





RESEARCH ARTICLE

Population status and genetic diversity of two endangered giant clams (*Tridacna squamosa* and *Tridacna maxima*) on the fringing reefs of Perhentian Islands, Malaysia

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Abstract

1. With the increasing demand for giant clams in the ornamental trade as well as habitat destruction of coral reefs, giant clam populations have been threatened across the Indo-Pacific. This study documents the population status and genetic diversity of giant clams in Perhentian Islands Marine Park (PMP), a Marine Protected Area (MPA) on the east coast of Peninsular Malaysia, plus Rhu Island, an adjacent island outside the MPA.
2. Of the 13 reef sites surveyed across an area of 11,200 m², two giant clam species were recorded: *Tridacna squamosa* and *Tridacna maxima*, with average densities of 1.5 ± 2.2 and 5.2 ± 6.0 ind. 100 m⁻², respectively. The size-class survey revealed a higher number of *T. maxima* recruits (88 recruits) as compared to *T. squamosa* (only three recruits), suggesting a disparity in recruitment in the area.
3. The genetic diversity of *T. squamosa* ($n = 83$) and *T. maxima* ($n = 104$) was explored using the mitochondrial cytochrome c oxidase I (*COI*) and 16S rRNA gene markers. Interestingly, a higher genetic diversity was detected in *COI* than 16S for both species. No significant genetic differentiation was detected between the populations of PMP and Rhu Island, while a low but significant genetic structure was detected in both species across the sites of PMP (*COI* datasets, AMOVA, *T. squamosa*, $F_{CT} = 0.14$, $P < 0.05$; *T. maxima*, $F_{CT} = 0.11$, $P < 0.05$).
4. In general, the results of this study revealed healthy giant clam populations in PMP, but the decline warrants urgent attention to integrating conservation strategies such as restoration programmes in conjunction with a sustainable giant clam fishery. Given the relatively high genetic diversity of *T. maxima* at Rhu Island, expansion of the current MPA is needed for better conservation coverage.

KEYWORDS

coral reef, genetic structure, giant clam, mitochondrial DNA, recruitment, size-class distribution