



Exotic dressing: Record of an interaction between a native sea urchin and a non-native coral

MÁRCIO ALVES SIQUEIRA*, ALEXANDRE DIAS KASSUGA & LUCIANA ALTVATER

FUNDEP/IEAPM, Departamento de Biotecnologia Marinha, Arraial do Cabo, RJ 28930000, Brazil.

* Corresponding author: marciosiqueira92@gmail.com

ORCID numbers: MAS 0009-0008-8134-9904; ADK 0000-0002-4057-9139; LA 0000-0002-3879-9431

Abstract: Corals genus *Tubastraea* are scleractinian corals non-natives to the Brazilian Coast. Here we present the first record of a native sea urchin, *Lytechinus variegatus*, using a living colony of *Tubastraea* as covering material.

Key words: covering behavior, sun coral, exotic species.

Vestimenta Exótica: Registro de uma interação entre um ouriço-do-mar nativo e um coral não-nativo. Resumo: Os corais do gênero *Tubastraea* são corais escleractíneos não nativos na costa brasileira. Apresentamos aqui o primeiro registro de um ouriço-do-mar nativo, *Lytechinus variegatus*, utilizando uma colônia viva de *Tubastraea* como cobertura.

Palavras-chave: comportamento de cobertura, coral-sol, espécies exóticas.

The covering behavior is a common trait among echinoids, however its function is not clear (Zienghorn 2017). The green sea urchin *Lytechinus variegatus* (Lamarck, 1816), a species widely spread in Brazil, is commonly found holding pieces of rubble on its aboral (upper) surface (Lees & Carter 1972). An individual of *L. variegatus* carrying a sun coral *Tubastraea*, was spotted (Fig. 1) during a night survey at the rocky shore of Ilha dos Porcos, Arraial do Cabo, Southeast Brazil (-22.965041 W, -41.993276 S). Both organisms (*L. variegatus* and *Tubastraea*) are quite common in this location. However, this behavior has never been documented.

Tubastraea is a genus of azooxanthellate scleractinian corals, non-native to the Brazilian Coast. It has been reported that living *Tubastraea* colonies may often detach and fall off, becoming part of the rubble in northern São Paulo (Capel et al. 2020). It is common to find detached colonies or fragments beneath high-density *Tubastraea* populations on Ilha dos Porcos (personal observation). As registered in this study, detached

colonies may be used as covering material by *L. variegatus*. Species of *Tubastraea* display remarkable plasticity, can regenerate and develop new polyps from small tissue fragments (Luz et al. 2018) and detach polyps (process known as bail-out) during extreme conditions (Capel et al. 2014). Those traits may enhance the chances of colonies transported by sea urchins successfully re-establishing themselves after being displaced.

It is known that sea urchins can carry various organisms on their bodies, some of which are picked up for covering, while others actively seek refuge in their spines (Barel and Kramers 1977). A specimen of deep-sea urchin *Cystochinus loveni* (A. Agassiz, 1898), was found carrying over 24 taxa of living and dead foraminiferans, as well as two isopods, one polychaete, one sipuncula and one tanaid (Levin et al. 2001). There are also reports of other benthic species using cnidarians as cover such as crustaceans (Hand 1975; Fujii 2017; Menezes & Thakur 2023) and gastropods (Ates 1995; Berthe et al. 2021). The use of cover as protection against predators has been



Figure 1. Sea urchin *Lytechinus variegatus* covering with a sun coral *Tubastraea*. Sea urchin was about 10 cm in diameter **a** upper view and **b** side view. Photo: Kassuga, A. D.

reported for *Sterechinus* spp., which uses macroalgae and mats of hydroids as physicochemical defense against predatory sea anemones and king crabs (Dayton et al. 1970; Amsler et al. 1999; Brothers et al. 2016). The nematocysts present in cnidarian tentacles provide protection for the invertebrates that carry these cnidarians (Ates 1995). Crude extracts from *Tubastraea* inhibited predation by generalist fish

(Lages et al 2010), which may also benefit sea urchins covered with sun coral colonies.

The sea urchin behavior of picking up objects is greatly increased in exposure to UV light (Dumont et al. 2007), however, it can also be displayed in dark conditions (Lees & Carter 1972). Additionally, this behavior may protect the animal from dislodgement by wave surge (Lees & Carter 1972; James 2000; Dumont et al. 2007). Studies on the sea

urchin genus *Lytechinus* often attribute their covering behavior to protection from sunlight and wave surge (Zienghorn 2017). Nonetheless, it is plausible that covering behavior in sea urchins is influenced by a combination of multiple biotic and abiotic factors (Dumont et al. 2007).

Some studies have shown that sea urchins can actively select their covering material. *Lytechinus variegatus*, for example, prefers coral rubble and shells over sea grass, even when sea grass is more available (Amato et al. 2008). Sea urchins can travel moderate distances in short periods of time (Klinger and Lawrence 1985; McCarthy & Young 2002), dropping and changing their covers as they travel (James 2000). Klinger and Lawrence (1985) reported that *ex-situ* *L. variegatus* wandered between 30-96cm per hour varying with different conditions (day-night, fed-starved). In a study by McCarthy & Young (2002), most *L. variegatus* moved 1 to 3 m day^{-1} . Some individuals of *Toxopneustes roseus* (A. Agassiz, 1863) were reported with the same cover item for 2 weeks without dropping it (James, 2000). This may influence the distribution of species carried by their covering. The use of rhodoliths as covering material by *T. roseus* may facilitate the dispersal of associated algae (James 2000), and *Sterechinus neumayeri* (Meissner, 1900) has been shown to spread macroalgae through this mechanism (Amsler et al. 1999). Detached *Tubastraea* colonies carried by sea urchins could potentially be relocated to nearby areas along the rocky shore.

Such an interaction between sea urchins and scleractinian corals has not been previously recorded. It is possible that this phenomenon could also occur within the native range of *Tubastraea* or with other scleractinian corals. Areas with occurrence of sun coral, especially in Brazil (e.g., Arraial do Cabo), are commonly visited by scuba divers, both researchers and recreational. The interaction between the sea urchin and *Tubastraea* could contribute to a small-scale spread of the sun coral. However, the lack of previous reports of the interaction between the two species may indicate that it is not a common occurrence. Nevertheless, it alerts for a sun coral dispersion mechanism unreported so far and based on the interaction with sea urchins.

Ethical statement

The present investigation did not involve the manipulation of regulated animals and did not require approval by an Ethical Committee.

Acknowledgments

We thank the editor and the anonymous reviewers for their valuable comments and suggestions, which greatly improved the manuscript. The authors declare that they have no conflict of interest.

Author Contributions: MS conceptualized and wrote the paper. AK Took the photos. AK and LA supervised, reviewed and edited the manuscript.

References

- Amato, K. R., Emel, S. L., Lindgren, C. A., Sullan, K. M., Wright, P. R., & Gilbert, J. J. (2008). Covering behavior of two co-occurring Jamaican sea urchins: differences in the amount of covering and selection of covering material. **Bulletin of marine science**, 82(2), 255-261.
- Amsler, C. D., McClintock, J. B. & Baker, B. J. 1999. An Antarctic feeding triangle: defensive interactions between macroalgae, sea urchins, and sea anemones. **Marine Ecology Progress Series**, 183, 105-114.
- Ates, R. M. L. (1995, July). Gastropods carrying actinians. **In Proceedings of the 6th International Conference on Coelenterate Biology** (pp. 11-20).
- Barel CD, Kramers PG (1977) A survey of the echinoderm associates of the north-east Atlantic area. 2001. **Zool Verh** 156(1):1-159
- Berthe, C., Sowinski, J., & Sowinski, L. (2021). Coral growing on living conch shell: what is the fate of both?. **Marine Biodiversity**, 51(6), 89.
- Brothers, C. J., Smith, K. E., Amsler, M. O., Aronson, R. B., Singh, H., & McClintock, J. B. (2016). Covering behavior of deep-water echinoids in Antarctica: possible response to predatory king crabs. **Marine Ecology Progress Series**, 553, 155-162.
- Capel, K. C. C., Migotto, A. E., Zilberberg, C., & Kitahara, M. V. (2014). Another tool towards invasion? Polyp "bail-out" in *Tubastraea coccinea*. **Coral Reefs**, 33, 1165-1165.
- Capel, K. C. C., Kitahara, M. V., Creed, J. C., & Zilberberg, C. (2020). Invasive corals trigger seascape changes in the southwestern Atlantic. **Bulletin of Marine Science**, 85(1), 217-218.
- Dayton, P. K., Robilliard, G. A., & Paine, R. T. (1970). Benthic faunal zonation as a result of anchor ice at McMurdo Sound, Antarctica. **Antarctic ecology**, 1, 244-258.

- Dumont, C. P., Drolet, D., Deschênes, I., & Himmelman, J. H. (2007). Multiple factors explain the covering behaviour in the green sea urchin, *Strongylocentrotus droebachiensis*. **Animal Behaviour**, 73(6), 979-986.
- Fujii, T. (2017). A hermit crab living in association with a mobile scleractinian coral, *Heteropsammia cochlea*. **Marine Biodiversity**, 47(3), 779-780.
- Hand, C. (1975). Behaviour of some New Zealand sea anemones and their molluscan and crustacean hosts. **New Zealand journal of marine and freshwater research**, 9(4), 509-527.
- James, D. W. 2000. Diet, movement, and covering behavior of the sea urchin *Toxopneustes roseus* in rhodolith beds in the Gulf of California, Mexico. **Marine Biology**, 137, 913e923.
- Klinger, T. S., & Lawrence, J. M. (1985). Distance perception of food and the effect of food quantity on feeding behavior of *Lytechinus variegatus* (Lamarck)(Echinodermata: Echinoidea). **Marine & Freshwater Behaviour & Phy**, 11(4), 327-344.
- Lages, B. G., Fleury, B. G., Pinto, A. C., & Creed, J. C. (2010). Chemical defenses against generalist fish predators and fouling organisms in two invasive ahermatypic corals in the genus *Tubastraea*. **Marine Ecology**, 31(3), 473-482.
- Lees, D. C., & Carter, G. A. (1972). The covering response to surge, sunlight, and ultraviolet light in *Lytechinus anamesus* (Echinoidea). **Ecology**, 53(6), 1127-1133.
- Levin, L. A., Gooday, A. J. & James, D. W. 2001. Dressing up for the deep: agglutinated protists adorn an irregular urchin. **Journal of Marine Biological Association of the U.K.**, 81, 881e882.
- Luz, B. L. P., Capel, K. C. C., Zilberberg, C., Flores, A. A. V., Migotto, A. E., & Kitahara, M. V. (2018). A polyp from nothing: The extreme regeneration capacity of the Atlantic invasive sun corals *Tubastraea coccinea* and *T. tagusensis* (Anthozoa, Scleractinia). **Journal of experimental marine biology and ecology**, 503, 60-65.
- McCarthy, D. A., & Young, C. M. (2002). Gametogenesis and reproductive behavior in the echinoid *Lytechinus variegatus*. **Marine Ecology Progress Series**, 233, 157-168.
- Menezes, C., & Thakur, N. L. (2023). Facultative association of *Purpura panama* with *Bunodosoma goanense*. **Marine Biodiversity**, 53(6), 84.
- Ziegenhorn, M. A. (2017). Sea urchin covering behavior: A comparative review. **Sea Urchin Covering Behavior: A Comparative Review**, 19-33.

Received: May 2024

Accepted: November 2024

Published: May 2025