

Hong Kong Offshore LNG Terminal Project, Marine Conservation Enhancement Fund
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Space and time matter: Long-term spatiotemporal distribution of sea turtle strandings and factors contributing to their morbidity and mortality in Hong Kong waters

Executive Summary and Way Forward

The project was designed to strengthen the scientific foundation for sea turtle conservation in Hong Kong by consolidating historical records, enhancing stranding investigation, and translating research into public education and conservation action. From 1 December 2022 to 30 November 2025, the team integrated retrospective data from the Agriculture, Fisheries and Conservation Department (AFCD) with prospectively collected cases examined through a standardised virtopsy-led workflow. This produced a dataset spanning over two decades of sea turtle strandings in Hong Kong waters. The project substantially improved understanding of temporal patterns, spatial distribution, and likely causes of mortality, while highlighting the importance of rapid reporting, coordinated response, and sustained public engagement in marine conservation.

A key achievement was the assembly of a comprehensive dataset (2002–2025) covering both live and deceased strandings, with standardised information on species, life stage, location, and apparent cause. Analyses focused on 2002–2024 data (excluding 2025 due to project end) and applied monthly summaries, seasonal grouping, generalized additive modelling, and kernel density estimation. These approaches enabled a shift from descriptive reporting to evidence-based interpretation. Results showed a steady increase in strandings from 2002 to a peak in 2018, followed by a plateau through 2024. This trend indicates persistent pressure on sea turtles; the recent stabilisation likely reflects interactions among environmental conditions, human activity, reporting effort, and carcass recovery, rather than reduced risk.

Seasonal patterns were also evident. Strandings peaked in January, April, and November, with the lowest numbers in February. Juveniles were dominating across distributions, followed by adults and sub-adults, consistent with higher vulnerability of younger individuals to environmental and anthropogenic stressors. Spatially, strandings occurred across Hong Kong but were concentrated in eastern waters, particularly Sai Kung. Kernel density analyses showed higher densities of deceased cases in eastern and southern waters, while live strandings were mainly concentrated in the east. These findings suggest that certain coastal areas function as recurrent risk zones or recovery hotspots, providing a clear basis for prioritising monitoring, response, and mitigation.

The project also clarified likely causes of mortality. Many cases remained undetermined due to advanced decomposition, limiting diagnostic resolution. Among identified causes, anthropogenic factors (i.e., fishery interaction, vessel collision, pollution) were prominent. This underscores the cumulative impact of human threats on sea turtles in Hong Kong. The high proportion of undetermined cases reinforces a central conclusion: without timely reporting and carcass retrieval, critical opportunities to identify mortality drivers are lost. The project therefore not only documents mortality patterns but also demonstrates the need for a more responsive and coordinated conservation system.

A major scientific output was the peer-reviewed publication “Mapping the past for the future: Spatial and temporal patterns and long-term trends of sea turtle strandings in Hong Kong and wider East Asian waters” in *Ecological Informatics*. This manuscript integrates AFCD data with project-generated records and applies robust statistical and spatial analyses, providing one of the most comprehensive long-term assessments in the region. Beyond documenting cases, it interprets ecological and management implications, identifying high-risk seasons, hotspot areas, and anthropogenic pressures. It serves both as a scientific reference and a practical tool for conservation planning.

The project’s impact extended beyond publication through sustained public engagement. Findings were disseminated via social media, workshops, exhibitions, guided activities, and regional scientific exchange. Social media platforms provided ongoing outreach on sea turtle conservation and marine stewardship. Workshops translated technical findings into accessible knowledge and promoted citizen participation through the mobile application *eSeaAnimals*. HK SciFest 2025 further expanded outreach through talks and guided sessions. Extensive media appearance, including 19 interviews with TV, radio, and print media, effectively heightened public discourse on marine conservation. These activities were integral to the project’s knowledge-transfer mission, ensuring research outputs were accessible, visible, and socially relevant.

Methodologically, the project established a strengthened framework for sea turtle conservation in Hong Kong. Retrospective and prospective records were unified into a single analytical structure, supported by standardised cause-of-mortality classification and a consistent investigation workflow. The resulting dataset provides a critical baseline for future analyses of species composition, stranding frequency, seasonality, and spatial patterns. The project also reinforced the importance of rapid response and public reporting in improving diagnostic certainty and enabling timely intervention. Tools such as the *eSeaAnimals* app, workshops, and social media should be regarded as operational components of conservation rather than ancillary outreach.

Looking ahead, several priorities emerge. Continued monitoring should focus on eastern waters, particularly Sai Kung, where strandings are consistently concentrated. Reporting systems should be strengthened to enhance case retrieval and diagnostic outcomes. The dataset should support finer-scale hotspot analysis and investigation of links between strandings and anthropogenic pressures. Public outreach should remain active, as awareness directly influences reporting and community support. Finally, regional collaboration should be expanded, recognising that effective sea turtle conservation in East Asia requires cross-border data sharing and coordinated strategies.

In conclusion, the project achieved its objectives by delivering a long-term, evidence-based assessment of sea turtle strandings in Hong Kong, producing a high-quality peer-reviewed publication, and establishing strong public engagement. Its value lies in integrating historical data, ongoing investigation, and conservation communication into a coherent framework for future action. The findings demonstrate that strandings are structured ecological signals reflecting seasonality, spatial concentration, and human pressure. Future efforts should build on this foundation by improving response efficiency, refining hotspot analysis, and sustaining outreach to ensure conservation impact.