

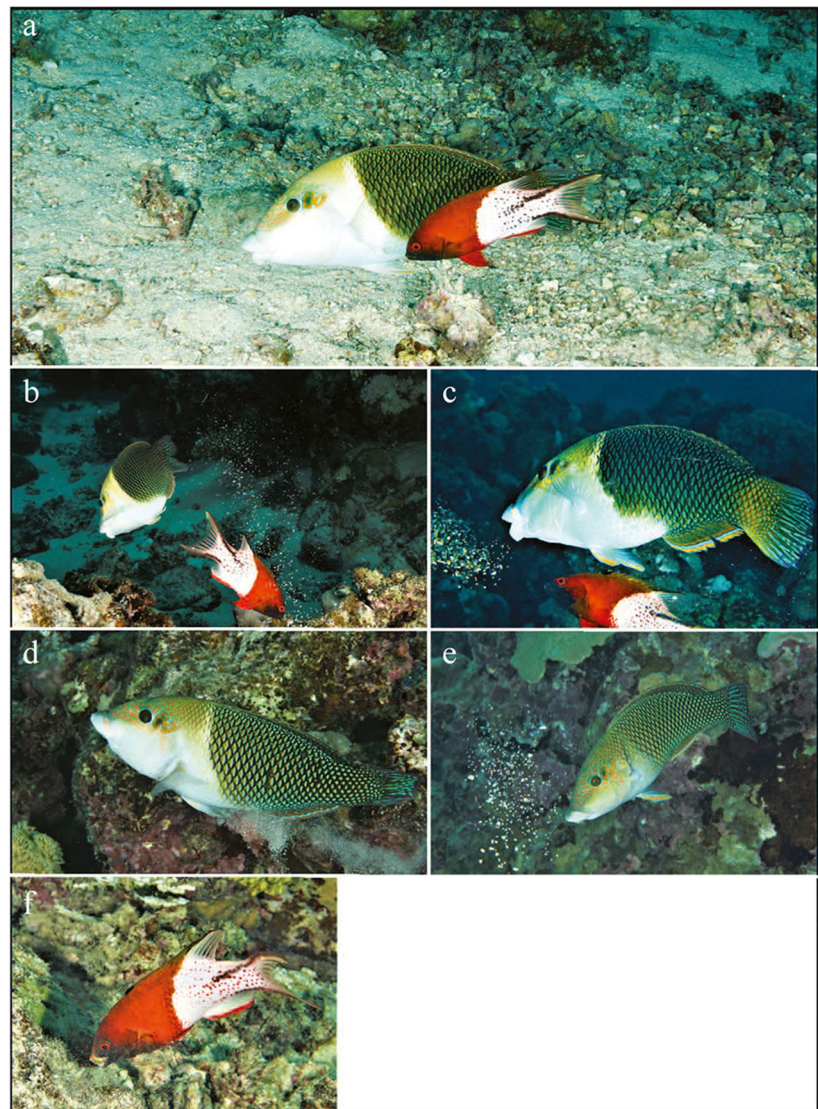


A novel feeding association between blackeye thicklip wrasse (*Hemigymnus melapterus*) and lyretail hogfish (*Bodianus anthioides*)

Song He¹ · Michael L. Berumen¹

Received: 19 January 2022 / Revised: 11 April 2022 / Accepted: 28 April 2022
© The Author(s) 2022

Fig. 1 Associated feeding behavior between blackeye thicklip wrasse (*Hemigymnus melapterus*) and lyretail hogfish (*Bodianus anthioides*): lyretail hogfish closely following a blackeye thicklip wrasse (**a**); lyretail hogfish trying to catch the food particles from the sand stream from the blackeye thicklip wrasse's gills (**b**) and particles ejected from the mouth (**c**). Individual feeding behavior of the blackeye thicklip wrasse (**d** and **e**) and of the lyretail hogfish without the associated blackeye thicklip wrasse (**f**). All photos were adjusted to improve the exposure; original, unedited photos and videos depicting these behaviors are available in [Supplemental File 1](#)



Communicated by M. Schratzberger

✉ Song He
song.he@kaust.edu.sa

¹ Red Sea Research Center, Division of Biological and Environmental Science and Engineering, 4700 King Abdullah University of Science and Technology, Thuwal 23955-6900, Saudi Arabia

During underwater marine fish biodiversity surveys from December 2021 to January 2022, on Red Sea coastal coral reefs north of Jeddah, Saudi Arabia, we observed a unique feeding behavior association between blackeye thicklip wrasse (*Hemigymnus melapterus*) and lyretail hogfish (*Bodianus anthioides*) at depths between 7 and 20 m. Observations occurred on > 20 separate dives during daytime hours (10h00 to 15h30).

When the two species co-occurred, a lyretail hogfish was always closely following a blackeye thicklip wrasse while the latter was feeding (Fig. 1a). The blackeye thicklip wrasse, in its typical foraging behavior, takes a mouthful of sand and gravel from the substratum and swims upward, streaming sand from the gill openings (Randall 2013). Whenever this occurred, the associated lyretail hogfish would catch any remaining food as it fell from the gill openings of the blackeye thicklip wrasse (Fig. 1b). The blackeye thicklip wrasse processed the fossorial (i.e., benthic) prey within its mouth and pharynx for a few moments and then forcefully ejected the remaining fragments from its mouth. At this point, the lyretail hogfish would move to feed on those ejected particles (Fig. 1c). Lyretail hogfish would also aggressively defend their position as the sole associated fish with the blackeye thicklip wrasse from other lyretail hogfish individuals. Based on our observations, blackeye thicklip wrasse feeding behavior appeared unchanged by the lyretail hogfish feeding association (Fig. 1d and e). Conversely, when the lyretail hogfish was alone, it changed its feeding behavior to blowing at the benthos to uncover prey among the substrate (Fig. 1f). (Videos of all behaviors depicted in Fig. 1 are provided in Supplemental File 1.) The blackeye thicklip wrasse appeared to process substantially more substrate than the lyretail hogfish on their own. Therefore, this interspecific feeding behavior might be unilaterally beneficial to lyretail hogfish by increasing its feeding efficiency with no notable impact on feeding the blackeye thicklip wrasse.

Given the large and overlapping distributions of these two species throughout the Indo-Pacific region (Gomon 2006; Randall 2013), further observations in a larger geographic scope could confirm whether this interspecific feeding behavior association appears elsewhere. Investigations of gut contents could reveal whether the feeding association influences dietary composition for the lyretail hogfish. More broadly, comparing populations with and without the presence of blackeye thicklip wrasse could determine the influence of the association on the fitness of the lyretail hogfish (e.g., using individual fitness metrics or population densities).

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12526-022-01281-5>.

Acknowledgements We thank the manager Mr. Abdulaziz Magamal and staff of Blue Reef Dive Center in Bhadur resort, Jeddah, Saudi Arabia, for their kind assistance during fieldwork. We thank two anonymous reviewers for their valuable comments and revision suggestions.

Funding Financial support was provided by KAUST (baseline research funds to M.L.B.).

Declarations

Conflict of interest The authors declare no conflict of interest.

Ethical approval No animal testing was performed during this study.

Sampling and field studies The study does not contain sampling material.

Data availability The datasets generated during current study are available from the corresponding author on reasonable request

Author contribution SH and MLB conceived and designed research. SH conducted observations. SH and MLB wrote the manuscript. All authors read and approved the manuscript.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Gomon MF (2006) A revision of the labrid fish genus *Bodianus* with descriptions of eight new species. The Australian Museum, Sydney, Australia. <https://doi.org/10.3853/j.0812-7387.30.2006.1460>
- Randall JE (2013) Review of the Indo-Pacific labrid fish genus *Hemigymnus*. J Ocean Sci Found 6:2–18. <https://doi.org/10.5281/zenodo.1035950>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.