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ARAŞTIRMA MAKALESİ RESEARCH PAPER

Analysis of Leading Countries in Sea Bream (*Sparus aurata*) Export Performance with Multi-Criteria Decision-Making Methods

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Abstract: Sea bream (Sparus aurata) is being produced and exported more and more with the increasing demand worldwide. Sea bream is a prominent species, especially in Mediterranean aquaculture, and its importance is growing for exporting countries. The increase in sea bream exports and competition necessitates closer monitoring of the performance of exporting countries. In this context, this study aims to evaluate the export performance of the world's top sea bream exporting countries using multi-criteria decision-making (MCDM) techniques. In the study, CRITIC, SD, and combined methods were used to weight the criteria. The MAIRCA method was used to rank the export performance of the countries. In addition, BORDA counting methods were integrated into these methods, and more precise results were obtained. Thus, the highest weights in criterion weighting are the annual growth rate of exports in the last five years and market concentration. Conversely, net trade had the lowest criterion weight. Greece, Türkiye, and Morocco had the highest performance in sea bream exports, respectively. Cyprus had the lowest performance in sea bream exports. To improve their performance in exporting sea bream, countries must emphasize export growth, increase the value of exports per unit, and focus on exporting to more countries.

Keywords: Aquaculture trade, BORDA counting method, CRITIC, export performance, MAIRCA, sea bream.

Çok Kriterli Karar Verme Yöntemleri ile Çipura (*Sparus aurata*) İhracat Performansında Önde Gelen Ülkelerin Analizi

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Öz: Çipura (Sparus aurata), dünya çapında artan taleple birlikte gün geçtikçe daha fazla üretilmekte ve ihraç edilmektedir. Özellikle Akdeniz su ürünleri yetiştiriciliğinde öne çıkan bir tür olan çipura'nın ihracatını yapan ülkeler açısından önemi artmaktadır. Çipura ihracatı ve rekabetinin artması, çipura ihraç eden ülkelerin performansının daha yakından izlenmesini gerekli kılmaktadır. Bu kapsamda çalışmanın amacı, dünyada en fazla çipura ihracatı yapan ülkelerin ihracat performansını çok kriterli karar verme (ÇKKV) teknikleri ile değerlendirmektir. Çalışmada CRITIC, SD ve ortak ağırlıklandırma yöntemleri ile kriter ağırlıklandırılmaları yapılmıştır. MAIRCA yöntemi ile ülkelerin ihracat performansı sıralaması oluşturulmuştur. Ayrıca BORDA sayım yöntemleri bu yöntemlere entegre edilerek daha net sonuçlara ulaşılmıştır. Böylelikle kriter ağırlıklandırmada en yüksek ağırlığın ihracatın son beş yıldaki yıllık büyüme oranı ve pazar yoğunlaşması olmuştur. Buna karşın en düşük kriter ağırlığının ise net ticarette olduğu görülmüştür. Çipura ihracatında en yüksek performansı gösteren ülkeler sırasıyla Yunanistan, Türkiye ve Fas olmuştur. Kıbrıs ise en düşük çipura ihracat performansa sahip olmuştur. Ülkelerin çipura ihracat performansını arttırması için ihracat büyümesine daha fazla önem vermesi, birim başına çipura ihracatının değerini yükseltmesi ve ülke çeşitliliğine önem vermesi gerekmektedir.

Anahtar kelimeler: BORDA sayım yöntemi, CRITIC, çipura, ihracat performansı, MAIRCA, su ürünleri ticareti.

INTRODUCTION

Sea bream (*Sparus aurata*) exports have become more important for bream-exporting countries due to changing consumer preferences and the growth of aquaculture. Mediterranean countries play a significant role in sea bream exports (Yıldırım & Çantaş, 2021). Greece and Türkiye alone account for 63.6% of global sea bream exports (Trade Map, 2025). These countries are followed by Italy, Spain, and Croatia. Meanwhile, the countries with the highest sea bream production are Türkiye (38.54%), Greece (21.43%), Egypt (13.87%), Tunisia (6.96%), Spain (4.82%), and Italy (2.84%) (Mhalhel et al., 2023). Croatia, whose sea bream production has increased in recent years, has also been included among these countries (FEAP, 2025).

The increased importance of sea bream trade has raised interest in this fish (Oikonomou & Polymeros, 2015). In this regard, countries can improve their export performance by exporting more sea bream. Export performance is a key factor in countries' economic growth and development (Ruzekova, Kittova, & Steinhauser, 2020). Higher export performance increases production and income, improves employment, and contributes to foreign exchange earnings and a positive trade balance (Işık, Engeloğlu, & Karaoğlan, 2018). Higher export performance also has positive effects, such as innovation, competitiveness, improved living standards, and direct foreign investment (Dong, Kokko, & Zhou, 2022). Therefore, in the global competitive environment, it is of great importance for countries to demonstrate higher export performance. In this context, a systematic evaluation of export performance analyzes the current economic situation and provides a solid foundation for future strategic planning. Beyond this, analyses of export performance reveal a country's ability to compete in foreign markets. They also enable cross-country comparisons, contributing to the identification of successful trade models and policies.

Sea bream exports are important not only for the economic benefits they provide to trading countries, but also for environmental sustainability (Oikonomou & Polymeros, 2015). The Mediterranean Sea, in particular, offers a favorable ecosystem for aquaculture and species such as sea bream that are caught in the wild (Fernández Polanco, Llorente, & Fernández Sánchez, 2024). However, overfishing these species and environmental pollution can disrupt ecosystem balances (FAO, 2024). Therefore, it is important for bream producers to consider these factors not only for economic gain but also for protecting biodiversity and marine ecosystems (Verep & Balta, 2023). Focusing on sustainable production methods to meet the increasing demand for sea bream and comply with environmental regulations provides an opportunity for sea bream exporters to increase their competitiveness.

Several studies have been conducted on the trade of aquaculture products, including sea bream. Among these studies, there are studies focusing on seafood trade (Can, Şimşek, Demirci, Demirci, & Akar, 2020; Demir & Aksoy, 2021; Kaimakoudi, Polymeros, & Batzios, 2014; Yıldırım, Türkten, & Ceyhan, 2022) as well as studies on sea bream trade (Bayramoglu, 2019; Fernández-Polanco, Llorente, & Asche, 2021; Fernández Polanco et al., 2024; Oikonomou & Polymeros, 2015; Oikonomou & Polymeros, 2017; Regnier & Bayramoglu, 2017). Studies on aquaculture trade using multi-criteria decision-making (MCDM) methods (Akmermer & Çelik, 2021; Çelik & Akmermer, 2022) are quite limited. In addition, it has been observed that there are studies on export performance with MCDM methods for countries (Işık et al., 2018) and different sectors (Kahreman, Ünal, & Ekinci Hamamcı, 2021; Özaytürk & Özekenci, 2024). In this regard, it is clear that studies on the export performance of sea bream are lacking.

This study aims to determine the criteria for sea bream export performance and evaluate the performance of countries using MCDM methods. However, there is no single criterion or generally accepted criterion for measuring export performance (Chakrabartty ve Sinha, 2022). This study is novel because it directly measures export performance using export criteria. Thus, export performance criteria that can be applied in future studies have been established. To this end, two important research questions are addressed. First, which criteria are more important in determining export performance for countries with the highest sea bream exports? Second, how are countries ranked according to export performance criteria? These questions will clarify the reasons for countries' low or high sea bream export performance. In this context, the study discusses ways to improve export performance and presents policy recommendations. Thus, important criteria for sea bream export performance have been identified, and a ranking of countries' sea bream export performance has been established. Additionally, more consistent results were obtained by using the BORDA counting method with MCDM techniques. Therefore, this study is expected to contribute to research on seafood exports, particularly in the sea bream sector, and to policymakers active in this field.

MATERIAL AND METHOD

Material: The present study analyzes the export performance of the countries that export the most sea bream with the HS code 030285 on a global scale. These countries include Greece, Türkiye, Italy, Spain, Croatia, the Netherlands, Morocco, Cyprus, New Zealand, and Albania. These countries accounted for 90.8% of the world's total sea bream exports. The following six criteria were determined for the analysis of the export performance of these countries:

export value (UNCTAD, 2005), trade balance (Kahreman et al., 2021; Mimouni vd., 2007; Özaytürk & Özekenci, 2024; UNCTAD, 2019), unit value (Szczygielski & Grabowski, 2012), annual growth in export value (UNCTAD, 2019) between 2020-2024, share in world exports (Chakrabartty & Sinha, 2022; Mimouni vd., 2007; Özaytürk & Özekenci, 2024), and market concentration (Mimouni vd., 2007; Özaytürk & Özekenci, 2024; UNCTAD, 2019). Table 1 presents the details of these criteria.

Table 1. List of criteria

Criteria	Definition	Source	Direction
Export value (USD thousand) (C1)	It refers to the sea bream exports of a country in a year.	Trade Map (2025)	Max
Trade balance (USD thousand) (C2)	This indicates a country's net exports of sea bream.	Trade Map (2025)	Max
Unit value (USD/unit) (C3)	The USD value per unit ton of sea bream exports.	Trade Map (2025)	Max
Annual growth in value between 2020-2024 (%) (C4)	It refers to the growth rate of the country's sea bream exports over the past five years.	Trade Map (2025)	Max
Share in world exports (%) (C5)	This indicates the country's share in world sea bream exports.	Trade Map (2025)	Max
Market concentration (C6)	The concentration is determined using the Herfindahl index, which is calculated by squaring the share of each country in the market and summing the numbers.	Trade Map (2025)	Min

According to Table 1, the first criterion is export value. Export value is one of the most fundamental indicators of export performance. It increases a country's income as its exports of that product increase. This provides many benefits, primarily economic development (UNCTAD, 2005). However, increased exports alone do not contribute positively. Therefore, it is beneficial to consider other export criteria together when assessing the sustainability and competitiveness of exports. Among the objective criteria used in this study, unit value was chosen because it indicates the quality of a country's exports of a given product (Szczygielski & Grabowski, 2012). The trade balance reflects the difference between a country's export and import levels, directly affecting its capacity to generate foreign exchange (Blavasciunaite, Garsviene, & Matuzeviciute, 2020). While an increase in exports leads to a positive improvement in the trade balance, an increase in imports has a negative impact on this balance. The share of world exports represents the country's competitiveness in the product or sector subject to export, while the export growth rate is considered a reflection of economic dynamism and success in foreign markets (UNCTAD, 2019). The market concentration criterion represents the opposite of export market diversity. Whether exports are dependent on specific markets is an important criterion in determining a country's economic vulnerability and resilience to external shocks. As market diversity increases, the risk of being affected by fluctuations in external demand decreases (Aydemir, 2024). Among the criteria mentioned here, only market concentration is minimum-oriented. The other criteria are evaluated as having a maximum direction. Data for these criteria were obtained from the Trade Map (2025) database. Due to missing data from previous years, the year 2024 was used as the basis.

Methods: The present study considered the CRITIC, SD, and combined methods for criteria weighting. The CRITIC method was chosen because it is a well-established and useful method compared to other current weighting methods. The SD method was preferred because, like CRITIC, it is an objective evaluation method (Mukhametzyanov, 2021). It is also easier to calculate than other methods, and the criteria weights are determined using standard deviations. A combined method was employed to ensure the consistency of these weights (Aydemir, 2025). The MAIRCA method was used to determine the export performance ranking of countries based on a set of criteria weightings. The MAIRCA method was selected over other ranking methods because it requires simple mathematical operations, provides stable solutions, and can be integrated with other methods (Gigović, Pamučar, Bajić & Milićević, 2016). Multiple export performance rankings were consolidated into a composite ranking using the BORDA counting method.

The CRITIC Method: The CRITIC (Criteria Importance Through Intercriteria Correlation) method is based on the standard deviation proposed by Diakoulaki, Mavrotas, and Papayannakis (1995). It considers the correlation between the criteria and the standard deviation when determining the criteria weights (Wang & Luo, 2010). This method increases objectivity by eliminating subjective decisions (Aydemir, 2025). The CRITIC's steps are in Table 2.

The SD Method: The SD (Standard Deviation) method is based on a mathematical approach that measures the instability of given values (Paradowski, Shekhovtsov, Bączkiewicz, Kizielewicz, & Sałabun, 2021). This approach is similar to the entropy method in that it assigns reduced weights to an attribute with analogous values across alternatives (Ersoy, 2022). The method's steps are in Table 3

***The Combined Method*:** As stated by Zavadskas and Podvezko (2016), the weighting of common criteria can be achieved by integrating multiple criteria weighting techniques. The combined weighting of the CRITIC and SD methods used for objective criteria weighting is illustrated in Equation 13 (Aydemir, 2025).

$$w_j = \frac{w_{j,CRITIC} * w_{j,SD}}{\sum_{j=1}^{m} w_{j,CRITIC} * w_{j,SD}} \quad (13)$$

Table 2. Steps of the CRITIC Method

Step 1. Creation of the decision matrix	$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$	(1)
Step 2. Normalization of the decision matrix	$r_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}}$	(2)
	$r_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}}$	(3)
Step 3. Creation of correlation coefficient matrix	$P_{jk} = \frac{\sum_{i=1}^{m}(r_{ij} - r_j)(r_{ik} - r_k)}{\sqrt{\sum_{i=1}^{m}(r_{ij} - r_j)^2 \sum_{i=1}^{m}(r_{ik} - r_k)^2}}$ (4)	
Step 4. Calculation of C_j values	$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m}(r_{ij} - r_j)^2}{m}}$	(5)
	$C_j = \sigma_j \sum_{k=1}^{n}(1 - P_{jk})$	(6)
Step 5. Calculation of criteria weights	$w_j = \frac{C_j}{\sum_{k=1}^{n}(C_k)}$	(7)

Source: Diakoulaki et al. (1995).

Table 3. Steps of the SD Method

Step 1. Creation of the decision matrix	$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$	(8)
Step 2. Normalization of the decision matrix	$x_{ij}^* = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}}$	(9)
	$x_{ij}^* = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}}$	(10)
Step 3. The standard deviation of the evaluation criteria is calculated using Equation (11). The criteria weights are determined using Equation (12).	$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m}(x_{ij} - \overline{x_j})^2}{m}} \; j = 1$	(11)
	$w_j = \frac{\sigma_j}{\sum_{j=1}^{n}\sigma_j}$	(12)

Source: Diakoulaki et al. (1995).

The MAIRCA Method: Introduced to the MCDM literature by Gigović et al. (2016), MAIRCA (Multi-Atributive Ideal-Real Comparative Analysis) is a method based on identifying gaps between ideal and empirical evaluations. The total gap for the decision alternatives is obtained by summing the gaps for each criterion (Ayçin, 2020). At the conclusion of the application process, the alternative with values that approximate the ideal evaluations according to the majority of criteria is identified as the optimal alternative (Gigović et al., 2016). The method's steps are in Table 4.

Table 4. Steps of the MAIRCA Method

Step 1. Creation of the decision matrix	$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$	(14)
Step 2. Prioritization of alternatives	$P_{Ai} = \frac{1}{m}; \sum_{i=1}^{m} P_{Ai} = 1$	(15)
Step 3. Calculation of the theoretical evaluation matrix elements (T_p)	$T_p = \begin{bmatrix} P_{A1}.w_1 & P_{A1}.w_2 & \dots & P_{A1}.w_n \\ P_{A2}.w_2 & P_{A2}.w_2 & \dots & P_{A2}.w_n \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ P_{Am}.w_1 & P_{Am}.w_2 & \dots & P_{Am}.w_n \end{bmatrix}$	(16)
Step 4. Calculating the true rating matrix (T_r)	$t_{rij} = t_{pij}.(\frac{x_{ij} - x_{ij}^-}{x_{ij}^+ - x_{ij}^-})$	(17)
	$t_{rij} = t_{pij}.(\frac{x_{ij} - x_{ij}^+}{x_{ij}^- - x_{ij}^+})$	(18)
	$T_r = \begin{matrix} \end{matrix} \begin{matrix} C_1 & C_2 & \cdots & C_n \end{matrix} \begin{bmatrix} t_{r11} & t_{r12} & \dots & t_{r1n} \\ t_{r21} & t_{r22} & \dots & t_{r21} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ t_{rm1} & t_{rm2} & \dots & t_{rmn} \end{bmatrix}$	(19)
Step 5. Calculating the total gap matrix (G)	$G = T_p - T_r = \begin{bmatrix} t_{p11}.t_{r11} & t_{p12}.t_{r12} & \dots & t_{p1n}.t_{r1n} \\ t_{p21}.t_{r21} & t_{p22}.t_{r22} & \dots & t_{p2n}.t_{r2n} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ t_{pm1}.t_{rm1} & t_{pm2}.t_{rm2} & \dots & t_{pmn}.t_{rmn} \end{bmatrix}$	(20)
Step 6. Calculating the final values of the criteria function (Q_i)	$Q_i = \sum_{j=1}^{n} g_{ij}$	(21)

Source: Pamucar, Tarle, and Parezanovic (2018).

The BORDA Counting Method: The BORDA count method is a voting procedure referred to as the "method of marks" (Reilly, 2002). In this method; assuming that there are studies with m alternatives, the alternative with the highest ranking is assigned $n-1$ point and the BORDA score (bi) is obtained with equality-1. The least preferred alternative is ranked with zero points (Öztürkçü & Özcan, 2024). The alternative with the highest BORDA score is selected as the best decision alternative (Türkoğlu & Karataş, 2023). For example, when there are 10 different alternatives, the best alternative receives a score of 9, while the lowest alternative receives a score of 0. Borda points were calculated using Equation 22:

$$b_i = \sum_{k=1}^{n}(N - r_{ij}) \qquad (22)$$

where r_{ij}: rank of alternative i for criterion k,

N : total number of alternatives.

RESULTS

This part of the study presents the results of the analysis in the form of tables. In the first stage of the analysis, the results obtained by applying the CRITIC, SD, and combined methods to determine the criteria weights are presented. In the second stage, all three criteria weighting methods and the MAIRCA ranking method were applied together. At last, the ranking results were combined in accordance with the BORDA counting method.

Table 5. Decision-matrix

	Max	Max	Max	Max	Max	Min
Country	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
Greece	412359	352565	6423	5	35.4	0.21
Türkiye	328515	327221	5613	8	28.2	0.09
Italy	73237	-198128	7038	11	6.3	0.16
Spain	66081	-110394	6087	19	5.7	0.29
Croatia	60631	53534	7702	10	5.2	0.32
Netherlands	29317	-14808	6486	-1	2.5	0.21
Morocco	25851	25717	9193	19	2.2	0.59
Cyprus	23925	23058	7254	6	2.1	0.93
New Zealand	21216	21216	7155	2	1.8	0.59
Albania	16144	15611	5297	18	1.4	0.92

Source: Trade Map (2025).

In Table 5, the criteria of the countries exporting the most sea bream and the data related to the criteria are given. Greece is the country that exports the most sea bream. Moreover, Greece has the highest trade balance value and the highest export share in the world. Morocco had the highest value of exported sea bream in terms of quantity compared to other countries. At the same time, the country with the highest increase in export value in the last five years was Morocco, followed by Spain. The country with the lowest market concentration of sea bream exports was Türkiye, while the highest market concentration was in Cyprus. On the other hand, although Italy and Spain have high levels of sea bream exports, they also have high levels of trade deficit. Albania exported the lowest value of sea bream and had the lowest export share. However, the Netherlands was the only country to experience a decline in exports over the past five years.

Table 6. Criteria weighting results using BORDA integration

Method		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
CRITIC	w_j	0.131	0.130	0.197	0.240	0.131	0.172
	Rank	5	6	2	1	4	3
	Point	1	0	4	5	2	3
SD	w_j	0.176	0.152	0.141	0.174	0.176	0.180
	Rank	3	5	6	4	2	1
	Point	3	1	0	2	4	5
Combined	w_j	0.138	0.119	0.167	0.251	0.139	0.186
	Rank	5	6	3	1	4	2
	Point	1	0	3	5	2	4
BORDA Count	Point	5	1	7	12	8	12
	Rank	5	6	4	1	3	1

Source: Author's calculations.

In Table 6, different criteria weightings are encountered according to different methods. In order to reduce these differences, the BORDA counting method was applied. As a result of this method, the most important criteria were C4 and C6. C5, C3 and C1 were ranked respectively. C2 was ranked last.

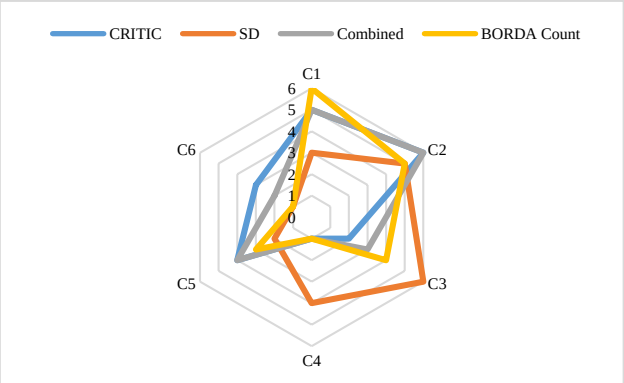

Figure 1. Comparison of ranking results for criteria weighting (**Source:** Author's calculations).

As shown in Figure 1, the radar plot indicates that the criteria weightings differ significantly based on the methods employed.

Table 7. Export performance results by country using BORDA integration

	CRITIC-MAIRCA			**SD-MAIRCA**			**Combined-MAIRCA**			**BORDA Count**	
Country	Q_i	Rank	Point	Q_i	Rank	Point	Q_i	Rank	Point	Point	Rank
Greece	0.017	1	9	0.012	1	9	0.016	1	9	27	1
Türkiye	0.019	2	8	0.015	2	8	0.018	2	8	24	2
Italy	0.029	6	4	0.031	6	4	0.028	6	4	12	6
Spain	0.027	5	5	0.030	5	5	0.026	4	6	16	5
Croatia	0.027	4	6	0.029	4	6	0.027	5	5	17	4
Netherlands	0.037	8	2	0.037	7	3	0.037	8	2	7	7
Morocco	0.022	3	7	0.027	3	7	0.023	3	7	21	3
Cyprus	0.038	10	0	0.040	10	0	0.039	10	0	0	10
New Zealand	0.037	9	1	0.038	8	2	0.038	9	1	4	9
Albania	0.036	7	3	0.039	9	1	0.036	7	3	7	7

Source: Author's calculations.

According to the BORDA counting method in Table 7, Greece ranked first with the highest score. Türkiye ranked second and Morocco third. Cyprus ranked tenth. New Zealand ranked ninth, while Albania and the Netherlands tied for seventh place.

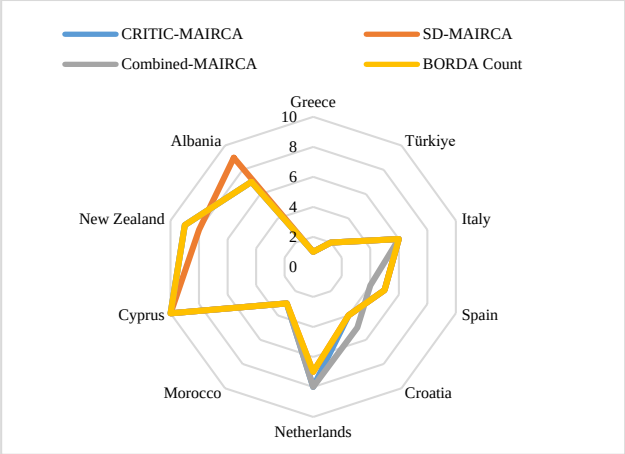

Figure 2. Comparison of export performance ranking results for countries (**Source:** Author's calculations).

According to the radar plot in Figure 2, the country rankings for sea bream export performance do not differ significantly according to the methods. Conversely, there were slight differences in the country rankings for Albania, New Zealand, the Netherlands, Croatia, and Spain.

DISCUSSION AND CONCLUSION

The present study evaluates the export performance of the leading countries in sea bream exports. Remarkably, this study, which was conducted on a very large portfolio of countries, shows that more than one country plays an important role in sea bream export performance. However, the study's weakness is its use of only 2024 data. However, since the study criteria include growth in exports over the last five years, the impact of this weakness is mitigated. Six criteria were identified to evaluate sea bream export performance. CRITIC, SD, and the combined method that takes the weights of the two into account were preferred as objective weighting methods for the criteria. According to the CRITIC and combined methods, export growth in the last five years is the most important criterion. However, according to the SD method, it ranks fourth. Conversely, market concentration is the most important criterion according to the SD method, ranking second according to the combined method, and third according to the CRITIC method. To minimize this complexity, the BORDA counting method was used, in which export growth over the last five years and market concentration were the most important criteria. Therefore, the most important criteria for successful sea bream export performance have been export growth and market concentration. The trade balance criterion ranked last in terms of criterion weight in almost all methods.

This study used the MAIRCA and BORDA counting methods to perform a ranking analysis. The results revealed that Greece and Türkiye are the most important countries in the sea bream export ranking, with similar performance. This finding is also similar to Oikonomou and Polymeros (2015) and Oikonomou and Polymeros (2017). Morocco ranked seventh in global sea bream exports and third in the export performance ranking. Croatia and Spain had similar export performance rankings. Cyprus had the lowest export performance. Thus, it has been understood that the export value alone does not reflect the export performance of sea bream, and that it needs to be supported by other export indicators. At the same time, countries with good and poor performance in sea bream exports have diverged due to their different performance in export criteria. However, countries with high export growth rates and low market concentration have diverged positively.

The top five countries with the best export performance accounted for 77% of global sea bream exports (Trade Map, 2025). Greece had the highest export performance, the highest sea bream exports, the highest net trade, and the highest world export share. However, its relatively low export growth rate and export value per unit over the last five years have prevented a higher export performance. Additionally, Greece's diversification away from European Union (EU) countries (Oikonomou & Polymeros, 2017). where market concentration is likely to increase price pressure (European Commission, 2025), could support its export performance.

Sea bream is the fish with the highest economic value for Türkiye (Akmermer & Çelik, 2021). It ranks second in export performance due to its high export value, net trade, and world export share, as well as its low market concentration. However, to improve its export performance, Türkiye needs to increase the export value of sea bream per unit. To this end, Türkiye should focus on markets, especially Thailand and the United States, where sea bream imports are increasing and the import value per unit is higher.

Morocco ranked seventh in the world export rankings and third in the export performance rankings due to the rapid growth of sea bream exports and high net export unit value over the last five years. However, Morocco needs to reduce its market concentration and export to more countries to improve its export performance, as it currently exports a significant portion of its exports to EU countries (Trade Map, 2025). However, doing so without reducing the unit value of exports will strengthen Morocco's position in the sea bream export market.

Croatia ranked fifth in sea bream exports and fourth in export performance. Croatia's sea bream export performance is characterized by a high export value per unit and growth in exports over the last five years. Total sea bream exports and net trade also contributed to Croatia's strong export performance. To improve its export

performance, Croatia should export sea bream to more countries.

Spain ranked fourth in sea bream exports and fifth in export performance. Its strong growth in sea bream exports in recent years has made it stand out. However, Spain's net trade deficit in sea bream remains quite high. Additionally, the export value of sea bream per unit remains low. Therefore, Spain should take measures to increase exports and reduce imports to improve its sea bream export performance.

It is important for countries with poor performance, such as the Netherlands and Albania, to add more value to their sea bream exports to increase their value per unit. Albania, Cyprus, and New Zealand have underperformed because they export sea bream to only a few markets. Albania depends on Italy, Cyprus depends on Israel, and New Zealand depends on Australia and the US. Therefore, expanding into more markets is crucial for these countries. Conversely, Italy is the third-largest global exporter and the top importer of sea bream (Trade Map, 2025). However, despite its high imports, Italy's exports remain low, which significantly impacts the country's poor performance. Therefore, Italy should reduce its imports and increase its exports.

As policy recommendations, Greece, Croatia, Albania, Cyprus, Morocco, and New Zealand should focus on different markets. Meanwhile, Türkiye, the Netherlands, and Albania should aim to increase their export unit values. Italy and Spain, on the other hand, should prioritize improving their trade balance. Achieving further growth in sea bream exports is crucial to maintaining a top position in the global export rankings. To achieve rapid growth in sea bream exports, priority should be given to sustainable production, traceability, digital marketing, changes in consumer preferences, and exploring new markets. In this context, environmentally friendly, sustainable, and certified production is important for exporting higher-value sea bream. In particular, carbon emissions from production and logistics processes should be reduced for exports to EU countries. At the same time, importance should be given to meeting the demand for organic, healthy sea bream and reducing the use of pesticides. Additionally, making the sea bream supply chain digitally traceable will inspire more confidence in importers and consumers. Furthermore, digital marketing activities will allow small and medium-sized producers to access international markets and improve export performance. High market concentration among countries also negatively impacts sea bream export performance. To overcome this, special attention should be given to markets where import density has increased in recent years, along with the high import value of sea bream per unit. For this reason, country administrations should support bream exporters more in their search for new markets.

In this study, which specifically analyzes the sea bream export performance of countries, the objective criteria weighting data are taken into account. The objective criteria used in this study allow for the re-measurement of export performance based on a comparison of countries and weights of criteria. These objective criteria can be applied to other species of fish as well as to other sectors. However, these criteria are limited to trade indicators. More comprehensive studies can also take into account criteria such as price-cost and efficiency-effectiveness, as well as market dynamics, consumer preferences, and quality assurance. Furthermore, applying these criteria using different MCDM methods will allow for an examination of countries' sectoral export performance from different perspectives.

DECLARATIONS

Authors' Contributions: This study was prepared by a single author.

Conflict of Interest: There is no conflict of interest in this study.

Ethical Approval: This study, which did not require ethics committee approval and/or legal/private permission, complied with research and publication ethics.

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