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The Giant Barrel Sponge *Xestospongia testudinaria* Shelters a Number of Indo-Pacific Reef-Building Corals

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Abstract

It is known that the giant barrel sponge (GBS) *Xestospongia* spp. may provide shelter or a micro-environment for multi-species coral colonies both in the Indo-Pacific and Atlantic regions. An assessment of such interactions between Indo-Pacific GBS *Xestospongia testudinaria* and stony corals performed for two groups of small Vietnamese islands in the Gulf of Thailand revealed at least 12 species of scleractinians associated with GBS. An average of 21.7% of all observed GBSs were found to interact with stony corals. The phenomenon of positive GBS–coral interactions without any restrictions on coral development can be regarded as a form of ecological facultative commensalism and warrants further investigation.

Keywords: coral-sponge interaction; stony corals; micro-environment; shelter

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An effect of shelter, or micro-environment, which giant barrel sponge (GBS) may provide for multi-species coral colonies is known both for the Indo-Pacific GBS *Xestospongia testudinaria* [1] and for the Atlantic GBS *Xestospongia muta* [2]. During coral surveys conducted in the period of May–June 2025 off the Vietnamese Tho Chu Islands and An Thoi Islands in the Gulf of Thailand (Figure 1), we carried out an assessment of the associations between *Xestospongia testudinaria* and scleractinian corals over a 1 h dive period at four different locations within the 5–12 m depth range. The results are presented in Figure 2. Typically, coral fragments found inside the oscula of GBSs are the result of strong hydrodynamic forces generated by storms and cyclones. However, the roughly indented surface of GBSs' bodies may contribute to the keeping of the coral fragments even outside osculum on the outer pinacoderm. Once settled, coral fragments that attach to the sponge's surface, both inside and outside oscula, grow and develop into adult colonies (Figures 3A–F and 4A,B). Occasionally the sponge itself may grow around (Figure 4C) or even over live coral colonies (Figure 4D). Sponges harboring large coral colonies are often morphologically distorted but do not appear to be negatively affected by the presence of these colonies (Figures 3D and 4A,C). In total, at least 12 species of scleractinians were found to be associated with GBS, with an average of 21.7% of all sponges observed during the dives being involved in such interactions. The lower occurrence of GBS–sponge interactions at site 4 may possibly be due to lower coral cover at this location. Sponges inhabiting coral reef ecosystems are usually regarded as spatial competitors, overgrowing

reef-building corals [3–5], or as active bioeroders of coral skeletons [6,7]. Some sponges, such as the coral-killing encrusting cyanosponge *Terpios hoshinota*, may cause extensive losses of stony coral cover [8,9].

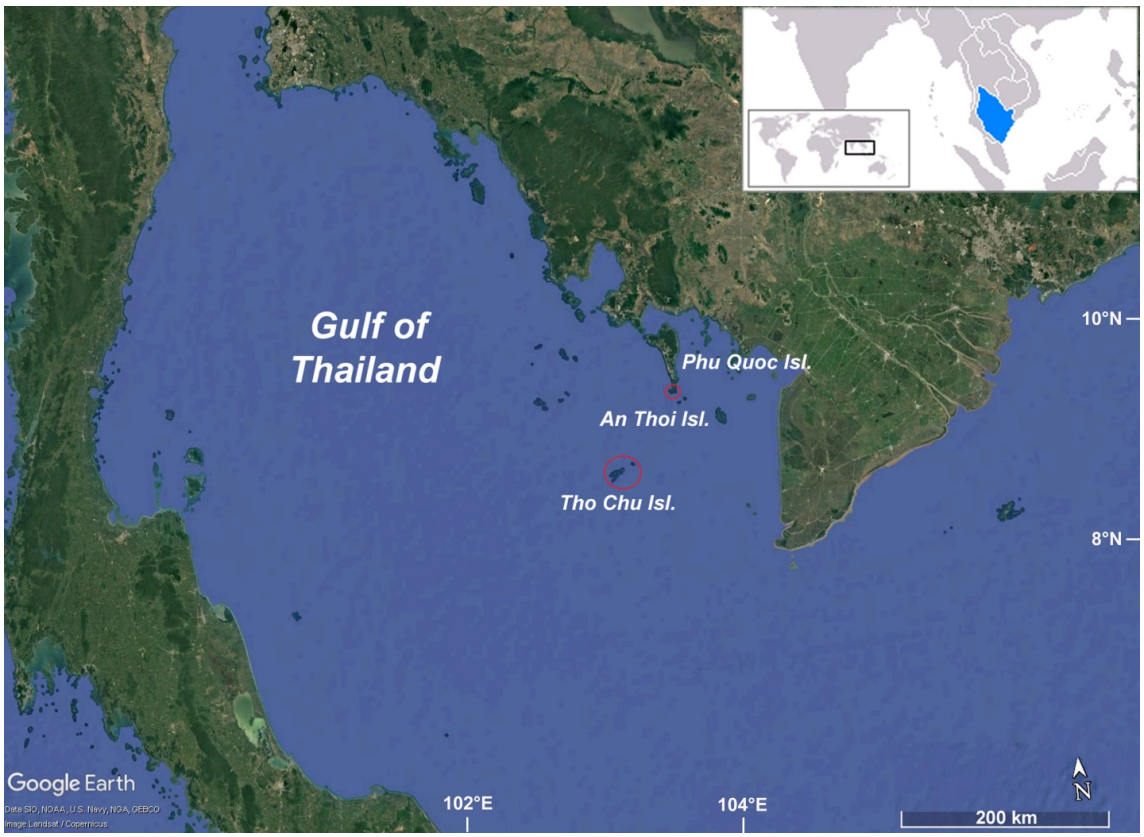


Figure 1. The two study sites (Tho Chu Islands and An Thoi Islands) in the Gulf of Thailand.

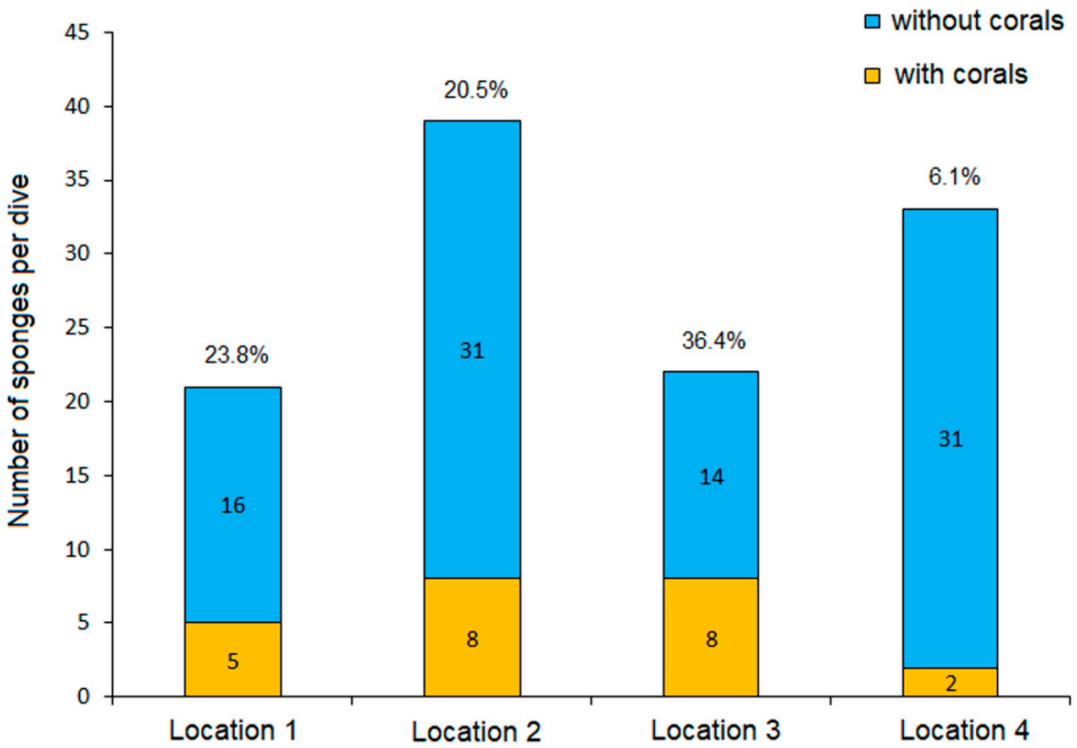


Figure 2. Occurrence of coral–sponge interactions per dive. Names of locations 1–4 are, respectively, Hon Nhan, Lighthouse, Kim Quy, and Gam Ghi.

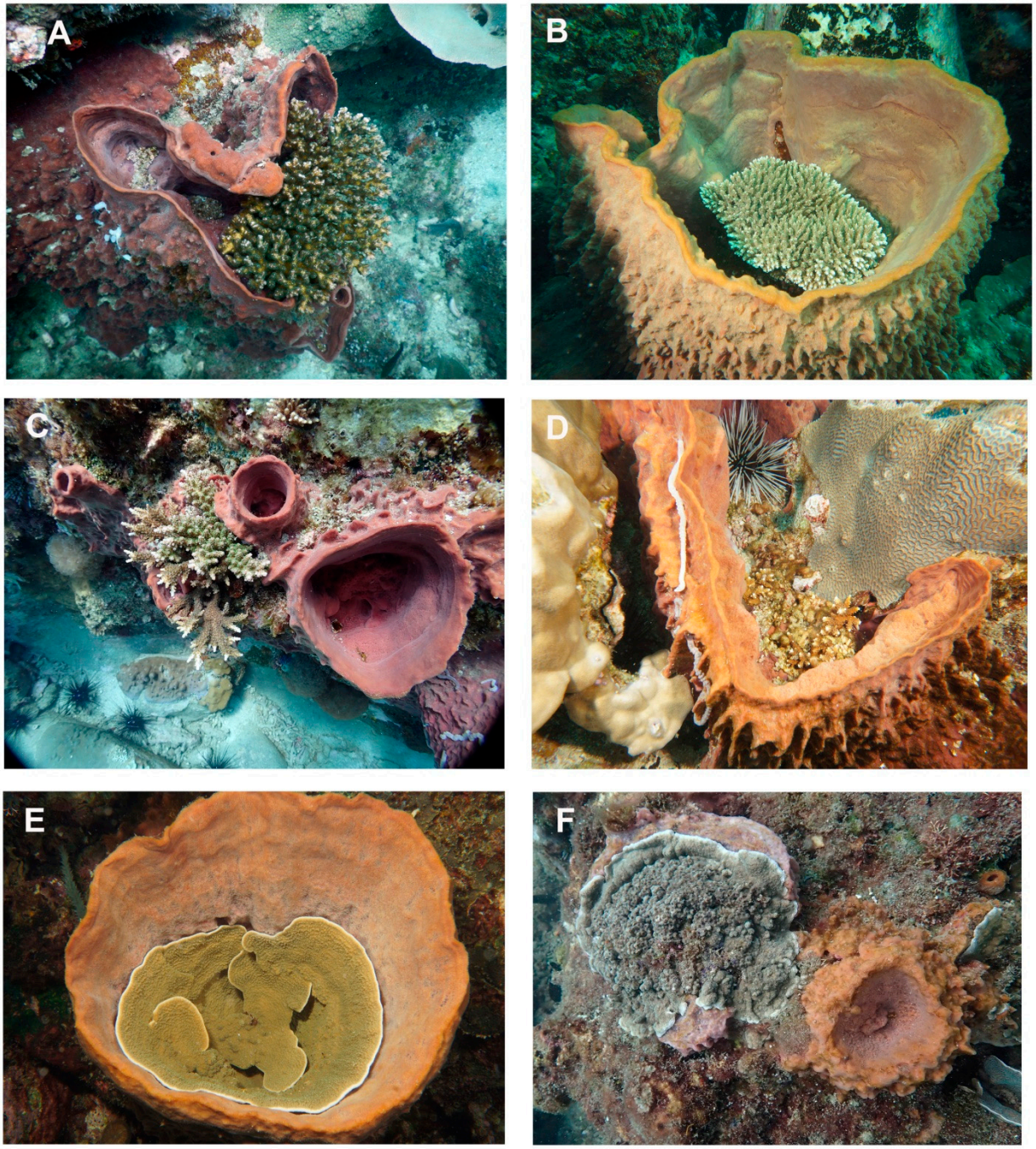


Figure 3. Coral–sponge interactions (I): (**A**) *Pocillopora damicornis*, (**B**) *Acropora cytherea*, (**C**) *Acropora* cf. *florida* + *Acropora* sp., (**D**) *Acropora* sp. + *Paragoniastrea* cf. *australensis*, (**E**) *Montipora aiquetuberculata*, (**F**) *Montipora* cf. *venosa*.

Sponge invasion may be enhanced under environmental conditions stressful to corals but tolerable for sponges, such as low irradiance and high levels of sedimentation, or following coral bleaching, diseases, or predation by crown-of-thorns starfish *Acanthaster* spp. [10]. Against this background of negative coral–sponge interactions, the harboring of scleractinians by GBS can be regarded as a form of ecological facultative commensalism where corals may benefit from such isolated micro-habitats. These habitats may not only provide shelter from strong hydrodynamic forces but may also reduce accessibility of harbored corals for major corallivorous predators such as crown-of-thorns starfish or the gastropod *Drupella* spp. Nevertheless, sponge-derived chemicals can undermine coral skeletal integrity, reduce photosynthetic efficiency and respiration, and inhibit the

settlement of new coral larvae [5,6,11]. Therefore, the phenomenon of positive coral–sponge interactions, without any restrictions on coral development in contact with GBS tissue, warrants further investigation and should be observed over time to better understand its ecological significance.

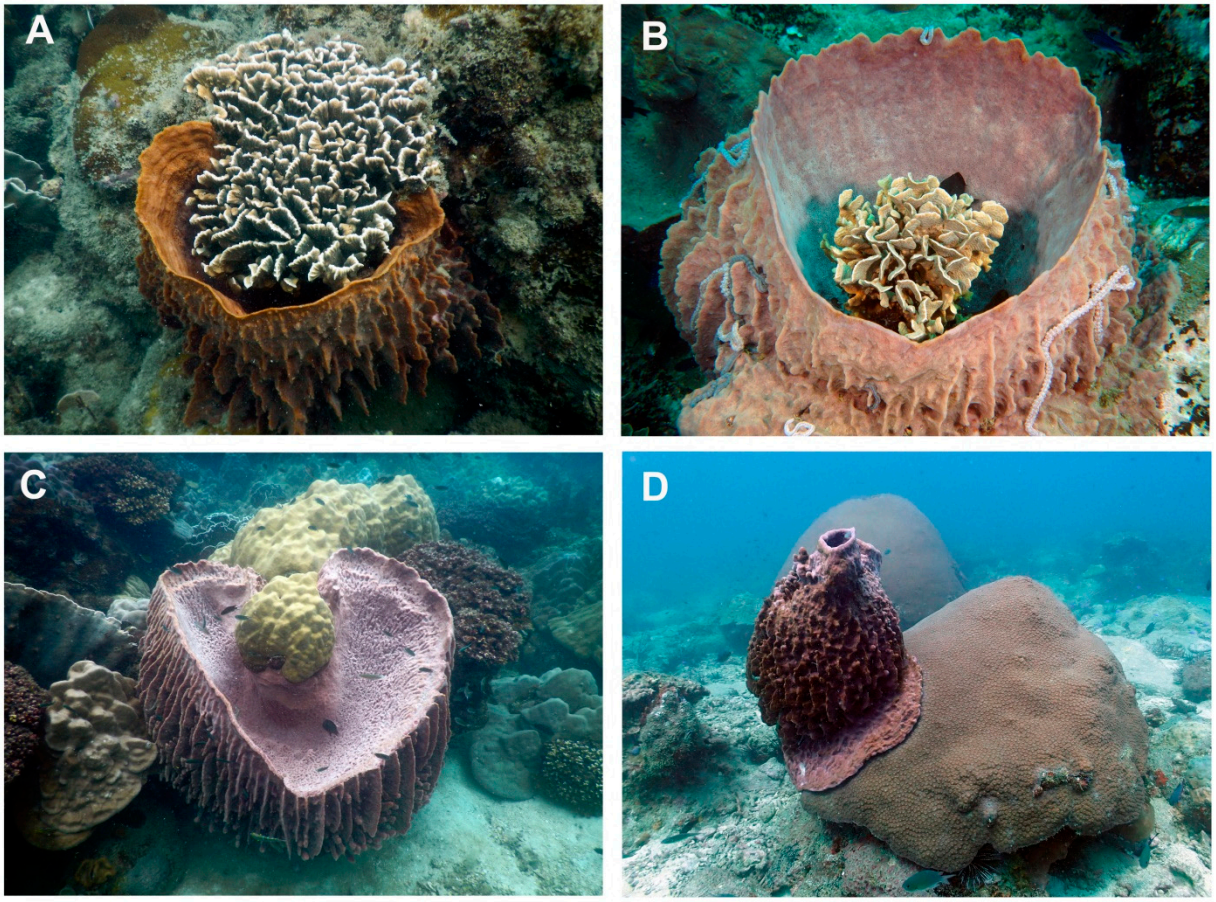


Figure 4. Coral–sponge interactions (II): (**A**) *Pavona frondifera*, (**B**) *Pavona* cf. *decussata*, (**C**) *Porites lutea*, (**D**) *Diploastrea heliopora.*

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