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NOTE ON THE GENUS *LEPTOCONCHUS* RÜPPELL, 1835 (MOLLUSCA, GASTROPODA, CORALLIOPHILIDAE) WITH THE DESCRIPTION OF TWO NEW SPECIES, *LEPTOCONCHUS VANGOETHEMI* sp.n. AND *LEPTOCONCHUS CYPHASTREAE* sp.n., FROM PAPUA NEW GUINEA

BY

C. MASSIN

(With five plates and eight textfigures)

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ABSTRACT

Two new species of *Leptoconchus, Leptoconchus vangoethemi* sp.n. and *Leptoconchus cyphastreae* sp.n., from Papua New Guinea are described. Particular attention is paid to the larval shell and the burrow shape in the host coral. The host coral specificity and the taxonomic value of the larval shell are briefly discussed.

RESUME

Deux nouvelles espèces de *Leptoconchus, Leptoconchus vangoethemi* sp.n. et *Leptoconchus cyphastreae* sp.n., provenant de Papouasie Nouvelle-Guinée sont décrites. Une attention toute particulière a été portée à l'étude de la coquille larvaire ainsi qu'à la forme du trou pratiqué dans le corail hôte. La spécificité vis-à-vis du corail hôte et la valeur taxonomique de la coquille larvaire sont brièvement discutées.

(1) Léopold III Biological Station, Laing Island, Contribution nº 50 .

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I am deeply indebted to Dr. J. VAN GOETHEM for help and criticism during this work. Grateful acknowledgment is extended to Dr. K. WOUTERS and Mrs. P. BOUTREUR for reading the manuscript; to Mrs. E. DELAYE who drew figures 1 and 5; to Mr. P. SCHOEMAKER for the macrophotography (plates I, III) and to Dr. K. WOUTERS for the SEM photography (plates II, IV, V).

INTRODUCTION

One of the main characteristics of the genus *Leptoconchus* is the high intraspecific variation of the shell shape and the shell sculptures (RISBEC, 1953; SHIKAMA, 1963; BOUILLON et al, in press). This variability, together with the fact that the soft parts of the animal as well as the host coral are generally unknown, largely contributes to confuse the classification of the genus.

When the coral host is known it is considered, according to the literature, as non specific. A single species can house different *Leptoconchus* spp. (see MASSIN, 1982). These observations were made for the hole Indo-Pacific region but no work deals with this specificity for a restricted area.

The host coral is important because very often the body shape of a « parasite » depends on it and principally on its mean thickness. According to KLEEMAN (1980) *Lithophaga* spp. (Bivalvia) vary depending upon whether they come from branching or encrusting colonies. Even for non parasitic molluscs, e.g. *Crepidula* spp., the nature of the support modifies the shell shape and sculptures (ADAM & LELOUP, 1936).

For adults it is quite impossible to know if a characteristic is genotypic or related to the settlement in a given host. In order to clarify the systematics of the genus *Leptoconchus* it would be useful to possess criteria independent from the host coral influence. The protoconch of the *Leptoconchus* spp. could provide such criteria because there is a free-living stage before the settlement on a coral. However, in adult stage, the protoconch is covered with calcareous secretions. Therefore, it can only be studied on the larvae. The larvae can be easily obtained from the egg capsules of the females (see GOHAR & SOLIMAN, 1963). In this study we will pay particular attention to the study of the larval shell.

MATERIALS AND METHODS

Corals containing *Leptoconchus* spp. were collected in the lagoon and on the fringing reef of Laing Island (4° 10' 20" S - 144° 52' 20" E, Hansa Bay, Madang Province, Papua New Guinea) during May 1981 by Dr. J.

VAN GOETHEM. They were picked up by scuba diving between 7 and 10 m depth. The *Leptoconchus* spp. and pieces of the coral host were fixed in 10 % neutral formaline and preserved in 5 % neutral formaline or 70 % alcohol. The larval shells were extracted from their egg capsules, cleaned by an ultra-sound water bath, washed in 100 % alcohol, dried, covered with gold, and observed with a S. E. M. (Philips SEM 501). Holotype and paratypes of the two new species are deposited in the collections of the I. R. S. N. B. (nº I. G. 26.273).

Leptoconchus vangoethemi sp.n.

Type-locality : Laing Island, fringing reef, East side.

Host coral : *Echinopora lamellosa* (ESPER, 1797).

Observed material : 25 specimens (6 empty shells and 19 with the animal preserved).

T h e a d u l t s (figs. 1, 2; pl. I, fig. A). — The shell is small (maximum 8.5 mm in height), translucent, completely white or with brown spots or stripes on the last whorl. These spots or stripes are distributed randomly or aligned in three spiral bands in the basal part of the last whorl (fig. 1:4). The general shape of the shell is typically conical with the broadest part at the apex. Some specimens are almost globular, others almost lenticular (fig. 2). The apex of the shell is flat or with a slight depression, or exceptionally conical. The columella is excentric because of a particularly well developed last whorl. The number of whorls is unknown. The callus is white, smooth, covering half to two thirds of the last whorl and extending over the apex of the shell (fig. 1:3). The aperture is triangular, very wide in the upper part and tapering in the lower part. Facing it, the aperture represents at least half of the shell width. The anterior canal is generally rather prominent, broad and rounded for the conical specimens.

Very fine and straight squamose lamellae appear on the shell. On some specimens the lamellae are more prominent on the basal part of the last whorl near the anterior canal (fig. 1:2). Generally the shell looks smooth. However, sometimes shells are crusted with calcareous secretions which thicken and roughen them. The peristome and the lamellae are orthocline.

The animal is yellowish with an orange siphon. The foot is well developed, ovoid with a relatively short (when contracted) proboscidiform appendage in front of it (fig. 3). The operculum is absent. The siphon is ventrally open all along its length. Its shape is more or less cylindrical with a narrow base.

The optic tentacles, relatively short, possess a wide base where they are connected. The eyes appear as black spots located on half of the

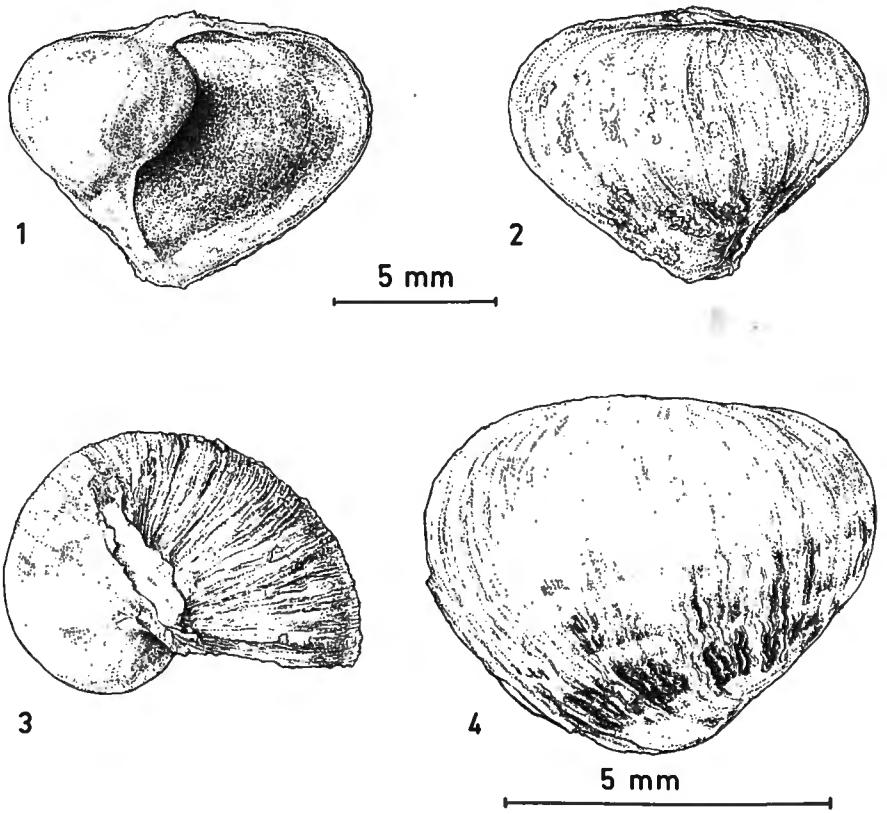

Fig. 1. — *Leptoconchus vangoethemi* sp. n.
1, 2, 3 : holotype; 4 : paratype with brown stripes aligned in spiral bands.

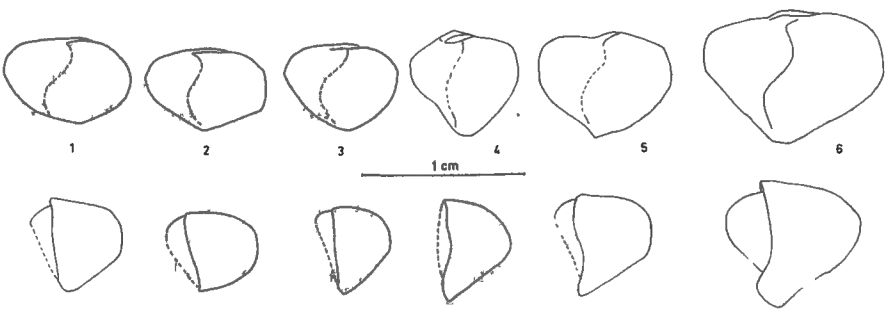

Fig. 2. — Shell shape variation among *Leptoconchus vangoethemi* sp. n.
1 to 5 : paratypes; 6 : holotype.
The parts of the shell hidden by the animal are represented by a dotted line.

length of the tentacles and on the exterior side. Beyond the eyes, the tentacles narrow bluntly (fig. 3:1).

Amongst all the animals observed, the proboscis was contracted. It lies in a spacious cavity located just behind the optic tentacles. The contracted proboscis is composed of two parts : a large base (0.5 mm in diameter) prolonged by a narrow and cylindrical part (0.2 mm in diameter) ending in a conical tip (fig. 3:4). Only females or empty shells were collected. Several females possess two or three egg capsules brooded in the left side of the mantle cavity. Each capsule looks like an ovoid pocket (4.0 × 2.8 × 2.0 mm). It consists of a transparent wall to which all the eggs adhere. These eggs are never seen floating freely in the egg capsule. In one single capsule there are either eggs or larvae but they are never found together. For a given period of the year, e.g. the month of May, some females bear eggs, others already larvae

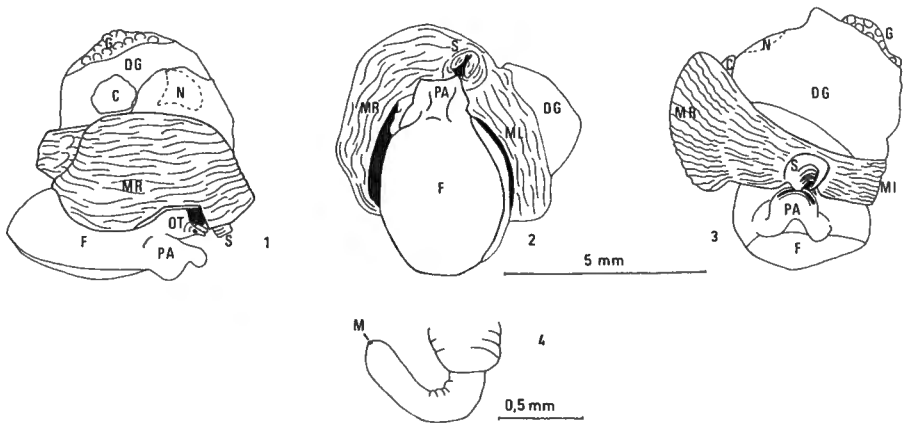

Fig. 3. — Animal of *Leptoconchus vangoethemi* sp. n.
1 : right lateral view; 2 : ventral view; 3 : frontal view; 4 : end of the proboscis.

The larval shell (pl. II). — The larval shell is globular with the base and the apex more or less flat (pl. II, fig. B). The aperture is ovate, higher than broad, and slightly smaller than half of the shell width (pl. II, fig. B). The basal part of the peristome is slightly reversed. The umbilicus is prominent (pl. II, fig. C). The operculum is always present and functional. The larval shell having three fourths of a whorl is 180 μm in diameter. It reaches 225 μm when there is a full whorl. The total thickness of the shell wall is ± 4.4 μm with respectively 2.9 μm for the shell itself and 1.5 μm for the calcareous excrescences covering the shell.

The surface of the shell is roughened with rounded calcareous excrescences or knots aligned in horizontal rows on the apical face (pl. II, fig. A). On the basal face the excrescences are flatter, oblong, and aligned in concentric rows around the umbilicus (pl. II, fig. C). Each knot is composed of a heap of intermixing calcareous tubules (pl. II, figs. D, E).

The knots are more or less 5 μm in diameter and 1.2 μm in height. The distance between them ranges from 4 to 7 μm. Different knots can fuse (pl. II, fig. D). Between the knots of the apical face, the shell is covered with a very dense meshwork of calcareous tubules in continuity with those of the knots (pl. II, figs. D, E). The calcareous tubules are not closely adhering to the shell. The meshwork is made of one or two layers of tubules (pl. II, fig. E). The mesh is sometimes closed by a calcareous sheath so that the original surface of the shell is no longer visible (pl. II, fig. E). Ventrally, the meshwork is reduced or absent and the surface of the shell appears smooth between the oblong excrescences (pl. II, fig. F).

The burrow. — *Leptoconchus vangoethemi* sp.n. bores its burrow in the living part of *Echinopora lamellosa* (ESPER, 1797). The *E. lamellosa* observed are foliaceous, being 45 mm thick at their base and more or less 1 or 2 mm thick at their free edge. The burrows are not limited to certain areas of the coral (fig. 4). The burrows are generally more or less conical and slightly larger than the shell. Globular and lenticular ones also appear (fig. 4, pl. I, fig. C). In the burrow the shell is always with the apex pointing downwards. The aperture of the burrow is narrow (1 mm in diameter) and located on the oral face of the coral. The aperture is either intracorallite or extracorallite. The chimney connecting the burrow with the outside is very short.

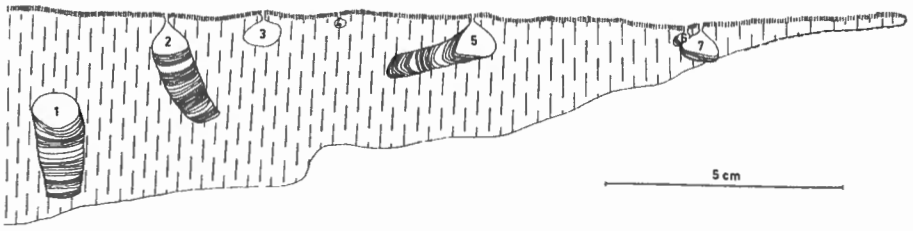

Fig. 4. — Schematic drawing of the form and the position of the burrows of *Leptoconchus vangoethemi* sp. n. in the host coral.

There are no obvious relations between the coral thickness and the shell height or the shell shape. When the coral is 10 mm thick, H/W (H = shell height; W = shell width) varies between 0.5 and 1.0. When the coral thickness reaches 45 mm, H/W only varies between 0.8 and 1.0. Consequently, only the lenticular shells seem to show a relation with the coral thickness.

The shell of *L. vangoethemi* moves up together with the growth of the coral (fig. 4, pl. I, fig. D). The anterior canal of the shell is always just beneath the coral surface. The shells which are found deep in the coral are always empty. When the shell enlarges its burrow upwards, calcareous secretions accumulate at the bottom of the burrow. These

calcareous secretions appear as a pile of calcareous sheets which are close together or separated by some space. They clearly indicate the movement of the shell through the coral (pl. I, fig. D). In the burrow the lower half is covered with the calcareous secretions whereas the upper half is naked and the skeletal structures of the coral are visible.

The shell seldom moves perpendicularly to the coral surface, but rather obliquely and from time to time almost parallel to the coral surface (fig. 4, pl. I, fig. C). Communication between two burrows was observed only once. Where the coral is very thin, the shell is separated from the exterior in its lower part only by its own calcareous secretions (pl. I, fig. B).

Comparison with related species. — *L. vangoethemi* is a very characteristic species which cannot be confused with any other species of the genus *Leptoconchus*. The two species presenting some affinities with *L. vangoethemi* are *Leptoconchus tenuis* (CHENU, 1843) and *L. djedah* (CHENU, 1843). To some extent the general shape of these shells is similar. However, in both species the aperture is obviously narrower than in *L. vangoethemi*.

This new species is dedicated to Dr. J. VAN GOETHEM who collected the material in Papua New Guinea and who gave me many facilities to study it.

Diagnosis. — Shell small, thin, conical with the broadest part up, sometimes rounded or lenticular. Last whorl very large with excentric columella. Apex flat or with a slight depression. Aperture very broad with an anterior canal generally well designed. Shell translucent, white all over or with brown spots on the last whorl. Callus thin, translucent, covering at least half of the last whorl and the apex of the shell. Shell sculpture reduced to fine straight orthocline lamellae.

Larval shell covered by knots (calcareous excrescences 5 μm in diameter) separated from each other by 4 to 7 μm. At the apex of the shell, between the knots, calcareous meshwork very dense, sometimes double and concealing the shell.

Important movement of the shell within the living coral. Older burrows filled with calcareous deposit. Animal with a cylindrical orange siphon. Post larval stage without operculum.

Leptoconchus cyphastreae sp.n.

Type-locality : Laing Island, lagoon.

Host coral : *Cyphastrea chalcidium* (FORSKAL, 1775).

Observed material : 7 specimens (2 empty shells and 5 with the animal preserved).

Synonymy : ? *Magilopsis lamarckii*; GOHAR & SOLIMAN, 1963, p. 102, fig. 1, pl. I, figs. 1, 3.

The adult (figs. 5, 6; pl. III, fig. A1). — The shape of *Leptoconchus cyphastreae* is similar to the one of *L. lamarckii* DESHAYES, 1863 (pl. III, fig. A). The shell is spindle-shaped, sometimes with a very short rostrum. The shell height varies between 18 and 20 mm, the shell width between 12 and 15 mm. The shell is white, translucent, very thin to rather thick. The top of the shell is smooth with the first whorls generally distinct, rarely covered with calcareous secretions. Four whorls are present. The callus is thin, white, translucent, covering one third of the last whorl. The aperture is ovate, very broad in its central part. The peristome looks like a question mark (fig. 5; pl. III, fig. A1).

Only the last whorl bears the undulating squamose lamellae which are characteristic of the genus. These lamellae are generally prominent at the base of the last whorl where they sometimes give rise to a spiral

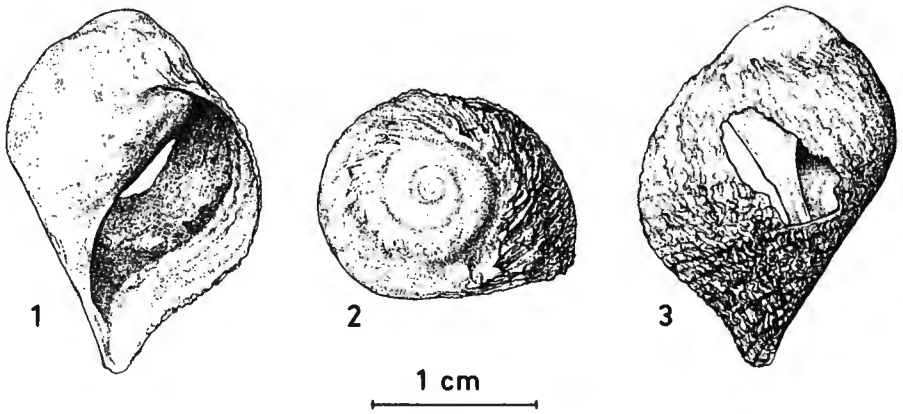

Fig. 5. — *Leptoconchus cyphastreae* sp. n.
1, 2, 3 : holotype.

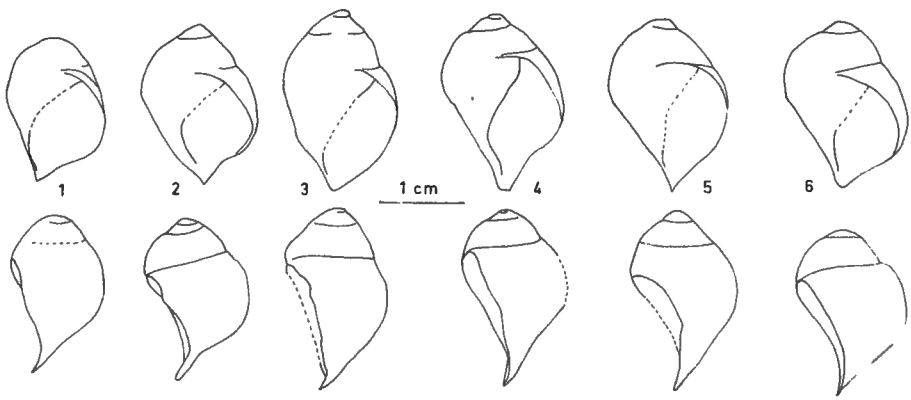

Fig. 6 : Shell shape variation among *Leptoconchus cyphastreae* sp. n.
1, 2, 3, 5, 6 : paratypes; 4 : holotype. The parts of the shell hidden by the animal, broken or indistinct are represented by a dotted line.

costulation (fig. 5:3). The lamellae can also be prominent along the suture of the last whorl.

The animal is yellowish all over. As in the other species of the genus, the foot is composed of two parts. A hind part elongated by a fore part, highly extensible, the proboscidiform appendage (fig. 7). The hind part is relatively small and almost round. The proboscidiform appendage is very important (fig. 7:1). The operculum is ovoid, yellowish, and measures 2.5 × 1.6 mm (fig. 7:3). It is not terminal but anchored on the posterior left side of the foot. It is not functional (fig. 7:4).

The optic tentacles are very long, almost cylindrical, tapering only beyond the eyes (black pigmented spots). The eyes are located on the external side of the optic tentacles at the upper third. The proboscis (fig. 7:2) was always observed contracted. Its end is curved with a slightly swollen terminal part. There is no radula.

The siphon, opened ventrally, is prominent with a broad base and a narrow apex (fig. 7:1). The mantle margins are muscular, well developed particularly on the right side. Only females were observed, all carrying ovoid egg capsules (± 8.2 × 5.3 × 3.5 mm) located on the right side of the mantle cavity. The majority of the egg capsules contain well developed freely floating larvae.

The larval shell (pl. IV). — The larval shell is round to lenticular (pl. IV, figs. A, B, C). The aperture is ovate, higher than broad. The basal part of the peristome is reversed, forming the outline of the future anterior canal (pl. IV, fig. A). The umbilicus is prominent. The operculum is always present and functional. Larval shells having a half whorl, a three quarters whorl or a full whorl measure respectively 170, 230, and 260 μm in diameter. The total thickness of the shell is 3.2 μm with 2.4 μm for the shell itself and 0.8 μm for the calcareous excrescences.

The surface of the shell is roughened with rounded calcareous excrescences or knots aligned in horizontal rows on the apical face (pl. IV, fig. B). On the basal face the excrescences are rounded or oblong and aligned in concentric rows around the umbilicus (pl. IV, fig. C). The nearer these excrescences get to the umbilicus, the flatter and smaller they become. The very young shells (half whorl) have an almost smooth basal part.

The knots show the same pattern as for *L. vangoethemi*. They are maximum 1.5 μm in height but generally flatter and about 5 μm in diameter (pl. IV, figs. D, E). Sometimes they are close together, sometimes separated by 2 to 7 μm. Between the knots of the apical face the shell is covered with a meshwork of calcareous tubules (pl. IV, figs. D, F). This meshwork is loose and the underlying shell is always visible. The tubules of the meshwork arise from the knots and look like roots of trees emerging from the ground (pl. IV, fig. E). The suture is devoid of any calcareous excrescences (pl. IV, fig. F). On the basal face the calcareous excrescences are scanty and the space between them is almost

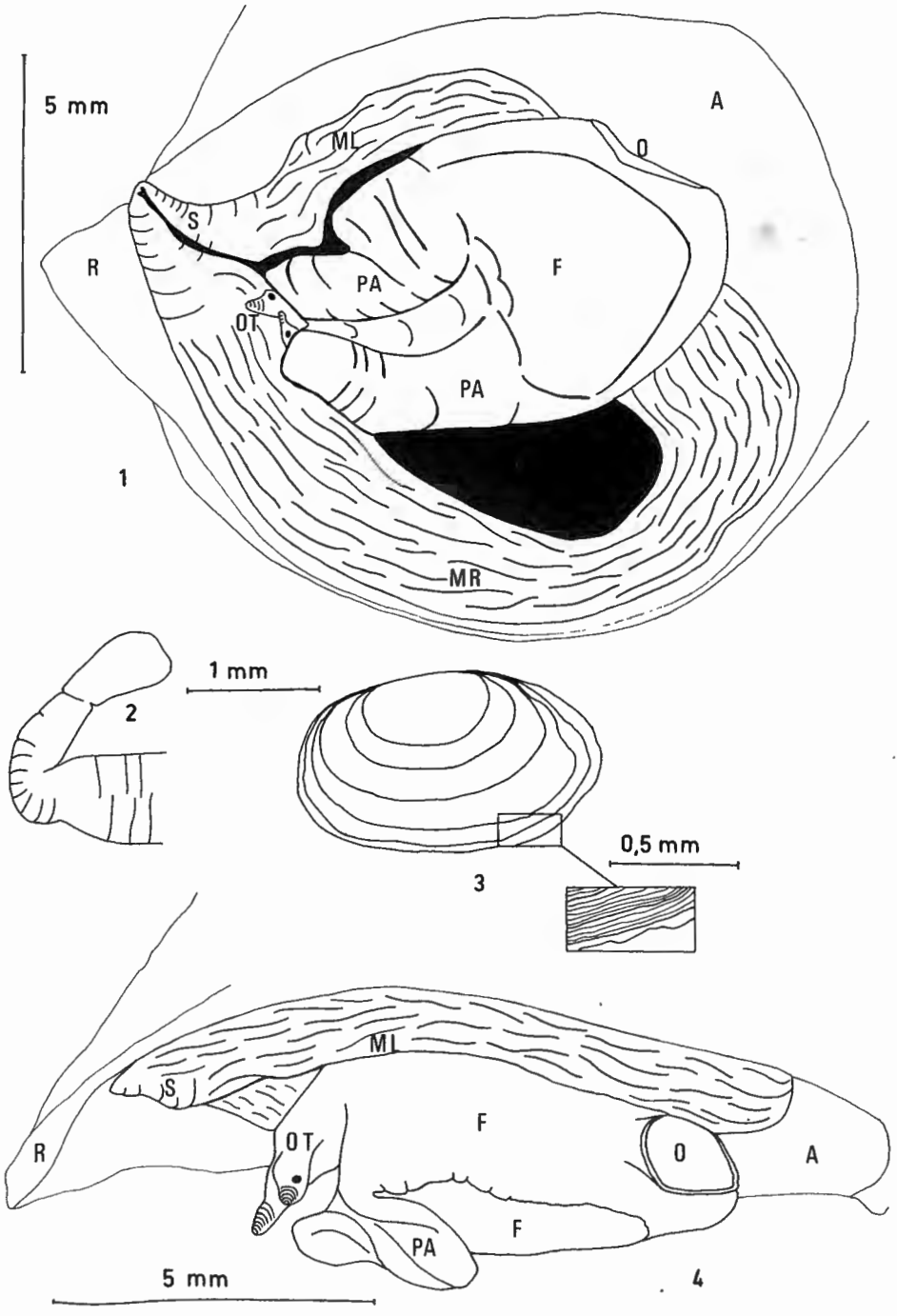

Fig. 7. — Animal of *Leptoconchus cyphastreae* sp. n.
1. : ventral view; 2 : end of the proboscis; 3 : operculum; 4 : left lateral view.

smooth (pl. IV, fig. G). The transition between the dorsal and the basal excrescences pattern is generally progressive (pl. IV, fig. G).

The burrow (pl. III, figs. B, C, D). — *Leptoconchus cyphastreae* sp.n. bores its burrow in the living part of *Cyphastrea chalcidium* (FORSKAL, 1775). I observed only two animals still in the coral. The burrow is spindle-shaped or rounded. In one case the burrow is slightly broader and longer than the shell (pl. III, fig. B). In the other case the burrow is as broad as the shell in the upper part but broader at the bottom. This burrow is longer than the shell and is divided internally by one ridge separating the actual space occupied by the animal, from an older one (pl. III, fig. D). The main axis of the burrow is sligtly bent. The shells always have the apex down and the rostrum up. The aperture of the burrow is 2.5 mm in diameter, extracorallite, and visible on the living coral (pl. III, fig. C). There is no chimney and the rostrum of the shell is at level with the coenosarc but does not protrude outside. The walls of the burrow are naked and the coral structures are visible.

Comparison with related species. — In many respects *Leptoconchus cyphastreae* ressembles *L. lamarckii* and *L. rostratus* A. ADAMS, 1864. The elongated specimens of *L. cyphastreae* are very similar with *L. lamarckii* but the aperture is broader, the shell more globose and the operculum non-functional. The rostrum is generally shorter than the one of *L. lamarckii*. The diagram (fig. 8) clearly shows that, regarding the shell proportions, *L. cyphastreae* has an intermediate shape between *L. lamarckii* and *L. rostratus*. Moreover the *L. cyphastreae* from Papua New Guinea possess a very thin and brittle shell whereas the thirty one shells examined from Tahiti, Maurice, and Seychelles Islands (collections of the I. R. S. N. B.) are very thick and solid.

For several reasons I think that the « *Magilopsis lamarckii* » observed by GOHAR & SOLIMAN (1963) are in fact *L. cyphastreae*. First, the shell proportions of the specimens of GOHAR & SOLIMAN fall into the limit of variation of *L. cyphastreae* and certainly not of *L. lamarckii* (see fig. 8). Secondly the host coral and to some extent the burrow shape are the same. Thirdly the presence of a non-functional operculum which size is very similar to the one of the specimens from Papua New Guinea.

Diagnoisis. — Shell medium size, spindle-shaped, thin with a more or less pronounced rostrum and broad aperture in its central part. Peristome like a question mark. Shell white, translucent, apically smooth, covered with squamose lamellae on the last whorl. Generally spiral costulation is present to conspicuous at the base of the last whorl.

Larval shell covered with knots (calcareous excrescences 5 μm in diameter) separated from each other by 2 tot 7 μm. At the apex of the shell, between the knots, calcareous meshwork very loose, underlying shell always visible.

No apparent movement of the shell in the living coral. Older burrows separated from new ones by more or less well defined ridges. Animal with

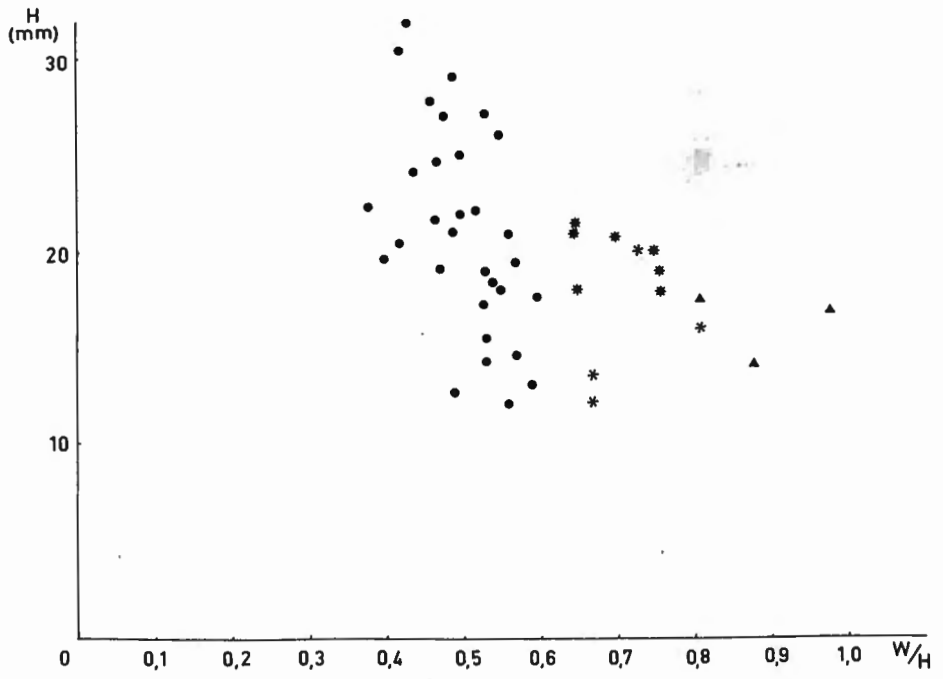

Fig. 8. — Scatter diagram showing the variation in the shell proportions between *Leptoconchus lamarckii* DESHAYES, 1863 (●), *L. cyphastreae* sp. n. (* : specimens from Papua New Guinea; * : specimens from the Red Sea), and *L. rostratus* A. ADAMS, 1864 (▲). H : height of the shell; W : width of the shell.

conical yellowish siphon, very large at its base. Operculum present, non-functional.

Leptoconchus striatus RÜPPELL, 1835

The specimens of *Leptoconchus striatus* RÜPPELL, 1835 from Papua New Guinea studied previously (see BOUILLON et al., in press; MASSIN, 1982) carry also egg capsules. The latter always contain eggs and in one case very young larvae. For comparison, I shall also describe the larval shell of this species living in *Fungia* spp.

The larval shell (pl. V). — The general aspect of the shell is closely similar to the two others previously described. The young larval shell (half whorl) is 190 μm in diameter. The umbilicus is present but not yet achieved. The operculum is present and as large as the one of *L. cyphastreae* and *L. lamarckii*.

The general feature of the calcareous excrescences is similar to *L. cyphastreae* (pl. V, fig. A, B). However, the knots are smaller (2,4 to 3,3 μm in diameter), closer together (space between them ranging from 1 to 4 μm),

and the meshwork intermediate between *L. vangoethemi* and *L. cyphastreae* (pl. V, figs. A, C). The calcareous tubules are not closely adhering to the shell. Although they are numerous, the underlying shell is always visible (pl. V, figs. C. D).

On the apical face, the knots are not aligned in rows (pl. V, fig. A). The basal face is nearly smooth (pl. V, fig. B).

DISCUSSION

Till now different species of *Leptoconchus* from Hansa Bay were never found together with the same host coral. However, one single species was observed in different species of host corals belonging to the same genus. Consequently, the relationship between *Leptoconchus* spp. and living corals from Hansa Bay seems to be highly specific. This is in agreement with the opinion of KLEEMAN (1980) who asserted that a certain host will generally be occupied by one species only, if the host is living.

On the contrary, a single species of *Lithophaga* (Bivalvia) from Lizard Island (Great Barrier Reef) was observed in eleven different coral species belonging to three different suborders (KLEEMAN, 1980).

The local specificity of *Leptoconchus* spp. is in contrast but not contradictory to the non specificity observed in the literature on the scale of the Indo-Pacific (see introduction). The specificity in a given area depends, amongst others, on the other coral boring species and on the available host corals. There is no strict relation of dependency between a well defined host coral and a particular species of *Leptoconchus*. However, a same coral may house the same species of *Leptoconchus* even in two very distant places.

Cyphastrea chalcidium and *Echinopora lamellosa* are closely related species belonging to the same sub-family (Montastreinae) and possessing a very similar calcareous skeleton. *Leptoconchus cyphastreae* and *L. vangoethemi* dig in the living part of these corals, always in the same position, i.e. apex downwards. However, both species present very different burrow shapes. These observations confirm my opinion (MASSIN, 1982, p. 24) that the boring behaviour and the burrow shape are specifically determined in *Leptoconchus* ssp.

Since *L. vangoethemi* lives at level with the coral surface, it is reasonable to think that its vertical migration counterbalances the growth of the coral. However, the movement parallel to the host coral surface remains unexplained.

L. vangoethemi and *L. cyphastreae* are represented in our samples only by females. This sex ratio is not surprising for the genus *Leptoconchus* (BOUILLON *et al.*, in press). There is, as yet, no explanation for this large if not absolute majority of females.

All the observed larval shells of *Leptoconchus* spp. are roughened by the same type of calcareous excrescences but with enough diversity to dis-

tinguish them specifically. These excrescences, knots aligned in spiral rows, are similar to the general sculpture found on the larval shell of many species belonging to the superfamily Muricacea (BANDEL, 1975, p. 62).

The similarity of the larval shell of the *Leptoconchus* spp. studied with the one of *Coralliophila* spp. from the Caribbean Sea (BANDEL, 1975, pl. 13) is amazing. It is very difficult to distinguish the sculpture of the larval shell of *Coralliophila aberrans* (C. B. ADAMS, 1850) from the one of *Leptoconchus cyphastreae* sp.n. The sculpture of the larval shell of *Coralliophila caribaea* ABBOTT, 1958, and *Leptoconchus vangoethemi* sp.n. presents also many affinities. It strongly suggests that these species, from very different localities and with very different adult shells, belong to the same gene pool and that both genera (*Coralliophila* H. & A. ADAMS, 1853 and *Leptoconchus* RÜPPELL, 1835) are closely related.

As larval shell shape and sculpture are independent from the host coral, their diversity provides valuable criteria to complete the diagnosis of *Leptoconchus* spp. These observations must now be extended to animals from the whole Indo-Pacific region to see if larval shells are constant for a given species whatever the geographical origin. Indeed the morpho-characters of the larval shell are greatly affected by the ecological conditions of the collecting place (THORSON, 1950).

These larval shells could also help to establish the phylogenetic relations between the genera belonging to the family Coralliophilidae.

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EXPLANATION OF PLATES

PLATE I

Fig. A. — Shell shape variation among *Leptoconchus vangoethemi* sp. n. 1, 2 : females; 3, 4, 5 : empty shells.

Fig. B. — Fused burrows of *L. vangoethemi* in *Echinopora lamellosa*. On the lower side, the largest burrow is separated from the exterior only by its own calcareous secretions.

Fig. C. — Burrows of *L. vangoethemi* in *E. lamellosa*. Note the right burrow with the calcareous secretions parallel to the surface of the coral.

Fig. D. — Burrow of *L. vangoethemi* in *E. lamellosa*. The calcareous secretions are spaced and clearly indicate the movement of the shell in the coral.

For figs. B, C, D the living part of the coral is upwards.

PLATE II

Scanning photographs of the larval shell of *Leptoconchus vangoethemi* sp. n.

Fig. A. — Dorsal view of the larval shell. See fig. B for scale.

Fig. B. — Frontal view of the larval shell.

Fig. C. — Ventral view of the larval shell. See fig. B for scale.

Fig. D. — Close-up of the dorsal face of the larval shell.

Fig. E. — Close-up of the knots and the calcareous meshwork of the dorsal face.

Fig. F — Close-up of the ventral face near the umbilicus.

PLATE III

Fig. A. — Comparison between *Leptoconchus cyphastreae* sp. n. and *L. lamarckii* DESHAYES, 186. 1 : *L. cyphastreae* from Papua New Guinea; 2 : *L. lamarckii* from Tahiti; 3, 4, 5 : *L. lamarckii* from the Mauritius.

Fig. B. — *Leptoconchus cyphastreae* in *Cyphastrea chalcidium*. Burrow without ridge.

Fig. C. — *Cyphastrea chalcidium*. The arrow indicates the aperture of the burrow of a *L. cyphastreae*.

Fig. D. — *L. cyphastreae* in C. *chalcidium*. The ridge separating the actual burrow from the older one is clearly visible.

For figs. B and D the living part of the coral is upwards.

PLATE IV

Scanning photographs of the larval shell of *Leptoconchus cyphastreae* sp. n.

Fig. A. — Frontal view of the larval shell. See fig. B for scale.

Fig. B. — Dorsal view of the larval shell.

Fig. C. — Ventral view of the larval shell. See fig. B for scale.

Fig. D. — Close-up of the dorsal face of the larval shell.

Fig. E. — Close-up of the knots and the calcareous meshwork of the dorsal face.

Fig. F. — Close-up of the suture. Note the fused knots.

Fig. G. — Close-up of the ventral face of the larval shell. Note the progressive variation of the knots from the right (near the umbilicus) to the left (lateral part of the shell).

PLATE V

Scanning photographs of *Leptoconchus striatus* RÜPPELL, 1835.

Fig. A. — Dorsal view of the larval shell.

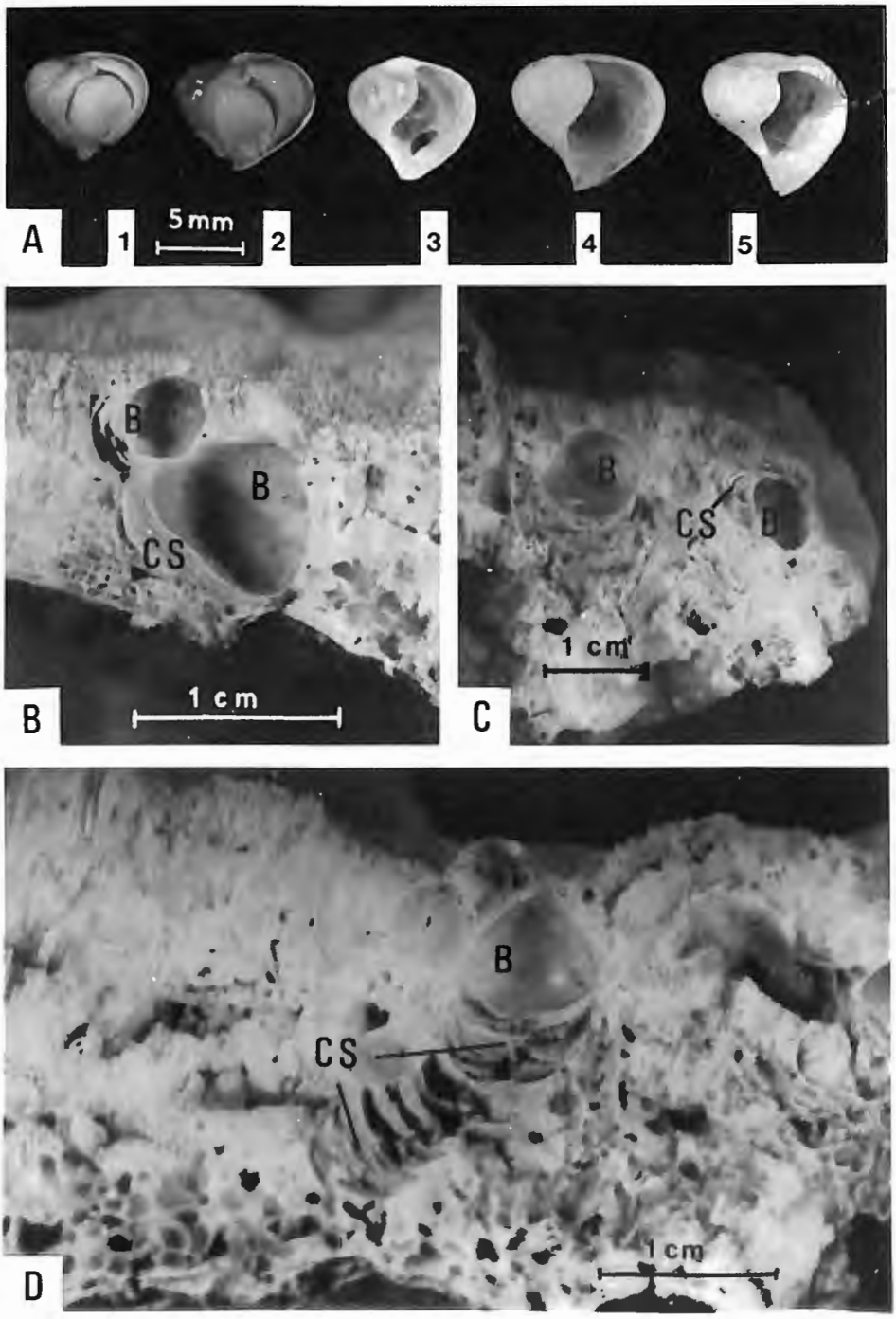
Fig. B. — Ventral view of the larval shell. See fig. A for scale.

Fig. C. — Close-up of the dorsal face of the larval shell.

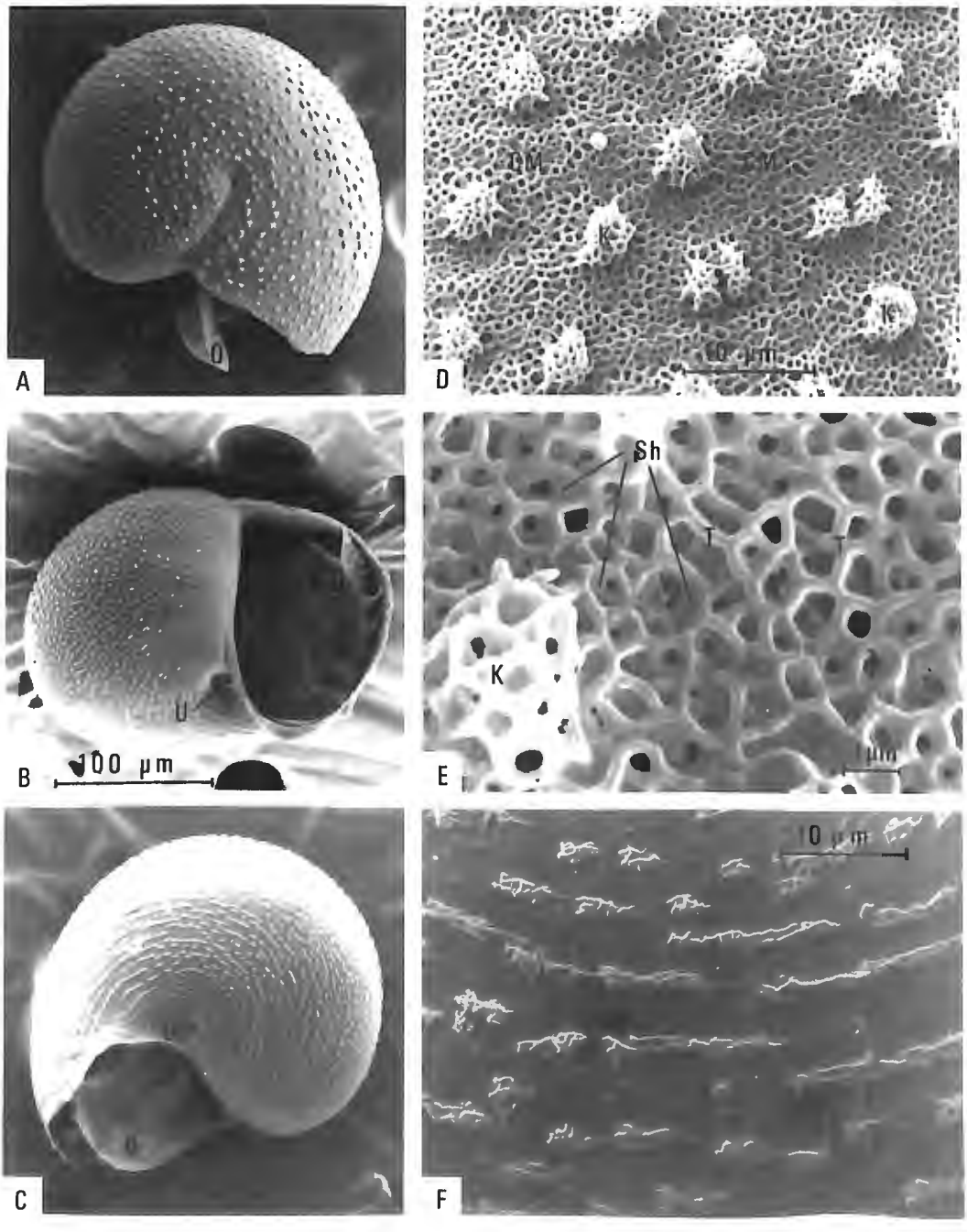
Fig. D. — Close-up of the knots and the calcareous meshwork of the dorsal face.

ABBREVIATIONS OF THE TEXTFIGURES AND THE PLATES

A : aperture of the shell.
AB : aperture of the burrow.
B : burrow.
C : remain of the columella.
CM : calcareous meshwork.
CS : calcareous secretions.
DG : digestive gland.
F : foot.
G : gonad.
K : knot.
M : mouth.
ML : left side of the mantle margin.
MR : right side of the mantle margin.
N : nephridium.
O : operculum.
OT : optic tentacle.
PA : proboscidiform appendage.
R : rostrum of the shell.
Rd : ridge.
S : siphon.
Sh : sheath.
St : suture.
T : tubules of the calcareous meshwork.
U : umbilicus.



C. MASSIN. — Note on the genus *Leptoconchus* RÜPPELL, 1835 (Mollusca, Gastropoda, Coralliophilidae) with the description of two new species, *Leptoconchus vangoethemi* sp.n. and *Leptoconchus cyphastreae* sp. n., from Papua New Guinea



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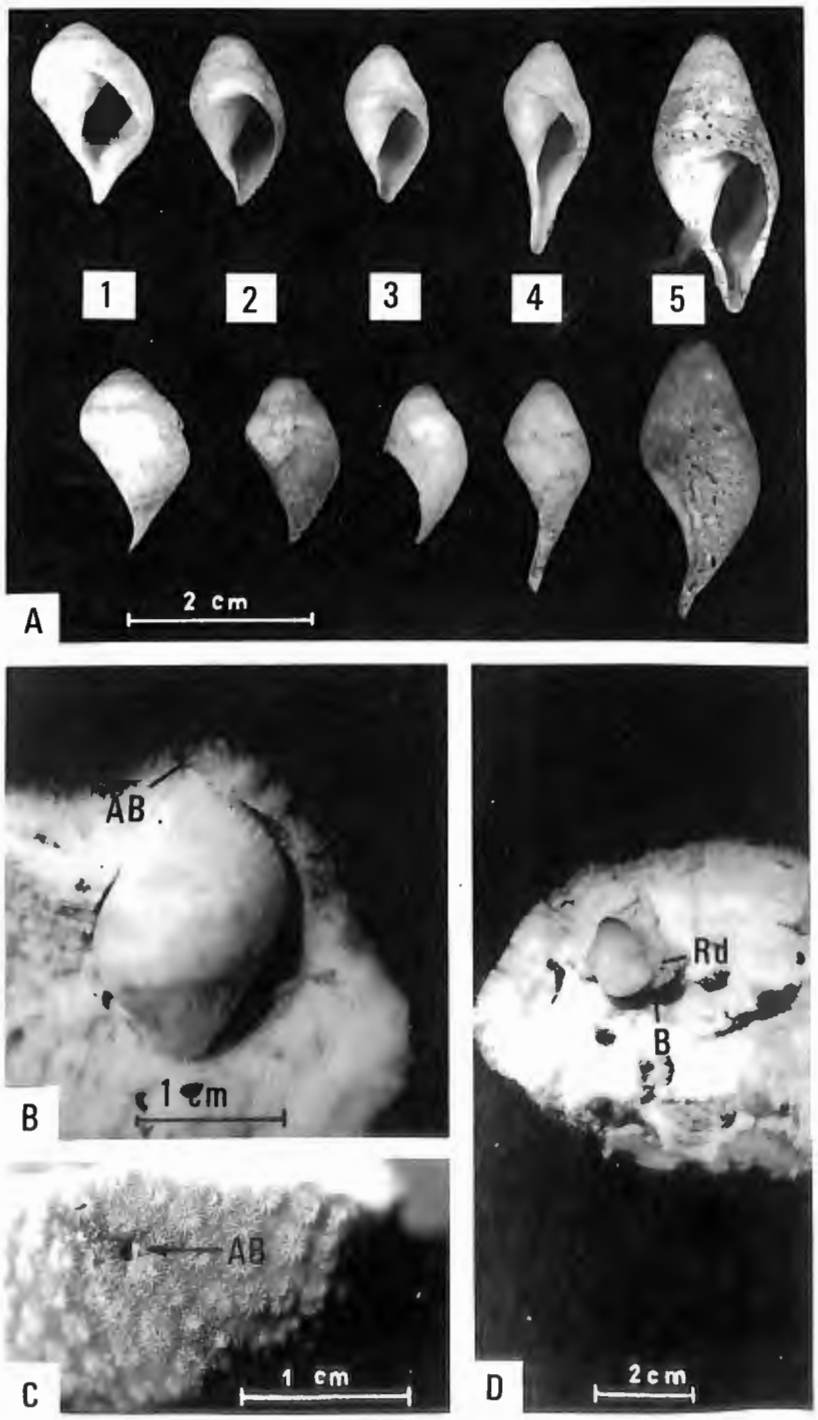

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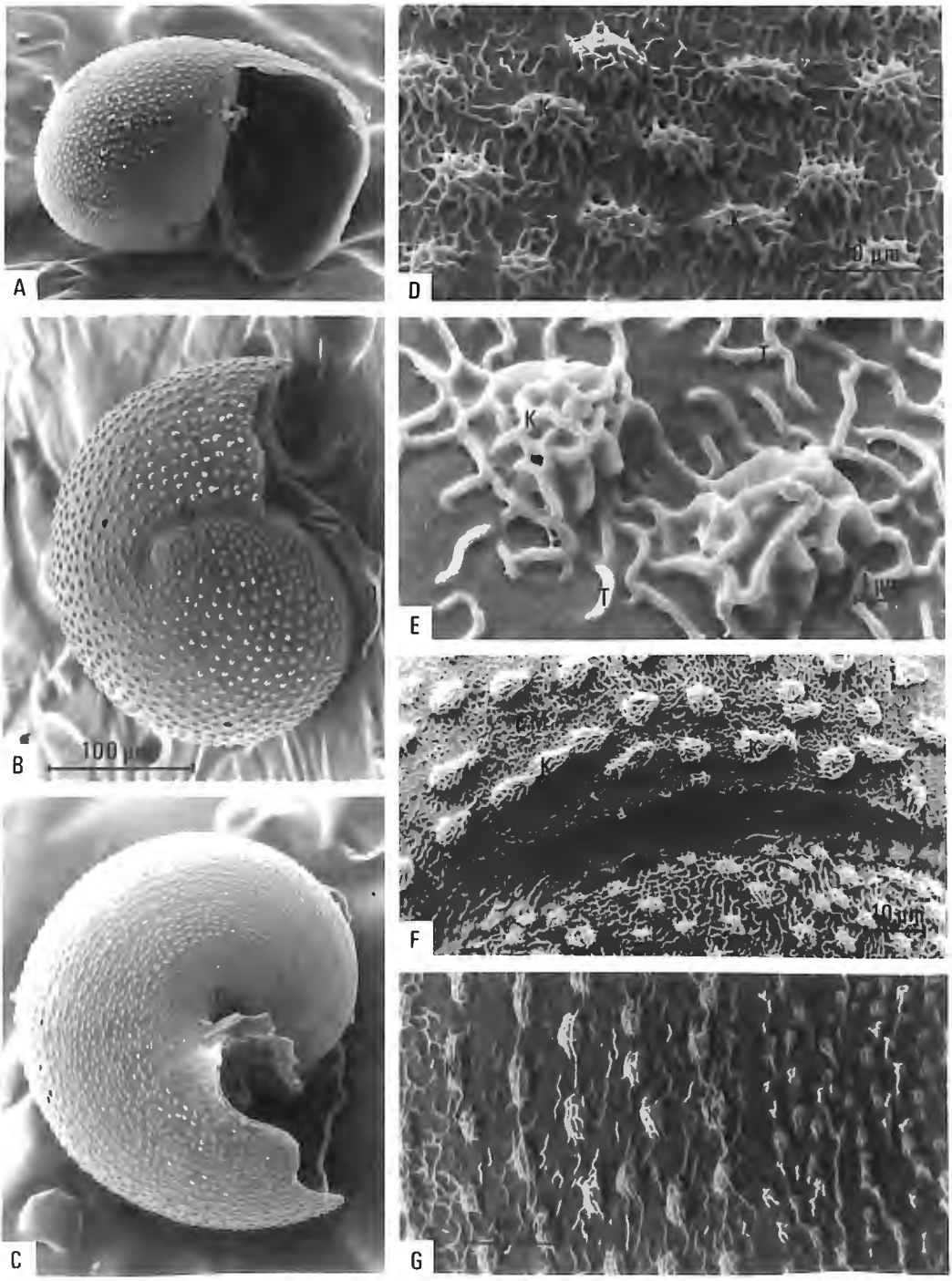

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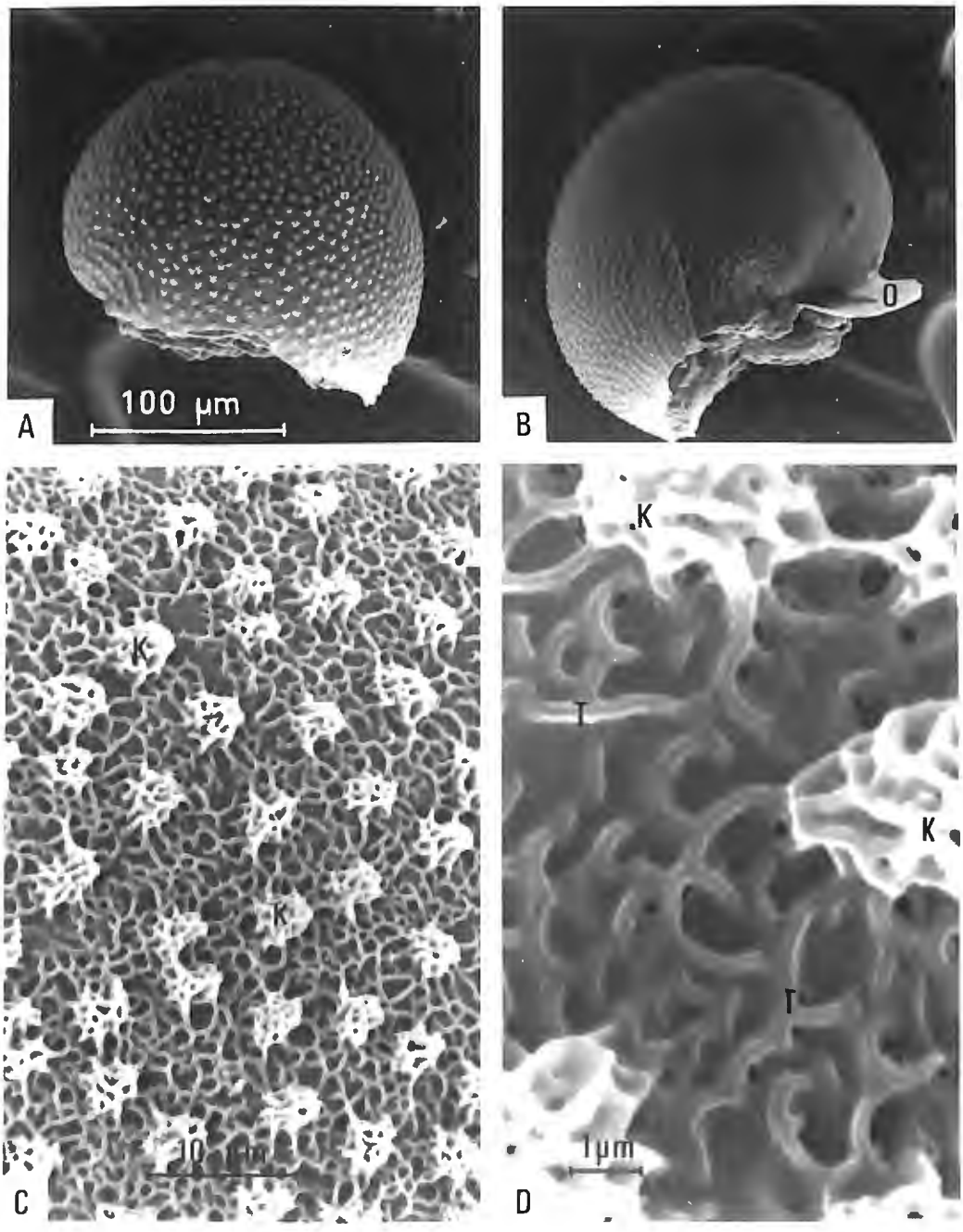

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