Hong Kong Offshore LNG Terminal Project
MCEF22116 Completion Report

1. Funded Project Information

Funding Scheme:	Marine Conservation Enhancement Fund			
Project Number:	MCEF22116			
Project Title:	Exploring the hidden fish community and fishery value of estuarine mangroves in western Hong Kong waters through environmental DNA metabarcoding			
Name of Organisation:	Lingnan University			
Reporting Period:	From:	01/01/2024	To:	31/12/2025
Date of Report Submission:	28/02/2026			
Project Leader:	Dr. Chi-Ho IP, Assistant Professor			

Executive Summary

Hong Kong's western estuarine waters, particularly mangrove habitats in Deep Bay and around Lantau Island, support highly diverse fish and decapod assemblages that provide essential nursery, foraging, and refuge functions, sustaining local fisheries and traditional practices such as gei wai culture. These vulnerable ecosystems face intense pressures from overexploitation, habitat loss, urbanization, and hydrological changes in the heavily impacted Pearl River Estuary region. Conventional survey methods (e.g., gillnets, purse seines, and underwater visual census) are limited by high turbidity, shallow depths, structural complexity, and low visibility, often failing to detect cryptic, rare, or habitat-hiding species.

This study addressed critical knowledge gaps by conducting the first application of environmental DNA (eDNA) metabarcoding alongside conventional surveys (gillnets and baited cage traps) to comprehensively assess fish and decapod biodiversity in western Hong Kong mangrove ecosystems. Over a one-year period with quarterly sampling, we surveyed four sites (Ha Pak Nai, Ngau Hom Sha, Tung Chung, Tai O) along a salinity and environmental gradient from semi-enclosed, estuarine inner Deep Bay to more open, oceanic-influenced southwest Lantau waters. Sampling targeted both mangrove and adjacent open-water (control) habitats during dry and wet seasons to evaluate spatiotemporal dynamics, methodological complementarity, and seasonal changes.

The combined approaches detected 196 fish species (142 genera, 78 families), 32 crustacean species (23 genera, 12 families, including 2 stomatopods), three elasmobranchs, and two marine mammals. eDNA metabarcoding alone detected 147 fish species (75.0%) and 14 crustacean species (43.7%) missed by conventional methods, including nine IUCN-threatened species exclusively via eDNA (e.g., Japanese Eel *Anguilla japonica*, Chinese White Dolphin *Sousa chinensis*). This highlights eDNA's superior sensitivity for rare, cryptic, or low-abundance taxa, confirming its value as a non-destructive, complementary tool for turbid estuarine systems.

Distinct spatial patterns emerged, with assemblages differing between Deep Bay (warmer, lower salinity) and Lantau sites (higher salinity/conductivity influence), primarily driven by temperature and conductivity gradients (as revealed by dbRDA). Seasonal turnover was more pronounced in eDNA data, reflecting finer detection of temporal shifts despite relatively stable overall diversity. No significant differences were found between mangrove and open-water habitats, likely due to strong tidal mixing and hydrological connectivity homogenizing shallow estuarine communities.

These results establish a robust baseline for mangrove-associated fish and decapod communities in western Hong Kong waters, revealing substantial fishery value (58 commercial species detected, many exclusively via eDNA) and underscoring the power of integrating eDNA metabarcoding with traditional surveys for comprehensive, sustainable monitoring. The findings directly support informed decision-making for estuarine ecological management, conservation priorities under Hong Kong's Biodiversity Strategy and Action Plan (BSAP), and sustainable fishery practices in threatened mangrove ecosystems of the Pearl River Estuary region.