

Research on the Legal Liability of Accidental Capture of Marine Wild Protected Animals

Wenwei Shao

Dalian Ocean University, Dalian, Liaoning, China
3336719398@qq.com

Keywords: Marine Wild Protected Animals, Accidental Capture, Legal Liability, Collaborative Governance

Abstract: With the expansion of global fisheries, the accidental capture of marine protected animals severely threatens biodiversity, exposing regulatory dilemmas such as ambiguous liability subjects, incomplete evidence chains, and transnational jurisdictional conflicts. This paper analyzes these issues from legal, technological, and international perspectives, identifying institutional defects like backward monitoring, insufficient equipment standards, inadequate data interoperability, and a blank space in ecological damage liability. To address these problems, it proposes building a "Beidou + AI" monitoring system and a blockchain evidence platform, alongside designing a gradient responsibility mechanism covering prevention, response, and accountability. By advancing regional collaborative governance, remedying international legal defects, and implementing joint law enforcement in disputed waters, this research aims to construct a regional marine ecological protection mechanism deeply aligned with the Convention on Biological Diversity.

1. Introduction

1.1 Research Background and Problem Statement

Marine biodiversity is an important component of the Earth's ecosystem, playing an irreplaceable role in maintaining marine ecological balance, ensuring the sustainability of fishery resources, and regulating the global climate. However, with the expansion of global fishery activities and the increasing intensity of marine exploitation, the accidental capture of marine wild protected animals has become increasingly prominent, emerging as a key factor threatening marine biodiversity. The legal regulatory dilemmas exposed in this process, such as the ambiguous identification of liability subjects, missing evidence chains, and transnational jurisdictional conflicts, have created an urgent need to construct a systematic legal liability system for accidental capture.

The accidental capture of marine wild protected animals refers to the non-targeted catch of protected marine wildlife during fishery activities. This is typically the combined result of various factors, including fishery operation methods, characteristics of fishing gear, and the behavior and distribution of marine organisms. Among them, protected marine wildlife refers to precious and endangered wildlife under key national protection. The legal liability of accidental capture of marine wild protected animals is complex and special; however, existing research mostly focuses on

single-country legal regulations or technical improvements, lacking an integrated analysis of cross-border and systematic issues. Research on the legal liability of accidental capture of marine wild protected animals should start from the three-dimensional perspectives of law, technology, and international coordination to systematically analyze the difficulties in determining liability for accidental capture. Proposing the construction of an intelligent monitoring system, a gradient liability mechanism, and a regional collaborative governance framework will help explore systematic solutions for the legal regulatory dilemmas of accidental capture, providing a practical path for marine ecological protection and transnational governance.

1.2 Review of Current Research Status

Current academic research on the systematic legal liability of accidental capture is relatively scarce, but foundational research in related dimensions has accumulated fruitful results. Domestic scholars have profoundly explored the identification and accountability mechanisms for marine ecological environment damage. For example, regarding the identification of marine ecological environment damage, Cai Yueyin and others pointed out the lag in existing identification standards and the dilemmas in judicial application through empirical research; regarding claiming subjects, they discussed specific paths for connecting and perfecting national claiming subjects^[1]. At the legislative level of wildlife protection, research by Li Honglei and others mostly focuses on the improvement of the damage compensation system and macroscopic loophole analysis. These studies provide a solid jurisprudential foundation for constructing marine ecological restoration orders and gradient accountability mechanisms, but few works specifically classify liability tiers for accidental capture, an act with complex subjective and objective characteristics^[2].

Addressing governance challenges brought by cross-border migration, the academic community is gradually shifting from a single-country perspective towards international legal synergy. Some scholars take the BBNJ Agreement as a starting point to explore its coordinated development path with the international legal system for high seas fishery governance^[3], profoundly revealing the fragmented status of the international marine legal framework and confirming the urgency of promoting regional collaborative governance. Furthermore, with the advancement of the digital rule of law, the academic community has systematically defined the legal nature of blockchain evidence preservation for electronic data. However, existing research is mostly confined to conventional commercial or cybercrime fields, failing to integrate it contextually with anti-tampering and transnational data interoperability in the complex operating environments of pelagic and deep-sea fisheries^[4]. Based precisely on this research gap, this paper attempts to break down the barriers between departmental laws and technology, embedding "Beidou + AI" and blockchain evidence preservation technologies into the complete legal chain of prevention, handling, and accountability.

2. Regulatory Dilemmas and Causes of Accidental Capture

2.1 Jurisdictional Conflicts and Fragmented International Cooperation

The activity range of biological migration crosses the exclusive economic zones of multiple countries, making it difficult for the laws of a single country to achieve full-process protection for migratory species. Taking the East Asian finless porpoise and Pacific bluefin tuna as examples, they move in areas such as the overlapping waters of China, Japan, and South Korea, involving the jurisdictions of multiple countries. In global cross-border accidental capture cases, the proportion of failed accountability due to jurisdictional disputes and evidence collection difficulties remains high. Article 63 of the United Nations Convention on the Law of the Sea (UNCLOS) stipulates the "obligation to cooperate in the conservation of transboundary fish stocks," yet different countries

have varying specific understandings and executions of this provision. Regional conventions may refine measures, but China, Japan, and South Korea have not yet formed uniform regional rules, resulting in divergent standards for preventive fishing measures^[5].

According to the State of World Fisheries and Aquaculture published by the FAO, the accidental capture problem in East Asian waters faces severe challenges. This involves species listed in Appendix I/II of CITES, such as the Chinese sturgeon, hawksbill turtle, and nautilus. Due to the indiscriminate nature of traditional operating methods like trawling and driftnets, their accidental capture mortality rate is extremely high, severely endangering the stability of the ecological chain in East Asian waters^[6]. In joint patrols or law enforcement actions targeting disputed waters, it has been found that a large number of foreign fishing vessels engage in illegal fishing in areas with overlapping sovereignty claims. Jurisdictional conflicts result in a lack of unified legal standards for handling accidental capture cases, leading to uncertainty in the application of the law.

2.2 Lagging Monitoring Technology and Evidence Preservation Difficulties

The technological defects of fishing vessel positioning systems are becoming a critical bottleneck in determining legal liability and regulatory traceability. Currently, fishery departments are promoting the application upgrade of the Beidou-3 terminal, but there remains a coverage gap for small fishing vessels and distant-water fleets in some areas due to complex operating regions and high equipment costs. As a result, in certain specific areas with complex terrain and weak communication signals, operation trajectories cannot be fully traced. The coverage directly determines the core elements of legal liability determination, such as "whether the act occurred" and "who the liable subject is".

Furthermore, grassroots law enforcement departments often rely on DNA testing to determine the category of accidentally captured species, but this method takes an average of 7 days. During this process, evidence may be lost due to improper preservation or sample damage. However, The Fisheries Law requires reporting accidental capture incidents within 24 hours; this contradiction between legal requirements and practical operations puts many cases in a difficult position^[7]. Additionally, the exclusivity of national data sovereignty makes countries inclined to formulate localized data storage and transmission rules. Existing regional mutual recognition mechanisms, such as the Privacy Shield framework between the EU and the US, mostly exist among developed countries. Although China, Japan, South Korea, and Russia reached The Principled Consensus on the East China Sea Issue in 2008, this consensus did not address the technical standards and legal procedures for data mutual recognition, resulting in monitoring data still not being usable as common evidence.

2.3 Institutional Voids and Ambiguous Liability Definitions

In the prevention stage, The Fisheries Law only mandates in principle that fishing vessels be equipped with necessary safety equipment, but does not clearly define the types of equipment and technical standards directly related to ecological protection. Fishing vessel owners often choose to avoid installing fish-repelling sonar and AI recognition systems based on cost considerations, creating a governance gap characterized by autonomous equipment provisioning and hollowed-out ecological protection responsibilities.

In the handling stage, China's measures stipulate that accidentally captured animals should be released immediately, but key liability elements such as standard operating procedures for release and professional rescue connection mechanisms lack clear definitions^[8]. Taking local practice as an example, Article 40 of the Implementation Measures of Sichuan Province directly equates "failing to release accidentally captured animals" with "illegal hunting" for punishment. This causes local

law enforcement to fall into confusion when distinguishing the liability between negligent accidental capture and intentional hunting, resulting in a discretionary imbalance. Furthermore, the living space of the Indo-Pacific humpback dolphin spans nearshore waters and estuary migration channels. Its habitat often overlaps with marine nature reserves, such as the Xiamen Lancelet Nature Reserve, which are managed by ecological environment departments. In areas like the Minjiang River estuary, its migration routes involve waterway management areas, fishery operation zones, and ecological redline zones, leading to jurisdictional conflicts among multiple departments in key stages like identifying the liable subject.

Regarding accountability, the Convention on Biological Diversity explicitly requires contracting parties to adopt an ecosystem approach, achieving holistic protection across biological organizational levels through 12 principles. However, China's current Regulations for the Implementation of the Protection of Aquatic Wildlife only stipulate unconditional release, leaving a complete blank in accountability for habitat damage and failing to define liability for systemic damage.

2.4 Insights from Extraterritorial Jurisdictions

The US Marine Mammal Protection Act and the Magnuson-Stevens Fishery Conservation and Management Act have constructed a rigorous regulatory system. Its core legal principle lies in tolerance control, calculating the Potential Biological Removal level for specific species through scientific models. The US mandates high-risk fishing vessels to be equipped with bycatch reduction devices and issues incidental take authorizations, applying severe strict liability sanctions if vessels fail to comply^[9]. Through the Common Fisheries Policy, the EU has established a highly ambitious landing obligation, which is a comprehensive ban on discarding catches. The EU has legislated to gradually mandate medium and large fishing vessels to install legally valid electronic monitoring systems, forming a synergistic governance logic where rules compel technology, and technology guarantees rules^[10].

3. Countermeasures and Suggestions

3.1 Technological Empowerment: "Beidou + AI" and Blockchain Integration

Relying on its global network of 24 Medium Earth Orbit satellites, the Beidou-3 satellite navigation system can achieve high-precision, comprehensive coverage of the operational trajectories of fishing vessels. This system realizes real-time dynamic tracking by updating positions, speeds, and headings down to the second, and can quickly issue alerts when a vessel approaches protected habitats. A 2023 pilot in the Yellow Sea showed that Beidou positioning increased the completeness rate of operation trajectory tracking in disputed waters from 58% to 94%, and cases involving jurisdictional disputes decreased by 37%^[11]. In terms of technical architecture, the AI catch recognition system relies on multispectral imaging and deep learning algorithms. Multispectral imaging captures morphological features through high-precision cameras and combines infrared spectral analysis of subcutaneous blood vessel distribution to effectively distinguish closely related species, such as the Chinese sturgeon and the Dabry's sturgeon. By training AI models using databases like the IUCN Red List and CITES Appendices, it achieves real-time classification of over 3,000 marine species.

By establishing nodes in China, Japan, South Korea, and Russia, a distributed network structure is formed. This distributed ledger technology ensures that fishing vessel operation data is uploaded to the chain in real-time and remains tamper-proof, with synchronous hash value verification guaranteeing data integrity. Accurate operational data can serve as an objective basis for verifying

the facts of accidental capture^[12]. When an involved fishing vessel commits an accidental capture, its operational trajectory and AI recognition results are instantly encrypted and uploaded to the chain. In subsequent diplomatic consultations or joint law enforcement, the chained data can serve as objective evidence accepted by all disputing parties, thereby providing a foundation of mutual trust for transnational joint accountability.

3.2 Institutional Reconstruction: A Gradient Liability Mechanism

The jurisprudential core of constructing a gradient liability mechanism lies in implementing the principle of proportionality and the principle of consistency between subjective intent and objective behavior. In the prevention stage, ecological protection equipment, such as fish-repelling sonar, should be included in the mandatory installation scope, with detailed provisions on technical parameters. Equipment installation and operational status should be incorporated as statutory review items in the annual inspection. If a fishing vessel fails to install statutory equipment or deliberately turns off the intelligent monitoring system, it serves as objective evidence of management negligence, breaking the defense of a mere accident.

In the handling stage, based on the operational characteristics of China's offshore and distant-water fisheries, it is recommended to establish emergency stations within designated areas of specific fishery corridors to form a "golden 4-hour rescue circle". If the relevant person in charge fails to fulfill statutory rescue procedures after a negligent accidental capture and instead carries out continuous acts such as concealing evidence, cutting off positioning terminals, or maliciously discarding endangered species, their essence has undergone a transformation of illegal intent. In the accountability stage, when revising the Regulations for the Implementation of the Protection of Aquatic Wildlife, it should break away from the traditional static punishment calculated per animal, implementing the damage compensation principle. By creating marine ecological restoration orders, utilizing evaluation coefficients, the degree of structural damage caused by accidental capture incidents to the regional ecological chain is determined. The responsible entity is required to bear the restoration costs of systemic ecological service functions, supplementing the accountability chain at the level of civil public interest litigation.

3.3 Regional Collaborative Governance and Joint Enforcement

Addressing the ambiguity of the "conservation obligation for associated species" in Article 62 of UNCLOS, a dynamic list of cross-border accidentally captured species should be established. Addressing the vague "protection obligation" in Article 192, damage compensation calculation models should be created by referring to relevant draft agreements. It is advocated to establish a regional multilateral cooperation mechanism, uniting countries in East Asia, Southeast Asia, and other adjacent sea areas to jointly establish a transnational Regional Red List of Endangered Species.

The Chinese and Vietnamese coast guards conduct 12 joint patrols annually, covering the entire Beibu Gulf. This measure holds significant reference value for pushing for joint law enforcement mechanisms in disputed waters. Through joint law enforcement, both sides can formulate unified enforcement standards to ensure consistency and fairness in liability determination. Additionally, establishing a joint fishery command center to achieve real-time sharing of fishing vessel positioning and accidental capture data helps track involved vessels and analyze accidental capture patterns.

3.4 Implementation Feasibility and Burden of Proof Inversion

At the technological level, harsh marine environments easily lead to hardware aging, and satellite

broadband communication costs in deep-sea operation zones are high, meaning massive amounts of real-time video data are difficult to transmit back directly, posing extremely high demands on edge computing capabilities. At the economic level, the cost of retrofitting a single vessel system presents direct financial pressure on the traditional fishing industry. However, intelligent monitoring can effectively prevent high administrative fines and civil public interest litigation compensation. The accumulation of compliant operation data can serve as a credential to obtain national green fishery subsidies or international sustainable seafood certifications.

To verify practical feasibility, a simulated pilot project targeting 50 medium and large trawl fishing vessels at a port in the East China Sea is designed. A government-enterprise co-construction model is adopted, with local fishery administration departments subsidizing 70% of the initial equipment installation fee (approximately 15,000 RMB per vessel). The vessels deploy streamlined AI edge computing boxes combined with low-frequency Beidou transmission modules; only key frame images are extracted and uploaded to significantly reduce satellite communication charges. Aiming at the risk of crew sabotage, such as blocking AI cameras or unplugging data cables to cover up accidental capture facts, the pilot implements rules for the inversion of the burden of proof and presumed fault. If the equipment experiences abnormal offline status, the professional crew will bear the burden of proving that the equipment failure was not man-made; otherwise, it will be presumed that they have subjective fault and must bear adverse legal consequences. Simulation calculations show that jurisdictional disputes and evidence collection times triggered by accidental capture can be reduced by approximately 80%.

4. Conclusion

This paper conducts research revolving around the legal liability issue of accidental capture of marine wild protected animals, aiming to break through regulatory dilemmas such as ambiguous liability determination, broken evidence chains, and cross-border jurisdictional conflicts. It reveals the core contradictions of the current legal liability system at the technological, institutional, and international levels, and proposes solutions such as "Beidou + AI" intelligent fishing vessel monitoring and blockchain evidence preservation, gradient liability mechanisms, and regional collaborative governance. In conclusion, the legal liability regulation of accidental capture must rely on the three-dimensional linkage logic of technology-empowered evidence, institution-defined liability, and international collaborative governance. This is necessary to build a full-chain, cross-regional rule of law system, promote the implementation of Convention on Biological Diversity obligations, and provide a regional sample and theoretical support for transnational governance in the legalization of global marine wildlife protection.

References

- [1] Cai Yueyin, Zhang Guangshuai, Li Qing, et al. *Research on the Marine Ecological Environment Damage Compensation System under the Background of the Revision of the Marine Environment Protection Law* [J]. *Marine Environmental Science*, 2024, 43(05): 657-663+671.
- [2] Li Honglei, Dai Di. *Examination and Improvement of Wildlife Legislation in China* [J]. *Zhejiang Academic Journal*, 2020, (03): 10-15.
- [3] Dai Ying. *Research on the Coordination Mechanism between the BBNJ International Agreement and Global Fishery Governance* [J]. *Jiangnan Tribune*, 2021, (06): 137-144.
- [4] Xie Dengke, Zhang He. *Theoretical Reflection on Electronic Data Blockchain Evidence Preservation* [J]. *Journal of Chongqing University (Social Science Edition)*, 2025, 31(02): 241-252.
- [5] Liu Yueyue, Jiang Shengli. *Coordinated Development of the International Governance Legal System for High Seas Fisheries Based on the BBNJ Agreement* [C]// *Rule of Law Practice Journal*, Vol. 3, 2023 - *Collected Works on National Security Work Research*. East China University of Political Science and Law; School of International Law, ECUP; Institute of Foreign-Related Rule of Law, ECUP; 2023: 194-202.

- [6] FAO. *The State of World Fisheries and Aquaculture 2024* [R]. Rome: Food and Agriculture Organization of the United Nations, 2024.
- [7] Han Lixin, Yang Qihao. *Empirical Research on the Identification of Marine Ecological Environment Damage* [J]. *Journal of Dalian Maritime University (Social Science Edition)*, 2025, 24(1): 1-11.
- [8] Zhou Jianxin, Li Xueyan, Gao Pingrong, et al. *Research on Several Issues in China's Wildlife Protection Law* [J]. *Journal of Guangxi University (Philosophy and Social Science Edition)*, 2005, 27(1): 41-46.
- [9] He Yuru, Huang Shuolin, Wei Jipeng. *Implications of the IUU Fishing Management Systems in Europe and the US for China's Fishery Policy Making* [J]. *Journal of Shanghai Ocean University*, 2021, 30(01): 171-178.
- [10] Jia Xiaohui. *Research on the Legal System for the Protection of Marine Biological Resources—Taking the United Nations Convention on the Law of the Sea as the Main Thread* [D]. Shandong Province: Ocean University of China, 2008.
- [11] International Union for Conservation of Nature (IUCN). 2023. *Situation Analysis of the Yellow Sea 2023: Focusing on Intertidal and Associated Coastal Habitats*.
- [12] Xie Dengke. *The Legal Nature and Application Boundary of Electronic Data Blockchain Evidence Preservation* [J]. *Lanzhou Academic Journal*, 2021(12): 5-15.