ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

(MINISTERIE VAN CULTUUR, RECREATIE EN MAATSCHAPPELIJK WERK)

Deel 49 no. 18 2 juni 1976

PSEUDOGLESSULA LIBERA, A NEW SUBULINID LAND SNAIL FROM GUINEA, WEST AFRICA (MOLLUSCA, GASTROPODA PULMONATA)

by

ALAN SOLEM

Field Museum of Natural History, Chicago, U. S. A.

and

A. C. VAN BRUGGEN

Department of Systematic Zoology of the University,
c/o Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands

With 2 text-figures and 3 plates

Study of some land snails collected in Guinea, West Africa, by Ms. Diane deVry has led to the description of a new species, *Pseudoglessula libera*. It is currently known only from several localities near Conakry, but probably has a wide distribution. Detailed comparisons with previously described taxa unfortunately were not possible. Many early descriptions are very brief and most available illustrations do not clearly show details of shape and sculpture that would enable quantifying differences. Direct comparisons with named material in major museum collections (London, Frankfurt-a.-M., Paris, Leiden, Chicago, Philadelphia) have failed to locate conspecific or very closely allied morphs, hence specific description is necessary. We include data on epiphragm structure and implied functioning, as well as describing and illustrating systematically significant features of the shell, radula and genital anatomy.

We are indebted to Ms. Diane deVry for collecting and contributing the material on which this report is based; to F. Huysmans for preparing the photographic prints; to Jayne Freshour and Dorothy Karall for manuscript preparation and figure mounting; and to Elizabeth Liebman for preparing the text figures. The scanning electron microscope photographs were taken by the senior author using a Cambridge S-4 Stereoscan, provided Field

Museum of Natural History by National Science Foundation Grant BMS 72-02149 A01.

Abbreviations as to specimen location are: FMNH (Field Museum of Natural History, Chicago) and RMNH (Rijksmuseum van Natuurlijke Historie, Leiden).

Pseudoglessula (Pseudoglessula) libera nov. spec. (fig. 1, plates 1-3)

Diagnostic characters. — A relatively small, slender species, usually less than 14 mm long, with 8 to 9 whorls, radially ribbed apex, every third rib weakly denticulated at the suture. Lateral and marginal teeth of radula tricuspid, jaw irregularly ribbed.

Description of shell. — Shell small, usually 12 to 14 mm high with 7 to 9 whorls, rarely reaching 19 mm high with more than 10 whorls. Shape terebriform, regularly increasing in whorl width, H/D ratio generally 3.0-3.8 in specimens more than 11 mm high. Colour uniform pale corneous brown. Apex protruding, first half whorl smooth, then followed by prominent, sharply chiselled radial ribs that terminate abruptly just above the suture (pl. 1 fig. 2). On postnuclear whorls, every third rib extends higher and expands slightly above to denticulate the suture (lower left of pl. 1 fig. 2). Ribs greatly reduced to virtually absent below whorl periphery (pl. 1 figs. 1, 3). Rib interstices somewhat variable, generally 1.5 to 2 times rib width. Juvenile examples show the rib difference below periphery more strongly than do the adults, with a distinct angulation, but no keel, at the periphery. Sutures incised, whorls slightly flattened laterally. Aperture ovate, lip simple, columella imperforate at all stages of growth, slightly concave, obliquely truncated.

Description of anatomy. — Body yellow, without darker markings, eye spots black. Aulacopod type grooves present on side of foot. Pallial roof (fig. 1, c) typically subulinid, with kidney (K) elongately triangular and barely reaching hindgut (HG), ureter (KD) originating subapically and opening (KX) just posterior to anus (A) after reflexing up alongside hindgut. Heart (H) and intestinal loops (I) typical, pulmonary vein (PV) without obvious branching, extending nearly to edge of mantle collar (MC). Genitalia (fig. 1, a, b) of all examined specimens with penial complex reduced in prominence. Specimens collected in January with albumen gland (GG) quite large, hermaphroditic duct (GD) simple, talon complex (GT) a swollen bulb. Uterus (UT) with a small apical sac, main chamber with thin walls. Prostatic region (DG) of digitate follicles. Spermatheca (S) with slightly swollen head, relatively enlarged shaft. Vagina (V) long, slightly swollen apically near junction with spermatheca. Vas deferens (VD) originating just above spermathecal junction, entering penis (P) after a slight

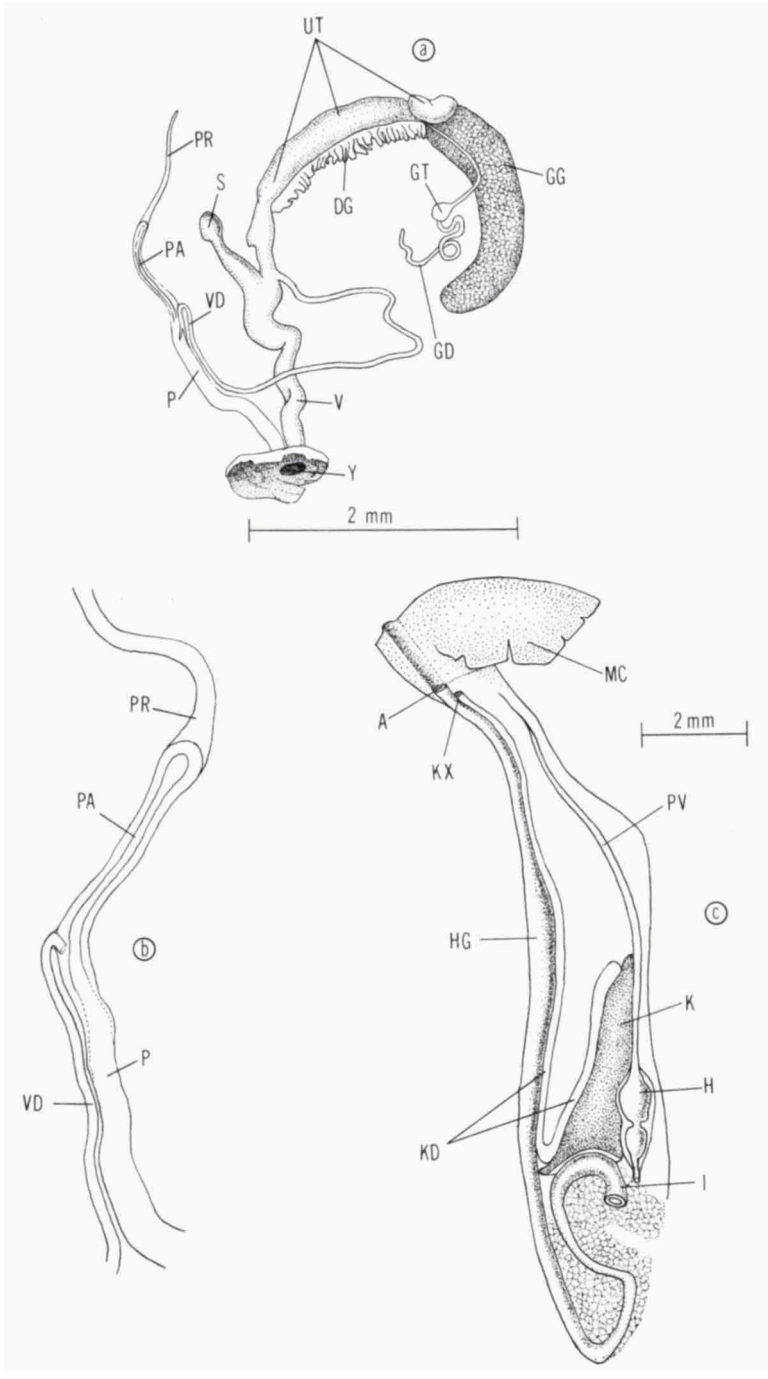


Fig. 1. *Pseudoglessula libera* Solem & Van Bruggen, north shore Fatala River, Boffa, Guinea, paratypes (FMNH 170359). a, genitalia; b, detail of penial complex; c, pallial complex. Symbols explained in text.

reflection (fig. 1, b). Penial retractor originating from diaphragm, inserting onto head of a penial caecum (PA) that extends about half the penis length above the vas deferens insertion. Atrium (Y) very short, hardly recognizable as a distinct region.

Jaw (pl. 3 fig. 1) narrow in centre, expanded at both ends. Surface irregularly ridged with wavy, narrow crests. Whole structure highly flexible.

Radula (pl. 3 figs. 2-6) typically subulinid. Central tooth (pl. 3 fig. 5) minute, tricuspid, with narrow basal plate. Laterals 6 to 8 in number, large, tricuspid. Transition to marginals (pl. 3 fig. 3) occurs over 3 to 4 teeth, involving reduction in mesocone length, shortening and lowering of both ectocone and endocone, loss of anterior margin sinuosity, and shortening of the entire elevated portion. Marginals (pl. 3 fig. 2, 4) tricuspid, up to 20 in number, middle marginals (pl. 3 fig. 4) with endocone set posteriorly on mesocone, a tendency for ectoconal splitting present, and no free anterior margin. Outermost marginals become wider than long, with nearly complete endoconal loss, but no marked ectoconal splitting.

Measurements of shell: diameter 3.3-4.9 mm; height of probable adults 10.0-19.4 mm; H/D ratio 2.56-4.30, correlated with change in height (see fig. 2).

Distribution. — *Pseudoglessula libera* is known at present only from the vicinity of Conakry, Guinea.

Guinea: Boffa, north shore Fatala River, 20 ft., 3 January 1973, leg. Diane deVry (FMNH 170359 in alcohol and dry examples; RMNH 55046 (dry), 9021 (alc.); holotype FMNH 170854); Conakry II, Ratoma, 12 October 1972, leg. Diane deVry (FMNH 170855, 3 examples) and 22 September 1972 (FMNH 170856; RMNH 55047 (dry), 9022 (alc.), many examples); Conakry, arr. 9, Astaldi Property, km. 15, 24 November 1973, leg. Diane deVry (FMNH 170857; RMNH 55048 (dry), 9023 (alc.), many specimens dry and in alcohol). All specimens were taken from humus or off vegetables in garden areas. All the specimens, apart from the holotype, are considered paratypes.

This species has been named *libera* to recognize the free spirit of its collector, the origin of deVry from the Dutch "vrij", or free, and in token appreciation of Diane deVry's malacological efforts over the years.

The relationships of *Pseudoglessula libera* are difficult to establish. Analysis of the structures shown by this species and tabulation of the data accumulated in the major literature on West Africa subulinids (D'Ailly, 1896; Pilsbry, 1904-1905, 1919; Boettger, 1905; Germain, 1916; Connolly, 1928; Ortiz de Zárate & Ortiz de Zárate, 1959) demonstrate little to no congruence between currently accepted generic limits and patterns of structure. The

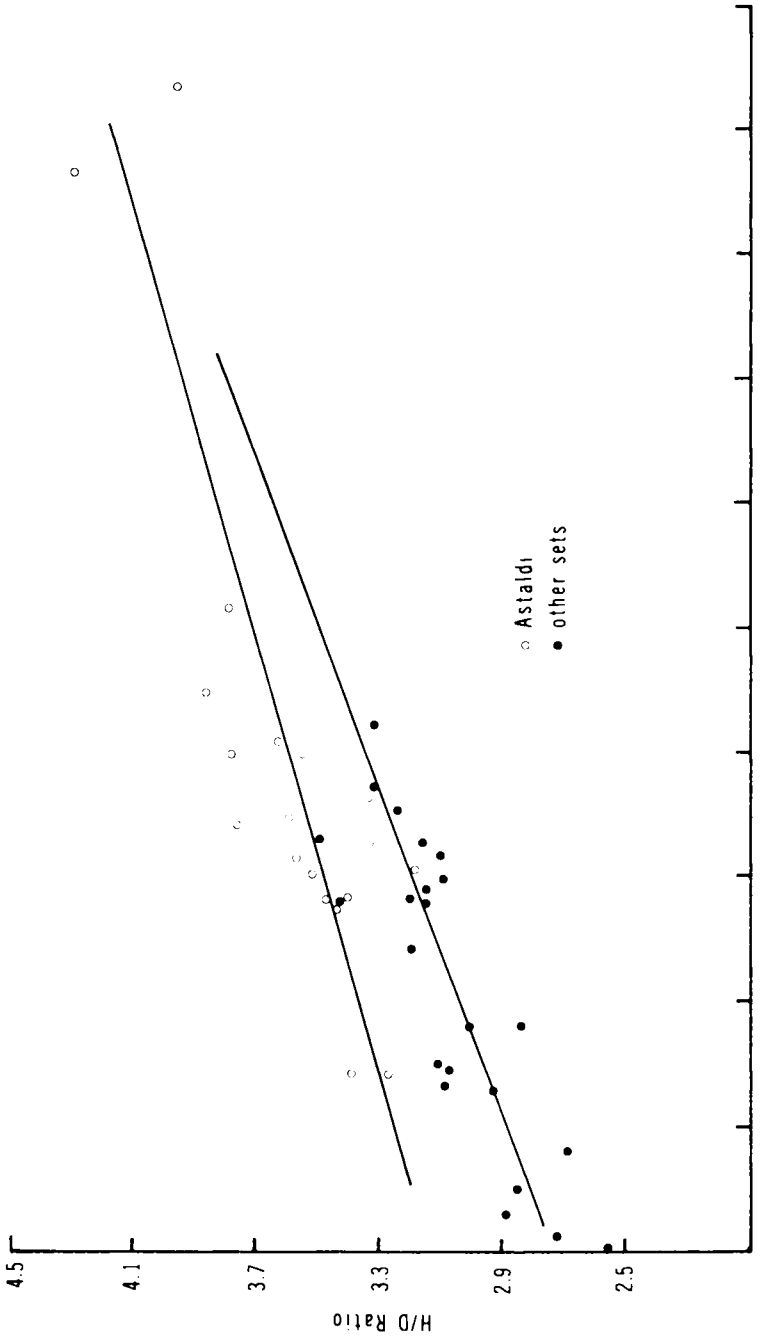


Fig. 2. *Pseudoglessula libera* Solem & Van Bruggen, scatter diagram of shell height and H/D ratio, showing slight difference in growth pattern between populations sampled. The regression lines are for y on x.

complex of genera including *Subulina* Beck, 1837, *Pseudoglessula* O. Boettger, 1892, *Subulona* Von Martens, 1889, *Homorus* Albers, 1850, *Pseudopeas* Putzeys, 1899, and some *Curvella* Chaper, 1885, is badly in need of restudy, but resolution of this problem is well beyond the scope of this report. We can merely point out some of the problems and illustrate structural complexes that might have high information content for revisionary work.

The terebriform shape, truncate columella and radial ribbing of the shell are characters shared by the entire complex. Ribbed species of *Subulina* s. l., differ in having a smooth or only weakly ribbed apex and in having the sculpture continue more strongly below the periphery. Specimens of *Subulina striatella* (Rang, 1831), for example, have a larger, smoother apex, less well defined sculpture, but only slightly stronger subperipheral sculpture than the new species. At comparable whorl counts, specimens of *S. striatella* are 4 to 6 mm higher. In general appearance, however, the two species are very similar to each other.

More than thirty species assigned to *Pseudoglessula* have been described previously from West Africa and adjacent islands. Doubtless some of these are synonyms or belong in other genera, just as nominate units in other genera may belong instead to *Pseudoglessula* s. l. Comparisons with specimens in the British Museum (Natural History), London, and in the Leiden collection were made by the second author, and in the Senckenberg, Paris and Philadelphia collections by the senior author. The second author undertook a search of the literature. Primary papers are listed in the references, but numerous short descriptive notes that were examined have not been formally cited.

Most species of *Pseudoglessula* s. s. are considerably higher and as a rule have a distinctly larger diameter, with the H/D ratio significantly less than 3 for adult shells. Species referred to the subgenus *Ischnoglessula* Pilsbry, 1919, are equally slender as *P. libera,* but generally have a distinct keel on the periphery. We do not consider that *Ischnoglessula* is a well characterized group, and doubt that it is a valid unit. Species assigned to this taxon, however, have the greatest conchological similarities to the new species. *P. (I.) subfuscidula* Pilsbry, 1919 (Pilsbry, 1919, pl. 18 fig. 8) has much coarser, more widely spaced sculpture and is only 10.5 mm high at 9 1/3 whorls. Syntypes of *P. (I.) fuscidula* (Morelet, 1885) in the British Museum (Natural History) were studied. Comparative measurements of two juveniles with the same height indicate the differences in shells:

P. libera, 8.9 × 3.4 mm, H/D 2.63, last whorl 4.6 mm, aperture 2.6 mm long, 6 1/4 whorls.

P. fuscidula, 8.9 × 3.0 mm, H/D 2.96, last whorl 3.9 mm, aperture 2.2 mm long, 7 3/4 whorls.

Anatomical differences are more striking. Both Pilsbry (1919: 148) and Ortiz de Zárate & Ortiz de Zárate (1959) assign species with unicuspid or bicuspid lateral teeth to *Pseudoglessula.* In *P. libera* the teeth are tricuspid, agreeing with the species traditionally placed in *Subulina, Pseudopeas, Lamellaxis* Strebel & Pfeffer, 1882, and *Prosopeas* Mörch, 1876. The lack of marked ectoconal splitting in the outer marginals of *P. libera* also is somewhat unusual. Other dissected *Pseudoglessula* may have a short mid-penial appendix (*P. duseni* D'Ailly, 1896, and *P. boravechensis* Ortiz de Zárate & Ortiz de Zárate, 1959, see Ortiz de Zárate & Ortiz de Zárate, 1959: 64, figs. 43, 48), or lack the long penial caecum found in *P. libera* [see *P. walikalensis* Pilsbry, 1919, and *P. stuhlmanni* (Von Martens, 1895) in Pilsbry, 1919, and *P. retifera* (Von Martens, 1876) and *P. sjoestedti* D'Ailly, 1896, in Ortiz de Zárate & Ortiz de Zárate, 1959: 56, figs. 38, 41]. Pilsbry (1919) reported that the penial retractor originated from the diaphragm, while Ortiz de Zárate & Ortiz de Zárate (1959) cited a free retractor origin as characteristic of *Pseudoglessula.* In *P. libera* it originates from the diaphragm. In addition, the very short spermatheca of *P. libera* is more like the structure seen in *Lamellaxis* and some *Subulina* than in other *Pseudoglessula.* Too few data are available concerning the internal penial complex structure in other species for comparisons.

There is thus a situation in which the cusping of the lateral teeth, origin of the penial retractor muscle, basic structure of the penis complex, spermathecal length, and presence or absence of a medial appendix on the penis vary without correlation to accepted generic limits. We consider it quite possible that the present genera of West African subulinids recognize minor convergences in shell shape.

The general aspect and basic shell sculpture of *P. libera* suggest lodging it in *Pseudoglessula.* We recognize that the generic units currently are convenient museum filing systems, rather than reflections of phylogeny. The illustrations presented here are designed to provide accurate base line data against which other species can be compared in the future. Long verbal descriptions have been omitted, since comparable detail of structure in other taxa is unknown.

We also take the opportunity to briefly discuss the epiphragm structure. It has long been known that the achatinoid groups secrete a calcified epiphragm with a breathing pore located near the parietal-palatal margin. A good illustration of this is given by Smith (1899: 309, figs. I-II). Use of the scanning electron microscope has enabled adding additional data on the equivalent structures in *P. libera.* The outside aspect of the epiphragm (pl. 1 fig 3) shows a slightly convex surface with simple opening to the breathing pore

and trace of the internal ridge formation seen in pl. 1 fig. 4. The breathing pore internally is extended into a slight tube, with an irregularly descending ridge running past the centre of the epiphragm. At higher magnification (175× in pl. 2 fig. 1) a series of ladderlike ridges are seen lining the breathing pore.

Evidence that the calcification is achieved by vertical deposition of crystals is shown in pl. 2 figs. 3, 4. The fracture edge of the epiphragm (pl. 2 fig. 4) shows the smooth outer surface (? mucoid layer), rough inner surface, and the vertical nature of the crystals. Similarly, in an angled view of the inner surface (pl. 2 fig. 3), the pattern of the crystal layers dipping down into the surface is quite apparent. This suggests that calcification proceeds from the outer edges toward the center of the epiphragm, with the thickness established by the crystals being deposited perpendicularly to the mucous membrane.

The unbroken edge of the epiphragm is shown in pl. 2 fig. 2. The interface between epiphragm and shell is honeycombed by a series of anastomosing weak grooves, many of which have micropitting at their deepest points. The function of this groove and pit system presumably is to allow moisture secreted by the snail to loosen the epiphragm so that it can be shed intact as the snail emerges. There is no comparable structure on the inside of the shell aperture. Hence this must be a structure secreted by the snail's mantle as part of epiphragm formation. Quite possibly a mucoid template on the shell surface serves to provide a broader point of attachment for the initial mucous sheet across the aperture. The initial calcification on the inside of the shell would conform to the mucous sheet, with subsequent dissolution by the snail shedding the epiphragm.

Material of *Pseudoglessula libera* was collected in January, September, October and November. Only the November examples contained encapsulated eggs. Generally three to four flatly circular white eggs are visible through the shell. The eggs in the uterus measure 1.1 mm thick and 1.4-1.5 mm in diameter. The January examples showed an enlarged albumen gland, but otherwise there were no noticeable seasonal anatomical differences.

Maximum shell size was slightly over 14 mm high, except for two shells taken on the Astaldi property. These were 18.7 and 19.4 mm high with 10 3/8 and 10 whorls respectively. We interpret these as postreproductive gigantism, since no intermediate examples are known. Fig. 2 demonstrates the slightly different proportions of the Astaldi specimens when compared with the Boffa and other Conakry shells. The differences are thought to reflect microhabitat differences and to have no systematic significance. Sample size is too small to make the nonparallelity of the regression lines significant.

References

BOETTGER, O., 1905. Beitrag zur Kenntnis der Land-, Süsswasser- und Brackwasser-Mollusken von Kamerun (zugleich Aufzählung aller von dort bekannten Arten). — NachrBl. dt. malakozool. Ges., 37: 153-184.

CONNOLLY, M., 1928. The non-marine Mollusca of Sierra Leone. — Ann. Mag. nat. Hist., (10) 1: 529-551.

D'AILLY, A., 1896. Contributions à la connaissance des mollusques terrestres et d'eau douce de Kaméroun. — Bih. K. svenska VetenskAkad. Handl., 22 (IV, 2): 1-137.

GERMAIN, L., 1916. Étude sur les mollusques terrestres et fluviatiles recueillis par L. Féa pendant son voyage en Afrique occidentale et aux îles du Golfe de Guinée. — Ann. Mus. civ. Stor. nat. Genova, 47: 150-336.

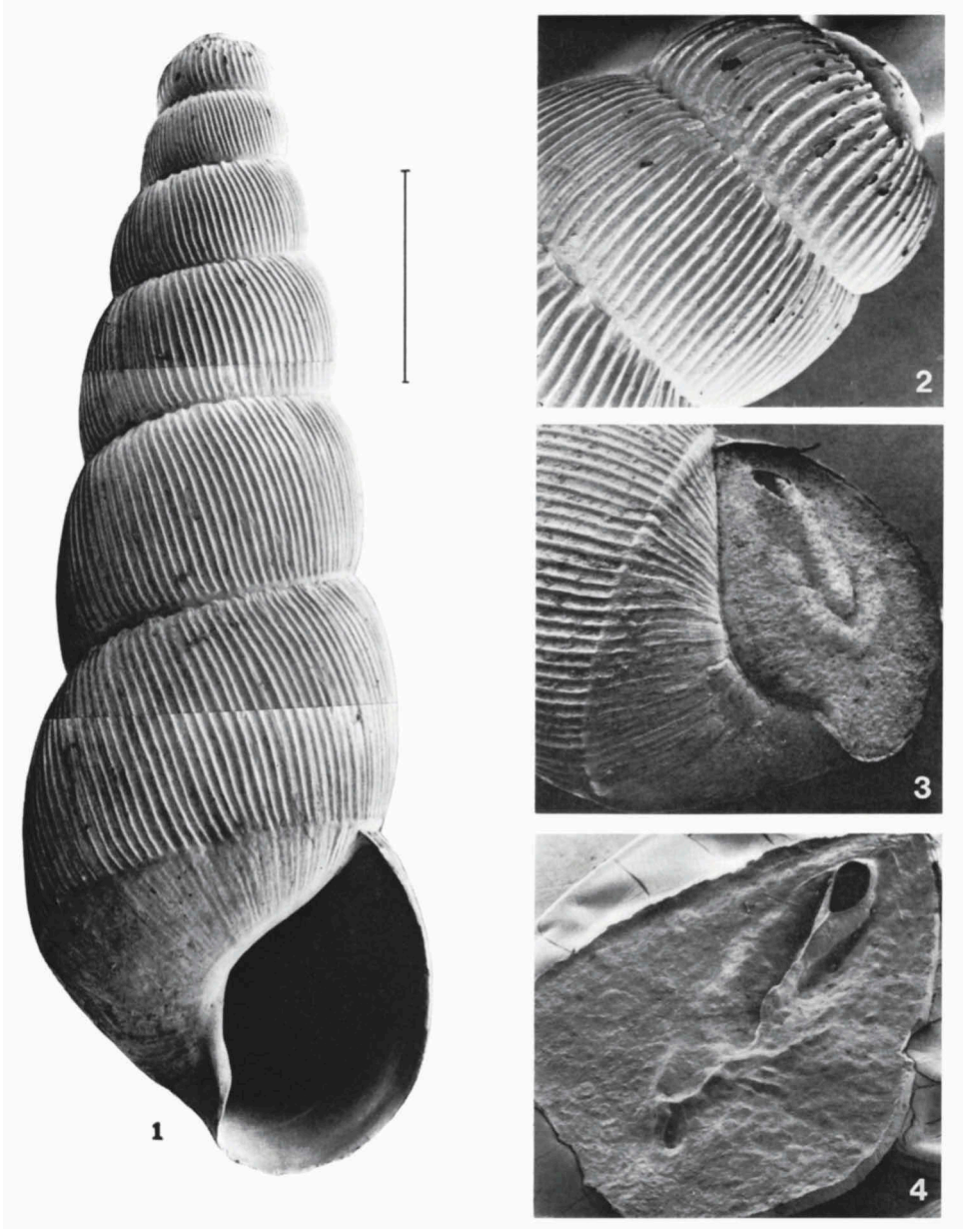
MORELET, A., 1858. Côte occidental de l'Afrique. M. L. de Folin. — 1846.47. — Series conchyliologiques comprenant l'énumeration de mollusques terrestres et fluviatiles recueillis pendant le cours de différents voyages, ainsi que la description de plusieurs espèces nouvelles, 1: 1-34. (Paris).

ORTIZ DE ZÁRATE LÓPEZ, A. & A. ORTIZ DE ZÁRATE ROCANDIO, 1959. Descripción de los moluscos terrestres de la isla de Fernando Poo (Familia Achatinidae). — Inst. Estud. afr. Madrid (Consejo Sup. Invest. cient.): 1-128.

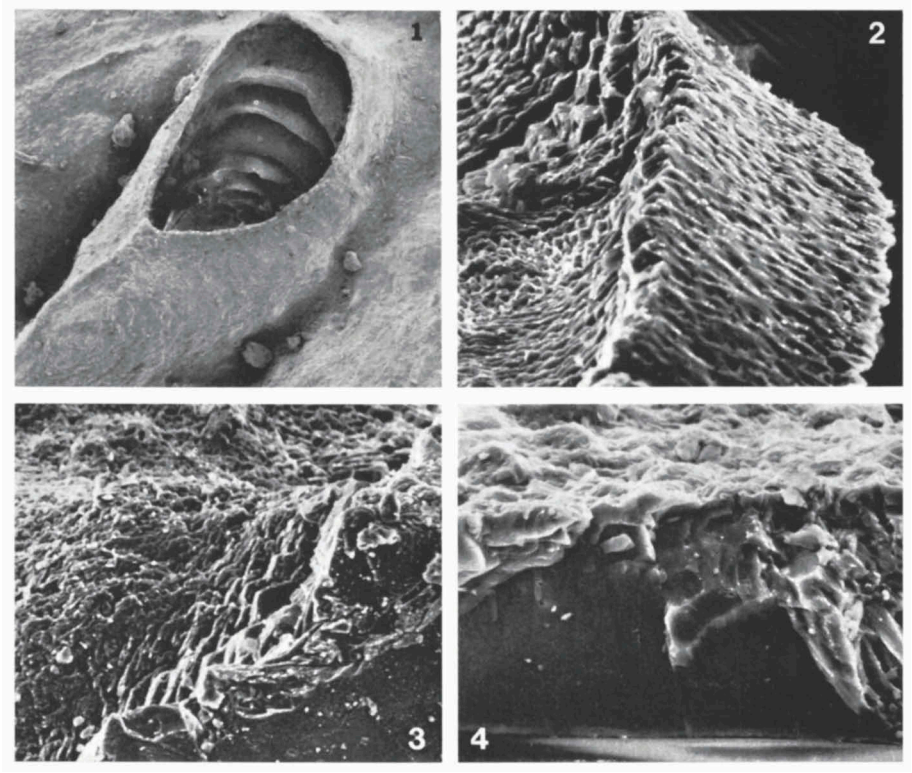
PILSBRY, H. A., 1904-1905. African Achatinidae. Man. Conch., (2) 17: i-xviii, 1-232. (Philadelphia).

——, 1919. A review of the land mollusks of the Belgian Congo chiefly based on the collections of the American Museum Congo Expedition, 1909-1915. — Bull. Am. Mus. nat. Hist., 40: 1-370.

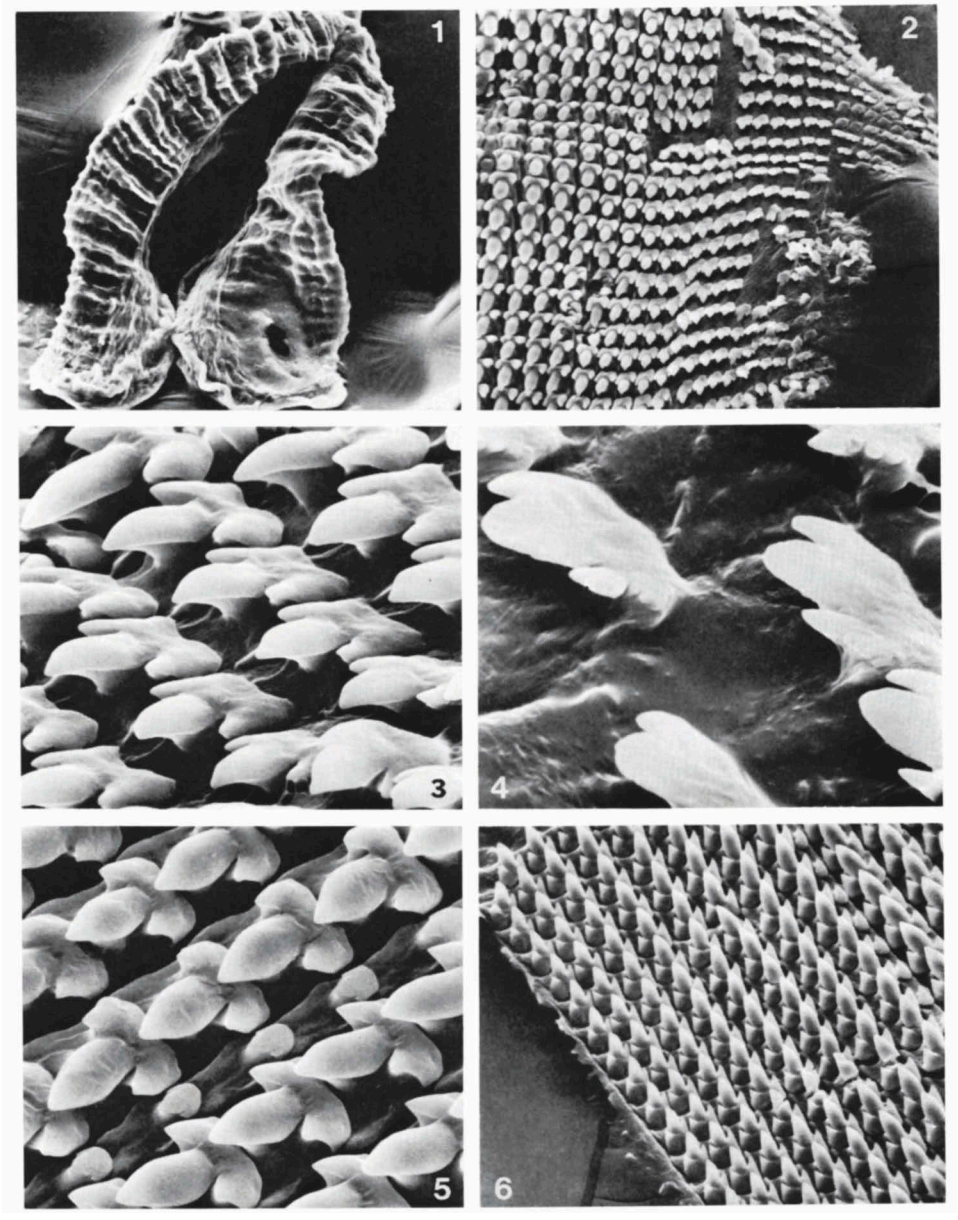
SMITH, E. A., 1899. Note on the epiphragm of Achatina immaculata, Lam. — Proc. Malac. Soc., London, 3: 309-310.



Pseudoglessula libera Solem & Van Bruggen, north shore Fatala River, Boffa, Guinea, 3.1.1973, paratype (FMNH 170359). 1, shell; 2, shell apex at 37× showing suture sculpture gap and major rib crenulations; 3, epiphragm in place at 17.5× showing breathing pore near parietal-palatal margin; 4, inside view of epiphragm at 27.5× showing breathing pore sides and formation ridge. Scale line fig. 1 : 2 mm.



Pseudoglessula libera Solem & Van Bruggen, north shore Fatala River, Boffa, Guinea, 3.1.1973, paratype (FMNH 170359). 1, breathing pore of epiphragm from inside showing internal ridges, 175×; 2, edge of epiphragm at lower right of plate 1 fig. 4, showing irregular anastomosing grooves and micropits on the interface between epiphragm and shell, 890×; 3, detail of inner surface at 620× showing vertical pattern of crystal structure; 4, fracture surface at 870× showing inner surface (upper part) and possible membrane edge (lower margin).



Pseudoglessula libera Solem & Van Bruggen. 1, Astaldi Property, km. 15, Arr. 9, Conakry, Guinea, 24.11.1973 (FMNH 170857), isolated jaw at 22.5×; 2, half radula view at 235×; 3, transition between lateral (upper left) and marginal (lower right) teeth at 1,375×; 4, mid-marginal teeth at 3,500×; 5, north shore Fatala River, Boffa, Guinea, 3.1.1973 (FMNH 170359), central and early lateral teeth at 815×, viewed from almost directly above; 6, central and lateral teeth at 315×, viewed from a high anterior angle.