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Effects of herbivorous fish community structure on dominance of corals

Cheng-Han comes from Taiwan, where he studied forestry and ecology at the National Taiwan University. His MSc thesis was completed under the supervision of Dr T. S. Ding and entitled "Plant-plant interaction and habitat heterogeneity shape individual spatial patterns of woody plant community in a subtropical rainforest". After this, Cheng investigated climate and anthropogenic impacts on the ecosystems found in Lake Biwa as part of a team under Dr Chihhao Hsieh at the Institute of Oceanography, National Taiwan University. This encompassed diverse topics ranging from environmental changes to phytoplankton, zooplankton and fish ecology and led Cheng to develop an interest in aquatic ecology, fisheries, and theoretical ecology, heading a project entitled "Phytoplankton functional group dynamics explain species abundance distribution in a directionally changing environment". This was a time series approach of classical species-abundance patterns.

Cheng-Han's PhD project will develop an integrated framework and new quantitative tools to investigate the effects of herbivorous fish community structure on the dominance of corals in fluctuating environments.

It is generally assumed that herbivorous fish biodiversity sustains coral reef ecosystem functions and resilience, with species richness in a community increasing with niche partitioning among species, such that the top-down control (trophic cascade) can maintain the coral dominated state.
However, the functional consequences of fish species richness remain largely uncertain. This is because different coexistence mechanisms underlie responses to environmental stochasticity, which then structure communities and determine the net effect of species richness.

This project will use a large-scale spatio-temporal coral reef monitoring data set, to explore coexistence mechanisms underlying fish communities (especially species' niche differences, interactions, and responses to environmental stochasticity), and their influence on the spatio-temporal changes in benthic coral versus algal coverage (proxy for top-down control). The resulting integrated framework and quantitative techniques developed to link the role of ecological community structure to ecosystem function, can improve future predictive ecosystem modelling.