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A SECOND RECORD OF *LAEVIPILINA ROLANI* WARÉN & BOUCHET, 1990 (MOLLUSCA: MONOPLACOPHORA) FROM THE NORTHWEST OF SPAIN

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ABSTRACT

A single specimen of *Laevipilina rolani* was collected off the Galician coast at 840 m depth on a ferromanganese nodule bottom. It is the second record of this species and the first outside the Galicia Bank. The shell, external morphology of the soft parts, intestine and radular configuration are described and compared with the original description and with other species of genus *Laevipilina*. Their ecology and diet are also discussed.

INTRODUCTION

Since the description of *Neopilina galathea* by Lemche (1957), eighteen species of Monoplacophora have been recorded (Warén & Hain, 1992; Goud & Gittenberger, 1993). Five of these are known from the North Atlantic and the Mediterranean: *Rokopella zografi* (Dautzenberg & Fischer, 1896) from the Azores (Bouchet, McLean & Warén, 1983) and the Mediterranean, NE of Corsica and E of Sardinia (Cesari, Giusti & Minelli, 1987), *Rokopella goesi* (Warén, 1988) from the Caribbean, Virgin Islands (Warén, 1988), *Micropilina minuta* (Warén, 1989) from Iceland (Warén, 1989), *Laevipilina rolani* Warén & Bouchet, 1990 from the NW Spain, Galicia Bank (Warén & Bouchet, 1990) and *Rokopella brummeri* Goud & Gittenberger, 1993 from the east of the Mid-Atlantic Ridge (Goud & Gittenberger, 1993). Only *L. rolani* was found alive; the other four species are based on empty shells.

Warén & Bouchet (1990) described *L. rolani* from two specimens collected on the Galicia Bank at depths of between 985 and 1000 m (Expedition SEAMOUNT I). They also examined one of the two shells in Rolán's collection, taken from the same locality but at a slightly shallower depth. (Rólan, 1983: as *Acmaea* sp.).

A specimen of *L. rolani* was collected by us on the Galician coast (Fig. 1) in 1991 (Expedition CANGREXO I), which represents the second record of this species and the first out of the type locality. We presented the preliminary information to the Eleventh International Malacological Congress in Siena, Italy (Urgorri & Troncoso, 1992).

At the present time, only three species of the genus *Laevipilina* are known: *L. hyalina* (McLean, 1979) from California, at a depth of

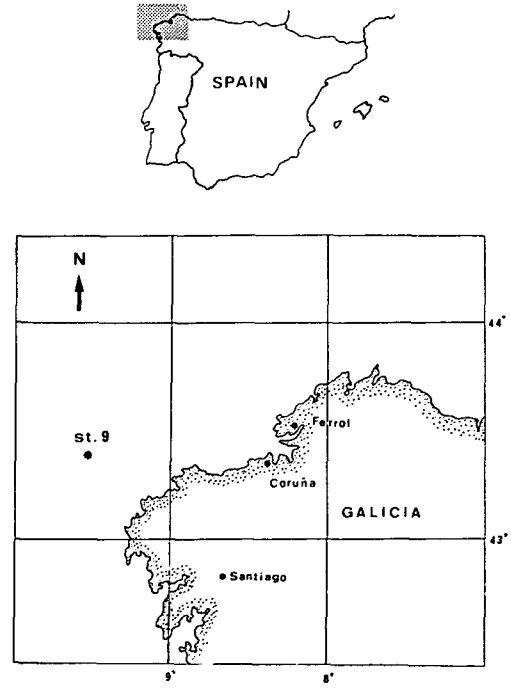

Figure 1. Location of the sampling station no. 9: A Quiniela, Galicia, NW of Spain (43°23′31″N; 09°32′19″W).

174-388 m on a smooth bottom with pebbles and small rocks, sparse shell debris (McLean, 1979), *L. rolani* (Warén & Bouchet, 1990) from NW Spain at a depth of 985-1000 m, on bottoms with living corals, gravel and stones (Warén & Bouchet, 1990) and *L. antarctica* Warén & Hain, 1992 from the Weddell and Lazarev seas, Antarctica, at a depth of 210-644 m on bottoms of sand and gravel with stones (Warén & Hain, 1992). McLean has a fourth species from off Central America (Warén & Bouchet, 1990).

MATERIALS AND METHODS

Expedition CANGREXO I: station 09, 09/07/1991. A Quiniela, Galicia, NW of Spain (43°23'31"N; 09°32'19"W), 1 specimen of 1.30 mm length, 1.01 mm width and 0.55 high, was found at a depth of 840 m on a bottom of ferromanganese nodules, with calcareous plates, coal slag and small stones. The specimen was collected on a ferromanganese nodule having abundant sessile epifauna.

The samples were obtained on board 'Noche de Reyes' during the brachyuran decapod *Chaceon affinis* ('cangrexo real') fishing expedition. The samples were hauled on board entangled in the nets of the fishing baskets, then placed in a jug filled with alcohol to be sorted later in the laboratory. Unfortunately the sample from station 09 was left out in the sun for 6 hours, until the boat reached port. This sample was examined before being placed in alcohol and on a ferromanganese nodule, we found a somewhat dried-out, specimen of *L. rolani*, partially broken in the central half of the dorsum.

RESULTS

Laevipilina rolani *Warén & Bouchet, 1990*

Description: The shell is thin, fragile, oval, iridescent, and highly transparent (Fig. 2A). It is a small shell (1.30 mm in length, 1.01 mm width, and 0.55 mm in height) and high (42.32% = H/L × 100). The peristome is regular, smooth, elliptic and 1.29 times greater in length than in width (Fig. 2B). The posterior and superior surface is uniformly convex and the anterior surface, slightly concave (Figs. 2C-

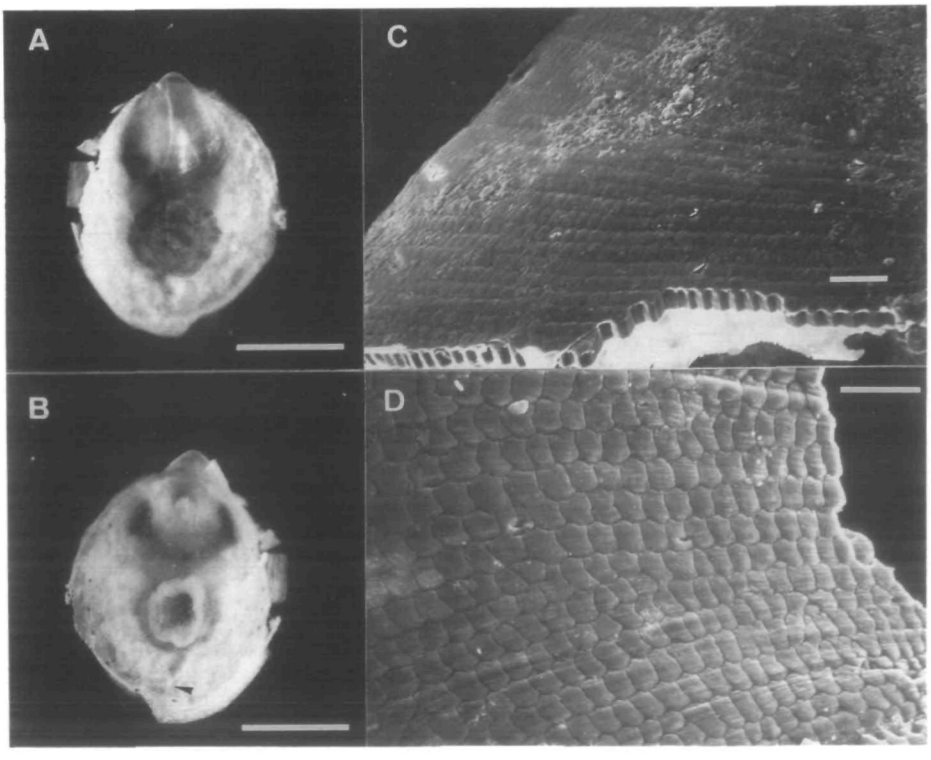

Figure 2. *Laevipilina rolani*. **A.** Dorsal view, a specimen of 1.3 mm; **B.** Ventral view, of the same; **C.** Posterior surface; **D.** Anterior surface. Scale bars, A and B = 0.5 mm; C and D = 50 μm. Arrow indicates anal papilla.

D). The shell is adorned with concentric grooves that mark the successive rows of prisms, whose surface is formed by a sculpture of lines varying in thickness, which are also arranged concentrically, with 5 or 6 lines per row of prisms (Figs. 3A; 4A). The anterior surface of the shell has a more striking decoration, which makes it look more ridged. It also has a smaller number of rows of prisms that diverge at the anterior sides in 2, 3 or more rows

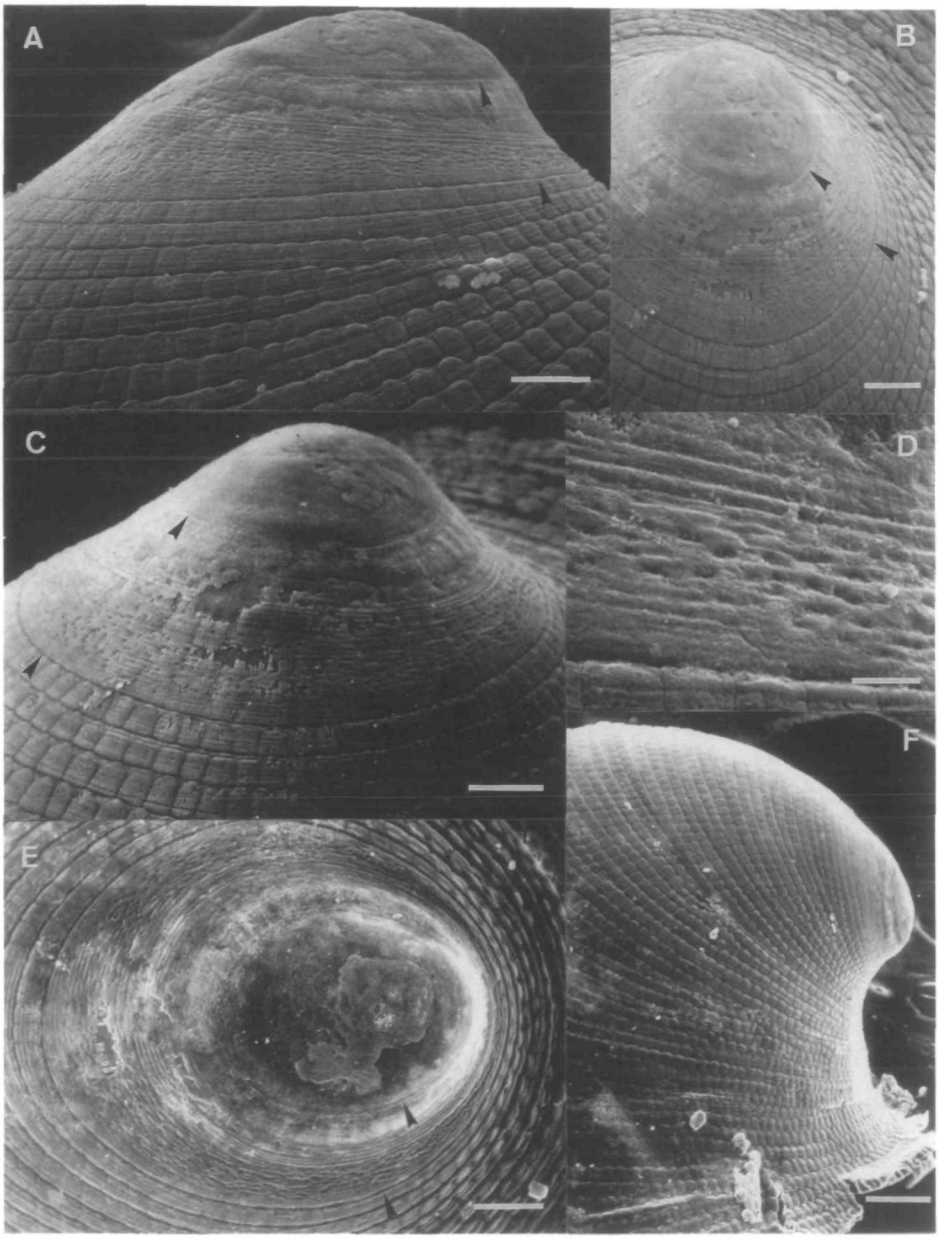

Figure 3. *Laevipilina rolani*. Apex: **A.** Lateral view; **B.** Dorsal-posterior view; **C.** Posterior view; **D.** Detail of apex sculpture on second area; **E.** Dorsal view; **F.** Apex and anterior part of shell. Scale bars, A, B, C and E = 30 μm; D = 5 μm; F = 100 μm. Arrows indicate the different sculptural areas.

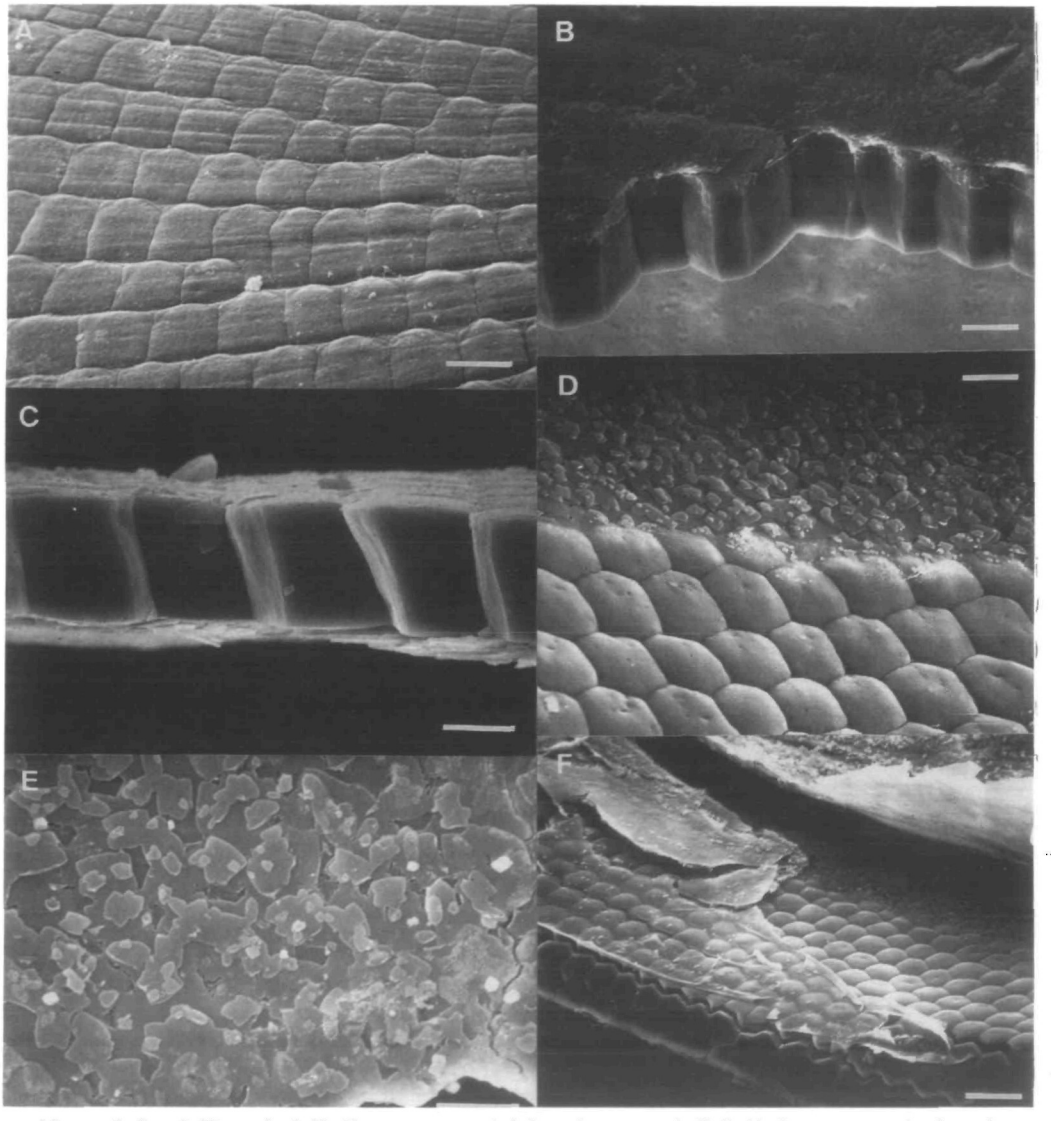

Figure 4. *Laevipilina rolani.* Shell structure: **A.** Adult sculpture on shell; **B.** Periostracum and prismatic layer; **C.** Fragment of shell, periostracum upper, prismatic layer middle and nacreous layer lower; **D.** Interior view with prismatic layer and nacreous layer; **E.** Nacreous layer; **F.** Interior view of edge of shell. Scale bars, A, B, C and E = 15 μm; D = 20 μm; F = 40 μm.

towards the dorsal and posterior surface (Figs. 3F; 4A). The apical area measures 243 μm in length, 192 μm in width and 81 μm in height, and protrudes slightly over the anterior edge of the shell, facing downwards (Fig. 3F). The apex is semiglobular, helmet-shaped (Fig. 3A), with two clearly differentiated areas (Figs. 3B-C-E), similar to the description given by Warén (1988; 1989) in *Rokopella goesi* and *Micropilina minuta*: a more convex apical area, strongly corroded, showing no primary structure; the second area with the same curvature as the rest of the shell, from which it is clearly separated, is adorned with small pits and uniformly concentric lines (Fig. 3D), similar to those of the shell but with no visible prismatic structures.

The periostracum is thin and strong (Fig. 4B). The prismatic layer is made up of rela-

tively uniform hexagonal prisms, whose height varies between 20 and 30 μm, and whose greatest diameter fluctuates between 25 and 36 μm, with some prisms reaching 47 μm (Figs. 4B-C). In the anterior part of the shell, the prisms are smaller and more irregular in shape (Fig. 2D). There is a line of prisms on the edge of the shell (peristome) which are pentagonal (Fig. 4F). The thickness of the laminar nacreous layer is 2.6 μm (Figs. 4D-E). It begins at the pallial line 270 μm from the edge of the shell, leaving 10 or 11 rows of marginal prisms exposed (Fig. 4F). We did not observe any muscle scars on the shell.

The anterior lip is conspicuous, arched and separated from the velum by a deep, narrow groove. The velum is well-developed with two triangular lobules that diverge towards the pallial groove. The posterior lip is wide. We were unable to observe the presence of postoral tentacles on it.

The foot (contracted) is small, circular and sucker-shaped, ¼ of the shell length (Fig. 2B). It has a wide pallial groove, with five pairs of gills (not well preserved), which extend from the posterior area to the anterior edge of the foot. The two posterior gills are larger than the three anterior ones. However, we were unable to observe the number or the shape of the digitform processes. The anus is found on a small papilla (Fig. 2B), widening in the posterior area of the pallial furrow. There are 13 black spots scattered irregularly around the edge of the mantle (Fig. 2B).

There are seven pairs of retracting pedal muscles, the 1st, 2nd and 7th are narrow, and the 3rd, 4th, 5th and 6th are wide (Fig. 5). 4½ intestinal coils (Fig. 5) are visible through the transparent shell, and located on the third posterior quarter of the animal (Fig. 2A), opening on to a small anal papilla, found on the central posterior part of the pallial furrow (Fig. 2B). The examination of the stomach contents revealed 7 foraminifers of the *Globigerina*, *Ammonia* and *Bolivina* genus, polychaete bristles, scattered sponge spicules, several small mineral particles and unidentified organic material.

The radula (Figs. 6A-B) is 1.3 mm in length and 0.075 mm wide, with 44 V-shaped transverse lines (39 upper and 5 lower), each having 11 teeth (44 × 1:3:2). The central tooth is long and narrow. The lateral teeth have an elongated base and the front edge of the cusp is serrated, and clearly asymmetrical, the 2nd being the largest, with a sharp lateral process, and the 3rd has the most prominent denticles

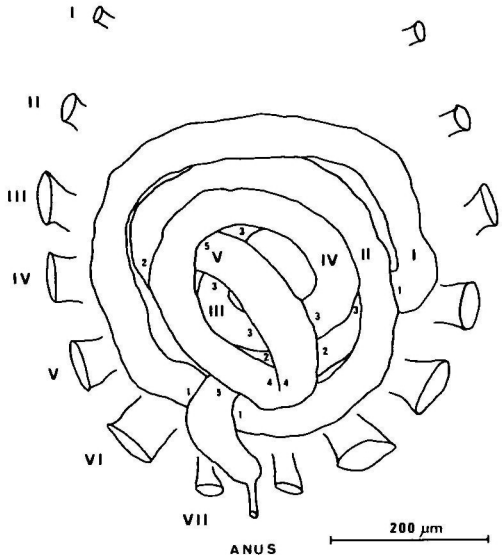

Figure 5. *Laevipilina rolani.* Intestine coils and retracting pedal muscles.

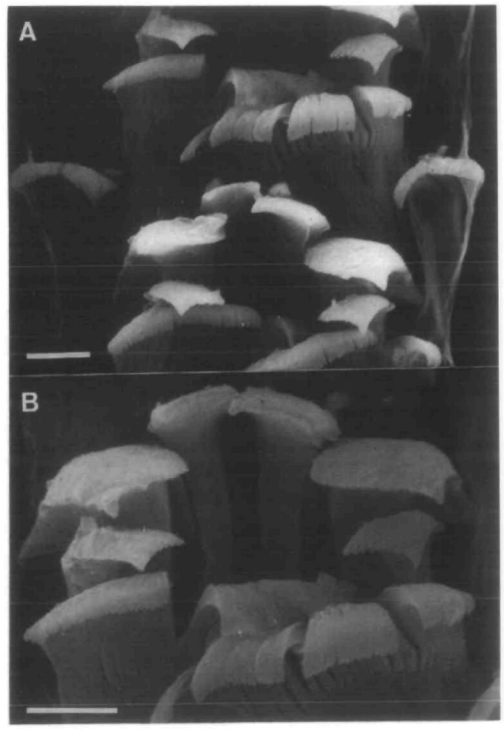

Figure 6. *Laevipilina rolani.* **A.** Radula; **B.** Radula, central field. Scale bars, A and B = 10 μm.

(about 11). The first marginal tooth is wide with a triangular base, composed of 45-48 falciform hooks in a fan-like arrangement. The second marginal tooth has an apparently serrated cusp with an elongated triangular base.

DISCUSSION

In general, our specimen of *L. rolani* fits the original description given by Warén & Bouchet (1990). Although smaller in size, (1.3 mm), it is akin to the type material with the high shell (42.32%), with a similar sculpture and the same prismatic structure of the shell (Warén & Bouchet, 1990). The strongly corroded apical area in the type material, is clearly divided into two areas in the case of our specimen, one of which is adorned with small pits and uniformly concentric lines.

As regards the external body morphology, our sample coincides with the original diagnosis, except for the black spots on the edge of the mantle, which were not pointed out by Warén & Bouchet (1990). We did not observe the presence of postoral tentacles or the number of digitiform processes in the gills due to the poor condition of the specimen, which was dry when collected. The presence of 7 pairs of retracting pedal muscles and the arrangement of the intestinal coils complete the original diagnosis of *L. rolani*.

Warén & Bouchet (1990) do not specify the number of rows in the radula of *L. rolani*, which in our specimen is 44, coinciding with figures 7 and 8 of the original description.

L. rolani differs from the other two known species of this genus in that it has a substantially high shell (42% in *L. rolani*, 29% in *L. hyalina* and 24% in *L. antarctica*) around the apical area that protrudes slightly over the anterior edge of the shell.

The height of the prisms is about equal to the diameter in *L. rolani* and *L. hyalina*. They are shorter in *L. antarctica*.

The number of postoral tentacles and the anus ending in a papilla distinguishes *L. rolani* from the other two species. They also differ from *L. rolani* in several aspects related to the radula, such as the small central tooth of *L. antarctica* or the shape and size of the cusps of the lateral teeth in *L. hyalina* and *L. antarctica*.

Warén & Hain (1992) mention that only two specimens of *L. antarctica* were found on stones after a thorough search, and of the other known Monoplacophora species, only *Adenopilina adenensis* (Tebble, 1967) and *Monoplacophorus zenkewitchi* Moskalev, Starobogatov & Filatova, 1983 were found, also on hard substrates. Warén & Bouchet (1990) did not observe the substrate used by *L. rolani*, as their specimens were found dead among samples of sediment sorted in the laboratory, originating from bottoms made up of dead and living coral, gravel and stone, where *L. rolani* may live. The fact that our specimen was collected on a ferromanganese nodule, where abundant calcareous plates, coal slag and small stones also exist, confirms that *L. rolani* lives on hard substrates. In view of the radula structure and the stomach contents of our specimen and the sample analyzed by Warén & Bouchet (1990), it is possible that *L. rolani* feeds on the layer of organic debris deposited on the stones.

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