

Persistent Gene Flow and Fine-Scale Genetic Retention in an Endangered Marine "Living Fossil" across a Degraded Strait Seascape

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Host: Dr Lee Bee Yan

Registration: [Zoom Link](#)



ABSTRACT:

Coastal habitat fragmentation is widely assumed to erode genetic connectivity in marine species, particularly those dependent on intertidal spawning grounds. Yet the extent to which marine dispersal buffers against fragmentation at conservation-relevant spatial scales remains unresolved. The Taiwan Strait, shaped by complex geological history, dynamic oceanography, and intensive coastal modification, provides a natural system in which this assumption can be tested. Whole-genome resequencing was used to resolve population structure in the tri-spine horseshoe crab (*Tachypleus tridentatus*), a species linking intertidal nurseries with continental shelf habitats. Despite documented habitat degradation and regional population declines, genetic connectivity was found to persist among Xiamen, Kinmen, Penghu, and Taiwan Island, with only shallow differentiation detected. These results indicate that adult dispersal currently mitigates the immediate genetic effects of habitat fragmentation. However, fine-scale analyses identified a Penghu-saved genetic component within the central strait, consistent with localized retention shaped by oceanographic processes and geological history. This pattern supports a corridor–filter framework in which strait–archipelago systems simultaneously promote gene flow while maintaining spatially structured heterogeneity. Overall, broad-scale genetic connectivity can persist in marine species with dispersive life-history stages even within fragmented coastal systems, whereas fine-scale structure reflects the enduring influence of oceanographic and geological dynamics. This genome-wide, strait-scale approach provides a generalizable framework for evaluating fragmentation impacts in dynamic coastal environments worldwide.

About the Speaker:

Dr Shih Yi-Jia is a marine biologist with a Ph.D. in Environmental Biology and Fisheries Science. Her research utilizes integrated approaches based on genomics, resource assessment, and morphological taxonomy. Her primary research focuses on: 1) **Crustacean Systematic**: Investigating marine crab taxonomy, diversity, phylogeny, and environmental adaptation using morphological and genomic methods; 2) **Population Dynamics and Habitat Spatial Planning**: Assessing population sizes, dispersal patterns, and genetic structures of endangered and keystone species to directly guide the spatial planning of their conservation habitats. By formulating protection strategies and evaluating the effectiveness of wetland restoration and marine protected areas, this provides empirical scientific evidence for sustainable marine biodiversity conservation; and 3) **Habitat Restoration Effectiveness Assessment**: Evaluating ecological recovery and blue carbon sequestration potential within mangrove reforestation sites. By monitoring changes in benthic biodiversity and carbon storage following the removal of invasive plants (e.g., *Spartina alterniflora*), it provides empirical scientific evidence for sustainable wetland management and marine conservation.