

A new species of *Spiogalea* (Polychaeta: Spionidae) from Brazil, with an amended diagnosis of the genus

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A new Spiogalea species is described from South-east Brazil. The specimens were collected in muddy bottoms during a large survey (15–3000 m) in southern Brazil. This genus comprised, up to now, only one species described from Capbreton Canyon (Bay of Biscay). The new species differs from the type-species, mostly in the morphology of the prostomial chitinous plate, a character restricted to the genus Spiogalea. With this new species, the generic diagnosis of the genus was amended.

Keywords: *Spiogalea*, Spionidae, Espírito Santo Basin, Doce Canyon

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INTRODUCTION

Polychaetes belonging to the Family Spionidae Grube, 1850 are very common and ecologically important in many marine ecosystems, and are one of the most species-rich polychaete families. Currently there are 606 nominal species distributed in 39 genera (Read & Fauchald, 2016).

Around 90 nominal species of the family were already recorded for the Brazilian coast, distributed in 17 genera (Amaral *et al.*, 2013), although some authors suggest that those numbers are underestimates, as many species remain undescribed, mainly in the continental slope and deep-sea (Paiva & Barroso, 2010).

Taxonomic studies on this family in the Brazilian coast are still scarce, focusing mainly on coastal and intertidal environments and only a few genera, such as *Laonice* Malmgren, 1867 (Nonato *et al.*, 1986; Radashevsky & Lana, 2009), *Scolecopsis* Blainville, 1828 (Rocha *et al.*, 2009; Rocha & Paiva, 2012), *Pseudopolydora* Czerniavsky, 1881 (Radashevsky & Migotto, 2009), *Dipolydora* Verrill, 1881 (Radashevsky & Nogueira, 2003) and *Polydora* Bosc, 1802 (Radashevsky *et al.*, 2006), have received any detailed attention.

Large-scale studies are restricted to those of Bolívar & Lana (1987) in the continental shelf of Paraná State and Paiva & Barroso (2010) in the continental slope of Campos Basin, Rio de Janeiro State.

The genus *Spiogalea* Aguirrezabalaga & Ceberio, 2005 is known only by the type-species, *S. vieitezi* Aguirrezabalaga & Ceberio, 2005. It is characterized by two chevron-shaped

chitinous plates surrounding anterior part of prostomium, lack of branchiae, notopodial chaetae all capillary. Other significant generic characters of *Spiogalea* are parapodia of first chaetiger reduced and devoid of notopodial postchaetal lobe while presenting a small neuropodial postchaetal lobe.

Along with the genera *Spiophanes* Grube, 1860, *Spiophanella* Fauchald & Hancock, 1981 and *Glyphochaeta* Bick, 2005, *Spiogalea* lack branchiae, which is unusual for Spionidae.

During the Project 'Marine Environmental Characterization of Espírito Santo Basin and Northern Portion of Campos Basin' (AMBES), coordinated by the research centre CENPES/PETROBRAS, focusing on the southern coast of Brazil, three specimens belonging to an undescribed species of *Spiogalea* were found on the continental slope of southern Brazil, at 950 m depth.

These specimens fit reasonably well to the diagnosis of the genus, but noteworthy differences were observed, such as the presence of notopodial hooks on posteriormost chaetigers and a large single chitinous plate covering the dorsal and ventral sides of the prostomium. A description of this new species and an amended diagnosis are provided on this paper.

MATERIALS AND METHODS

Specimens were collected on the continental slope of Espírito Santo Basin, Doce Canyon at 950 m depth using a Box-corer sampler, during the cruises of AMBES (Figure 1). Specimens were fixed in 10% formalin and preserved in 70% ethanol.

Morphological traits of specimens were observed under a Zeiss Stemi SV 11 stereomicroscope and Zeiss Axio Lab A1 microscope. Specimens were stained in a strong solution of methyl green (1 g l⁻¹) for 5 s and then transferred to

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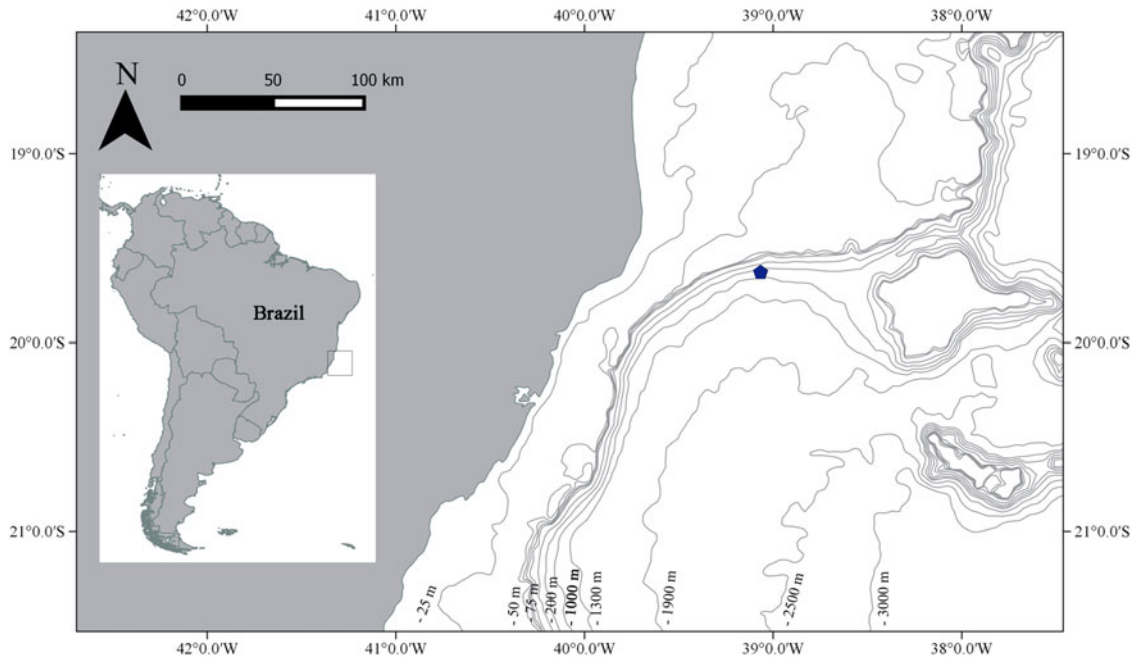


Fig. 1. Map showing sampling location of *Spiogalea capixaba* sp. nov.

70% ethanol to improve the visualization of characters. The staining is temporary and fades completely in ethanol after a few minutes.

Due to the small number of specimens, it was decided not to perform SEM studies. As the specimens were fixed in 10% formalin, molecular studies were also not possible.

Since these specimens display characters that differ from or were not observed on the original description of the genus, its diagnosis was therefore amended.

The holotype (MNRJP 1220) and two paratypes (MNRJP 1221) were deposited in the Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro State, Brazil.

RESULTS

SYSTEMATICS

Order SPIONIDA *sensu* Rouse & Fauchald, 1997

Suborder SPIONIFORMIA *sensu* Fauchald, 1977

Family SPIONIDAE Grube, 1850

Genus *Spiogalea* Aguirrezabalaga & Ceberio, 2005

DIAGNOSIS (AFTER AGUIRREZABALAGA & CEBERIO, 2005, AMENDED)

Prostomium anteriorly rounded or with short anterolateral projections, narrowing posteriorly, with caruncle. Nuchal organs absent. Two chevron-shaped chitinous plates or single chitinous plate surrounding anterior part of prostomium. Eyes absent. Peristomium well developed forming posteriorly open collar that surrounds prostomium. Branchiae absent. Parapodia of first chaetiger reduced, lacking notopodial postchaetal lobe and with small neuropodial postchaetal lobe. Subsequent parapodia larger, well-developed with rounded noto- and neuropodial postchaetal lobes. Posterior notopodial lobes connected by low dorsal ridge or ridges

absent. Notopodial chaetae all capillary or capillaries and multidentate hooded hooks on posterior chaetigers. Posterior neuropodia with long-shafted, multidentate hooded hooks, with

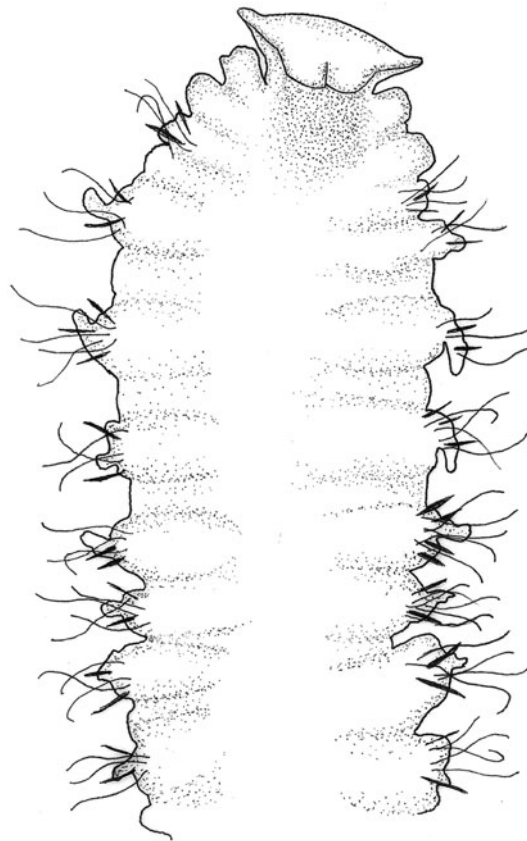


Fig. 2. *Spiogalea capixaba* sp. nov., holotype: anterior region, dorsal view. Scale bar: 400 μ m.

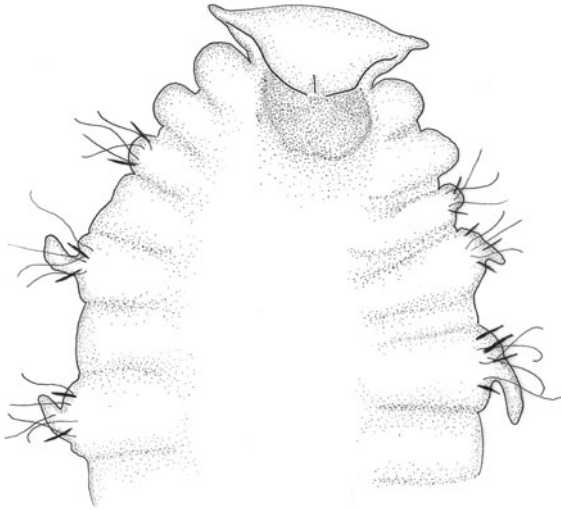


Fig. 3. *Spiogalea capixaba* sp. nov., holotype: close-up of the prostomium, dorsal view. Scale bar: 200 μ m.

complete hood. Sabre chaetae present. Pygidium morphology uncertain, possibly rounded with a pair of small anal cirri.

Spiogalea capixaba sp. nov.
(Figures 2–5)

TYPE MATERIAL

Holotype: Incomplete specimen, 0.8 mm wide, palps missing. AMBES Project, Station Amb 3 CAND6R2 (19°37'49.14"S, 39°3'59.7"W), 950 m depth (MNRJP 1220); coll. V. Veloso/PETROBRAS, 11/12/2011.

Paratypes: two incomplete specimens, 0.3 and 0.7 mm wide, palps missing (MNRJP 1221). Collection details as for holotype.

COMPARATIVE MATERIAL EXAMINED

Spiogalea vieitezi Aguirrezabalaga & Ceberio, 2005. Paratype: Incomplete specimen, palps missing. (Aguirrezabalaga's personal collection; not deposited in MNHN), Capbreton Canyon, Bay of Biscay, Station KF 50 (43°35'35"N 18°55'15"W); collected with Flusha Box corer, 1000 m depth, 14/09/1989.

DESCRIPTION

Three specimens examined, all incomplete. Holotype with 44 chaetigers; 4 mm long, 0.8 mm wide at chaetiger 4 (excluding parapodia).

Body elongate, dorsoventrally flattened, without regionalization. Anterior portion wide, tapering from middle body region onwards (Figure 2).

Prostomium bearing short anterolateral projections, posteriorly narrowing to an inconspicuous caruncle reaching posterior margin of first chaetiger. Nuchal organs absent. Single large chitinous plate present on the dorsal and ventral sides of anterior part of the prostomium. Eyes absent (Figure 3).

Peristomium large, well developed, separated from chaetiger 1, encircling the prostomium. Peristomium biannulated, overlapping the first chaetiger on posterior margin. Palps lost. Branchiae absent throughout the body.

First chaetiger reduced. Notopodial postchaetal lobe absent, bearing few long non-limbate capillaries. Neuropodial

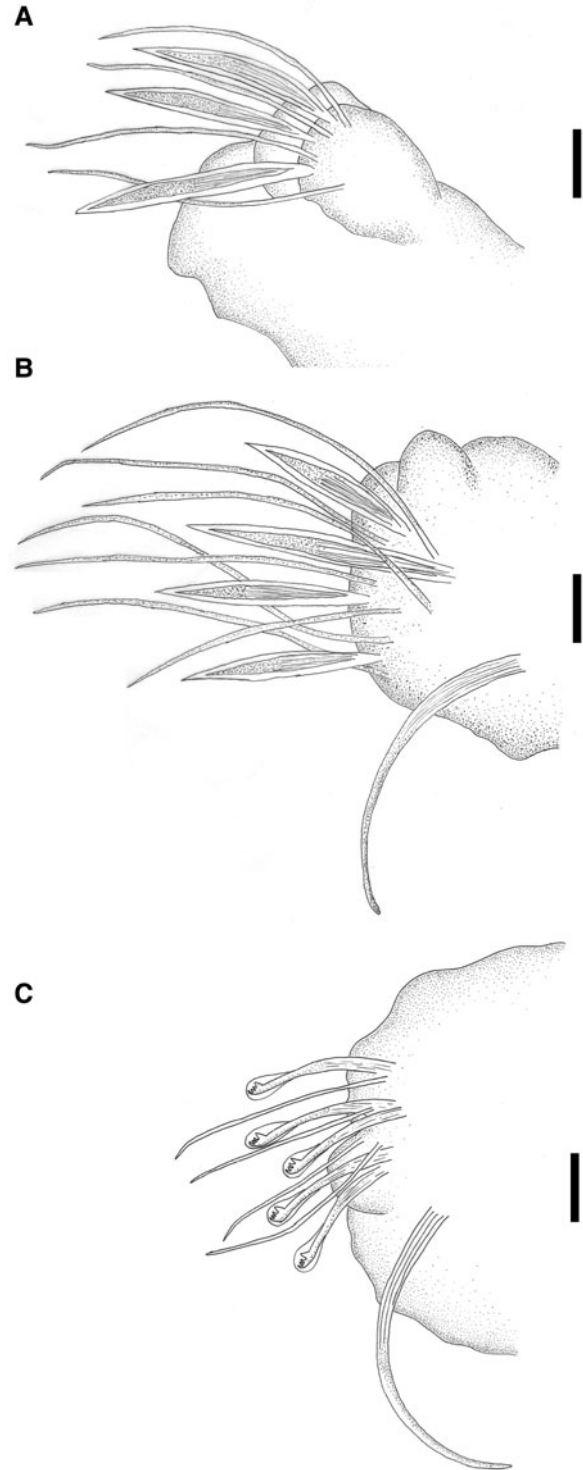


Fig. 4. *Spiogalea capixaba* sp. nov., holotype: (A) Left notopodium of chaetiger 8, dorsal view; (B) Left neuropodium of chaetiger 9, ventral view; (C) Left neuropodium of chaetiger 16, ventral view. Scale bars: 70 μ m.

postchaetal lobe thick and rounded, reduced, bearing few long non-limbate capillaries.

Parapodial lamellae well developed starting on chaetiger 2. Notopodial postchaetal lamellae rounded from chaetigers 2–5, being progressively smaller between chaetiger 6–9 and reduced from chaetiger 10 onwards. Dorsal ridges absent. Neuropodial postchaetal lamellae from chaetigers 2–7 short,

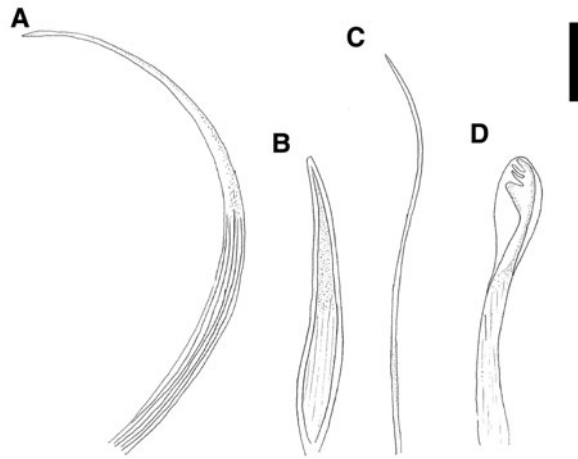


Fig. 5. *Spiogalea capixaba* sp. nov., holotype: (A) sabre chaeta from neuropodium of chaetiger 14; (B) short limbate capillary chaetae; (C) long non-limbate capillary chaetae; (D) hooded hook. Scale bars: 20 μ m.

slender and cirriform, progressively smaller from chaetiger 4 and strongly reduced from chaetiger 8 onwards (Figure 4).

Notopodial chaetae of three types: (1) anterior row of 3–6 wide, short, limbate chaetae, densely granulated throughout length, decreasing in number after chaetiger 8, being absent after chaetiger 13; (2) posterior row of 5–10 long (up to 1.5 times longer than limbate chaetae) non-limbate chaetae and (3) from chaetiger 25–27, 2–4 long-shafted multidentate (3–4 pairs of small teeth above main tooth) hooded hooks per rami, accompanied by 1–4 long non-limbate chaetae (Figure 5).

Neuropodial chaetae of four types: (1) anterior row of 2–5 wide, short, limbate chaetae, densely granulated throughout length, decreasing in number after chaetiger 8, being absent after chaetiger 13; (2) posterior row of 4–8 long (up to 2 times longer than limbate chaetae) non-limbate chaetae; (3) from chaetiger 12–16, 2–5 long-shafted multidentate (3–4 pairs of small teeth above main tooth) hooded hooks per rami, accompanied by 1–4 long non-limbate chaetae and (4) lightly granulated sabre chaetae from chaetiger 9–10, only one per rami, almost straight at chaetigers 9–10 and more curved on following chaetigers (Figure 5).

Gametes not observed. Pygidium unknown.

Methyl green staining pattern: Margins of postchaetal notopodial lamellae of chaetigers 2–10 and whole dorsal and ventral surfaces of chaetigers 15–20 intensely stained.

ETYMOLOGY

'Capixaba' is the common denomination given to natives of the Espírito Santo State, in south-eastern Brazil, where the specimens were collected.

DISTRIBUTION

Espírito Santo Basin, Doce Canyon, on muddy bottoms (mainly silt), 950 m depth.

The present record expands the geographic range of the genus to the Western Atlantic.

REMARKS

Spiogalea capixaba sp. nov. exhibited significant morphological differences from *S. vieitezi*, mainly the presence of a single prostomial chitinous plate instead of two, a T-shaped rather than

bluntly rounded prostomium, biannulated peristomium, absence of low dorsal ridges, presence of notopodial hooded hooks and the position of neuropodial hooded hooks.

According to Aguirrezabalaga & Ceberio (2005), long non-limbate notopodial capillaries are absent, although such chaetae could be observed on the first 9 chaetigers of the paratype. The fact that notopodial hooded hooks are present in *S. capixaba* sp. nov. and lacking in *S. vieitezi*, is quite unusual, since this character is usually constant among species of the same genus. While notopodial hooded hooks are not present on all *Scolecopsis* species (Rocha & Paiva, 2012) and absent on most *Laonice* species (Sikorski, 2003), in *Aurospio*, notopodial hooded hooks may start after the 30th chaetiger (Maciolek, 1981; Mincks *et al.*, 2009; Paterson *et al.*, 2016). Based on the original illustrations of *S. vieitezi*, it is likely that the type-specimen was regenerating the posteriormost chaetigers and the pygidium, since the authors described a pygidium of uncertain morphology that could not be seen clearly. Furthermore, the holotype had only 19 chaetigers, against 44 in *S. capixaba*. Thus, the absence of notopodial hooded hooks in *S. vieitezi* is doubtful considering that type-specimens are likely to be not complete.

According to Aguirrezabalaga & Ceberio (2005), the chitinous plates surrounding the anterior part of the prostomium are a feature that distinguishes *Spiogalea* from the remaining genera of Spionidae. Other features include the absence of branchiae, peristomium forming a posteriorly open collar encircling the prostomium, parapodia of the first chaetiger reduced and long-shafted multidentate neuropodial hooded hooks with complete hoods.

The presence, distribution and morphology of the branchiae are features of great taxonomic importance for spionids (Foster, 1969, 1971; Blake & Kudenov, 1978; Johnson, 1984; Maciolek, 1985; Blake, 1996; Bick, 2005; Delgado-Blas, 2009; Radashevsky, 2012). Branchiae are also useful to access phylogenetic relationships of the family, as seen in Sigvaldadóttir *et al.* (1997), Sigvaldadóttir (1998) and Blake & Arnofsky (1999). Absence of branchiae is an unusual character that probably evolved independently among spionid genera. It is recorded only in the genera *Spiophanes*, *Spiophanella*, *Glyphochaeta*, some species of *Polydorella* Augener, 1914 (Williams, 2004), and a single species of *Aurospio* Maciolek, 1981 (Neal *et al.* in Paterson *et al.*, 2016).

Spiogalea can be distinguished from *Spiophanes* based on the presence of a chitinous prostomial plate, absence of nuchal organs, absence of crook-like chaetae on chaetiger 1, and presence of multidentate long-shafted neuropodial hooks. *Spiogalea* can be distinguished from *Spiophanella*, a monotypic and doubtful genus (Sigvaldadóttir *et al.*, 1997), based on the presence of a chitinous plate and by the shape of the peristomium, which is large, well-developed, separated from chaetiger 1, encircling the prostomium, and a reduced first chaetiger lacking notopodial postchaetal lobe and reduced postchaetal lobe. *Spiophanella* lacks notopodial multidentate hooded hooks, which are present at least in *S. capixaba* sp. nov.

Glyphochaeta is a recently described genus, which comprises only *Glyphochaeta laudieni* Bick, 2005, described from Kongsfjorden, Spitsbergen. *Spiogalea* can be separated from *G. laudieni* based on the morphology of the prostomial projections, and the presence, in the former, of sabre chaetae, a chitinous plate and absence of grooved spines.

The genus *Polydorella* belongs to a complex of related genera informally called 'Polydora-complex' (Sigvaldadóttir

et al., 1997), 'polydorids' (Blake, 1996) or 'polydorins' (Radashevsky, 2012), which comprises spionids with a modified 5th chaetiger bearing spines. According to Williams (2004), branchiae may be absent on some species, although *Spiogalea* species can be easily distinguished from *Polydorella* by the presence, in the former, of a chitinous plate and the absence of a modified 5th chaetiger bearing spines.

As for *Aurospio*, one of the main diagnostic characters are branchiae starting on chaetiger 3 (Maciolek, 1981; Mincks *et al.*, 2009), although a new species without branchiae, *Aurospio abbranchiata* Neal, Paterson & Soto in Paterson *et al.*, 2016, was recently described in the North-east Atlantic, near Portugal. *Spiogalea* species can be easily separated from *Aurospio abbranchiata* based on the presence of a chitinous plate, position of notopodial hooded hooks and morphology of the postchaetel notopodial lamella of chaetiger 3, that is rounded in *Spiogalea* and greatly enlarged and nearly square-shaped in *A. abbranchiata*.

In conclusion, as both the lack of branchiae and presence of a prostomial chitinous plate are unusual features for the family Spionidae, the collection of more specimens of *Spiogalea*, including entire material suitable for morphological as well as molecular studies, would be of great relevance. The use of molecular techniques could provide valuable information on both the position of the genus and its relationships within Spionidae.

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