

Competitive Exclusion by the Invasive Cowrie *Naria turdus*

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ABSTRACT Since its introduction in Aruba in 2020, the invasive cowrie *Naria turdus* has been found to have largely displaced the native species *Naria acicularis*. This is hypothesized to be due to competitive exclusion.

KEY WORDS Gastropoda, Cypraeidae, *Naria turdus*, *Naria acicularis*, *Luria cinerea*, Caribbean, Aruba, competitive exclusion

INTRODUCTION

Naria turdus (Lamarck, 1810) is a well known herbivorous gastropod, native to tropical marine waters, and occurring on a variety of habitats, including coral reefs, rocky shores, and seagrass beds, at a range of depths from the lower intertidal to 45 meters. *Naria turdus* is now known to be an introduced and invasive species from the Indian Ocean and Red Sea to Aruba, Curaçao, Puerto Rico (Dekkers & Ros, 2022), to Florida (Oleinik *et al.*, 2023), and to the coast of Alabama (Douglas Shelton, personal communication). Since cowrie species like *N. turdus* lay eggs which have free-swimming pelagic veliger larvae it easily spreads with the oceanic currents. Hundreds of specimens of *N. turdus* have come up in lobster traps at 40 to 50 meters depth off the Dry Tortugas (Randy Rivera, personal communication), suggesting that this invasive species will continue to spread farther up the Atlantic coast with the Gulf Stream, possibly as far as Cape Hatteras, North Carolina.

DISCUSSION

The junior author was the first person to discover *Naria turdus* in the Caribbean, having

found it in Aruba in July 2020, living alongside the local species *N. acicularis* (Gmelin, 1791). Dead adult specimens of *N. turdus* were commonly found near octopus dens with drill holes reflecting predation. Not long after *N. turdus* was found in large numbers in Aruba large number of empty shells without drill holes were found at the opening of octopus dens. Therefore, it appears that local octopus in Aruba have adapted their predation methods and have learned how to effectively consume *N. turdus* without drilling as its aperture is wider than the local species *N. acicularis* and it can be eaten without drilling a hole in the shell.

Since its introduction to Aruba, *N. turdus* has been found all over the west and south side of Aruba in shallow water from three to six meters, in warm water and under algae-rich rocks. The species breeds all year round in Aruba, and the large females are frequently found close to the eggs, often with a few smaller ones (presumably males) in the vicinity. Because *N. turdus* thrives in a wide variety of habitats, is fecund and breeds all year round, it was initially assumed that it may outcompete local cowrie species in Aruba. (Figures 1 and 2).

The typical habitat in Aruba for *N. acicularis* is shallow water under rocks and coral slabs. This species is known to graze on algae, sponges, and other sessile invertebrates, which makes *N. turdus* a competitor in their shared habitat for these limited resources. Another cowrie species, *Luria cinerea* (Gmelin, 1791), eats an unidentified species of yellow sponge, accordingly it does not directly compete with *N. turdus* for limited food resources. (Figure 3) The three cowrie species discussed in this paper are show on Plate 1.

Over hundreds of dives along the coast of Aruba in recent years where the *N. turdus* are found living, reproducing, and thriving *N. acicularis* has become extremely rare to absent. The authors contend that the displacement of *N. acicularis* by *N. turdus* is due to competitive exclusion as they share the same ecological niche. (Hardin, 1960). Over the past year very few live *N. acicularis* have been found in Aruba, suggesting that this widespread Caribbean species may become locally extinct due to competition with the invasive species *N. turdus*.

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Plate 1. A= *Naria acicularis* (Gmelin, 1791) 9.8 mm in length; B= *Luria cinerea* (Gmelin, 1791) 21.9 mm in length; C= *Naria turdus* (Lamarck, 1810) 38.5 in length. All collected at 10-12 feet at Malmok, Aruba.



Figure 1. Live *Naria turdus* near egg mass. Malmok, Aruba.

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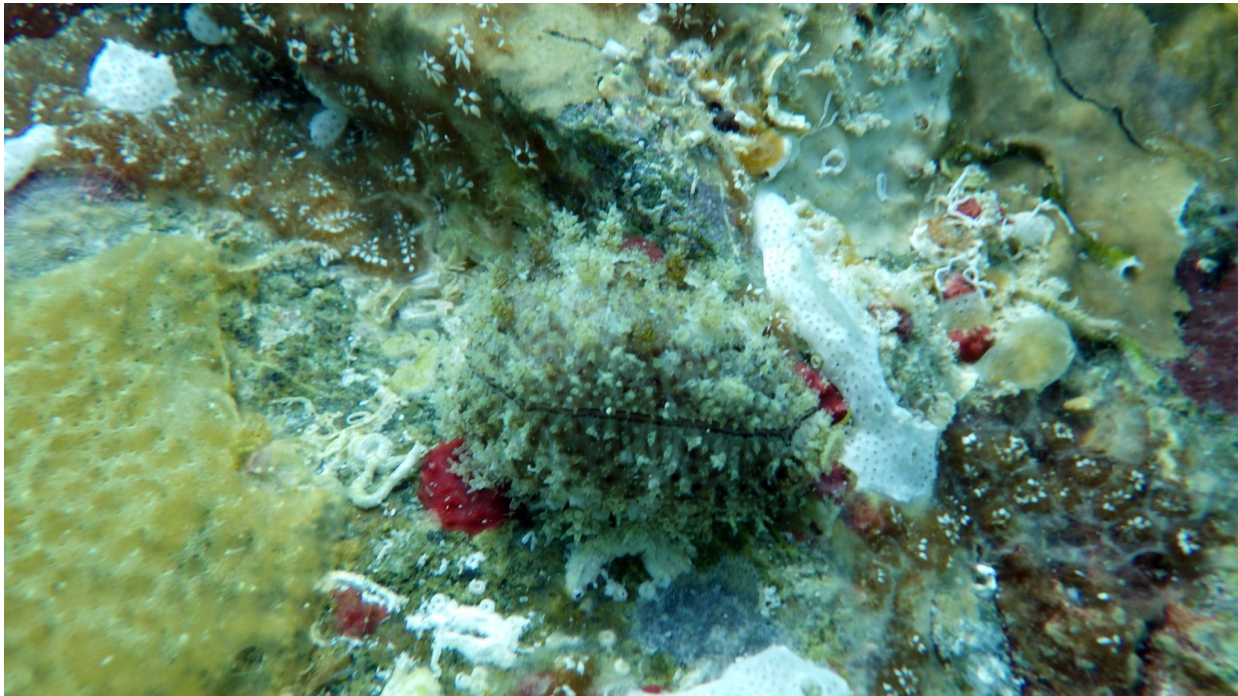


Figure 2. Live *Naria turdus* with mantle fully extended. Malmok, Aruba.



Figure 3. Live *Luria cinerea* near egg mass. Malmok, Aruba.