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A NEW SPECIES OF *LEPTOCHITON* (POLYPLACOPHORA: LEPTOCHITONIDAE) FROM THE SOUTHWESTERN ATLANTIC

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ABSTRACT

Leptochiton sanmatiensis, new species, is described from shallow-waters of Argentina. The species is characterized by having a quincuncial arrangement of tegmental granules on head valve, lateral areas of intermediate valves and postmucronal area of tail valve, and a longitudinal arrangement of these structures on the central areas of intermediate valves; each granule having a macraesthete and four micraesthetes. In addition, the new species has pectinated dorsal scales, with 14–21 ridges; a low number of ctenidia (up to six on each side in the largest specimens); and the second lateral tooth with three denticles in the cusp. The species lives on small gravel and shells.

Key words: Lepidopleurida, Lepidopleurina, Argentina, Polyplacophora, diversity.

INTRODUCTION

The most important morphological features currently used to define the Order Lepidopleurida include the usual absence of insertion plates or if present, the absence of slits, and the merobranchial adanal gill arrangement (Kaas & Van Belle, 1985; Sirenko, 2006; Sigwart, 2009; Sigwart et al., 2013, 2014). Sigwart et al. (2014) also added the Schwabe organ as a synapomorphy of the order. Included in Lepidopleurida is *Leptochiton* Gray, 1847, a specious, non-monophyletic genus (Sigwart, 2009; Sigwart et al., 2011) with about 100 valid extant, small-sized species, characterized by slit-less brittle valves and finely granulose tegmentum (Gray, 1847; Kaas & Van Belle, 1985; Sirenko & Schwabe, 2011).

Three valid species of this genus are currently accepted from the southwestern Atlantic: *Leptochiton kerguelensis* Haddon, 1886, *L. medinae* (Plate, 1899) and *L. darioi* (Righi, 1973b). Two other species, *L. pagenstecheri* Pfeffer (in von Martens & Pfeffer), 1886, described from South Georgia, and *L. agesilaus* (Dall, 1919), described from the Magellan Strait, are currently regarded as synonyms of *L. kerguelensis* and *L. medinae*, respectively (Thiele, 1906, 1908; Kaas & Van Belle, 1985). Thiele (1893) identified one specimen collected at Tuesday Bay, Magellan Strait, as *Lophyropsis imitatrix* Smith, although this record was subsequently reassigned by the same author (Thiele, 1908) to *L. medinae.*

In the course of studying the diversity of mollusks from the San Matías Gulf, we found a species of *Leptochiton* that did not fit any published description. The aim of this contribution is to describe this species and to compare it with other species of this genus present in the area.

MATERIAL AND METHODS

Benthic samples were collected by diving with a hand-trawl of 2 mm mesh-size net. Living mollusks were sorted from the sediment under a stereoscopic microscope, photographed alive, fixed in 5% sea-water formalin and preserved in 70% ethanol.

The 16 largest specimens of *Leptochiton* n. sp. were measured according to the following criteria: length (L): refers to the maximum distance between the anteriormost part of the head valve and the posteriormost part of the tail valve; and width (W): refers to the maximum distance perpendicular to L, of valve IV. None of these measurements included the girdle. The mean value and standard deviation (SD) for the W/L ratio were calculated. Height and width of valves IV, in anterior view, were

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measured in five specimens following Kaas & Van Belle's (1985) criterion to obtain the dorsal elevation H/W.

Six whole specimens were dehydrated in an ascending ethanol series (from 70% to 100%), treated with hexamethyldisilazane and air-dried, coated with gold-palladium (40–60%) and photographed with a Phillips XL-30 scanning electron microscope (SEM). The radula of five specimens was dissected and treated with a 5% sodium hypochlorite solution under stereoscopic microscope until completely clean, and subsequently studied with SEM. Isolated valves, scales and spicules were obtained by digestion of the girdle in the same way. Measurements of isolated scales and spines were obtained from SEM photographs.

To confirm the adulthood condition of the largest individuals examined, histological sections of three Bouin's fixed specimens (about 4 mm length) were performed. For this, specimens were dehydrated in ethanol, embedded in Historesin® Leica™, sectioned at 3.5 µm thick, with a Leica RM2255 motorized microtome, and stained with hematoxilin-eosin.

The studied material is deposited at the Invertebrates Collection of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In), Buenos Aires. Number of specimens (s.) for each lot is indicated in the material examined section. The MACN-In collection was also searched for additional specimens.

Information on other species of *Leptochiton* described from the area comes from their original descriptions and illustrations; the examination of photographs of the syntype of *L. kerguelensis*, housed at The Natural History Museum, United Kingdom (NHMUK 1889.11.9.4); the photograph of the paratype (wrongly referred to as holotype in the text) of *L. darioi*, provided by Dornellas & Simone (2011); and the photographs of the lectotype of *L. medinae* provided by Schwabe & Sellanes (2010); as well as from the complementary information provided by Leloup (1956), Kaas & Van Belle (1985) and Schwabe & Sellanes (2010). Morphological and anatomical characters of other species of *Leptochiton* in the discussion are mainly based on their original descriptions and their re-descriptions by Kaas & Van Belle (1985, 1990). A lot of *L. medinae* from the Beagle Channel (MACN-In 39659) was examined for comparative purposes, to determine the number of ctenidia of small-sized specimens of this species.

SYSTEMATICS

Order Lepidopleurida Thiele, 1909
Suborder Lepidopleurina Thiele, 1909
Family Leptochitonidae Dall, 1889
Genus *Leptochiton* Gray, 1847

Type species: *Chiton cinereus* Linnaeus, 1767, sensu Montagu, 1803 (*non* Linnaeus) (SD Gray, 1847); = *Chiton asellus* Gmelin, 1791. Europe.

Leptochiton sanmatiensis
Güller, Liuzzi & Zelaya, n. sp.
(Figs. 1–37)

Type Locality

Las Grutas, San Matías Gulf, Río Negro Province, Argentina (40º56'27.2''S 65º07'58.2''W), 10–11 m.

Type Material

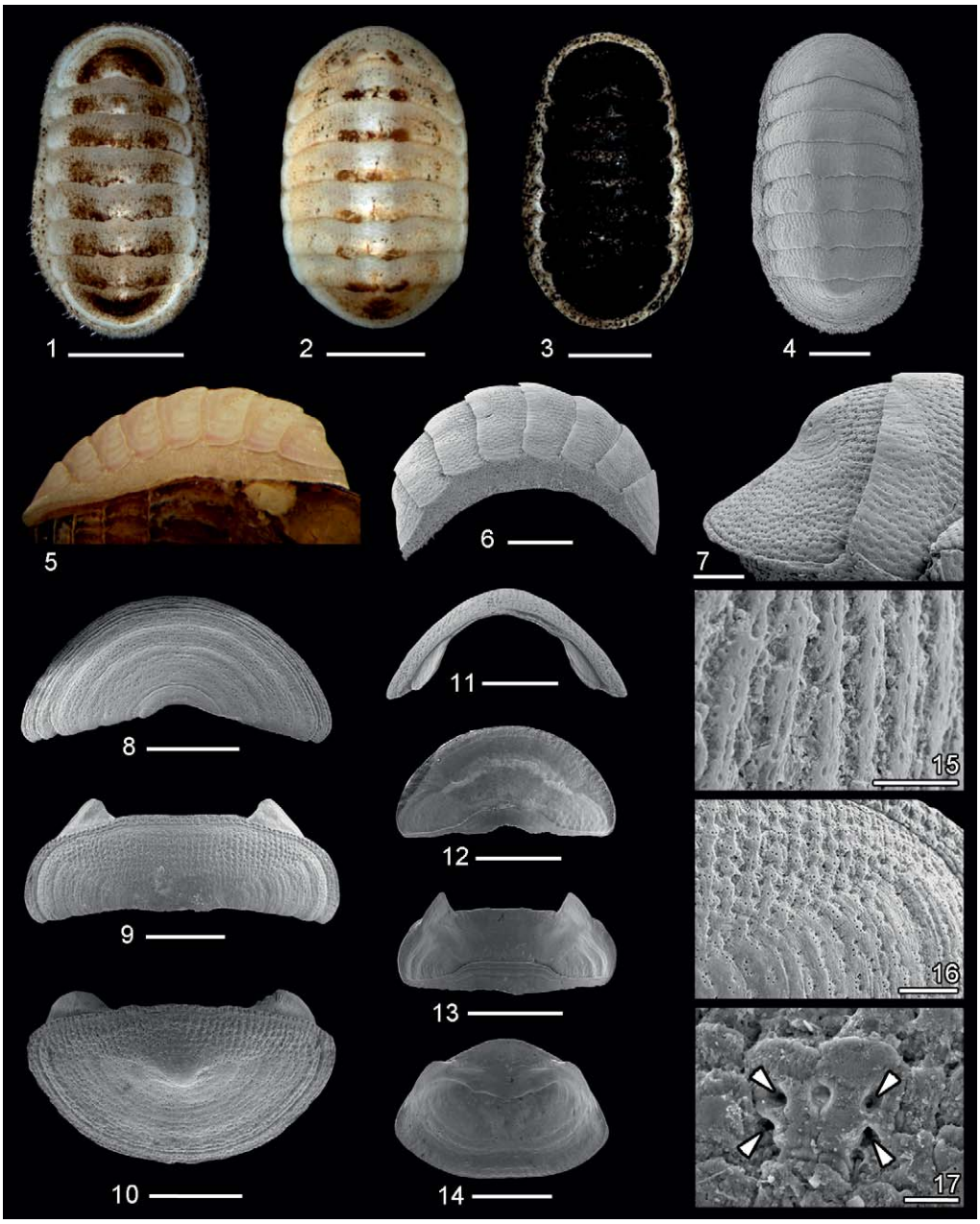
Holotype (2.6 mm L, 1.6 mm W, 0.58 mm H, partially curved) (MACN-In 39660) and 5 paratypes from the type locality (5 paratypes MACN-In 39661.

Other Material Examined

San Matías Gulf: Las Grutas: 40°25'47.4"S, 65°25'14.1"W, 8 m (MACN-In 39662: 2 s.); 40°50'12.8"S, 65°04'42.2"W, 10 m (MACN-In 39663: 2 s.); 40°50'35.5"S, 65°04'43.7"W, 12 m (MACN-In 39664: 1 s.); 40°54'00.0"S, 65°06'43.1"W, 6 m (MACN-In 39665: 2 s.); 40°54'08.3"S, 65°06'28.0"W, 9 m (MACN-In 39666: 1 s.); 40°55'17.4"S, 65°08'07.6"W, 7–8 m (MACN-In 39667: 3 s.); 40°56'26.6"S, 65°07'59.1"W, 9 m (MACN-In 39668: 2 s.); 40°56'49.0"S, 65°07'36.2"W, 5 m (MACN-In 39669: 2 s.); 40°57'29.4"S, 65°05'59.6"W, 20 m (MACN-In 39670: 74 s.).

Playas Doradas: 41°39'03.1"S, 65°00'38.3"W, 12–14 m (MACN-In 39671: 7 s.); 41°40'17.8"S, 65°00'27.8"W, 16 m (MACN-In 39672: 14 s.); 41°40'48.3"S, 65°00'46.1"W, 12 m (MACN-In 39673: 1 s.); 41°40'49.1"S, 65°00'46.5"W, 12 m (MACN-In 39674: 2 s.).

Puerto Lobos: 41°58'03.9"S, 65°03'27.6"W, 15–18 m (MACN-In 39675: 13 s.); 41°58'22.8"S, 65°03'28.6"W, 16.5 m (MACN-In 39676: 38 s.); 41°58'31.7"S, 65°03'38.6"W, 13 m (MACN-In 39677: 14 s.); 41°59'0.4"S, 65°03'34.2"W, 15 m (MACN-In 39678: 25 s.); 41°59'48.5"S,



FIGS. 1–17. ***Leptochiton sanmatiensis***, n. sp. FIGS. 1–4: Dorsal views. FIGS. 5, 6: Lateral views; FIG. 5: Living specimen; FIG. 6: Holotype; FIG. 7: Detail of tail valve, lateral view. FIGS. 8–10: Dorsal views of isolated valves. FIG. 8: Head valve; FIG. 9: Valve III; FIG. 10: Tail valve; FIG. 11: Anterior view of an intermediate valve. FIGS. 12–14: Ventral views of isolated valves. FIG. 12: Head valve; FIG. 13: Valve VII; FIG. 14: Tail valve. FIGS. 15–17: Detail of tegmentum. FIG. 15: Longitudinal rows of granules in central area of valve IV; FIG. 16: Central and lateral areas of valve III; FIG. 17: Detail of a granule and aesthetes (arrowheads showing micraesthetes). Figs. 1, 4: MACN-In 39676; Figs. 2, 3: MACN-In 39680; Fig. 5: Specimen from Las Grutas; Fig. 6: MACN-In 39660; Figs. 7, 15: MACN-IN 39665; Figs. 8–11, 13, 14, 16, 17: MACN-In 39670; Fig. 12: MACN-In 39672. Scale bars: Figs. 1–3 = 1 mm, Figs. 4, 6, 8–14 = 500 µm, Fig. 7 = 200 µm, Fig. 15 = 50 µm, Fig. 16 = 100 µm, Fig. 17 = 10 µm.

65°03'32.3"W, 11.5 m (MACN-In 39679: 1 s.); 42°00'07"S, 65°03'20.8"W, 21 m (MACN-In 39680: 10 s.).

Buenos Aires coast: off Mar del Plata, 38°14'55.68"S, 57°01'41.16"W, 55–60 m (MACN-In 38200: 2 s.).

Habitat

On small gravel or shells, associated to coarse sand, gravel, mud or hard bottoms, from 5 to 60 m deep.

Etymology

The species name refers to San Matías Gulf, from which most of the studied material comes.

Diagnosis

Tegmentum sculptured with granules arranged in quincunx on head valve, lateral areas of intermediate valves and postmucronal area of tail valve, and longitudinally on central areas of intermediate valves and antemucronal area of tail valve. Each granule with a megalaesthete and four micraesthetes. Dorsal girdle scales imbricated, each with 14–21 ridges. With up to six pairs of ctenidia. Second lateral tooth with three denticles in the cusp.

Description

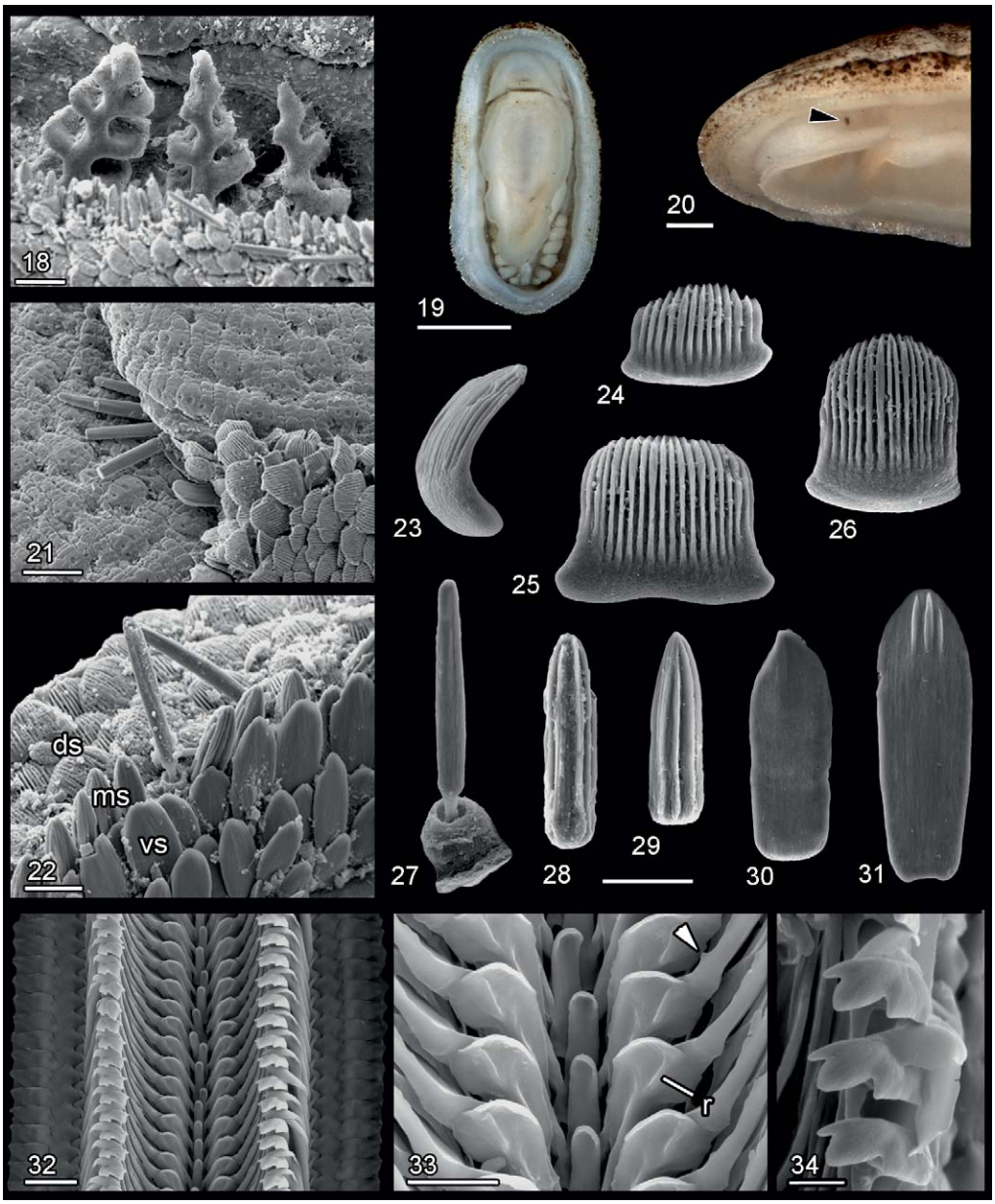
Exterior Morphology: Animal small (max. L observed = 5.7 mm), elongate-ovate (W/L = 0.49 ± 0.04), delicate (Figs. 1–4). Valves thin, rather elevated (dorsal elevation up to 0.48), lacking insertion plates (Figs. 5, 6, 11–14). Tegmentum and girdle white-yellowish, frequently stained with brown deposits, which give a darker appearance (Figs. 1–3, 5).

Tegmentum with low, coarse, irregular granules and faint, thin striae radiating from the apex, only visible under high magnification (Figs. 7–10, 15–17). Each granule containing a central megalaesthete and four micraesthetes: two of them flanking the megalaesthete, and the other two at the base of the granule, scarcely visible in dorsal view (Fig. 17). Granules more evident towards the growing margins of valves, hardly visible on eroded specimens. Valves with well-marked growth lines forming step-like disruptions, less pronounced on central areas of intermediate valves (Figs. 8–10).

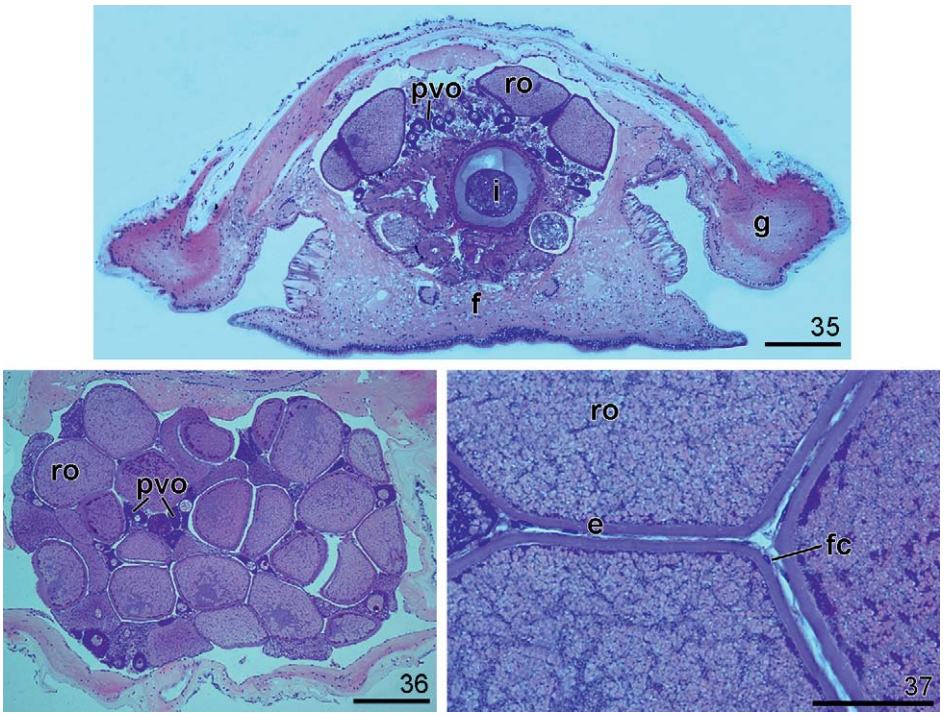
Head valve more than semicircular; posterior margin widely V-shaped (Fig. 8); tegmentum with granules arranged in quincunx. Intermediate valves subrectangular (Fig. 9), anterior margins straight, slightly convex or sinuous; valve II sometimes with widely convex anterior margin. Central area sculptured with 37–47 rows of granules joined by coarse longitudinal cords; adjacent rows joined by lateral projections of granules (Figs. 15, 16). Lateral areas somewhat raised; granules arranged in quincunx (Fig. 16). Tail valve subovate, similar in size to head valve. Anterior margin almost straight. Mucro prominent, anteromedial (Fig. 10). Antemucronal area with about 40 longitudinal rows of granules joined as in the central areas of intermediate valves; postmucronal slope concave, with granules arranged in quincunx (Fig. 7).

Articulamentum frequently mimicking outer step-like growth disruptions, more evident underneath lateral areas of intermediate valves (Fig. 13). Apophyses of intermediate valves triangular, with rounded tips, markedly asymmetrical, with inner margin about 2/3 the length of outer; widely separated (Figs. 9, 13). Apophyses of tail valve trapezoidal, symmetric, with rounded margins (Fig. 10).

Girdle of about 200 µm in diameter (in fixed specimens) bearing irregularly imbricated scales, and spicules (Figs. 21, 22). Dorsal scales bent (Fig. 23), usually wider than longer (30–45 µm wide x 20–40 µm long; Figs. 24–26), longer at valve margins; base wide, ovate, smooth; distal part pectinated with 14–21 strong, narrow longitudinal ribs which sometimes form pairs; interspaces as wide as ribs or somewhat narrower (Figs. 24–26). Bunches of up to four intersegmental spicules present between all valves (Fig. 21); spicules elongated (about 50 µm x 7 µm), rounded at the tip, smooth or faintly longitudinally striated. Marginal scales-spicules cylindrical, elongated (about 50 µm x 10 µm), distally pointed, sculptured with strong longitudinal ridges, separated by wide interspaces (Figs. 22, 28, 29). Marginal spicules smooth or faintly striated, needle-like (about 50 µm x 7 µm), with rounded tip and narrow stalk (Figs. 22, 27). Ventral scales flat, subrectangular to ovate (50–65 µm x 45–50 µm), with rounded to bluntly pointed distal tip, increasing in size outwards; imbricated, radially arranged; ventral side of scales faintly longitudinally striated (Figs. 22, 30); dorsal side with 3–4 short but stout, longitudinal ridges at tip (Fig. 31).



FIGS. 18–34. ***Leptochiton sanmatiensis***, n. sp. FIG. 18: Detail of the three anteriormost left side ctenidia of a hexamethylized specimen; FIG. 19: Specimen in ventral view. FIG. 20: Anterior part of a specimen showing Schwabe organ (arrowhead); FIGS. 21–31: Details of scales and spicules. FIG. 21: Intersegmental spicules between valves V and VI; FIG. 22: Dorsal scales, marginal scales-spicules and ventral scales; FIGS. 23–26: Dorsal scales; FIG. 23: Lateral view; FIGS. 24–26: Dorsal view; FIG. 27: Marginal spicule; FIGS. 28, 29: Marginal scales-spicules; FIGS. 30, 31: Ventral scales; FIG. 30: Ventral view; FIG. 31: Dorsal view. FIGS. 32–34: Radula. FIG. 32: Full radular width; FIG. 33: Detail of central and first lateral tooth (arrowhead pointing the knob on the shaft of second lateral tooth); FIG. 34: Detail of cusps of second lateral teeth. Figs. 18, 19, 22, 25, 28, 30–34: MACN-In 39670; Fig. 20: MACN-In 39680; Fig. 21: MACN-In 39665; Figs. 23, 24, 26, 29: MACN-In 39672; Fig. 27: MACN-In 39676. References: ds = dorsal scales; ms = marginal scales-spicules; r = ridge or thickening; vs = ventral scales. Scale bars: Figs. 18, 21 = 50 µm, Fig. 19 = 1 mm, Fig. 20 = 200 µm, Figs. 22, 23–31 (common scale), 32 = 20 µm, Fig. 33 = 10 µm, Fig. 34 = 5 µm.



FIGS. 35–37. ***Leptochiton sanmatiensis***, n. sp., histological sections. FIG. 35: Transverse section of whole specimen showing several oocytes in advanced stage of vitellogenesis; FIG. 36: Frontal section of a dorsal portion of the gonad showing oocytes in advanced stage of vitellogenesis; FIG. 37: Detail of ripe oocytes showing the egg hull. References: e = egg hull; f = foot; fc = follicle cell; g = girdle; I = intestine; pvo = previtellogenic oocyte; ro = ripe oocyte. Scale bars: Fig. 35 = 100 µm, Fig. 36 = 200 µm, Fig. 37 = 50 µm.

Anatomy: Gill merobranchial; with up to six ctenidia on each side, extending from beneath valve VI to anus (Fig. 19). Ctenidia increasing in size posteriorly (Figs. 18, 19), except for the rearmost, which is the smallest, located close to the anus. Mouth lappets large, covering a concentrated dot of brownish pigment on each side (the Schwabe organ) (Fig. 20). Out of the three histologically processed specimens, two were females and one male. Transverse sections of female gonads showed two clearly separated cohorts of gametes: one, towards the periphery, formed by late vitellogenic and ripe oocytes, and a second, at the gonad base, with crowded primary and previtellogenic oocytes which likely enter the vitellogenesis after the spawning of the former cohort (Figs. 35, 36). Ripe oocytes (about 200 µm diameter), polygonal in shape due to the compression within the gonad, showed a well-developed smooth egg hull and surrounding follicular epithelium (Figs. 36, 37). The gonad of male specimen showed already mature sperm. This degree of gonad development confirms the adulthood condition at 4 mm length.

Radula: Central tooth narrow, elongate, rectangular, enlarged at the base; cutting edge smooth, rounded (Figs. 32, 33). First lateral tooth larger than central tooth, hardly cusped, with strong ridge or thickening at the base (Figs. 32, 33). Second lateral tooth with narrow, elongated shaft bearing irregular knobs (Figs. 32, 33), and three denticles in the cusp, the central, the largest (Figs. 32, 34). Fifth lateral ("major uncinal") tooth elongated, slightly curved, with lanceolate cusp. Second ("middle") marginal tooth rhomboidal, smaller than the third ("outer") marginal tooth, which is elongated, wider than high (Fig. 32).

DISCUSSION

In the general arrangement of tegmental granules, the presence of multistriated dorsal scales and the tricuspid second lateral tooth, ***Leptochiton sanmatiensis***, n. sp., resembles *L. muelleri* Sirenko & Schwabe, 2011, from Sri Lanka, *L. compostellanum* Carmona Zalvide & Urgorri, 1999, from the Iberian Peninsula, and *L. cimicoides* (Monterosato, 1879) from Italy. *Leptochiton compostellanum*, however, has a smaller tail valve than head valve, more numerous longitudinal rows of granules on the central areas of intermediate valves (52–63 *vs*. 37–47 in ***L. sanmatiensis***, n. sp.), pointed dorsal scales, and the fifth lateral tooth shorter than the second lateral. *Leptochiton cimicoides* has a smaller tail valve with a postmedian mucro, stronger tegmentum sculpture, longer intersegmental spicules (100 µm *vs.* 50 µm) and the central tooth pinched in the middle and distally widened. In *Leptochiton muelleri* the tail valve is shorter and has a narrow antemucronal area, the sculpture is more prominent, the dorsal scales have less ribs (8–10 *vs.* 14–21 in ***L. sanmatiensis***, n. sp.), and the needle-like spicules are much longer (210 µm).

Leptochiton sanmatiensis, n. sp., also shares with the Japanese species *L. latidens* (Bergenhayn, 1933) and *L. habei* Saito, 1997, the Australian *L. badius* (Hedley & Hull, 1909), and with the Iberian *L. gascognensis* Kaas & Van Belle, 1985, the arrangement of granules and the presence of multistriated dorsal scales. However, *L. latidens* and *L. habei* clearly differ in the morphology of the second lateral tooth (tricuspid in ***L. sanmatiensis***, n. sp., unicuspid in *L. latidens* and bicuspid in *L. habei*). Furthermore, *L. latidens* has sharply pointed marginal spicules, very long intersegmental spicules (360 µm), a narrow first lateral tooth with a wing-like projection, and 9–10 ctenidia on each side. *Leptochiton habei* reaches a larger size, has elongated dorsal scales (50 µm x 20 µm), with fewer (8–12) ribs, 7 aesthetes per granule (*vs.* 5 in ***L. sanmatiensis***, n. sp.), flat and longer marginal scales (100 µm long), and lacks needle-like spicules. *Leptochiton badius* is somewhat less elevated than ***L. sanmatiensis***, n. sp. (dorsal elevation: 0.33 *vs.* 0.48), has a more pronounced sculpture, a straight postmucronal slope, the longitudinal rows of granules on the central areas of intermediate valves slightly curved on the pleural area and converging posteriorly, near the outer sides, and the marginal spicules (100 µm long) and needle-like spicules (about 150 µm long) longer than those of ***L. sanmatiensis***, n. sp. According to the original description, *L. gascognensis* is highly elevated (dorsal elevation *ca.* 0.55), has trapezoidal intermediate valves and a small, triangular tail valve. In addition, its marginal scales-spicules are bent, the needle-like spicules are scattered among dorsal scales, and most girdle elements are longer than in ***L. sanmatiensis***, n. sp. (dorsal needle-like spicules: 192 µm, intersegmental spines: 216 µm, marginal scales-spicules: 85–90 µm, ventral scales: 88 µm).

Comparing with the other *Leptochiton* species currently known from the southwestern Atlantic, ***L. sanmatiensis***, n. sp., may be clearly distinguished by the presence of shorter and wider dorsal scales, sculptured with a greater number of ribs (14–21 in ***L. sanmatiensis***, n. sp., *vs*. 3–4 in *L. darioi*; 4–6 in *L. kerguelensis*; and 6 in *L. medinae*). Furthermore, ***L. sanmatiensis***, n. sp., has a lower number of ctenidia on each side compared to similar-sized specimens (6 ctenidia in specimens of ***L. sanmatiensis***, n. sp., of about 5.5 mm long *vs*. 8–9 in *L. medinae* about 5.0 mm long, 8–10 in *L. darioi* 3.6 to 4.2 mm long and 8–10 in *L. kerguelensis* of about 5 mm long). The quincuncial arrangement of the granules on the head valve, lateral areas of intermediate valves and postmucronal area of tail valve of ***L. sanmatiensis***, n. sp., clearly differs from that of *L. medinae* (including its synonym, *L. agesilaus*) and *L. darioi*, where granules are arranged in radial rows (or comarginally in the case of postmucronal area of *L. darioi*), and resembles the pattern present in *L. kerguelensis*. However, the latter species (as well as *L. pagenstecheri*) lacks the longitudinal rows of granules in the central area of intermediate valves, and antemucronal area of posterior valves, which characterize ***L. sanmatiensis***, n. sp. Moreover, in *L. kerguelensis* each granule has only a single aesthete (megalasthete), while in ***L. sanmatiensis***, n. sp., granules show a megalaesthete and four micraesthetes. Like *Leptochiton darioi*, ***L. sanmatiensis***, n. sp., has a tricuspid second lateral, while this tooth is bicuspid in *L. kerguelensis* and *L. medinae*. Furthermore, insertion plates on the terminal valves are mentioned in the original description of *L. darioi*, which are absent in ***L. sanmatiensis***, n. sp.

At present, currently available information suggests that ***Leptochiton sanmatiensis***, n. sp., is allopatric with the three other *Leptochiton* species reported for the southwestern Atlantic:

L. darioi is thus far only known from Brazil, between São Paulo and Rio de Janeiro (although Rios (1994) reported it up to Espírito Santo); *L. kerguelensis* and *L. medinae* occur in southern Argentina and the southeastern Pacific, the former also occurring in sub-Antarctic and Antarctic waters (Kaas & Van Belle, 1985). The northernmost confirmed record of *L. medinae* in the Southwestern Atlantic comes from Villarino, Golfo San José (MACN-In 37534); that of *L. kerguelensis* is from Malvinas/Falkland Islands (Dell, 1964; Sirenko, 2006). Dell (1964) reported *L. kerguelensis* from *RRS William Scoresby* station 583, wrongly georeferentiating it as "38°22'S, 73°41'W", although this station actually comes from 53°39'S, 70°54.5'W, Magellan Strait (Anonymous, 1949). Righi (1973a) assigned to *Leptochiton kerguelensis* (as *Lepidopleurus*) "one rolled and partially fragmented specimen" from Baía da Ilha Grande, Rio de Janeiro, Brazil. However, Kaas & Van Belle (1985), based on the short, multistriate girdle scales figured by Righi (1973a: fig. 1), noted that this record is a misidentification. In fact, these girdle elements appear similar to those described herein for ***L. sanmatiensis***, n. sp., *Leptochiton kerguelensis* was also reported from Gough Island by Dell (1964), but taking into account the great isolation of this site, the record requires revision.

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LITERATURE CITED

ANONYMOUS, 1949, Station List, R.R.S. 'William Scoresby', 1931-1938. *Discovery Reports*, 25: 143–280.

BERGENHAYN, J. R. M., 1933, Die Loricaten von Prof. Dr. Sixten Bocks Expedition nach Japan und den Bonin-Inseln 1914. *Kungliga Svenska Vetenskaps Akademiens Handlingar*, 12: 1–58, figs. 1–17, pls.1–3.

CARMONA ZALVIDE, P. & V. URGORRI, 1999, Description of two new species of Mollusca Polyplacophora from the Iberian Atlantic coast: *Leptochiton* (*L.*) *gascognensis* Kaas and Van Belle, 1985 and *L* (*L.*) *compostellanum* sp. nov. *Iberus*, 17: 97–107.

DALL, W. H., 1889, Report on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877–78) and in the Caribbean Sea (1879–80), by the U. S. coast survey steamer "Blake", Lieutenant-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding, 29, Report on the Mollusca. Part 2, Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology, Harvard University*, 18: 1–492, pls. 10–40.

DALL, W. H., 1919, Descriptions of new species of chitons from the Pacific coast of America. *Proceedings of the United Stated National Museum*, 55: 499–516.

DELL, R. K., 1964, Antarctic and sub-Antarctic Mollusca: Amphineura, Scaphopoda and Bivalvia. *Discovery Reports,* 33: 93–250, pls. 2–7.

DORNELLAS, A. P. S. & L. R. L. SIMONE, 2011, Annotated list of type specimens of mollusks deposited in Museu de Zoologia da Universidade de São Paulo, Brazil. *Arquivos de Zoologia*, 42: 1–81.

GMELIN, J. F., 1791, Vermes. *Caroli a Linné Systema Naturae*, Editio Decima Tertia, Aucta Reformata. Tome 1, Pars 6 (Vermes). G. E. Beer, Lipsiae [Leipzig], pp. 3021–3910.

GRAY, J. E., 1847, Additional observations on chitones. *Proceedings of the Zoological Society of London*, 15: 126–127.

HADDON, A. C., 1886, Report on the Polyplacophora collected by H.M.S. Challenger during the years 1873–76. In: *Report on the Scientific Results of the Voyage of H.M.S. Challenger*, Zoology, 15: 1–50, pls. 1–3.

HEDLEY, C. & A. F. B. HULL, 1909, Descriptions of new and notes on other Australian Polyplacophora. *Records of the Australian Museum*, 7: 260–266, pls. 73–74.

KAAS, P. & R. A. VAN BELLE, 1985, *Monograph of living chitons (Mollusca: Polyplacophora). Vol. 1, Order Neoloricata: Lepidopleurina*. Brill, J. E., Leiden, 240 pp.

KAAS, P. & R. A. VAN BELLE, 1990, *Monograph of living chitons* (*Mollusca: Polyplacophora*). *Vol. 4, Suborder Ischnochitonina: Ischnochitonidae: Ischnochitoninae* (*continued*). *Additions to vols 1, 2 and 3*. Brill, J. E., Leiden, 298 pp.

LELOUP, E., 1956, Polyplacophora. *Reports of the Lund University Chile Expedition 1948–49. 27. Acta Universitatis Lundensis*, Avd. 2, Bd. 52, 15: 1–93.

MARTENS, E. VON & G. PFEFFER, 1886, Die Mollusken von Süd-Georgien, nach der Ausbeute der Deutschen Station 1882–83. *Jahrbuch der Hamburgischen wissenschaftlichen Anstalten*, 3: 63–135.

MONTAGU, G., 1803, *Testacea Britannica, or natural history of British shells, marine, land and the fresh-water, including the most minute: systematically arranged and embellished with figures.* Romsey, London, XXXVII + 606 pp., 16 pls.

MONTEROSATO, T. A. DI, 1879, Monografia dei chitonidi del Mediterraneo. *Giornale di Scienze Naturali ed Economiche*, 14: 1–23.

PLATE, L. H., 1899, Die Anatomie und Phylogenie der Chitonen. Fauna Chilensis II, Heft 1. *Zoologische Jahrbücher,* Suppl. 4: 15–216.

RIGHI, G., 1973a, Moluscos da Baía da Ilha Grande, Rio de Janeiro, Brasil. II. Polyplacophora. *Papéis Avulsos de Zoologia*, 26: 237–245.

RIGHI, G., 1973b, Adições aos Polyplacophora brasileiros (Mollusca). *Papéis Avulsos de Zoologia*, 26: 259–273.

RIOS, E., 1994, *Seashells of Brazil*. Editora da FURG, Rio Grande, 368 pp., 113 pls.

SAITO, H., 1997, Deep-sea chiton fauna of Suruga Bay (Mollusca: Polyplacophora) with descriptions of six new species. *National Science Museum Monographs*, 12: 31–58, pls. 1, 2.

SCHWABE, E. & J. SELLANES, 2010, Revision of Chilean bathyal chitons (Mollusca: Polyplacophora) associated with cold-seeps, including description of a new species of *Leptochiton* (Leptochitonidae). *Organisms Diversity & Evolution*, 10: 31–55.

SIGWART, J. D., 2009, Morphological cladistic analysis as a model for character evaluation in primitive living chitons (Polyplacophora, Lepidopleurina). *American Malacological Bulletin*, 27: 95–104.

SIGWART, J. D., E. SCHWABE, H. SAITO, S. SAMADI & G. GIRIBET, 2011, Evolution in the deep sea: a combined analysis of the earliest diverging living chitons (Mollusca: Polyplacophora: Lepidopleurida). *Invertebrate Systematics*, 24: 560–572.

SIGWART, J. D., I. STOEGER, T. KNEBELSBERGER & E. SCHWABE, 2013, Chiton phylogeny (Mollusca: Polyplacophora) and the placement of the enigmatic species *Choriplax grayi* (H. Adams & Angas). *Invertebrate Systematics*, 27: 603–621.

SIGWART, J. D., L. H. SUMMER-ROONEY, E. SCHWABE, M. HEß, G. P. BRENNAN & M. SCHÖDL, 2014, A new sensory organ in "primitive" molluscs (Polyplacophora: Lepidopleurida), and its context in the nervous system of chitons. *Frontiers in Zoology*, 11: 7.

SIRENKO, B., 2006, New outlook on the system of chitons (Mollusca: Polyplacophora). *Venus*, 65: 27–49.

SIRENKO, B. & E. SCHWABE, 2011, Description of a minute new chiton (Mollusca, Polyplacophora) from Sri Lanka. *Ruthenica*, 21: 113–121.

THIELE, J., 1893, *Das Gebiss der Schnecken, zur Begründung einer Natürlichen Classification*. Nicolai, Berlin, pp. 337–409, pls. 29–32.

THIELE, J., 1906, Ueber die Chitonen der deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition*, 9: 325–336.

THIELE, J., 1908, Die Antarktischen und Subantarktischen Chitonen. *Deutsche Südpolar Expedition 1901–1903*, 10. Band, Zoologie, Teil 2: 9–23, pl. 1.

THIELE, J., 1909, Revision des Systems der Chitonen. II. *Zoologica. Original-Abhandlungen aus dem Gesamtgebiete der Zoologie*, 22: 71–132, pls. 7–10.

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