



Who are you? The “anemone shrimp” *Periclimenes rathbunae* perched on the stony coral *Mussa angulosa*

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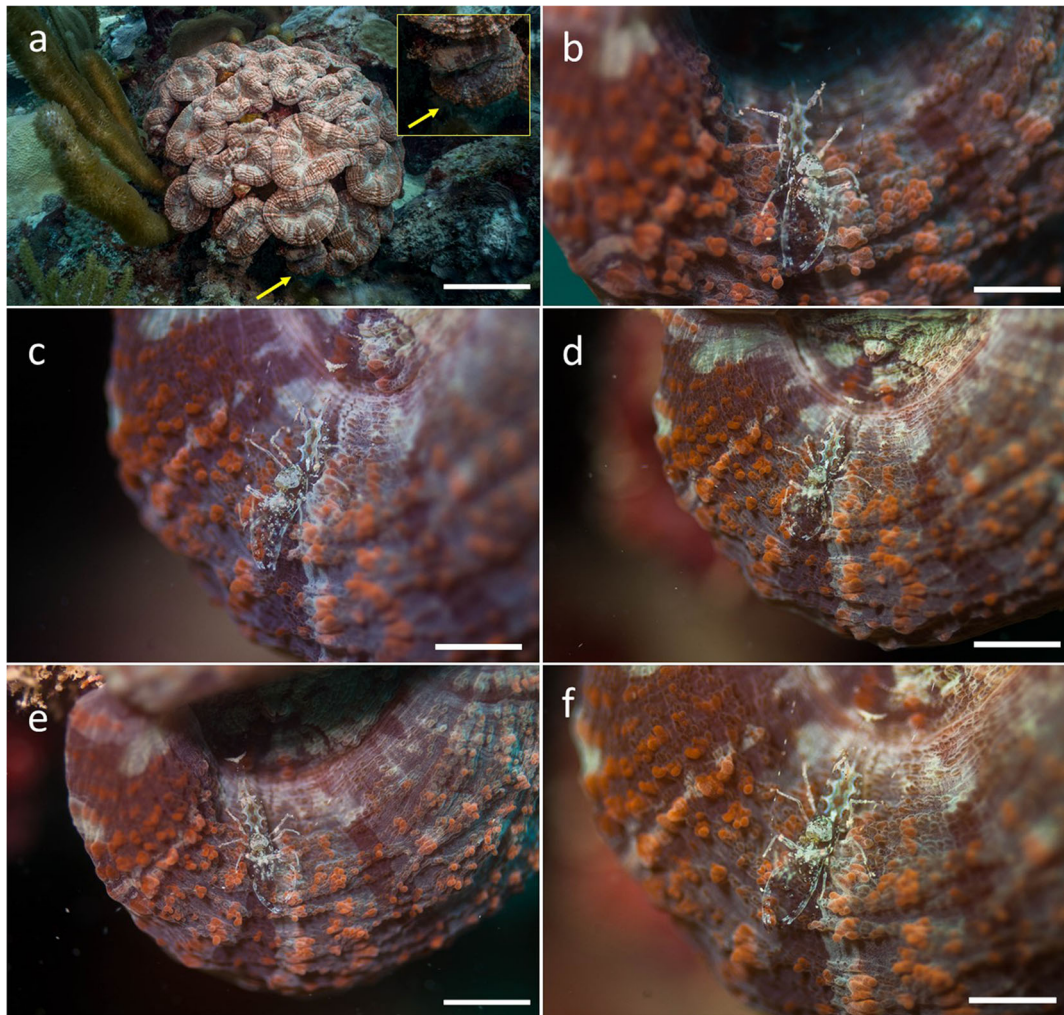


Fig. 1 **a** Scleractinian coral *Mussa angulosa* as host for the anemone shrimp *Periclimenes rathbunae* (arrow), colony depth = 7 m, scale bar = 10 cm; **b–f** close up of the shrimp *P. rathbunae* on *M. angulosa*.

Coloration of *P. rathbunae* matches that of the host coral. Scale bars approximately 1 cm

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Shrimps belonging to the genus *Periclimenes* O.G. Costa, 1844 inhabit shallow and deeper waters at tropical and subtropical latitudes and are typically intertwined in cryptic symbiotic associations with several epibenthic host organisms like sponges, sea anemones, soft and stony corals, bivalves, ascidians, echinoderms, and gastropods (Horká et al. 2016).

In the western Atlantic, several *Periclimenes* spp. appear to have developed a close symbiotic affinity with sea anemones. In Puerto Rico, *P. rathbunae* has been observed on the sea anemones *Stichodactyla helianthus* and *Homostichanthus duerdeni* (Spotte et al. 1991). However, previously unknown facultative ontogenetic host-switching behavior by *P. rathbunae* Schmitt, 1924 has been recently documented on the scleractinian *Dendrogyra cylindrus* (Brinkmann and Fransen 2016) and the heterobranchian *Elysia crispata* (Hoeksema and Fransen 2017). During a coral reef survey (6 October 2020), a single individual of *P. rathbunae* was opportunistically observed (7 m depth) associated with the scleractinian *Mussa angulosa* (Pallas, 1766) at La Parguera Natural Reserve, Puerto Rico (17.936° N, -67.020° W). The shrimp stood perched on a closed polyp, highly camouflaged, its chromatophores emitting a similar pink-orange psychedelic coloration pattern as the mussid (Fig. 1a–f).

Interestingly, all three reports of western Atlantic *Periclimenes* spp. stony coral “host-switch” have only been observed with phylogenetically distinct stony coral species; *D. cylindrus*—*P. rathbunae* (Brinkmann and Fransen 2016), *Montastraea cavernosa*—*P. yucatanicus* (González-Muñoz et al. 2019), and *M. angulosa*—*P. rathbunae* (present paper). The overall morphology of *M. angulosa*, with fleshy polyps and small tentacles (usually hidden during daylight) is strikingly different from that of *D. cylindrus* (the other known scleractinian host). It appears, as hypothesized by Brinkmann and Fransen (2016) that a surface with tentacles, or at least tentacle-like extensions, is crucial for *P. rathbunae* to extend its habitat range. Undoubtedly, the apparent ability of palaemonid shrimps to adapt to new habitats by switching hosts has significantly contributed to the evolutionary success of the group (Horká et al. 2016).

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Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Ethical approval No animal testing was performed during this study.

Sampling and field studies All necessary permits for sampling and observational field studies have been obtained by the authors from the competent authorities and are mentioned in the acknowledgements, if applicable.

Data availability All data generated or analyzed during this study are included in this published article.

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References

- Brinkmann BW, Fransen CHJM (2016) Identification of a new stony coral host for the anemone shrimp *Periclimenes rathbunae* Schmitt, 1924 with notes on the host-use pattern. *Contrib Zool* 85: 437–456
- González-Muñoz R, Garese A, Acuña FH, Reimer JD, Simões N (2019) The spotted cleaner shrimp, *Periclimenes yucatanicus* (Ives, 1891), on an unusual scleractinian host. *Diversity* 11:213
- Hoeksema BW, Fransen CHJM (2017) Host switch by the Caribbean anemone shrimp *Periclimenes rathbunae* in Curaçao. *Coral Reefs* 36:607
- Horká I, De Grave S, Fransen CHJM, Petrusek A, Ďuriš Z (2016) Multiple host switching events shape the evolution of symbiotic palaemonid shrimps (Crustacea: Decapoda). *Sci Rep* 6:26486
- Spotte S, Heard RW, Bubucis PM, Manstan RR, McLelland JA (1991) Pattern and coloration of *Periclimenes rathbunae* from the Turks and Caicos Islands, with comments on host associations in other anemone shrimps of the West Indies and Bermuda. *Gulf Res Rep* 8:301–311

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