



***Sparisoma rocha*, a new species of parrotfish (Actinopterygii: Labridae) from Trindade Island, South-western Atlantic**

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Abstract

A new species of parrotfish, *Sparisoma rocha* **sp. n.**, is described from Trindade Island off South-eastern Brazil. It differs from its Western Atlantic congeners by the unique colour pattern of live and freshly preserved individuals: initial phase red overall with a brownish shade from lower jaw to over the abdominal cavity, sparse orange blotches on head, and pale circumpeduncular band; terminal phase reddish brown with orange stripe from jaw angle to end of preopercle, sparse orange blotches on head, three pinkish to reddish stripes from about midline to dorsum, from midline to belly pale greyish green to whitish with suffusion of pale reddish brown, a black spot on base of pectoral fins and a bright-yellow blotch below this spot. Additionally, mitochondrial 12S and 16S rRNA loci sequences do not match any known *Sparisoma* species. The new parrotfish increases to six the species of the genus *Sparisoma* recorded from South-western Atlantic.

Key words: *Sparisoma*, new species, Labridae, reef fish, oceanic islands, Western Atlantic

Introduction

The South-western Atlantic parrotfishes of the genus *Sparisoma* Swainson were recently reviewed by Moura *et al.* (2001) who recognised five species. Since then one additional species was described from the South-western Atlantic (Gasparini *et al.* 2003), which replaced *Sparisoma atomarium* (Poey) from the list presented by Moura *et al.* (2001), and is already treated as such in Robertson *et al.* (2006). Herein we describe a new species of *Sparisoma* from Trindade Island, off South-eastern Brazil, raising to six the number of species within this labrid genus (*sensu* Westneat & Alfaro 2005) recognised for South-western Atlantic.

Material and methods

Counts and measurements follow Moura *et al.* (2001) and Gasparini *et al.* (2003). Specimen lengths are given as mm standard length (SL). Abbreviations IP and TP refer to initial and terminal colour phases (see Warner & Robertson 1978). Colour characterisation is based on type specimens shortly after death and those recorded alive in nature, as well as after preserved in ethanol. Mention to colours of other *Sparisoma* species is based on Moura *et al.* (2001), and personal observations. Institutional abbreviations follow Leviton *et al.* (1985), except CIUFES (Coleção Ictiológica, Departamento de Oceanografia e Ecologia, Universidade Federal do Espírito Santo). The new species had its mitochondrial 12S and 16S rRNAs analysed by G. Bernardi (*in litt.*). DNA was extracted from one sample and PCR amplified for the mitochondrial 12S and 16S rRNAs genes using universal primers (Robertson *et al.* 2006). Sequences were then compared with all known *Sparisoma*

species (Robertson *et al.* 2006). GenBank access numbers are GU985520 for 16S rRNA and GU985521 for 12S rRNA.



FIGURE 1. *Sparisoma rocha* **sp. n.**, a TP individual (top) and an IP individual (bottom) in the reef habitat under natural light (Photographs by H. T. Pinheiro).

Sparisoma rocha sp. n.

Trindade parrotfish

(Figures 1–4)

Sparisoma frondosum, Moura *et al.* 2001, p. 512 (part, distribution).

Type series: Holotype: CIUFES 0848 (261.8, TP), Ponta da Calheta, Ilha da Trindade (20°31'S, 29°19'W), collected by H. Pinheiro & R.G. Santos, 29 April 2009. Paratypes: (all from the same locality and the same collectors as holotype): CIUFES 1529 (268.2, IP), 30 April 2009; ZUEC 6349 (252, TP), 30 April 2009; 01 May 2009; ZUEC 6350 (151, IP), 16 April 2009.

Comparative material: *Sparisoma frondosum*: ZUEC 4654, 6347, 6348, MZUSP 52831, *Sparisoma amplum*: ZUEC 4653, MZUSP 46803, *Sparisoma axillare*: ZUEC 3090, 4655, MZUSP 52831, *Sparisoma radians*: ZUEC 5233, MZUSP 51547, *Sparisoma tuiupiranga*: CIUFES 1821 (holotype), 1822 (paratype), ZUEC 2745, ZUEC 6217 (paratype).

Diagnosis: *Sparisoma rocha* **sp. n.** differs from its South-western Atlantic congeners (Moura *et al.* 2001, Gasparini *et al.* 2003) by the following unique combination of colour characters: initial phase (IP) red overall with a brownish shade from lower jaw to over the abdominal cavity, sparse orange blotches on head, and pale circumpeduncular band; terminal phase (TP) reddish brown with orange stripe from jaw angle to end of preopercle, sparse orange blotches on head, three pinkish to reddish stripes from about midline to dorsum, from midline to belly pale greyish green to whitish with suffusion of pale reddish brown, a black spot on base of pectoral fins and a bright-yellow blotch below this spot. Additionally, mitochondrial 12S and 16S rRNA loci sequences do not match any known *Sparisoma* species.

TABLE 1. Standard length (mm) and proportional measurements (% SL) of the four type specimens of *Sparisoma rocha* **sp. n.** CIUFES 0848 holotype terminal phase (TP), remainder paratypes: CIUFES 1529 initial phase (IP), ZUEC 6349 TP, ZUEC 6350 IP.

Specimens	CIUFES 0848	CIUFES 1529	ZUEC 6349	ZUEC 6350
Standard length	261.8	268.2	252	151
Body depth	36.1	35.6	35.9	34.4
Body width	22	17.9	18.6	17.7
Head length	31.2	32	30.5	29.7
Snout length	12.1	14.5	13	10
Orbit diameter	5.2	5.5	5.2	6.1
Interorbital width	8	7.9	7.8	7.5
Caudal peduncle depth	11.9	11.2	12.4	12.1
Caudal peduncle length	10.7	11.5	11.9	12.2
Predorsal length	32.4	33.2	32.9	28.9
Prepelvic length	32.6	37.5	33.6	31.4
Dorsal fin base length	55.6	50.5	54.5	55.8
Anal fin base length	25.6	24.6	26.8	28.2
First dorsal spine length	9.5	8.2	8.6	9
Ninth dorsal spine length	9.5	8.5	9.8	7.6
Third anal spine length	9.3	10.2	9	9.5
Longest anal ray length	10.2	10.1	11.2	10

Description: Based on holotype and 3 paratypes (1 TP individual and 2 IP ones); morphometric data summarised in Table 1. Dorsal-fin IX, 10 (last ray branched to base); anal-fin III, 9 (last ray branched to base); pectoral rays 12 (uppermost rudimentary, the second unbranched); pelvic-fin I, 5; Caudal-fin 1+12+1 (branched principal rays 12, secondary [uppermost and lowermost] unbranched); upper procurrent caudal rays 7-8; lower procurrent caudal rays 6-7; lateral-line scales 26-27 (2 posterior to hypural, last one enlarged); 5-6 scales between lateral-line scales and origin of anal-fin; 2 rows of scales between lateral-line scales and dorsal

fin, scales in upper row about half the size of those in lower row; circumpeduncular scales 12; median predorsal scales 4; 2 mid-ventral scales posterior to origin of pelvic-fins; 5 scales on cheek in single row; lateral (internal) gill rakers on first gill arch 15, characteristically the most posterior with 2 or 3 projections from base.



FIGURE 2. *Sparisoma rocha* sp. n., holotype CIUFES 848 (top) and paratype CIUFES 1529 (bottom) shortly after death (Photographs by H. T. Pinheiro).

Caudal-fin emarginate to lunate (slightly rounded in juveniles), its length 3.9-5.49 in SL; origin of dorsal-fin after upper end of gill opening; dorsal spines pungent; distal tip of pectoral-fins reaching a vertical slightly anterior to slightly posterior to pelvic-fin tips (not reaching a vertical through anus); pelvic-fins 1.56-1.88 in HL. Lateral-line follows contour of the dorsum to the level of posterior part of dorsal-fin, then angles sharply downward and continues along mid-axis of caudal peduncle and base of caudal-fin (last horizontal portion with 7 scales); tubes of all lateral-line scales (including the last enlarged scale) with several branches. Mouth slightly oblique, not reaching a vertical through anterior nostril; teeth coalesced into beak-like dental plates, free edge irregular; two canines on each side.



FIGURE 3. *Sparisoma rocha* **sp. n.**, juvenile CIUFES 1480 (38.8 mm SL) shortly after death (Photograph by H. T. Pinheiro).

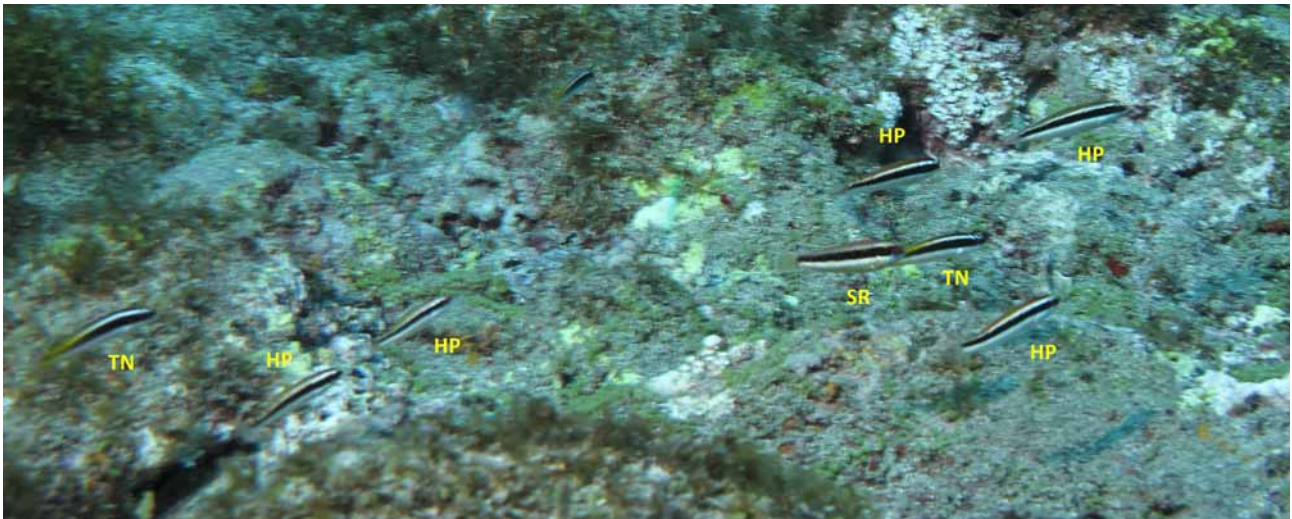


FIGURE 4. *Sparisoma rocha* **sp. n.**, juvenile associated with a mixed group of two other labrid species in the reef habitat under natural light (HP= *Halichoeres penrosei*; SR= *Sparisoma rocha*; TN= *Thalassoma noronhanum*) (Photograph by H. T. Pinheiro).

Colour pattern: TP individuals alive and shortly after death (up to 2 h) conveniently illustrate the colour pattern of the new species. Colour of IP individuals larger than 150 mm, alive and shortly after death mostly red (Figures 1 and 2). The most prominent colour features of the new species are those given in the diagnosis: IP red overall with a brownish shade from lower jaw to over the abdominal cavity, sparse orange blotches on head, and pale circumpeduncular band; TP reddish brown with orange stripe from jaw angle to end of preopercle, sparse orange blotches on head, three pinkish to reddish stripes from about midline to dorsum, from midline to belly pale greyish green to whitish with suffusion of pale reddish brown, a black spot on base of pectoral fins and a bright-yellow blotch below this spot (Figures 1 and 2). Colour of juveniles alive and shortly after death variable (Figures 3 and 4), that of individuals associated with other labrid species characterised by a conspicuous dark stripe from snout to end of caudal peduncle (Figure 4). In preservative (ethanol) the vivid orange and pink, and pale greenish grey of TP specimens fade and turn to yellowish white and the reddish brown changes to greyish brown; the vivid red of IP specimens changes to yellowish light grey and fins become largely translucent.

Etymology. The specific name honours our friend and ichthyologist colleague Luiz A. Rocha, who

pioneered molecular genetics and phylogeography of Brazilian reef fishes. Additionally, 'rocha' means rock in Portuguese, an allusion to the volcanic rocky formation of Trindade Island (type locality of this parrotfish). To be treated as a noun in apposition.

Distribution: The new species is presently known only from Trindade Island (20°31'S, 29°19'W), a volcanic formation off SE Brazil, South-western Atlantic.

Remarks: As parrotfishes are morphologically conservative (Bellwood 1994) and most characteristics overlap broadly (*e.g.* Randall 1996, Moura *et al.* 2001), colour pattern is very important for species identification (*e.g.* Randall & Choat 1980, Choat & Randall 1986). Thus, the best way to diagnose and/or identify a species within the genus *Sparisoma* is the use of colour pattern (see Moura *et al.* 2001, Gasparini *et al.* 2003). *Sparisoma rocha* **sp. n.** is readily distinguished from all other species within the genus by its unique colour pattern, including the overall red colouration of IP individuals. The only other *Sparisoma* species whose IP is predominantly or entirely red is the smaller *Sparisoma tuiupiranga* Gasparini, Joyeux & Floeter, which has yellow-orange eyes and hyaline pectoral-fin (eyes and pectoral-fin red in the new species), whereas TP is bluish suffused with reddish from dorsum to midline (reddish brown with pinkish to reddish stripes from dorsum to midline in the new species). From the remaining four species recognised for the South-western Atlantic, the new species differ as follows: IP individuals of *Sparisoma frondosum* (Agassiz), with which *Sparisoma rocha* **sp. n.** may occasionally be confused (*e.g.* Moura *et al.* 2001, JLG pers. obs.), have a pale blotch on the upper part to the middle of caudal peduncle (pale circumpeduncular band in the new species). Additionally, TP of *S. frondosum* is mottled in green or blue and brown or reddish overall, whereas IP is reddish brown to brown. IP individuals of *Sparisoma amplum* (Ranzani) have greenish head, greyish green dorsum and reddish belly, whereas TP individuals, which bear a yellow to orange broad stripe from jaw angle to end of preopercle, are turquoise overall. TP of *Sparisoma axillare* (Steindachner) is greyish overall and has a bright-yellow blotch above the black spot at the base of pectoral fins (bright-yellow blotch below the black spot at the base of pectoral fins in the new species), whereas IP is greyish to reddish brown. *Sparisoma radians* (Valenciennes) is highly variable, brownish to greenish with combination of darker or lighter mottling, blotches, spots and stripes (no such colour pattern in the new species). IP of *Sparisoma griseorubra* Cervigón, a Caribbean endemic, is reddish grey dorsally and bright red ventrally (red overall in the new species), whereas TP is greyish green dorsally and yellowish ventrally (reddish brown with pinkish to reddish stripes from dorsum to midline in the new species). Differences of colour pattern of the species in the genus *Sparisoma* recognised for the South-western Atlantic and those presently recognised for the Caribbean and North-western Atlantic are described in detail by Moura *et al.* (2001) and Gasparini *et al.* (2003).

Mitochondrial 12S and 16S rRNA loci sequences from *Sparisoma rocha* **sp. n.** do not match any known *Sparisoma* species (G. Bernardi, *in litt.*). Preliminary analyses indicate that the new species groups with the *S. "rubripinne"* clade (see Robertson *et al.* 2006) and seems to be sister to that clade (G. Bernardi, *in litt.*).

There are six species within the genus *Sparisoma* presently recognised for the South-western Atlantic: *S. amplum*, *S. axillare*, *S. frondosum*, *S. radians*, *S. tuiupiranga*, and *Sparisoma rocha* **sp. n.** (Moura *et al.* 2001, Gasparini *et al.* 2003, this paper). The latter species is the only parrotfish presently known only from an oceanic island in SW Atlantic. Trindade Island harbours three additional species of *Sparisoma* (*S. amplum*, *S. axillare* and *S. tuiupiranga*) and *Cryptotomus roseus* Cope (Pinheiro *et al.* 2009, JLG and HTP pers. obs). With the addition of *Sparisoma rocha* **sp. n.**, five species of Scarines are recorded for this island so far. The number of reef fish species endemic to Trindade Island (6.2%, see Gasparini & Floeter 2001) increases very slightly with the discovery of this new parrotfish, although more endemics are expected with further studies of the still little sampled Trindade-Martin Vaz oceanic insular complex, which may raise the percentage of endemic species to about 10% (Pinheiro *et al.* 2009).

Natural History: *Sparisoma rocha* **sp. n.** is a scraper (*sensu* Bellwood & Choat 1990), recorded grazing upon epilithic algae growing on rocky and calcareous substrata at 10–25 m depth. The males are solitary, whereas the females may be seen alone or in couples and accompanied by juveniles. Small juveniles (about 2–5 cm) associate with mixed groups of the labrids *Halichoeres penrosei* and *Thalassoma noronhanum*, which have a similar colour pattern (Figure 4). This association may be considered as a form of social mimicry (Krajewski *et al.* 2004).

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Literature cited

- Bellwood, D.R. (1994) A phylogenetic study of the parrotfishes family Scaridae (Pisces: Labroidei), with a revision of genera. *Records of the Australian Museum*, 20 (supplement), 1–86.
- Bellwood, D.R. & Choat, J.H. (1990) A functional analysis of grazing in parrotfishes (family Scaridae): the ecological implications. *Environmental Biology of Fishes*, 28(1), 189–214.
- Choat, J.H. & Randall, J.E. (1986) A review of the parrotfishes (family Scaridae) of the Great Barrier Reef of Australia, with description of a new species. *Records of the Australian Museum*, 38(4), 175–228.
- Gasparini, J.L. & Floeter, S.R. (2001) The shore fishes of Trindade Island, western South Atlantic. *Journal of Natural History*, 35(11), 1639–1656.
- Gasparini, J.L., Joyeux, J.-C. & Floeter, S.R. (2003) *Sparisoma tuiupiranga*, a new species of parrotfish (Perciformes: Labroidei: Scaridae) from Brazil, with comments on the evolution of the genus. *Zootaxa*, 384, 1–14.
- Krajewski, J.P., Bonaldo, R.M., Sazima, C. & Sazima, I. (2004) The association of the goatfish *Mulloidichthys martinicus* with the grunt *Haemulon chrysargyreum*: an example of protective mimicry. *Biota Neotropica*, 4(2), 1–4.
- Leviton, A.E., Gibbs, Jr., R.H., Heal, E. & Dawson, C.E. (1985) Standards in herpetology and Ichthyology: Part I; Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia*, 1985(3), 802–832.
- Moura, R.L., Figueiredo, J.L. & Sazima, I. (2001) A new parrotfish (Scaridae) from Brazil and revalidation of *Sparisoma amplum* (Ranzani 1842), *Sparisoma frondosum* (Agassiz 1831), *Sparisoma axillare* (Steindachner 1878) and *Scarus trispinosus* Valenciennes 1840. *Bulletin of Marine Science*, 68(3), 505–524.
- Pinheiro, H.T., Camilato, V., Gasparini, J.L. & Joyeux, J.-C. (2009) New records of fishes for Trindade-Martin Vaz oceanic insular complex, Brazil. *Zootaxa*, 2298, 45–54.
- Randall, J.E. (1996) *Caribbean reef fishes*. 3rd ed. T.F.H. Publications, Hong Kong, 368 pp.
- Randall, J.E. & Choat, J.H. (1980) Two new parrotfishes of the genus *Scarus* from the central and south pacific, with further examples of sexual dichromatism. *Zoological Journal of the Linnean Society*, 70(4), 383–419.
- Robertson, D.R., Karg, F., Moura, R.L., Victor, B.C. & Bernardi, G. (2006) Mechanisms of speciation and faunal enrichment in Atlantic parrotfishes. *Molecular Phylogenetics and Evolution*, 40(3), 795–807.
- Warner, R.R. & Robertson, D.R. (1978) Sexual patterns in the labroid fishes of the western Caribbean, II: The parrotfishes (Scaridae). *Smithsonian Contributions in Zoology*, 255, 1–26.
- Westneat, M.W. & Alfaro, M.E. (2005) Phylogenetic relationships and evolutionary history of the reef fish family Labridae. *Molecular Phylogenetics and Evolution*, 36(2), 370–390.