (Çolakoğlu & Çolakoğlu, 2013). Nevertheless, studies directly examining the current status of mollusc and arthropod production quantities and producing future projections remain quite limited in the existing literature in Türkiye (Eminçe Saygı & Acarlı, 2024). At the international level, aquatic foods are increasingly recognized for their contributions to food security, nutrition, livelihoods, and fisheries economies. According to FAO (2024), global capture fisheries production has remained relatively stable since the late 1980s, while continuing to display interannual fluctuations; the report also evaluates crustaceans and molluscs as distinct components of global aquatic animal production. Molluscs, particularly those harvested and farmed in coastal regions, are becoming increasingly important in meeting human nutritional needs. In this respect, like other seafood, molluscs are known to have sustainable and efficient production processes as a source of protein (Akdemir, 2025: Ekon ve Tosun, 2026). Within this broad category, crustaceans, cephalopods, molluscs, and other aquatic invertebrates constitute distinct components of aquatic food production and supply (Tacon & Shumway, 2024; Crona et al., 2023). Global assessments also indicate that crustacean fisheries have expanded substantially and have gained economic importance, while this growth has simultaneously raised concerns regarding fishing pressure, ecosystem effects, data limitations, and sustainable management (Boenish et al., 2022). These developments highlight the need to monitor non-fish marine resources not only through aggregate production quantities but also through differences in production trends and variability among species groups.

In recent years, increasing anthropogenic and environmental pressures on marine resources have led to fluctuations in species-based production quantities and marked contractions in some groups (Demirel et al., 2023; Eminçe Saygı & Acarlı, 2024). In this context, descriptive trend analyses based on official statistics are of great importance for revealing the direction of change and the stability of production in the sector (Eminçe Saygı & Acarlı, 2024). Despite the growing international attention to crustacean, mollusc, and cephalopod fisheries, comparative assessments addressing both long-term growth trajectories and interannual production variability remain limited for Türkiye. Existing official statistics provide species-level production records, yet these records have rarely been evaluated together to distinguish declining, highly variable, and relatively stable production patterns. Such an assessment does not replace species-specific biological stock evaluations; rather, it provides a statistical baseline for identifying species and groups that may require more detailed biological, environmental, or fisheries-based investigation.

Accordingly, this study aimed to evaluate production trends and interannual variability in major non-fish marine products captured in Türkiye during 2016–2025 using official production statistics. Specifically, the study aimed to: (i) characterize the overall trajectory of total non-fish marine capture production; (ii) compare long-term growth or contraction among selected species and species groups using the Compound Annual Growth Rate (CAGR); (iii) assess relative production variability using the coefficient of variation; and (iv) identify linear time trends through simple regression models. By jointly evaluating growth direction and production variability, the study seeks to provide a comparative statistical baseline for distinguishing declining, highly variable, and relatively stable components of Türkiye’s non-fish marine capture production.

MATERIAL AND METHOD

Data Source: In this study, fisheries production data covering the period 2016–2025 were used. The data were obtained from the *Fishery Products Statistics* published by the Turkish Statistical Institute (TurkStat, 2026). The study was designed as a descriptive trend analysis based on secondary data.

Annual Growth Rate and CAGR Calculations: To determine year-to-year changes in production quantities, the annual growth rate was calculated using the following formula:

$$Growth\ Rate\ (\%) = \left[\left(X_t - X_{(t-1)}\right)/X_{(t-1)}\right] \times 100$$

where X_t denotes the production quantity in the current year and X_{t-1} denotes the production quantity in the previous year.

To summarize long-term change, the Compound Annual Growth Rate (CAGR) was calculated as follows:

$$CAGR = \left[\left(X_{final}/X_{initial}\right)^{(1/n)} - 1\right] \times 100$$

where $X_{initial}$ represents the production quantity in the initial year (2016), X_{final} represents the production quantity in the final year (2025), and denotes the number of periods. For the 2016-2025 period, n=9. The results are reported as percentages (%). CAGR has also been used in recent international assessments to summarize long-term changes in aquatic food supply and to compare growth patterns across regions and production components (Tacon & Shumway, 2024).

Volatility Analysis: To compare relative production variability across species, the mean, standard deviation (SD), and coefficient of variation (CV) of annual production quantities were calculated. The coefficient of variation was expressed as follows:

$$CV = SD\ /\ Mean$$

This approach allows the relative volatility of species or species groups with different average production levels to be compared.

Linear Trend Analysis: To evaluate long-term linear trends in production quantities, simple linear regression models were estimated. In these models, the dependent variable was the annual production quantity of the relevant species or species group, while the independent variable was a time index representing the study period (t=1, 2,…,10). For each model, the intercept, slope coefficient, standard error, t-statistic, p-value, and coefficient of determination (R^2) were reported.

The regression models were used as descriptive trend models rather than as forecasting or causal models, consistent with the objective of identifying the direction and statistical strength of linear change over the observed period. Data processing, ratio calculations, and summary statistics were performed using Microsoft Excel.

Construction of the Composite Group: For descriptive comparison, an octopus–squid–shrimp composite group was constructed by summing the annual production quantities of octopus, squid, and the shrimp subtypes reported in the TurkStat dataset. The shrimp component included speckled shrimp, green tiger prawn, caramote prawn, giant gamba prawn, deep-water rose shrimp (Çimçim), and, from 2023 onward, giant red shrimp and blue and red shrimp, which were reported separately in the official statistics.

This composite group was created as an operational statistical indicator rather than as a biological or taxonomic classification. Its purpose was to provide a concise comparison between the production pattern of these selected commercially harvested taxa and the production patterns of the dominant individual groups examined in the study, namely striped venus and sea snail. Because octopus, squid, and shrimp differ in their life histories, stock dynamics, fishing methods, and management requirements, results obtained for the composite group were interpreted only in terms of aggregated production growth and variability. They were not interpreted as evidence of common biological status, stock condition, or sustainability among the constituent taxa.

RESULTS

Production Trends and Volatility: During the 2016–2025 period examined, an overall downward tendency was observed in the total catch quantity of the non-fish marine products group in Türkiye. Total production was 37,739.1 tons in 2016, reached its highest level of the period at 61,931.2 tons in 2018, and then declined to 31,902.5 tons in 2025. Accordingly, the Compound Annual Growth Rate (CAGR) calculated for the total group was negative, indicating an average annual contraction of 1.85% over the study period.

The annual course of total non-fish marine capture production during 2016–2025, together with the fitted linear trend and its 95% confidence interval, is presented in Figure 1. The figure was prepared using Fishery Products Statistics published by the Turkish Statistical Institute (TurkStat, 2026). As shown in Figure 1, total production peaked in 2018 and, although it followed a fluctuating pattern thereafter, generally moved within a lower range and fell below its initial level by the end of the period. When considered together with the negative CAGR value, this visual pattern indicates an overall downward structure in total production. The wide confidence interval around the fitted trend is consistent with the considerable interannual variability of the series and the non-significant trend result at the 5% level.

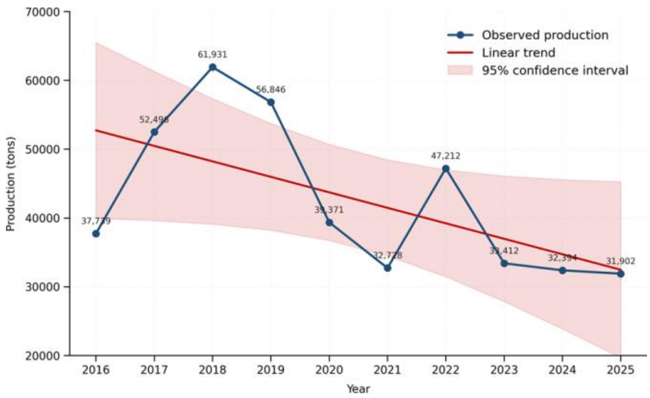

Figure 1. Annual total non-fish marine capture production in Türkiye, fitted linear trend, and 95% confidence interval (2016-2025).

The overall pattern shown in Figure 1 suggests that different production dynamics emerge when the series is disaggregated by species. Therefore, volatility and growth indicators for selected species and species groups, together with total production levels, are presented in detail in Table 1.

Species-based evaluations indicate that production did not change uniformly across all groups. Striped venus declined from 20,931.7 tons in 2016 to 17,953.0 tons in 2025, and the CAGR for this species was calculated as -1.69%. However, striped venus had an average production of 25,238.0 tons, a standard deviation of 9,817.0 tons, and a coefficient of variation of 38.9%, indicating that it was the most volatile group among the species examined.

Sea snail production decreased from 10,353.7 tons in 2016 to 6,526.8 tons in 2025. The CAGR calculated for this species was -5.00%, indicating a more pronounced contraction compared with the other selected groups. The average production of sea snail was 8,759.8 tons, with a standard deviation of 1,588.5 tons and a coefficient of variation of 18.1%.

In the octopus–squid–shrimp composite group, production increased from 5,135.8 tons in 2016 to 5,560.2 tons in 2025. The CAGR for this group was calculated as 0.89%, while average production, standard deviation, and coefficient of variation were 5,597.4 tons, 397.1 tons, and 7.09%, respectively. These values indicate that the composite group had the lowest relative production variability among the groups examined.

Table 1. Production level, volatility, and CAGR values in non-fish marine capture fisheries in Türkiye (2016–2025)

Variable (Species)	2016 Production (Tons)	2025 Production (Tons)	Mean (Tons)	Standard Deviation (SD)	Coefficient of Variation (CV, %)	CAGR (%)
Total Other Marine Products	37,739.1	31,902.5	42,603.2	10,631.8	25.00	-1.85
Striped Venus	20,931.7	17,953.0	25,238.0	9,817.0	38.90	-1.69
Sea Snail	10,353.7	6,526.8	8,759.8	1,588.5	18.10	-5.00
Octopus–Squid–Shrimp Composite Group*	5,135.8	5,560.2	5,597.4	397.1	7.09	0.89

Note: The octopus–squid–shrimp composite group was constructed as the sum of octopus, squid, and shrimp subtypes. The shrimp group included speckled shrimp, green tiger prawn, caramote prawn, giant gamba prawn, deep water rose prawn (Çimçim), and, from 2023 onward, giant red shrimp and blue and red shrimp. The official Fishery Products bulletin of the Turkish Statistical Institute states that statistics on marine fish and other marine products capture are compiled in cooperation with the Turkish Statistical Institute and the Ministry of Agriculture and Forestry. To maintain consistency with the official data source, the species names in the table follow the Turkish Statistical Institute classification.

Linear Trend Models

The results of the simple linear regression models established to evaluate long-term linear trends in production quantities are presented in Table 2. The models were constructed on the basis of the official TurkStat series in order to reveal the relationship between the annual production quantities of selected species and species groups and the time variable. The 2025 fishery products bulletin of TurkStat states that statistics on marine products and other marine products capture are compiled in cooperation between the Turkish Statistical Institute and the Ministry of Agriculture and Forestry.

In Model 1, which explains total non-fish marine products production, the slope coefficient of the time variable was found to be negative (-2,250.8). This result indicates the presence of a downward linear trend in total production during the period examined. However, the p-value of the model was calculated as 0.062, indicating that this trend was not statistically significant at the 5% significance level. The explanatory power of the model was determined as R^2=0.370.

In Model 2, which explains sea snail production, the slope coefficient of the time variable was calculated as -374.3, and this coefficient was found to be statistically significant (p=0.032). The R^2 value of the model was 0.458, indicating that approximately 45.8% of the variation in sea snail production was explained by the linear time trend. This finding suggests that sea snail production exhibited a more pronounced and statistically supported downward trend throughout the study period.

In Model 3, which explains the octopus–squid–shrimp composite group, the slope coefficient was calculated as 16.9; however, this coefficient was not found to be statistically significant (p=0.737). The R^2 value of the model was 0.015, indicating that the explanatory power of the linear time trend for the production change of this group was quite low. This result suggests that no clear linear increasing or decreasing trend was observed in the octopus–squid–shrimp composite group during the period examined.

Table 2. Results of long-term linear trend models in non-fish marine capture fisheries in Türkiye (t=1, 2, …,10).

Model (Dependent Variable)	Intercept	Slope Coefficient	Standard Error (SE)	p-value	t-value	R^2
Model 1: Total Production	54,982.6	-2,250.8	1,038.9	0.062	-2.17	0.370
Model 2: Sea Snail	10,818.5	-374.3	143.9	0.032*	-2.60	0.458
Model 3: Octopus–Squid–Shrimp Composite Group	5,504.4	16.9	48.5	0.737	0.35	0.015

***Note:** Statistically significant at the p<0.05 level. In the regression models, the independent variable is the time index (t=1, 2,…,10).

DISCUSSION

The findings of this study indicate that non-fish marine capture fisheries in Türkiye generally exhibited a downward tendency during the 2016-2025 period. When the negative CAGR value calculated for total production is considered together with the negative slope coefficient obtained from the linear trend model, it can be stated that the sector as a whole followed a contractionary pattern. This finding is broadly consistent with recent sectoral assessments suggesting continued growth in aquaculture and ongoing pressure on capture-based production in the Turkish fisheries sector (Eminçe Saygı, 2024). However, the p-value of 0.062 obtained for the linear regression model of total production indicates that this tendency is not strongly supported at the 5% significance level. Therefore, for total production, the expression "a downward tendency" is more appropriate than "a statistically significant decline." Moreover, this finding is also consistent with projection studies based on ARIMA models, which forecast an overall decline in arthropod and mollusc production in Türkiye by 2030 (Eminçe Saygı & Acarlı, 2024). The downward tendency observed in Türkiye should also be considered within the broader international context of aquatic food production. Tacon and Shumway (2024) reported that global aquatic food supply increased during 2010–2020, although growth patterns differed substantially among regions and product groups. Their assessment also treated crustaceans, cephalopods, other molluscs, and aquatic invertebrates as distinct components of aquatic food supply. This international evidence supports the need to evaluate non-fish marine production not only at the aggregate level but also according to the production trajectories of its constituent groups.

When evaluated at the species level, the most striking finding is the decline in sea snail production. The negative CAGR value together with the statistically significant linear trend coefficient indicates that the decline in this species was more pronounced than in the other groups examined. Previous studies on sea snail fisheries have shown that the selectivity of the fishing gear used and its effects on the benthic ecosystem constitute an important issue from the perspective of fisheries management (Sağlam, 2007). For this reason, the consideration of more selective fishing gear and alternative practices may be beneficial for the sustainable management of sea snail stocks.

More broadly, international studies on commercially harvested invertebrates indicate that production or landing trends alone are insufficient to determine stock status because recorded changes may reflect the interacting effects of fishing pressure, biological characteristics, environmental variability, markets, and management measures. Accordingly, the statistically significant decline identified for sea snail production in the present study should be interpreted as a warning signal requiring species-specific stock, fishing-effort, and catch-per-unit-effort data, rather than as direct evidence of a particular causal mechanism. Within the scope of the present study, which is based solely on production quantities, it is therefore not possible to determine the causes of the observed decline. More comprehensive datasets would be required to evaluate the potential roles of fishing pressure, environmental conditions, stock status, market structure, and management practices. Factors such as climate change, mucilage events, illegal fishing, invasive species, diseases, legal regulations, and fisheries management policies have also been reported as potential influences on mollusc and crustacean production (Eminçe Saygı & Acarlı, 2024). Similarly, development planning and sectoral assessment reports emphasize that fisheries production may be affected by environmental pressures and resource-management problems (ÖİK, 2013).

One of the economically important bivalve groups along the coasts of Türkiye is recorded as "Beyaz kum midyesi" in TurkStat data and given the English equivalent "striped venus." In a study focusing on the striped venus processing industry in Türkiye, the species was directly identified as *Chamelea gallina* (Dalgıç et al., 2006). Accordingly, the term "striped venus" is used in the present study in accordance with the English designation provided in the TurkStat classification.

The high coefficient of variation observed for striped venus production (38.9%) indicates marked interannual fluctuations in this group. Earlier studies addressing crustacean and mollusc production and exports also show that this group has long been treated as an economic topic in the Turkish fisheries literature (Başçınar, 2007). In this respect, the volatility observed in striped venus production may be regarded as an issue that should be carefully monitored in terms of the sector's production structure.

This finding is consistent with the broader international concern that economically important shellfish resources may display substantial variability and require monitoring systems capable of separating changes in recorded production from changes in stock condition, fishing activity, markets, or data collection. In the wider aquatic food literature, molluscs are recognized as an important component of food supply and coastal livelihoods; however, their contribution and development patterns differ considerably among countries and regions (Tacon & Shumway, 2024; Crona et al., 2023). The high variability observed for striped venus in Türkiye therefore underlines the importance of maintaining consistent species-level records and complementing production statistics with stock- and fishery-related indicators.

As emphasized in the literature, instability in bivalve mollusc production is linked not only to biological factors, but also to hygiene, monitoring, depuration, legislation, and the management of production areas (Çolakoğlu & Çolakoğlu, 2013). Since bivalve molluscs are filter-feeding organisms, regular monitoring of production areas and the effective implementation of legal procedures are essential for the sustainability of the sector.

In this context, production fluctuations in economically valuable species such as striped venus should be evaluated not only in relation to stock quantities but also together with managerial and procedural factors. Given its large share in total production, volatility in striped venus may also be considered an important factor affecting the overall production structure of the sector. This suggests that a substantial part of the fluctuation observed in total production may be driven by changes in a few dominant species.

By contrast, the octopus–squid–shrimp composite group had a low coefficient of variation (7.09%) and a non-significant linear trend, indicating relatively low variability in the aggregated production series during the period examined. This result should not be interpreted as evidence that the constituent taxa share similar biological status or sustainability conditions. International studies demonstrate that crustacean fisheries alone encompass species with markedly different life histories, stock structures, exploitation patterns, and assessment requirements (Boenish et al., 2022). The same caution applies when crustaceans are considered together with cephalopods. Therefore, the relatively low variability observed in the composite series reflects only the aggregated statistical behavior of recorded production and may conceal divergent trends among its constituent taxa. Species-specific biological, fishing-effort, environmental, and market data would be required to assess the mechanisms underlying these patterns.

Another issue to be considered in interpreting the present findings is the change in the method of compiling the official data. The footnotes in the tables published by TurkStat indicate that, for some species, the data have been based on administrative records of the Ministry of Agriculture and Forestry beginning in 2023 and 2024. Therefore, caution is needed when interpreting some of the increases and decreases observed particularly in the most recent years. Accordingly, the findings of this study should be regarded as statistical indicators describing production trends; stronger cause-and-effect interpretations would require additional data sources. This distinction is also important from an international assessment perspective. Catch and production records are often the most widely available information for data-limited fisheries, but their interpretation becomes more reliable when they are supported by fishing-effort, abundance, size-composition, biological, and environmental data. Thus, the present analysis should be viewed as an initial screening framework for identifying production series that warrant more detailed investigation. This interpretation is consistent with recent assessments emphasizing the need to complement catch records with data capable of supporting stock assessment and management decisions in data-limited crustacean fisheries (Goto et al., 2025).

Overall, the results show that non-fish marine capture fisheries in Türkiye do not have a homogeneous production structure and that important differences exist among species in terms of both growth/decline patterns and volatility levels. For this reason, it would be more appropriate to monitor the sector through regular species-based evaluations rather than focusing solely on total production quantities. At the same time, in order to reduce production fluctuations and support the sustainability of resources, it is important to conduct regular stock assessments in natural beds, monitor production areas, and strengthen traceability from production to market (Çolakoğlu & Çolakoğlu, 2013). In addition, recent studies emphasize that more accurate forecasting results may be obtained by using more focused, species-based datasets rather than aggregate total series in future modeling studies (Eminçe Saygı & Acarlı, 2024). Development planning reports also highlight the importance of long-term and regular stock research and note that data continuity is critical for resource management policies (ÖİK, 2013). In this context, strengthening species-based data monitoring networks and expanding them at the national scale emerges as an important need.

Accordingly, the principal contribution of the present study lies not in replacing biological stock assessments or identifying causal drivers, but in jointly comparing the direction of long-term change and relative production variability across selected non-fish marine production series. This combined perspective provides an initial basis for identifying declining, highly variable, and comparatively low-variability production components and for prioritizing future species-specific research.

LIMITATIONS

This study is based on official production data published by the Turkish Statistical Institute (TurkStat) and covers only the recorded quantities of non-fish marine capture fisheries. Therefore, unreported fishing, illegal fishing, and aquaculture-based production are beyond the scope of the study. The data used in the study reflect production quantities only and do not include variables such as fishing capacity, fishing effort, stock size, catch per unit effort (CPUE), environmental conditions, market dynamics, or price movements. Accordingly, the findings make it possible to describe production trends; however, they do not allow direct causal inferences regarding the underlying reasons for these trends.

The simple linear regression models used in this study were applied to identify the general direction of change over time and do not constitute advanced time-series modeling. Therefore, the results should be interpreted within the framework of describing linear trends. In addition, the period examined includes only 10 annual observations. The limited number of annual observations may reduce the statistical power of linear trends and, in some models, may result in borderline levels of significance.

Another important limitation concerns changes in the method of data compilation. As indicated in the footnotes of the TurkStat tables, administrative record data began to be used for some species starting in 2023 and 2024. This requires caution, particularly when interpreting changes observed in recent years. Similarly, the construction of the octopus–squid–shrimp composite group as a composite indicator leads to different dynamics among the constituent subtypes being evaluated within a single aggregated series. Therefore, the relatively low variability observed in the aggregated series should not be interpreted as indicating that all constituent taxa followed the same trend.

CONCLUSION

This study shows that non-fish marine capture fisheries in Türkiye generally followed a downward tendency during the 2016–2025 period. Although total production displayed a fluctuating pattern throughout the period, the negative CAGR value, based on the initial and final production levels, indicates an average annual contraction at the sectoral level. However, the fact that the linear trend model estimated for total production was not statistically significant at the 5% level suggests that the overall decline should be interpreted with caution.

Species-based evaluations clearly demonstrate that the production structure is not homogeneous. Sea snail emerged as one of the species showing the most notable signal of decline, with both a negative CAGR value and a statistically significant downward linear trend. By contrast, striped venus, despite its high share in total production, had the highest coefficient of variation among the groups examined, indicating marked year-to-year fluctuations in its production. The octopus–squid–shrimp composite group displayed relatively low production variability and a non-significant linear trend. However, this aggregated result should not be interpreted as evidence that the constituent taxa share a common biological status or sustainability condition.

Overall, non-fish marine capture fisheries in Türkiye should be evaluated not only through total production levels but also through species-based differences in trends and volatility patterns. The findings indicate that some species exhibit a more fragile structure, whereas comparatively low production variability was observed in the octopus–squid–shrimp composite series. In this respect, total production indicators alone do not appear sufficient, and more meaningful results can be obtained through detailed species-based monitoring and assessment.

RECOMMENDATIONS

In light of the findings obtained, species-based monitoring and evaluation processes for non-fish marine capture fisheries should be strengthened. In particular, the marked declining trend observed in sea snail production necessitates a more detailed examination of the production dynamics of this species. In this context, it is recommended that more comprehensive assessment studies be conducted in which catch quantity, fishing capacity, stock indicators, and environmental conditions are monitored together for the species concerned.

The high volatility identified in striped venus suggests that the overall production structure of the sector may be sensitive to changes in a few dominant species. Therefore, it would be useful to report production composition in greater detail, to regularly monitor species-based annual fluctuations, and to increase periodic assessments for species showing high volatility. In addition, in order to reduce the possible effects of changes in data compilation methods on the results, it is important that methodological changes in official statistics be explained in a more visible and systematic manner.

Although relatively low volatility was observed in the octopus–squid–shrimp composite group, this should not be interpreted as a directly positive indicator in terms of biological sustainability. For this reason, it is recommended that the relationship between stock status, fishing pressure, and economic structure in this group also be supported by separate studies. In future research, examining production data together with environmental indicators, market data, export trends, and fishing effort would contribute to a more comprehensive understanding of sectoral dynamics.

Finally, based on the findings of this study, it is recommended that the management of non-fish marine capture fisheries adopt a monitoring approach that considers species-based trend and variability profiles rather than focusing only on changes in total production. Such an approach would provide a sounder basis for decision-making processes in terms of both resource management and production planning.

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