

Red fluorescence in symbiotic coral-dwelling gall crabs

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Communicated by Andrew Baird (Ecology Editor)

Keywords associated fauna, Cryptochiridae, visual signalling

Fluorescence is common in plants and animals in the terrestrial and marine realms, however, in many instances, the biological function of fluorescence is poorly understood. Parts of the marine environment are lacking in some regions of the light spectrum. For example, most sunlight in the ‘red’ 600–700 nm range has been absorbed at depths below 10m. Therefore, organisms that fluoresce red add colour to these depths. Red fluorescence can enhance visual contrast and, therefore, might function as a communication or attraction signal for organisms that can detect light of these wavelengths (Michiels et al. 2008). During a night dive on 23 July 2019, on La Machaca reef (Bonaire, Dutch Caribbean) a coral-dwelling gall crab, *Troglocarcinus corallicola* Verrill, 1908 (Cryptochiridae), that appeared to be fluorescing red was



Fig. 1 The gall crab *Troglocarcinus corallicola* pictured inside its dwelling in *Colpophyllia natans* during a night dive. Inset: *T. corallicola* showing red fluorescence under UV light.

photographed in the scleractinian coral *Colpophyllia natans* (Houttuyn, 1772) (Faviidae) at ca. 10m depth (Fig. 1) using a GoBe Nightsea torch (excitation spectrum 440–460 nm) and an Olympus Tough TG-5 camera. The coral tissue around the crab's dwelling fluoresced light blue-green. A second red fluorescent *T. corallicola* specimen was observed on a separate night dive, nested between the polyps of a colony of *Montastraea cavernosa* (Linnaeus, 1767) (Montastraeidae). Many marine fish fluoresce, as well as some marine invertebrates, in particular, scleractinian corals (Michiels et al. 2008), however, this is the first record of (red) fluorescence in marine brachyuran crabs. The semi-terrestrial ocapodid crab *Austruca mjoebergi* (Rathbun, 1924) has been documented to use ultraviolet cues in mate choice on intertidal flats, however, these crabs do not occur at depths where red light is absorbed (Detto and Backwell 2009). Matsumura and Qian (2014) proposed that fluorescent signals provide cues to induce the settlement of marine invertebrate larvae, such as cyprid larvae responding to barnacle auto-fluorescence. The purpose (if any) of a fluorescent signalling mechanism in these cryptochirid crabs is unknown. Gall crabs have a visiting mating system, in which the male wanders over the reef visiting female counterparts (van der Meij 2014), therefore the added contrast provided by red fluorescence in combination with the light blue-green fluorescent coral tissue might help males find mates. However, while spectral sensitivity of cryptochirids is unknown, many decapod crustaceans cannot perceive the colour red (Detto and Blackwell 2009).

Acknowledgements

SB thanks A Verstappen for the introduction to UV-light night dives and the use of equipment, and Z Kohl for the introduction to fluorescence and bioluminescence. Fieldwork was sponsored by the TREUB-maatschappij (Society for the Advancement of Research in the Tropics). We thank T Naruse and the editor for their comments.

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Received: 17 September 2019/Accepted: 7 November 2019

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