 DOI: 10.19601/j.cnki.issn1943 -9903.2018.9.006

# Development Status and Policy Path of Cultivating Marine Bio-industry Cluster in Zhanjiang City

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**Abstract** Cultivating the marine bio-industry cluster is a key industrial strategy for Zhanjiang to seize the manufacturing position of Guangdong's marine economy. By deconstructing the overall scale, characteristics and industrial composition of marine bio-industry cluster and the development status of the industrial parks and bases in Zhanjiang, the resource misallocation coefficient was used to analyze the problems in the marine bio-industry cluster and the resource allocation in Zhanjiang. It is found that in the cultivation of the marine bio-industry cluster in Zhanjiang, the leading effect of leading enterprises needs to be upgraded, the key technologies needs to be broken, the scientific and technological service system needs to be improved, and policy support needs to be strengthened. Moreover, there are serious resource misallocation and high efficiency losses. By optimizing resource allocation, the healthy development of cultivation of marine bio-industry cluster in Zhanjiang will be promoted. To this end, the policy paths that the government can implement are as follows: improving the market access system to appropriately guide medium and small-sized marine enterprises to enter the marine bio-industry, inspiring the marine bio-industry market demand with the industrialization of innovation results as the guide, improving the legal guarantee system to create an innovative atmosphere for the marine bio-industry, and promoting the deepening of the division of labor in the industrial parks.

**Key words** Zhanjiang City, Marine bio-industry cluster, Development status, Policy path

## 1 Introduction

With the continuous development of the social economy, a series of problems such as increasing population, lack of energy and environmental pollution have gradually emerged. Since 2000, the ocean has become a new hot spot for human development as a field area of 71% of the world, and the world has triggered a new wave of demand for space, resources and wealth from the ocean. The marine bio-industry, as an emerging industry, has slowly become the main battlefield of deployment of marine economic development strategies of some costal countries and regions in the world[1].

Zhanjiang City has a sea surface area of 20 000 $km^2$ and a coastline of 2 043.5 km, with three sides surrounded by the sea. The marine resources of Zhanjiang City benefit from a superior geographical position, and it is a large ocean city in Guangdong and even the whole country. In order to speed up the establishment of a strong marine economy and achieve a "blue rise", the Zhanjiang government vigorously implements the marine development strategy, develops the marine industry in depth, and support marine life-based strategic emerging industries using its natural location endowment. As the marine bio-industry cluster grows in size, their contribution to the Zhanjiang national economy has reached 10.2% (*Zhanjiang Government Work Report 2015*). Meanwhile, Zhanjiang marine bio-innovative industrial cluster successfully applied for the pilot unit of Guangdong's innovative industrial cluster construction. At present, Zhanjiang City has basically formed a modern marine bio-industry system and has initially built a national first-class marine bio-innovative industrial cluster with reasonable layout, high-end industries, leading technology, scientific management, and strong international competitiveness[2].

## 2 Development status and problems of marine bio-industry cluster in Zhanjiang City

### 2.1 Development status of marine bio-industry cluster in Zhanjiang City

**2.1.1** Overall scale and characteristics of marine bio-industry cluster in Zhanjiang City. The overall scale of the marine bio-industry cluster in Zhanjiang City is relatively large, with good development trend. In 2015, the total production value of the marine bio-industry cluster in Zhanjiang City reached 28 billion yuan, accounting for 21% of the total output value of the marine industry in Zhanjiang. From the perspective of leading industries, the total production values of the marine biological breeding industry, the marine aquaculture industry, the seafood deep processing industry, and the marine biomedical industry reached 4.48 billion, 8.12 billion, 5.88 billion and 9.52 billion yuan, respectively, which accounted for 16%, 29%, 21% and 34% of the total output value of the cluster. From the perspective of social impact, the city has more than 1 000 related businesses in the marine bio-industry. Among them, there are more than 120 enterprises above designated size (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 -2020)*.

The development of the marine bio-industry cluster in Zhanjiang City is good, with detailed labor division and obvious synergistic effect. First, the industrial cluster includes four links, ma-

Received: July 20, 2018 Accepted: September 6, 2018

Supported by Philosophy and Social Science Project of Guangdong Ocean University (qhjh2017zx13); Guangdong Soft Science Research Project (2016A070705063).

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rine breeding, aquaculture, processing and biomedicine, which form a complete industrial chain of the system, effectively promoting the structural adjustment and development of the marine bio-industry. Second, the industrial cluster drives the rapid development of related enterprises and effectively enhances the economies of scale and competitiveness of the marine bio-industry. Third, the industrial cluster includes more than 30 institutions of higher learning and research institutes including Guangdong Ocean University and the South Asian Tropical Crops Research Institute of Chinese Academy of Tropical Agricultural Sciences and absorbs more than 30 000 high-tech talents in the marine economy and marine biotechnology, realizing the effective integration of production and technology, and providing technical and intellectual support for marine bio-industry innovation. Fourth, the industrial cluster covers 15 industrial parks represented by Zhanjiang Marine Industry Base and constructs more than a dozen of industry incubators and accelerators such as Zhanjiang Marine Technology Industry Innovation Center and Marine Industry Incubation Center, promoting the effective transformation of marine biotechnology achievements.

**2.1.2** Specific composition of the industry cluster. The current marine bio-industry cluster in Zhanjiang is mainly composed of marine biological breeding industry, seawater healthy breeding industry, seafood deep processing industry and marine biomedical industry. First, regarding the marine breeding industry, at present, there are more than 50 enterprises in the marine biological breeding industry in Zhanjiang City, and a breeding industry that uses shrimp seeds as the leading product has been formed, including Hengxing, Guolian, Yuehai, Dongfang and Haimao and other aquatic seeds rearing enterprises. Among them, the southern base of marine aquaculture and aquatic seeds in Zhanjiang City belongs to the national "863" high-tech project. In the seawater aquaculture industry, in 2014, the Zhanjiang area exported a total of 122 800 t of aquatic products, with a total value of 988 million US dollars. The export volume and value of farmed aquatic products ranked first in China. Zhanjiang City has a total of 188 aquaculture farms for export processing, with a total breeding area of 18 844 ha, including 117 shrimp farms, 61 tilapia farms, 14 marine fish farms, and 6 shellfish farms (*Zhanjiang City Statistical Yearbook 2015* and *Zhanjiang Government Work Report 2015*). The farming methods represented by "multi-level high-level pond culture", "closed, low-salinity, low-density culture" and "shrimp-fish or shrimp-algae polyculture" are mainly adopted. In terms of seafood deep processing industry, Zhanjiang City has formed a large number of special seafood processing industry areas, such as the shrimp processing industry and tilapia processing industry in Zhanjiang Development Zone, Mazhang District, Xiashan District and Potou District, the scallop industry in Leizhou and Suixi, the pearl farming and processing industry in Xuwen and Leizhou, and the jellyfish processing industry in Wuchuan, which have a great influence in Guangdong Province and even the whole country. In the process of industrial development, a large number of well-known enterprises with industry influence, such as Guolian Aquatic Products, Hengxing Aquatic Products, Asian Seafood and Zhonglian Aquatic Products have been cultivated. Among them, Guangdong Hengxing Group Co., Ltd. And Zhanjiang Guolian Aquatic Products Development Co., Ltd. are among the top 500 modern industries in Guangdong Province and the top 50 modern industries in Zhanjiang City. Fourth, in terms of marine biomedical industry, there are more than 30 marine biomedical production enterprises in Zhanjiang City. Representative enterprises include Shuanglin Bio-Pharmaceutical, Tongde Pharmaceutical, Nanguo Pharmaceutical, Wuzhou Pharmaceutical, Jimin Pharmaceutical, Tongling Medical Biology, Collien Biology, *etc.* The main products include spirulina, Haicikang, pearl royal jelly, *tachypleus* amebocyte lysate, Tang reagent, chitin, agar, chitosan, marine drug wine, *etc.* Among them, the tachypleus amebocyte lysate is specialized detection reagents and kits, made from coastal marine organisms Tachypleus, for the detection of endotoxin in pharmaceuticals, medical devices and humans. Zhanjiang's tachypleus amebocyte lysate production enterprises account for more than 80% of the national market.

**2.1.3** Industrial parks and bases of industry cluster. (i) Marine industrial bases in Zhanjiang City. There are 205 enterprises in the base area, including 23 high-tech enterprises, one key high-tech enterprise, five backbone enterprises, two domestic listed companies, and eight enterprises with operating income exceeding one billion yuan. The enterprises have 9 075 technicians with college or above, 13 provincial-level enterprise technology centers, 89 municipal-level enterprise technology centers, one enterprise post-doctoral workstation, five industrial technology inspection platforms, two incubators, and four productivity promotion centers. In 2014, the industrial production value was 21.24 billion yuan. In 2014, the total investment in R & D in the base reached 450 million yuan. The enterprises have undertaken one national Torch Program project, two provincial science and technology projects, and 80 municipal science and technology projects. They have applied for 1 132 patents, including 153 invention patents. A total of 628 patents have been granted, including 128 invention patents (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 – 2020)*.

(ii) Zhanjiang Characteristic Fishing and Marine Industry National Agricultural Science and Technology Park. Zhanjiang Characteristic Fishing and Marine Industry National Agricultural Science and Technology Park relies on the cultivation and deep processing of Zhanjiang's characteristic agricultural and marine products. The total planned area of the core area is about 2 200 ha. The shrimp industry has formed a complete industrial chain. It has won seven national firsts in seed production, aquaculture area, aquaculture production, feed production, processing scale, export volume and trading volume. The main fishing and marine industries and enterprises in Zhanjiang area gathered in the park. There are more than 130 licensed shrimp seed farms in the park, which is the largest shrimp seed supply base in China. The park has 17 large-scale fishing and marine products processing enterprises, of which the annual processing capacity accounts for more than half of the city's total. The Xiashan Aquatic Products Wholesale Market in the park is the largest shrimp market in China. In 2015, the trading volume of shrimp was 320 000 t, and the trans-

action volume was more than 15 billion yuan (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 – 2020)*.

(iii) Zhanjiang Marine Science and Technology Industry Innovation Center & Marine Industry Incubation Center. Zhanjiang Marine Science and Technology Industry Innovation Center & Marine Industry Incubation Center is the start-up project of strategic implementation of Zhanjiang Marine Science and Technology Industry Innovation Center, and is a major construction platform for innovation and development of Guangdong Province. The planned area of the Zhanjiang Marine Science and Technology Industry Innovation Center & Marine Industry Incubation Center is 26.7 ha, and the total construction area is 280 000 $m^2$, covering headquarter service building, public technology platform, research and development incubator area, science and education training area, and living supporting service area. At present, the construction of the incubation center park has started in full swing, with a total investment of 680 million yuan. There have been 13 units to participate in, with a booking area nearly 10 000 $m^2$ (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 – 2020)*.

(iv) Fenyong High-tech Zone. Fenyong High-tech Zone of Zhanjiang City is a Guangdong provincial high-tech industrial development zone and also an ASEAN industrial park in China. Taking marine biomedicine, electronics and high-end equipment manufacturing as the leading industries, it has successfully built provincial high-tech industrial park, technology incubator and state-level medical device testing center. There are 11 marine bio-food and pharmaceutical companies and six high-end mechanical equipment manufacturing enterprises in the Fenyong High-tech Zone. The total investment is 2.952 billion yuan, and the estimated annual output value is 5.29 billion yuan, of which eight projects have been put into production. After reaching production, the annual output value can reach 2.31 billion yuan, and the estimated tax is 76.50 million yuan. In 2015, ten new projects were introduced, with a total investment of 5.551 billion yuan, estimated annual output value of 10.65 billion yuan and tax revenue of 660 million yuan (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 – 2020)*.

(v) Zhanjiang (Wuchuan) Marine Industry Demonstration Park. Zhanjiang Marine Industry Demonstration Park is the most important marine industry demonstration park in southern China. Its industrial choices include marine biomedicine and biofunctional foods, marine biological products and other industries, building a public research and development platform for marine medicine and biological products in the park, cultivating and introducing high-end enterprises of marine biomedicine and biological products, and striving to introduce scientific research achievements transformation projects for marine medicine and biological products. The total planned area of Zhanjiang Marine Industry Demonstration Park is 400 ha. Among them, the upgrade and transformation of marine fishery industry covers an area of about 133 ha. The land area for marine emerging industry demonstration zone and the construction of modern marine service platform and high-end living supporting service area is 133.3 ha. The land area for the construction of modern marine service platform and marine high-tech research and development, incubation and transformation demonstration area is 66.7 ha (*Construction and Development Planning of Marine Bio-innovative Industrial Clusters in Zhanjiang City (2016 – 2020)*.

### 2.2 The main problems facing the development of marine bio-industry cluster in Zhanjiang City

**2.2.1** The driving effect of leading enterprises needs to be improved. At present, in the field of marine bio-industry, leading enterprises represented by Hengxing Group, Guolian Aquatic Products, Shuanglin Biological, Bandao Technology, *etc.* have been formed. In the process of perfecting the upstream and downstream industrial chain around the main business, with capital, technology and market as the link, the role of these enterprises in the rapid development of scientific and technological medium and small-sized enterprises such as Aosi Biotechnology, Bokang Biotechnology, Andus Biology, Lvbaiduo Biology and Jianliyuan Medical and the expansion of industrial cluster still needs to be improved.

**2.2.2** Key technical areas need to be broken. In the field of marine bio-industry, certain technological and product innovations have been achieved. But overall, the level of technological innovation is low. In particular, the key technologies for seawater breeding, large-scale seawater aquaculture, marine functional foods, superior marine drugs, marine biological enzymes, marine bio-source cosmetics, *etc.* still need to be broken. There is an urgent need to improve the level of technological innovation of Zhanjiang marine bio-industry, achieving the transformation of processing from quantity to quality.

**2.2.3** The technology service system needs to be improved. In recent years, the science and technology service system for the development of marine bio-industry has been basically established through the construction of China Ocean Economy Expo, Marine Economic Development Technology Alliance, Marine Economic Trading Platform, Zhanjiang Marine Science and Technology Industry Innovation Center, and Technology Business Incubator. However, the science and technology service platforms for Ocean Big Data Trading Center, Technology Research and Development Platform, Joint Research and Achievement Transformation Platform, Intellectual Property Analysis and Service, and International Cooperation and Exchange that meet the technological innovation and industrial cluster development of the marine biotechnology industry need to be built, and the science and technology service systems need to be further improved.

**2.2.4** Policy support needs to be strengthened. The marine life industry is an emerging industry and is an industry with a long development cycle and high investment risks. It requires a large amount of capital investment and scientific and technological talent support, which in turn requires a sound policy system to provide support. At present, although Zhanjiang has formulated a number of policies such as *Opinions on Accelerating Scientific* and *Technological Innovation and Implementation Opinions on Accelerating the*

*Introduction and Cultivation of Talents in High-Level Industries*, there are no policies specifically targeting the development of marine bio-industry cluster. Therefore, there is still a lack of policy guarantees in terms of scientific and technological financial support, scientific and technological personnel protection, and scientific and technological innovation environmental improvement.

## 3 Economic efficiency analysis of Zhanjiang government on cultivating marine bio-industry cluster

**3.1 Theoretical framework** In the cultivation of marine bio-industry cluster, there is one marine bio-industry cluster involving $n$ sea-related enterprises, which conforms to the scale-constant Cobb-Douglas function. The two elements of sea-related capital $K$ and sea-related labor $L$ are the elements of investment in the marine life industry. Assuming that each sea-related enterprise has the same production function, its production density conforms to a normal distribution, and the output share of each company is $\theta_i$, then:

$$Y = \prod_{i=1}^{N} Y_i^{\theta_i} \qquad \sum_{i=1}^{N} \theta_i = 1 \tag{1}$$

$$Y_i = A_i K_i^{\theta_i} L_i^{\beta_i} \tag{2}$$

where, $Y_i$ represents the output value of the marine bio-industry of the $i$ company; $\alpha_i$ represents the share of the contribution of the sea-related capital to the output of the marine life industry, that is, the output elasticity of the marine life industry of the sea-related capital; $\beta_i$ represents the share of the contribution of sea-related labor to the output of marine bio-industry, that is, the output elasticity of labor.

$$\alpha_i + \beta_i = 1$$

Drawing on the research of Hsieh and Klenow[3], Zhu Xi *et al.*[4], the relative mismatch coefficient of corporate capital $i$ and labor can be derived:

$$\hat{\lambda}_{Ki} = \frac{K_i}{K} \Big/ \frac{\theta_i \alpha_i}{\alpha} \tag{3}$$

$$\hat{\lambda}_{Li} = \frac{L_i}{L} \Big/ \frac{\theta_i \beta_i}{\beta} \tag{4}$$

where, $K_i/K$ indicates the proportion of capital of marine organisms used by marine biological companies in the marine economic capital of the marine bio-industry park; $\theta_i\alpha_i/\alpha$ indicates the proportion of marine biological capital the manufacturer matches according to the actual situation when the resources of the marine bio-industry are effectively allocated; $L_i/L$ indicates the proportion of the labor force employed by marine biological companies in the total labor of marine economy of the entire marine bio-industry park; and $\theta_i\beta_i/\beta$ indicates the matching arrangements of labor of companies when the marine bio-industry reaches a fully effective resource allocation.

The relative resource misallocation coefficient measures the matching of capital and labor arrangements in the research and development of marine bio-industry. Taking the marine bio-industry capital as an example, when $\hat{\lambda}_{Ki} > 1$, it indicates that the excessive investment in the capital of the marine bio-industry of the manufacturer $i$ does not match the capital actually required, damaging the social welfare of the marine life industry; when $\hat{\lambda}_{Ki} < 1$, it indicates that the cost of capital of the marine bio-industry of the manufacturer $i$ is lower than the average level of the marine economy of the marine bio-industry park, and the manufacturer $i$ will be more inclined to invest in the capital of the marine industry, and reduce the supply of marine life labor; and when $0 < \hat{\lambda}_{Ki} < 1$, it indicates that the capital of the manufacturer $i$ in the marine life industry is insufficient. In that case, the capital cost of marine biological manufacturers using the marine bio-industry is higher than the average level of the marine economy of the entire industrial park, so the marine biological manufacturers are more inclined to invest in marine bio-labor and reduce capital supply of the marine bio-industry.

Combining formula (2), formula (3) and formula (4), the TFP of the overall marine life industry is transformed into two sections. The first is the maximum of TFP of non-marine biological resources misallocation that are not associated with the allocation of marine biological resources. The other is the loss of TFP efficiency in the marine bio-industry caused by the misallocation of marine biological resources, including two items of mismatch efficiency losses, the capital of the marine bio-industry and the labor force of the marine bio-industry.

$$AL_i = \sum_{i=1}^{N} \theta_i (\alpha_i \ln \hat{\lambda}_{K_i} + \beta_i \ln \hat{\lambda}_{L_i}) \tag{5}$$

$$AL_{Ki} = \sum_{i=1}^{N} \theta_i \alpha_i \ln \hat{\lambda}_{K_i} \tag{6}$$

$$AL_{Li} = \sum_{i=1}^{N} \theta_i \beta_i \ln \hat{\lambda}_{L_i} \tag{7}$$

**3.2 Efficiency measurement and analysis** Using the value added to the marine bio-industry, the R & D investment in the marine bio-industry, and the number of scientific and technical personnel employed in the marine bio-industry of the *Zhanjiang City Statistical Yearbook* and *the Zhanjiang Government Work Report*, according to formula (5), formula (6) and formula (7), the efficiency losses caused by capital mismatch and labor mismatch, as well as the total efficiency loss in the Zhanjiang marine bio-industry cultivation, were calculated, and the results were shown in Fig. 1.

By analyzing the resource misallocation coefficient, it could be seen that since 2003, the capital and labor allocation of Zhanjiang marine bio-industry has been excessively uneven, or the matching of input factors has been insufficient. In the integration of marine living resources, there are also phenomena of unreasonable allocation or mismatch, which will bring losses to the cultivation and development of the marine life industry in Zhanjiang. From the perspective of capital allocation, the impact of capital mismatch on the cultivation of marine bio-industry is relatively small. The average economic efficiency loss since 2003 is about 1.72%, and the value is not large. With the optimization of the capital allocation for the marine life industry, the mismatch efficiency loss caused by the input mismatch will become smaller. From the perspective of the allocation of marine life labor, the average annual loss due to labor mismatch reaches 8.53%, and the value is large, suggesting that the mismatch of labor force has a greater impact on the cultivation of marine life industry, and it has become a major factor in the loss of economic efficiency. Consid-

ering the cultivation and development of marine life industry in Zhanjiang, the efficiency loss caused by resource misallocation is 10.32% per year on average, indicating that resource misallocation will seriously hinder the development of the marine life industry in Zhanjiang, thereby greatly reducing the economic development speed of such industries in Zhanjiang. From the above analysis, it can be found that there are still many problems in the economic development of the marine life industry in Zhanjiang, manifested by serious resource mismatch and high efficiency loss. But at the same time, it also shows that the economic development of Zhanjiang marine bio-industry has a good development prospect, and the optimal allocation of resources can promote the economic development of such industries. Therefore, in order to give play to the decisive role of the market economy in resource allocation, government departments should clarify their rights, responsibilities and function positioning to revitalize the development of the marine life industry, thus promoting the sustainable and healthy development of the cultivation of marine bio-industry cluster.

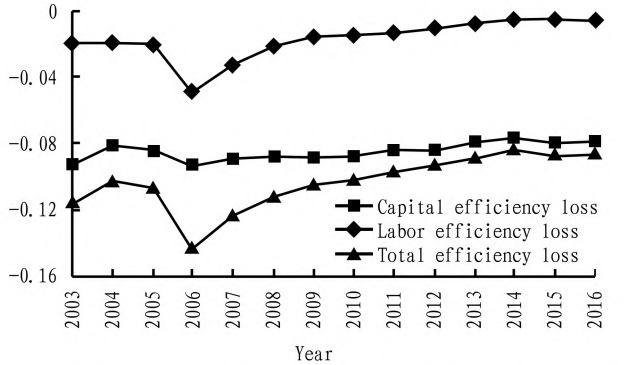


**Fig. 1 Losses of capital efficiency, labor efficiency and total efficiency in Zhanjiang marine bio-industry cultivation**

## 4 Policy path of cultivating marine bio-industry cluster in Zhanjiang

**4.1 Completing market access system to guide small and medium-sized marine enterprises to enter the marine bio-industry** In the development of the marine bio-industry, we must not only focus on developing better enterprises. Instead, more sea-related small and medium-sized enterprises should be introduced into the marine life industry. In the process, it is necessary to lower the threshold for small and medium-sized enterprises to enter this field. This does not mean reducing the hard standards of technology and environmental protection. Instead, it is necessary to develop marine bio-industry in combination with respective advantages. In term of specific aspects, the government must guide enterprises to develop toward intensive industries and curb excess capacity in some areas. In addition, it should pay attention to small and medium-sized enterprises and private capitals involved in the sea, standardize the threshold system for entering the marine industry, relax the control of private companies involved in the sea, and weaken the institutional support for state-owned manufacturers, ensuring that multiple business entities maintain a good interactive competitive relationship[5]. At the same time, the government should suppress the influence of international monopoly in the market. The marine life industry is related to the acceleration of the construction of the central city of Beibu Gulf and the national economic security of Zhanjiang. The supply of the system should be based on the formal institutional arrangements for the marine economic zone in Guangdong Province and even the whole country. In particular, the current marine life industry in Zhanjiang has only started and is not yet mature, so it is necessary to strengthen protection. A number of monopoly measures must be adopted to control overseas manufacturers that have invaded China's maritime security.

**4.2 Guided by the industrialization of innovation results, stimulating the market demand for marine bio-industry** The marine bio-industry is just beginning to develop. The cost of manufacturing their products is still high, and they have not formed a certain scale. The government should actively help enterprises to pass the early stage of development, formulate different measures according to the characteristics of different products, guide enterprises to industrialize products and stimulate market demand for products. The specific practices can be divided into the following situations.

First, the government should provide support for the industry, such as expanding the market of innovative products in the marine bio-industry, and reducing market entry barriers. This does not mean that the quality of the products is not required. Instead, sound market supervision should be established to avoid disturbing the order of market competition. When the products are introduced to the market, financial subsidies can be provided. Rational use of price leverage will create a social environment conducive to the promotion of innovative products to the market[6]. For example, the development of the marine biomedical industry can be promoted by accelerating the construction of intelligent biomedical facilities, and the use of pharmaceutical products can be improved. In terms of marine biomedicine, the marine biomedical supply chain can be improved, and the limited development strategy of the marine biomedical industry can be implemented.

Second, according to the current development status, for the marine areas with development potential, the government can formulate a series of preferential policies to encourage competitive offshore companies or research institutions to conduct research and development. They conduct topic selection, research, and make special breakthroughs to promote and demonstrate innovation results. For the enterprises with better performance in the demonstration, the scope of the demonstration can be further expanded. For example, the application of marine biological products and healthy green seawater farming from the 13th Five-Year Plan period can be further expanded, and high-performance marine biological products, seawater living supplies, marine biomedical deep processing products and other engineering projects can be promoted and demonstrated in a wider range.

Third, for the results of independent research and development of manufacturers in the sea-related field, the government must vigorously promote their deepening use. Especially in the public domain related to the sea, the application of marine bio-innovation results can be extended, and to a certain extent, foreign markets can be tried to open up[7]. For the bidding in the marine

life industry, the Zhanjiang Municipal Government will give priority to R & D products of marine biological manufacturers that are conducive to the development of the marine economy of this Municipality. On the one hand, the enthusiasm of enterprises for development will be mobilized. On the other hand, the introduction of foreign sea-related products must be cautious. This will greatly promote the development of sea-related enterprises in Zhanjiang City and make full use of the local sea-related marine biotechnology and talent capital to enhance the local marine life industry.

**4.3 Improving the legal guarantee system and building an innovative atmosphere for the marine bio-industry** A sound legal system is particularly important in the marine bio-industry cluster. The government should establish a legal system that is compatible with the marine life industry as soon as possible[8]. On the one hand, the Zhanjiang Municipal Party Committee and Municipal Government proposed the development strategy of marine life industry in 2012. Many Zhanjiang media interpreted this as a short-term stimulus plan formulated by the Zhanjiang Municipal Party Committee and Municipal Government to enhance the high status of the marine bio-industry in the strategic emerging industries of the ocean. This is only a personal point of view, and this interpretation is not conducive to the development of the marine industry. In fact, this strategy was formulated to make effective use of the advantages of marine resources, and to use this industry as a long-term development plan, occupying the highest point of the marine high-tech industry. So in order to increase the confidence of private capital in investing in the marine life industry, the government must clarify the specific development direction of the marine life industry, as well as formulating fiscal and tax incentives and talent support policies and improving relevant laws and regulations, thus guaranteeing the long-term development of the industry. On the other hand, when the government is formulating a strategic plan for marine emerging industries, the decisive role played by the market must be respected, and the direction and focus of the industry must be clarified. In the early stage of the development of marine life industry, the government plays an irreplaceable role, so it must handle the relationship between the parties, regulate the market competition order, and create a level playing field. At the same time, the government must clarify its main responsibilities. Regarding the relationship between the central and local governments, the Zhanjiang Municipal Party Committee and the Municipal Government closely follow the strategic spirit of the Beibu Gulf. They have developed a path suitable for the development of local marine life industry in Zhanjiang, and increased the enthusiasm of sea-related enterprises to enter the marine life industry.

**4.4 Promoting the deepening of the division of labor in industrial parks and providing carriers for the development of marine bio-industry cluster** First, relying on major platforms, the development of marine bio-industry cluster will be promoted. Relying on Zhanjiang City National Marine Economic Innovation and Development Demonstration City, National Torch Program Zhanjiang Marine Industry Base, Zhanjiang Characteristic Fishing and Marine Industry National Agricultural Science and Technology Park, Zhanjiang Water and Seawater Products (Prawns) National Foreign Trade Transformation Demonstration Base, Zhanjiang Marine Science and Technology Industry Innovation Center and other major platforms, the layout or support of marine bio-industry bases, parks and projects is carried out to actively promote the development of marine bio-industry cluster.

Second, making use of the opportunity of revitalizing eastern, western and northern Guangdong, marine bio-industrial parks will be developed vigorously. The construction of industrial parks is an important starting point for the revitalization of eastern, western and northern Guangdong. Zhanjiang marine bio-industry cluster can take advantage of this historical opportunity, actively integrate into the revitalization strategy of eastern, western and northern Guangdong, actively connect with the relevant industrial parks in the Pearl River Delta, built a number of marine bio-industry science and technology parks, marine bio-industry parks with regional characteristics, and marine bio-industry transfer parks to provide platforms and conditions for the development of marine bio-industry cluster.

The third is to do a good job in supporting the construction of the relevant parks in the Zhanjiang marine bio-industry. The construction land of the marine bio-industry parks will be incorporated into the overall land plan, providing land security for the development of the parks. For enterprises registered in the parks and research institutions engaged in the development of high-tech products, as well as the technology transfer of the main body of the parks and related technical service income, tax preference will be given, thus attracting technology-based enterprises and research institutions to gather in the parks.

## References

[1] BAI FC, JIA BL, ZHANG YQ, *et al.* The research on construction of green Zhanjiang based on a scientific outlook on development[J]. Journal of Zhanjiang Ocean University,2012, 32(5): 45-52. (in Chinese).

[2] REN XP. Study on development problems and countermeasures of marine biological pharmaceutical industry in China[J]. Modern Economic Information,2011, 26(2): 212-219. (in Chinese).

[3] HSIEH CT, KLENOW P. Misallocation and manufacturing TFP in China and India[J]. Quarterly Journal of Economics, 2009, 124(4): 1403-1448.

[4] ZHU X, SHI QH, GAI QE. Misallocation and TFP in China[J]. Economic Research Journal, 2011, 57(5): 86-98. (in Chinese).

[5] TAN ZM. On the financial support measures for the development of strategic emerging industries[J]. Enterprise Economy, 2012, 31(2): 172-175. (in Chinese).

[6] LIN JJ. Network, social capital and cluster life cycle study——A new economic sociology perspective[M]. Shanghai: Shanghai People's Publishing House, 2005: 89. (in Chinese).

[7] MENG LJ. Current situation and prospect of marine biological medicine in China[J]. Commercial Culture, 2011, 5(7): 369-370. (in Chinese).

[8] JIANG XZ, FANG JY. Exemplary research of the marine industry clusters and economic growth: based on the Bohai sea region[J]. Chinese Fisheries Economics, 2012, 31(3): 103-107. (in Chinese).