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Unusual observations of juveniles of the elusive Sawtail Grouper (*Mycteroperca prionura*) highlight its association with colonies of Black Coral (*Antipathes galapagensis*)

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ABSTRACT. The Sawtail Grouper (*Mycteroperca prionura*) is a serranid species endemic to the Gulf of California. Notably, very little is known about its ecology. Although *M. prionura* is rarely observed by scuba divers, it is thought this species prefers deep (30–50 m) rocky reef habitats containing gorgonians or black corals. *Mycteroperca prionura* is categorized as Data Deficient on the Red List of the International Union for Conservation of Nature (IUCN). Therefore, any observations of its distribution and habitat improve our understanding of the ecology of this elusive species. In the dataset of an 18-year historical monitoring program in Bahía de La Paz, located in the southern Gulf of California, records of *M. prionura* were rare. However, during field surveys conducted in 2023 and 2024 at La Gaviota Island, which hosts patches of Black Coral (*Antipathes galapagensis*) at 15–20 m depth, we regularly observed *M. prionura* juveniles in close association with colonies of *A. galapagensis*. Juvenile *M. prionura* were consistently observed sheltering among *A. galapagensis* branches, indicating that the structural complexity provided by black corals may offer critical refuge and nursery habitat.

Key words: black coral, data deficient, Gulf of California, habitat engineer, rare species, reef fish, refuge, Sawtail Grouper, structural complexity.

INTRODUCTION

The Sawtail Grouper (*Mycteroperca prionura*) (Rosenblatt and Zahuranec 1967) is a species endemic to the Gulf of California that can reach up to 1 m total length (Heemstra and Randall 1993, Robertson and Allen 2015). Although the depth range of *M. prionura* oscillates between 10 and 90 m, it is most frequently encountered at depths of 30 m over rocky reefs characterized by large boulders, gorgonians, and black corals (Heemstra and Randall 1993, Sala et al. 2003, Robertson and Allen 2015, Craig and Erisman 2018). Spawning has also been reported at sites with black corals, which suggests that this habitat may be important across multiple life stages (Sala et al. 2003). *Mycteroperca prionura* is considered naturally rare within its range and typically occurs as solitary individuals or in small groups (Musick et al. 2000, Sala et al. 2003, Craig et al. 2011, Craig and Erisman 2018). Indeed, *M. prionura* is too rare to constitute an important resource in commercial fisheries (Heemstra and Randall 1993, Sala et al. 2003). Nonetheless, occasional captures by commercial and sport fisheries could threaten the persistence of this elusive species, whose population size and ecology remain poorly understood (Craig and Erisman 2018). This lack of information is reflected in its classification as Data Deficient on the Red List of the International Union for Conservation of Nature (IUCN) (Craig and Erisman 2018). Given that *M. prionura* and its associated black coral habitats remain poorly understood, any observations documenting their ecological relationship, including anecdotal records, contribute essential baseline information for the development of appropriate conservation measures.

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Black corals (order Antipatharia) are slow-growing, long-lived organisms that serve as key habitat engineers and form structures often described as animal forests, primarily in mesophotic ecosystems (Wagner et al. 2012). *Antipathes galapagensis* is broadly distributed in the Eastern Tropical Pacific and can be found from the Gulf of California to Ecuador at depths of 4–120 m (Aburto-Oropeza et al. 2011, Lavorato et al. 2021, Agarwal et al. 2024). Through its branched, multi-dimensional architecture, *A. galapagensis* creates complex structures that provide shelter, foraging grounds, and potential nursery habitat for fish and invertebrates (Matamoros-Calderón et al. 2021, Segovia 2023, Rabasco et al. 2025). All black corals have been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora since 1981 (CITES 2026). In Mexico, *A. galapagensis* is listed as threatened under NOM-059-SEMARNAT-2010 (DOF 2010). The dependence of a fish species listed as Data Deficient in the IUCN Red List on a slow-growing and threatened engineer species highlights the conservation importance of this ecological association and the need to improve our understanding of both species. Based on field surveys conducted at La Gaviota Island in Bahía de La Paz, we report the first records of juvenile *M. prionura* associated with *A. galapagensis* colonies in the Gulf of California.

Materials and methods

The study was conducted at La Gaviota Island (24°17′8.5″N, 110°20′30.9″W), located in eastern Bahía de La Paz in the southwestern Gulf of California, Mexico (Fig. 1). We monitored 6 permanent 10 × 10 m quadrats spaced 10–20 m apart. Three of these quadrats were located at 15–16 m depth and contained *A. galapagensis* colonies (mean density: 0.59 ± 0.08 colonies·m^{-2}). The remaining 3 quadrats, in which *A. galapagensis* was absent or nearly absent, were situated at 12–14 m depth and served as controls.

We conducted 3 underwater visual census (UVC) surveys per quadrat and monitoring period, which were separated by at least one week across four periods: June 2023, December 2023, June 2024, and December 2024. The benthic fish communities were monitored in each of the 6 permanent quadrats during each survey. All 72 surveys were conducted by the same 2 experienced divers, who were each responsible for half a quadrat. The divers systematically inspected the substrate, crevices, and *A. galapagensis* branches to record and identify small fishes (5–20 cm) closely associated with these features.

To highlight the rarity of *M. prionura* in the region, we compared our dataset with UVC data from a long-term monitoring program conducted by *Sociedad de Historia Natural Niparajá A.C.*, which surveyed various reefs around the Espiritu Santo Archipelago in eastern Bahía de La Paz from 2005 to 2022. Their monitoring program employed both linear transects (30 × 2 m) and circular plots (radius: 7.5 m; observation time:15 min).

The rarity of *M. prionura* precluded quantitative statistical analyses; therefore, *M. prionura* occurrences (number of observations in comparison to the sampling effort) recorded at the Espiritu Santo Archipelago (*Sociedad de Historia Natural Niparajá A.C.*) and La Gaviota (present

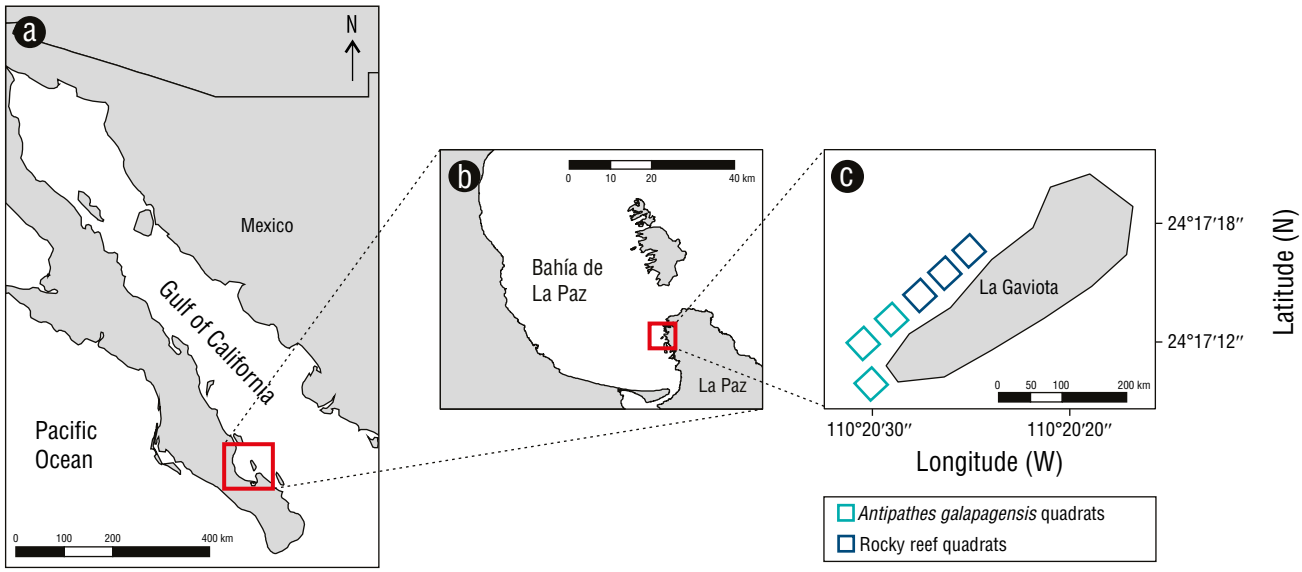

Figure 1. Study area. Location of Bahía de La Paz (red rectangle) in the Gulf of California (GC) (**a**). Location of La Gaviota Island (red rectangle) within Bahía de La Paz (**b**). Locations of Black Coral (*Antipathes galapagensis*) and control quadrats near La Gaviota Island (**c**).

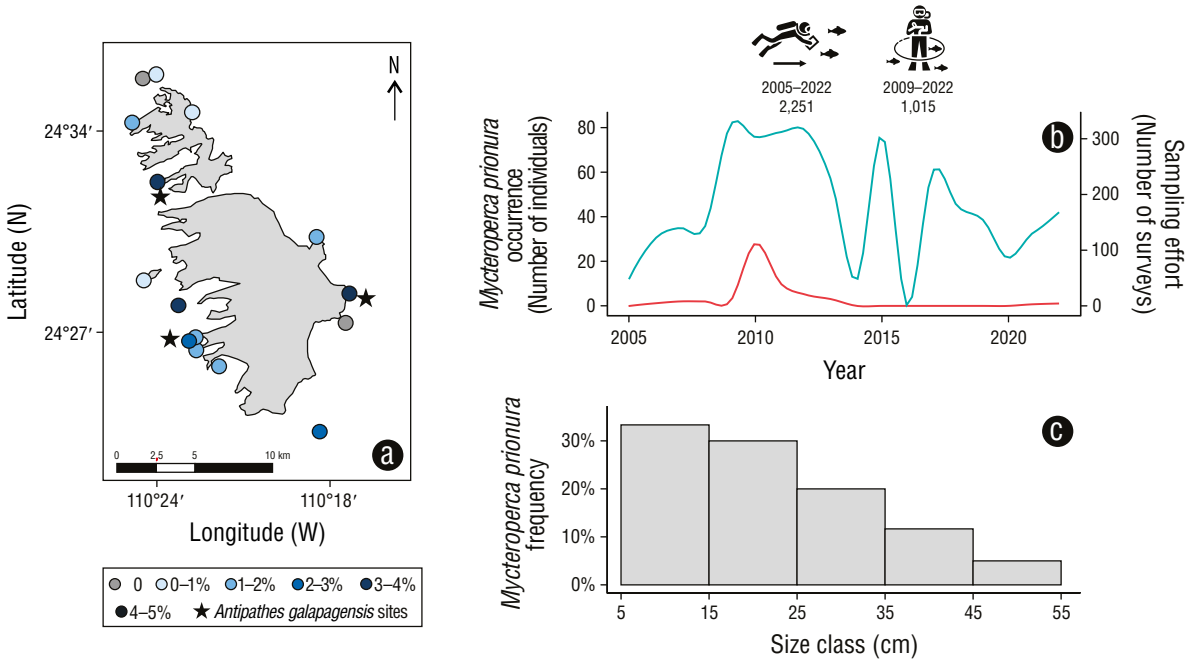

Figure 2. Map of the Espiritu Santo Archipelago showing *Mycteroperca prionura* records by site from 2005 to 2022 (**a**). Black stars indicate the rocky reefs hosting Black Coral (*Antipathes galapagensis*). Annual *M. prionura* records (red line) and sampling effort (blue line) (**b**). Size-class distribution of *M. prionura* from 2005 to 2022 (**c**).

study) were summarized with descriptive statistics and visual representations. Size-frequency distributions were plotted to characterize the composition of life stages across datasets. All analyses were conducted in R v. 4.4.0 (R Core Team 2024).

Results

A total of 55 records of *M. prionura* were identified in the historical data of the Espiritu Santo Archipelago, with the highest number of detections observed close to rocky reefs hosting *A. galapagensis* (Fig. 2a). Nevertheless, *M. prionura* records in the historical data were rare, and almost all observations were recorded around 2010 (Fig. 2b). Sampling effort varied across years, with notably reduced effort in 2014 (46 transects) and no surveys conducted in 2016, whereas an average of ~230 surveys were conducted annually during the remaining years (Fig. 1b). Most recorded *M. prionura* individuals were small (<35 cm total length) (Fig. 2c).

During June and December 2024 at La Gaviota Island, we observed *M. prionura* individuals measuring 5–25 cm total length in one-third of the transects within *A. galapagensis* quadrats; no *M. prionura* individuals were observed in the rocky reef quadrats without *A. galapagensis* colonies (Fig. 3a, b). *Mycteroperca prionura* individuals were always observed sheltering among *A. galapagensis* branches (Fig. 3c).

Discussion

The rarity of *M. prionura* records in the historical dataset agrees with previous descriptions of the species as naturally uncommon across its distribution range (Heemstra and Randall 1993, Musick et al. 2000, Sala et al. 2003). However, after 2013, records of this species became very rare, which may be linked to fishing pressure or environmental change. It is worth noting that sampling effort decreased in 2014 and 2016, which may partly explain the low number of records during these specific years. Nevertheless, we can rule out an effect of sampling effort, as numerous transects were performed over the period of 2017–2022, during which detections of *M. prionura* remained rare. In addition, as *M. prionura* has been more frequently observed in the northern, more temperate region of the Gulf of California (Craig and Erisman 2018), the tropicalization of the gulf may have reduced its population size in the southern gulf or induced a northward geographical shift (Favoretto et al. 2022).

Although the size at first sexual maturity is unknown for *M. prionura*, its closely related congener *Mycteroperca rosacea*, which exhibits similar size and distribution, has been reported to reach sexual maturity at ~30 cm total length (Aburto-Oropeza et al. 2008, Estrada-Godínez et al. 2011). These values suggest that all *M. prionura* individuals observed among *A. galapagensis* branches were juveniles. Therefore, *A. galapagensis* may serve as nursery habitat for *M. prionura*.

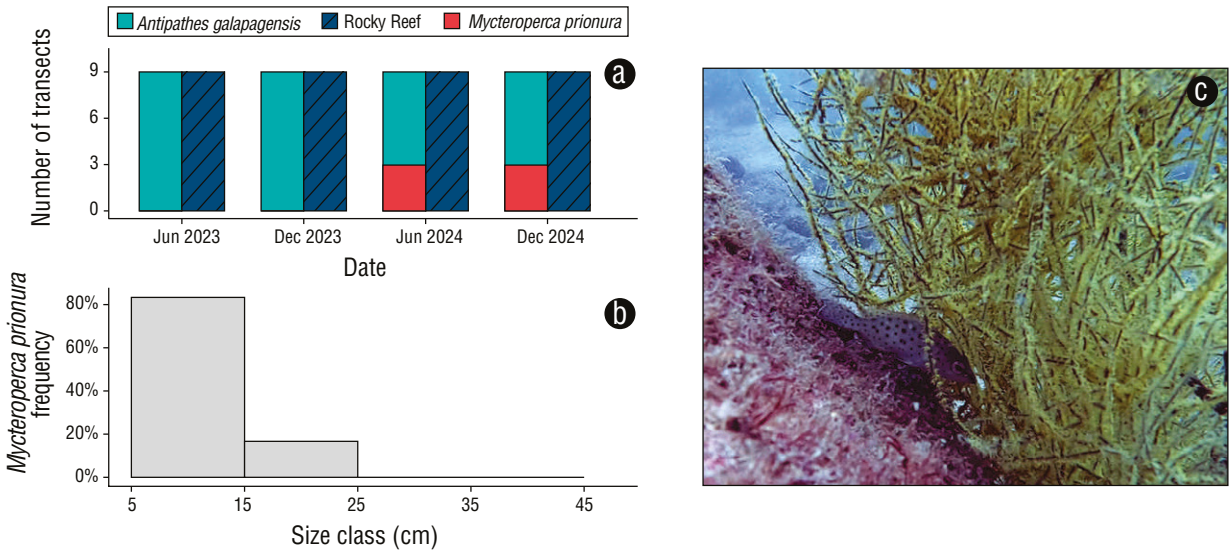

Figure 3. *Mycteroperca prionura* records and number of transects per habitat during the monitoring periods of June 2023, December 2023, June 2024, and December 2024 (**a**). Size-class distribution of *M. prionura* observed in 2023 and 2024 (**b**). *Mycteroperca prionura* sheltering among Black Coral (*Antipathes galapagensis*) branches (**c**).

However, these observations should be interpreted with caution, as *A. galapagensis* may also serve as an important habitat for adult *M. prionura* on deeper reefs, for which data are currently unavailable.

In the historical dataset of the Espiritu Santo Archipelago, most of the few observations of *M. prionura* were recorded at sites located near known deep *A. galapagensis* habitats, despite the absence of *A. galapagensis* from the transects themselves. During the 2023–2024 surveys at La Gaviota, *M. prionura* juveniles were consistently observed sheltering within *A. galapagensis* branches (Supplementary Video S1) and were also observed in a less common black coral species (*Myriopathes panamensis*) outside the quadrats (Supplementary Video S2). This behavior suggests a strong dependence on the structural complexity provided by black coral colonies, which may offer both protection from predators and suitable microhabitats for feeding. The use of structurally complex habitats by *M. prionura* during its early life stages is consistent with observations of its congener *Mycteroperca rosacea*, whose juveniles often rely on *Sargassum* beds before recruiting to deeper reefs (Aburto-Oropeza et al. 2007).

The absence of *M. prionura* in 2023 and its regular observation in 2024 at La Gaviota Island could be linked to environmental variability associated with the 2023 El Niño event. Elevated temperatures and reduced productivity during El Niño events can alter fish distributions, particularly in species that rely on the cooler and stable conditions under the thermocline, which deepens during these events (Dulvy et al. 2008, Iglesias et al. 2024). Given that *M. prionura* typically inhabits deeper reefs with cool waters (Robertson and Allen 2015, Craig and Erisman 2018), such conditions, potentially associated with a deepening of the thermocline, may have driven temporary downward shifts in habitat use. The lack of *M. prionura* observations in 2023 is consistent with those of Rabasco et al. (2025), who reported only one *M. prionura* sighting across 56 linear transects in four sites containing black corals between 15 and 30 m depth in the same area during 2023. These sites, including La Gaviota Island, are shallower than the typical depth range of *A. galapagensis* in the Gulf of California, as most populations are found below 25 m (Munguía-Vega et al. 2020). Thus, observations of *M. prionura* at shallower depths between 15 and 30 m appear to be a recurring feature of Bahía de La Paz.

Conclusions

Overall, the rare observations of *M. prionura* juveniles in the present study confirm the ecological importance of *A. galapagensis* for the species, which is consistent with previous research (Sala et al. 2003, Craig et al. 2011). *Mycteroperca prionura* typically occurs on deep reefs (>30 m), where black corals form structures described as animal forests that may play an important ecological role for the species. Therefore, although the current observations contribute to our understanding of the ecology of *M. prionura*, future studies at depths greater than 30 m are needed, particularly to quantify the population status of this vulnerable species. The apparent reliance of a fish species classified as Data Deficient in the IUCN Red List on a threatened habitat engineer suggests that declines in black coral habitats in the Gulf of California could have cascading consequences for *M. prionura*, which further highlights the need to monitor and protect these habitats.

Declarations

Supplementary material

The supplementary material for this work can be downloaded from: https://doi.org/10.5281/zenodo.20536245.

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Conflict of interest

The authors declare they have no conflict of interest.

Author contributions

Conceptualization: DO, FR; Data curation: FR; Formal analysis: FR; Funding acquisition: DO; Investigation: DO, FR; Methodology: DO, FR; Project administration: DO; Resources: DO; Software: FR; Supervision: DO; Validation: DO, FR; Visualization: FR; Writing–original draft: FR; Writing–review & editing: DO, FR.

Data availability

The R code and partial dataset necessary to reproduce the analyses are available from: https://doi.org/10.5281/zenodo.20739075. The data from *Sociedad de Historia Natural Niparajá A.C.* are available upon request.

Use of AI tools

The authors did not employ any AI tools in this work.

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