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RESEARCH ARTICLE

Competitive power of Turkey's aquaculture sector and comparison with other leading countries

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ABSTRACT

In the study, the production, foreign trade, and competitiveness of the countries, which have an important share in world aquaculture production, were examined. According to the 2019 data shows that Chine and Indonesia are the most important aquaculture producers in the world. The data set belonging to 2010-2019 was used in the research. In the study, Revealed Comparative Advantage (RCA), Vollrath Relative Export Advantage Index (RXA), Relative Trade Advantage Index (RTA), Relative Competitiveness Index (RC), Relative Import Advantage Index (RMA), and Trade Balance Index (TBI) indices were used. According to the index results, it is concluded that Turkey is advantaged in terms of fresh and chilled fish foreign trade competition. Turkey has an importer position in world frozen fish and other aquaculture trade.

Introduction

Archeological remains show that products obtained as a result of fishing and pisciculture have been used as a staple food due to the vital activities of humanity since the early ages (OKA, 2013; Candemir & Dağtekin, 2020). Today, the need for food with the increasing world population has led to important developments in the fishing industry (Anticamara et al., 2011). Thanks to these developments, the aquaculture sector has employed millions of people as a result of economic activities such as production, processing, conservation, and transportation. The upward trend in the production and trade of aquaculture products across the world has enabled an increase in the number of people employed in this sector (Bashimov & Aydın, 2018). Today, the aquaculture sector -with the employment and income revenue volume that it has created- is one of the sectors with great economic value (Turan et al., 2006; Tatlıdil et al., 2009; Saygı et al., 2015).

When the countries with the greatest foreign trade volume are examined, China which is the greatest producer of aquaculture products is also observed to hold the leading position in the exportation of them. Again, it is interesting that European countries and Canada, which are not among the important producers, rank among the first 10 exporters. While

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the majority of these countries are at the same time among the top importing countries, a considerable part of their export figure is comprised of processed products with an increased added value. As it is seen, besides being a producer in the sector, processing, and product diversification also provide countries important commercial advantages (FAO, 2020). When the processing level of Turkey's fisheries exports is examined, it is observed that unprocessed and less processed products with low added value are exported, and more processed products are imported. It is understood that the sector with the highest share of highly processed products in the exports of our country is in herbal products, and the highest unprocessed products are in fisheries (Yılmaz et al., 2018).

Turkey is an attractive country with its high foreign trade volume and growth rate among developing countries. In addition to its wide agricultural areas, its coastal and inland water facilities are the most important factors that shape the country's production model and comparative advantage structure (Kuşat, 2019). When the country's population and rapidly increasing world population are considered in terms of nutrition, fisheries production in addition to agricultural production gains importance. This study, it is aimed to measure both the competitiveness and export performance of the Turkish aquaculture sector against the leading countries of the world aquaculture sector. For this purpose, the sector's competitive power has been evaluated with the help of RCA, TBI, RMA, RTA, and RC indices.

Material and Methods

The main material of the study is the trade data obtained from the database of the International Trade Center (INTRACEN). In the study, the data set from the years between 2010 and 2019 is used. Apart from the data set, both Turkish and foreign literature reviews and statistics were also used in the study. The results of the Balasa Revealed Comparative Advantage-RCA index, Vollrath Relative Export Advantage-RXA index, Relative Trade Advantage-RTA index, Relative Competitiveness-RC index, Relative Import Advantage-RMA index, and Trade Balance Index-TBI index are presented in tables. Several indices are used in international trade to measure competitive power. The most commonly used indices are Balassa and Vollrath indices. (Hinloopen & Marrewijk, 2001; Welch & Lyford, 2007; Tao & Fu, 2007; Fertő, 2008; Serin & Civan, 2008; Bojnec & Fertő, 2012; Erkan et al., 2015; Terin et al., 2018). This is the reason to use them in this study as well. Developed by Balassa (1965) this index is called the Balassa index. In this index, the share of an industry in the country's total exports is calculated and it is proportioned to the share of

world exports in the same industry in the total world (Atik, 2005; Akdağ, 2013). Revealed Comparative Advantage-RCA index is an index used to measure specialization in international trade and is widely accepted in the literature (Kanaka & Chinadurai, 2012; Pilinkiene, 2014; Torok & Jambor, 2016). RCA index is used in studies to determine the strong and weak export sectors (Aiginger, 2000; Bojnec & Fertő, 2007; Terin & Yavuz, 2018). The purpose is to determine whether the country has a comparative advantage, rather than identifying the reasons underlying comparative advantage (Çakmak, 2005). Balassa's RCA index is formulated as follows (Equation 1):

$$RCA_{ij} = \left[\left(\frac{X_{ij}}{X_i} \right) / \left(\frac{X_{wj}}{X_w} \right) \right] \qquad (1)$$

Here RCA_{ij}, X_{ij}, X_i, X_{wj}, and X_w indicate respectively; the revealed comparative advantage index for sector '*j*' of country '*i*', the export of sector '*j*' of country '*i*', the total export of country '*i*', the world export of sector '*j*', and the total world export. RCA index takes a value between 0 and ∞. If the index value is greater than 1, it indicates that the country for the calculation of competitiveness has a comparative advantage. If it is less than 1, then it shows that the country has no competitive power and has no comparative advantage (Hinloopen & Marrewijk, 2001; Havrila & Gunawardana, 2003; Esmaeili, 2014).

Developed as an alternative to the RCA index of Balassa, Vollrath's index is commonly used. According to Vollrath, import values should be taken into account together with exports in the calculation of the index. Thus, Vollrath developed 3 methods of measurement as an alternative to the index of Balassa. The first of the measurements is the Relative Export Advantage (RXA) index. When the RCA and RXA index formulas are examined, it is seen that it is RCA = RXA.

Relative Export Advantage index can be defined as the ratio of the export share of any country in the world markets to the share of all other goods in the world export in a given product (Atik, 2005). This feature of the index enables the countries and goods being measured to be excluded when calculating the total export (world) thereby avoiding them to be calculated twice (Fertő & Hubbard, 2003; Çakmak, 2005; Altay & Gürpınar, 2008). The second method of measurement of Vollrath is Relative Trade Advantage (RTA) which is calculated as the difference between Relative Export Advantage (RXA) and Relative Import Advantage (RMA). The third method is the Relative Competitiveness index. If the RXA index is greater than 1, it indicates that the sector in question has a competitive advantage (Utkulu & Seymen, 2004). According to Vollrath, if

the RMA value is less than 1, the sector in question has a competitive advantage, and RC indices show comparative advantage if they are positive, and negative values indicate comparative disadvantage (Vollrath, 1991; Frohberg & Hartmann, 1997; Akhtar et al., 2013; Bashimov, 2016). These indices are formulated as follows (Equations 2-5):

$$RXA_{ij} = \frac{\left(X_{ij}/X_{nj}\right)}{\left(X_{ir}/X_{nr}\right)} \quad (2)$$

$$RMA_{ij} = \frac{\left(M_{ij}/M_{nj}\right)}{\left(M_{ir}/M_{nr}\right)} \quad (3)$$

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \quad (4)$$

$$RC_{ij} = \ln\left(RXA_{ij}\right) - \ln\left(RMA_{ij}\right) \quad (5)$$

In these formulas, X = export, M = import, n = all remaining goods, and r = rest of the world. According to this; RTA = relative trade ij advantage in good i of country j RXA = relative export ij advantage in product i of country j RMA = relative import ij advantage in product i of country j RC = relative competitive advantage index in product i of country j.

Another index used in this study to determine the level of competitiveness is Trade Balance Index (TBI). TBI is used to determine whether a country is a net exporting or importing country in a given good and formulated as follows (Equation 6) (Lafay, 1992; Widodo, 2008).

$$TBI_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \quad (6)$$

In this formula; TBI_{ij} shows the trade balance index in good j of country i. X_{ij} and M_{ij}, on the other hand, indicate the export and import in good j of country i. This index takes a value between -1 and +1. If $TBI_{ij} > 0$, the country is in the position of net exporter of the product in question. If $TBI_{ij} < 0$, the country is a net importer of the product in question (Widodo, 2008; Ullah & Kazuo, 2013; Topcu & Sümerli Sarıgül, 2015; Terin & Yavuz, 2019).

Results and Discussion

Considering the world fisheries and aquaculture production, 54% of the total production of 178 500 000 tons was obtained from fishing, while 46% was obtained from aquaculture. While aquaculture constituted 15% of the total production in the 1980s, it has increased significantly today (Table 1).

China takes first place in fish production from fishing with 14.6 million tons, followed by Indonesia with 7.2 million tons and Peru with 7.2 million tons (Figure 1).
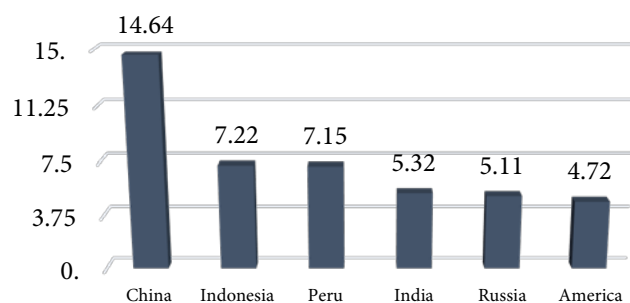
Figure 1. Top six global fisher capture producers (million tonnes)

Table 1. World fisheries and aquaculture production (million tonnes) (FAO, 2021)

Production	1986-1995	1996-2005	2006-2015	2016	2017	2018
Capture						
Inland	6.4	8.3	10.6	11.4	11.9	12.0
Marine	80.5	83.0	79.3	78.3	81.2	84.4
Total Capture	86.9	91.3	89.9	89.7	93.1	96.4
Aquaculture						
Inland	8.6	19.8	36.8	48	49.6	51.3
Marine	6.3	14.4	22.8	28.5	30.0	30.8
Total Aquaculture	14.9	34.2	59.6	76.5	79.6	82.1
Total World	101.8	125.5	149.5	166.2	172.7	178.5

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Table 2. Competition index results in Turkey and leading countries in world aquaculture production (302)*

Country	Index	Year									
		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
China	RXA	0.12	0.10	0.11	0.09	0.06	0.07	0.07	0.04	0.05	0.06
	TBI	0.25	0.25	0.08	0.08	-0.34	-0.35	-0.34	-0.56	-0.67	-0.66
	RMA	0.09	0.07	0.11	0.09	0.15	0.20	0.20	0.20	0.31	0.34
	RTA	0.04	0.03	0.00	0.00	-0.09	-0.13	-0.13	-0.15	-0.26	-0.29
	RC	0.34	0.39	0.00	-0.01	-0.93	-1.08	-1.05	-1.50	-1.84	-1.80
Indonesia	RXA	1.59	1.28	1.35	1.04	0.87	1.12	0.72	0.57	0.51	0.65
	TBI	0.97	0.98	1.00	1.00	0.96	0.87	0.63	0.51	0.46	0.52
	RMA	0.03	0.01	0.00	0.00	0.02	0.08	0.18	0.20	0.19	0.21
	RTA	1.57	1.27	1.34	1.04	0.85	1.03	0.54	0.36	0.32	0.44
	RC	4.12	4.63	6.39	6.01	3.82	2.61	1.39	1.03	0.99	1.15
India	RXA	0.15	0.18	0.30	0.27	0.31	0.28	0.24	0.15	0.13	0.18
	TBI	-0.12	-0.31	0.34	0.85	0.68	0.59	0.75	0.61	0.55	0.52
	RMA	0.12	0.24	0.09	0.02	0.04	0.05	0.03	0.03	0.02	0.04
	RTA	0.02	-0.06	0.21	0.25	0.27	0.23	0.22	0.13	0.10	0.14
	RC	0.16	-0.27	1.18	2.79	1.99	1.72	2.20	1.79	1.66	1.50
Peru	RXA	0.07	0.06	0.11	0.10	0.07	0.10	0.11	0.12	0.06	0.07
	TBI	-0.62	-0.55	-0.22	-0.25	-0.62	-0.73	-0.70	-0.70	-0.70	-0.51
	RMA	0.36	0.27	0.20	0.17	0.27	0.57	0.66	0.75	0.39	0.24
	TRTA	-0.29	-0.21	-0.09	-0.07	-0.20	-0.47	-0.55	-0.63	-0.33	-0.17
	RC	-1.68	-1.49	-0.59	-0.55	-1.39	-1.76	-1.78	-1.87	-1.86	-1.23
Russia	RXA	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01
	TBI	-1.00	-1.00	-0.99	-1.00	-0.99	-0.98	-0.97	-0.98	-0.97	-0.97
	RMA	3.25	3.00	3.66	3.47	2.33	1.04	0.84	0.96	1.01	0.82
	RTA	-3.25	-3.00	-3.65	-3.46	-2.32	-1.04	-0.84	-0.96	-1.00	-0.81
	RC	-7.48	-7.78	-6.25	-6.78	-5.64	-5.41	-4.81	-5.19	-5.02	-4.77
Turkey	RXA	1.35	1.53	1.36	1.68	2.16	2.45	2.29	2.44	2.45	2.60
	TBI	0.68	0.63	0.57	0.69	0.74	0.69	0.80	0.82	0.84	0.86
	RMA	0.16	0.20	0.26	0.20	0.22	0.32	0.19	0.17	0.17	0.18
	RTA	1.18	1.33	1.11	1.48	1.94	2.13	2.10	2.27	2.28	2.42
	RC	2.11	2.03	1.67	2.15	2.28	2.03	2.48	2.68	2.69	2.70

Note: *302: Calculated by authors (Fish, fresh or chilled)

Table 3. Competition index results in Turkey and leading countries in world aquaculture production (303)*

Country	Index	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
China	RXA	0.77	0.93	0.91	0.89	0.89	0.89	0.95	0.88	0.89	0.85
	TBI	0.92	0.94	0.92	0.91	0.90	0.90	0.89	0.85	0.73	0.63
	RMA	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.09	0.16	0.24
	RTA	0.74	0.90	0.88	0.84	0.84	0.83	0.88	0.79	0.73	0.62
	RC	3.16	3.51	3.17	2.89	2.76	2.65	2.59	2.27	1.73	1.28
Indonesia	RXA	1.76	1.72	2.25	2.10	1.85	1.76	1.98	2.05	1.63	1.90
	TBI	0.95	0.96	0.96	0.98	0.98	0.98	0.96	0.96	0.96	0.96
	RMA	0.05	0.03	0.04	0.02	0.02	0.02	0.04	0.04	0.03	0.04
	RTA	1.71	1.69	2.21	2.08	1.83	1.74	1.94	2.01	1.60	1.86
	RC	3.63	3.92	4.08	4.70	4.39	4.47	3.85	3.94	4.01	3.87
India	RXA	2.28	2.01	1.87	1.82	1.78	1.77	1.77	1.82	1.70	1.19
	TBI	1.00	0.99	0.99	0.99	0.99	0.98	0.97	0.97	0.97	0.93
	RMA	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.02	0.02	0.03
	RTA	2.28	2.00	1.86	1.82	1.77	1.76	1.75	1.81	1.69	1.16
	RC	6.85	6.37	5.69	5.93	5.29	4.96	4.34	4.67	4.69	3.75
Peru	RXA	0.68	1.98	2.25	1.44	1.33	1.02	1.32	1.63	1.28	1.72
	TBI	-0.49	0.45	0.53	0.01	0.03	-0.30	-0.12	0.08	-0.09	0.23
	RMA	2.12	0.82	0.72	1.40	1.16	1.64	1.66	1.56	1.65	1.15
	TRTA	-1.45	1.16	1.53	0.04	0.17	-0.61	-0.35	0.08	-0.37	0.57
	RC	-1.14	0.88	1.13	0.03	0.14	-0.47	-0.24	0.05	-0.25	0.40
Russia	RXA	3.60	2.87	3.05	3.27	3.03	4.43	5.06	4.23	4.40	4.41
	TBI	0.37	0.37	0.45	0.33	0.30	0.48	0.51	0.48	0.54	0.52
	RMA	2.56	1.98	1.79	2.77	2.90	2.92	2.58	2.36	2.49	2.46
	RTA	1.04	0.90	1.26	0.51	0.13	1.51	2.48	1.86	1.91	1.95
	RC	0.34	0.37	0.53	0.17	0.05	0.42	0.67	0.58	0.57	0.58
Turkey	RXA	0.26	0.31	0.30	0.43	0.40	0.34	0.32	0.33	0.44	0.53
	TBI	-0.31	-0.19	-0.11	-0.01	0.02	-0.27	-0.12	-0.24	0.02	0.22
	RMA	0.27	0.22	0.23	0.27	0.26	0.40	0.29	0.36	0.32	0.29
	RTA	-0.01	0.08	0.07	0.16	0.15	-0.06	0.03	-0.03	0.12	0.24
	RC	-0.04	0.32	0.28	0.47	0.44	-0.17	0.09	-0.09	0.33	0.59

Note: *303: Calculated by authors (Frozen fish)

Table 4. Competition index results in Turkey and leading countries in world aquaculture production (304)*

Country	Index	Year									
		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
China	RXA	2.02	2.02	1.91	1.79	1.70	1.54	1.49	1.47	1.38	1.30
	TBI	0.76	0.68	0.58	0.50	0.48	0.40	0.33	0.27	0.01	-0.24
	RMA	0.31	0.40	0.53	0.63	0.68	0.85	0.96	1.00	1.55	2.47
	RTA	1.72	1.62	1.37	1.16	1.02	0.68	0.53	0.47	-0.17	-1.17
	RC	1.89	1.62	1.27	1.04	0.91	0.59	0.44	0.38	-0.11	-0.64
Indonesia	RXA	1.40	1.30	2.06	1.93	2.00	2.30	2.20	2.00	2.21	2.44
	TBI	0.83	0.70	0.75	0.70	0.73	0.79	0.72	0.72	0.74	0.71
	RMA	0.15	0.25	0.28	0.31	0.29	0.27	0.38	0.35	0.31	0.38
	RTA	1.26	1.04	1.79	1.61	1.71	2.03	1.82	1.65	1.89	2.05
	RC	2.26	1.63	2.01	1.82	1.94	2.13	1.76	1.76	1.95	1.85
India	RXA	0.46	0.47	0.64	0.40	0.36	0.48	0.45	0.58	0.64	0.57
	TBI	0.93	0.89	0.90	0.83	0.77	0.78	0.78	0.84	0.83	0.81
	RMA	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.04	0.04
	RTA	0.45	0.45	0.63	0.37	0.33	0.44	0.41	0.54	0.60	0.53
	RC	3.84	3.31	3.55	2.74	2.47	2.52	2.43	2.87	2.86	2.67
Peru	RXA	1.79	1.82	2.57	1.91	2.46	3.06	2.81	2.28	2.33	1.87
	TBI	0.80	0.74	0.75	0.67	0.64	0.76	0.76	0.68	0.70	0.63
	RMA	0.22	0.33	0.38	0.35	0.48	0.34	0.37	0.47	0.44	0.44
	TRTA	1.57	1.50	2.19	1.56	1.99	2.72	2.45	1.81	1.89	1.43
	RC	2.08	1.72	1.90	1.69	1.65	2.19	2.04	1.58	1.66	1.45
Russia	RXA	0.41	0.41	0.30	0.48	0.57	0.69	0.72	0.74	0.66	0.70
	TBI	-0.17	-0.16	-0.33	-0.03	0.05	0.23	0.26	0.35	0.25	0.27
	RMA	0.95	0.92	0.92	0.81	0.84	0.77	0.64	0.55	0.72	0.67
	RTA	-0.55	-0.51	-0.63	-0.32	-0.27	-0.08	0.08	0.19	-0.07	0.03
	RC	-0.85	-0.81	-1.13	-0.51	-0.39	-0.11	0.12	0.30	-0.10	0.05
Turkey	RXA	0.56	0.63	0.65	0.70	0.73	0.90	1.01	0.98	0.94	0.96
	TBI	0.48	0.54	0.60	0.62	0.68	0.69	0.78	0.74	0.82	0.78
	RMA	0.12	0.10	0.10	0.09	0.09	0.11	0.09	0.10	0.07	0.10
	RTA	0.44	0.53	0.55	0.61	0.65	0.79	0.92	0.88	0.87	0.86
	RC	1.57	1.81	1.90	2.03	2.14	2.12	2.47	2.33	2.61	2.29

Note: *304: Calculated by authors (Fish fillets and other fish meat)

Table 5. Competition index results in Turkey and leading countries in world aquaculture production (306)*

Country	Index	Year									
		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
China	RXA	0.65	0.67	0.67	0.65	0.60	0.52	0.49	0.39	0.34	0.26
	TBI	0.38	0.25	0.13	0.10	0.10	-0.04	-0.11	-0.25	-0.55	-0.74
	RMA	0.33	0.43	0.59	0.65	0.64	0.84	0.92	0.96	1.48	2.20
	RTA	0.32	0.23	0.09	0.00	-0.04	-0.31	-0.43	-0.56	-1.14	-1.94
	RC	0.68	0.43	0.14	0.00	-0.06	-0.47	-0.63	-0.89	-1.48	-2.13
Indonesia	RXA	5.25	5.21	5.96	6.63	7.12	6.26	6.27	5.97	5.80	5.40
	TBI	0.95	0.91	0.90	0.91	0.93	0.93	0.91	0.92	0.90	0.88
	RMA	0.16	0.27	0.30	0.32	0.27	0.27	0.36	0.33	0.30	0.34
	RTA	5.10	4.94	5.65	6.31	6.85	5.99	5.90	5.64	5.50	5.06
	RC	3.51	2.95	2.97	3.03	3.28	3.15	2.85	2.90	2.96	2.76
India	RXA	4.23	5.02	5.81	7.23	8.34	8.40	8.52	9.58	9.20	9.17
	TBI	0.99	0.99	0.99	1.00	0.99	0.99	0.99	0.99	0.98	0.98
	RMA	0.01	0.01	0.02	0.01	0.02	0.03	0.03	0.04	0.06	0.05
	RTA	4.22	5.01	5.79	7.22	8.32	8.37	8.49	9.54	9.15	9.12
	RC	5.71	5.91	5.79	6.56	6.08	5.70	5.61	5.46	5.11	5.25
Peru	RXA	1.71	1.82	1.91	2.52	2.94	3.03	2.66	2.92	3.09	3.22
	TBI	0.92	0.91	0.92	0.90	0.88	0.55	0.71	0.55	0.47	0.61
	RMA	0.09	0.10	0.09	0.14	0.19	0.84	0.51	1.11	1.34	0.84
	TRTA	1.62	1.72	1.81	2.37	2.75	2.19	2.15	1.81	1.75	2.38
	RC	2.99	2.88	3.04	2.86	2.73	1.28	1.65	0.97	0.84	1.34
Russia	RXA	0.51	0.48	0.53	0.54	0.76	1.11	1.44	1.59	1.75	2.37
	TBI	0.04	0.01	0.09	0.01	0.22	0.59	0.53	0.60	0.64	0.71
	RMA	0.82	0.80	0.74	0.96	0.93	0.59	0.77	0.75	0.79	0.73
	RTA	-0.31	-0.32	-0.21	-0.41	-0.17	0.52	0.67	0.84	0.96	1.65
	RC	-0.48	-0.51	-0.33	-0.57	-0.21	0.63	0.62	0.75	0.80	1.18
Turkey	RXA	0.04	0.03	0.01	0.03	0.02	0.03	0.03	0.03	0.02	0.03
	TBI	0.24	-0.32	-0.48	-0.07	-0.25	-0.03	0.31	0.15	-0.03	0.04
	RMA	0.02	0.04	0.03	0.02	0.03	0.03	0.01	0.02	0.02	0.03
	RTA	0.03	0.00	-0.01	0.01	0.00	0.01	0.02	0.01	0.00	0.01
	RC	0.97	-0.08	-0.63	0.29	-0.18	0.21	0.85	0.54	0.15	0.22

Note: *306: Calculated by authors (Crustaceans, whether in the shell or not, live, fresh, chilled, frozen, dried, salted)

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The results of the Relative Export Advantage Index (RXA), Relative Import Advantage Index (RMA), Relative Trade Advantage Index (RTA), Revealed Competitiveness Index (RC), and Trade Balance Index (TBI) used to measure competitiveness in the international world fish trade are given in the tables below. Since Balassa's RCA index values and Vollrath's RXA index values are the same, interpretations in the tables are made according to RXA index values instead of RCA. When the competition index values of fresh and chilled fish are examined in Table 2, it is seen that Turkey has a comparative advantage (RXA> 1) between 2010 and 2019. It is striking that Turkey is a net exporter according to the TBI index result (TBI> 0). RTA and RC index results were calculated as 1.82 and 2.28, respectively. According to these index results, Turkey has a comparative advantage in the international fresh and chilled fish trade. Kuşat (2019) found Turkey's competitive power in the fish trade high in his study. According to the average RXA index results, it has been determined that the leading countries in world seafood production do not have a comparative advantage. TBI index results are: China (-0.22), Indonesia (0.79), India (0.44), Peru (-0.56) and Russia (-0.98). According to these results, China, Peru, and Russia are net importers while Indonesia and India are exporters. When the RTA and RC index results of the same countries are examined, it can be said that countries other than India and Indonesia are disadvantageous countries in foreign trade of fresh and chilled fish.

When the competition indices of the leading countries in the world frozen fish production are examined, it can be said that especially Russia, Indonesia, India, and Peru have comparative advantages in the international frozen fish trade. Since the RXA values of China and Turkey are 0.88 and 0.36, respectively, it can be stated that these countries have no comparative advantages. When the TBI index values are examined, it can be said that while it is not certain for Peru (0.03), other countries except Turkey are net exporters. When we look at the index values of RTA (1.86 and 1.79) and RC (4.1 and 5.25) of Indonesia and India, it is seen that they have a very high competitive advantage.

When the competition index values of fish fillets and other fish meats (whether minced, fresh, chilled, or frozen) are examined in Table 4, it draws attention that between 2010 and 2019 Turkey did not have a comparative advantage in the trade of fish fillets and other fish meats, that it was an exporter and that it had a competitive advantage. Between those years, the average RXA, TBI, RTA, and RC index results for Turkey were calculated as 0.81, 0.67, 0.71, and 2.13, respectively. According to the index results of RXA, TBI, RTA, and RC, other countries except Russia have a comparative advantage in the international trade of fish fillets and other fish meats. The TBI and RMA index results reveal that countries other than Russia are net exporters in the international trade of fish fillets and other fish meats.

The study results showed that Indonesia, India, Peru, and Russia have a comparative advantage in the international shellfish trade (Crustaceans, whether in the shell or not, live, fresh, chilled, frozen, dried, salted) (Table 5). RXA, RMA and RC index results for these countries are as follows; Indonesia (5.99, 0.29, 3.01), India (7.55, 0.03, 5.72), Peru (2.58, 0.52, 2.06) and Russia (1.11, 0.79, 0.19). Here, Russia's RC index values fell to negative values in the first 5 years and took positive values in the following years. Considering the TBI results of these countries (0.92, 0.99, 0.74, 0.34), it can be said that they are a net exporter. Looking at the index results of China and Turkey, the RXA values are 0.52 and 0.02, respectively, and according to these results, it can be said that there is no competitive advantage in either country. When we look at the RMA and TBI values of these two countries, the following is seen: China (0.90, -0.07) and Turkey (0.02, -0.04). According to these values, it can be said that China and Turkey are exporters according to RMA value and importers according to the TBI index. In short, these two countries can be said to be disadvantageous countries in the shellfish trade.

Conclusion

As of 2018, 178.5 million tons of fisheries and aquaculture products are produced in the world. The major part of this production is carried out by China. Indonesia, Peru, India and Russia are the other countries that have an important share in production. In measuring the countries ranking first in the world seafood production and Turkey's competitive power in the international world walnut trade; Relative Export Advantage Index (RXA), Trade Balance Index (TBI), Relative Import Advantage Index (RMA), Relative Trade Advantage Index (RTA) and Relative Competitiveness Index (RC) were used. These index results show that even though countries have significant potential in production in some cases, they cannot get a say in international trade. The index results revealed that, although China has a significant share in the world's seafood production, it has no competitive advantage in products other than frozen fish and that it is an important importer. The results of the research have shown that Indonesia and India have a comparative advantage in the international aquaculture trade. It shows that these countries are net exporters in world aquaculture exports. Peru has shown that it has a comparative advantage in aquaculture trade, except for the sub-sector of

fresh or chilled fish. Although Turkey is not an important actor in world aquaculture production, it has made significant progress, especially in fresh and chilled fish production. According to the index results used in the measurement of competitiveness, it is seen that Turkey is advantageous in terms of foreign trade competition. Again, Turkey is an exporter in the seafood trade, except for Crustaceans. As a result, it was concluded that only a high amount of production is not enough to get a say in the world aquaculture trade.

Compliance With Ethical Standards

Authors' Contributions

Author AA designed the study. ND wrote the first draft of the manuscript, AA and ND read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

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