Sleeping Sites in Parrotfishes

Sitios donde Duermen los Peces Loro

Site de Couchage de Poissons Perroquets

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EXTENDED ABSTRACT

Coral reef fishes commonly show high site fidelity, long term site attachment, territoriality, and complex social structure, all of which are important shaping population dynamics and distribution patterns. Daylight behaviors are highly complex, creating a many-sided interaction network in different behavioral topics such as food web, cleaning, agonistic, and fish and benthos interactions (Cantor et al. 2018). However, it is also known that some species of fish exhibit circadian movements (migration, feeding, reproduction), and it is necessary to magnify the knowledge about the behaviors on the dark. Nocturnal behaviors, such habitat use, are poorly understood. Probably associated with logistics of data collection. Due the intensity of recreational and commercial fishing pressure (Pauly and Zeller 2016), it has been necessary to expand the behavioral knowledge of ecologically important fishes, such herbivorous fishes, in order to prioritize conservation programs over functional important groups (Parravicini et al. 2014). Parrotfishes are well known about their daylight behavioral, presenting several roles in the dynamics of tropical reefs, grazing over different algae, eroding dead coral skeletons and generating reef sediments (Bonaldo et al. 2004). By these, they are an important trophic link between their natural predators and algal primary producers (Hughes et al. 2007a). This link on trophic chain also is important to provide resilience to coral reef habitats to stochastic and anthropogenic factors (Hughes et al. 2007b). In a way to comprise one of the main focus of marine protected areas (MPA's), which is to maintain ecological functions in shape (Jones, 2002), thus avoiding disrupt any ecosystem processes mediated by herbivores (Hughes et al. 2007a). In a present scenario, where our understand of species behavior and distribution is largely restricted to diurnal period, and biodiversity management is spatially explicitly, it is important to comprehend the habitat use and nocturnal distribution of those key species. The main aim of this study is to check if parrotfish shows fidelity for sleeping sites by assessing comparative patterns of abundance, distribution and habitat selectivity at night. We analyzed species distribution for more than 12,000 m^2 in five different sites at an marine extractive reserve through visual census (strip transect: 50 m long x 2 m wide = 100 m^2), where 192 individuals of different species was observed trough animal focal method, and 18 individuals were tracked using active telemetry. Underwater sampling were done during nighttime, between 19:00 and 22:00 h, in depths ranging 1.5 – 12 m, which correspond the entire range of the rocky reefs studied. The parrotfishes species were identified, counted and size estimated (total length in cm) comparatively in an environmental gradient of depth and structural complexity. A Permutational Multivariate Analyses of Variance (PERMANOVA; with 999 permutations) based on a Bray-Curtis dissimilarity matrix was used to check the influence of depth and transect complexity on parrotfishes species distribution. A non-metric multidimensional scaling (nMDS) was used to graphically display the influence of the abiotic factors against data of abundance. During animal focal observations the diver recorder the substrate that the fish was lying down, and in four more other points, 30 cm far from the individuals and 90° separated each other to substrate type. Ivlev's electivity index was used to assess sleeping site selectivity, i.e. the selection for preferred benthic substrata to sleep. Local topographic complexity (LTC) and depth was also recorded by the diver. The LTC was classified in three levels: low (the individuals were totally unsheltered), medium (the individuals was partially protected by the topography) and high (the individuals were sheltered, protected by topography in more than two ways). The diver kept a distance of 1 – 3 m from the fish to avoid disturbance (Itzkowitz et al., 2000). For telemetry, only *Sparisoma frondosum* and *Sparisoma axillare*, the two most abundant and large parrotfishes were chosen to being monitored. During the night, 3 individuals of each species were captured and tagged in three sites (sites with more abundance), and after tagging, they were followed during 7 - 10 days. During the UVC's it was observed 7 parrotfishes species, *Scarus trispinosus*, *Scarus zelindae*, *Sparisoma amplum*, *Sparisoma frondosum*, *Sparisoma axillare*, *Sparisoma radians* and *Sparisoma tuiupiranga.* The most abundant species were *Sp. frondosum*, *Sp. axillare*, *Sp. tuiupiranga* e *Sc. zelindae*. There were no differences among sites or different structural complexity, but the depth show influence on the species composition distribution (R^2 = 0.04 and p < 0.05). The electivity index for the four most abundant species, showed a selectivity to sleep substrate on sediment and avoidance to the zoanthid, *Palythoa caribaeorum* (Figure 1). *Scarus zelindae* proportionally slept on places with the highest complexity and intermediate depth, on the other hand *Sparisoma tuiupiranga* slept manly on the interface of rocky shore and sand flat (Figure 2). Fidelity by site was high for 95% of individuals tracked. These results represent the first assessment of parrotfishes distribution and behavior at night and

are important data to improve local management and conservation of this important group of fish in a scenario of escalating overfishing.

KEYWORDS: Nocturnal behavior, reef fish, site fidelity

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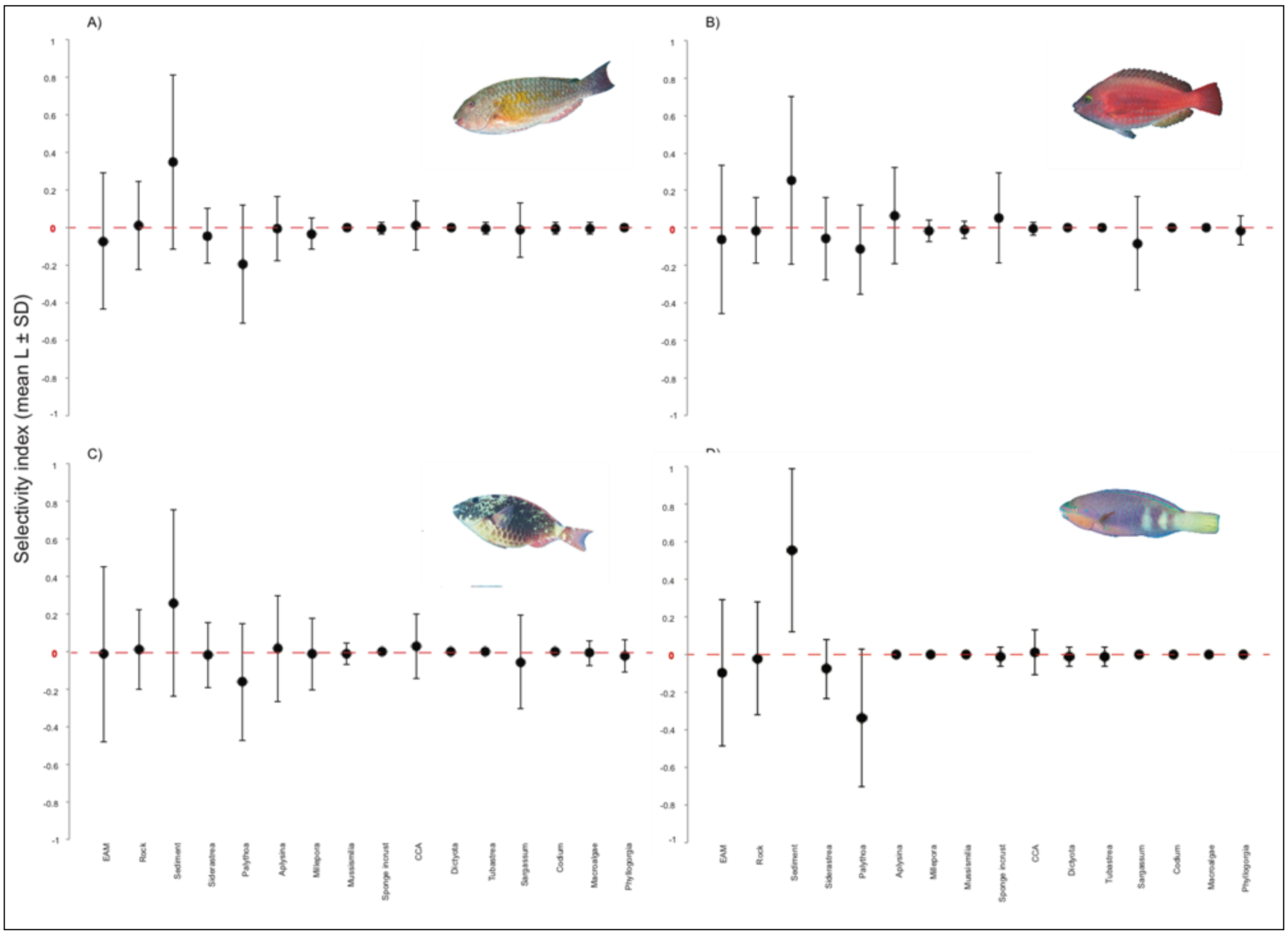

Figure 1. Ivlev's Selection Index for the four most important parrotfish species in terms of abundance. A) *Sparisoma axillare*; B) *Sparisoma tuiupiranga*; C) *Sparisoma frondosum* and D) *Scarus zelindae*. Values are Means ± Standart desviation.

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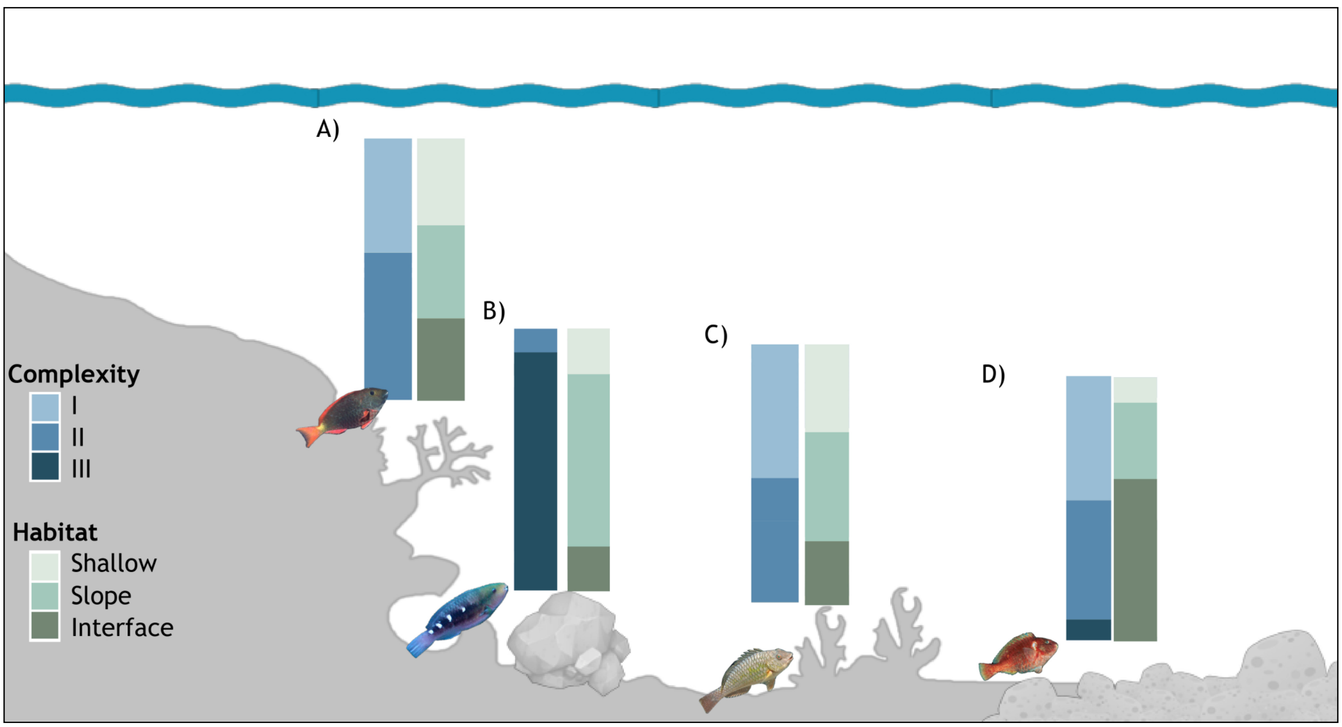

Figure 2. Conceptual figure of the proportional distribution of parrotfishes at Arraial do Cabo - RJ - Brazil. A) *Sparisoma frondosum*; B) *Scarus Zelindae*; C) *Sparisoma axillare*; D) *Sparisoma tuiupiranga*. Blue color - Local complexity (I, II and III). Green color - Sleeping habitat (Shallow, Slope and Bottom).