

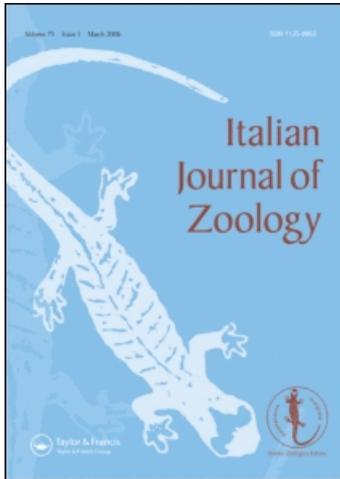
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New data on Polyplacophora from Tuscan Archipelago. I. *Leptochiton sarsi* Kaas, 1981 and *Leptochiton pepezamorai* Carmona Zalvide, Urgorri & Garcia, 2004, two species new to the Mediterranean Sea

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Abstract

Two Atlantic species of *Leptochiton*, *Leptochiton sarsi* Kaas, 1981 and *Leptochiton pepezamorai* Carmona Zalvide, Urgorri & Garcia, 2004, were found in the Tuscan Archipelago, at the Santa Lucia Bank. This area, between the Corsica and the Gorgona Island, is characterized by extensive white corals and hard bottom biocenosis extending from 125 to 800 m, which is particularly rich in molluscs. The two species were found looking over a great amount of old detritus from a depth estimated near 500 m. The study of *L. sarsi* (compared with some Atlantic specimens) and of *Leptochiton pepezamorai* permits us to better define some morphological features of these species, not well characterized in the original description. The collection of these Atlantic species in the Mediterranean Sea extends to 34 the number of species of Polyplacophora present in this area.

Keywords: *Mollusca*, *Polyplacophora*, *Leptochiton*, *Tuscan Archipelago*, *Santa Lucia Bank*

Introduction

The examination of some private malacological collections has led to the recognition of many specimens of rare or poorly known species of Polyplacophora coming from Tuscan Archipelago. This area is particularly rich in molluscs due to the great diversity of habitats. For example, the Santa Lucia Bank, between Corsica and the Gorgona Island, is characterized by extensive white corals and hard bottom debris, extending from 125 to 800 m. The intense fishery allowed us to retrieve a great amount of this debris where some interesting species of Polyplacophora are present along with other species typically associated with the white coral or bathyal mud hard substrates.

This first contribution documents the presence of two *Leptochiton* species previously only known from the Atlantic, now extended to the Mediterranean Sea.

The use of the scanning electron microscope (SEM) allowed us to better define some

morphological features of these species, not well characterized in their original descriptions.

Materials and methods

The studied material comes mainly from the Santa Lucia Bank (Figure 1), ca. 43° 35' N–9° 28' E, and, for comparison, we examined material from other localities. The depth data are always approximate, based on unchecked subjective reports from the local fishermen. The examined material is often badly preserved because it comes from old debris examined long after its recovery. The specimens are often rolled up and are often incomplete or with broken parts or with the tegmentum surface covered by fouling, which is difficult to remove even with ultrasonic treatment. These aspects often obscure the sculpture of the tegmentum and other diagnostic morphological features.

Abbreviations used: BDA, Bruno Dell'Angelo collection (Genova); MZB, Zoological Museum of

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Figure 1. Santa Lucia Bank location.

University of Bologna; PP, Paolo Paolini collection (Livorno).

Taxonomic accounts

We follow the systematic proposed by Sirenko (2006).

Class Polyplacophora Gray, 1821
 Subclass Loricata Shumacher, 1817
 Order Lepidopleurida Thiele, 1909
 Family Leptochitonidae Dall, 1889
 Genus *Leptochiton* Gray, 1847

Type species: *Chiton cinereus* sensu Montagu, 1803 (*non* Linnaeus, 1767) = *Leptochiton asellus* (Gmelin, 1791) by subsequent designation (Gray, 1847)

Leptochiton sarsi Kaas, 1981 (Figures 2a–n, 3a–i)

Leptochiton sarsi Kaas, 1981: 225 figs 4, 9, 10C,D (bibliography and synonymy); Hansson, 1998: 8; Bakken, 1999: 26; Slieker 2000: 26, pl. 1, fig. 10; Lundin *et al.* 2006: 30.

Leptochiton (L.) sarsi Kaas & Van Belle, 1985: 60, fig. 25.

Lepidopleurus (Leptochiton) sarsi Dell'Angelo & Palazzi 1989: 77, pl. 21, 25, figs 1–3; Dell'Angelo & Giusti 2000: 54, figs 5–10.

Lepidopleurus cfr. *sarsi* Giovine & Dell'Angelo 1993: 168, pl. 1, figs 4–5.

Lepidopleurus cancellatus (*non* Sowerby, 1840): G. O. Sars. 1878, pl. 7, figs 6a–h; – *mult. auct.*

Material examined

Santa Lucia Bank: 2 specimens (BDA); Tautra-Tømmerdalen (Norway), –200 m: 4 specimens (BDA); Koster isl. (Sweden), –150 m: 2 specimens (BDA).

Remarks

Leptochiton sarsi was described by Kaas (1981) in his revision of *Leptochiton* living along the Scandinavian coasts. By studying a lot of specimens, identified as *L. cancellatus* (Sowerby 1840a), Kaas found that specimens described and figured by G.O.Sars (1878: 111, pl. 7, figs 6a–h) as *L. cancellatus*, did not agree with the species described by Sowerby (1840a: figs 104, 104a,b, 105; 1840b: 4), and these were described as the new species *L. sarsi*, along with an elaboration of the differences between the two taxa (Kaas 1981: table 2). The distribution of *L. cancellatus* was restricted to the British Isles, the Atlantic coasts of France, Spain and Portugal, and the Mediterranean Sea, while *L. sarsi* appeared to be continuously distributed along the Scandinavian coast, from Bohuslän (Sweden) up to Finmark (Norway) at a depth of 40 to over 700 m.

The species was characterized by its tegmental sculpturing, with small roundish separated granules arranged in quincunx on the head valve, lateral areas, and postmucronal area, except towards the outer margin they appear to form radial rows interrupted by many very fine, concentric lines of growth. On the central areas, the granules are arranged in about 50 longitudinal series. The granules are more compact and roundish on the longitudinal series, moderately raised and a little rounded off (Figures 2f, g), and bear three aesthetes lined up along the diameter on the top: a central macroaesthete and two microaesthetes at the extremities (Figures 2g, l). The granules are narrower where they are arranged in quincunx, less roundish and more crushed from one side (Figures 2i, m), and show a variable number of aesthetes, normally six (Figures 2j, n) with a central macroaesthete and two or more microaesthetes on the two sides. The dorsal girdle is covered with elongate conical scales (Figures 2c, d), sculptured with 5–6 weak, narrow riblets, and smooth needle-shaped spicules (Figure 2d).

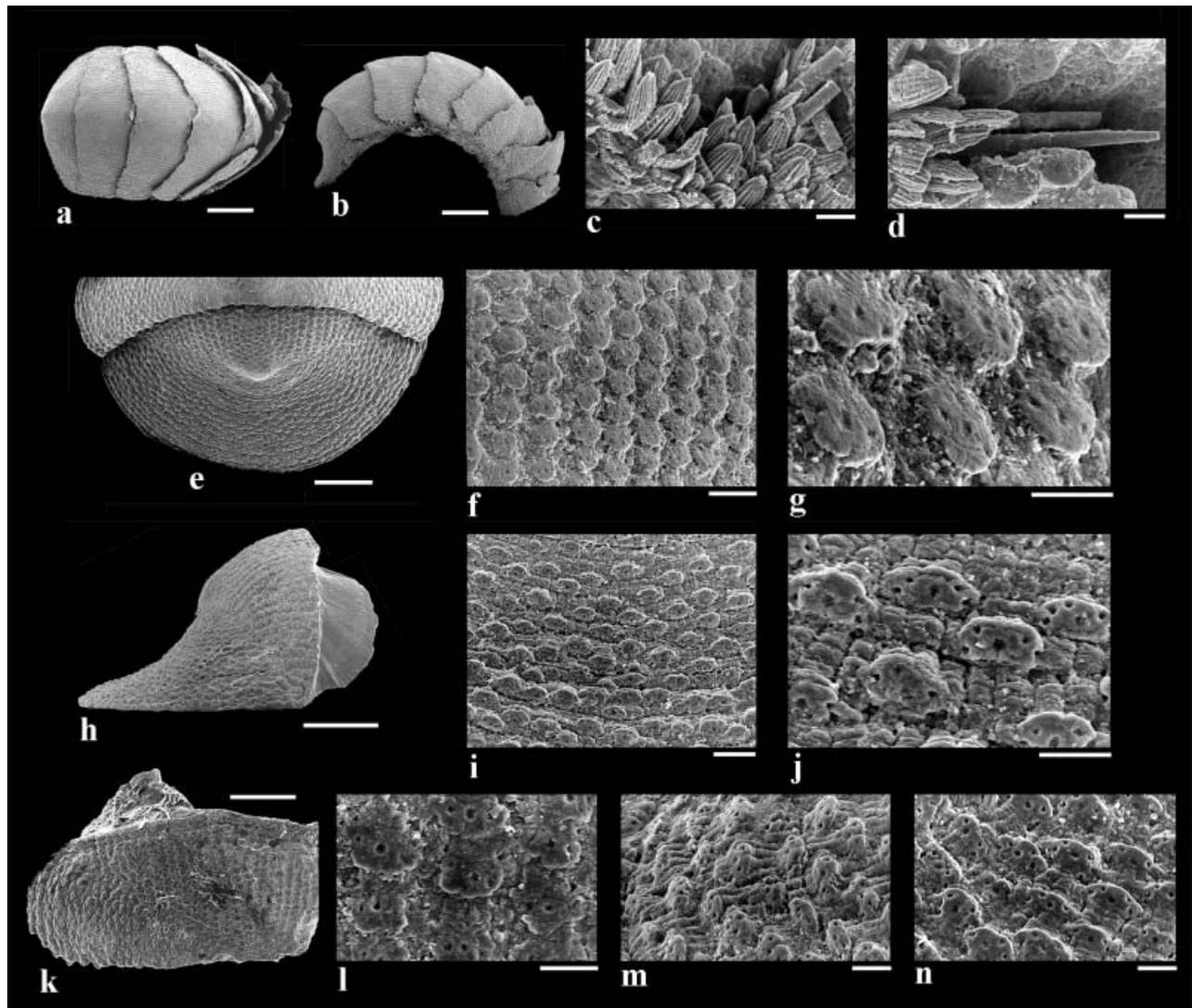


Figure 2. *Leptochiton sarsi*, Santa Lucia Bank. **a,b**, complete specimen in dorsal and lateral view; **c,d**, dorsal girdle formations; **e**, tail valve; **f,g**, arrangement of granules in central area; **h**, removed tail valve; **i,j**, arrangement of granules in postmucronal area; **k**, removed intermediate valve; **l**, arrangement of granules in central area; **m,n**, arrangement of granules in lateral area. Scale bars: **a,b**, 1 mm; **e,h,k**, 500 μ m; **f,i**, 100 μ m; **c,d,g,j,l-n**, 50 μ m.

Two specimens of this species were found in the Santa Lucia Bank by G. Di Paco in the 1990s, from an unknown depth, probably about 500 m, and so they represent the first report of living specimens of *L. sarsi* in the Mediterranean Sea (Figures 2a–n). The specimens could be identified with confidence even though they are not complete and are damaged, with some valves and soft parts lacking.

The species was already previously reported on the basis of single valves, considered as subfossil, by Giovine & Dell'Angelo (1993) (an intermediate valve from Cannitello, Reggio Calabria, in detritus 150 m depth), and by Dell'Angelo & Giusti (2000) (many valves from the Southern Ligurian Sea, between Capraia Id. and Capo Corso, 350–500 m depth). Moreover, the species was already reported

as a fossil in some bathyal Pleistocene outcrops in Southern Italy: Archi (Reggio Calabria), San Procopio (Reggio Calabria), Salice (Messina) (Dell'Angelo & Palazzi 1989), and Venetico Marina (Messina) (Palazzi & Villari 1994).

We have also studied some specimens of *L. sarsi* from Tautra-Tømmerdalen, Norway, kindly put at our disposal by Jon-Arne Sneli. These specimens were collected on 9 July 1973 at a depth of 200 m and were identified by Piet Kaas. We provide images of one of these specimens (Figures 3a–i) for comparison with our material. We observed the presence of some smooth needle-shaped spicules among the dorsal girdle scales (Figure 3f), not reported in the species' original description. These spicules are in any case present in our material too (Figures 2c, d).

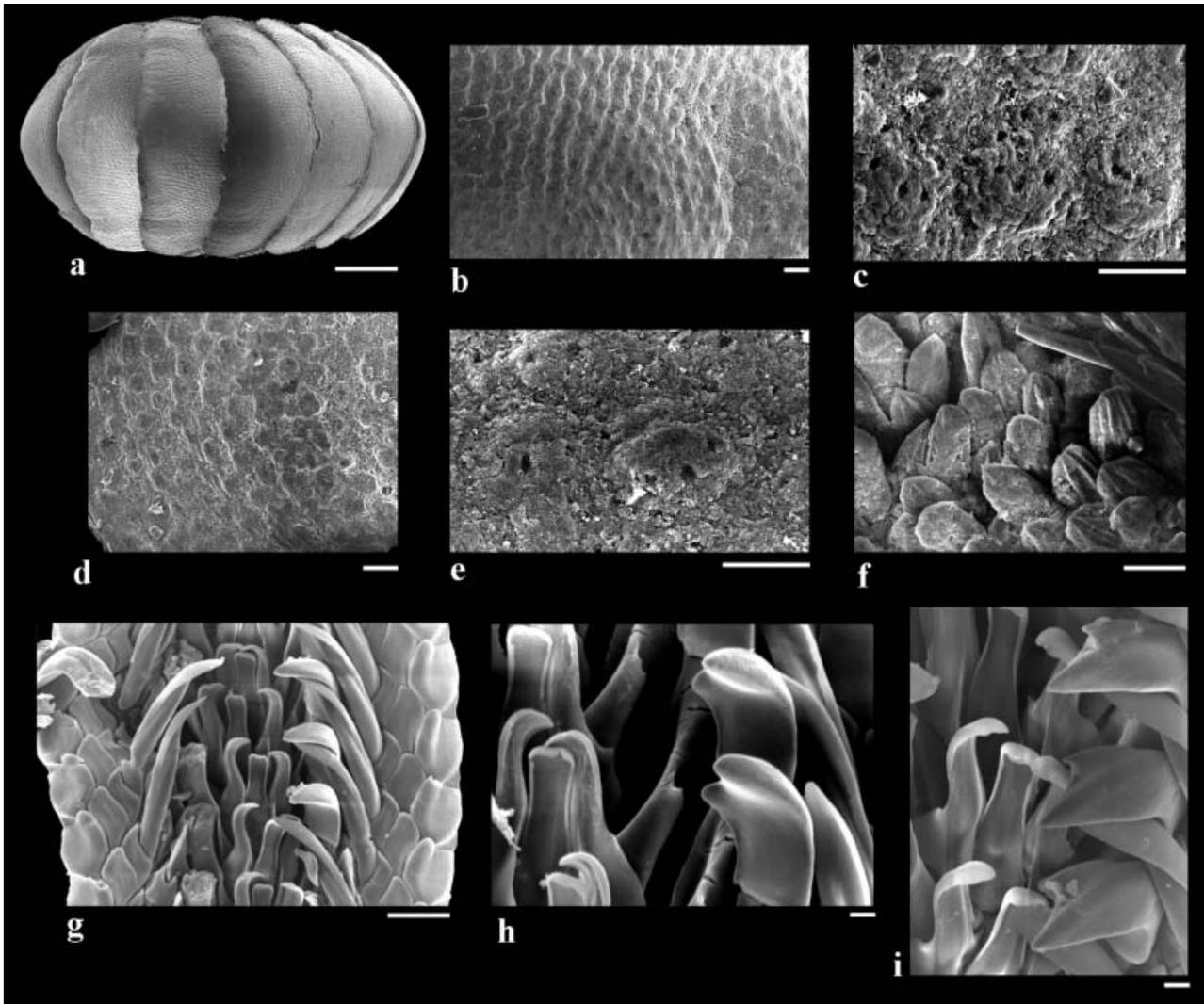


Figure 3. *Leptochiton sarsi*, Norway. **a**, complete specimen in dorsal view; **b**, arrangement of granules in valve V; **c**, detail of granules; **d**, arrangement of granules in lateral area of valve VII; **e**, detail of granules; **f**, dorsal girdle formations; **g–i**, radula. Scale bars: **a**, 1 mm; **b, d**, 100 μ m; **c, e–g**, 50 μ m; **h, i**, 10 μ m.

The *L. sarsi* radula is known only by the Kaas drawings (1981: figs 9K,L), so we illustrate the radula of the Norway specimen; this reveals some differences compared to Kaas's description, mainly in the shape of the central and first lateral teeth, and the accessory plate of the second lateral tooth, reported by Kaas to be "with a curved, sharply pointed main denticle and a very small exterior one", while, on the contrary, we found the external denticle to be well evident. It is now possible to define the accessory plate of the second lateral tooth as bicuspidate (Figures 3h, i).

Distribution

The species is only known from the Scandinavian coasts (40–700 m depth) and from the

Tuscan Archipelago (Santa Lucia Bank, about 500 m depth, and subfossil valves between Capraia Id. and Capo Corso, 350–500 m depth) and Calabria (Cannitello, 150 m depth, a single subfossil valve).

Leptochiton pepezamorai Carmona Zalvide, Urgorri & García, 2004 (Figures 4a–p)

Leptochiton (Leptochiton) pepezamorai Carmona Zalvide, Urgorri & García 2004: 147, figs 21–38; Fernandez, 2005: 264; Schwabe, 2005: 100.

Material examined

Santa Lucia Bank, about –500 m: 1 specimen (PP), 2 intermediate valves (BDA).

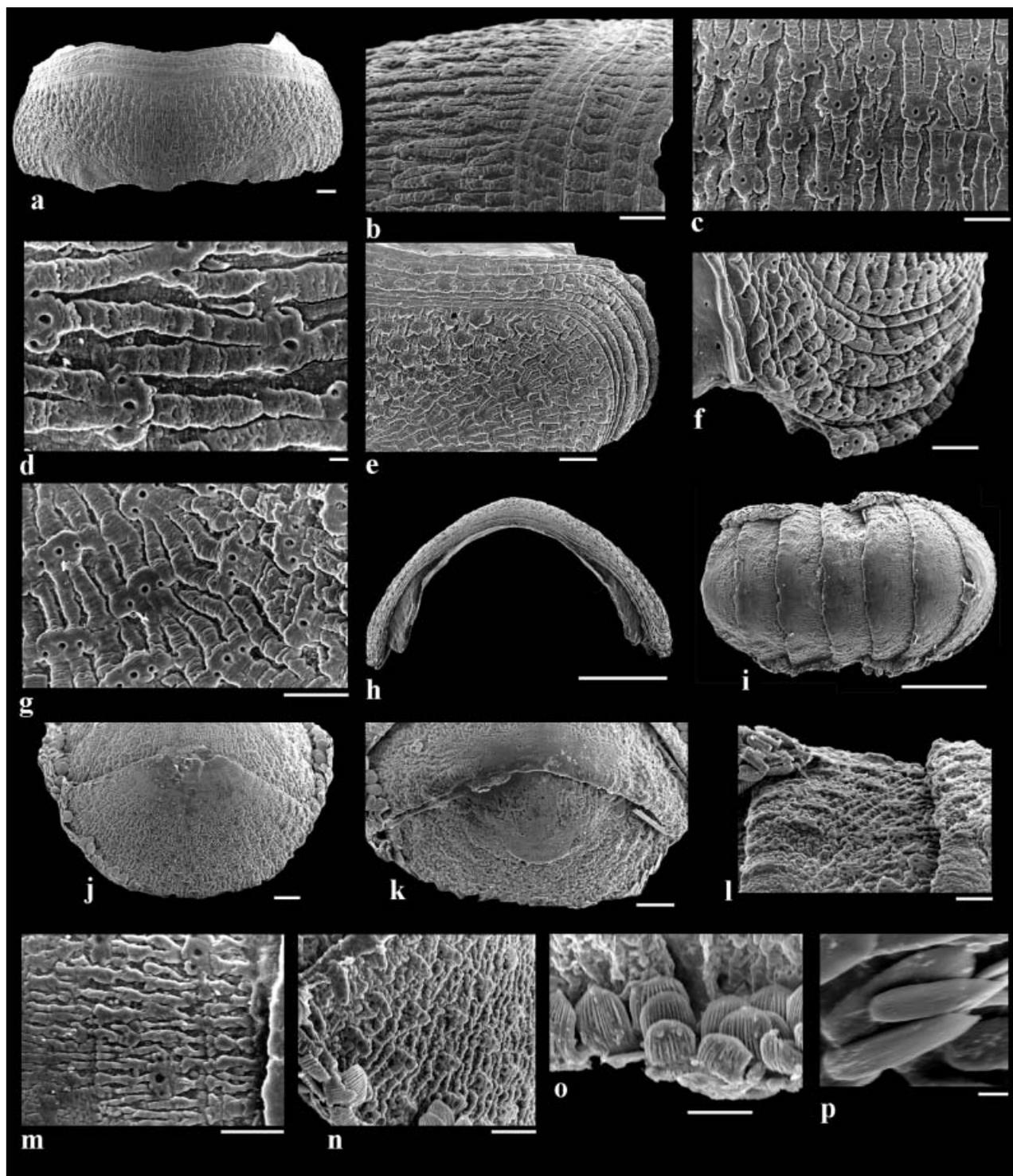


Figure 4. *Leptochiton pepezamorai*, intermediate valve. **a**, dorsal view; **b**, detail of jugal area; **c**, arrangement of granules in central area; **d**, detail of granules and stems; **e**, detail of lateral and central areas; **f**, detail of lateral areas with growth marks; **g**, concentrically arranged granules in lateral area; **h**, frontal view. *Leptochiton pepezamorai*, living specimen. **i**, complete specimen in dorsal view, anterior region on the right side; **j**, head valve; **k**, tail valve; **l**, intermediate valve, lateral area; **m**, arrangement of granules in central area; **n**, arrangement of granules in lateral area; **o**, dorsal girdle scales; **p**, smooth dorsal girdle spicules. Scale bars: **h**, **i**, 500 μm ; **a**, **e**, **j**, **k**, 100 μm ; **b**, **c**, **f**, **g**, **l**–**o**, 50 μm ; **d**, **p**, 10 μm .

Remarks

Leptochiton pepezamorai Carmona Zalvide, Urgorri & Garcia, 2004 was based on four specimens collected in 1990–1991 during the “Cangrexo I” campaign off Galicia (north-western Spain) between 753 and 832 m depth. The species is small (from 1.4×0.7 to 2.4×1.3 mm) and is characterized by the tegmentum sculptured with rounded granules and two or three stems on the apical zone, showing a more or less concentric arrangement on the head valve, lateral areas, and postmucronal area. On the central areas, the granules are arranged in longitudinal rows separated by shallow grooves. The number of rows varies between 56 and 67. As a general rule, the stems give a striated aspect to the tegmentum, and are interrupted by the granules (Figure 4m). In addition, the head valve, lateral areas, and postmucronal area always show a variable number of growth marks that give a very characteristic aspect to the valves (Figures 4b, e, f). Each granule bears three aesthetes (Figures 4d, g). The dorsal girdle is covered with pointed, rectangular, slightly curved scales, sculptured with 14–16 longitudinal lamellae (Figure 4o), smaller scales with 8 longitudinal ribs, and smooth dorsal spicules (Figure 4p). There is a marginal fringe of pointed conic spicules and the ventral scales are sharply rectangular, with a weak median longitudinal rib.

A living specimen of this species (Figures 4i–p) was found at the Santa Lucia Bank at an unknown depth, but estimated to be near 500 m. This specimen (PP) is slightly rounded and its estimated length (1.8–2 mm) and width (1.1 mm) agree with those of the type material.

We found also two intermediate valves (Figures 4a–h) from the Santa Lucia Bank that can be identified as *L. pepezamorai*. The two valves (BDA) were found by G. Di Paco, in debris coming from fishing-boats at an estimated depth of 500 m, on the basis of the information given by fishermen. The two valves are fresh and fragile, almost transparent, whitish.

The characteristics of the living specimen and the two intermediate valves agree with those reported in the original description of the species. The following girdle descriptions only point out some slight differences in comparison with the original description. The dorsal scales (Figure 4o) seem more “squared” (compare with fig. 33 in the original description) and have a lesser number of longitudinal lamellae (12–14 vs. 16–18 in the original description).

Distribution

The species is only known from the Atlantic Spanish coasts (Galicia) and from the Tuscan Archipelago (Santa Lucia Bank), at depth between 753 and 832 m (Galicia) and near 500 m (Tuscan Archipelago).

Conclusive remarks

The Tuscany Archipelago is one of the most interesting areas for the study of the Mediterranean deep Polyplacophora.

Leptochiton sarsi Kaas, 1981 and *Leptochiton pepezamorai* Carmona Zalvide, Urgorri & Garcia, 2004 were known only from the Atlantic Ocean; their collection in the Mediterranean Sea now extends to 34 the number of species of Polyplacophora presents in this area (Dell’Angelo & Smriglio, 1999; Koukouras & Karachle, 2005). Moreover, on the basis of the examined specimens, we were able to improve on the description of *Leptochiton sarsi*.

Acknowledgements

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