Protecting the Yangtze Finless Porpoise: Measures for Preventing and Controlling Water Pollution in the Yangtze River

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Abstract: The Yangtze finless porpoise, an ecologically vital species, is currently facing severe threats from water pollution in its native habitat, the Yangtze River. This study examines the various sources of this pollution, which include industrial discharge, agricultural runoff, and domestic waste, and assesses their adverse effects on the porpoise population. Notable impacts include increased mortality, reproductive challenges, and loss of habitat. The paper evaluates the effectiveness of existing conservation strategies and governance mechanisms, highlighting the need for stricter enforcement of pollution control laws and the establishment of protected areas. It also suggests the integration of advanced water treatment technologies and a comprehensive monitoring system involving both governmental and non-governmental stakeholders. The article underscores the importance of community engagement and education, as well as international cooperation in conservation efforts, to ensure the long-term survival of the Yangtze finless porpoise. This comprehensive approach aims to mitigate the negative effects of pollution and foster a sustainable environment for this critical species.

1 INTRODUCTION

The finless porpoise is a small toothed whale belonging to the mammalian class, cetacea, toothed whale suborder, porpoise family, and finless porpoise genus. The finless porpoise is small in size, with a blunt and round head, no dorsal fin, and an unequal number of small spines in the middle of the back. It has a flat tail fin, with a body length of 130~160 cm as adults. It is distributed in tropical and subtropical coastal waters and rivers in Asia, mainly in the Pacific coast of Japan, the Sea of Japan, the Seto Inland Sea and the coastal waters of Korea in the north, the northern Java Islands in Indonesia in the south, and the coast of the Persian Gulf in the west. The finless porpoise is distributed in China's coastal waters and rivers, lakes and estuaries, such as the lower reaches of the Yalu River, the middle and lower reaches of the Yangtze River, and the Qiantang River. In the Yangtze River, finless porpoises are found in the lower reaches of the Yichang River and the Tongjiang Lake. They can enter the Dongting Lake and even trace the Nanxiang River, and can also be seen in Poyang Lake and the connected Ganjiang River (Zhang, 2012).

However, since 2006, the water ecology in the middle and lower parts of the Yangtze River basin has been declining due to extreme weather and increased human activity. In particular, regions like Poyang Lake and Dongting Lake have witnessed numerous deaths of finless porpoises. To better understand the population of Yangtze finless porpoises, the Institute of Hydrobiology of the Chinese Academy of Sciences, in collaboration with the World Wide Fund for Nature (WWF), the Wuhan Baiji Dolphin Conservation Foundation (WBCF), and various government entities, have jointly conducted several field investigations focusing on these porpoises (Xiong and Huang, 2022). At the same time, relevant scientific research institutions, dolphin protection institutions, and fishery management institutions from China and abroad actively participated in the event to show their attention. These initiatives aimed to investigate the critically endangered Yangtze finless porpoise, assess its population status and habitat status, and hope to find the rarer baiji porpoise once again. The focus and efforts directed towards the finless porpoise population hold immense historical importance for safeguarding not only the Yangtze finless porpoise but also the entire ecosystem of the Yangtze River.

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The Yangtze finless porpoise stands as a pivotal species in the ecosystem of the Yangtze River, as evidenced by recent data. However, it faces severe threats, primarily stemming from illegal fishing and water pollution, with the latter exhibiting a broader and more pressing impact. This article thus aims to dissect the causes of water pollution, its ramifications on finless porpoises, and evaluate existing remedial measures.

2 WATER POLLUTION IN THE YANGTZE RIVER

The current state of water pollution in the Yangtze River reveals alarming trends attributed to various factors. Industrial effluents, agricultural runoff, and urban waste contribute significantly to the degradation of water quality, posing severe challenges to the survival of aquatic life.

2.1 Current Status of the Yangtze River

Human civilization has embarked on water since ancient times, and human beings are as dependent on water as babies are on milk. The Yangtze River, being the largest in China, holds an indispensable position in the country's social and economic development. However, such a golden waterway, which is also unique in the world, has now become a sewer for human beings on both sides of the river to discharge wastewater. All kinds of waste and garbage have been poured into it to have made the Yangtze River more and more polluted. Increasing pollution is turning the Yangtze River into severe danger. Pollution causes serious harm to a variety of fish forage organisms, such as plankton and benthic organisms, destroys the food chain of fish, and directly affects the growth of fish. In particular, those precious aquatic creatures including finless porpoises are in danger of extinction, and more aquatic creatures are also facing a survival crisis. If effective countermeasures are not taken in time, it won't be much time before all aquatic creatures in the Yangtze River are eradicated (Wang and Wang, 2004).

2.2 Causes

The main sources of water pollution in the Yangtze River include soil erosion, farmland drainage, industrial sewage discharge in the whole basin, oil pollution discharge from mainstream transport ships and man-made solid waste. Recently, with the rapid development of industry and agriculture in the basin, the scale of cities has been expanding, and the pollution of surface water bodies in the basin has become increasingly serious. The discharge of sewage outlets along the River is the root cause of near-shore pollution in the mainstream and its larger tributaries. There are more than 400 sewage outlets below Panzhihua city in the mainstream of the Yangtze River, and most of them are located on the shore. The mainstream of the River serves as the primary water source for cities and towns along its banks, with over 500 water intakes of various kinds currently in operation. These intakes are all subject to varying degrees of influence from pollution along the riverbanks. Over years, as economic development has surged in the Yangtze Basin, sewage discharge across the entire basin has been increasing at a rate of 3% annually. A significant portion of this sewage is being directly released into the river without adequate treatment. Moreover, there are over 100,000 ships navigating the mainstream, the majority of which lack oil-water separation and domestic sewage treatment devices. Consequently, millions of tons of oily sewage, nearly 100 million tons of domestic sewage, and 750 million tons of household garbage are being discharged into the Yangtze River annually. This constitutes a significant and mobile pollution source that cannot be overlooked in the context of the Yangtze River (Yin, 2003).

Besides, pollution incidents and ship accidents, involving the capsizing of vessels carrying various chemicals such as sulfuric acid, luminol, kerosene, and crude oil, have exacerbated the degradation of water resources in the Yangtze River. According to statistics, in 1997 and 1998, there were 63 and 70 ship accidents in the mainstream of the Yangtze River. Moreover, non-utilitarian solid waste, such as expired newspapers, glass bottles, metal cans, paper cups, plastic bottles, abandoned vehicles, rubber, slag, animal skins, dust, sludge, and food residues, has been indiscriminately discarded into the Yangtze River. The substantial accumulation of solid waste along the Yangtze River constitutes another significant factor contributing to the pollution of its water quality. In 1992, the annual production of solid waste in the Three Gorges Reservoir area alone reached 4.62 million tons, and the stockpile reached 21.7 million tons. These untreated solid wastes were washed by floods and leached by rainwater, and various toxic and harmful substances in them were easy to enter the water body and seriously polluted

the water quality. There were nearly 20 million tons of industrial and domestic waste stored below the submerged line in the towns along the river below Chongqing, and there was no domestic waste treatment plant that met the national standard. A large number of graves, toilets and hospital sewage were stored in the towns below the submerged line, as well as various mines and slags, all of which were leached out and spread into the water body in large quantities (Dong et al., 2000).

3 THE IMPACTS ON FINLESS PORPOISES

The Yangtze finless porpoise, with its dwindling population and restricted habitat, faces grave consequences due to water pollution. Direct mortality events, as well as reproductive impairments, have been observed, exacerbating the species' decline. Furthermore, deteriorating water conditions lead to the shrinking of viable habitats, exacerbating the porpoise's plight.

3.1 The Declining Finless Porpoise

According to the survey data from 1984 to 1991, the number of finless porpoises in the Yangtze River was estimated to be 2,700, of which about 500 were in the section from Yichang to Wuhan and about 2,200 in the section below Wuhan. According to the results of the 2006 Yangtze River Freshwater Dolphin Expedition, the population of the Yangtze finless porpoise was about 1,800 by the end of 2006, which means a decline at a rate of about 5% per year. The Yangtze finless porpoise has been listed as a national second-class protected animal and is listed as an endangered species by the International Union for Nature Conservation Commission on Species Survival (IUCN-SSC). Given its endangered status and deteriorating living environment of the Yangtze finless porpoise, the Chinese government has been working hard to upgrade it to a national first-class key protected species. Six years later, Chinese scientists set sail again in November 2012 at the dock in Wuhan to explore the Yangtze finless porpoise along the Wuhan-Yichang-Wuhan-Shanghai-Wuhan line in the middle and lower reaches of the Yangtze River. The 2012 Yangtze River Freshwater Dolphin Expedition was organized by the Ministry of Agriculture, with the participation of the Institute of Hydrobiology of the Chinese Academy of Sciences(the Institute), the World Wide Fund (WWF) and the Wuhan Baiji Dolphin Conservation Foundation. A scientific expedition team composed of nearly 40 representatives, as well as volunteers, launched an expedition to the mainstream (Wang and Guo, 2022).

3.2 The Severe Impact of Water Pollution on the Finless Porpoise

In 2006, the Yangtze River freshwater dolphin survey found no baiji dolphins, and the number of finless porpoises was found to have dropped sharply, to only about 1,800 individuals. According to estimates at the time, if no effective measures were taken, the number of finless porpoises could fall to 200 by the year of 2035, reaching the critically endangered standard of the IUCN Red List of Threatened Species. Before the start of the 2012 expedition, the team conducted a pre-survey of the two remaining large lakes on the River, Poyang Lake and Dongting Lake, at the end of October. A preliminary survey of the two lakes revealed that there were about 450 finless porpoises in Poyang Lake and about 90 in Dongting Lake. Compared with the results of the 2006 expedition, the number of finless porpoises in Dongting Lake has decreased significantly, and the distribution area has also narrowed to the waters from the catfish mouth of East Dongting Lake to Yueyang City. This indicated that the living environment of the finless porpoise had further deteriorated.

4 DISCUSSION

As a particular species of the Yangtze River ecosystem, the finless porpoise is a direct reflection of the health status of the River. After those investigations, the Institute has been revising and improving the Rescue Action Plan, which will be submitted to the Ministry for approval and official release. The plan proposes to comprehensively strengthen the protection of finless porpoises and their habitats through a three-pronged approach of natural population and habitat conservation, ex-situ conservation and artificial breeding research.

4.1 Existing Methods

Existing governance methods aimed at curbing water pollution exhibit varying degrees of effectiveness. While some strategies show promise, others fall short of addressing the root causes adequately.

The Institute is mainly engaged in freshwater ecology and aquatic life conservation and applied research. Since the 70s the last century, it has been committed to the research and protection of the finless porpoise in the Yangtze River and has put forward three major conservation countermeasures: in situ conservation, ex-situ conservation and artificial breeding protection. At the same time, it carried out multidisciplinary comprehensive research on the conservation biology of the finless porpoise. Since the 90s of last century, under the guidance and support of the aquatic wildlife protection department, the Institute has promoted the establishment of several national, provincial and municipal nature reserves, ex-situ protected areas in the mainstream of the middle and lower reaches of the Yangtze River and Tongjiang lakes. Since 1992, researchers from the Institute have moved a small group of Yangtze finless porpoises from the mainstream to the ex-situ porpoise reserve in Shishou Tian'ezhou, Hubei Province, and carried out ex-situ conservation research. In addition, there are 7 Yangtze finless porpoises raised in the Baiji Dolphin House of the Aquatic Institute, which is currently the only captive breeding group of Yangtze finless porpoises. At present, the Institute of Aquatic Sciences is assisting the Aquatic Wildlife Conservation Office of the Ministry of Agriculture in revising the Yangtze Finless Porpoise Rescue Action Plan. The plan is an important guiding document for the conservation of freshwater dolphins in the Yangtze River in China for a long time (Yu, Dong and Wang, 2002).

4.2 Prospective Suggestions

Suggestions for enhancing regulatory frameworks and implementing stricter enforcement mechanisms could bolster conservation endeavors and safeguard the Yangtze finless porpoise's future.

The WWF, recognized as one of the world's foremost and autonomous non-governmental environmental conservation organizations, began its operations in China during the 1980s. Within the Yangtze basin, the WWF designates the Yangtze finless porpoise as one of its three flagship species, alongside the giant panda and the snow leopard. The organization has maintained a longstanding commitment to and advocacy for the conservation of the finless porpoise. In the coming five years, WWF will strengthen the protection action of finless porpoises in the following four aspects: 1)Drawing lessons from the successful model of the Tian'ezhou Ex-situ Conservation Area and leveraging the geographical advantages of the Yangtze River to encourage the establishment of additional ex-situ protected zones. 2)Intensifying efforts to combat illegal fishing, bolster pollution control measures and law enforcement, reduce the discharge of sewage into rivers, and enhance societal oversight to mitigate harm to the finless porpoise. 3)Advocating for the recognition of the Yangtze finless porpoise as a nationally designated first-class protected species. 4)Urging the government to enact the rescue action plan aimed at fortifying protection measures for the entire population and habitat of the Yangtze finless porpoise. (Shan, 2019).

4.3 Potential Reviews: Raising Awareness of Water Conservation

Although the water resources are relatively abundant, the total amount is still limited, and the spatial and temporal distribution is uneven. For an extended period, there has been a widespread belief that the Yangtze possesses a vast and seemingly limitless water supply. People often do not pay attention to cherishing, saving and protecting water resources, especially the development of industry and cities. It has paid large attention to economic benefits and ignored environmental protection, sewage and wastewater discharge at will so that the water environment in the Yangtze River basin is deteriorating day by day. The result is affecting human health, restricting economic development, and affecting the sustainable usage of water resources. Mankind is in an important historical period, and we must renew our thinking and raise our awareness of the importance of protecting water resources for the implementation of sustainable development. Preserving the water resources of the Yangtze River is a collective responsibility that requires mobilizing the entire society. It's essential to rally all sectors of society through intensified advocacy, education, and public oversight, ensuring widespread understanding and adherence to water-related laws. Strengthening public awareness of water resource protection is crucial, with a particular emphasis on fostering a conscious commitment to environmental stewardship among leaders at all levels. This involves ingraining values of valuing, cherishing, and safeguarding water resources as integral behaviors of the populace. The protection of water resources should be managed in a unified manner by the principles of integrating water resources and the water environment, so as to achieve macro-control and formulate and plan the objectives, measures and requirements (Chen, 2013).

Water resources in the Yangtze River basin play an irreplaceable role in China's sustainable

development. The current Constitution stipulates the principles of the State for the protection of the environment, and the prevention and control of pollution and other public hazards. The shortcoming is that it does not explicitly regard sustainable development as the guiding ideology for the protection of the environment and resources. This problem also exists in China's Environmental Protection Law and other laws and regulations related to environmental protection, pollution prevention and control, and protection of natural resources. However, China's 10 major countermeasures for environment and development, as well as the White Paper and Outline, all regard the implementation of the strategy of sustainable development as a major strategy for modernization. This shows that there is a disconnect between China's environmental and resource laws and environmental and resource policies. In addition, China's individual natural resources law was formulated in the 80s of the 20th century, because the guiding ideology did not regard ecological environmental protection as an important legislative purpose, and there was a lack of specific provisions on ecological environmental protection in the development of natural resources, it was difficult for the laws of these natural resources to meet the needs of ecological environmental protection. The Constitution should therefore be amended in due course to include a sustainable development component. Sustainable development is based on the protection of natural resources and the environment, and development and resources and environmental protection are interrelated, and they constitute an organic whole, which should be reflected in the fundamental law of the country (Chen, Shi and Wang 2003).

5 CONCLUSION

The Yangtze finless porpoise faces a dire predicament due primarily to persistent water pollution in its natural habitat. Our findings reveal that the key pollutants—industrial waste, agricultural runoff, and domestic sewage—are critically impairing the river ecosystem, thereby affecting the porpoise's survival through direct toxicity, disruption of food sources, and degradation of breeding areas.

The analysis underscores the inadequacy of current environmental governance and conservation strategies in effectively mitigating these impacts. For a viable future for the Yangtze finless porpoise, the paper advocates for the implementation of advanced pollution control technologies and stricter regulatory frameworks.

Additionally, the paper calls for enhanced protective measures such as the creation of designated sanctuaries. Fostering community involvement and promoting international collaborative efforts are essential for the long-term conservation of this endangered species. These comprehensive measures are crucial not only for the porpoise but also for preserving the ecological balance of the Yangtze River ecosystem.

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