

FUTURE OF GIANT CLAM MARICULTURE IN SINGAPORE: PROBLEMS AND POTENTIAL SOLUTIONS

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ABSTRACT

Singapore waters are heavily loaded with sediments, caused mainly by three decades of land reclamation and constant dredging for harbor and navigational purposes. Although all domestic sewage from mainland Singapore is treated, the waters also contain relatively high levels of nutrients, possibly due to heavy shipping activities, and other anthropogenic sources from the Johore and Malacca Straits. Ammonium and phosphate concentrations have been found to be 15 and 8 times higher, respectively, compared to levels at the Great Barrier Reef. The high sedimentation and nutrient levels have had a major effect on marine life in Singapore, especially coral reefs. Recent surveys made around the southern islands of Singapore recorded very few giant clams, compared to observations made two decades ago. Apart from the environmental issues, the unmanaged collection in the past also led to the serious decline of the giant clam population today. Consequently, one of the aims of the Tropical Marine Science Initiative of the National University of Singapore, is a reseeded of the reefs in Singapore's Marine Nature Areas.

The rehabilitation of giant clams in Singapore will be launched with the following aim:

- a. Breed *Tridacna squamosa*, *T. crocea*, *T. maxima* and *Hippopus hippopus* in enriched waters;
- b. Study the settlement stage of giant clam larvae;
- c. Study the effects of nutrients on the early stages of clams such as the effects on survival at metamorphosis and settlement stages (the most critical phases) and the effects on growth of juveniles;
- d. Observe animal physiology under high nutrients and sedimentation rates such as the observation of clearance and filtration rates in waters with high sedimentation rates and the observation of photosynthetic and filter feeding processes under high nutrient levels; and
- e. Observe major stress signals due to water quality criteria.

The expected outputs of the project will provide an insight into the following processes:

- a. The effects of high level of nutrients and sediments at each stage of the Tridacnidae life cycle;
- b. Biohabitats and associations of giant clams with other marine organisms in a stressful environment due to heavy anthropogenic outputs; and
- c. The effects of increased nutrient level on reef health, in relation to coral reef community structure and calcium-carbonate deposition.