

Legislation Issues on the Invasion of Alien Species Through Ballast Water in Ships

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Abstract: The issue of alien species invasion caused by ballast water from ships has been recognized by the Global Environmental Fund as one of the four major threats to the oceans. As a major maritime nation, China is also confronted with the same problem. This paper outlines the hazards of alien species invasion through ballast water and analyzes the current legislation status and shortcomings of ballast water in Chinese ships. It proposes legislative strategies, including clearly defining legislative purposes, enacting specialized laws, and establishing a coordinated regulatory system, aiming to provide assistance to legislation and practices in China regarding the invasion of alien species through ballast water.

Keywords: Ballast Water, Alien Species, Legislation

1. Introduction

In recent years, driven by the promotion of global international trade, the shipping industry has expanded rapidly. However, amidst the flourishing development of the shipping industry, the issue of alien species invasion brought about by the discharge of ballast water from ships cannot be ignored. With approximately 12 billion tons of ballast water transported by ships globally each year and around 7,000 marine species in the global ballast water daily, approximately 500 marine alien species confirmed to be spread through ballast water have significantly impacted the environment and public health of coastal countries, drawing extensive attention from the international community and some nations [1]. In response, the International Maritime Organization formulated the "International Convention for the Control and Management of Ships' Ballast Water and Sediments" in 2004 to address the issue of alien species invasion caused by ships' ballast water. Various countries have also enacted corresponding legislation. However, in theoretical terms, China has not given sufficient attention to this issue, with legislation containing only a few incomplete provisions. Consequently, it is imperative to urgently study and draw insights from foreign legislation on ships' ballast water, analyze the current status and shortcomings of domestic legislation, and explore effective legislative strategies for the invasion of alien species through ships' ballast water.

2. Hazards of Invasion by Alien Species through Ballast Water

Alien species invasion refers to the intentional or unintentional introduction of a foreign organism into a new ecosystem. Through suppression and displacement of local species, a single dominant

species is established, leading to the infringement of the invaded ecosystem, biodiversity, and even public health. With the development of international trade and shipping, ballast water from ships has become a major pathway for global marine alien species invasion. The hazards posed by marine alien species introduced through ship ballast water are considerably greater compared to other invasion pathways. Once these species invade local waters, their elimination becomes nearly impossible. Unlike typical marine environmental pollution events such as oil spills, which can be cleaned or absorbed by the ocean, the harm caused by ballast water invasion has emerged as a severe threat in many countries and regions worldwide.

2.1. Impact on Marine Ecological Environment

Upon entry into new marine areas, marine alien species carried by ballast water lack natural predators or other constraints, allowing them to occupy local waters, exploit local biological resources, compete with and displace native species, and undergo extensive reproduction. This leads to the disruption of the local ecosystem structure and marine biodiversity, resulting in a sharp decline or even extinction of local species. In recent years, widespread occurrences of red tide disasters along China's coasts have been attributed in part to the invasion of alien species triggered by ship ballast water. Once a red tide disaster erupts, it not only threatens the survival of marine organisms but also disrupts the local marine ecological environment, causing an imbalance in the marine ecosystem [2].

2.2. Impact on Human Health

Ballast water from ships contains a large number of pathogenic bacteria and pathogens. The discharge of ballast water can trigger infectious diseases, posing a serious threat to human life and health. As early as 1347, several merchant ships returning from Constantinople to Venice carried the infectious disease known as the Black Death, which spread across the entire European continent, resulting in widespread disease infections and a population decline exceeding 65% in some countries. In September 2004, the chain-forming *Alexandrium* alga triggered a red tide in the Dalian port area. Japan had previously suffered from an invasion of the chain-forming *Alexandrium* alga, leading to poisoning in Japanese bivalves and significantly affecting food safety. Moreover, red tide occurrences in the Hong Kong region of China in recent years have led to local seafood contamination, causing multiple instances of food poisoning.

2.3. Impact on Economic Development

Economic losses caused by marine alien species invasion can be categorized into direct and indirect losses. Direct economic losses mainly include the direct economic impact of biological invasion on marine industries such as tourism, transportation, and fisheries. According to statistics from the National Maritime Administration, marine alien species invasion causes nearly billions of dollars in economic losses worldwide each year. A notable example is the invasion of zebra mussels in the Great Lakes in the 1980s. Zebra mussels carried by ballast water clogged water pipes and turbines in hydroelectric power plants, resulting in \$5 billion in economic losses for the United States. As a major maritime nation, China also suffers from the invasion of marine alien species through ship ballast water, with overall losses reaching billions annually and direct economic losses reaching 57.4 billion yuan. Compared to direct economic losses, the destruction caused by marine alien species invasion to ecosystems and species diversity is immeasurable in monetary terms.

3. Challenges in Legislation on Ballast Water in China

3.1. Deviation in Legislative Objectives

The legislative objectives reflect the issues and priorities a law addresses, determining the guiding principles and adjustment targets of the legislation. Examining China's legal provisions regarding ballast water management, the legislative objectives are primarily focused on the regulation of oil pollution, toxic substances, and the prevention and control of diseases. The emphasis is mainly on economic benefits, guided by the development of a socialist market economy and the protection of human health. However, it overlooks the threat posed by ballast water-induced marine species invasion to the marine environment and biodiversity, neglecting ecological benefits. For instance, the legislative purpose of the "Marine Environmental Protection Law" is to protect and improve the marine environment and resources, prevent and control pollution damage, with more emphasis on land-based pollutants and ship-source pollutants. There is insufficient attention to the issue of marine alien species invasion caused by ballast water, only stipulating that the discharge of ballast water into the ocean must not violate the law [3]. The "Regulations on Inspection and Quarantine Management of Entry and Exit Ships" stipulates that ballast water from epidemic areas, which the country has explicitly defined as requiring sanitary treatment, should undergo treatment before discharge. Its main purpose is to prevent the spread of infectious diseases, safeguard marine economic development, and protect human health, rather than maintaining ecological security. Due to the lack of correct legislative objectives, efforts to prevent and control the invasion of alien species through ballast water in China face significant challenges.

3.2. Lack of Specialized Legislation

The harms caused by marine alien species invasion are substantial, leading to imbalances in marine ecosystem structure, loss of biodiversity, and even ecosystem collapse. However, it is evident that China currently lacks specialized legislation to prevent the invasion of biological species through ship ballast water. The content adjusted by laws and regulations related to ballast water management is mainly limited to preventing marine pollution and the prevention of infectious diseases. The quantity of relevant provisions regarding the invasion of alien species through ballast water is low, the legal hierarchy is relatively low, and most are principled regulations. The norms lack coordination in content and lack specific operability [4]. For example, the "Implementation Rules for the Law on Frontier Health and Quarantine" only stipulate the treatment of ballast water from cholera epidemic areas, but there are no relevant provisions for the treatment of ballast water from non-epidemic areas. The "Marine Environmental Protection Law," as China's first law protecting the marine environment, only broadly mentions that any ship must not violate the law by discharging ballast water into the ocean and does not address specific measures for ballast water management. The absence of specialized legislation and the one-sidedness and gaps in current legal legislation place China's ballast water management and prevention efforts in a passive position. This not only hampers the safety of ship navigation but also obstructs improvements in marine environmental quality, failing to meet the strategic requirements for national sustainable development.

3.3. Dispersed Enforcement System

The regulation of ship ballast water in China involves multiple departments. Currently, departments with regulatory functions related to ballast water in China include the environmental protection administrative authority, maritime administrative authority, maritime safety administrative authority, fisheries administrative authority, inspection and quarantine authority, and others. This fragmented management and enforcement model is not conducive to the effective management of ship ballast

water [5]. For example, the maritime administration focuses on whether ship ballast water carries prohibited discharges of solid waste, oil pollution, and toxic substances but does not pay attention to the issue of marine alien species invasion caused by ship ballast water. The maritime administrative authority is responsible for the supervision and management of the marine environment, but its management of marine alien species introduced through ship ballast water is relatively weak and cannot conduct rigorous monitoring of all foreign ships. The inspection and quarantine authority carries out quarantine treatment for ballast water from epidemic areas specified by the country, and the limitations in scope can result in a lack of oversight for some ballast water. This decentralized enforcement model, where each department often exercises its functions from its own specialized perspective, makes it challenging to effectively coordinate and collaborate with other departments, making it difficult to achieve the comprehensive management goals of preventing marine alien species invasion through ship ballast water.

4. Legislative Strategies for Preventing Invasion of Marine Alien Species through Ballast Water

4.1. Clarify Legislative Objectives

Establish the concept of sustainable development. The concept of sustainable development has shifted from viewing economic development and environmental protection as conflicting perspectives to emphasizing harmonious coexistence between humans and nature. It demands a focus on the sustainable use of the environment while promoting economic development, achieving comprehensive and harmonious development between humans and nature [6]. The marine ecosystem is a highly complex system with certain self-regulatory functions. To ensure the benign circulation of the marine ecosystem and maintain its stable balance, it is essential to establish the concept of sustainable development through legislation. In the legislation to prevent and control the invasion of alien species through ballast water, establishing the legislative objective of the sustainable development concept aims to balance the relationship between human production activities and the protection of the marine ecosystem. This approach avoids sacrificing environmental interests to promote economic development. The concept of sustainable development dictates that legislation on ballast water cannot prioritize economic interests but must start from protecting the marine ecological environment and biodiversity. The goal is to achieve sustainable development in both the economic and social spheres and the marine environment.

4.2. Formulate Specialized Laws

As mentioned earlier, China lacks specialized legislation to prevent the invasion of alien species through ballast water. Relying solely on existing scattered provisions related to ballast water discharge is insufficient to achieve the goal of preventing the invasion of alien species through ballast water. In recent years, the threat of alien species invasion to China's marine ecology has become increasingly severe, with frequent red tide disasters in coastal areas serving as a prominent example. Therefore, China urgently needs to establish specialized legislation for the invasion of alien species through ballast water to achieve the goal of protecting its marine biological resources and biodiversity. In response to significant losses caused by the invasion of zebra mussels in the Great Lakes in the 1980s, the United States Congress passed the "Non-Indigenous Aquatic Nuisance Prevention and Control Act" in 1990. This law became the first in the United States specifically addressing the invasion of alien species carried by ballast water. The law covers five aspects: 1) preventing unintentional introductions of alien species; 2) coordinating investigations and sharing information; 3) developing and implementing environmentally compliant control measures; 4) minimizing economic and ecological harm; 5) establishing research plans for investigating and studying alien

species invasion. By drawing on relevant provisions of the "Ballast Water Convention" and beneficial experiences and practices from developed countries, China's State Council can formulate specialized administrative regulations for the invasion of alien species through ship ballast water. This would integrate current scattered legal provisions related to ballast water into a unified legal framework.

4.3. Establish a Coordinated Regulatory System

The current decentralized enforcement system for regulating ship ballast water in China hampers the management efforts. If a leading authority can coordinate efforts among other agencies within their respective areas and establish an organization through legislation to coordinate the work of various agencies, it would meet the practical needs of effectively preventing and controlling the invasion of alien species through ship ballast water. The U.S. Coast Guard was initially the sole maritime law enforcement agency for regulating ship ballast water. As the situation of invasion by alien species through ballast water worsened, the United States legislatively established a coordinating organization—the Aquatic Nuisance Species Task Force. It included the scope of authority, organizational structure, and working methods within a legal framework [7]. China can learn from this approach and authorize the Maritime Administration as the lead agency through legislation. It can oversee the prevention and control of ship ballast water issues, with other agencies managing their respective areas of expertise in collaboration. By establishing legislation, create a coordinating task force for preventing and controlling the invasion of alien species through ship ballast water, incorporating environmental protection, maritime, quarantine, and other departments as member units. This would comprehensively coordinate and manage prevention and control efforts, enhancing the efficiency of China's ship ballast water regulation and enforcement.

5. Conclusion

With the rapid development of maritime shipping, China frequently faces the challenge of invasion by alien species carried in ship ballast water. Therefore, it is imperative to pay attention to research on legislation related to ballast water. To address this, China should promptly improve legal provisions related to ballast water, implementing legislative measures such as clarifying legislative objectives, formulating specialized laws, and establishing a coordinated regulatory system. These measures will contribute to establishing a legal prevention and control mechanism for the issues caused by the discharge of ship ballast water leading to the invasion of alien species. It is believed that through this approach, we can effectively address the marine ecological environmental pollution problems caused by ship ballast water and achieve the grand goal of protecting China's marine ecological environment.

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