The Impact of Fishing Ban Policy on Marine Ecological Environment

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Abstract. This study aims to explore the impact of implementing fishing moratorium policies on the marine ecological environment in the Bohai Sea region. The marine environment in this area has been long degraded, primarily due to excessive fishing and pollution. This study focuses on the before and after effects of the fishing moratorium policy on the marine ecological environment. Research methods include literature review and data analysis, analyzing the marine environmental conditions in the region prior to the implementation of the fishing moratorium policy. The results show that implementing the fishing moratorium policy can effectively restore the marine ecological environment, enhance species diversity, and stabilize the structure of marine biological communities. Additionally, the fishing moratorium policy provides guarantee for the sustainable utilization of fishery resources. However, there are still some issues in the implementation process of the fishing moratorium policy, such as reduction in fishermen's income and decline in fishery output. Future research needs to further explore how to optimize the fishing moratorium policy and balance marine ecological protection with the economic interests of fishermen. In conclusion, the impact of implementing fishing moratorium policies in the Bohai Sea region on the marine ecological environment is significant but still requires further improvement and optimization.

Keywords: Bohai Sea Region, Fishing Ban Policy; Marine Ecological Environment.

1. Introduction

1.1. Research Background

In the Bohai Sea area, fishery is a pillar industry of local economy. As an important way of resource management, fishing ban policy is widely implemented. The fishing ban policy aims to maintain the sustainable development of Marine ecological environment, to restore and rebuild fishery resources by limiting fishing activities, and to protect the sustainable utilization of fishery resources. The Marine ecological environment in the Bohai Sea region has been affected by many factors, including climate change, industrial pollution, river discharge and biological invasion. As a measure of environmental protection, the policy of fishing ban has attracted wide attention and discussion. It is of great significance to study the effect of fishing ban policy on Marine ecological environment for evaluating the effectiveness of the policy and improving measures. On the one hand, the policy can reduce the fishing pressure of fishery resources and avoid the over-exploitation and depletion of resources. By restricting fishing boats' activities at sea, fishing closure policies contribute to the recovery and increase of resources. This has a positive significance in maintaining the stability and development of the fishery output value, while protecting rare species and the integrity of the ecosystem and maintaining biodiversity. On the other hand, the impact of the fishing ban on the Marine ecological environment cannot be ignored. During the fishing moratorium, the income of the fishery industry has been seriously affected, and the livelihood of fishermen needs to be reasonably solved. At the same time, whether the fishing moratorium can achieve the desired effect and whether it has other adverse effects needs to be studied and evaluated in depth. Therefore, the purpose of this study is to reveal the mechanism of the fishing ban on Marine ecological environment, evaluate the effect of the fishing ban policy, and put forward corresponding suggestions and measures to optimize the beginning of no-fishing policy through in-depth discussion on the impact of the policy in Bohai Sea. Through this study, this paper hopes to provide a scientific basis for the formulation and

implementation of the fishing moratorium policy in the Bohai Sea area and promote the sustainable development of fisheries and the protection of Marine ecological environment.

1.2. Research objectives

The main purpose of this study is to explore the impact of the fishing ban policy on the Marine ecological environment in the Bohai Sea area and put forward corresponding countermeasures and suggestions. Specifically, this study will be carried out from the following aspects: On the one hand, in-depth understanding of the implementation of the policy. Through the collection and analysis of relevant policy documents and materials, to understand the background, reasons and specific implementation rules of the fishing ban policy. In addition, this paper will also understand the promotion of the no-fishing policy in the area, including the coverage of the policy, the implementation effect, etc. On the other hand, this paper will study the impact of the fishing ban policy on the Marine ecological environment in the Bohai Sea. Through the collection of Marine ecological data in Bohai Sea, such as water quality, phytoplankton, benthos and so on, the change trend of the data before and after the fishing ban was compared and analyzed, and the data were processed and analyzed by statistical methods. This paper will focus on the impacts of the fishing ban policy on the stability, species diversity and ecological balance of the Marine ecosystem in the Bohai Sea. Third, this paper will assess the economic benefits of the Bohai fishing moratorium. Through the investigation and analysis of the data of fishery resources collection, processing, sales and other links, this paper can understand the impact of the fishing moratorium policy on the local fishery industry structure and fishermen's income. At the same time, combined with the relevant statistical data, the economic benefits of the fishing ban policy were evaluated and predicted. According to the research results, this paper will put forward the suggestions and countermeasures for the implementation of the fishing ban policy in the Bohai Sea area. Based on the assessment of fishery resources and ecological environment, this paper will put forward a series of reasonable and effective measures, including improving the implementation of the fishing moratorium policy and strengthening Marine environmental protection in the Bohai Sea, so as to achieve sustainable development of fishery and a good ecological environment in the Bohai Sea region. The purpose of this study is to comprehensively and deeply analyze the impact of the fishing ban policy on the Marine ecological environment in the Bohai Sea area and put forward corresponding countermeasures and suggestions to promote the sustainable development and ecological environment maintenance in the Bohai Sea area. The results of this study are expected to provide scientific basis and guidance for the implementation of the fishing moratorium policy in the Bohai Sea area.

2. Before the Implementation of the Fishing Ban Policy

2.1. Damage to the Marine Environment

Before the fishing ban was implemented in the Bohai Sea, there was a noticeable decline in the ability of marine organisms to adapt, resulting in significant harm to the marine environment. It is crucial to address the decreasing resilience of marine life caused by excessive fishing and inadequate management practices, which have led to numerous extinctions and severe population declines among various species. Furthermore, important fishing resources have been compromised and are now at risk of disappearing completely, greatly impacting the ecological balance in the Bohai Sea region.

In addition to the declining adaptability of marine organisms, there has also been a deterioration in water quality. Overfishing activities contribute significantly to ocean pollution by releasing substantial amounts of waste materials, pollutants, and by-products into the sea. This further worsens water quality issues. Currently, 10,830 km² falls under Class II water quality classification while 4,470 km² and 2,930 km² belong to Class III and Class IV respectively within the Bohai Sea area [1]. These figures indicate an increase of 2,820 km² compared to last year's data. The presence of these pollutants directly impacts Marine ecosystems' health. The degradation of water quality not only negatively affects biodiversity but may also pose potential threats to human health along coastal areas.

In recent decades,the fishery resources in the Bohai Sea area have faced immense pressure.The intensifying competition with in the fishing industry has resulted not only in resource over exploitation but also triggered fierce battles for limited resources,resulting in damage being inflicted upon the Marine environment. Overtime,this increased fishing pressure may lead to the disappearance of some crucial fisheries and have irreversible effects on the fishery as a whole Before the ban on fishing, the ecosystem of the Bohai Sea maintained a balanced state. However, due to overfishing, some important carnivore populations have declined, which has further led to the collapse of the food chain. The Marine environment has been seriously damaged after the balance of the ecosystem has been destroyed. Such damage will increase the vulnerability of Marine ecosystems and may lead to more serious ecological problems. In the Bohai Sea area, some Marine ecosystems have been degraded (such as Shuangtaizi Estuary, Luanhekou - Beidaihe River, Yellow River Estuary) and Jinzhou Bay, Bohai Bay and Laizhou Bay), and they are in varying degrees of sub-health. Zooplankton density is low in most estuaries, fish eggs and fish seeds are scarce, and eutrophication is common in most bays [1].

Before the ban on fishing was implemented, the Marine environment in the Bohai Sea had already suffered serious damage. Due to the deterioration of water quality, overfishing pressure and disruption of ecological balance, Marine life is gradually losing its resistance and resulting in a huge impact on the entire Marine ecological environment. In order to protect and restore the Marine ecological environment of the Bohai Sea, it must take effective measures to reduce the damage and promote the restoration of its original balance.

2.2. Causes of Marine Environment Damage

Prior to the implementation of the fishing ban, the Bohai Sea region had been experiencing gradual environmental degradation. China places great importance on ecological and environmental development; however, there are periodic occurrences of coastal water pollution, eutrophication, and red tide that result in significant economic losses for the aquaculture industry. These incidents also have long-term consequences for the ocean ecosystem, posing a threat to its ecological balance [2]. The primary reasons behind this can be summarized as follows:

Overfishing is a major contributing factor. One of its main negative impacts is its detrimental effect on marine environments. Due to excessive exploitation of marine resources in the past, fishermen in the Bohai Sea area have resorted to various measures that contribute to overfishing. Consequently, numerous fish stocks have been excessively exploited leading to reduced fisheries and disturbance in ecosystem equilibrium [3].

1) Before implementing fishing bans, illegal fishing activities were widespread in the Bohai Sea area with frequent violations occurring extensively. These illegal fishing vessels disregarded regulations concerning protection and enforcement measures related to fishing bans which not only endangered fishery resources but also inflicted serious harm upon marine ecosystems.

2) Pollutant discharge also plays a crucial role: Being an important oilfield production zone involves frequent exploitation and transportation activities that result in waste disposal issues and pollutant discharges posing substantial threats to Bohai Sea's marine ecology. In recent years, there have been instances of oil spills along with pollution caused by illicit industrial emissions and coastal cage farming practices significantly impacting this region's natural environment. The use of antibiotics during the Conocophillips spill incident in 2014 caused a significant decline in fish and shrimp populations, resulting in severe environmental damage to the Bay Area [3].

3) Moreover, human activities have also had negative impacts on the natural environment of Bohai Sea. For example, extensive construction and island development have destroyed numerous underwater habitats and disrupted hatching and growth conditions for various fish species. Additionally, rapid tourism growth has put immense pressure on the local natural landscape through soil utilization and demolition.

2.3. Possible consequences

Drawing from previous studies and practical experience, the implementation of a no-fishing policy in the Bohai Sea can potentially result in various outcomes. Firstly, the fishing ban will directly impact the fishery output in this region, with potential consequences on both fishery resources and fishermen's income during the extended ban period and recovery phase. This poses significant challenges for the Bohai Sea area, which heavily relies on fishing as its main economic source and livelihood mode. Moreover, enforcing a fishing ban may lead to closures and job losses within fishing-related businesses across the entire industry chain including vessels, processing plants, and transportation companies. The expansion of no-take areas coupled with prolonged periods without fishing can limit suppliers' ability to provide sufficient quantities of fish products, thereby intensifying market competition and potentially forcing smaller players out of business. Additionally, this policy may also have social implications for local farmers who rely on fishing as their primary income source. Reduced earnings from fishing could push some farmers into poverty or financial hardship, making it difficult for them to cover basic living expenses or afford education for their children. Consequently, some farmers might be compelled to change careers or relocate elsewhere in search of alternative livelihood opportunities – exacerbating issues related to family breakdowns. However, it is worth noting that recreational fishing has positive aspects too; it can contribute towards marine resource restoration efforts while effectively maintaining ecological balance within marine ecosystems by providing better breeding conditions for diverse species such as fish and shellfish – ultimately enhancing sustainability and biodiversity levels. Thus, highlighting that a prohibition on fishing in the Bohai Sea could yield multifaceted consequences. Playgrounds and industries related to play may face consequences, impacting the livelihoods of farmers and their social life. However, it can also act as a catalyst for increased news coverage and contribute towards ending overfishing. Therefore, prior to implementing the Fuwen policy, it is crucial to thoroughly consider and evaluate potential outcomes while adopting corresponding response measures to address and mitigate any possible adverse effects. This approach will ensure the feasibility and effectiveness of the policy.

3. Fishing Moratorium Policy

3.1. The Fishing Moratorium Policy

Fishing ban policy refers to a policy measure implemented to protect the Marine ecological environment and maintain the sustainable development of fishery resources. Its implementation means that within a certain time range, fishermen are prohibited from fishing activities in a specific sea area. Specifically, it can be implemented in the form of maritime law enforcement patrol, fishing port inspection, "roll call" verification of landing fishing vessels, discussion and research meetings, and night unannounced visits [4]. Jiangsu Marine fishing ban during the summer season is Confirmed Payment confirmation "mechanism to ensure the payment of wages Safeguards are put in place. As an important fishery producing area in China, the Bohai Sea area has gradually introduced and carried out the fishing ban policy in recent years. The core objective of the policy is to restore and protect the Marine ecosystem by limiting fishing activities. Specifically, the fishing moratorium can achieve the following objectives. First, it can protect fishery resources and prevent overfishing and overfishing, thus ensuring the sustainable development of the fishery. For example, in order to conserve squid resources, China has set up independent fishing closure zones in the Middle East Pacific Ocean, the Southwest Atlantic Ocean and the northwest.

Indian Ocean. From 2020, for the first time, China will conduct an independent fishing moratorium in the Middle East Pacific High Seas from September 1 to November 30 each year September 1 [5]. Secondly, the fishing ban policy can also promote the restoration and balance of the Marine ecosystem and provide a better ecological environment for the fishery and the recovery and growth of the catch. At the same time, the fishing ban policy can also improve the stability and anti-interference ability of the Marine ecosystem and reduce the adverse impact of Marine environment changes on the fishery.

The implementation of the fishing ban policy needs a series of supporting measures. First of all, a sound supervision system must be established to strictly manage and monitor the closed fishing area to ensure the implementation effect of the policy. Secondly, effective communication and consultation should be carried out with fishermen, and training and publicity should be strengthened to make them understand the importance and necessity of the fishing ban policy. In addition, the government should also provide corresponding economic compensation and driving measures to reduce the economic pressure of fishermen during the fishing ban period. Although the fishing ban policy has played an important role in promoting the protection of the Marine ecological environment, there are also some problems and challenges. First of all, the implementation of the fishing ban policy needs to invest a lot of manpower, material and financial resources, which puts higher requirements on the government and relevant departments. Secondly, the fishing ban policy may lead to the loss of some fishermen's economic interests to a certain extent, and effective measures need to be taken to mitigate its impact and find a better way to develop. In addition, the effect of the fishing ban policy is also affected by external environmental factors, such as climate change. Marine pollution and so on. Therefore, in the future, it is necessary to further strengthen research and exploration, and formulate more scientific and reasonable policy measures to improve its implementation effect and adaptability. The fishing ban policy is an important measure implemented to protect the Marine ecological environment and the sustainable development of fishery resources. Its implementation can effectively curb overfishing and overfishing and promote the restoration and balance of the Marine ecosystem. However, the implementation of the fishing ban policy requires the joint efforts of the government, fishermen and all sectors of society, and faces some problems and challenges at the same time. Therefore, in the future, it is necessary to further strengthen the research and exploration, improve the implementation effect and adaptability of the policy, in order to achieve the sustainable and healthy development of the Marine ecological environment.

3.2. The Impact of the Fishing Ban Policy

The implementation of the fishing ban policy in the Bohai Sea has had a profound impact on the Marine ecological environment. First of all, with the promotion of the fishing ban policy, the Marine living resources in the Bohai Sea have been effectively protected and restored. As fishery resources have suffered from the double pressure of overfishing and environmental pollution in recent years, the quantity and quality of many fishery species have shown a downward trend. The implementation of the fishing ban policy has effectively restricted fishery activities and protected the reproduction and growth of Marine life. Taking eel,a fishery resource in Bohai Sea, for example, the population of eel has rebounded significantly due to the promotion of the fishing ban policy. The fishing ban policy has significantly adjusted and improved the Marine ecosystem in the Bohai Sea. The Bohai Sea area is a vast Marine ecosystem with many species. In the past few decades, the ecological balance has been destroyed due to excessive fishing activities. However, through the implementation of the fishing ban policy, the restriction of fishing activities has allowed the Marine ecosystem to recover and adjust. For example, spawning populations are better protected. The summer fishing ban coincides with the peak spawning season of economic fish, such as the annual spawning peak of fish is mainly concentrated in June, July and August. During this period, fishing is banned to avoid the destruction of natural ecology caused by human cool-fishing overcatching of spawning groups [6]. Therefore, summer fishing ban plays a key role in protecting the spawning fish groups in summer, ensuring the normal spawning and hatching of the main economic fish spawning groups such as hairtail, large yellow croaker, small yellow croaker and pomfret, and at the same time enabling the safe growth and development of larvae and juvenile fish, laying a foundation for the increase of juvenile fish occurrence [7].

The implementation of the fishing ban has also brought some economic and social effects. On the one hand, fishermen in the Bohai Sea region face a loss of economic interests during the fishing moratorium, especially those who depend on fishing for their livelihood. Through the implementation of the fishing ban policy, fishermen can realize the importance of protecting Marine resources,

gradually change their minds and find other economic ways. In particular, some fishermen began to turn to fishing tourism, aquaculture and other fields, providing a new economic growth point for the sustainable development of the Bohai Sea area. For example, theoretically, according to the fishing intensity and efficiency from 1990 to 1995, the output of hairtail decreased by 80,000- 100,000 tons in the summer season, and the output of hairtail increased by 100,000- 130,000 tons in the winter season. During the winter season, the price of each kilogram of belt fish is calculated at about 4 yuan, which can increase the benefit of 200-300 million yuan after deducting the output value of the summer season, and because the fishing vessels are closed in the winter season, the cost only decreases and does not increase, which can not only save the tight energy for the country, but also ensure the production safety during the winter season. The economic benefits are significant, and the safety of production is guaranteed. And in the spring and summer season of the next year, the number of resources of the egg-producing groups of 1 age and above can be increased by 200-300 million, that is, the number of resources of the remaining groups can be increased by about 15%. As long as it insists on 5-6 years, the resource base can be restored [8]. On the other hand, the implementation of the fishing ban policy has also aroused the attention of the society for Marine ecological protection. During the implementation of the fishing ban policy in Bohai Sea, the government has taken a series of publicity and education measures to improve the public's understanding of the Marine ecological environment. By strengthening the social awareness, more people should pay attention to and participate in the Marine ecological protection, so as to achieve the purpose of jointly maintaining the Marine ecological environment in the Bohai Sea. After more than ten years of the implementation of the summer fishing ban system, through the vigorous publicity of fishery administrative departments at all levels and the news media, the majority of cadres and fishermen have a deeper understanding and knowledge of fishery laws and regulations. After more than 10 years of the implementation of the summer season fishing ban system, through the vigorous publicity of fishery administrative departments at all levels and the news media, the majority of cadres and fishermen have a deeper understanding and knowledge of fishery laws and regulations [9]. At the same time, the stable, effective and successful implementation of the summer fishing ban system has aroused strong repercussions at home and abroad and established a good international image of the Chinese government in protecting resources, protecting the ecological environment and maintaining the sustainable development of the fishery [10]. The implementation of the fishing ban policy in the Bohai Sea has had a profound impact on the Marine ecological environment. By protecting and restoring fishery resources, adjusting and improving Marine ecosystems, and drawing social attention to Marine ecological protection, the policy has laid the foundation for the sustainable development of the Bohai Sea. In the future, it hopes that the fishing ban policy can be formulated more scientifically and rationally, so as to achieve better protection of the Marine ecological environment.

3.3. Outlook on the Future of Fishing Ban Policy

In the Bohai Sea area, the impact of the fishing ban policy on the Marine ecological environment has become increasingly prominent. In order to protect Marine resources, the Bohai Sea area adopted the fishing ban policy, prohibiting fishing activities for a certain period of time. At present, the fishing ban policy has achieved positive results to a certain extent, but at the same time it also faces some challenges and problems. Therefore, it is necessary to conduct in-depth research and future outlook on the fishing ban policy. The future fishing ban policy should focus on making scientific and reasonable time arrangements. The fishing moratorium period should be reasonably determined according to the principles of bioecology and the breeding cycle of Marine species, so as to protect the stable and sustainable development of Marine ecosystems to the maximum extent. The fishing ban policy should also fully consider the impact of seasonal changes, climate factors and other factors, so as to adjust the fishing ban period to adapt to the actual situation in different years and regions. Future fishing ban policies should strengthen law enforcement and supervision measures. More efforts should be made to crack down on illegal fishing activities, and the inspection and monitoring of fishing ban areas should be strengthened to ensure the implementation effect of the fishing ban

policy. A sound monitoring system should be established to obtain the data of Marine ecological environment in the closed fishing area in time, so as to scientifically evaluate the implementation effect of the closed fishing policy and make corresponding adjustments and optimization in time.

Marine ecological education and public participation should also be strengthened in the future fishing ban policy. Through strengthening publicity and education to the public, the public's awareness and understanding of the fishing ban policy should be enhanced, and the public's awareness of environmental protection and responsibility should be enhanced. Actively advocate public participation in Marine ecological protection work, encourage the public to participate in Marine ecological restoration and protection actions, and form a good situation of joint participation of the whole society. The future fishing ban policy should be coordinated with other relevant policies to form a comprehensive management system. The fishing ban policy is closely related to fishery management policy, Marine protection policy and environmental protection policy, and needs to be connected and coordinated with each other to form an effective management system and maximize the overall benefits of Marine ecological environment protection in the Bohai Sea. In the case of serious surplus fishing capacity in China, once the fishing moratorium period is over, fishermen carry out predatory production day and night to make up for the loss caused by the fishing moratorium, thus showing concentrated and cluster fishing. As a result, the supplementary groups of fish resources increased by the fishing moratorium cannot withstand the impact of too strong fishing forces, and the remaining groups that can survive to reproduce in the next year are very small. As a result, the effect of the fishing moratorium cannot be reflected for a long time [6]. For the future outlook of the ban policy in the Bohai Sea, people should pay attention to scientific time arrangement, strengthen law enforcement and supervision, strengthen Marine ecological education and public participation, and cooperate with other policies. Only by comprehensively and deeply studying the Marine ecological environment of the Bohai Sea can better protect the Marine ecological environment and realize sustainable development and long-term welfare.

4. Conclusion

According to the above research content and analysis, the following conclusions can be drawn:

1) The implementation of the fishing ban policy has a positive impact on the Marine ecological environment in the Bohai Sea area. By limiting fishing activities, the policy protects the reproduction of Marine life and the balance of the ecosystem. Research shows that during the fishing moratorium, the fishery resources in the Bohai Sea have been effectively restored and protected, the number and variety of fish in the waters have increased, and the biodiversity has been improved.

2) The fishing ban policy has caused certain economic losses to the fishery industry in the Bohai Sea. During the fishing ban period, the fishermen could not catch, resulting in the reduction of fishery income, and some fishermen faced economic pressure. However, through the study found that during the implementation of the fishing ban policy, the fishery resources have been effectively regenerated and restored, which has a certain role in promoting the sustainable development of the fishery.

3) The fishing ban policy faces some problems and challenges in the implementation process. First of all, supervision is not in place, leading to the existence of some illegal fishing activities, causing damage to fishery resources. The second is the fishermen's difficulties in making a living, which requires appropriate economic compensation and transformation support policies. In addition, the length of the fishing ban policy and the scope of the fishing ban area also need to be further studied and discussed to make the policy more scientific and effective.

4) In view of the positive impact and existing problems of the fishing ban policy in the Bohai Sea, it is suggested that the government should strengthen the supervision of the fishing ban policy, intensify the crackdown on illegal fishing behavior, and take comprehensive measures to promote the transformation and development of fishermen and reduce their economic burden. In addition, the duration and scope of the fishing ban policy should be further studied to protect the Marine ecological environment and fishery resources in the Bohai Sea more scientifically. The implementation of the

fishing ban policy has a certain positive impact on the Marine ecological environment in the Bohai Sea area, but there are still some problems and challenges. Through scientific research and management, the effect of the fishing ban policy can be further improved, and the sustainable development of fishery and the protection of ecological environment in the Bohai Sea can be realized.

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