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Marine Conservation Enhancement Fund (MCEF)

Completion Report

(2021-2024)

Project Title:	Understanding and Managing the Threats of Toxic Algae to the Chinese White Dolphin and Finless Porpoise in Hong Kong's Southern and Western Waters
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Name of Applicant Organisation:	The Hong Kong Polytechnic University

Executive Summary

The project titled "Understanding and managing the threats of toxic algae to the Chinese White Dolphin and Finless Porpoise in Hong Kong's southern and western waters" was initiated to address the ecological impacts of toxigenic algae on critical marine species such as the Chinese White Dolphin and the finless porpoise in Hong Kong. The primary focus was on the lipophilic toxins produced by these algae, which can pose significant risks to top predators like the Chinese White Dolphin and Finless Porpoise, both of which are species of conservation concern.

The main objectives were to:

1. Establish a comprehensive understanding of the dynamics of harmful and toxic microalgae.
2. Evaluate the trophic transfer of algal toxins to marine mammals.
3. Assess the impact of these toxins on the health of affected marine species.
4. Disseminate findings to inform marine conservation strategies.

To achieve these goals, the project employed a multi-faceted approach that included extensive fieldwork, laboratory analyses, and the development of a harmful and toxic microalgae database (HTMaDB) and species-specific cell lines for the Chinese White Dolphin and the finless porpoise. Field surveys were conducted across various seasons to collect and analyze samples for microalgal communities, algal toxins, and their environmental triggers. Laboratory work focused on identifying and characterizing the algal species involved, their toxin production, and the toxicity of these toxins and other pollutants on dolphin and porpoise cells.

The project's key findings provided significant ecological insights, revealing distinct seasonal patterns in the phytoplankton community with an increase in taxonomic richness and toxin production during the dry season; dinoflagellates were identified as the dominant contributors to toxin production, while diatoms were more associated with non-toxic, bloom-forming species. The project successfully utilized the harmful and toxic microalgae database (HTMaDB) to map the distribution and abundance of these microalgae, significantly enhancing our understanding of algal bloom dynamics. On the impact on marine mammals, the creation of species-specific cell lines for the Chinese White Dolphin and Finless Porpoise facilitated direct assessments of toxin impacts, which showed significant cytotoxicity and potential disruption to cellular functions; risk assessments highlighted the high risks posed by certain algal toxins, especially those affecting cell viability during the dry season when toxin concentrations peaked. From a management and conservation perspective, these findings are pivotal for developing strategies to manage harmful algal blooms (HABs) and mitigate their impacts on marine biodiversity and public health, enabling the formulation of data-driven management strategies to predict and mitigate the impacts of toxic algae on vulnerable marine species and ecosystems.

The outcomes of the project were extensively disseminated through peer-reviewed publications, conferences, and public engagement initiatives, ensuring that the scientific insights reached a broad audience, including researchers, conservationists, and policymakers. Training sessions and workshops further extended the impact of the project by building capacity among local and international stakeholders in marine and environmental science.

The project not only met but exceeded its objectives by establishing a solid foundation for future research and conservation efforts. It bridged the gap between scientific research and

practical conservation strategies. The ongoing research will continue to explore the interactions within marine ecosystems, focusing on microbial dynamics and their role in algal bloom formation and toxin production. This forward-looking approach ensures sustained contributions to marine conservation and policy development, reinforcing the project's long-term commitment to environmental stewardship and sustainable management of marine resources.