

Current Situation, Problems and Digital Countermeasures of Export Trade of Aquatic Products in Zhanjiang City, China

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How to cite this paper: Chen, H. Z., Xu, Y. L., Xu, C. J., & Cai, J. X. (2024). Current Situation, Problems and Digital Countermeasures of Export Trade of Aquatic Products in Zhanjiang City, China. *American Journal of Industrial and Business Management*, 14, 1479-1497.

<https://doi.org/10.4236/ajibm.2024.1411075>

Received: October 16, 2024

Accepted: November 24, 2024

Published: November 27, 2024

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Abstract

Zhanjiang City, Guangdong Province is an important city for the export of aquatic products in China. In order to solve some of the problems existing in the export of aquatic products in Zhanjiang City, this paper, based on the current situation of aquatic products export in Zhanjiang City, utilized the literature method and data analysis method to analyze its trade competitiveness. And this paper used two analysis models, the trade competitiveness index analysis and the explicit comparative index analysis. On the basis of quantitative analysis combined with qualitative analysis, it pointed out the problems existing in the export trade of aquatic products in Zhanjiang City, and put forward targeted countermeasure proposals according to the problems that have emerged. This may promote the healthy and steady development of the export trade of aquatic products, and improve the economic strength of Zhanjiang City.

Keywords

Fish Products, Exports, Trade Competitiveness Index, Explicit Comparative Advantage Index

1. Introduction

Since the reform and opening up, China has actively combined the strategies of “bringing in” and “going out” to participate in global trade. As a large marine country, China is a relatively large exporter and importer of aquatic products. As China opens up more and more, and as China’s economic relationship with the world becomes closer, aquatic products from Guangdong Province are slowly going global and being recognized by more countries in the world. According to the

Guangdong Statistical Information Network, Guangdong Provincial Statistical Yearbook and Customs data, it can be seen that Guangdong Province is currently an important export province in the domestic aquatic industry, with the price advantage and resource advantage, its international advantages are reflected. Zhanjiang City, because of its unique geographical advantages has developed of its aquatic industry relatively well. The total volume of aquatic products and the total output value for more than 20 consecutive years ranked first in Guangdong Province. According to the Zhanjiang Customs and Zhanjiang government data collated and calculated, it can be seen that Zhanjiang City, aquatic products exports are to promote the economic growth of Zhanjiang City, an important force. However, in recent years, due to the epidemic, international trade barriers, the international financial crisis and other factors, the entire aquatic market has been relatively depressed. So in today's Zhanjiang City, do aquatic exports still have an advantage? What are the problems of its aquatic exports?

2. Literature Review

Research on the import and export of aquatic fisheries has always been a popular topic for scholars at home and abroad. Foreign research on the export trade of aquatic products is earlier than that of our country, so the export trade situation studied by foreign scholars also brings certain guiding significance to our country's research on the export trade of aquatic products. However, the national conditions of each country are different, and the focus of each country in the research process is also different. The export trade of aquatic products in Zhanjiang City, Guangdong Province accounts for a relatively large proportion of merchandise trade. As early as a few years ago, Chinese scholars based on China's national conditions made quantitative or qualitative analysis of the development of China's aquatic products export trade.

2.1. A Study of the Current Export Status of Aquatic Products by Scholars at Home and Abroad

From the point of view of domestic scholars' research, [Lao Tongfen, Ye Shengquan et al. \(2013\)](#) mainly analyzed the production of Zhanjiang's exported farmed aquatic products and its foreign trade in processed finished products in recent years, and came to the conclusion that its industry plays an economic role for Zhanjiang City, as well as giving some development countermeasures. [Zhao Haijun, Zhang Xiaoliu et al. \(2018\)](#) mainly studied the current situation of Zhanjiang's exported aquatic products in the context of Guangdong ASEAN Advance Zone. Through the trade data and export varieties in Zhanjiang exports of ASEAN aquatic products, they analyzed and concluded that the weight and value of goods in Zhanjiang exports of ASEAN aquatic products in 2016 appeared to be a small increase, but it is also necessary to improve the competitiveness of their own products, adjust and improve the inspection and quarantine supervision methods and so on. [Chen Xianqiang \(2020\)](#) analyzed the current situation of China's aquatic

products export trade through the three models of China's aquatic products export trade international market share, the explicit comparative advantage index, and indicative comparative competitive advantage index, and concluded that: China's aquatic products in the international market share continues to increase, and there is a tendency to expand with a large competitive advantage. However, there are problems such as unreasonable product structure of export trade and technical barriers to trade and so on.

From the research of foreign scholars, [Singh & Dey \(2017\)](#) mainly used the constant market share model to deeply analyze the domestic and international competitiveness of American catfish. The article pointed out that the marginalization of the competitiveness of U.S. catfish is mainly affected by the imbalance of domestic catfish supply and demand due to the withdrawal of Vietnamese catfish from the U.S. market, and the impact of the development of aquaculture industry in China, Thailand and other countries on the country. In addition, [Rabbani A G et al. \(2017\)](#) utilized the lightening gravity model of international trade to explore the impact of American catfish in terms of import and export trade. In studying the fisheries economy of Southeast Asia, [Van Mulekom L et al. \(2006\)](#) showed that the economic development of Southeast Asia is largely dependent on the export of valuable indigenous natural resources at low prices. The fisheries policies of these countries have stimulated economic development, but have not ensured their food security and to some extent this has caused damage to the surrounding ecology as well as to the rural areas, thus affecting the domestic macro-economy.

2.2. Review of Literature

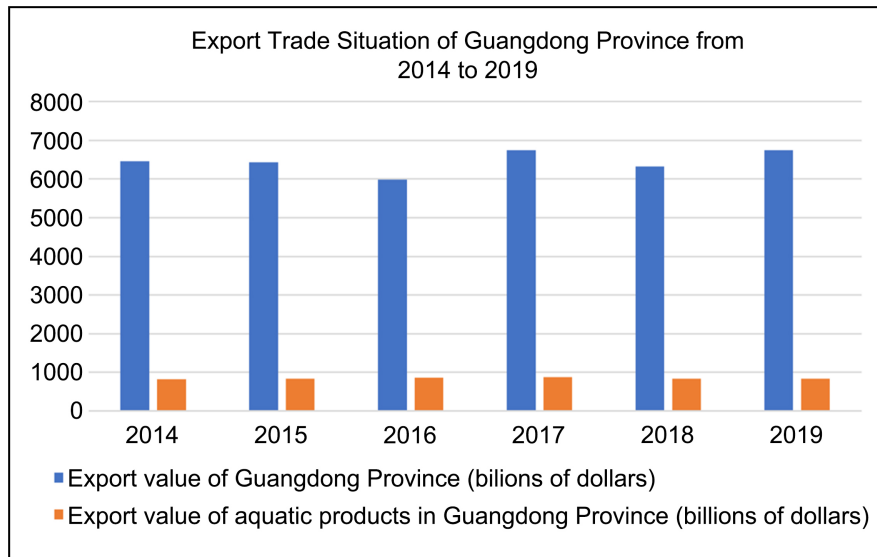
On the study of the current situation of aquatic products export, most of our scholars analyzed their export competitiveness from the total amount of exports and the types of export products, while foreign scholars tend to conduct research on aquatic products from a technical perspective, combining data to construct economic models, and analyzing the export situation based on the magnitude and pattern of model changes. This has feasible reference significance for Chinese scholars to study aquatic products. When analyzing the literature on aquatic products by different scholars at home and abroad, there are still many places that need to be studied.

3. Current Situation of Export Trade of Aquatic Products in Zhanjiang City

3.1. Current Situation of Aquatic Product Exports in Guangdong Province

From [Figure 1](#) and [Table 1](#), the rise of the total export trade of Guangdong Province tends to be a steady trend. The total amount of export trade is quite large every year, among which there is a downward trend in 2016 and 2018. The total export value of Guangdong Province in the past five years tends to be between 500

billion dollars and 700 billion dollars, with a slightly higher value in 2017, reaching 674 billion dollars. The export trade value of aquatic products in Guangdong Province tends to account for between 12% and 15% of the export trade value of Guangdong Province, and its proportion is relatively high, which can be seen that the export trade of aquatic products in Guangdong Province has a certain contribution to the overall trade of Guangdong Province.



Data source: Guangdong statistical information network, based on Guangdong statistical yearbook and customs data.

Figure 1. Trade and aquatic product export trade in Guangdong province from 2014 to 2019.

Table 1. Proportion of Guangdong Province’s aquatic product export trade volume.

Table Head	Table Column Head		
	Total export trade of Guangdong Province	Total export trade of aquatic products in Guangdong Province (million dollars)	Percentage
2014	6560.87	816.13	12.44%
2015	6434.68	836.34	12.75%
2016	5985.64	858.22	13.08%
2017	6740.59	873.79	13.32%
2018	6317.93	833.54	12.70%
2019	6740.59	842.44	12.84%

Data source: Guangdong Statistical Information Network, based on Guangdong Statistical Yearbook and Customs data.

3.2. Current Situation of Aquatic Product Exports in Zhanjiang City

From **Figure 2**, during the period 2014-2019, the highest export trade value of aquatic products in Zhanjiang City was in 2014, reaching \$1.14 billion. From 2015, it began to decline with a decrease of 17.5%. In 2016, the export trade value fell to the lowest during this five-year period with only \$890 million, but the downward trend was a decrease of 5.32%. Starting in 2017, Zhanjiang City's fish export trade volume began to grow, and for three consecutive years it began to grow at an average rate of 2%. The export trade value of aquatic products in 2019 was \$950 million.



Data source: Guangdong statistical information network, Zhanjiang customs, Zhanjiang Government's data collation and calculations.

Figure 2. Comparison between the export trade volume of aquatic products and the total export trade volume of Zhanjiang City.

Table 2. Growth rate of export trade value of aquatic products in Zhanjiang City.

Table Head	Table Column Head	
	Export trade of aquatic products in Zhanjiang City (US\$ in billion)	Export growth rate
2014	11.4	0
2015	9.4	-17.5%
2016	8.9	-5.32%
2017	9.1	2.25%
2018	9.3	2.20%
2019	9.5	2.15%

Data source: Guangdong statistical information network, Zhanjiang customs, Zhanjiang Government's data collation and calculations.

Table 3. Exports and imports of fish and fishery products in Zhanjiang City.

Table Head	Table Column Head		
	Exports (\$ billion)	Imports (\$ billion)	Trade balance (\$ billion)
2013	10.5	0.65	9.85
2014	11.4	0.9	10.5
2015	9.4	1.2	8.2
2016	8.9	0.78	8.12
2017	9.1	0.7	8.4
2018	9.3	0.8	8.5
2019	9.5	0.72	8.78

Data source: Guangdong statistical information network, Zhanjiang customs, Zhanjiang Government's data collation and calculations.

From **Table 2** and **Table 3**, comparison of the export value and import value of aquatic products in Zhanjiang City shows that the export of aquatic products in Zhanjiang City has been in trade surplus. Zhanjiang City has a large production capacity of aquatic products, and turns to foreign markets after meeting its own needs. As Zhanjiang's aquatic products are rich in resources, naturally, imports of aquatic products from abroad will be relatively less, and the trade surplus difference is in the range of 8 - 10 billion U.S. dollars. It shows that the export trade of aquatic products in Zhanjiang is more competitive.

4. Trade Competitiveness Analysis of Aquatic Products Exported from Zhanjiang City

4.1. International Market Share

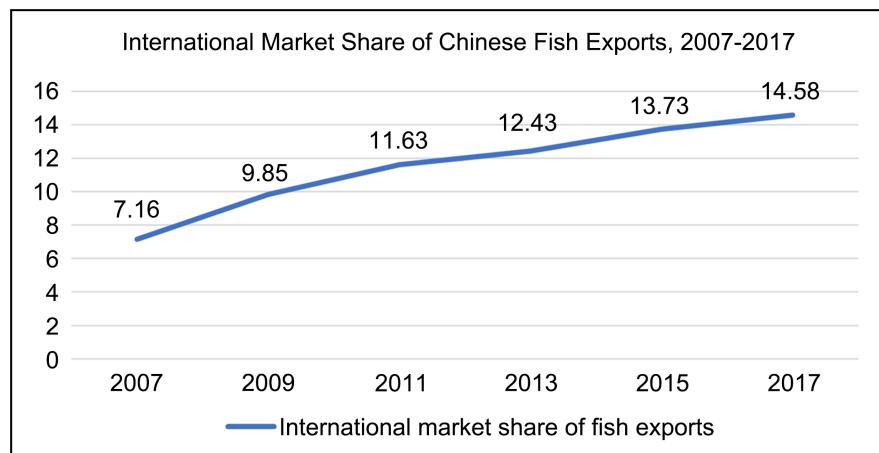
The international market share (MOR) refers to the share of exports of a certain product category in the total world exports of that product category from a certain country or region. This indicator reflects the competitiveness and competitive position of a product in the international market. Its calculation formula is:

$$\text{MOR}_{ij} = \frac{x_{ij}}{x_{w_j}} \quad (1)$$

where MOR_{ij} represents the international market share of product j of country i ; x_{ij} represents the total exports of product j of country i ; x_{w_j} represents the total world exports of product j . The higher the international market share, the higher the share of product j in the international market. The higher the international market share, the stronger the international competitiveness of the country's j products.

From 2007-2017 in **Figure 3**, we can see that China's aquatic products exports

in the international market share was increasing year by year, indicating that China's aquatic products exports in the international market was strengthening the competitive advantage. And according to Zhanjiang Guolian Aquatic Development Co., Ltd. transfer information, its main products were shrimp, tilapia and other products, shrimp exports to the United States accounted for 40% of China's shrimp exports to the U.S. market in the total amount of 40%, indicating that Zhanjiang aquatic exports in the U.S. accounted for a relatively high proportion, and the U.S. was one of the main markets for exports of aquatic products in Zhanjiang.



Data source: Calculations based on data from the China fishery products import and export trade yearbook.

Figure 3. International market share of Chinese fish exports, 2007-2017.

4.2. Analysis of the Trade Competitiveness Index

4.2.1. Concept of Trade Competitiveness Index

The Trade Competitiveness Index, also known as the TC (Trade Competitiveness) Index, is the difference between a country's import and export trade as a proportion of its total import and export trade. The formula for its calculation is:

$$TC = \frac{X_i - M_i}{X_i + M_i} \quad (2)$$

among these,

X_i refers to the value of a country's exports in product i ;

M_i refers to the value of a country's imports on product i .

4.2.2. Analysis of Competitiveness Index of Zhanjiang City's Fish Trade

As shown in **Table 4**, the trade volume of Zhanjiang aquatic products exported from 2013 to 2019 is generally larger than the import trade volume, and the TC index is positive and close to 1, indicating that the aquatic products in Zhanjiang have obvious competitive advantages. The highest TC index appeared in 2013, reaching 0.88. The lowest TC index appeared in 2015, only 0.77. The overall difference is not big, indicating that the trend of aquatic products exported from

Zhanjiang is stable in recent years. The larger the TC index, the more competitive it is. From the current TC index, Zhanjiang City has an advantage in the export of aquatic products, which tells us to seize the favorable aspects of the problem, but also to solve the problems at this stage.

Table 4. Competitiveness index of Zhanjiang fish trade.

Table Head	Table Column Head		
	Exports (\$ billion)	Imports (\$ billion)	TC Index
2013	10.5	0.65	0.88
2014	11.4	0.9	0.85
2015	9.4	1.2	0.77
2016	8.9	0.78	0.83
2017	9.1	0.7	0.86
2018	9.3	0.8	0.84
2019	9.5	0.72	0.86

Data source: Zhanjiang municipal government, Zhanjiang customs, Guangdong statistical yearbook.

4.3. Analysis of the Explicit Comparative Advantage Index

4.3.1. Concept of Explicit Comparative Advantage Index

The explicit comparative advantage index can reflect the comparative advantage of a country's (region's) trade in a particular industry. It is the proportion of the value of a country's exports of a particular commodity as a share of the total value of all commodities exported from that country to the value of world exports of that commodity as a share of the total value of world exports of all commodities. The formula for its calculation is:

$$RAC_{ij} = \frac{X_{ij}/X_i}{W_j/W} \quad (3)$$

among these,

RCA_{ij} : represents the explicit comparative advantage index of product j in country (region) i ;

X_{ij} : represents the export value of product j from country (region) i to the world market;

X_i : represents the total exports of country (region) i to the world market;

W_j : represents exports of product j on the world market;

W : represents total exports of products to the world market.

4.3.2. Analysis of the Explicit Comparative Advantage Index of Zhanjiang City's Fish Trade

Table 5 and **Table 6** show the changes and share of the export value of aquatic products in Zhanjiang City with the total export products from 2015 to 2019.

Table 7 shows the situation of the explicit comparative advantage index of aquatic products exported in Zhanjiang City from 2015 to 2019, which is calculated according to **Table 5** and **Table 6**.

Table 5. Comparison of export value and total export value of aquatic products in Zhanjiang City from 2014 to 2019.

Table Head	Table Column Head		
	Exports of aquatic products from Zhanjiang City (\$ billion)	Total export products from Zhanjiang City (\$ billion)	X_{ij}/X_i
2015	9.4	97.4	0.09
2016	8.9	105.5	0.08
2017	9.1	102.7	0.09
2018	9.3	98.6	0.094
2019	9.5	96.4	0.099

Data source: Zhanjiang City bureau of statistics, annual statistical Yearbook.

Table 6. Comparison of world aquatic product exports and total export products from 2015 to 2019.

Table Head	Table Column Head		
	Exports of fish products (billions of dollars)	Total export products (Billions of dollars)	W_{j}/W
2015	897.9	43030.00	0.02
2016	786.5	39569.01	0.019
2017	987.6	36849.14	0.027
2018	1000.1	4107.64	0.024
2019	1209.1	46224.15	0.026

Data source: World bank database, calculated and organized.

Table 7. Explicit comparative advantage index of aquatic product exports from 2015 to 2019.

Table Head	Table Column Head		
	X_{ij}/X_i	W_{j}/W	RCA
2015	0.09	0.02	4.5
2016	0.08	0.019	4.2
2017	0.09	0.027	3.3
2018	0.094	0.024	3.9
2019	0.099	0.026	3.8

Data source: World bank database, calculated and organized.

The values of RCA, the explicit comparative advantage index of aquatic products in Zhanjiang City, are all between 3 and 5, which are all greater than 1, indicating that the export trade of aquatic products in Zhanjiang City are all internationally competitive. During the five-year period, the maximum value of RCA appeared in 2015, which was 4.5; the minimum value was in 2017, which was 3.3. By analyzing the comparative advantage index of Zhanjiang City's aquatic products exports, it is further understood that Zhanjiang City's aquatic products export trade has international competitiveness.

5. Problems in the Export of Aquatic Products in Zhanjiang City

5.1. Water Pollution and Water Quality Issues

Shijian Zhong (2013) said, Economic development is a product of the ecological environment and is constrained by it. In turn, economic development plays a leading role in environmental change. Due to the richness of marine resources, Zhanjiang can rely on marine resources to better develop its economy. In the process of economic development, it will inevitably cause damage to the environment, positively making changes in the marine environment, and negatively constraining the development of its economy to a large extent by the marine environment.

As we all know, the most important issue in the export trade of aquatic products is whether the quality of aquatic products meets the standards. In 2020, some media reported that the 20 kilometer silver beach in Wuchuan, Zhanjiang turned black. It was reported that the marine aquaculture industry in Wuchuan, Zhanjiang was very developed. However, due to the fact that for many years the factory discharged a large amount of untreated shrimp farming tail water directly, resulting in serious pollution of the marine environment, the Gold Coast turned into a black beach. In recent years, the development of industrialization in Zhanjiang, Japan's nuclear sewage discharge and other factors, has also been more or less affect the waters of Zhanjiang as well as the quality of water, thus bringing a certain impact on the development of aquatic products in Zhanjiang waters.

5.2. Gradually Rising Domestic Labor Costs and Lower Product Margins

Due to factors such as the acceleration of aging and the gradual transfer of surplus labor in China, Wen Xiao, Tianhang Xue (2019) deemed labor prices are continuing to rise. According to the data of China Statistical Yearbook, the average wage of employed persons in China's urban non-private units has increased from 9333 yuan in 2000 to 97,379 yuan in 2020, rising 10.43 times, with an average annual growth rate of 12.4%. The data shows that the rapid rise in labor costs will greatly exert pressure on labor-intensive enterprises with high labor costs. The aquatic products processing industry is an important part of the aquaculture industry, which is a continuation on the basis of aquaculture and fishery fishing. At present, Zhanjiang aquatic products processing is still mainly a labor-intensive industry,

but with the gradual decline of China's demographic dividend, the domestic labor costs are gradually rising, resulting in a decrease in the profitability of aquatic products, which affects the economic efficiency of Zhanjiang aquatic products exporters, and even affects their export strategy and international competitiveness. Zhanjiang City, as a major aquatic products export city in Guangdong Province and even in the country, whose aquatic products exporters are facing the double pressure of rising labor costs and declining profits.

5.3. Smaller Firms and Lower Degree of Clustering

Despite the better development of the export market for aquatic products and the large number of aquatic enterprises in Zhanjiang, Zhanjiang aquatic enterprises are mainly composed of small and medium-sized enterprises (SMEs), which are usually small in scale and have a low degree of clustering. The reason for the relatively small scale of aquaculture in Zhanjiang is mainly due to the single industrial structure, fewer large-scale aquaculture enterprises, and the inability to improve the efficiency of aquaculture technology, etc. (Yu, 2024). This situation affects the efficiency and competitiveness of Zhanjiang's aquatic products exports. Small and medium-sized enterprises (SMEs) may face many challenges in the export process, such as capital, technology and market, and all these factors may affect the scale and efficiency of export. The main reasons for the low level of clustering include insufficient scale and intensification of aquaculture upstream, aging of aquaculture practitioners, and aquaculture technology to be updated. If Zhanjiang aquaculture enterprises have a high degree of intensification, it will help to form an industrial agglomeration effect, promote technological innovation and cost reduction, and thus improve the competitiveness of export products. However, the current low degree of clustering of Zhanjiang's aquatic product export enterprises limits the realization of this agglomeration effect.

5.4. Overfishing Is still a Problem

As we all know, the Guangdong Ocean Seasonal Fishing Closure Period lasts for four months from 12:00 a.m. on May 1st to 12:00 a.m. on August 16th. Although the fishing moratorium has an impact on the short-term income of fishermen, it provides time for fish reproduction and growth of young fish, allowing the marine ecology to fully recuperate. However, there are still people who are desperate for profit and illegally fish for aquatic products, which not only seriously disrupts the normal order of offshore fishery production and seriously affects ecological and environmental protection, but may also affect the international market, especially the export trade of Zhanjiang's aquatic products.

5.5. Affected by Trade Barriers

As one of the main bases for aquaculture, processing and export in China, Zhanjiang enjoys a good reputation for its aquatic products in the international market. However, with the development of international trade, Zhanjiang aquatic

products are also facing the challenge of trade barriers from different countries and regions. These trade barriers mainly include technical trade barriers and non-tariff barriers, of which technical trade barriers are particularly prominent. It involves a wide range of aspects, including food safety, environmental protection, human health, etc., making it necessary for Zhanjiang aquatic products to meet more stringent standards and requirements when exporting. Meng Wu (2016) mentioned that technical barriers to trade is the main obstacle facing China's agricultural export trade after WTO accession. In terms of export markets, they have rich experience in formulating relevant laws and regulations on technical barriers to trade, and they are more stringent, even higher than international standards. In addition, Zhanjiang's aquatic enterprises for technical barriers to trade screening is poor. On the one hand, the enterprise personnel for technical barriers to trade related knowledge reserves are not solid enough, easy to be at a disadvantage in the trade, and can not reasonably use legal means to protect the legitimate rights and interests of enterprises in trade; on the other hand, for the inspection mechanism of various countries as well as the release of the latest trade policy, they can not grasp the relevant information, thus making passive trade.

6. Measures to Solve the Problems of Aquatic Products Export in Zhanjiang City

6.1. Enterprise Perspective

6.1.1. Focusing on the Safety of Water Quality and the Protection of Clean Waters

General Secretary Xi once said, "Green mountains are golden mountains." It can be seen that in the process of social development, it is necessary to harmonize the relationship between the protection of the environment and economic development. Only in this way can we make our enterprises sustainable development. The transformation of 20 kilometers from Yintan to Heitan in Wuchuan, Zhanjiang City is the result of a certain enterprise's failure to pay attention to the protection of the ecosystem. Over the years, a large amount of untreated shrimp farming tail water has been discharged directly onto the beach, seriously polluting the marine environment. Therefore, Zhanjiang aquatic enterprises should pay attention to the design of the aquaculture system, regularly clean up the breeding process of the mud. At the same time, they should treat the breeding of wastewater harmlessly, and recycled the organic components in the waste to minimize the pollution of the environment through fermentation technology. The Zhanjiang government can also increase the investment of funds for the environmental protection of the sea based on the development of the economy, so that its carrying capacity is constantly improved to provide a certain basis for the development of environmental protection (Liu, 2022).

6.1.2. Increasing the Added Value of Multiple Products and Accelerating Product Transformation and Upgrading

Zhanjiang has greater achievements in the deep processing of golden pomfret,

with a complete processing system and a wide range of processed products. However, there is still to be developed in other aquatic products. Therefore, Zhanjiang aquatic enterprises should gradually develop in the direction of multi-product deep processing and high value-addedness, such as accelerating the development of multi-species prepared vegetables. First of all, Zhanjiang aquatic enterprises can cooperate with Lingnan Normal University, Guangdong Ocean University and other universities to establish engineering and technology research centers to inject innovative vitality and promote the research and development of prepared vegetables and other marine foods. Furthermore, they can improve the added value of their products by creating public brand name cards, such as Zhanjiang's famous oysters. In foreign trade, in addition to exporting golden pomfret and shrimp, Zhanjiang aquatic enterprises can also export processed products such as oysters, eels, crabs, etc., and try to develop more varieties of pre-prepared dishes, optimize the export structure, which not only improves the value-added multi-products, accelerate product transformation and upgrading, but also to a certain extent to increase the amount of foreign trade.

6.1.3. Actively Addressing Trade Barriers and Promoting Diversification

First of all, Zhanjiang aquatic enterprises need to strengthen the quality and safety supervision of aquatic products, standardize their own production and management work, and ensure that product quality meets the standards of importing countries, such as minimizing drug residues on aquatic products and improving the quality and safety of exported aquatic products. At the same time, Zhanjiang aquatic enterprises need to pay close attention to changes in trade policy at home and abroad, combined with the needs of their own business development to make a clear positioning, choose the right export market, timely adjustment of business strategies and market layout. Zhanjiang Guolian Aquatic Products Company actively responded to the anti-dumping measures taken by the United States against shrimp from China and other countries, and ultimately became the only Chinese aquatic enterprise to win zero tariff treatment. In addition, the Zhanjiang municipal government needs to strengthen cooperation with Zhanjiang aquatic enterprises, the establishment of anti-dumping and a variety of non-tariff barriers early warning mechanism. Yuanfei Wang (2013) said the government needs to make full use of the relevant WTO dispute settlement provisions to resolve conflicts, reasonable consultations, for Zhanjiang City, aquatic enterprises export efforts to create a favorable trade environment.

At present, the trade war between China and the United States has entered a new stage. Although the trade between the two countries has eased, the trade friction between the two countries has not stopped. Therefore, Zhanjiang aquatic enterprises should pay closer attention to the changes in trade policies between China and the United States, including tariff adjustments, import and export restrictions, etc., and adjust their strategic layout in a timely manner. In addition to the U.S. market, Zhanjiang aquatic enterprises can actively expand other overseas markets, such as the BRICS countries and ASEAN region, in order to reduce the

dependence on a single structure of the market and promote diversification.

6.1.4. Promoting the Optimal Allocation of Resource Elements and Facilitating the Scale and Clustering of Enterprises

The government of Zhanjiang City has issued “the Notice of the Office of the People’s Government of Zhanjiang City on the Issuance of Fifteen Measures to Support the High-Quality Development of Modernized Sea Ranches in Zhanjiang City”. Zhanjiang aquatic enterprises can make reasonable use of the relevant policies of the Zhanjiang municipal government to promote the optimal allocation of the resource elements of this enterprise, and promote the scale and clustering of the enterprise by means of industrial integration and digital transformation.

Zhanjiang aquatic enterprises should first determine the suitable species, scale and density of aquaculture in each aquaculture area, implement the sustainable development model of “ecological sparing”, carry forward the upgrading of aquaculture facilities, transform the traditional “wood + white foam floating ball” fishing raft, and popularize the recyclable environment-friendly high-density plastic fishing raft, which can not only meet the new development concept of green, but also promote the restoration of the marine ecological environment. Secondly, Zhanjiang aquatic enterprises can actively build modern industrial parks and join hands with coastal tourism to develop together (Lu, 2021). For example, the industrial park of Guangdong Zunding Pearl Co., Ltd. integrates the hatching and culturing and processing of Liusha pearl in Leizhou City, which further enhances the modernization of the South Pearl industry and promotes the local economic growth. Furthermore, they can collaborate with universities such as Lingnan Normal University and Guangdong Ocean University to develop new aquaculture technologies, promote collaborative development of scientific research, achievement transformation, demonstration and promotion, and the integration of primary, secondary, and tertiary industries, injecting innovative vitality into enterprise development and using science and technology to endow aquaculture with scale. At the same time, it is also possible to jointly develop new varieties of prepared vegetables, optimize the relatively single industrial structure, and promote the scale of enterprises. Finally, Zhanjiang aquaculture enterprises should continue to promote the development of the entire industry chain of ocean going enterprises, improve the operation mode of the integrated fishing, breeding, processing, cold chain and trade industry chain, and provide market guarantee for large-scale aquaculture.

6.2. Government Perspective

6.2.1. Strengthening the Management of the Sea

In the process of economic development, the government has simultaneously increased its efforts to protect the environment, strengthened its efforts to remediate enterprises, increased its efforts to remediate and manage wastewater, etc., and resolutely prevented wastewater from being discharged into the groundwater, the oceans and so on. At the same time, the government should optimize the relevant

programs on seawater management, and actively call on local people to carry out seawater management and raise public awareness of ocean protection. In September 2017, October 2018, and November 2019, the Zhanjiang Municipal Party Committee and Government respectively issued the “Zhanjiang Coastal Zone Cleanup and Remediation Work Plan”, “Zhanjiang City Implementation of the ‘Bay (Shore) Chief System’ Pilot Work Plan”, and “Zhanjiang City Coastal Sea Pollution Prevention and Control Implementation Plan”. The Zhanjiang Municipal Government should continue to promote the expansion and quality improvement of urban sewage treatment plants, strengthen the control of garbage entering the sea, improve the approval system for construction waste disposal, and continue to carry out rural household waste management work simultaneously, in order to achieve the goal of managing the sea and protecting this beautiful harbor in Zhanjiang.

6.2.2. Focusing on Control between Closed Seasons

Although there is a fishing ban from May 1st to August 16th every year, villagers or seafood companies who still have a lucky mentality still engage in illegal fishing. Therefore, the government should effectively carry out the supervision of fishing vessels during the fishing ban period, strengthen law enforcement supervision and safety management, increase inspection efforts, resolutely crack down on illegal and irregular behaviors such as fishing vessels going out to sea and cross regional and cross line operations, promote the fishing ban policy, emphasize the importance of fishing bans in the ocean during the summer season, organize centralized mooring points for fishing vessels, and if necessary, carry out special law enforcement activities to investigate and punish illegal fishing and other behaviors in accordance with the law, in order to ensure the effective implementation of the fishing ban measures. According to the “Guangdong Provincial Marine Comprehensive Law Enforcement Headquarters to fully rectify the problem of illegal poaching during the fishing moratorium in Zhanjiang area”, it can be reflected that Guangdong Provincial Marine Comprehensive Law Enforcement Headquarters pays close attention to the rectification of the situation, and organizes the team in Zhanjiang area to carry out a special crackdown, and fully rectifies the chaotic phenomenon of poaching during the fishing moratorium in Zhanjiang area.

6.2.3. Increasing Support for Fish Exporters

Zhanjiang City government should improve the current financial subsidy system for aquatic export enterprises, moderately increase the financial subsidies to support the strength of the aquatic export enterprises based on different development scales to develop targeted policies (Cao, 2023). The government should set up a special fund for aquatic product innovation, and provide tax incentives for research-based aquatic enterprises (Zhou, 2019). The government also should strongly support the construction of the marine ranch seed industry system, support the construction of deep-sea aquaculture equipment, support the green

development of aquaculture, promote the normalization of government bank enterprise docking, broaden diversified financing channels, strengthen financial technology empowerment, and promote the linkage between the aquatic industry and the present. In recent years, the Zhanjiang Municipal Government has issued a notice on the issuance of 15 measures to support the high-quality development of modern marine ranches in Zhanjiang City by the Zhanjiang Municipal People's Government Office. The Financial Bureau of Zhanjiang City has also issued several measures to support the high-quality development of the aquatic industry in Zhanjiang City. It can be seen that the release of relevant policies aims to better support the high-quality development of the aquatic industry and help Zhanjiang accelerate the construction of a global aquatic industry highland.

7. Digital Countermeasures for Exports of Aquatic Products in Zhanjiang City

7.1. Advancing the Digitization of Customs Quality Control Processes

Zhanjiang Customs should continue to promote the construction of a smart customs, fully implement the overall deployment of the General Administration of Customs' smart customs construction through the implementation of the "Smart Customs Strong Country" action, and strengthen the approval of pilot projects, taking technology empowerment, machine substitution, and smart application as the implementation path, innovatively integrating various intelligent detection technologies, to achieve real-time online inspection and supervision of bulk resource-based commodities. For example, Zhanjiang Customs has successfully issued an "Entry Animal and Plant Quarantine Permit" for a batch of imported Thai South American white shrimp through the "Intelligent Approval Channel". The process from accepting the application to issuing the quarantine permit only took 4 seconds, reflecting Zhanjiang Customs' efforts in promoting intelligent quality inspection construction, improving approval efficiency and service quality.

7.2. Promoting the Digitalization of Farming Techniques

The first measure is to build a digital service platform. By building a cross-county cluster deep-sea net cage "5G + Smart Fishery" digital service platform, intelligent management of deep-sea net cage aquaculture can be achieved. The second is to promote the digitization of deep-sea aquaculture. Through innovative technologies such as deep-sea Internet of Things and satellite remote sensing, sensors are installed for marine equipment to monitor the water quality and meteorological conditions of aquaculture water bodies, ensuring the normal growth of fish and other aquatic organisms. The third is to improve offshore aquaculture platforms. Through interdisciplinary joint research and development, we will strengthen the research and innovation of deep-sea aquaculture technology and facilities, in order to continuously improve the platform's level of informatization, intelligence, and modernization. At the same time, we will explore new aquaculture technologies

and equipment, such as new truss cages, new gravity deepwater cages, and large aquaculture factory ship.

7.3. Improving the Digital Aquatic Export Platform

By building a digital platform for the supply chain, gathering key information from the industry chain, and utilizing advanced technologies such as big data, the Internet of Things, cloud computing, and artificial intelligence, the entire process of aquaculture can be digitized and visualized for expression, design, control, and management. This includes real-time monitoring and intelligent control of the breeding environment, as well as improving breeding efficiency and yield through precision breeding and intelligent management, reducing resource waste and environmental pollution. In addition, the digital aquatic export platform should focus on the collection of international aquatic import and export information, take into account the internationalization characteristics of aquatic exports, understand the international market demand, and adjust and optimize the export strategy as a way to improve the competitiveness of the international market.

8. Conclusion

Because of its proximity to the sea on three sides and numerous islands, Zhanjiang's aquaculture industry has abundant marine resources thanks to its geographical advantages. Due to its unique advantages and effective development, the aquatic industry in Zhanjiang has been ranked first in Guangdong Province in terms of total aquatic production and output value for more than 20 years. It also has a complete aquatic industry chain, covering aquaculture, aquatic seed industry, aquatic product circulation and processing, equipment manufacturing, import and export trade, feed accessories and other systems, forming a complete industrial chain integrating feed production, biopharmaceuticals, machinery manufacturing, packaging and transportation, intelligent services, leisure fisheries and other industries. This provides a good development for the aquatic industry and is an important contribution to the economic development of Zhanjiang. However, through this study, it was found that the export of aquatic products in Zhanjiang is facing some problems, such as rising domestic labor costs, water pollution, insufficient scale and intensification of enterprises, and the impact of trade barriers. In the face of these problems, this article also provides corresponding countermeasures one by one: increasing product-added value, actively responding to trade barriers, striving for diversified development, promoting the optimization of resource allocation, and paying attention to water quality issues. With the profound development of international trade and the marine industry, the aquatic industry in Zhanjiang will continue to be a source of vitality in the future, and the Zhanjiang Municipal Government is also better supporting the high-quality development of the aquatic industry, helping Zhanjiang accelerate the construction of a global aquatic industry highland. It can be foreseen that the export of aquatic products in Zhanjiang City will be greatly developed.

Acknowledgements

This research was financially supported by the First Class Professional International Economics and Trade Project hosted by Professor Xu Chaojun in 2022 in Guangdong Province.

This research was financially supported by Scientific Research Project of Lingnan Normal University. The project is Research on Economic Growth in Underdeveloped Areas (Xu Yanli, Grant No. ZW1807).

It is a pleasure to acknowledge the support of the project from Xu Yanli being selected in the introduction of shortage top talent of “Yangfan (Sailing up) project” in Guangdong Province in 2014. The project is Leading Industry Development Strategy Research in Emerging Areas in Western Guangdong for Accelerating the Economic Development of Western Guangdong.

It is also a pleasure to acknowledge the support from the talents introduction project of universities in Guangdong Province.

It is also a pleasure to acknowledge the support from the following projects: 1) Excellent Course “Macroeconomics” in Teaching Quality and Teaching Reform Project in Lingnan Normal University in 2017 (Grant No. 114961700227). 2) Comprehensive reform experiment of International Economics and Trade major in Guangdong University of Petrochemical Technology.

This research is supported by Guangdong Coastal Economic Belt Development Research Center, Lingnan Normal University (Grant No. 20223L08, Grant No. 20191L01).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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