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Fishery legislative reform towards Japan's Fukushima nuclear wastewater discharge into the sea—A Chinese perspective

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Japan's discharge of Fukushima nuclear wastewater into the sea will have a profound and far-reaching impact on the marine environment and the fishing industry. Although Japan did not discharge nuclear wastewater directly into China's waters, the wastewater flowed into the sea and infringed upon China's rights and interests in pelagic fishing, as the nuclear-contaminated water is fundamentally different from discharges from normal nuclear plants. After the People's Republic of China was founded, the Central Government and people's governments of all levels started to manage fishery. However, the fishery management measures at this stage were primarily targeted the fishing industry itself, particularly the marine fishing industry. Several problems of China's existing fishery legislation do not cope effectively with Japan's nuclear sewage discharge. China's fishery legislation keeps pace with the development pace of international laws, but it has not enacted specific regulations on certain types of marine pollution, such as nuclear sewage pollution. The *Fisheries Law of the People's Republic of China* needs to produce an extraterritorial effect indirectly through other laws and regulations. China's existing domestic laws only stipulate the rights of coastal countries. In this context, China's fishery legislature should find a way forward, including changes in management standards; facilitating the formation of a complete extraterritorial effect by China's fishery legislation a complete extraterritorial effect; improving supporting administrative legislation system; and facilitating the digitalization of fishing management to monitor Japan's nuclear sewage discharge and its resultant harm, etc.

KEYWORDS

Fukushima nuclear wastewater discharge, *United Nations Convention on the Law of the Sea*, China's fishery legislation, fishing vessel monitoring system, extraterritorial effect

1 Introduction

On August 4, 2022, the construction of facilities to release radioactive wastewater into the sea from the crippled Fukushima Daiichi Nuclear Power Plant in northeastern Japan began despite opposition from the local community and neighboring countries (Huaxia, 2022). The waters near Fukushima Prefecture not only serve as the economic source that coastal citizens rely on for survival but are also vital parts of the Pacific Ocean and oceans worldwide. Its extensive amount of radioactive materials will exert an inestimable impact on ocean creatures and human health (360info, 2022). It is generally believed the Fukushima Daiichi Nuclear Power Plant accident had at least a Level 6 impact on the surrounding environment. Radioactive materials exceeding national standards were detected in the waters surrounding the power plant. For example, the content of ^{137}Cs detected 3–4 days after the accident equaled 20%–50% of the total amount leaked by the Level 7 Chornobyl Nuclear Power Plant accident within 10 days (The Times, 2011). Furthermore, the maximum content of ^{137}Cs and ^{90}Sr exceeded the level detected in China's marine background range by 300 times and 10 times, respectively; the maximum content of ^{137}Cs and ^{134}Sr was above China's seawater quality standards (IFENG.COM, 2011). Since the half-life of ^{137}Cs and ^{90}Sr is about 30 years, their impacts will be long-lasting. In particular, radioactive materials may be consumed by living organisms, transmitted *via* food chains, intensified and concentrated biologically, leaving a lasting, significant impact on marine creatures, the marine ecosystem, and even human health. The general principle of our law is that the loss from an accident must lie where it falls (Oliver, 1881). China, a country neighboring Japan and a representative country along the coast of the Pacific Ocean, voiced its strong dissent to this nuclear wastewater discharge: if Japan insists on putting its own interests above the public interest of the international community and insists on taking the dangerous step, it will surely pay the price for its irresponsible behavior and leave a stain in history (Wang, 2022). How China's fishing industry copes with Japan's Fukushima nuclear wastewater discharge into the sea and what reform should be conducted in China's fishery legislation have caused deep concern on the part of the stakeholders of this discharge action.

Among all nuclear accidents in history, only the Chornobyl nuclear accident and the Fukushima Nuclear Power Plant accident reached Level 7 (The Times, 2011). Nevertheless, the Chornobyl power plant did not discharge its nuclear wastewater into the sea. In contrast, Japan discharged nuclear wastewater into the local sea, which then flowed to the Pacific Ocean and damaged the wider marine ecological environment severely (See Figure 1). Through the movement of ocean currents and transport by pelagic fishes that can take up and accumulate radionuclides, more widespread distribution can and will occur (UH News, 2022). Since China is located next to Japan and shares the same waters, its fishing industry will inevitably suffer from the negative impacts of such nuclear wastewater. Although Japan did not discharge nuclear wastewater directly into China's waters, the wastewater flowed into the sea and infringed upon China's rights and interests in pelagic fishing, as the nuclear-contaminated water is fundamentally different from discharges from other normal nuclear plants (Global Times, 2021).

This paper first analyzes China's fishery legislation practices based on relevant international laws, aiming to propose feasible, effective legal reform methods and cope with the impacts of Japan's nuclear sewage discharge on China's fish stocks and their destruction. The second part analyzes the development course of China's fishery legislation. It concludes that China's current fishery legislation fails to deal with Japan's nuclear sewage discharge into the sea, so China's fish stocks will be substantially damaged in the long term. The third part classifies and analyzes the scientific statistics and indexes of Japan's nuclear sewage discharge, hoping

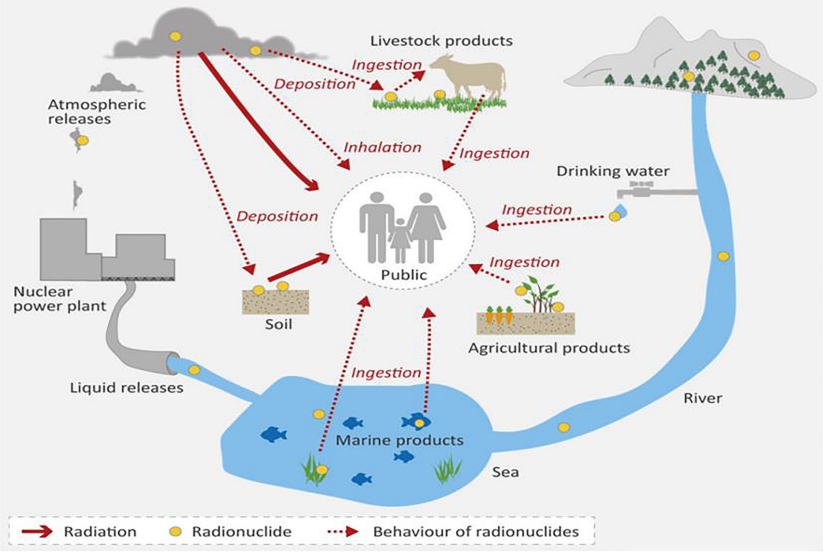

FIGURE 1
Exposure pathways of Japan's Fukushima nuclear wastewater. Source: The Fukushima Daiichi Accident (IAEA, 2015) .

to introduce objectively how Japan's discharge act damages China's fishing rights. Targeting the deficient responses of China's fishery legislation to Japan's nuclear sewage discharge into the sea, the fourth part proposes the paths for reforming China's fishery legislation and advocates improving it in four aspects.

2 Gains and losses of China's fishing legislation—facing Japan's nuclear sewage discharge into the sea

2.1 Embryonic stage and development of China's fishery legislation

Ancient China imposed limitations on fishing and managed it through the fishery officer system. After the Revolution of 1911, the Nanjing ROC government tried managing the fishing industry and facilitated its development. Hence it enacted the *Fisheries Law* in 1929, proposing regulations on fishery development and management. In 1930, it launched *Rules on Enforcement of the Fisheries Law*. In the early 1930s, the ROC government launched a series of laws on fishery management. In July 1930, it launched *Rules on Fishery Registration* and issued *Detailed Regulations on Enforcement of the Rules on Fishery Registration*. In 1931, the ROC government issued *Regulations on Fishery Police*. In 1932, it promogulated the *Provisional Rules on Fishery Vessel Head and Fishing Head Registration* and *Organizational Rules on Marine Fishery Management Administrations*. In 1933, it launched the *Provisional Regulations of the Ministry of Commerce on the Collection of Fishery Construction Fees* and *Provisional Rules of the Ministry of Commerce on the Fishery Protection Office* (Huang, 1995). In 1937, the War of Resistance against Japanese Aggression broke out, leaving fishery management in a semi-standstill state. Hence, these regulations and laws were not implemented after being enacted.

After the People's Republic of China was founded, the Central Government and people's governments of all levels started to manage the fishery. However, fishery management measures of this stage were mainly targeted at the fishing industry, particularly the marine fishing industry. In June 1955, the State Council published *Orders on Prohibited Fishing Zones for Wheel Trawling Fishing in Bohai, Yellow, and East China Seas*. In April 1957, the Marine Product Department enacted *the Provisional Regulations (Draft) on the Breeding and Protection of Aquatic Resources*. In July 1957, the State Council promulgated Supplementary Regulations to the *Orders on Prohibited Fishing Zones for Wheel Trawling Fishing in Bohai, Yellow, and East China Seas*. In July 1957, the Marine Product Department published *Instructions for Handling the Intrusion of Fishing Vessels into Prohibited Fishing Zones*. In April 1962, the Marine Product Department published the *Notice on the Prevention of Qiao Zhou Gu Fishing in Zhejiang Province* (Huang, 1995). In July 1962, the *Provisional Measures for the Protection of Shrimp Resource Breeding in the Bohai Sea Zone* formulated by the Marine Product Department was approved. Owing to an inadequate understanding of fishery production and the lack of in-depth studies on fishery management theories, the government had not set up a sound fishery management system or proposed systematic and institutional fishery management measures. At that time, China's fishery management was at an embryonic stage. After the reform and opening up, China started to pay attention to fishery management. In February 1979, the State Council launched *Regulations on the Protection of Aquatic Resources*, providing a legal basis for protecting aquatic resources. In 1979, the State Aquatic Product General Bureau enacted *Provisional Regulations on Certain Questions Concerning Fishery Licenses*, *Provisional Regulations on Fishery Administration Management*, and *Provisional Measures for Fishing Administration Vessel Management*, laying a preliminary legal foundation for China's fishery administration management (Huang, 1995). In 1982, the *Marine Environment Protection Law of the People's Republic of China* was passed. In 1984, the *Law on Water Pollution Prevention and Control of the People's Republic of China* was enacted. In 1989, the *Environmental Protection Law of the People's Republic of China* was enacted, providing a legal basis for protecting fishery waters. In 1986, the *Fisheries Law of the People's Republic of China* was enacted, symbolizing the formation of China's fishery management system and the entry of China's fishing industry into the era of comprehensive management.

Based on *Several Opinions of the State Council on Promoting the Sustainable and Healthy Development of Marine Fisheries (NDRC (2013) No.11)*, China must first build China unswervingly into a maritime power, focus on accelerating the transformation of marine fishery development, and insist on the production guidelines of placing ecology first, combining breeding and fishing, controlling coastal waters, expanding open waters, and developing the high seas. Second, efforts should be made to strengthen the conservation of marine fishing resources and the ecological environment to enhance the sustainable development of marine fishery. Third, efforts should orient toward adjusting the structure and layout of fishery production to speed up the construction of a modern industrial fishery system. Fourth, measures must be taken to improve the level of facilities and equipment, the degree of organization, and the management competence of marine fishery. Fifth, the marine fishery's comprehensive production capacity, risk-solving competence, and international competitiveness must be constantly improved. Finally, a priority should be laid on building fishing villages and optimizing fishermen's employment structure to safeguard and improve livelihoods. China's Chairman Xi Jinping proposed "building China into a maritime great power" in 2018 and put forward the concept of "building a maritime community with a shared destiny" in 2019, forcing China to pay more attention to governing the marine ecological environment (Tobin, 2018).

2.2 China's fishery legislation cannot effectively cope with Japan's nuclear sewage discharge

The first problem of China's fishery legislation (see Table 1) addresses the development pace of international laws; however, it has not enacted specific regulations on certain marine pollution,

TABLE 1 China's relevant existing fishery legislation.

International Laws	1. *UNCLOS*, came into force on 16 Novermber, 1994 (1833 UNTS 397) 2. *United Nations Agreement for the Implementation of the Provisions of the UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, came into force on 11 December 2001 (A/CONF.164/37) 3. *Rio Declaration on Environment and Development*, *Agenda 21*, adopted in June 1992 (A/CONF.151/26/Rev.l) 4. *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972*, came into force on 30 August 1975 (1046 *UNTS* 120) 5. *Convention on Early Notification of a Nuclear Accident*, came into force on 27 October 1986 (1439 UNTS 275) 6. *Convention on Nuclear Safety*, came into force on 24 October 1996 (1963 UNTS 293)
Domestic Laws	1. *Law of the PRC on the Administration of the Use of Sea Areas*, came into force on 27 October 2001 2. *National Division of Marine Function Zones (2011-2020)*, came into force on 25 April 2012 3. *Several Opinions of the State Council on Promoting the Sustainable and Healthy Development of Marine Fisheries (NDRC (2013) No.11)*, came into force on 8 March 2013 4. *Fisheries Law of the PRC*, came into force on 1 July 1986 5. *Provisions on the Administration of Pelagic Fishery*, came into force on 1 April 2020 6. *Environmental Protection Law of the People's Republic of China*, came into force on 1 January 2015

Source: Created by the author.

such as nuclear sewage pollution. In June 1992, the United Nations held the Environment and Development Conference in Rio de Janeiro, and the heads of state or government of 183 countries delivered their speeches. The *Rio Declaration on Environment and Development*, *Agenda 21*, and many other important documents were signed at the conference (United Nations, 1992). Article 17 of the Rio Declaration on Environment and Development, *Agenda 21*[1] stipulates the protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources. It especially elaborates on protecting the marine environment and the sustainable development of marine resources. This article highlights the marine environment—including the oceans and all seas and adjacent coastal areas—forms an integrated entire that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development. Symbolized by the UN Conference on Environment and Development, humans' understanding of the environment and development was elevated to a new level: the environment and development are indispensable and supplement each other. The conference was a milestone marking humans' change of traditional development models and lifestyles and their pursuit of sustainable development (United Nations, 1992). Moreover, it made the thinking on sustainable development widely recognized and contributed to the consensus on the attainable goals of sustainable development. Shortly after this conference was held, the *United Nations Convention on the Law of the Sea (UNCLOS)* took effect in 1994. These important historical events about the marine environment prompted China's fishery legislation to enter a new development stage. In 1993, the National People's Congress passed a series of laws concerning fishery, such as the *Agricultural Law of the People's Republic of China*, further specifying fishing rights. Since 1997, China has enacted a series of laws and regulations to solve new problems occurring in fishery management, such as the *Measures for the Administration of Aquatic Animal and Plant Nature Reserves* in 1997, the *Provisions on Fishery Administrative Penalties* in 1998, 24 comprehensive revisions of the *Fisheries Law* of the 1986 version in 2000, and the *Law on the Use of Sea Areas of the People's Republic of China* in 2001. The most significant achievement in this stage was the *Property Law of the People's Republic of China*, promogulated on March 16, 2007. It stipulates fishing rights, including breeding and fishing rights.

However, these laws do not specify the mode of governing the marine ecological environment after nuclear pollution occurs, and cannot handle the issues related to conserving marine fishing resources. Currently, the stipulated regional scope of China's forbidden fishing areas does not involve banning fishing behaviors in waters with a high radiation content. Additionally, the fishing license system of China's pelagic fishery has not specified permission to catch fish that may be contaminated. Neither have legislative regulations mentioned measures regarding sea-going fishing vessels catching fish in nuclear-polluted waters. Referring to international pelagic fishing legislation, China's domestic pelagic fishing legislation has established a legal system based on the *Fisheries Law of the PRC* and supplemented by the *Provisions on the Administration of Pelagic Fishery*. Before nuclear wastewater flows into the sea, the priority of regulatory legislation for China's pelagic fishing focuses on the regional scope and restricts illegal fishing means and behaviors to protect pelagic fish resources. Nevertheless, there are no regulations on differentiating and handling contaminated fish. Owing to technical deficiencies, China designated forbidden fishing areas to protect biological

1 Article 17 of Rio Declaration on Environment and Development, Agenda 21——Protecting And Managing the Ocean: Sets out goals and programs under which nations may conserve "their" oceanic resources for their own and the benefit of the nations that share oceans with them, and international programs that may protect the residual commons in the interests even of land-locked nations, such as: anticipate and prevent further degradation of the marine environment and reduce the risk of long-term or irreversible effects on the oceans; ensure prior assessment of activities that may have significant adverse impact on the seas; make marine environmental protection part of general environmental, social, and economic development policies; apply the "polluter pays" principle, and use economic incentives to reduce polluting of the seas; improve the living standards of coast-dwellers; reduce or eliminate discharges of synthetic chemicals that threaten to accumulate to dangerous levels in marine life; control and reduce toxic-waste discharges; stricter international regulations to reduce the risk of accidents and pollution from cargo ships; develop land-use practices that reduce run-off of soil and wastes to rivers, and thus to the seas; stop ocean dumping and the incineration of hazardous wastes at sea.

resources rather than regulate the act of catching fish contaminated by nuclear wastewater. Article 23 of the *Fisheries Law of the PRC*[2] and Article 29 of *Provisions on the Administration of Pelagic Fishery*[3] emphasize summarizing several circumstances for issuing a permission certificate for fishing, such as fishing tools and sites, yet contain no regulations that restrict the catching of radiation-contaminated fish. Moreover, the punishments for violating the fishing permission are not serious in China's laws and regulations on the pelagic fishery. Existing regulations only stipulate "the catch and illegal gains shall be confiscated, and a fine of the less than 50,000 yuan may be imposed. If the violation circumstance is serious, the fishing tools shall be confiscated, and the fishing license may be revoked"[4]. However, if the radiation-containing fish is caught in highly-radioactive waters, its harm to the human body is unpredictable after being consumed, and such hazardous consequences do not match the punishments stipulated by laws and regulations.

Another problem is that the *Fisheries Law of the PRC* should produce an extraterritorial effect indirectly through other laws and regulations. For instance, legal responsibilities produce an indirect extraterritorial effect based on the *Criminal Law of the People's Republic of China*, while administrative responsibility produces an extraterritorial effect based on the *Provisions on the Administration of Pelagic Fishery*. Article 2 of the *Fisheries Law of the PRC* stipulates the governance range, which reflects the principle of territorial jurisdiction[5]. Its regulation range excludes fishing behaviors on the high seas. Therefore, in practice, illegal fishing behaviors outside China's extraterritorial range cannot be regulated by the Fisheries Law of the PRC. Owing to inadequate efficacy, the *Fisheries Law of the PRC* cannot eliminate the impacts of Japan's nuclear wastewater flowing into the high seas. For example, regarding illegal fishing behaviors, Article 38 of the *Fisheries Law of the PRC* stipulates the clauses for affixing the actor's criminal responsibilities[6]. Compared with the regulations concerning the crime of destroying environmental resource protection and Chinese citizens' extraterritorial crimes in the *Criminal Law of the People's Republic of China*, the criminal responsibilities of the *Fisheries Law of the PRC* are based on the *Criminal Law of the People's Republic of China*. Hence, the extraterritorial effect of the *Fisheries Law of the PRC* is undisputed. Nevertheless, the punitive regulations on illegal fishing in the *Fisheries Law of the PRC* cannot be used directly for extraterritorial pelagic fishery. If the *Criminal Law of the People's Republic of China* lacks regulations on investigating and affixing Chinese citizens' criminal responsibilities for extraterritorial crimes, the regulations of territorial jurisdiction in the *Fisheries Law of the PRC* can hardly restrict the criminal act of fishing in the pelagic sea. Similarly, administrative punishments should be based on the *Provisions on the Administration of Pelagic Fishery*. As a result, the authority of the *Fisheries Law of the PRC* in managing pelagic fishery is reduced.

China's existing domestic laws only stipulate the rights of coastal countries, which is the third problem of China's fishery legislation. As for the fish species that may be contaminated by nuclear radiation, Chinese laws cannot determine whether Japan's nuclear wastewater discharge violates the obligation stipulated in the right of discretion. Currently, the international community's regulation of pelagic fishing focuses on the IUU (illegal, unreported, and unregulated behaviors of pelagic fishing vessels (Gohar, 2015). Thereunto, no regulations involve the obligation to report the catching of fish contaminated with nuclear radiation and the illegality of such fishing. Even during China's 13th Five-year Plan period, the legislative goal of the comprehensively amended *Provisions on the Administration of Pelagic Fishery* still focused on the normative and orderly development of pelagic fishery, and their regulation priority lay in enhancing the monitoring and management of pelagic fishing

2 Article 23: Fishing licenses for marine fishing with large trawlers and purse seines and for fishing in the jointly managed fishery zones defined in the agreements concluded between the People's Republic of China and the countries concerned or on the high seas shall be granted upon approval by the administrative department for fisheries under the State Council. Other fishing licenses shall be granted upon approval by the administrative department for fisheries under the local people's governments at or above the county level. However, the sizes for vessels and fishing gear specified in the fishing licenses issued for marine fishing may not exceed the control sizes for vessels and fishing gear fixed by the State. Specific measures in this respect shall be formulated by the people's governments of provinces, autonomous regions, and municipalities directly under the Central Government.

3 Article 29: Pelagic fishery enterprises shall provide training and education to pelagic fishery sailors on production safety, foreign affairs discipline and legal knowledge before they leave the country. Seafarers of pelagic fisheries abroad shall abide by the laws and regulations of the country where they are located and the provisions of relevant international treaties and agreements, and respect the local customs and habits.

4 See Article 38 (1) of the Fisheries Law of the People's Republic of China.

5 All productive activities of fisheries, such as aquaculture and catching or harvesting of aquatic animals and plants, in the inland waters, tidal flats, territorial waters and exclusive economic zones of the People's Republic of China and in all other sea areas under the jurisdiction of the People's Republic of China shall be conducted in accordance with this Law.

6 Where a person uses explosives, poisons, electricity or other means in fishing, which impairs the fishery resources, engages in fishing in violation of the regulations on restricted fishing areas and closed seasons, uses banned fishing gear and methods or fishing nets with mesh smaller than the minimum size, or catches juvenile fish the proportion of which exceeds the specified level, his catch and illegal gains therefrom shall be confiscated and he shall be fined not more than RMB 50,000 yuan. If the circumstances are serious, his fishing gear shall be confiscated and his fishing license revoked. If the circumstances are especially serious, his fishing vessel may be confiscated. If a crime is constituted, he shall be investigated for criminal responsibility in accordance with law.

vessels[7]. As of 2020, the *White Paper on Implementation in China's Pelagic Fishery (2020)* (hereinafter abbreviated as the *White Paper 2020*) still focuses on proposing more detailed methods for regulating the pelagic fishery than the *Provisions on the Administration of Pelagic Fishery*. Its second chapter is the Regulation of Pelagic Fisheries. Aside from cracking down on the abovementioned IUU behaviors, management regulations generally focus on regulating the positions of pelagic fishing vessels and checking them at ports (Chang and Mehran, 2021). Thus, it can be seen that China had not attached importance to the potential consequences of nuclear wastewater flow into the sea on pelagic fishery, and its legislation lacks foresight in this regard.

3 China's assessment of the consequences of Japan's nuclear wastewater discharge into the sea

After the Fukushima nuclear pollution incident, the Tokyo Electric Power Company (TEPCO) and the Japanese government have taken a series of countermeasures, but the overall attitude can be summarized as negative and the effect is poor. First, the accident was not handled in time. The earthquake and tsunami that occurred on March 11, 2011 led to the power failure of the refrigeration system of the Fukushima Nuclear Power Plant, and water vapor appeared in Unit 1. On the morning of the 12th, TEPCO had considered using nearby seawater to cool the reactor, but to preserve the economic benefits of the existing assets, it was not until the evening of the 12th that the explosion occurred and the Japanese government ordered that TEPCO should begin to use seawater for cooling (Maeda, 2012). Second, after the explosion of the Fukushima Daiichi Nuclear Power Plant, the Japanese government did not fulfill its obligation to notify the surrounding countries, but tried to cover up the real situation of the incident and refused the assistance of the United States. Japan was forced to accept the assistance once the situation had become too serious to control (Haruko, 2011). Third, data on the incident are not transparent. After the Fukushima nuclear accident, the Japanese government refused to allow a third party to participate in the investigation, concealed the details of the accident process, and tried to cover up the seriousness of the accident through the accident report that it prepared itself (Yamamura, 2013). Therefore, because the concealment and falsification of relevant data are not consistent with the seriousness of the real situation, the credibility of the Japanese government has been widely questioned at home and abroad.

Fourth, there are problems with the technical means used to deal with the accident. Fukushima Daiichi Nuclear Power Plant uses a boiling water reactor, which has technical defects and outdated specifications and standards. Boiling water reactors require the efficient operation of the power system, but the tsunami destroyed the generator set, making the residual heat of the reactor unable to be released, which resulted in the explosion of the plant. The TEPCO announced that it would restore the power supply of cooling equipment as early as March 16th, but it did not recover until the 20th, which is enough to show that the company's technical response had major defects (Shun-ichi, 2012). Again, the response measures of TEPCO and the Japanese government are based on the principle of self-interest. After the Fukushima nuclear accident, the Japanese government gave priority to economic interests and refused to use seawater cooling units. Instead, it dumped nuclear wastewater directly into the sea, thus causing a substantial impact on the marine fishery resources, the diversity of marine organisms and quality of seawater in neighboring countries. According to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972*[8], *the Convention on Early Notification of a Nuclear Accident, Convention on Nuclear Safety* and other relevant international conventions, all parties should report the information of nuclear accidents as soon as possible to minimize the consequences of nuclear radiation damage (IAEA, 1986). Japan's response measures after the accident run counter to this principle and regulation, attempting to evade the national liability for serious nuclear pollution of the marine environment.

China is the world's largest fishing nation in terms of its fishing fleet, the number of employees in the fishing industry, and marine capture production (Xin and Jia, 2020). The discharged nuclear wastewater flowed into China's waters along with ocean currents, affecting marine biological resources within the region. As a coastal country, China has the right to formulate measures to conserve and manage these biological resources based on following the *UNCLOS*[9]. Regarding domestic laws, China's regulatory legislation for pelagic fishery is connected with the *UNCLOS* and

7 Article 1: This Law enacted for the purpose of enhancing the protection, increase, development and rational utilization of fishery resources, developing artificial cultivation, ensuring fishery workers' lawful rights and interests and boosting fishery production, so as to meet the need of socialist construction and the people's needs.

8 Article VI (4): Each Contracting Party, directly or through a Secretariat established under a regional agreement, shall report to the Organization, and where appropriate to other Parties, the information specified in sub-paragraphs(c) and (d) of paragraph (1) above, and the criteria, measures and requirements it adopts in accordance with paragraph (3) above. The procedure to be followed and the nature of such reports shall be agreed by the Parties in consultation.

9 The United Nations Convention on the Law of the Sea (UNCLOS) is a comprehensive and authoritative statute law regulating ocean issues, which is widely respected by the international community. The institutions and rules formulated by its three internal organizations and detailed and supplementary contents of the two implementation agreements not only enrich the relevant institutions and systems but also play an important role in the development of marine affairs. China's domestic law of the sea formulated in accordance with UNCLOS conform to its standardized principles and systems, and international community's assessment of China's domestic law of the sea is continuously enriched and improved according to the development of the times and actual situations.

supplements it with a regional division of fishing areas. Since the division by the *UNCLOS* of the exclusive economic zone may result in overlapping pelagic fishery zones between China and neighboring countries, China should set up marine function zoning according to the *Law of the PRC on the Administration of the Use of Sea Areas*[10]. The *National Division of Marine Function Zones (2011–2020)* divided China's waters into zones with different marine functions according to various factors, including waters' geographical position, natural resources, natural environmental conditions, and social demands (Tang et al., 2022). Japan's discharge of Fukushima nuclear wastewater will undoubtedly have an impact on the function zone division system of China's waters.

Japan's nuclear wastewater discharge indirectly violates China's rights and interests in possessing and utilizing marine fishing resources on the principle of freedom. The *UNCLOS* manages highly migratory species based on regional division, a method that adheres to the sovereignty principle and the principle of freedom. The sovereignty principle helps extend coastal countries' right of jurisdiction, allowing these countries to develop and utilize fishing resources in the governed regions without violating the *UNCLOS*. The principle of freedom prevents the sea from encroachment and safeguards the freedom of utilization. Any country is prohibited from infringing upon other coastal sovereign countries' possession and utilization of fishing resources (Treves, 2010). Owing to Japan's nuclear wastewater discharge into the sea, the resource quality of China's pelagic fishery will be threatened by radioactive materials in nuclear wastewater. Hence, the discharge violates the lawful rights and interests China enjoys in pelagic fishing activities (Huang and Han, 2022).

4 A way forward—China's fishery legislative path for handling Japan's nuclear wastewater discharge

Before nuclear wastewater flows into the sea, the legislation of China for pelagic fishery focuses on protecting the marine ecological environment, sustainably utilizing resources, and cracking down on IUU fishing activities. For example, China's State Council launched a policy document on resource conservation and green aquaculture in the 13th Five-year-Plan fishery strategy (Zou and Huang, 2015). Although the regulation on green development did not specify the legislation of pelagic fishery, it is the general trend for governing the marine ecological environment in regulatory legislation because pelagic fishery remains a critical component of China's fishing resources.

China's idea of conserving pelagic fishing resources is consistent with the concept of safeguarding biological diversity in the *Biodiversity Beyond National Jurisdiction Agreement (BBNJ)* (Kahlil and Robin, 2021). It involves controlling overfishing in pelagic fishery and extends to repairing the damage of pelagic fishing habitats in the marine ecological environment caused by vessel-source pollution, exploration and development of ocean resources in the high seas, dumping, and other activities. It can be said that China attaches substantial importance to participating in the global marine ecological environment governance system. Through the ecological protection of pelagic fishing habits in pelagic fishery regulation, China seeks to achieve the sustainable development of marine biological resource utilization (Zhang et al., 2004). Therefore, after nuclear wastewater has flowed into the sea, China's legislative priority should be converted to devote resources to facilitating the establishment of a new pelagic fishery management and regulation system based on adherence to the principles of international environmental laws.

4.1 Changes in the management standards of China's fishery legislation

Before Japan discharged nuclear sewage into the sea, the international community's fishery management standard concepts emphasized green and sustainable development, with importance attached to governing the marine ecological environment. *The State of World Fisheries and Aquaculture 2016* noted that 31.4% of fish species in the sea had been overfished and were in a state of unsustainable development (FAO, 2016). In the long term, the sustainable development of global marine fishery can hardly be sustained. However, fortunately, this problem has attracted due attention from the international community. Correspondingly, the international community, which is widely discussing and investigating the causes of the mounting pressure on marine fishery resources, analyzing the possible impacts of different factors on the sustainable utilization of marine fishery resources, and actively seeking effective solutions to the marine fishery crisis. For instance, the UN Conference on Environment and Development, the Conference of the Parties to the *Convention on Biological Diversity*, FAO, and IMO are exploring effective measures for conserving marine fishery resources (United Nations, 1992).

Moreover, different entities, such as flag, coastal, port, and market states, have been widely required to participate in conserving marine fishery resources. Moreover, the pace of improving the legal system of marine fishery is accelerating, and all marine power states are exploring reasonable and effective paths to enhance the effect of marine fishery management measures. More multilateral international marine fishery laws have been enacted by marine power states, including international laws that normalize fishing activities and conserve marine ecological resources, international laws that safeguard security for fishing vessels, prevent pollution and protect fishing vessel crew members' rights, and international laws concerning the quality of aquatic products and international trade.

10 Article 4: The state applies the system for marine function zoning. The sea areas shall be used in conformity with the marine function zoning. Article 10- The department in charge of marine administration under the State Council shall, in conjunction with the departments concerned and the people's governments of coastal provinces, autonomous regions, and municipalities directly under the Central Government work out marine function zoning plans.

The *Fisheries Law of the PRC* has no complete extraterritorial effect and cannot manage many fishing behaviors in the pelagic fishery (Anastasia, 2014). The deficiency in such fishery management is likely to cause negative externalities in the ecological environment, interactive negative externalities between fishermen, and other supply chain problems. Therefore, China can formulate implementation rules or matching regulations to regulate the behaviors of catching such special fish. Additionally, a fine mechanism can be added to the personal quota system. Finally, a pelagic fishery management system can be established on the basis of legal provisions, such as the *Fisheries Law of the PRC* and the *Provisions on the Administration of Pelagic Fishery* to fulfill the obligation of conserving and managing fishing resources in the high seas and build the image of a responsible pelagic fishery power. Regarding the Northern Gulf waters, China and Vietnam signed the Sino-Vietnamese Agreement on Fishery Cooperation in the Northern Gulf, while the maritime delimitation of surrounding waters has not been achieved (Zou, 2004). Since China and Japan have not settled the boundaries of the exclusive economic zone in the East China Sea, both parties hold different opinions regarding the maritime delimitation of the East China Sea. Hence, the fishery agreement between China and Japan remains transitory. The fishery agreement between China and Korea was a transitory agreement signed before determining the maritime boundary line to maintain the fishery order and manage the fishery between both countries (Ministry of Foreign Affairs of the People's Republic of China, 2000). The above mentioned agreements were signed in around 2000 and had incomplete content. After Japan discharged nuclear wastewater into the sea, China and neighboring countries in the overlapping economic zone can consider negotiating a temporary agreement to enhance the sharing and governance of pelagic fishing resources in the Yellow Sea and the East Sea and build a compliant monitoring system to solve the nuclear wastewater pollution of fishing resources. Additionally, as the discussions on the *BBNJ* become increasingly specific, whether coastal countries are given the right to manage and control the marine resources outside the area of their national jurisdiction, including pelagic fishing resources, plays a key role in China's governance of the marine ecological environment in the overlapping area and its formulation of leading pelagic fishery legislation after the nuclear wastewater discharge (Liu, 2022).

Additionally, regarding the specific policies on the pelagic fishery, China's regulatory provisions on pelagic fishery lack foresight. The trend of developing China's domestic laws is establishing a pelagic fishing rules and regulations system according to relevant international conventions, agreements, and resolutions. Although China's *Fisheries Law of the PRC* has been revised four times since its formulation, relevant administrative laws have not been formulated simultaneously[11]. Therefore, China should facilitate the revision of the *Fisheries Law of the PRC* while formulating special laws to regulate the pelagic fishery, providing a legal guarantee for the normative and orderly development of the pelagic fishery. Also, it is necessary to improve the regulatory system where the fishery department plays a leading role, and relevant departments perform their duties and cooperate. Eventually, a sound basic regulation mechanism should be established based on special laws (Huang and Han, 2022).

4.2 Assist China's fishery legislation to form a complete extraterritorial effect

If China's *Fisheries Law of the PRC* lacks a complete extraterritorial effect for the nuclear wastewater discharge, China cannot manage the pelagic fishery strictly amid nuclear wastewater discharge (Yang, 2021). The legal extraterritorial effect refers to the law's binding force in areas outside the enactor's jurisdiction limits. It emphasizes that the law's binding force is extended spatially outside the law-making state's jurisdiction limits. Regarding the concrete means for presenting legal extraterritorial effect, three types of opinions prevail in domestic and foreign academic circles: First, a law's extraterritorial effect means that the law has a binding force on the people, objects, and acts in extraterritorial regions, including binding force for natives and foreigners in the extraterritorial region. The second opinion believes extraterritorial effect refers to the state where the domestic law can be applied to or implemented by extraterritorial institutions or administrative organs outside the enactor's jurisdictional limits. In addition to the two conditions mentioned above, the third opinion believes that legal extraterritorial effect is also demonstrated in adjusting foreign-related legal relations within the jurisdictional region. The first and second opinions fall in the typical connotation category of legal extraterritorial effect, while the third opinion is inconsistent with the connotation consensus of extraterritorial effect. Its theoretical foundation should be the principle of national sovereignty, which does not need to be discussed in the discourse system of extraterritorial effect. Therefore, the law's extraterritorial effect inevitably involves extraterritorial factors. The spatial extraterritorial factor is the core. It mainly refers to the spatial range of action of "force," an inherent nature of law, which is extended outside the law-making country's territory. It either means the law has a binding force on people and things, and acts outside the territory, or the law can be applied to the state organs of other countries. The fast decline in fishing resources within the waters under China's jurisdiction turns the pelagic fishery into an important means for China's fishing industry to "change its mode and adjust the structure." Achieving normalized and orderly development of the pelagic fishery is a critical component of the 13th Five-Year Plan for China's fishery. Nevertheless, the normalized and orderly development of China's pelagic fishery cannot be done without governing Chinese people's illegal pelagic fishing acts effectively.

If China's *Fisheries Law of the PRC* lacks a complete extraterritorial effect for the nuclear wastewater discharge, China cannot manage the pelagic fishery strictly amid nuclear wastewater discharge (Yang, 2021). Moreover, the international community may have a negative understanding of China, which affects China's image as a great power. However, introducing laws and regulations to improve pelagic fishery legislation cannot be attained in the short term. Instead, it takes adequate research results and extensive discussion to achieve satisfactory results. By contrast, strengthening the spatial effect of the *Fisheries Law of the PRC* only needs one clause

11 China's Fisheries Law of the People's Republic of China was revised in 2000, 2004, 2009, 2013 successively.

to be added to the existing spatial effect range, "The citizens and legal persons of the PRC and vessels registered in China have the right to engage in fishing production activities in the high seas and waters governed by other countries (Huang and Han, 2022)." This clause is sufficient to create a complete extraterritorial effect for managing China's pelagic fishery based on the *Fisheries Law of the PRC* and provide China's pelagic fishery with a broader institutional space for coping with Japan's nuclear wastewater discharge.

4.3 Improve the supporting administrative legislation system for China's fishery legislation to cope with nuclear sewage discharge

The regulation system for China's forbidden fishing areas is formulated by many subjects. The National People's Congress and its standing committee enact laws, while the State Council formulates administrative regulations (FAO, 2022). After four revisions in 2000, 2004, 2009, and 2013, China's *Fishery Law* has set up a complete institutional system with regulations on conserving and managing fishing resources. Following two revisions in 2020, China's *Rules for Implementation of the Fishery Law* serve as effective supplements to the *Fisheries Law*. China's *Provisions on the Administration of Pelagic Fishery* not only adds regulations on fishing rights and fishing licensing but also involves specific problems of pelagic fishing. However, these fishery laws generally lack enforceability regarding issues like Japan's nuclear sewage discharge. The reason is that China's fishery legislation contains no administrative laws and rules to make these regulations more concrete. For example, China's *Fisheries Law* should specify the fishing of radiation-contaminated fish. Once Japan's nuclear sewage discharge leads to such special fish, more severe punitive efforts should be made against people who catch such fish. With the increase in fish contaminated by Japan's nuclear sewage discharge, the local administrative governments must expand prohibited fishing zones flexibly.

Regarding relevant administrative enforcement measures, China should rapidly improve the boarding examination system for pelagic fishing vessels. *The Fisheries Law of the PRC* has authorized power to the normative documents on designating forbidden fishing areas (Shen and Huang, 2021). China's existing legislation on forbidden fishing areas fails to meet the demand for regulating pelagic fishing in regions with a high nuclear radiation level. Instead, China's existing pelagic fishery legislation focuses on regulating illegal fishing behaviors and the illegal destruction of the marine ecological environment (He and Zhang, 2022). The flows of nuclear wastewater into the sea have brought such thoughts to China's pelagic fishery: The pelagic fishery should be restricted, and such restrictions are not only reflected in the legitimacy of fishing behaviors but also involve harsher limitations on the fishing zone, particularly addressing forbidden fishing areas. The flexible extension of the forbidden fishing area is conducive to enhancing the conservation of pelagic fishing resources in the nuclear radiation zone.

The boarding inspection of pelagic fishing vessels should be supplemented by improving pelagic fishing vessel monitoring system. It requires China to focus on expanding the scope of monitoring waters and preventing fishing vessels from fishing in highly-radioactive waters when implementing the *Measures for the Administration of Position Monitoring of Pelagic Fishing Vessels* (Iwao et al., 2021). The *National Plan for Development of the Pelagic Fishery in the 13th Five-Year Plan Period* mentions monitoring pelagic fishing vessels to regulate the pelagic fishery[12]. The boarding inspection on the high seas generally checks whether the fishing vessel has complete fishing certification, whether a monitoring system has been installed, and whether they have the right to fish in the pelagic fishery (European Fisheries Control Agency, 2017). Unlike China, the international community's boarding inspection on the high seas aims to conserve and manage biological resources and break the exclusive jurisdiction of the flag country on domestic vessels on the high seas. In comparison, China's boarding inspection of pelagic fishing vessels aims to crack down on illegal fishing. Section 2 of Chapter II in the *White Paper 2020* stipulates that China supports cracking down on illegal fishing activities within the framework of relevant international laws (Chang and Mehran, 2021). With the background of nuclear wastewater discharge, the boarding inspection should be combined with international laws to prevent illegal fishing basChaned on avoiding those fish contaminated by nuclear radiation. To gain an initiative in the boarding inspection on the high seas for pelagic fishery and safeguard its image as a fishing power, China should take the lead in publishing documents on extending the content of boarding inspection and guide the establishment of a new pelagic fishing system in the international community.

4.4 China's fishery legislation should facilitate the digitalization of fishery management to monitor Japan's nuclear sewage discharge and its resultant harm

China's digital industry has advanced rapidly in recent years. Facing the dangers brought by Japan's nuclear sewage discharge, China's fishery legislation should encourage the government to exercise its coordination and guidance roles and set up a promotion mechanism for monitoring scientifically and detecting pelagic fishery. The fishery legislation should encourage marine scientific research institutions, technological promotion institutions, and marine enterprises to make full use of digital technology, study how to efficiently and practically prevent and narrow down the harm brought by Japan's nuclear sewage discharge to fishing resources, and test the scientific achievements obtained in labs in practices (Pierre Girard Maritime Survey and Thomas Du Payrat Odyssée Development, 2017). Fishery legislation should set up a professional talent incentive mechanism to raise technicians' initiative, encourage them to board ships, go to sea, conduct technological contracting in the front line regarding Japan's nuclear sewage discharge, and make technical breakthroughs. More specifically, the frequency of monitoring should be

12 The fourth part "Key Task" of the national plan stipulates these contents, which is legally binding in China.

increased, and the monitoring range must be expanded. It is necessary to collect and record dynamic data concerning nuclear radiation during monitoring. The regulations on monitoring the legitimacy of pelagic fishing vessels and restricting fishermen's fishing acts are effective means for monitoring the source of deep-sea aquatic products and pelagic fishery. Tracking the imports and exports of deep-sea aquatic products aims to restrict the pelagic fishery from the consumption perspective, and prevent Japan from exporting radiation-contaminated fish to China. The *White Paper 2020* implements import inspection, supervision, and export certification for various fish products entering and leaving China, ensuring the export of fish catch is legal, compliant, and traceable (Chang and Mehran, 2021). Nevertheless, it excludes the inspection and detection of fish contaminated by nuclear radiation. The *National Plan for Development of Pelagic Fishery in the 13th Five-year Plan Period* also requires integrating matching functions, including fishing, breeding, processing, logistics trade, vessel maintenance, and personnel training, as per to the *Plan for Building Two Zones for Agricultural Foreign Cooperation*[13]. In other words, it aims to achieve a complete industrial chain from pelagic fishing and the cultivation of professional technicians to export monitoring, without mentioning the restrictions of catching fish in nuclear-radioactive waters.

Additionally, China and Russia signed an intergovernmental agreement on cracking down on illegal fishing, which agreed to implement import monitoring on partial products from Russia, prevent illegally fished products from entering the Chinese market, and guarantee the products distributed in the Chinese market are from a legal source (Huang and Han, 2022). Thus, monitoring the import and export of deep-sea products is a significant measure in regulating China's pelagic fishery. Currently, China has not realized the importance of monitoring fish contaminated by nuclear radiation. Therefore, China should focus on monitoring marine products imported from Japanese waters in subsequent import and export monitoring certification systems. The State Oceanic Administration of China can further raise the monitoring frequency and monitor the same waters several times. Subsequently, the collected data should be compared and studied to calculate the average radiation level in these waters. Additionally, the State Ocean Administration can expand the monitoring range and set up several mobile monitoring stations surrounding Japan to monitor the radiation content of seawater and diverse marine creatures. Moreover, relevant data should be updated over time to provide evidence for claiming compensation, and the accuracy of monitoring data should be improved. First, the State Ocean Administration's staff should select seawater samples strictly from representative waters in accordance with established standards. Following this selection, all samples should be prepared as per monitoring standards; such procedures are conducive to conserving the characteristics of the original samples and improving the accuracy of the monitoring data. Second, the monitoring equipment must be updated in time. The equipment that is used often should be examined and repaired on a regular basis. It is vital that the monitoring is conducted based on specific monitoring standards. The same waters can then be monitored several times to make the monitoring data more accurate. Finally, the monitoring data should be processed scientifically (Albus et al., 2020). Generally, the modified value comparison method is adopted to determine whether the results of the monitoring data are consistent with monitoring standards and regulations.

13 Part 4 (4) of National Plan for Development of Pelagic Fishery in the 13th Five-year Plan.

5 Conclusion

Japan's discharge of Fukushima nuclear wastewater infringes on the right to development of every country that may be affected. First, discharging nuclear wastewater into the sea will damage the right to development on the economic development level. Nuclear pollution will thwart neighboring countries' fisheries and limit the economic development of coastal areas, failing to guarantee that the affected developing and developed countries enjoy the same rights to environmental development. Second, discharging nuclear wastewater into the sea will damage the right to development on the level of sustainable development. To protect the normal development of its fishery and particularly pelagic fishery, China should not only introduce relevant content concerning international laws into domestic laws but also address the realistic changes caused by Japan's discharge of nuclear wastewater. Furthermore, and equally important, China must improve its domestic fishing laws and policies, thereby protecting its fishery and contributing to the sustainable development of fishery in Asia-Pacific regions.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

ML undertook the write-up, revisions and proofreads. The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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