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Development and Management Strategy of China's Marine Resources in the New Century

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Abstract: The development and management of marine strategic resources is an important way to effectively alleviate the resource and environmental problems faced by China's national economic development and enhance China's marine comprehensive strength. It is also an important trend of the world's MR development(MRD). It is of great practical significance to systematically study the industrialization development of MRD from the perspective of economics and management. Therefore, this paper makes strategic thinking on the development and management of China's MR in the new century. This paper analyzes the classification of China's MR and the main characteristics of marine strategic resources, takes the marine fishery resources of M city as the research object, investigates and analyzes the existing problems in the development and management of MR, and finally puts forward corresponding strategic countermeasures against the problems, which has important guiding significance for accelerating the breakthrough development of MRD technology and effective management.

1. Introduction

The ocean is the largest ecological and environmental system on the earth. There are many kinds of MR. Based on the understanding of resources, especially natural resources, MR can be defined as the materials, energy and space that can be used and generated social and economic value to bring human welfare in the present and foreseeable future in the geographical area of the ocean and coastal zone. In the new century, the strategic thinking of China's MRD and management has become the focus of current research.

The strategic thinking and Research on the development and management of MR at home and abroad are focused on the marine development technology and the environmental impact research of MRD in the field of natural science; In the field of social science research, the research on the

economics of MRD and the research on the development of marine industry have just started. Among them, more in-depth research has been carried out in the field of marine oil and gas development. At the same time, the research on the policies and regulations, economic benefit evaluation, International Geopolitics and other aspects of marine mineral resources development has started [1]. Looking at the research status and development trend at home and abroad, based on the optimistic prediction of the technological progress of marine development and the prospect of MR industrialization development, the economic research on the development of important marine strategic resources by using relevant theories such as resource economics, ecological economics and industrial economics can fill the gap of academic research to a certain extent and have important guiding significance for the development of MR industry [2].

The research in this paper can promote the development of marine strategic resources to a certain extent, and can attract the attention of the state and the public to the development of marine strategic resources and MR industry. It comprehensively considers the various factors that affect the development of marine strategic resources development industrialization, and tries to build the main mode of the development of marine mineral resources and biogenic resources industrialization. At the same time, in combination with the current situation of the development of China's marine mineral resources and biogenic resources, and drawing on the experience of foreign marine developed countries in the development of marine strategic resources, the strategic measures to accelerate the industrialization of China's marine mineral resources and biogenic resources development are put forward in a targeted manner, providing reference for the Chinese government and enterprises to formulate strategic decisions and relevant policies for the development of MR [3-4].

2. Analysis of China's MR in the New Century

2.1. Classification of MR

Marine energy refers to the energy contained in the sea water, which is derived from the direct and indirect absorption of solar radiation energy by the sea water and the potential energy generated by the periodic change of the gravitational force of celestial bodies on the earth and sea water with time and space, resulting in the temperature and salinity difference, tidal motion, wave motion and ocean current motion of the marine water body [5-6]. At the same time, according to the attributes of different types of MR, various types of MR can be further divided under the framework of three categories, as shown in Table 1.

Table 1. Classification of MR

Marine material resources	Sea water resources
	Marine mineral resources
	living MR
Marine space resources	Coastal zone space
	Ocean surface and upper space
	Marine aquifer space
	Undersea space
	Ocean island
Marine energy	Ocean tidal energy
	Ocean wave energy
	Current energy
	Seawater temperature difference energy
	Seawater salt differential energy

2.2. Main Characteristics of Marine Strategic Resources

Marine strategic resources include multiple resource types, and the attributes of different resource types vary greatly.

Marine strategic resources have the characteristics of future and dynamic. Futurism refers to the strategic significance of marine strategic resources to the long-term sustainable development of human economy and society in the future, which to a certain extent determines the development and utilization of human social resources and the development trend of marine economy [7]. Dynamic means that with the development of science and technology, the types of marine strategic resources will change constantly, and some MR that are currently concerned may lose their strategic value due to the constraints of technology, environment and other factors [8-9].

Marine strategic resources have significant characteristics of public goods. The principles of "freedom of the high seas" and "common heritage of mankind" and the natural characteristics of the interconnection of the oceans make the strategic MR have obvious characteristics of public goods, and their development and utilization are prone to negative externalities. Although the current relevant laws and regulations and international organizations have made binding provisions on the development and utilization of marine strategic resources, they cannot fundamentally eliminate the public goods characteristics of marine strategic resources [10-11].

The reserves of marine strategic resources are abundant. Marine strategic resources are widely distributed in marine areas accounting for more than 80% of the world's oceans. They are rich in types and huge in resources. According to the current marine exploration speculation of various countries, the reserves of marine strategic resources, especially marine oil and gas and mineral resources, are very rich. The reserves of marine oil and gas and various nodule minerals on the seabed surface are enough to make the factories on the earth operate for several centuries [12-13].

3. Investigation and Analysis of MRD and Management

3.1. Analysis of MRD

Considering the availability of data and its practical significance for the development of marine economy, combined with the actual development of MR in China, this paper selects marine fishery resources to represent the comprehensive development and utilization of marine biological resources, mainly including marine fishing and mariculture. In this paper, the marine biological resource coefficient is selected to comprehensively reflect the output of marine fishing and mariculture [14-15]. If the coefficient of marine living resources is expressed as a, the specific calculation formula is as follows:

$$A = \sum s_i v_i \tag{1}$$

Where, I includes marine fishing output and mariculture output, Si is its normalized value, and VI is the specific weight value of marine fishing output and mariculture output.

Marine mineral resources: the mineral resources discovered in the coastal zone of China are rich in types, which play an irreplaceable role in the development of marine economy and have potential supporting significance for the future development of marine economy. Among them, marine crude oil, marine crude salt, marine natural gas and marine mineral resources have a great impact on China's marine economic development [16]. If the standard quantity of marine mineral resources is expressed as B, then:

$$B = \sum h_i p_i \tag{2}$$

Where, I = 1, 2, 3 and 4, respectively, indicate the output of marine crude oil, marine crude salt, marine natural gas and marine placer, hi is the data after standardized processing, and PI is the index weight.

Marine space resources: mainly include land resources, port resources and sea water resources. Marine space resources provide a spatial support for the development of marine economy, and the development and construction of ports provide a basic support for the rapid development of marine economy.

Marine tourism resources: as an important part of the tertiary industry of the marine economy, the development and utilization of marine tourism resources is of great significance to the optimization and upgrading of the marine economic structure and the sustainable development of the marine economy [17-18].

3.2. Analysis of MR Management

Taking marine fishery resources as an example, this paper investigates the management of marine fishery resources in M city. Problems faced by the fishing permit management system according to the data of the third national census of agriculture and fisheries, the aging phenomenon of agricultural and fishery employees in M city is very serious, of which 51.31% are over 55 years old and 39.75% are 36-54 years old. In addition, the education level of agricultural and fishery employees is generally not high, of which only 0.51% are employees with college education or above, and only 3.81% are employees with high school or technical secondary school education. In addition, some employees have insufficient fishing knowledge and lack professional fishing technology, especially the non fishing labor force without fishing experience from other places, and do not have fishing skills at all. In addition, a considerable number of fishery practitioners are very skilled in traditional fishing techniques, but they often lack of learning about modern fishing techniques.

As shown in Table 2 and figure 1, it is the year-on-year growth table of the number of motorized fishing vessels in M city in the past 10 years, including the number, tonnage, power and other relevant data.

Table 2. Comparison of year-on-year growth data of motorized fishing vessels

Particular year	Number of vessels (vessel)	Gross tonnage (T)	Total power (10000 kW)
Year 1	8851	828808	141.71
Year 2	9091	858778	142.22
Year 3	8995	871623	141.4
Year 4	9086	949028	145.22
Year 5	9132	1059945	156.07
Year 6	8973	1101121	159.04
Year 7	8617	1119442	162.48
Year 8	7758	1147772	162.89
Year 9	7629	1185040	166.73
Year 10	7333	1239209	172.58

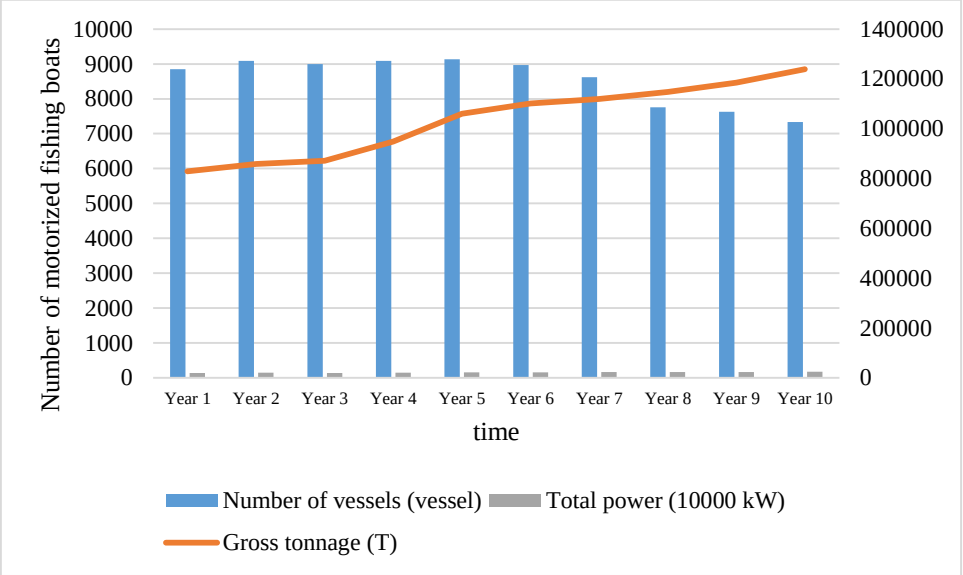

Figure 1. Year on year growth of the number of motorized fishing boats in M City

From the changes in the number of fishing vessels in recent years, it can be seen that the fifth year is a turning point in the number of fishing vessels. Since this year, the number of fishing vessels has decreased significantly, as if the implementation of the "double control" policy has achieved some results. However, the power of fishing boats increased from 1417100 kilowatts in the first year to 1854700 kilowatts in the tenth year. The total power and tonnage of motorized fishing boats are increasing. The "double control" system of M city has not reached the management goal. The fishing volume of Zhangwang fishing boats in M city shows an upward trend as a whole. In the eighth year, there was an inflection point, and then it began to rise again. The change trend of fishing volume in M city is basically the same as that of Zhangwang, but the proportion of fishing volume in the total fishing volume has always been the smallest. The fishing boats in M city are still mainly trawlers, Zhangwang fishing boats and gillnets.

3.3. M Main Problems Faced by the Management System of Marine Fishing Fishery Resources

It is difficult to effectively control the power of fishing vessels due to the unclear power and responsibility of the number and power of vessels. Moreover, some fishermen often refit the engines of fishing vessels without authorization. Although the law enforcement authorities require these illegal fishing vessels to implement rectification within a time limit in accordance with relevant regulations, the rectification within a time limit cannot keep up with the implementation process, and they can only be punished according to the power index, which ultimately leads to the continuous increase of the power of fishing vessels. In addition, the discrepancy of ship certificates is also one of the important reasons for the invalidation of the "dual control" system. The marine fishing boat industry is mixed with the interests of multiple groups. In order to sell more and larger fishing boats, shipyards and diesel factories collude with each other and often attach small-power nameplates to high-power engines. Therefore, the regulatory authorities can not know the true and accurate power of fishing boats. Moreover, after the fishing boats are sold, the power indicators are not transferred with the boats, As a result, the buyer becomes a fishing boat with large engine and small power index, and the seller can apply to the fishery management department again to build a new boat. Instead of reducing the number of fishing boats, the number of fishing boats increases.

Therefore, the power control is meaningless. It is not surprising that the "double control" system is ineffective.

The influx of foreign labor into Zhoushan marine fishing industry is also an important factor causing the failure of the "dual control" system. Due to the serious aging of local fishermen in M city in recent years, the demand for foreign labor has increased. In fact, the overall number of marine fishing fishermen has increased. However, these non fishing workers are more lacking in fishing experience and environmental awareness. They do not fully understand the marine fishery laws and regulations of m city and do not have a deep understanding of the "dual control" system.

In addition, the various fishery subsidies implemented by China to achieve the sustainable development of marine fishing fishery resources, including but not limited to ship reduction subsidies and fuel subsidies, often run counter to the original policy objectives. This is because the fishery subsidies reduce the fishing costs of fishermen and expand their income, but it also encourages fishermen to continue to develop large-scale fishing vessels and recruit more foreign fishing workers, Finally, the marine fishery resources are farther and farther from the goal of sustainable development.

With regard to the system of reducing the number of vessels and changing jobs, due to the poor matching of the supporting policies on changing jobs and the low cultural level of fishermen engaged in marine fishing in M City, the skills training for fishermen to change jobs has not achieved good results. The fishermen who make a living by fishing do not get the promised resettlement effect, let alone solve the employment problem of these fishermen. As a result, some fishermen are forced to re engage in marine fishing under the pressure of livelihood and become "three no fishing boats". The return of "three no fishing boats" has caused more serious damage to marine fishing resources than before.

4. Strategic Thinking on the Development and Management of China's MR in the New Century

4.1. Strategic Countermeasures for MRD

The destruction of marine ecological environment caused by resource development is one of the important constraints to the industrialization of marine mineral resources development. In the process of resource development, it is very important to strengthen the protection and restoration of marine ecological environment and ensure that the impact caused by resource development is controlled within the range of marine ecosystem. Therefore, the marine ecological environment protection matching with the industrialization of the development of marine mineral resources will gradually develop and become an important development field of the marine environmental protection industry. A series of marine ecological environment protection measures matching with the development of marine mineral resources, such as the protection of marine biodiversity in the mining area, the restoration of the topography and landforms in the marine bottom operation area, the treatment of marine operation wastewater, the treatment of smelting slag and deep processing, are indispensable.

As a basic industry with huge investment, good financial services are indispensable to the industrialization of marine mineral resources development. Diversified investment and financing channels are important conditions for the industrialization of marine mineral resources development. At different stages of the development of marine mineral resources industry, the channels and methods of investment and financing are different, as shown in Figure 2.

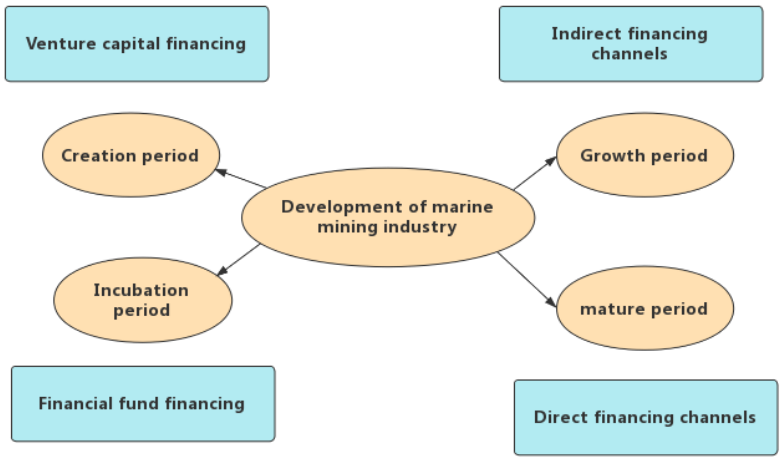

Figure 2. Financing channels for industrial development of deep sea mineral resources in different stages

At present, the marine mineral development industry is still in the gestation period and the initial stage of establishment. The government financial fund financing, which is mainly funded by public finance and special funds, plays a leading role. At the same time, venture capital financing, which is mainly based on risk funds and equity financing, also plays a positive auxiliary role.

International cooperative development mode based on joint-stock system. Facing the economic and technological risks, political risks and other major factors that restrict the development of marine mineral resources development and industrialization, based on the unique social attributes of marine areas under the current world marine system, and in accordance with the laws of market economy and the requirements of international economic integration, the best choice for the development and industrialization of marine mineral resources is to implement the international cooperative development mode based on the shareholding system. The way to realize the mode of international cooperative development is to sign transnational agreements and contracts through international negotiation and negotiation. The key lies in how to determine and allocate the rights and obligations of the cooperative development subjects, so as to ensure the smooth realization and development of cooperative development.

In accordance with the provisions of the Convention and the agreement, the International Seabed Authority is the manager and implementer of the exploration and development of resources in the area. Based on the above provisions, the joint-stock based international cooperative development should be implemented by the International Seabed Authority under the leadership of the United Nations, The way to realize this is to turn the existing enterprise department of the International Seabed Authority into an economic entity, that is, to establish a joint-stock development enterprise group with the enterprise department as the main body, so that the Pioneer Investment and the technology owned and developed by each pioneer investor can be converted into shares for participation. The rights and interests of countries and regions other than the pioneer investors are represented by the enterprise department, which is specifically responsible for the company's operation rights, as shown in Figure 3.

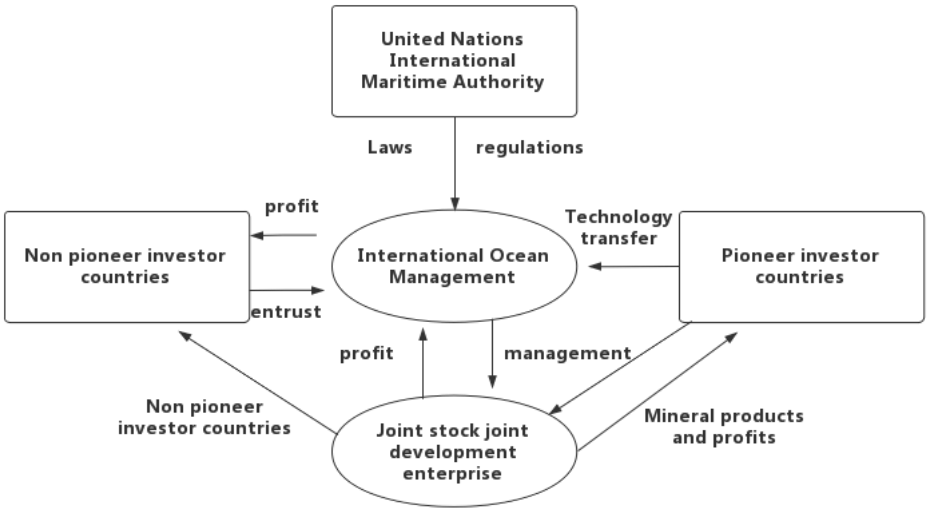

Figure 3. Realization mode of international cooperative development of "regional" resources

Under this cooperative development mode, the enterprise department of the International Seabed Authority is in the core position, specifically responsible for the operation of cooperative development enterprises, coordinating the distribution of interests of all parties, and playing a leading role in the development of resources and ecological environment protection in the "area".

4.2. Strategic Countermeasures for Ocean Management

First, it is necessary to further clarify the ownership and intensive management of marine living resources; Second, we should improve the compensation mechanism of marine mineral resources; Third, we should actively guide and encourage the development of marine power resources; Fourth, we should pay attention to improving technological innovation in the development of marine chemical resources. For the development of the city's MR, the paper also puts forward some countermeasures and suggestions, especially to learn from the experience of Singapore in the efficient development of ports, and to strengthen the initiative in the development of high-quality ports; The functional zoning of the port should be clear, accurate and pay attention to the scale effect; The management of port construction should be strict, but the management policy should be loose; At the same time, it is also necessary to continuously improve the hardware and software facilities of the port, improve the service level of the port, and pay attention to industrial upgrading by relying on the advantages of the port.

5. Conclusion

At present, there are still many problems in the development and management of China's MR. We should formulate corresponding development strategies and countermeasures. This paper analyzes various problems existing in the development and management of China's MR, and makes a deep analysis of the relevant causes. On the basis of comparing and referring to the advanced experience of developed countries and regions in the development of MR, it puts forward relevant countermeasures and suggestions for optimizing the development of MR in China. There are also shortcomings in this paper: limited to the availability of materials and data, the paper focuses on macro description in theoretical analysis, lacks sufficient empirical support, and does not carry out

micro case analysis and practical verification of theory, which makes the theoretical analysis slightly empty; The deep-sea mineral resources industry has not yet formed, and the deep-sea biogenic industry has just started. Under such circumstances, whether some ideas and countermeasures proposed in the paper based on theoretical and empirical analysis are scientific and feasible lacks practical tests, and still needs further in-depth research and continuous improvement.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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