

Gundlachia dutrae: n. sp. from Northwest Brazil (Mollusca: Basommatophora: Ancyliidae)

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A new species of Gundlachia, Gundlachia dutrae, is described from northwest Brazil.

It is distinguishable from other congeneric species by characteristics of the shell, radula and internal organs.

Shell relatively high. Aperture near-circular; periostracum dark brown without periostracal hairs. Apex slightly inclined to the right, projected but not hooked, with an apical depression surrounded by a sculpture of well-marked irregular punctations. Shell surface with prominent radial sculpture. No septate specimens were observed. Ratios (n = 59): shell width/shell length = 0,66- 0,79 (mean 0,73); shell height/shell length = 0,32- 0,45 (mean 0,37); shell height/shell width = 0,43- 0,63 (mean 0,51).

Body of normal ancyliid type; mantle pigmentation dark brown or black, concentrated along the mantle collar.

The dorsal surface of the right anterior muscle is elongated and medially constricted. The left anterior and the posterior muscles are almost elliptical. Adhesive area is V-shaped.

Pseudobranch unpigmented bearing a very small and thin dorsal lobe.

Ovotestis with more than 25 unbranched diverticula. Ovispermiduct with seminal vesicle rather developed. Elongated nidamental gland continuous with the glandular wall of the uterus. Nidamental gland appendix ending into a bulbous swelling. Spermathecal body almost rounded. Well-developed prostate with five long diverticula. Ejaculatory complex with long glandular flagellum, without a penis or true ultra-penis. "Penis sheath" developed. "Ultra-penis" projected as a tube inside the lumen of prepuce, with a slit between "ultra-penis" and "penis sheath".

Rachidian tooth tetracuspoid, with two median cusps assymmetrical and aculeated. Lateral teeth tricuspoid, with a reduced endocon and a prominent mesocon. A well marked gap occurs between meso and ectocon. Marginal teeth similar to lateral ones.

Jaw T-shaped, with about 28 dorsal plates.

Key words: Mollusca - Ancyliidae - *Gundlachia dutrae* - morphology

The ancyliids are widespread freshwater snails. They are represented in Brazil by *Gundlachia* Pfeiffer, 1849, *Ferrissia* Walker, 1903, *Burnupia* Walker, 1912 and *Laevapex* Walker, 1903.

Besides its abundance and wide distribution in South America, anatomical knowledge of ancyliids is still scarce. Most species have been described on shell morphology. Anatomical descriptions were presented by Scott (1953), Marcus and Marcus (1962), Hubendick (1964), Fernandez (1981), Lanzer (1988, 1991), and Santos (1989).

MATERIAL AND METHODS

Six samples were studied being five from the State of Pernambuco and one from the State of Bahia.

Twenty-nine living specimens from type-locality were relaxed in a 0.1% solution of nembutal for 6 hr, drawn from the shell and placed in Railliet-Henry's fixative. Five of them were dissected under the stereomicroscope.

Jaws and radulae of studied specimens were removed by means of 5% solution of KOH kept over a termic plate for 6 to 12 hr. They were mounted unstained in glicerine and some were stained with acetic carmin and mounted with Entellan.

The prepuce was pared away from the ejaculatory complex, mounted in glycerine and examined under microscope. Ejaculatory complex is used instead of penial complex because *Gundlachia* has no penis.

Specimens were collected at type-locality on superior surface of submersed rocks, in a small rapid stream.

Specimens were deposited in the following malacological collections: Instituto Oswaldo

Cruz, Rio de Janeiro; Museu Nacional do Rio de Janeiro, Rio de Janeiro; Academy of Natural Sciences, Philadelphia; Geneve Natural Museum.

DESCRIPTION

Gundlachia dutrae n. sp.

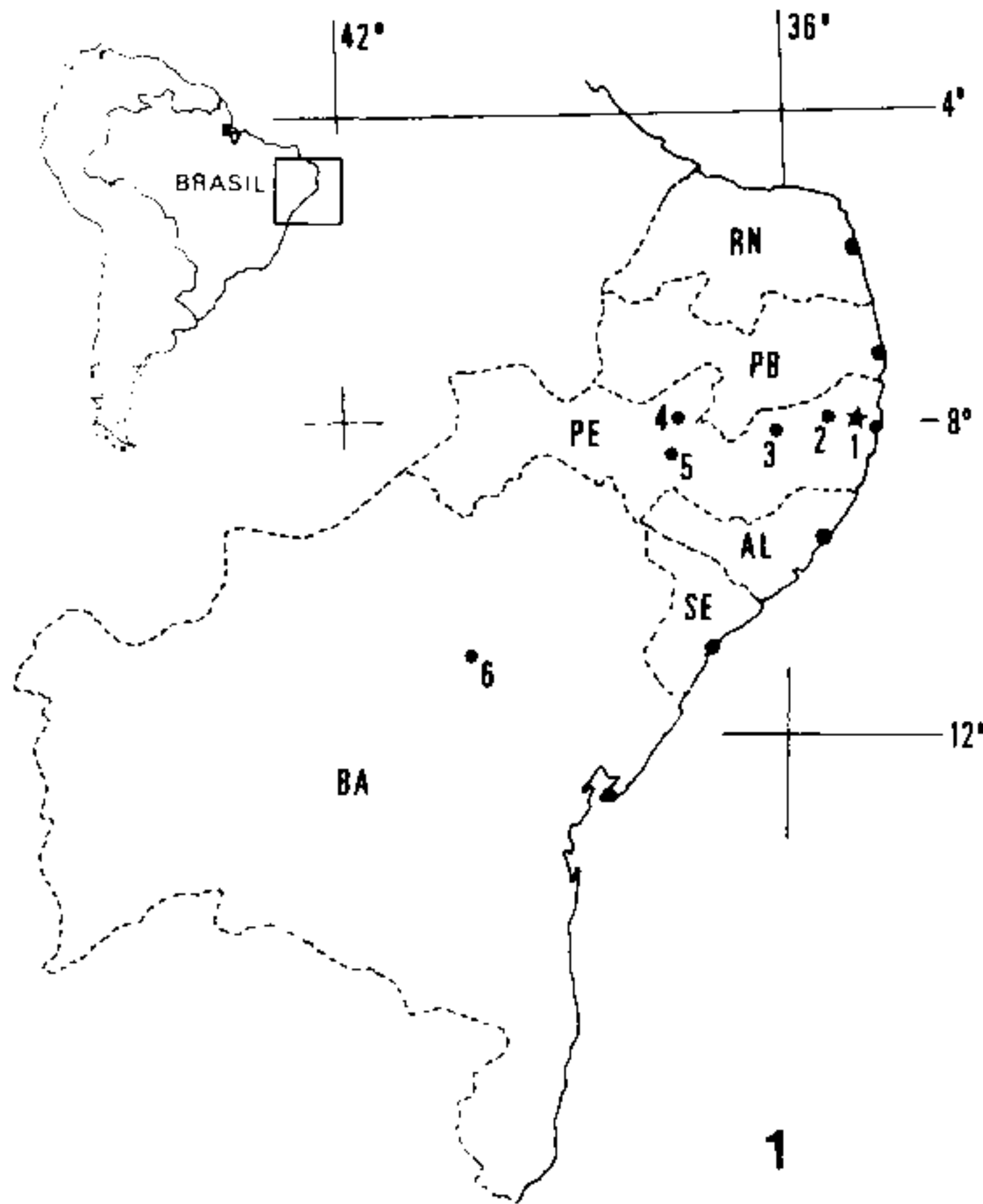
Types: Holotype: 27 C. Mol. IB-UERJ- Alto da Buchada Forest, Ecological Reserve of Tapacurá, São Lourenço da Mata City, State of Pernambuco. S. B. Santos, N. C. Salgado & A. V. C. Dutra col. 06/90.

Paratypes: 27-A C. Mol. IB-UERJ- with the same data of holotype (25 shells and animals); DZUFPE 18- Poço da Cruz, Ibirimir, Pernambuco. A. V. Dutra col. 12/03/82 (30 shells and animals, in alcohol); DZUFPE 116- Sanharó, Pernambuco. A. V. Dutra col. 26/05/81 (4 shells and 10 animals); DZUFPE 394- Riacho Pascoal, Custódia, Pernambuco. A. V. Dutra col. 16/01/86 (1 shell and animal); FIOCRUZ 3274 - São José do Jacuípe, Jacobina, Bahia. SUCAM col. 11/07/84 (1 shell and animal).

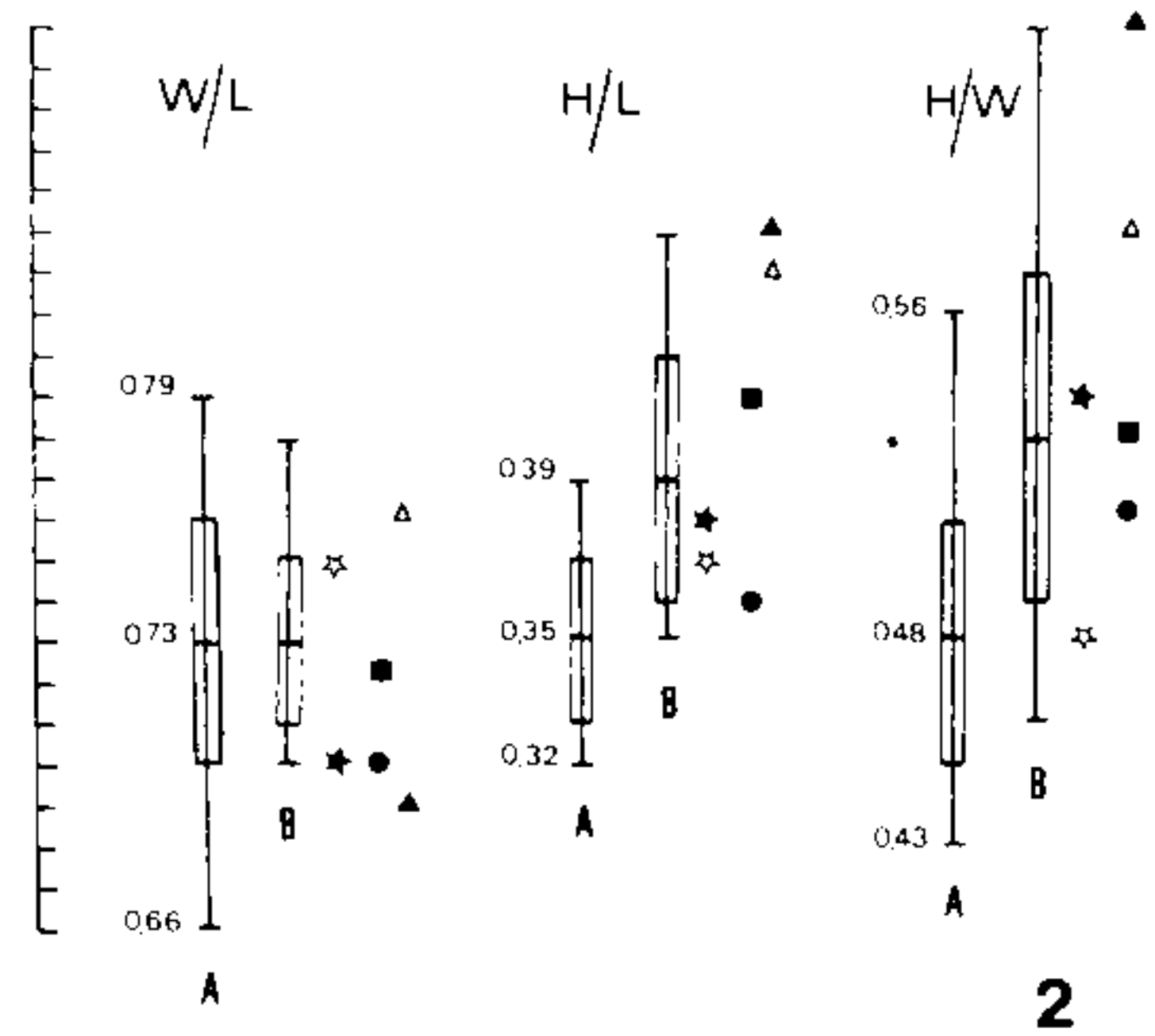
Type-locality: Alto da Buchada Forest, Ecological Reserve of Tapacurá, São Lourenço da Mata City, State of Pernambuco.

Other examined material: SMF 44352- Salgadinho, Recife, Pernambuco (two shells lent to Dr Rosane Lanzer by Senckenberg Museum).

The species name was dedicated to Dr Ana Virgínea C Dutra, from Federal University of the



Gundlachia dutrae n. sp. Fig. 1: map of northwest Brazil showing the localities. 1 - São Lourenço da Mata, PE; 2 - Salgadinho, PE; 3 - Sanharó, PE; 4 - Custódia, PE; 5 - Ibirimir, PE; 6 - São José do Jacuípe, BA. The star marks the type-locality.



Gundlachia dutrae n. sp. Fig. 2: shell indices: W/L - width/length; H/L - height/length; H/W - height/width. A - São Lourenço da Mata (n=29); B - Ibirimir (n=30); ☆★ - Sanharó (n=2); ● - Custódia (n=1); ■ - São José do Jacuípe (n=1); ▲△ Salgadinho (n=2).

State of Pernambuco, who provided all the facilities for field work.

The map on Fig. 1 shows the localities.

The shell indices of the specimens are shown in Fig. 2.

The shell aperture is near-circular, but a variation in the general shape of shell occurs. The periostracum is dark brown in color, showing various individual shades of color due to environmental impregnation. The apex is localized well-posterior in the shell, at the right of median line. It is projected but not hooked, pointing posteriorly and slightly to the right. There are a well marked apical depression surrounded by a sculpture of conspicuous irregular punctations (Fig. 3c).

A fine concentric growth sculpture and a well developed radial sculpture running from apex to margin occurs on all surface of shell (Figs 3a, b).

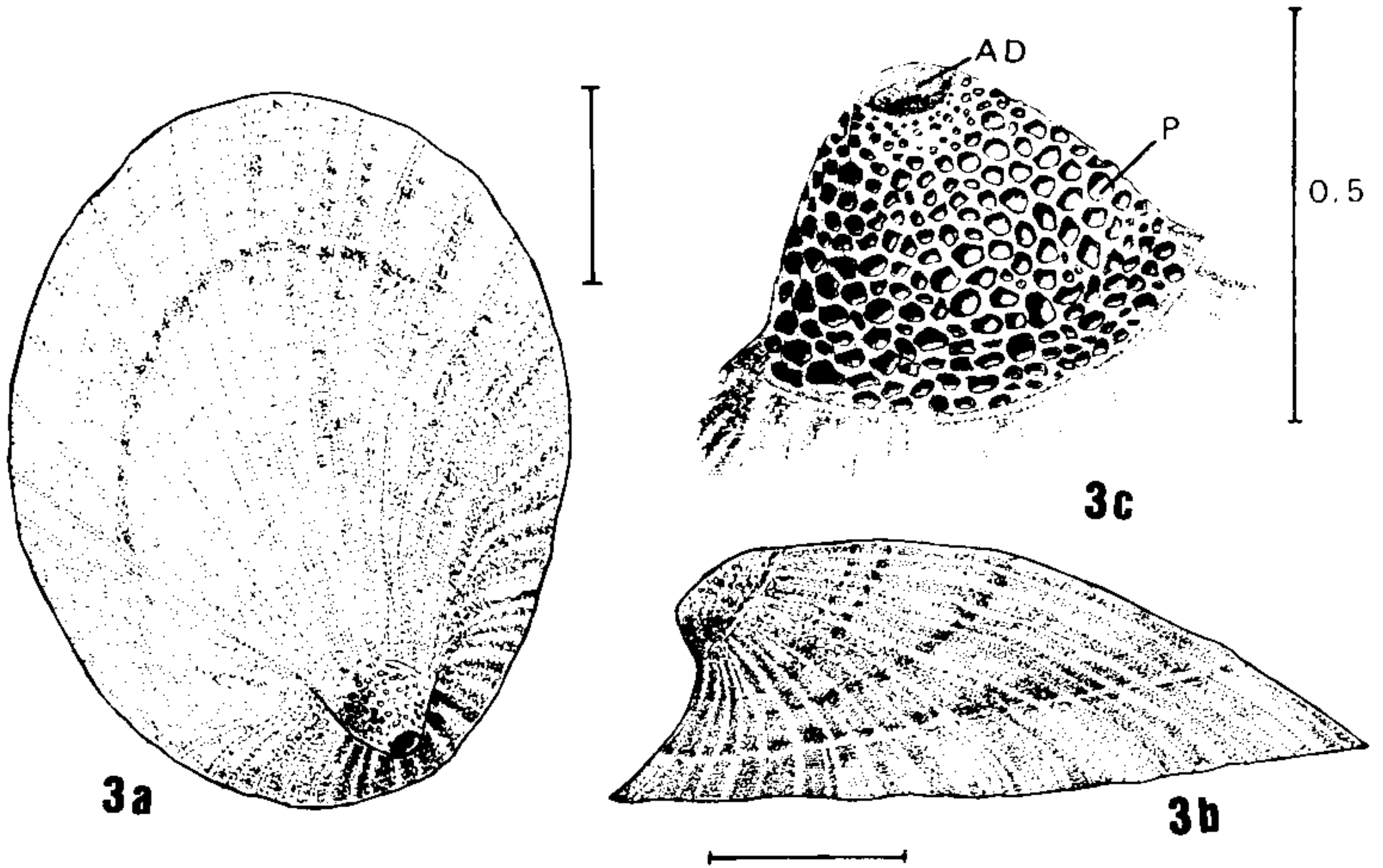
The highest shell, from Ibirimir, is 5.35mm in length x 3.75 mm in width x 2.00 mm in height. The shells from type-locality measure 3.10 x 2.15 x 1.10 mm to 4.75 x 3.40 x 1.70 mm.

Three muscle scars were observed, being the right anterior one the largest. It is an elongated scar, along the mantle margin, with a constriction in the middle. The left anterior muscle is elliptical, as the posterior one (Fig. 4a).

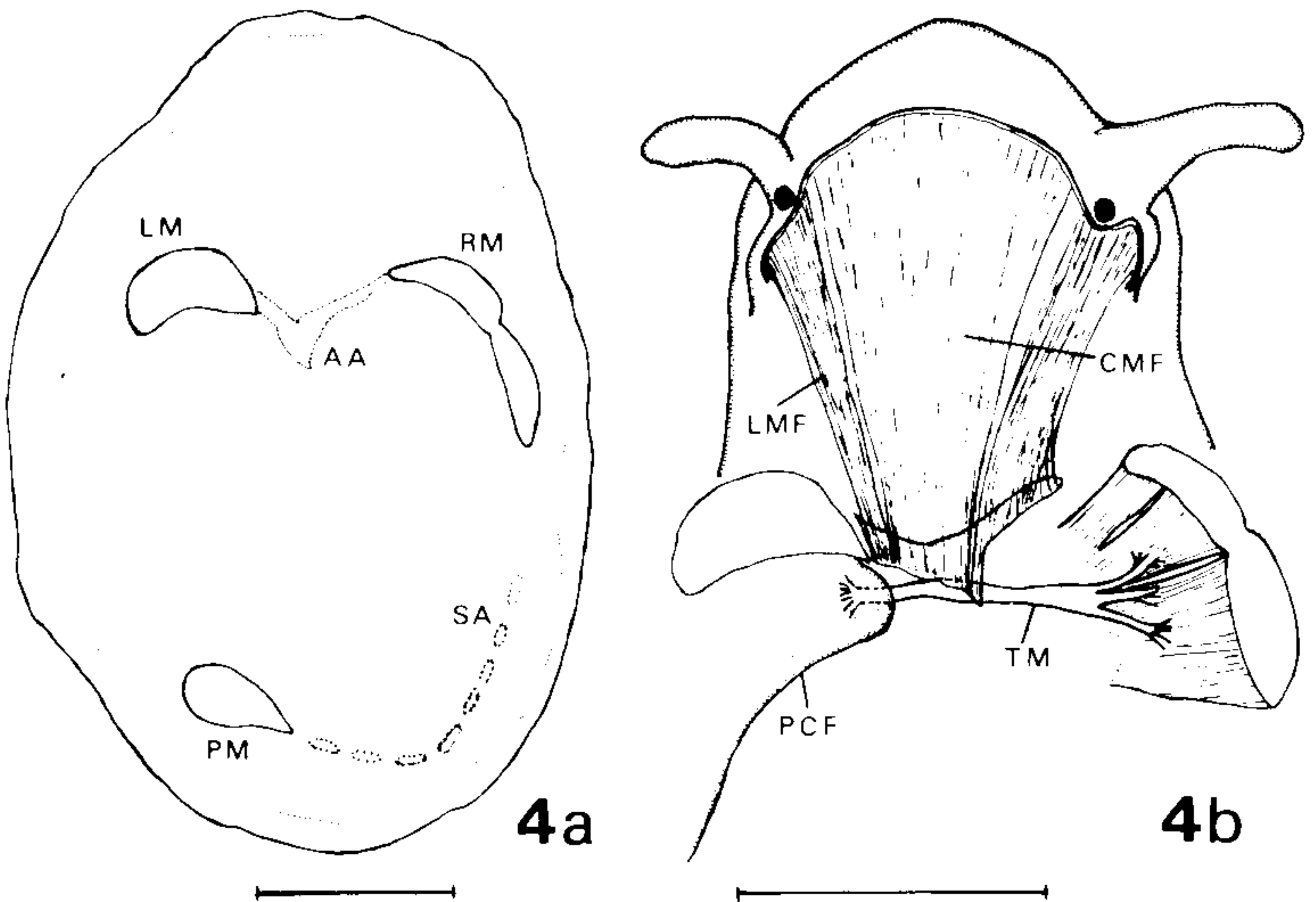
Between the two anterior muscle scars there is a V-shaped adhesive area.

Other small adhesive areas are seen between posterior muscle scar and the right anterior one. Delicate and isolated muscular fibers that come from the lateral body wall, run upward juxtaposed to the dorsal epithelia and reach these adhesive areas.

Removing carefully the head epithelia one can see, on right and left, two more evident deli-



Gundlachia dutrae n. sp. - Shell. Fig. 3a: dorsal view. Fig. 3b: lateral view. Fig. 3c: apical area enlarged. AD - apical depression; P - punctation. (Bar= 1 mm, unless otherwise stated).



Gundlachia dutrae n. sp. - Aspect of muscle scars. Fig. 4a: dorsal view of mantle. Fig. 4b: dorsal view without dorsal epithelia of head, mantle, palial cavity roof and part of digestive gland. AA - adhesive area; CMF - central muscular fascicle; LM - left anterior muscle scar; LMF - lateral muscular fascicle; PCF - palial cavity floor; PM - posterior muscle scar; RM - right anterior muscle scar; SM - small adhesive area; TM - transversal muscle (Bar= 1 mm).

cate muscular fascicles formed by isolated fibers that originate on the body wall near the base of tentacles. Between these muscles there are several muscular fibers that come from the frontal region. These muscular fibers are attached on V-shaped adhesive area (Fig. 4b).

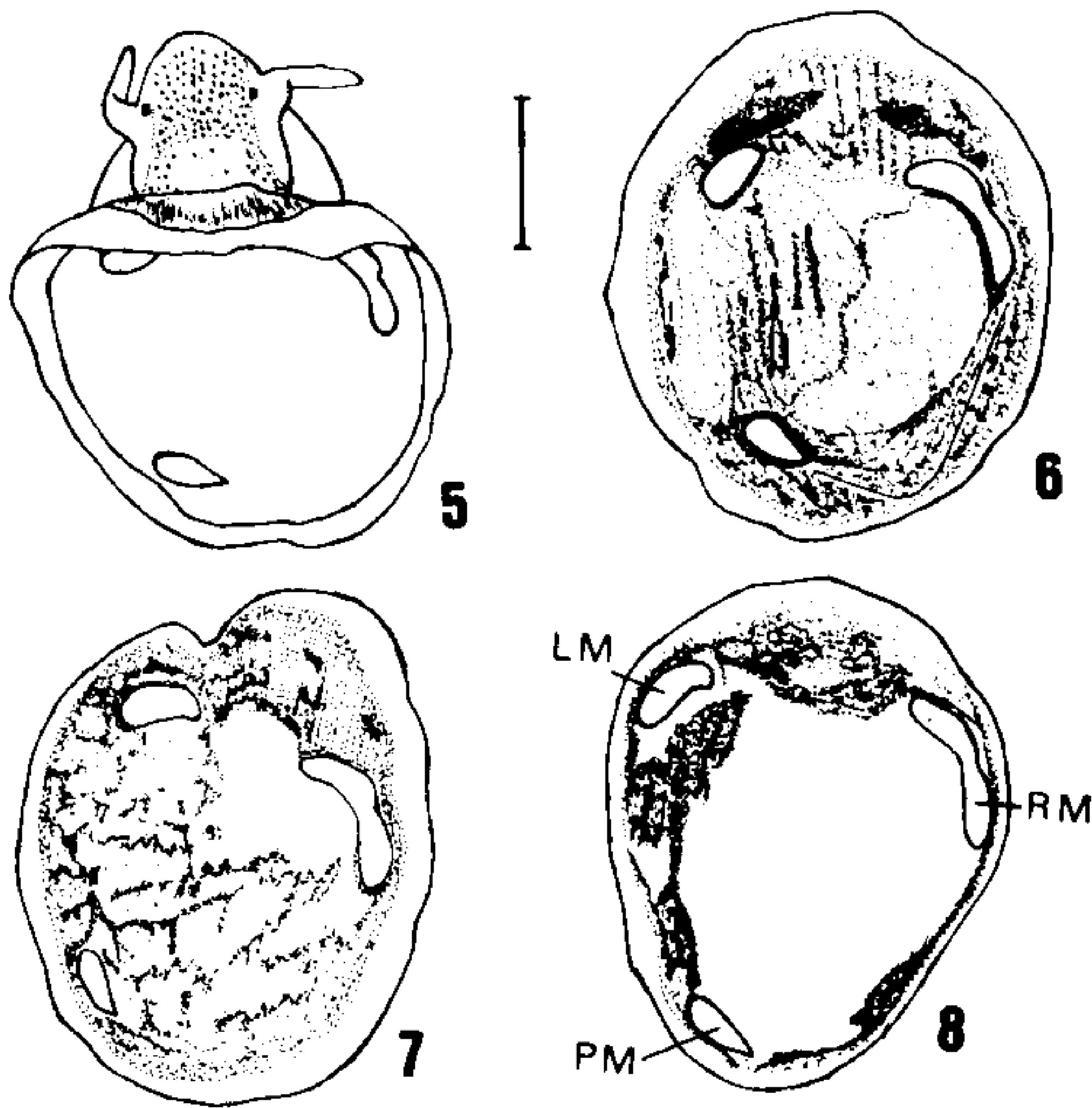
Removing the dorsal mantle epithelia, the roof of palial cavity and tearing away bit by bit the digestive gland, there is a transversal muscle running from ventral epithelia of palial cavity floor to internal wall of right anterior muscle. Just before reaching this muscle, the transversal muscle divides into three branches; the anterior one attaches the anterior fascicle of right muscle, the others the posterior fascicle (Fig. 4b).

The pigmentation of mantle varies in individuals (Figs 6, 7, 8), but is generally dark brown or blackly pigmented, being more concentrated along the mantle collar and becomes lighter in the central area of mantle. Foot and tentacles are not pigmented. On the head there are scattered small blotches of pigment (Fig. 5).

The genital system is shown in Figs 9 and 10. The ovotestis is wide, having about 35 unbranched closely pressed diverticula. It was embedded in the digestive gland, being its apex situated underneath the caudalmost intestinal loop.

The seminal vesicle is an enlargement of ovispermiduct with several digitiform-like, sometimes rounded diverticula.

The carrefour is a small structure situated between the albumen gland and the nidamental gland, represented by a short trunk that also gives rise to the oviduct, the spermiduct and receives the ovispermiduct (Fig. 9c). The spermiduct emerges from its left side, twists upward and soon downward, and runs forward giving rise to five unbranched prostatic diverticula. After, the spermiduct continues into the vas deferens, which runs forward within the lateral body wall to emerges just posterior to the attachment of the prepuce. The ejaculatory complex has a long



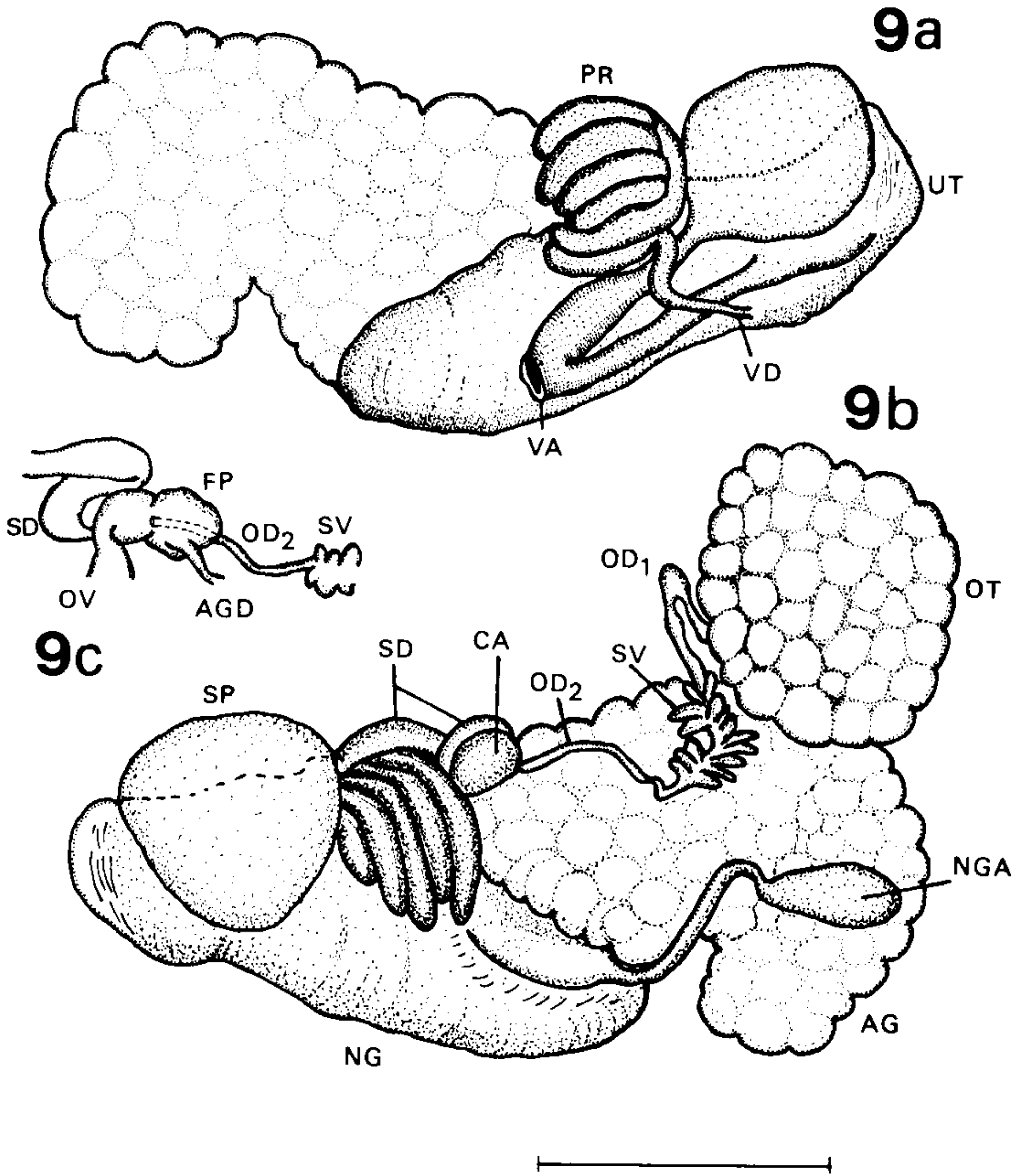
Gundlachia dutrae n. sp. - Fig. 5: head pigmentation. Figs 6, 7, 8: variation on mantle pigmentation. LM - left anterior muscle scar; PM - posterior muscle scar; RM - right anterior muscle scar (Bar= 1mm).

The pseudobranch is rather developed; the ventral lobe has only two or three folds. The dorsal lobe is very small and thin.

The pulmonary cavity is wide, reaching the midline of the animal. The excretory system has the typical serpentine shape of ancyliids.

glandular flagellum and a slitted "ultrapenis" is present.

The albumen gland is a large, almost cylindrical organ, with the posterior end twisted above and turned to the left. Its duct empties into an ovoid fertilization pouch. The oviduct emerges



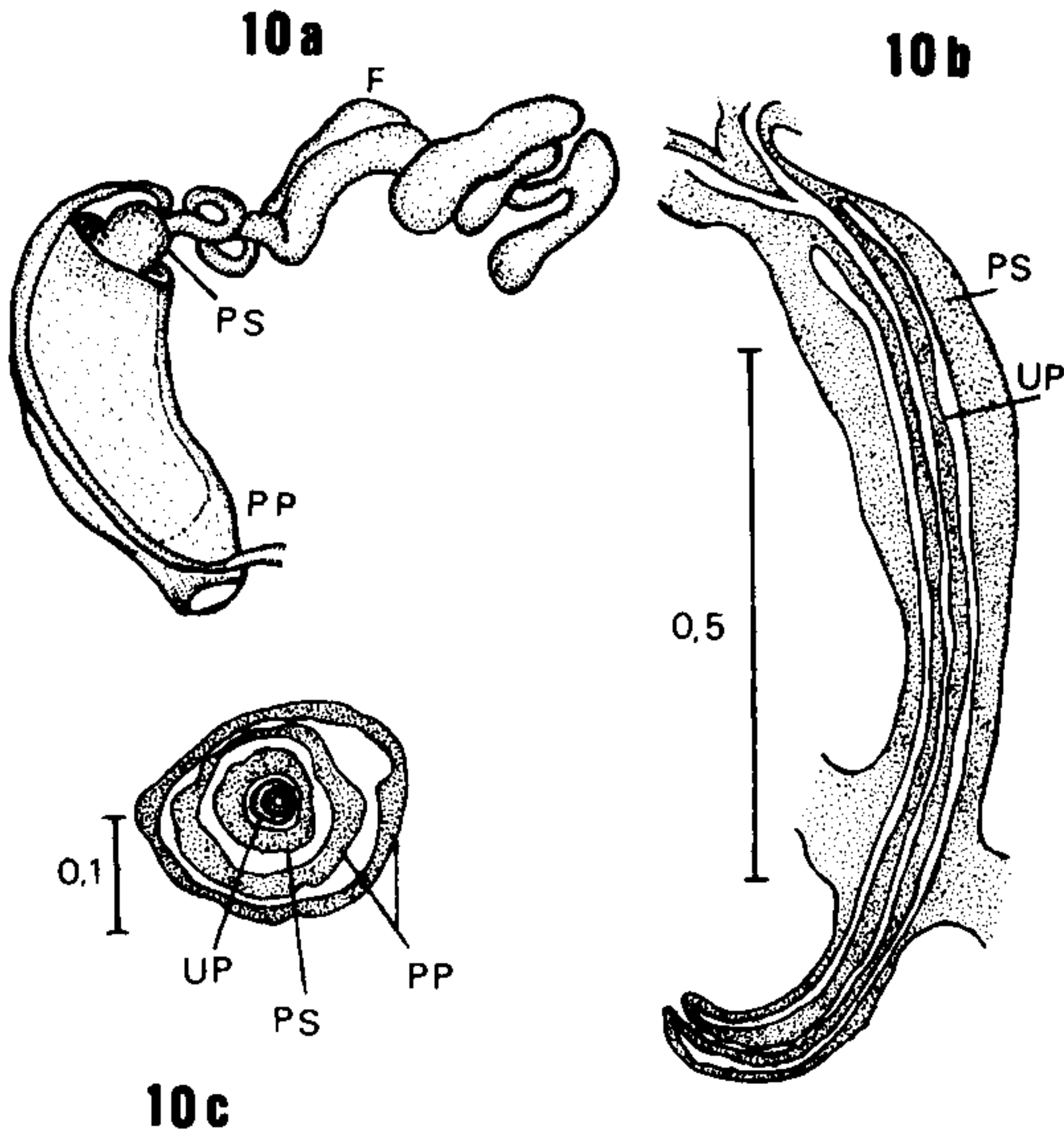
Gundlachia dutrae n. sp. - Reproductive organs. Fig. 9a: right view. Fig. 9b: dorsal view, the organs somewhat dislodged. Fig. 9c: carrefour and related organs. AG - albumem gland; AGD - albumem gland duct; CA - region of carrefour; FP - fertilization pouch; NG - nidamental gland; NGA - nidamental gland appendix; OD¹ - proximal portion of ovispermiduct; OD² - distal portion of ovispermiduct; OT - ovotestis; OV - oviduct; PR - prostate; SD - spermiduct; SP - spermathecal body; SV - seminal vesicle; VA - vagina; VD - vas deferens (Bar= 1 mm).

from right side of carrefour as a short duct that soon enlarges and reaches the nidamental gland.

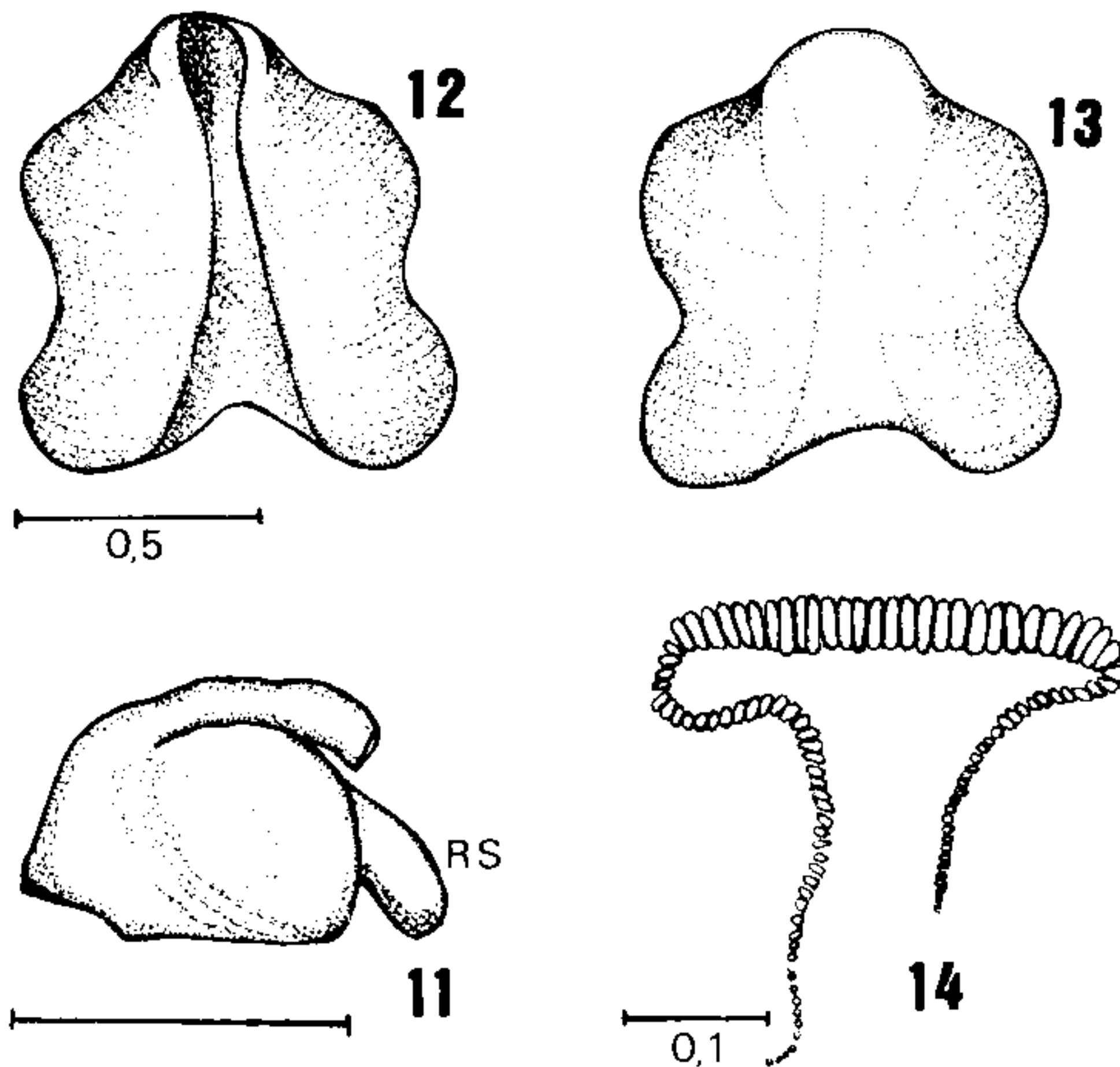
The nidamental gland is a large yellowish, almost cylindrical organ, being continuous with the uterus. This organ is flattened, thin-walled and well-pigmented. Its anterior portion reaches the ejaculatory complex. At the right posterior wall of nidamental gland, pressed against the al-

bumem gland, there is a very thin-walled pouch that gives rise to a long appendix. This appendix ends in an elongated-elliptical bulb with a metallic shine, near the posterior muscle.

The spermatheca has a roundish body. Its proximal duct is enlarged and gradually becomes more straight until it reaches the spermathecal body.



Gundlachia dutrae n. sp. - Ejaculatory complex. Fig. 10a: entire ejaculatory complex. Fig. 10b: transversal section; Fig. 10c: longitudinal section. F: flagellum; PP - prepuce; PS - "penis sheath"; UP "ultra-penis" (Bar= 1 mm, unless otherwise state).



Gundlachia dutrae n. sp. - Fig. 11: buccal bulb. Fig. 12: odontophore, dorsal view. Fig. 13: the same, ventral view. Fig. 14: jaw.

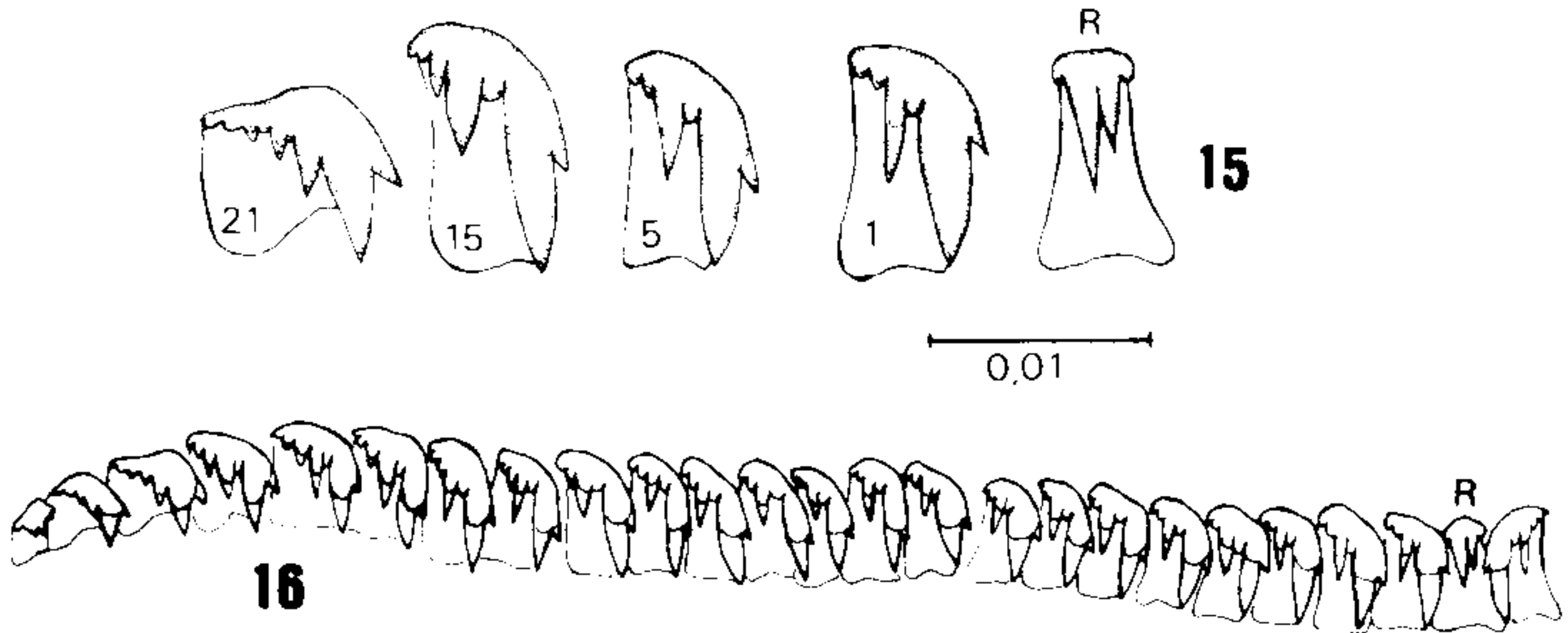


Fig. 15: radular teeth (R - rachidian tooth; the numbers refer to the order of position in the transverse row). Fig. 16: radula (half a transverse row); RS - radular sac. (Bar= 1 mm, unless otherwise stated).

The digestive system has no features of special interest. There is only an opening for the digestive gland.

The radular sac is relatively long, about half the length of buccal bulb (Fig. 11). Figs 12 and 13 show the odontophore.

The jaw is well developed, with about 28 dorsal plates and 45 lateral plates.

The radula shows marked characteristics (Fig. 15). There are a quadricuspid rachidian tooth, being the two main cusps asymmetrical and aculeated. Besides each principal cusp there is one small accessory cusp. There are three principal cusps in the lateral teeth. The mesocon is the most developed, long and aculeated; the endocon is reduced; between the meso and ectocon there is a marked gap; two or three pos-ectocon cusplets are visible, their number increasing in direction of the radular edge. The transition from lateral to marginal teeth is noted by progressive reduction of teeth size, not by form changes (Fig. 16).

REMARKS

Gundlachia Pfeiffer, 1849, has been considered an exclusive Neotropical genus, with several nominal species, the great majority of them based exclusively on shell. A good summary about this is provided by Hubendick (1967).

Comparing shells, radula and anatomical data, it was not possible to identify our specimens as to any *Gundlachia* already described.

The sculpture and form of apex distinguish *G. dutrae* immediately from *G. concentrica* (Orbigny, 1835) where the apex is projected and hooked; from *G. moricandi* (Orbigny, 1837) where the apex is obtuse, and from *G. radiata* (Guilding, 1828) or *G. ticaga* (Marcus & Marcus, 1962) where the apex is rounded.

The relation length/height, the sculpture of strong radial lines and the position and inclination of the apex resembles *G. obliqua* (Broderip & Sowerby, 1832) from Chile, but differs in the absence of radial lines in the protoconch.

The muscle scars are totally different from other *Gundlachia*. The most similar is seen in *G. obliqua*, where the right anterior muscle is also elongated, but never medially constricted. The genus *Burnupia* also has an elongated form of the right muscle scar (Brown 1961, Hubendick 1964).

The V-shaped adhesive area as well as the form of right anterior muscle scar relate *G. dutrae* n. sp. to *G. concentrica*, *G. crequii* (Bavay, 1904), *G. obliqua* and perhaps *G. foncki* (Philippi, 1866) according to anatomical data (Haas 1955, Hubendick 1955, 1964, 1967, Lanzer 1988) and personal observations.

Burch (1962) was probably the first author to mention the presence of additional muscle scars between the two anterior muscles, considering them as broken areas of adhesive epithelium. Lanzer (1988) observed in this area in *G. crequii* merely the presence of firmer tissue.

It was observed in *G. dutrae* n. sp. and other congeneric species (unpublished data) that the adhesive area is a true muscle scar, instead of an adhering epithelia. We believe that this character will probably be useful in taxonomic studies of ancyliids.

The transversal muscle is described for the first time in ancyliids.

The most similar species is *G. obliqua* from Chile. Apart the similarities already cited, both species present the mantle heavily pigmented, *G. dutrae* differing by having the foot, body wall and pseudobranchia not pigmented. The radula is similar in relation to rachidian tooth, where the median cusps are elongated and aculeated, the

mesocon is the most pronounced and the endocone tends to be reduced. There are not marked differences from lateral to marginal teeth. In *G. obliqua* there is no gap between meso and ectocon (Pilsbry 1924) as in *G. dutrae* n. sp. The seminal vesicle is not so developed as in *G. concentrica* and *G. moricandi*. The ejaculatory complex is similar, both having an "ultra-penis" projected as a tube within the lumen of prepuce and with a well developed slit.

Both species are common in lotic habitats, *G. obliqua* preferently on lower surface of stones (Biese 1948 and personal observations) whereas *G. dutrae* was found on upper surface of stones. Other congeneric species are most common in lentic habitats on leaves, stems and remains of aquatic plants (Hubendick 1964, Indrusiak 1983, Harrison 1983, Lanzer 1988).

The shells SMF 44352 was identified by Haas (1939:267) as *Burnupia (Unancylus) barilensis* (Moriciand, 1845) one of the synonyms of *Gundlachia concentrica*. It is clearly a misconception.

ACKNOWLEDGEMENTS

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