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30th September 2024

Dear MCEF Committee,

Re: Completion report MCEF20002 When was Acropora-coral-habitable environmental quality lost from the Hong Kong's southern waters? Historical ecology approach.

Here I would like to submit our completion report for the period from 1st September 2021 to 31st August 2024.

9.1.1 an executive summary of 1-2 pages of the Funded Project including a way forward following completion of the Funded Project;

A complete understanding of the long-term degradation of coral reefs or coral communities remains elusive, as it relies on limited biological observations from recent decades and often fragmentary historical and fossil records. Through environmental degradation over a long span of time, shifting baseline syndrome causes younger generations to have a hard time imagining how pristine coral reefs would be like. Here, using high-resolution radiocarbon dating on dead corals from Hong Kong SAR, at the northern tip of the Coral Triangle biodiversity hotspot, we investigated historical community changes in the reef-building coral, *Acropora*. Our results enabled us to unravel implications of the shifting baseline syndrome in this region. Initial coral collapse was driven by a substantial reorganization of atmospheric and oceanic circulation patterns, e.g., the ENSO variability enhancement and Asian Monsoon changes around 4000 years ago, which was a Pacific-wide pervasive event. Soon after the coral recovery at ~2000 years ago, when the climate variability subsided, the lime kiln industry started, leading to the 2nd collapse of the coral population at ~1000 years ago. After subsequent recovery at ~500 years ago, the lime kiln industry emerged again from ~300–200 years ago, leading to the 3rd collapse by early 20th Century. Although corals recovered again probably by 1980s, intense eutrophication in 1980–1990s led the corals to the 4th collapse. Shifting baseline syndrome made people to realize the situations before the final 1980s collapse difficult, but there were healthy natural corals in 7000–4000 years ago and multiple collapses and recoveries due to climate and humans. This historical lesson helps us to think about the future of other places of the Coral Triangle, where corals are less impacted by humans but potentially more vulnerable to climatic change. PI Yasuhara and the senior research assistant will write publications in peer-reviewed international journals and conduct public seminars to disseminate the results.