



## Opportunistic feeding behavior of *Diplodus argenteus* (Perciformes, Sparidae): human-fish interaction in two rocky reefs from SE and S Brazil

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**Abstract** This report is about two feeding behaviors of the silver porgy *Diplodus argenteus* in two rock reefs systems from the south Atlantic in Brazil. This species was a bottom feeder, which exhibited occasional and opportunistic behaviors.

**Key words:** behavior approach, silver porgy, opportunistic behavior

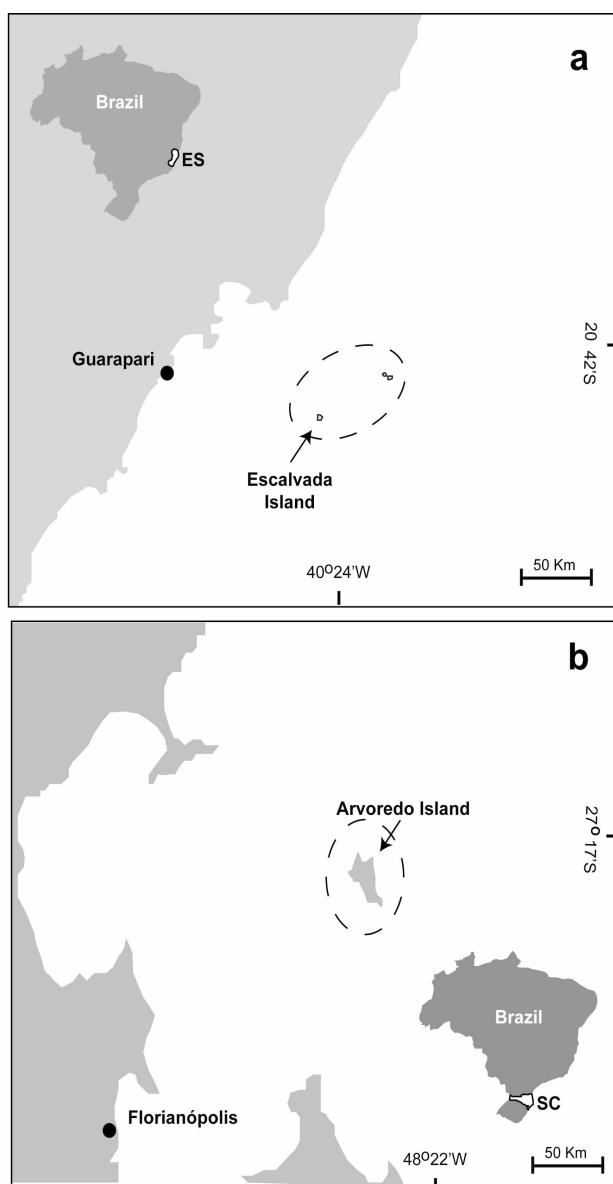
**Resumo.** Comportamento alimentar oportunista do marimbá *Diplodus argenteus* (Perciformes, Sparidae): interação humana-peixe em dois sistemas de costões rochosos do SE e SU do Brasil. Esse artigo aborda dois tipos de comportamentos alimentares do marimbá *Diplodus argenteus* em dois sistemas de costões rochosos do Atlântico sul no Brasil. Essa espécie alimentou-se sobre o fundo e exibiu comportamentos ocasionais e oportunistas.

**Palavras chave:** abordagem comportamental, marimbá, comportamento oportunista

The complexity of fish feeding patterns stems from the fact that many species present several opportunistic strategies behaviors to find and capture food including intra- and interspecific aggregations (Keenleyside, 1979). There are many theoretical and empirical examples of advantages or disadvantages of aggregation into groups (Macpherson, 1998). These abilities have designed feeding apparatus, various sensory systems and behavior modifications (Wainwright & Bellwood, 2002). On detecting potential food items, the fish orients itself towards them, approaches, and attempts to capture and ingestion. The complexity of fish feeding patterns originates from the fact that many species presented several behavior strategies to find and capture their food. Some are clearly opportunistic, varying their diet quickly to capitalize on sudden, short-term

abundance of particular prey (Keenleyside, 1979). The silver porgy, *Diplodus argenteus* (Valenciennes 1830), is widely distributed along the South Atlantic west coast and is either solitary or aggregates in small schools around rocky shores (Carvalho-Filho, 1999; David et al., 2005; Galván et al., 2005). A typical omnivore, it feeds mainly on benthos and, when aggregating in vast schools, also grazes on plankton (Ferreira et al., 2004). In the last few decades, with the growth of scuba diving activities, this opportunistic species started to follow scuba divers mainly over rocky bottoms (Netto & Krohling, 2012). For this report, we classify the feeding behavioral record of *D. argenteus* in SE and SU of Brazil. Our emphasis here was to identify the patterns of feeding behavior of this species in two different rock reef systems.

The first record of *D. argenteus* feeding aggregation was on Escalvada Island, Guarapari, Espírito Santo State, SE of Brazil ( $20^{\circ}42'02.72''\text{S}$ ,  $40^{\circ}24'21.93''\text{E}$ ) (Figure 1a). This island is one of the most visited by scuba divers from the nearest diving resort in Guarapari, ca. 40 km S of the State's Capital, Vitória, and belongs to a small archipelago composed by 'Três Ilhas, Ilha Escalvada and Ilhas Rasas', distance 3, 10 and 11 km respectively from the coast (Gasparini et al., 2000). The second record of feeding aggregation of *D. argenteus* was in Arvoredo Island Florianópolis, Santa Catarina State, S of Brazil ( $27^{\circ}17'68.82''\text{S}$ ,  $48^{\circ}22'47.40''\text{E}$ ) (Figure 1b).



**Figure 1.** Map of two rock reef systems indicating sites of feeding behaviour observation of *Diplodus argenteus*. a, Escalvada Island, b, Arvoredo Island, ES: Espírito Santo State, SC: St. Catarina State.

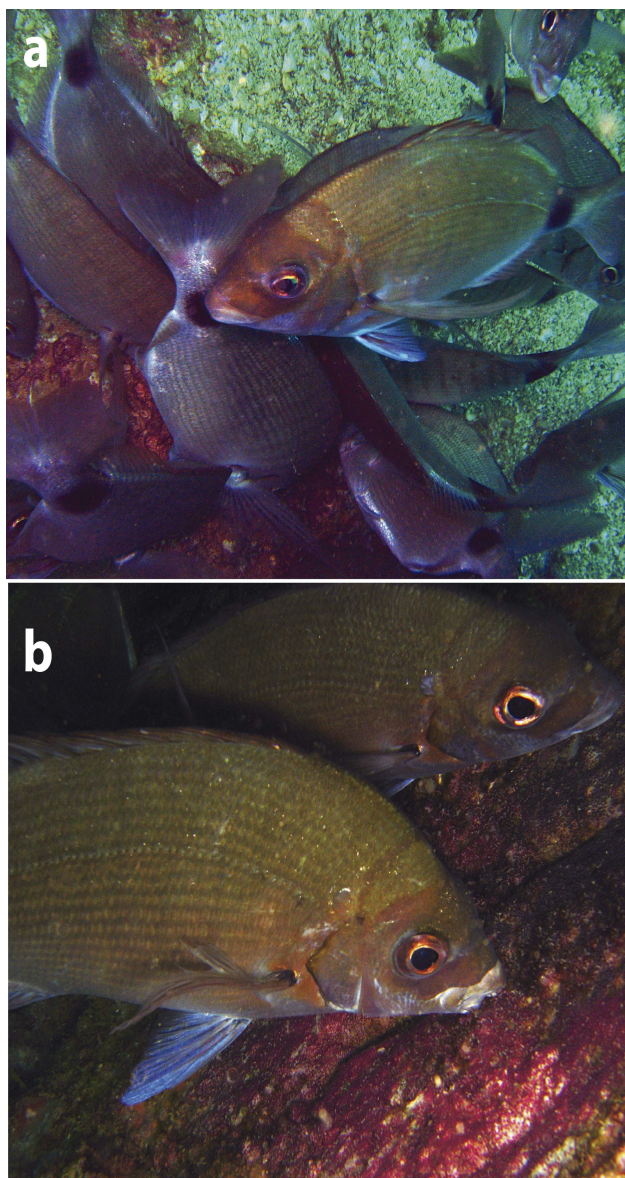
This island is also considered the best point of scuba diving of S of Brazil located 11 km from the Santa Catarina's coast (Hostim-Silva et al., 2006). The feeding behavior of *D. argenteus* was photographed, in Escalvada Island in October 10, 2005 at 0930 hr and photographed and filmed in Arvoredo Island in February 04, 2007 at 0846 hr. Both records were made over rocky and sand bottom between 8 and 18 m depth at morning using CANON Power Shot A95, WP-DC50 Underwater Housing. Corals, sponges, seaweeds and polychaetes mainly covered the rocky reef bottom.

The first record occurred in Guarapari when a feeding aggregation of *D. argenteus* was observed by the authors during a dive. Initially, after small shifts over the rock and sand bottom, the school of *D. argenteus* followed us and pecked at the small benthic invertebrates startled by our own movements (Figure 2a). When the authors stopped near the rocky bottom the school approached and fed on *Abudefduf saxatilis* (Linnaeus 1758) eggs placed over rocks (Figure 2b). This aggregation of *D. argenteus* comprised about 20 adults (~200 mm length) and lasted for 6 minutes. During this feeding aggregation of *D. argenteus* the preferred food item was eggs of *A. saxatilis*. The second observation on *D. argenteus* feeding behavior in Arvoredo Island presented only 2 individuals (15-20 mm length) and was followed by a single individual of *Pseudupeneus maculatus* (Bloch 1793) foraging on the sand bottom (Figure 3). Another species, *Haemulon steindachneri* (Jordan & Gilbert 1882), was observed interacting with *P. maculatus* following for food and mimicking *D. argenteus* (Figure 3a). While *P. maculatus* was swimming and foraging, the sand disturbance exposed small invertebrates that the *D. argenteus* started to prey on (Figure 3b).

Being an omnivore, *D. argenteus* feeds mostly on crustaceans, mollusks and polychaete as well as seaweeds (Sazima, 1986; Figueiredo et al., 2005) and often joins schools of other fish species of similar size and identical swimming behavior. *D. argenteus* has been considered as follower of substrate grubbers that are opportunistic species attracted by the feeding activities of other fishes, especially those which disturb the substrate (Gerhardinger et al., 2006). However, following is a part-time habit and, depending on the species, may be frequent or occasional (Sazima, 1986). Information on the ontogeny of many *Diplodus* species indicates that juveniles settle in shallow protected areas near sandy beaches or algal beds aggregating in small schools (McPherson, 1998). Larger adults are solitary or live in small groups around rocky shores (Menezes & Figueiredo, 1985; David et al., 2005). This study



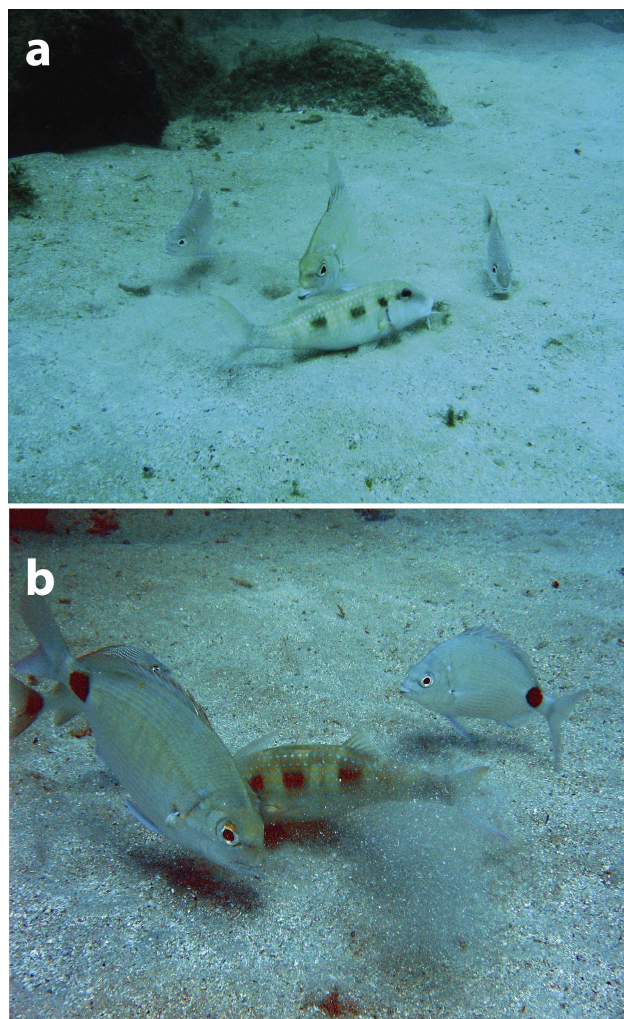
showed that the *D. argenteus* in the two rock reef systems were adults and diurnal bottom feeders.



**Figure 2.** First record in Depth 18 m, Escalvada Island. a, Detail of a school of *Diplodus argenteus* after following divers. b, Two fish picking up eggs from *Abudefduf saxatilis*.

The behavior of approaching scuba divers was probably triggered because the former disturbed the substrate and allowed an opportunistic foraging. Some individuals of *D. argenteus* are considered common predators of eggs of *A. saxatilis* when scuba divers approach the nests of *A. saxatilis* (Netto & Krohling, 2012). The two records of feeding behaviors were triggered mainly by substrate disturbance thus allowing an opportunistic foraging (Keenleyside, 1979; Sazima, 1986). More studies are necessary to understand the

impacts of scuba diving in the feeding behavior of a number of fish species.



**Figure 3.** Second record in Depth 8 m, Arvoredo Island. a, Two individuals of *Diplodus argenteus* following *Pseudupeneus maculatus* during the foraging. The third fish on the right is *Haemulon steindachneri* mimicking. b, *D. argenteus* preying small invertebrates exposed by *P. maculatus*.

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