

A new species of dwarf sea bass, genus *Serranus* (Serranidae: Actinopterygii), from the southwestern Atlantic Ocean

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Serranus alicae n. sp. is described from Rio de Janeiro and Espírito Santo States, southeastern Brazilian coast. The species is readily distinguished from its congeners by the following combination of characters: scales around the caudal peduncle 20 or 21; total gill rakers on first branchial arch 23-29; cheek-scales rows 5 or 6; and by the coloration of live specimens, which are reddish with a broad, conspicuous, white stripe from post-orbital region to the caudal-fin base and a white abdomen. The new species apparently inhabits the deeper (30 or more meters) portions of reef environments along the subtropical Brazilian coast, and is possibly associated with upwelling cold-water masses. The species was observed hovering above rocky bottoms, feeding on micro-crustaceans, squid larvae, and zooplankton. This new species increases to eight the number of valid *Serranus* species recorded in the southwestern Atlantic.

Serranus alicae sp. n. é descrita do Rio de Janeiro e Espírito Santo, costa sudeste do Brasil. Esta espécie é facilmente distinguível de suas congêneres pela seguinte combinação de caracteres: escamas ao redor do pedúnculo caudal 20 ou 21; rastros no primeiro arco branquial 23-29; 5 ou 6 séries de escamas na bochecha e pelo colorido de espécimes vivos, que têm corpo avermelhado com uma larga e evidente faixa branca que se estende da região pós-orbital à base da nadadeira caudal, e o ventre branco. A espécie nova aparentemente habita a parte profunda (30 metros ou mais) de ambientes recifais ao longo da costa subtropical brasileira, e possivelmente está associada a áreas de ressurgência. A espécie foi observada pairando acima de fundos rochosos, alimentando-se de microcrustáceos, larvas de lulas e zooplâncton. Esta espécie nova aumenta para oito o número de espécies válidas de *Serranus* registradas no Atlântico Sudoeste.

Key words: Brazil, Endemic species, Reef fish, Rocky reef, Subtropical, Teleostei.

Introduction

The “western Atlantic dwarf sea basses”, as defined by Robins & Ray (1986), comprise five genera of the Serranidae: *Diplectrum*, *Hypoplectrus*, *Schultzea*, *Serranus* and *Serraniculus*. A complete review of these genera is lacking despite the comprehensive work of Robins & Starck (1961) and Meisler (1987) on the group. Twenty-nine species of *Serranus* are currently recognized, 21 of which inhabit the Atlantic Ocean. Thirteen species of the genus are recorded in the western Atlantic, nine of which have been reported in Brazilian waters (Roux, 1973; Carvalho-Filho, 1999; Heemstra et al., 2002; Moura & Menezes, 2003; Heemstra, 2013): *S. annularis* (Gunther, 1880), *S. atrobranchus* (Cuvier, 1829), *S. baldwini* (Evermann & Marsh, 1899), *S. chionaraia* Robins & Starck, 1961, *S.*

flaviventris (Cuvier, 1829), *S. notospilus* Longley, 1935, *S. phoebe* Poey, 1852, *S. tabacarius* (Valenciennes, 1829), and *S. tigrinus* (Bloch, 1790). There are no published records of *S. chionaraia* for Brazil, but the species was recently reported from Abrolhos Archipelago, Bahia (C. L. Sampaio, pers. comm.). *Serranus notospilus* Longley, 1935 and *S. tigrinus* (Bloch, 1790), reported by Roux (1973) and Carvalho-Filho (1999) as occurring in Brazil, are probably misidentifications. *Serranus dewegeri* Metzellar, 1919 is now included in *Paralabrax* (Robins & Starck, 1961; Pondella et al., 2003), whereas *Serranus auriga* (Cuvier, 1829) is located in *Dules* (Robins & Starck, 1961).

In March 2009, while scuba diving in Arraial do Cabo, Rio de Janeiro State, Brazil, the second author observed an unidentified, relatively small, perch-like fish at about 30 meters deep, hovering above the rocky bottom. This and three

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other similar specimens were collected in that location. In December 2010, at a nearby site, the same author collected six additional specimens of that unidentified serranid, again at a depth of about 30 m. In April and May 2012 six more specimens were collected on a depth of about 70 m in a reef about 40 km off the rio Doce mouth, in Espírito Santo State, Brazil. That species is described herein, on the basis of morphological evidence. With the addition of that species, eight valid *Serranus* are now confirmed to occur in Brazilian waters.

Material and Methods

Counts and measurements follow Robins & Starck (1961). Standard Lengths are presented in mm. In the description below, measurements are expressed as percentage of standard length (SL), except for the upper-jaw length, which is expressed as percentage of head length (HL). Meristic data are given in the description, followed by the frequency of each count in parenthesis and an asterisk indicating values for the holotype. Institutional abbreviations are: CIUFES, Coleção Ictiológica da Universidade Federal do Espírito Santo; MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro; MZUSP, Museu de Zoologia da Universidade de São Paulo; and ZUEC, Museu de História Natural da Universidade Estadual de Campinas. All specimens were collected with hand-nets while scuba diving.

Results

Serranus alicae, new species

Figs. 1-2

Holotype. MNRJ 38911, 67.1 mm SL, Brazil, Rio de Janeiro, Arraial do Cabo, Ilha de Cabo Frio, Saco dos Ingleses, 23°00'25"S 42°00'19"W, 30 m, 23 Dec 2010, C. E. L. Ferreira.

Paratypes. MNRJ 38912, 1, 45.1 mm SL; MZUSP 109159, 2, 34.9-60.3 mm SL; ZUEC 6354, 1, 53.5 mm SL, collected with holotype. MNRJ 38913, 2, 23.5-30.1 mm SL; ZUEC 6355, 1, 21.9 mm SL; ZUEC 6356, 1, 26.8 mm SL, Brazil, Rio de Janeiro, Arraial do Cabo, Ilha de Cabo Frio, Saco dos Ingleses, 23°00'25"S 42°00'19"W, 28-30 m, 29 Mar 2009, C. E. L. Ferreira. CIUFES 2368, 1, 40.3 mm SL; CIUFES 2370, 2, 30.4-35.6 mm SL, Brazil, Espírito Santo State, deep reef near Peroá-Linhares Petrobras oilrigs, 40 km off rio Doce mouth, 19°34'44"S 39°17'19"W, 70 m, 13-14 Apr 2012, T. E. Simon, H. T. Pinheiro, R. M. Macieira & E.F. Mazzei.

Non-types. CIUFES 2382, 1, 33.4 mm SL, Brazil, Espírito Santo State, deep reef near Peroá-Linhares Petrobras oilrigs, 40 km off rio Doce mouth, 19°34'44"S 39°17'19"W, 70 m, 13 Apr 2012, T. E. Simon, H. T. Pinheiro, R. M. Macieira & E.F. Mazzei. CIUFES 2411, 2, 34.8-38.4 mm SL, Brazil, Espírito Santo State, deep reef near Peroá-Linhares Petrobras oilrigs, 40 km off rio Doce mouth, 19°34'44"S 39°17'19"W, 70 m, 29 May 2012, T. E. Simon, H. T. Pinheiro, R. M. Macieira & E. F. Mazzei.



Fig. 1. *Serranus alicae*, holotype, Brazil, Rio de Janeiro, Arraial do Cabo, Ilha de Cabo Frio, Saco dos Ingleses, MNRJ 38911, 67.1 mm SL, just after collection. Photo by Osmar J. Luiz.

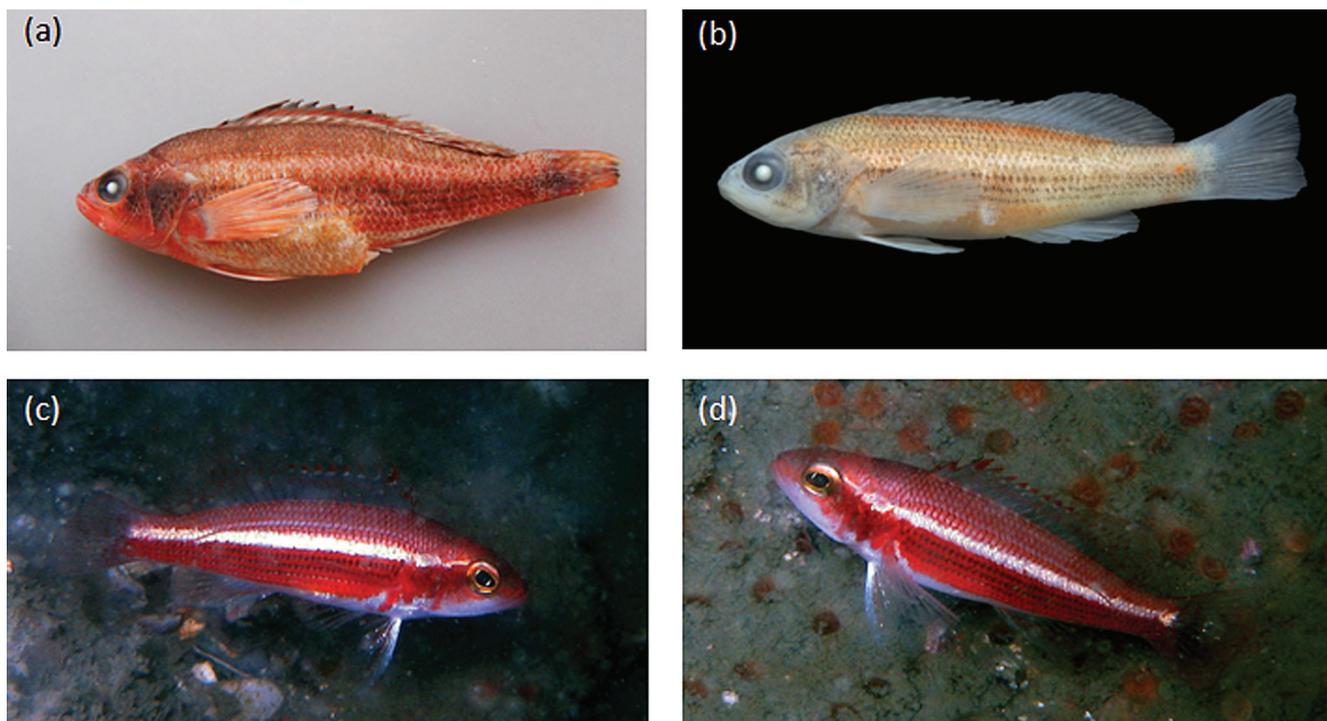


Fig. 2. *Serranus aliciae*: **a)** paratype, ZUEC 6354, 53.5 mm SL, recently fixed (photo by A. Carvalho-Filho); **b)** paratype, CI-UFES 2368, 40.3 mm SL, after five days in ethanol (photo by R. M. Macieira); **(c)** and **(d)**, underwater images at 35 (O. J. Luiz) and 40 m deep (C. E. L. Ferreira) on rocky reefs at Arraial do Cabo, Rio de Janeiro State, showing details of its live coloration.

Diagnosis. *Serranus aliciae* is readily distinguished from its congeners by the following combination of characters: scales around the caudal peduncle 20 or 21; total gill rakers on first branchial arch 23-29; cheek-scales rows 5 or 6; and by the coloration of live specimens, which are reddish with a broad, conspicuous, white stripe from post-orbital region to the caudal-fin base and a white abdomen. See Remarks for further comments on the diagnosis of the species.

Description. Measurements and counts are presented in Table 1. Body elongate, head sub-conical; inter-orbital region flattened. Mouth small, slightly oblique; maxilla almost reaching vertical through posterior margin of pupil, teeth in upper and lower jaws arranged in bands, a few outer ones enlarged and canine-like in both jaws of small specimens, adults with a few enlarged teeth only in lower jaw: a single teeth at symphysis and 1 or 2 laterally on each side; small villiform teeth on vomer and palatines; tongue lanceolate, proximal region very broad and distal tip bluntly pointed. Longest gill raker on first gill arch at angle, its size about half eye diameter. Nostrils in front of middle of eye and very close to one another, opening of anterior nostril about half the diameter of opening of posterior.

Opercle with three flat spines, the central straight, larger, and conspicuous than the others which are very difficult to see; opercular membrane pointed at posterior end. Preopercle profusely serrate on posterior border of vertical limb, with

about 30 tiny spines plus 5-7 enlarged spines at angle, and smooth on horizontal, ventral, edge. Branchiostegal rays 7.

Lateral line slightly arched over pectoral-fin area, parallel to dorsum profile from that point to the caudal peduncle, where it bends to middle of body and continues as a straight line to caudal-fin base. Scales ctenoid, firmly attached to skin, not deciduous; interorbital space, snout, preorbital region, jaws, dentary symphysis, gular region, and branchiostegal membranes naked; scales on top of head reaching anteriorly to vertical through posterior border of preopercle or slightly anterior to it; minute, embedded scales on basal half of soft portion of dorsal and anal fins; small scales only at the base of the pectoral fin.

Dorsal-fin origin over pectoral-fin base and fourth or fifth lateral-line scale; spiny portion incised; first spine about half length of second, third spine the longest, fourth to sixth somewhat shorter, seventh to tenth even shorter and subequal; dorsal-fin rays branched, last one branched to base; posterior tips of soft portion of dorsal and anal fins falls distinctly short of caudal-fin base when depressed. Anal-fin origin approximately below first dorsal-fin ray; first anal-fin spine about half the length of second, which is slightly shorter than third. Caudal fin truncate to slightly emarginated, the uppermost and lowermost caudal-fin rays not branched. Pectoral fin not reaching vertical through anus, all rays branched except uppermost and lowermost, eighth or ninth upper pectoral-fin ray longest. Pelvic-fin origin below pectoral-fin base, posterior tip not reaching anus.

Color in life. Body golden reddish brown to light red with a conspicuous white stripe running from eye or upper portion of opercle to caudal-fin base (Fig. 1). Lower portion of body, from dentary symphysis to caudal-fin base milky white, often with large red area anterior to origin of pelvic fins. Dorsum with brassy shine, margin of scales dark. Lateral of body, between mid-lateral whitish band and white abdomen, with 3-5 lines of blue dots, sometimes followed ventrally by 1-3 whitish lines; blue-dotted lines often containing whitish scales among the darker ones; white lines sometimes containing some dark, bluish scales among the pale ones. A small, bright, golden area usually present in the abdomen under the pectoral fin and posterior to it. Several small blue dots on opercle and preopercle often merged. Dorsal fin with a dark red triangle at the tip of each spine, and two white stripes between series of red spots, the upper one beneath the upper row of spots and the lower one ventral to the second row of spots; the lower white stripe does not extend to the posterior end of the fin as the upper white stripe does. Caudal fin hyaline, with one to several reddish spots or blotches on each ray. Anal, pelvic, and pectoral fins with orange-reddish markings in adults: pectoral fin uniformly orange-reddish, pelvic and anal fins white anteriorly with orange-reddish pigment in inner two-thirds; reddish orange pigment sometimes absent in small specimens. Upper portion of eye reddish to orange. When alive, *S. alicae* is capable of changing the color pattern of its flanks, the white band fades dramatically and several conspicuous dark blotches between this band and the white belly are more apparent. Almost immediately after death, the blue dots on the ventrolateral portion of body usually disappear, remaining as an outline around scales, and the white band fades dramatically.

Color in alcohol. Body tan to brownish overall, ventral region whitish, the white lateral stripe barely discernible, faded to a tan tone lighter than background color; fins hyaline, sometimes with a suggestion of the reddish marks.

Etymology. The specific epithet *aliceae* refers to the name of the dear daughter of the second author, Alice. A noun in apposition.

Distribution. Specimens of *S. alicae* were collected in two localities of southeastern Brazil: Arraial do Cabo, Rio de Janeiro State (23°00'25"S 42°00'19"W), in a reef formation at about a depth of 30 m, and also at about 40 miles off the rio Doce mouth, in Espírito Santo State, among reefs at about 70 m deep, (19°34'44"S 39°17'19"W). *Serranus alicae* apparently inhabits the deeper (30 or more meters) portions of reef environments along the subtropical Brazilian coast, and is possibly associated with upwelling cold-water masses. It is the only species of *Serranus* known to date that is endemic to Brazil.

Remarks. *Serranus alicae* has strongly ctenoid scales that are not deciduous, the top of head is not scaled in the region anterior to the posterior margin of the interorbital region, and the opercular spines are developed. That combination of characters places *S. alicae* in the subgenus *Serranus*, as defined by Robins & Starck (1961).

The low number of scales around the caudal peduncle (20 or 21) readily distinguishes *S. alicae* from other Atlantic species of both the *Serranus* and *Paracentropristis* subgenera. *Serranus atrobranchus* (subgenus *Paracentropristis*), for instance, has 22-25 of such scales, whereas all other Atlantic species have 23 or more scales (Robins & Starck 1961). Among the species of the subgenus *Serranus* reported from the western Atlantic, *S. alicae* also differs in terms of coloration (images and descriptions of other species available in Humann & DeLoach, 2002, and Kells & Carpenter, 2011). *Serranus alicae* is further distinguished from other Atlantic species of the genus by a series of features: *S. annularis* has a higher number of rows of scales on cheek (5 or 6 vs. 10-12). *Serranus baldwini* has a lower number of total gill rakers (23-28 vs. 14-17). *Serranus chionaria* also has a lower number of gill rakers in the first branchial arch (23-28 vs. 17-20), in addition to a higher number of rows of scales on cheeks (5 or 6 vs. 8 or 9). The number of pectoral-fin rays is higher in *S. flaviventris* (14 or 15 vs. 16 or 17). *Serranus luciopercanus* has a higher number of cheek-scales rows (5 or 6 vs. 8-10) and its middle opercular spine is upturned. *Serranus phoebe* has a lower number of total gill rakers (23-28 vs. 17-20) and a higher number of rows of scales on cheek (5 or 6 vs. 9-12). *Serranus subligarius* has a lower number of gill rakers in the first branchial arch (23-28 vs. 16 or 17). *Serranus tabacarius* has a higher number of lateral-line scales (46-48 vs. 50-55) and cheek-scales rows (5 or 6 vs. 10-12). *Serranus tigrinus* has a lower number of total gill rakers (23-28 vs. 15-19) and higher number of rows of scales on cheek (5 or 6 vs. 11-13). *Serranus tortugarum* is the most similar species to *S. alicae* in terms of counts, but differs by the longest dorsal fin spine (5th in *S. tortugarum* vs. 3rd in *S. alicae*).

Serranus alicae differs from the six Pacific species of the genus by the coloration pattern and several other features: from *S. aequidens* Gilbert, 1890, by the origin of the pelvic fins under the pectoral fin base (vs. ahead of the pectoral fin base) and the length of the same fin (63-80% in head length vs. about 50%); from *S. huascarii* Steindachner, 1900 by the higher number of lower gill rakers (15-18 vs. 12 or 13) and the lower number of rows of scales on cheek (5 or 6 vs. 8-11); from *S. psittacinus* Valenciennes, 1846 by the lower number of scales around the caudal peduncle (20 or 21 vs. 24-30); from *S. socorroensis* Allen & Robertson, 1992, by the lower number of scales around the caudal peduncle (20 or 21 vs. 27); from *S. stilbostigma* (Jordan & Bollman, 1890) by the lower number of lateral-line scales

(46-48 vs. about 58) (Gilbert, 1890; Jordan & Eigenmann, 1890; Meisler, 1987; Allen & Robertson, 1992; Allen & Robertson, 1998; Heemstra, 1995; Bussing & López, 2004; McCosker & Rosenblatt, 2010). Although there was never a detailed formal description of *S. tico* Allen & Robertson, 1998, from the Pacific Ocean, the species is currently considered as valid (e.g., Eschmeyer, 2013). *Serranus aliciae* differs from *S. tico* by the coloration pattern and geographical distribution. From the two western Indian Ocean *Serranus* species, *S. knysnaensis* Gilchrist, 1904 and *S. novemcinctus* Kner, 1865, *Serranus aliciae* differs by the coloration pattern and the lower number of lateral-line scales (46-48 vs. more than 67) (Heemstra & Randall, 1986; Heemstra & Heemstra, 2004).

Natural history. *Serranus aliciae* occurs in the deeper portion of coastal reefs, usually below 30 m, and is often observed hovering at a short distance above rocks, sand or rubble (Fig. 2). Other species of the genus (e.g., *S. tabacarius* and *S. tortugarum*) also exhibit a similar hovering behaviour (Robins & Starck, 1961; Randall, 1967). *Pronotogrammus martinicensis* (Guichenot, 1868), *Dules auriga* (Cuvier, 1829), and *Chromis flavicauda* (Günther, 1880) were occasionally observed in association with *S. aliciae* in the same site at Arraial do Cabo, Rio de Janeiro, Brazil. The stomach contents of four individuals of *S. aliciae* (ZUEC 6356, MNRJ 38912, MZUSP 109159, and the holotype MNRJ 38911) were examined. One of them had an empty stomach and intestine, the remainder had their stomachs and intestines almost full. Contents included carapaces of non-identified crustacean and a very tiny squid, which indicates that in addition to feeding on the bottom, *S. aliciae* is also a zooplankton picker. The four largest specimens examined have well-developed mature oocytes and sperm ducts, probably indicating that, like several other species of *Serranus*, they are simultaneous hermaphrodites (Erisman & Hastings, 2011; Fischer & Petersen, 1987). The largest fish examined with no mature oocytes or well developed sperm ducts is 34.9 mm SL, and the smallest one with well-developed mature oocytes and sperm ducts is 45.1 mm SL, suggesting that sexual maturity is attained at approximately 40 mm SL. Mass of two ripe individuals: holotype MNRJ 38911 (67.1 mm SL), 4.44 g, the eggs weighing 0.57 g (12.8% of total weight); paratype MZUSP 109159 (60.3 mm SL), 2.94 g, the eggs weighing 0.30 g (10.2% of total weight).

Conservation status: *Serranus aliciae* is the smallest species of the genus reported for the Brazilian coast, making it difficult to capture by commonly used commercial and/or artisanal fishing gears. Only *S. phoebe* and *S. atrobranchus* were previously identified from fish larvae collections made along the subtropical coast (Figueiredo *et al.*, 2002). Like those species, *S. aliciae* is probably distributed along the subtropical Brazilian coast, where the South Atlantic Central Water (SACW, T < 18°C) influences coastal reefs

(Castro-Filho & Miranda, 1998). Deep-reef exploration is resulting in the discovery of new endemic species (Luiz *et al.*, 2009) and distinct populations of widespread species (Carvalho-Filho *et al.*, 2009), underscoring this habitat as an important biodiversity repository. As all but the upper portions of deep reefs are beyond the maximum depths reached with traditional SCUBA gear, specialized skills and equipment are required (Pyle, 2000). Subtropical deep reefs and associated assemblages of the southern and southeastern Brazilian coast may not be under threat by impacts that are traditionally associated with shallow reefs (e.g., anthropogenic plus climate effects), but they may be impacted by different fishing practices. Major stresses, if any, on fishes inhabiting mesophotic cold reefs in the subtropical Brazilian coast are yet unknown. We suggest that deep-reef cryptic fishes like the small *S. aliciae* should be categorized as Data Deficient (DD) according to the IUCN (International Union for Conservation of Nature) criteria in future conservation assessments, pending more research on Brazilian deep-reef systems.

Comparative material. *Serranus atrobranchus*, MZUSP 55435, 1, 96.3 mm SL, Brazil, Santa Catarina, Florianópolis, Ilha do Arvoredo. *S. baldwini*, MZUSP 65593, 1, 53.2 mm SL, Brazil, Pernambuco, Tamandaré, Recife Carapitanga. MZUSP 53117, 1, 44.2 mm SL, Brazil, Maranhão, Parcel Manoel Luis. *S. flaviventris*, MZUSP 79742, 4, 54.3-62.1 mm SL, Brazil, Espírito Santo, Guarapari, Três Ilhas. MZUSP 60790, 4, 41.4-53.1 mm SL, Brazil, Bahia, Arquipélago de Abrolhos, Recife Popa Verde. *S. phoebe*, MZUSP 71073, 2, 158.3-172.6 mm SL, Brazil, São Paulo, Ubatuba.

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