KONINKLIJK MUSEUM VOOR MIDDEN-AFRIKA — TERVUREN, BELGIË
ANNALEN — REEKS IN-8° — ZOOLOGISCHE WETENSCHAPPEN — nr 159, 1967

STUDIES IN THE GENUS PSEUDACHATINA ALBERS

(MOLLUSCA-ACHATINIDAE)

by

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CONTENTS

1. ACKNOWLEDGMENTS

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Finally the authors would like to extend special thanks to Dr. BIDDER who granted them all the facilities at her disposal, allowed specimens to be borrowed in her name and stored in her department, and without whose help the present paper would not have materialised or would have been much reduced in scope.

Grateful thanks are due to the Director of the Musée Royal de l'Afrique Centrale, Tervuren, for publishing this work; the greater part of the species treated below are represented in the collections of this museum.

2. INTRODUCTION

Snails of the genus *Pseudachatina* are both conspicuous and attractive, and form an important element of the molluscan fauna of a restricted area of tropical rain forest in West Africa. *Pseudachatina* is closely related to the genera *Limi-*

colaria, *Achatina* and *Pseudotrochus*, all three of which have representatives living in the same area. It differs from *Achatina* in lacking the abruptly truncated columella characteristic of that genus, the columella being twisted but only weakly truncated. From *Pseudotrochus* and *Limicolaria* it differs in having a bulbous and distinctively sculptured apex. This apical sculpture is one of the most useful generic characters. Species of the "*leaiana* complex" can readily be distinguished from members of the three other genera by their rough irregular sculpture on the lower whorls and their thick periostracum. The most distinctive feature of the anatomy, as far as it is known, is a very marked penial enlargement which seems to be characteristic of this genus but occurs sporadically in the Achatininae.

3. PREVIOUS RESEARCH

The genus *Pseudachatina* was proposed in 1850 by ALBERS to contain the single species *P. downesii* (GRAY) (see footnote p. 12). Previously GRATELOUP (1839) had described and figured "*Achatina leaiana*"; G. B. SOWERBY jun. (1841) had figured "*Bulimus downesii*", and REEVE (1848) had described and figured under the name "*B. downesii* vars.", specimens now referred to *P. gabonensis* (fig. 117b) and *P. sodeni* (fig. 177a) all of which belong to this genus. PFEIFFER (1857 and 1865) added to the number of species and the first account of the genus as a whole was that of SHUTTLEWORTH (1856). The most important works on *Pseudachatina* are those of KOBELT (1893), D'AILLY (1896) and PILSBRY (1904). Each of these authors added greatly to the knowledge of the genus and each described some new species or varieties. An indication of the difficulties inherent in this genus can be seen by the varying interpretation given to different forms by each of these authors. What is considered as a variety of a species by one author is given specific rank by the next and vice versa. Since PILSBRY's monograph no comprehensive account has been attempted. PRESTON (1909), HIDALGO (1910), BLUME (1920) and DUPUIS (1922) have since added to the number of species described and other information on localities, etc. has been published from time to time. LOPEZ and ROCANDIO (1959) have published a dissection in the most recent work dealing with *Pseudachatina*.

4. ANATOMY

Virtually nothing has previously been published on the anatomy of *Pseudachatina* which has consequently remained something of an unknown quantity. LOPEZ and ROCANDIO (1959, p. 27, text-figs. 11-15) have published a figure and description of a species they refer to *P. downesii* (GRAY). Unfortunately from their plate it is certain that they have referred to more than one species under that name and which one was dissected is not stated. Further, from the authors

limited experience of the anatomy it has become evident that the variation in internal characters is very small compared with that of the shell and consequently LOPEZ and ROCANDIO's figures give only a general idea of the anatomy.

Through the generosity of Dr. Å. HOLM, of the Institute of Zoology, Uppsala, and Dr. P. Å ANDERSON, of the Naturhistoriska Riksmuseum, Stockholm one of us (C.P.) has been able to dissect several specimens of *Pseudachatina*. The identification of these dissections is, in some cases, open to doubt and as all but two examples had been in alcohol for some 80 years, a certain amount of distortion must have taken place. All but the two examples referred to were retracted before preservation and this has led to considerable contortion of the genitalia. MEAD (1950) emphasises the difficulty of distinguishing genuine contortions of the genitalia from those induced by retraction or preservation. It is hoped that the method of illustration adopted here will enable readers to make this distinction, but if not they will certainly appreciate the difficulties involved. All the dissections have been drawn to scale as laid out for examination.

Knowledge of the Anatomy of *Pseudachatina* remains very inadequate and it is worth repeating MEAD's remarks on Achatinine anatomy generally.

" The worth of a study of this sort depends not only upon anatomical variability, but variability of a tangible and significant nature. The real problem, therefore, rests first in discerning the presence of variability and then determining its nature. It is only after a good many dissections that a concept of this latter begins to emerge " (MEAD, 1950, p. 284).

In all the species dealt with an inadequate number of dissections has been performed and there still remains the large majority whose anatomy is totally unknown. This must be born in mind when discussing the general anatomical characters. As far as is known the anatomy is distinctive and varies little within the genus.

5. ECOLOGY AND DISTRIBUTION

As with the anatomy very little is known in detail about these aspects of *Pseudachatina*. D'AILLY says the following about their ecology : — " ...they live, ...on large leaves of " Elephant Grass " and on foliage of bushes and trees, where they are frequently found up to a height of 5 metres. ...they deposit their eggs up the trees in the forks of the branches closest to the trunk " (D'AILLY, 1896, pp. 85-86). Little can be added to this except that they are known to frequent banana plantations in the Cameroons.

Their distribution is a little better known. They are found in an area extending from Old Calabar in Southern Nigeria, down to somewhere North of the Congo. The extensive collecting in the Congo mouth region has failed to produce

one specimen of *Pseudachatina*, but the authors have seen one example sait to have come from Cabinda, immediately North. This locality may be open to doubt and it is possible the genus does not extend any further South than Gaboon. Most museum specimens seem to come from the coast or beside rivers but as many of these were collected when the interior was largely untravelled they probably give a distorted picture. *P. gravenreuthi* KOB. has been collected at 1300 m in the Cameroons by Knut BYSTRÖM, in 1956 and at 950 m at Buea, the type locality (KOBELT, 1893). *P. sodeni* KOB. is recorded from 750 m at Yaoundé, Cameroons (DAUTZENBERG, 1921). These species are the only ones with any record of altitude and, if typical, there would seem no reason for these snails not to extend considerably inland. The Eastern limit of their distribution remains unknown however. They are recorded from the islands of Fernando Po, St. Thomé and Prince's Isle.

The authors have found it convenient to group some of the species together into three " complexes ". These complexes appear to have restricted distributions within the area of the genus as a whole. The " *wrighti* complex " is the most northerly being recorded mainly from S. Nigeria, although the subspecies *P. wrighti buckholzi* KOB. occurs further South in the Cameroons. The " *leaiana* complex " occurs in the middle of the region and is dominant in the Cameroons, St. Thomé and Fernando Po, while the " *gabonensis* complex " seems to be dominant in Gaboon and Prince's Isle. *P. striata* nov. being the only species so far recorded from the Cameroons. There are, however, only a few reliable records of localities and so this broad pattern may break down when more detailed information is available. It may be stated that of the 200 odd specimens dealt with by D'AILLY from the Cameroons not one belonged to the " *gabonensis* complex " and *P. wrighti buckholzi* KOB. was the only member of the " *wrighti* complex " present and that represented by only three specimens.

6. TAXONOMY AND NOMENCLATURE

In these respects *Pseudachatina* is a particularly difficult genus. Variations within it are very striking and it is difficult to resist the temptation to name all such variations regardless of their taxonomic importance. To do so would be very ungenerous to future workers to say the least ! At this point is is pertinent to re-emphasise CROWLEY and PAIN's remarks on the genus *Burtoa*.

" It is well to remember in this connection the somewhat inflexible nature of the principles of taxonomy as regards infra-specific groups. Variants may, and in the case of Achatinae do, have extremely inconsistent value and it is therefore to some extent a matter of opinion, or subjective selection, what constitutes a subspecies. The official rules of nomenclature are so frozen that the only accep-

table infra-specific names must be dubbed subspecies regardless of the true value of the groups they designate" (CROWLEY and PAIN, 1959, p. 7).

Unlike *Burtoa* however, knowledge of the distribution of the various forms of *Pseudachatina* is so incomplete as to make it impossible to consider variants "in the light of the areas they inhabit" (C. and P., *loc. cit.*) as has been done for *Burtoa*. Faced with this difficulty the authors have tried to overcome it by describing "forms". "Forms" in this paper are variants sufficiently distinct, in the opinion of the present authors, to be worthy of attention, but which lack the ecological or geographical information necessary to call them subspecies. All of these forms may, with added information, be elevated to subspecies at a later date. Consideration of large series of shells has led inevitably to the relegation of several species to the synonymy of others but we have been left with a few very striking shells which do not, apparently, belong with previously described species either as "forms" or subspecies. We have therefore been forced to describe some new species with very little, or no, anatomical, ecological or geographical information. Some or all of these may in their turn be reduced to synonyms in the future.

In describing new "forms" or species the authors have avoided the previous practice of naming them after earlier researchers. This is not out of any lack of respect for our predecessors, our indebtedness to whom we readily acknowledge, but so few descriptive names have been used in this genus that we have an unrivalled opportunity to return to the original idea of a specific name as a descriptive appellation.

7. MEASUREMENTS

The authors have followed the method advocated by BEQUAERT and used by CROWLEY and PAIN in their revisions of the genera *Burtoa* (C. and P., 1959), and *Limicolariopsis* (C. and P., 1961). All dimensions are measured to the nearest 1/2 mm. The height, H., (or length) is that of the longest vertical axis of the shell, from the tip of the spire to the basal edge of the outer lip. The width, W., is the largest diameter in front view, measured at right angles to the vertical axis, from the left margin of the body whorl to the extreme outer edge of the outer lip. In the aperture, the height, H.A., is the longest distance from the insertion of the outer lip on the parietal wall to the basal edge of the outer lip. It is therefore not necessarily parallel to the vertical axis. The width, W.A., is measured at right angles to the length as the greatest distance from the inner margin of the columella to the outer margin of the outer lip. In *Pseudachatina* unlike both *Burtoa* and *Limicolariopsis* the outer lip is frequently expanded and thickened in adult specimens so variation in the width measured may occur in the species where this is most marked. However measurement of the width from the inner margin of the columella to the

inner margin of the lip is difficult, less accurate and suffers from the same drawback in the species where the inner margin of the lip is markedly thickened by callus.

8. KEY TO THE SPECIES, ETC. OF PSEUDACHATINA

The following key is offered in the hope that it may help in the identification of the species, subspecies and "forms" recognised. It is an entirely artificial device and in no way reflects the classification or genetic relationships of the forms dealt with. Use of it may be found to require a general knowledge of the genus.

1. — Shell finely striate longitudinally, some appearing smooth without periostracum 2
   — Shell not smooth without periostracum, usually strongly ornamented . 11
2. — Outline of the spire as a straight-sided cone, whorls flattened, suture beaded, with broad coalescing chestnut flammules 3
   — Shell without flattened whorls 4
3. — Shell smaller, last whorl angular ..... **P. pyramidata**
   — Shell larger, last whorl rounded ..... **P. pyramidata** f. **kobeltiana**
4. — Whorls slightly inflated, outer lip not strongly rounded 5
   — Whorls more distinctly inflated, outer lip strongly, evenly, rounded ... 7
5. — Shell small, very brightly flammulated throughout, last whorl vaguely bicarinate ..... **P. vignoni**
   — Shell larger, predominantly dull, unicolorous 6
6. — Shell ground colour white, tall and thin ... **P. gravenreuthi** f. **daillyana**
   — Shell ground colour light or dark brown, third and fourth whorls flammulated as in typical *Limicolaria* (e.g. *L. martensiana)* **P. gravenreuthi**
7. — Shell with nodes at the suture 8
   — Shell with suture beaded but not nodular 9
8. — Shell relatively tumid, whorls very strongly inflated **P. wrighti buckholzi**
   — Shell tall and thin, whorls less inflated ..... **P. pulchra**
9. — Shell with chestnut colour above the periphery, either as flammules or flecks 10
   — Shell with pale ground colour only above the periphery, relatively tall and thin ..... **P. wrighti** f. **buchneri**
10. — Shell small (less than 60 mm) very tumid ..... **P. wrighti** f. **minor**
    — Shell larger, less tumid ..... **P. wrighti wrighti**

11. — Shell with strong, irregular, sometimes vermiform, ribbing 12
— Shell without irregular ribbing 21

12. — Irregular ribbing breaking into granules, partly or wholly in some examples 13
— Ribbing never granular 14

13. — Shell larger, generally with some fine granules on the middle whorls, aperture relatively large ..... **P. granulata**
— Shell smaller, granulations coarser, middle whorls approaching cylindrical in outline, aperture small ..... **P. grandinata**

14. — Aperture relatively small, lip reflected but not flared 15
— Aperture relatively large, lip frequently flared 18

15. — Shell generally with pale ground colour above periphery, injury marks always present ..... **P. martensi**
— Shell with chestnut colour above the periphery, no injury marks ... 16

16. — Chestnut colour in flammules, outline of spire as a straight-sided cone ..... **P. leaiana**
— Shell pale chestnut throughout, outline of spire shouldered 17

17. — Shell generally smaller, ribbing coarser, outer lip rounded **P. connectens**
— Shell usually larger, ribbing finer, outer lip flattened **P. connectens** f. **rollei**

18. — Outer lip invariably tinged yellow 19
— Outer lip white, bluish, pinkish, or lurid purple 20

19. — Shell smaller, thinner, less strongly ornamented ... **P. sodeni** f. **elegantula**
— Shell very large (up to 115 mm) heavier, very strongly ornamented ..... **P. sodeni**

20. — Shell with strong livid-white plications ..... **P. connectens** f. **plicata**
— Plications not livid-white, aperture often lurid purple, outer lip sometimes produced into an external tooth ..... **P. connectens** f. **colorata**

21. — Shell with smooth regular ribbing, never vermiform 22
— Shell without smooth regular ribbing, coarsely nodular ..... **P. nodosa**

22. — Ribbing finer, closely spaced, sinuous, white flammules on pale red ground on third and fourth whorls ..... **P. striata**
— Ribbing coarser with fine striations intercalated 23

23. — Ground colour pale straw to horn-colour, last whorl 1/3-1/2 total height of shell ..... **P. elongata**
— Ground colour white, pink or pale mauve, sometimes with olive purple flammules, last whorl never more than 1/3 total height usually much less ..... **P. gabonensis**

9. SHELL CHARACTERS

The general shell characters are :

1. — The bulimoid shape, the shell distinctly taller than its greatest width. The shell is solid, generally opaque but transluscent in some species and young shells. The spire is produced, conical with a relatively blunt and rounded apex. The whorls enlarge comparatively slowly with the last often inflated and the aperture frequently flared.

2. — Columella usually twisted and weakly truncated at the base. Shell imperforate.

3. — Outer lip generally reflected and rarely produced into a tooth externally, joining the preceding whorl at 60-70 degrees. Parietal callus always present in mature shells, generally whitish or pinkish though it may be brightly coloured, usually with a thin transluscent band below the insertion of the outer lip through which the ground colour of the shell shows.

4. — The sculpture is very distinctive and frequently strongly developed. In the "*wrighti* complex" it is usually of fine longitudinal striae accompanied by spiral striae. In the "*leaiana* complex" it is of irregular vermiform ribbing sometimes breaking into granules. In the "*gabonensis* complex" it is of smooth sinuous ribs. *P. nodosa* PRESTON is nodular and does not fit into these complexes. The nepionic whorls are ornamented with a decussate or reticulate arrangement of minute pits, regarded by D'AILLY and KOBELT as hair pits. The spiral element of this ornament is usually stronger. This gives way to longitudinal striae or fine folds after approximately 1 1/2—2 whorls and the typical ornament of the species develops on the fourth or fifth whorl.

5. — The degree of impression of the suture varies considerably. It is often beaded and accompanied by a puckering of the whorls both above and below. It is sometimes white-margined.

6. — Colour varies considerably in most species, usually a pale ground colour with chestnut or horn-coloured flammules. The apex may be pink, orange, white or purplish, as may the aperture. Some species are very brightly coloured and weakly ornamented.

7. — The periostracum is usually thick and some shade of brown. Il is usually thinnest on the least strongly ornamented species.

10. ANATOMICAL CHARACTERS

The following characters are tentatively given as being of general occurrence but cannot be considered to be ubiquitous or diagnostic until many more species are dissected.

1. — The hermaphrodite gland is apical, multi-lobed and moss-like. It is connected by a fairly long, crenulate hermaphrodite duct to the inside of the lower end of the albumen gland, near the junction with the prostate gland.

2. — The prostate is large, coiled and variable. The outer region is lobed and the whole organ may be blade-like or circular in section.

3. — The oviduct is a short tube closely associated with the vas deferens and the spermathecal duct. Distally it swells out, gradually or suddenly and is inserted into the vagina.

4. — The spermatheca is a small pear-shaped sac attached to the outside of the lower end of the prostate. It is connected to the vagina by a thin spermathecal duct of the same general dimension, or slightly larger than the penis sheath.

5. — The vas deferens can be traced as a separate tube from the base of the prostate gland. It is a long, thin and generally tightly contorted tube. It continues down to the union of the penis sheath and the vagina at the genital atrium and then reverses its direction, being inserted in the penis sheath at approximately 1/3—1/4 the length of that organ up from the penial-vaginal union. Inside the penis sheath it is loosely held in place by strands of connective tissue and emerges proximally to continue to the proximal end of the penis.

6. — The penial retractor muscle is apparently always joined to the columella muscle complex near its base.

7. — The penis is a very large organ, as much as 4 times as long as the penis sheath. Near the proximal end it is doubled over on itself. This is apparently not due to preservation in alcohol for a very long period and is unexpected; contraction of the penial retractor muscle would seemingly only straighten out this bend and not until the straightening was completed would it withdraw the penis. The penis is so long that at this stage the penial retractor would in all probability be completely retracted. It is probable that ordinary extension and retraction of the penis in sexual activity is achieved by the musculature of the penis and the penial retractor is used, in conjunction with the columella muscle complex, to withdraw the whole lower body. The penis has its lower 1/3—1/4 inserted into the penis sheath where it is loosely connected to the sheath in the same way as the vas deferens.

8. — The penis sheath is a thin muscular organ covering the lower end of the penis and provided with circular muscle strands externally and longitudinal muscle strands internally. The nature of the musculature indicates that it could change shape considerably in life and may be useful as a specific character.

9. — The genital orifice is on the right hand side of the body below and behind the tentacles. It is inconspicuous, apparently surrounded by a sphincter muscle and leads into a short genital atrium. The walls of the lower ends of both the penis and the vagina are continuous with that of the genital atrium.

10. — The jaw is arcuate, gently curved or slightly angular and about 4 mm by 1 mm. It may be ornamented with both concentric and radial striae, radial ribs alone, or it may be almost perfectly smooth.

11. — The radula is large as might be expected. It is usually 4.5—5.5 mm across at the widest, and may reach 12.5 mm long or possibly more. The maximum number of teeth counted in one row was 124 and between 110 and 120 seems to be the usual number. The central tooth is very much reduced and the laterals grade imperceptibly into the marginals. The teeth are typically bicuspid with the inner cusp much reduced. In one species (*P. martensi* D'AILLY) it appears to be absent. The radula of *Pseudachatina* is very similar to the radulae of both *Achatina* and *Metachatina.*

11. TYPE MATERIAL

The authors consider themselves fortunate in the number of Types and Paratypes they have been able to examine personally. Types are preserved in the following institutions. All reproductions of these Types in this paper are produced with the permission of the authorities in charge of these institutions :

— British Museum (Natural History) (BMNH) :
Pseudachatina leaiana (GRAT.), Holotype.
Pseudachatina grandinata PFR., Holotype.
Pseudachatina granulata nov., Holotype.
Pseudachatina striata nov., Holotype.
Pseudachatina elongata PFR., Lectotype.
Pseudachatina vignoni (MORELET), Holotype.
Pseudachatina sodeni form *elegantula* nov., Holotype.

— Musée Royal de l'Afrique Centrale, Tervuren (MRAC) :
Pseudachatina nodosa PRESTON, Holotype.
Pseudachatina nodosa var. *eminens* PRESTON, Holotype.

— Senckenberg Museum, Frankfurt-am-Main (SMF) :
Pseudachatina nachtigali KOBELT, Holotype.
Pseudachatina wrighti buckholzi KOBELT, Lectotype.
Pseudachatina wrighti var. *buchneri* KOBELT, Lectotype.
Pseudachatina gravenreuthi KOBELT, Lectotype.
Pseudachatina gravenreuthi var. *preussi* KOBELT, Lectotype.
Pseudachatina rollei BLUME, Lectotype.

— Academy of Natural Sciences, Philadelphia (ANSP) :
Pseudachatina pyramidata kobeltiana PILSBRY, Holotype.
Pseudachatina daillyana PILSBRY, Holotype.

— Naturhistoriska Riksmuseum, Stockholm (RM) :
Pseudachatina connectens D'AILLY, Lectotype.
Pseudachatina martensi D'AILLY, Lectotype.

— Zoologisches Museum, Humboldt University, Berlin (ZMB) :
Pseudachatina pyramidata KOBELT, Lectotype.
Pseudachatina sodeni KOBELT, Lectotype.

— Musée d'Histoire Naturelle, Bern (MHNB) :
Pseudachatina gabonensis SHUTTLEWORTH, Lectotype.

— Zoologiska Institutionen, Uppsala (ZIU) :
Pseudachatina liljevalli D'AILLY, Lectotype.

The Holotypes of *P. pulchra* nov. and *P. connectens colorata* nov. are in the collection of C.R.C. PAUL and those of *P. wrighti minor* nov. and *P. connectens plicata* nov. are in that of T. PAIN. The former will eventually be deposited at Cambridge, the latter at Harvard.

The authors have failed to locate the Types of the following species and would be grateful to hear from anyone who knows their present whereabouts :

Pseudachatina perelongata ROLLE.
Pseudachatina guineensis HIDALGO.
Pseudachatina atapocochlioides DUPUIS.
Pseudachatina wrighti wrighti (SOWERBY).

In addition to the above, material has been examined in the following institutions :

National Museum of Wales, Cardiff (NMW);
Museum of the Dept. of Zoology, Cambridge University (CZM);
Birmingham Museum and Art Gallery (BMAG);
Museum of Comparative Zoology, Harvard (MCZ).

12. SYSTEMATIC DESCRIPTIONS

FAMILY ACHATINIDAE
SUBFAMILY ACHATININAE

Genus **Pseudachatina** ALBERS, 1850

(Genotype *Bulimus downesii* " Gray " SOWERBY 1841 = *Achatina leaiana* GRATELOUP 1839)

Pseudachatina ALBERS 1850, p. 192.
Pseudachatina H. & A. ADAMS 1855, **2**, p. 134.

Pseudachatina SHUTTLEWORTH 1856, p. 85.
Pseudachatina KOBELT 1893, p. 11.
Pseudachatina PILSBRY 1904, **16**, p. 205.

A. THE LEAIANA COMPLEX

Pseudachatina leaiana (GRATELOUP) 1839. Plate I, figs. 1, 4.

1839 *Achatina leaiana* GRAT, p. 416, pl. 2, fig. 7.
1841 *Bulimus downesii* GRAY in G.B. SOW. jun., fig. 99 (*).
? 1841 *Achatina downesii* PFR., p. 46.
? 1848 *Bulimus downesii* PFR., p. 15.
? 1850 *Pseudachatina downesii* ALBERS, p. 192.
1853 *Bulimus downesii* PFR., p. 301.
1855 *Pseudachatina downesii* H. & A. ADAMS, p. 134, pl. 75, fig. 1.
? 1855 *Pseudachatina downesii* PFR., p. 156.
1856 *Pseudachatina downesii* SHUTT., p. 85, pl. 9, figs. 3, 4.
? 1859 *Pseudachatina downesii* PFR., p. 597.
? 1860 *Pseudachatina downesii* ALBERS, p. 205.
? 1881 *Pseudachatina downesii* PFR., p. 266.
1893 *Pseudachatina downesii* KOBELT, p. 13, pl. 5, figs. 1, 6.
1904 *Pseudachatina downesii* PILS., p. 207, pl. 8, fig. 48.
? 1916 *Pseudachatina downesii* GERMAIN, p. 249, pl. 10, figs. 1, 2.
? 1924 *Pseudachatina downesii* BOFILL Y POCH & AGUILAR-AMAT, p. 7.
1951 *Pseudachatina downesii* ZILCH, p. 45.
1959 *Pseudachatina downesii* LOPEZ & ROCANDIO, p. 17, text-figs. 11-15, pl. 3, figs. 92, 93 (non figs. 90, 91 = *P. sodeni*).
(non *Pseudachatina downesii* D'AILLY, 1896 = *P. connectens rollei* BLUME, non *P. downesii* REEVE, 1848 = *P. sodeni* pars & *P. gabonensis* pars).

Types.

P. leaiana. Holotype, BMNH 1907.11.22.21.

P. downesii REEVE, 1848 = *P. Sodeni* pars & *P. gabonensis* pars.)
lost. BMNH 93.4.20.2. is from GRAY's collection and might conceivably be a syntype. If GRAY identified it himself it is the nearest anyone will get to under-

(*) G. B. SOWERBY jun. refers to fig. 99 as " *Bulimus downesii* GRAY ". This is the sum total information about the original figure. Most subsequent authors have referred the species to GRAY and we are following this precedent.

standing what GRAY meant by *Bulimus downesii*, as his figure bears only the vaguest resemblance to any form of *Pseudachatina*. This specimen is undoubtedly conspecific with the type of *P. leaiana*.

Type locality.

GRATELOUP stated that his specimen of *P. leaiana* came from Peru ! No locality was given for *P. downesii*. The authors therefore designate Fernando Po as the type locality on the grounds that several fine specimens have been collected there.

Original descriptions.

P. leaiana. — " Shell solid, conical-elongate, glossy, sub-pellucid; white with base reddish; with longitudinal obliquely waved wrinkles, some obscurely bifurcate; whorls 8, nearly flat except the apicals which are convex smooth and reddish; aperture obovate, white inside; lip reflexed, columella callous. Length 70-75 mm. Dia. 30-33 mm " (GRATELOUP, 1839, p. 416).

P. downesii. — No description was given by GRAY. The earliest description under this name, i.e. REEVE, 1848 is not of this species.

This is a moderately sized species for the genus with 7 1/2-8 flattened whorls which give the spire a regularly conical outline. The apex is covered with hair pits, giving way to spiral lineation on the 2nd whorl. The characteristic wrinkles commence on the 4th-5th whorls. The apex may be white, chestnut, pinkish or purplish in colour. The basic ground colour, under the brown periostracum which is lost, is whitish or yellowish and most shells have chestnut flammules. The wrinkles may be more concentrated near the sutures, which are hardly impressed at all. In the type the last whorl is vaguely keeled but the authors have seen examples with and without distinct keels. In general the shorter forms are more strongly keeled. The shell may become very solid in old individuals. The aperture is relatively small with the outer lip white and gently reflected. The columella is twisted and may be pink or white in colour.

Genital anatomy.

The authors have been unable to get any specimens of this species for dissection, however, there are published figures of the essential features in LOPEZ and ROCANDIO, 1959 (text-figs. 11-15). These figures give only a general picture but the marked penial enlargement, apparently characteristic of the genus, can clearly be seen. As remarked in the introduction LOPEZ and ROCANDIO referred all their specimens to the species *P. downesii* and from their figures on plate 3 the present authors believe at least two species are represented. It is possible therefore that the figures of the anatomy do not refer to this species. As these figures are not

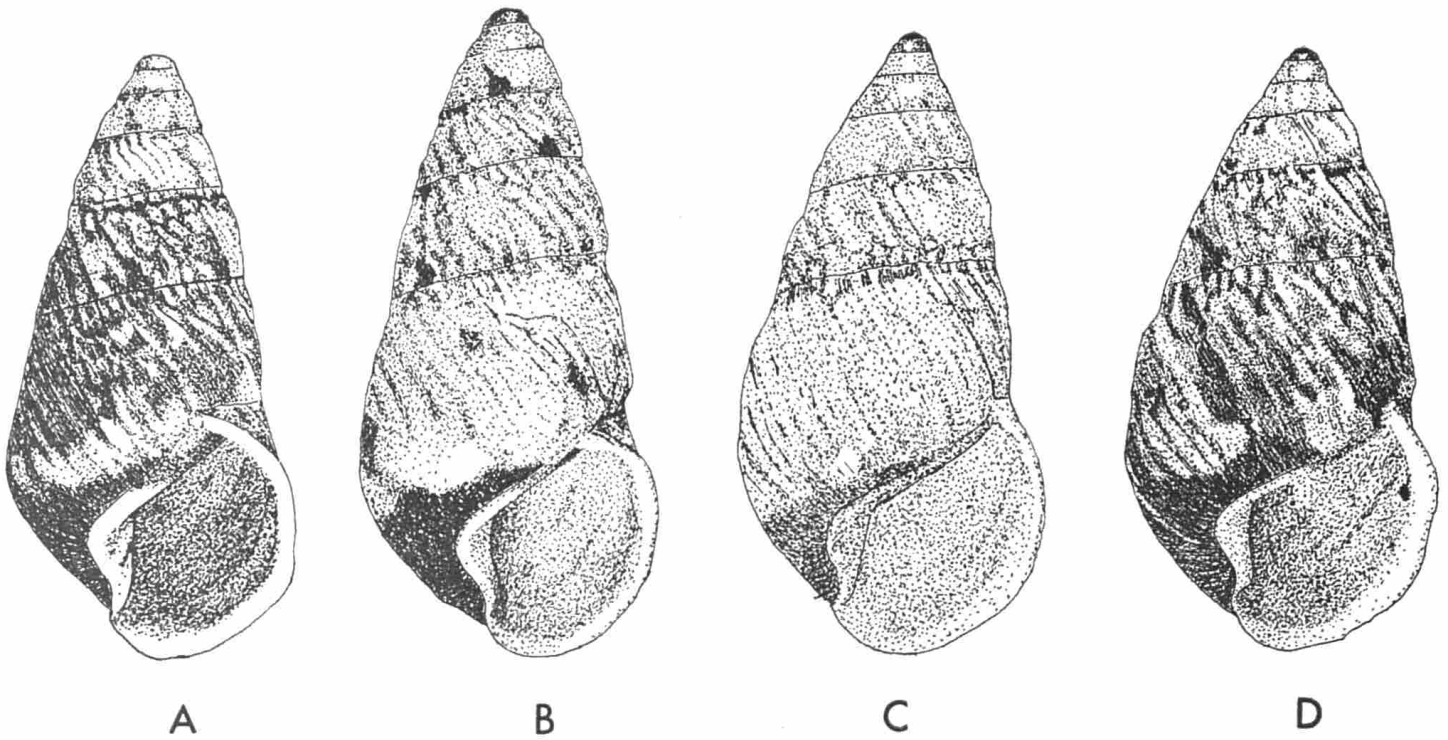


Fig. 1. — *Pseudachatina leaiana* (GRAT.). Four examples to show variation in shape and ornament. A. T.P. coll.; B. T.P. coll.; C. SHUTTLEWORTH coll., MHNB 102, Princes Is.; D. SAUL coll., CZM 689.

specifically recognisable when compared with other dissections it is best to regard the anatomy of this species as unknown until further material for dissection turns up.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype BMNH 1907.11.22.21	70.0	33.0	30.0	18.5	8
MRAC 495	64.0	31.0	27.0	16.5	8
T.P. coll.	69.5	31.0	27.0	17.0	8¼
CZM 689	63.5	32.0	29.0	17.5	7½
SHUTT. coll. MHNB 102	55.0	27.0	23.0	15.0	8
SHUTT. coll. MHNB 103	61.0	29.5	29.0	15.5	8

Specimens examined.

Gaboon (BMNH); Fernando Po (BMNH; LOPEZ & ROCANDIO coll. in lit.); Prince's Is. (MHNB); No loc. (T.P. coll., CZM, BMAG, BMNH).

Remarks.

There is no doubt in the minds of the present authors that *P. downesii* is a synonym of *P. leaiana*. Most early authors accepted this synonymy but used the later name. D'AILLY 1896, denied it but based his *P. downesii* on SHUTTLEWORTH's description and figure (SHUTT. 1856, p. 85, pl. 9, figs. 3, 4). The original of these figures is MHNB 105 and is rather atypical of the species, resembling a small *P. connectens* form *rollei* to which form all D'AILLY's specimens belong. PILSBRY, 1904 was uncertain as to the synonymy accepted here. As far as is known none of these authors saw the type of *P. leaiana* and so their opinions were based on figures and descriptions, which in the case of *P. downesii* are next to useless. In consequence there has been much mis-interpretation of this species and so the present authors have put a mark of interrogation against all references which could not be confirmed with specimens.

P. leaiana is in a complex of species which may be conveniently referred to as the "*leaiana* complex". Specimens in which the wrinkles are undeveloped are referred to *P. pyramidata* KOB., those with the wrinkles reduced and with injury marks are *P. martensi* D'AILLY. Larger specimens without a keel on the last whorl tend towards *P. sodeni* KOB., via the form *P. sodeni elegantula* nov. Some small fat specimens of *P. leaiana*, e.g. CZM 689 (text-fig. 1 D), are like small *P. sodeni* f. *elegantula* but without the flared lip that characterises that form. Specimens in which the wrinkles break up into granular ornament are referred to

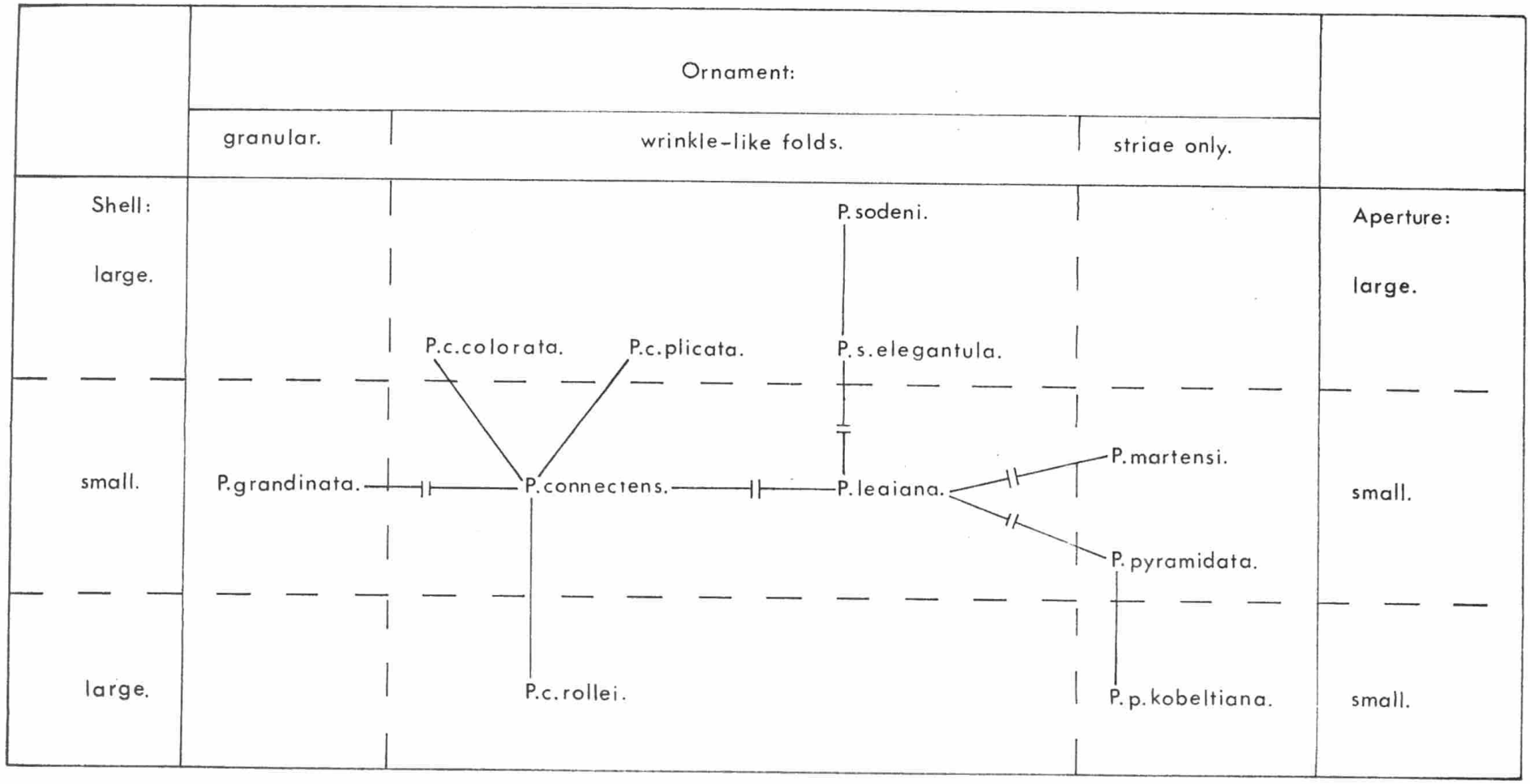


Fig. 2. — The supposed relationships of the various forms of the *leaiana* complex. This is based mainly on shell shape and ornament.

P. grandinata PFR., and *P. connectens* D'AILLY leads to several more forms less closely related to *P. leaiana.* This complex is very difficult to sort out taxonomically. LOPEZ and ROCANDIO seem to have " lumped " them all together under the one name *P. downesii* but this seems too extreme a vieff. The exact boundary between the species and forms recognised here is often very difficult to draw. Unfortunately ecological, anatomical and geographical information about this complex is almost entirely lacking and so the authors have had to base their taxa on as large a series of shells as was available. Something between 150 and 200 examples of forms from this complex have been seen. Preliminarily the authors recognise the scheme in fig. 2 which it is thought may represent genetic affinities and has hence become the basis for our classification of this complex.

Pseudachatina martensi D'AILLY, 1896. Plate I, figs. 5-6.

1896 *Pseudachatina martensi* D'AILLY, p. 95, pl. 4, figs. 7-9.
1896 *Pseudachatina liljevalli* D'AILLY, p. 98, pl. 5, figs. 1-2.
1904 *Pseudachatina martensi* PILSBRY, p. 215, pl. 6, figs. 30-32.
1904 *Pseudachatina liljevalli* PILSBRY, p. 216, pl. 2, fig. 4.

Types.

P. martensi Lectotype, RM Stockholm.
P. liljevalli Lectotype, ZIU Uppsala.

Type locality.

Itoki, Cameroons.

Original descriptions.

P. martensi. — " Shell imperforate, ovate oblong or turrited, solid closely and rather regularly plicate-striate. Under the scaley epidermis, which is generally lost from the upper whorls but frequently persists on the last near the aperture, it is shiny, whitish, or rose-fleshy, with darker apex, and very rarely ornamented with a few short reddish evanescent streaks above the suture of the median whorls; base blackish chestnut. Spire convexly conical or turrited, the apex obtuse. Whorls 7 1/2, the first four a little convex, smooth; following ones more or less flattened, impressed below the narrowly margined suture, irregularly, coarsely and distantly cristate-plicate or more rarely rather regularly set with distant conical tubercles above the suture. Last whorl behind, nearly half the length of the shell, more or less distinctly angular, the angle disappearing near the aperture. Aperture oblique, rounded-oval, whitish or whitish-fleshy inside, slightly pearly, the external basal brown zone showing through below. Peristome narrowly reflexed or flared-

reflexed, somewhat thickened, always white; margins joined by a whitish callus, which is thickened and opaque towards the columella, transparent towards the outer lip" (D'AILLY 1896, p. 95).

P. liljevalli. — " Shell imperforate, ovate-conical, thin but solid, lightly plicate-striate. Under a scaley epidermis, which is lost from the upper whorls and persistant near the aperture, it is shiny, fleshy-chocolate, the upper whorls blackish purple, marked with fine, superficial bluish white streaks, the median whorls sometimes ornamented with wide brown streaks, and narrower white ones; the last three whorls encircled with a wide whitish belt below the suture, last whorl encircled at the base with a blackish-chocolate zone, extending up the upper insertion of the lip. Spire convexly conical, the apex obtuse, with the usual sculpture. Whorls 7, parted by a suture narrowly margined by an impressed line, the first four whorls a little convex, nearly smooth, the rest flattened, impressed below the suture, more or less regularly roundly plicate-cristate, the plicae especially prominent below the sutural margin; last whorl nearly half the total length behind, distinctly angular, the angle disappearing towards the aperture. Aperture oblique, subround, tricoloured inside, showing the three colour zones of the exterior. Columella strongly twisted, obliquely truncate, white. Peristome narrowly reflexed, bordered with a whitish callus, the margins joined by a whitish callus, thickened and opaque near the columella, transparent near the outer lip" (D'AILLY 1896, p. 98).

The authors have been very fortunate in being able to examine Paratypes of *P. martensi* in alcohol and also one of the Syntypes of *P. liljevalli.* All the material seen of both species was retracted before preservation and the genitalia proved to be too contorted for useful measurements to be made, but a general idea of the anatomy could be obtained for both species. Drawings of these dissections are shown in text-figures 3 and 4.

P. martensi Paratype RM 023. — The apical genital organs are as in *P. gravenreuthi* and are typical of the genus as far as it is known. The spermatheca is a small sac placed at the outer side of the lower end of the prostate. It is connected to the vagina by a short narrow spermathecal duct which swells out distally and is inserted into the lower 1/4 of the vagina. At this point it is the same diameter as the vagina and the distal swelling is also the same length. The vagina is small for the genus as a whole, and tapers moderately into the oviduct. The penis is highly contorted in this example but was approximately 4 times the length of the penis sheath and the proximal end is somewhat bent back on itself though not as distinctly as in the other species dissected. The penial retractor originates in the apex of the penis and is inserted at the base of the columella muscle complex. The interior of the penis is papillated except near the base where there are many longitudinal muscle fibres. Apparently the penis is thinner within the penis sheath than above it, but this might be preservational in origin.

The jaw and radula.

The jaw figured is about 4 mm wide and arcuate with two slight angles marking two lateral portions and a median portion. It is almost perfectly smooth but 2 others dissected show the striae and ridges of the other species. The widest portion is median and is about 1 mm wide. The radula is typical of the genus with a degenerate central and laterals merging imperceptibly into marginals. There were at least 40 teeth on either side of the central which is less than in other species known.

P. liljevalli Syntype ZIU. — The apical genital organs are similar to those of all other known species and the only difference from those of *P. martensi* is that the prostate is shorter and the lobation more regular in outline. The significance of this is unknown. The spermatheca is similar in shape, size and position to that of *P. martensi* and is connected to the vagina by a short thin spermathecal duct which swells out distally into an organ slightly larger than the vagina and inserted into the basal 1/4 of the vagina. The vagina is small and tapers gradually into the oviduct which is short. The penis is only 2 1/2 times the length of the penis sheath and merges into the penial retractor muscle proximally. The penis sheath is longer and narrower in the present species than in *P. martensi* but this is almost certainly due to the retraction as is the different ratio of penis length to penis sheath length. The vas deferens is very similar in shape and size in the two species and is inserted in the penis sheath 1/4 of the way up that organ.

The radula and jaw.

The jaw is about 3 mm across, arcuate, and striated in the same way as the two jaws of *P. martensi* not figured. It has two short unstriated portions laterally. The radula is typical with more than 60 teeth in a row, again less than in the other two species dissected.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
P. martensi Lectotype, RM, Itoki, Cameroons	72.0	33.0	31.0	19.0	7¾
P. martensi Paralectotype, RM, Itoki, Cameroons	63.5	28.5	26.0	15.0	7½
P. martensi Paralectotype, RM, Itoki, Cameroons	67.5	32.0	27.0	18.0	7½
P. martensi Paralectotype, MRAC 97369, Cameroons	59.0	29.5	26.5	15.0	7¼
P. martensi Paralectotype, BMNH 1937.12.30.3678	53.0	26.5	23.5	19.0	7¼
P. liljevalli Lectotype, ZIU	51.0	26.5	22.0	15.0	7½

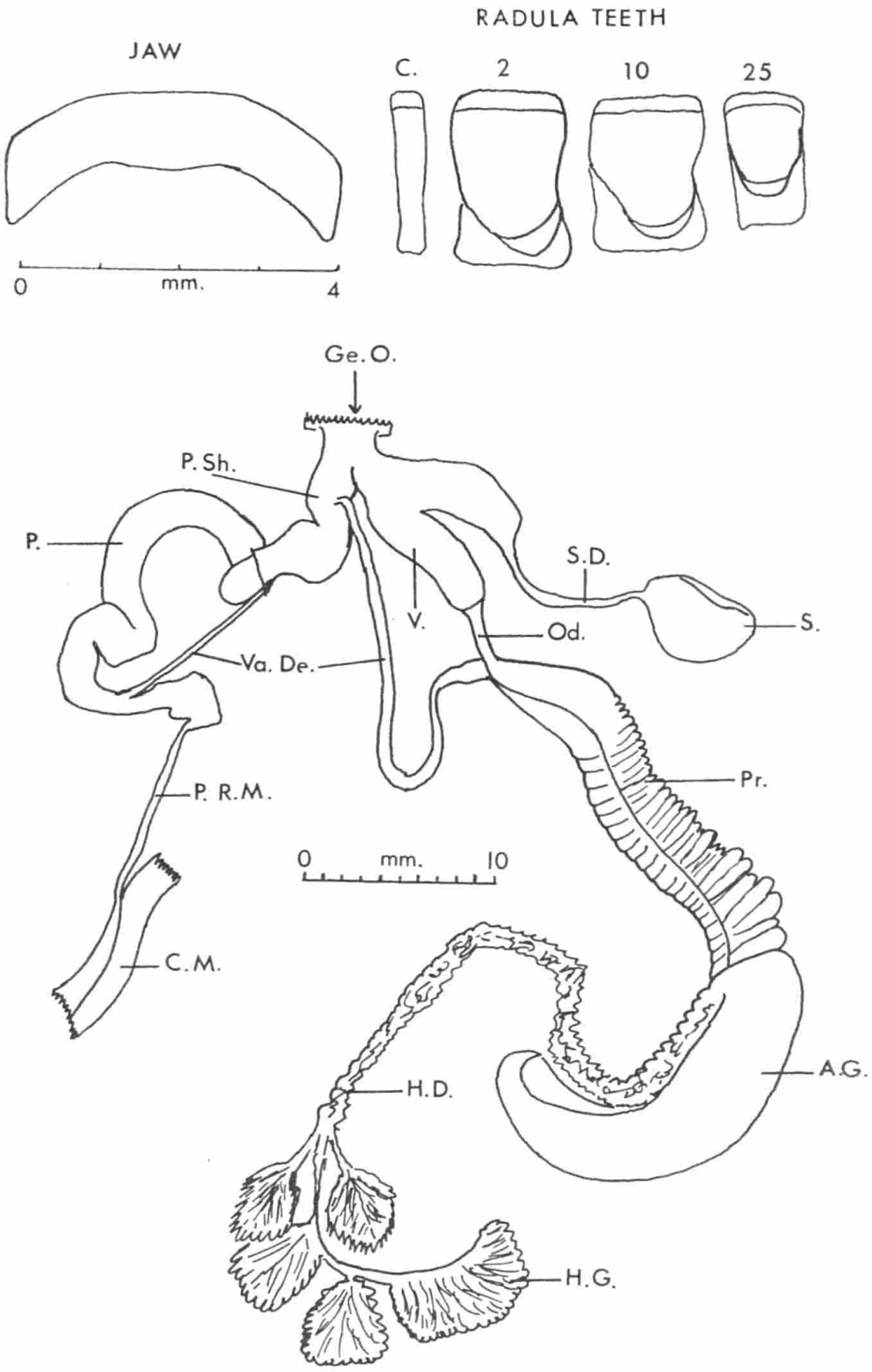


Fig. 3. — *Pseudachatina martensi* D'AILLY. Anatomy. RM 023, Paratype. Genital anatomy X 2.5, jaw X 10, radula teeth c. X 300. A.G. : Albumen gland; C.M. : Columella muscle complex; Ge.O. : Genital orifice; H.D. : Hermaphrodite duct; H.G. : Hermaphrodite gland; Od. : Oviduct; P. : Penis; P.R.M. : Penial retractor muscle; P.Sh. : Penis sheath; Pr. : Prostrate; S. : Spermatheca; S.D. : Spermathecal duct; V. : Vagina; Va.De. : Vas deferens.

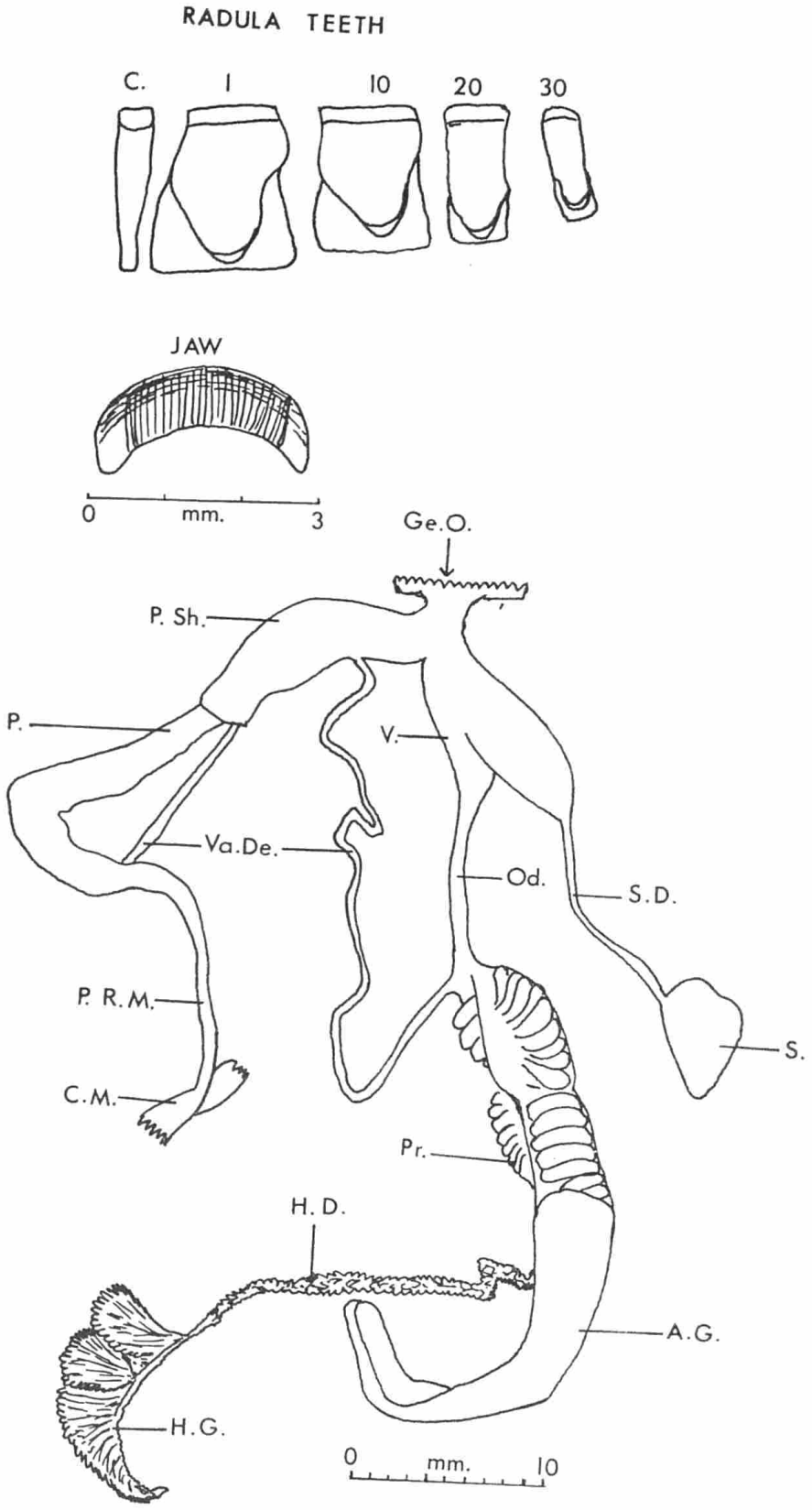


Fig. 4. — *Pseudachatina liljevalli* D'AILLY. Anatomy. ZIU, Syntype. Genital anatomy X 2.5, jaw X 10, radula teeth c. X 300. Symbols as in text-figure 3.

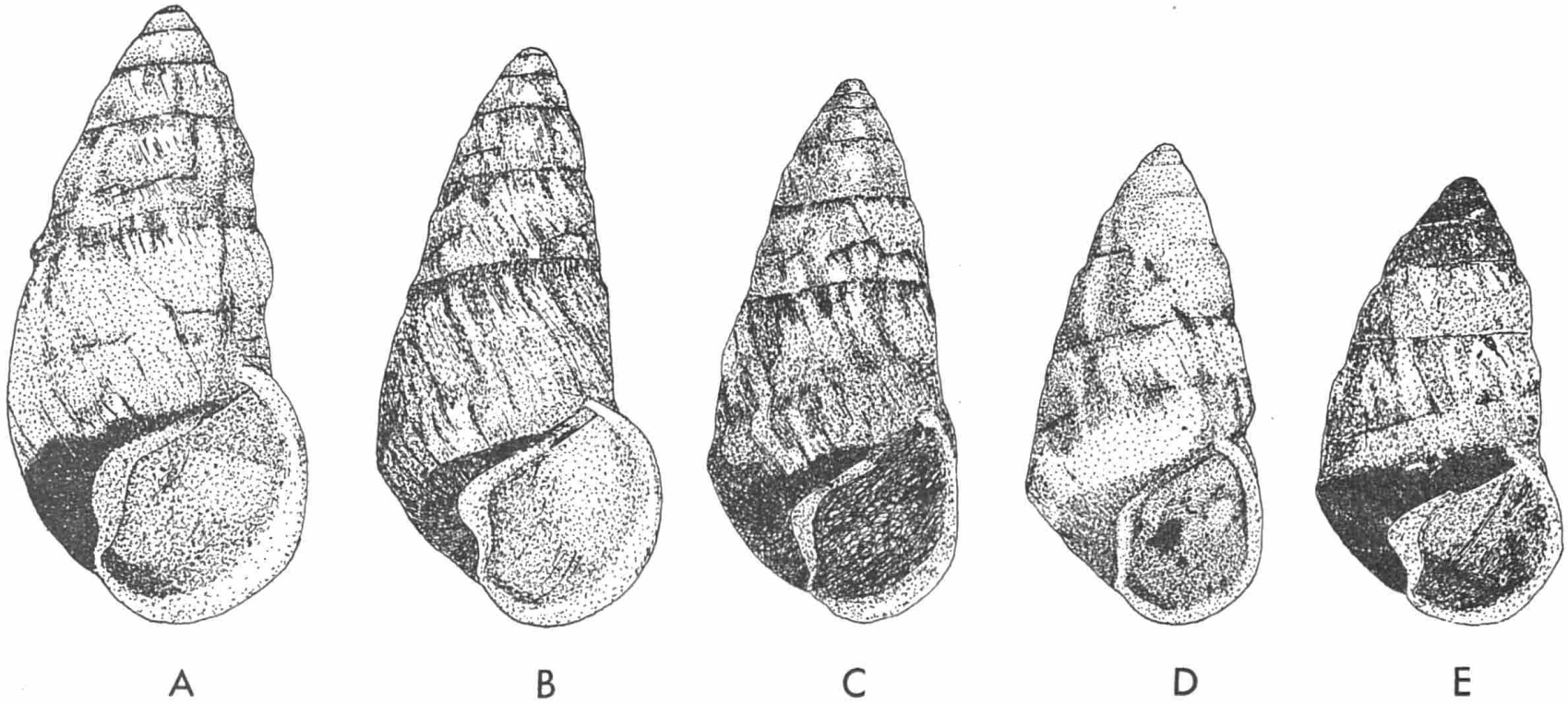


Fig. 5. — *Pseudachatina martensi* D'AILLY. Five examples to show transition from *P. martensi* to *P. liljevalli.* A. Lectotype of *P. martensi,* RM, Itoki, Cameroons; B, C & D. Paralectotypes of P. *martensi,* RM, Itoki, Cameroons; E. Lectotype of *P. liljevalli,* ZIU, Cameroons.

Specimens examined.

Itoki, Cameroons (RM, T.P. coll.); Etomé, Cameroons (RM); No loc., Cameroons (RM, MRAC, BMNH, ZIU (*P. liljevalli*).

Remarks.

Text-figure five shows a gradation in shell size from the Lectotype of *P. martensi* (fig. 5A) to the Lectotype of *P. liljevalli* (fig. 5E). There is no significant difference in shell characters between the two species and the only noticeable difference is in the colour of *P. liljevalli;* a very unreliable character. The anatomy differs in one or two points but again these apparently have no significance. The authors have therefore concluded that the two species are synonymous and *P. martensi* takes precedence being described earlier in D'AILLY's work than *P. liljevalli.*

P martensi is a distinct species if only because of the injury marks on the lower whorls. At first the present authors were inclined to regard it as simply an injury form of *P. leaiana,* to which it is probably most closely related. The discovery of the large number of identical specimens in the Stockholm collections however, showed that the species was not based on a few aberrant injured specimens. One can only speculate as to what aspect of this species' life causes it to be injured several times before reaching maturity. The normal habitat of *Pseudachatina* is said to be arboreal so there is a ready explanation of how the injuries could be caused but why they should be so consistently present in this species and generally absent in all the others remains a mystery. This is a particularly regrettable case of our lack of ecological information as it would appear to be of special interest.

Pseudachatina grandinata PFEIFFER, 1857. Plate II, fig. 1.

1857 *Pseudachatina grandinata* PFR., p. 257.
1859 *Pseudachatina grandinata* PFR., p. 598.
1881 *Pseudachatina grandinata* PFR., p. 267.
1893 *Pseudachatina grandinata* KOBELT, p. 23, pl. 12, fig. 2.
1904 *Pseudachatina grandinata* PILS., p. 209, pl. 3, fig. 7.
(non *P. grandinata* D'AILLY 1896 = *Pseudachatina connectens* from *rollei* BLUME.)

Type.

Holotype, BMNH 196551.

Type locality.

No type locality was designated by PFEIFFER. The type is said to have come from Gaboon but as there are two excellent specimens from Kribi, Cameroons; the authors are designating that as type locality.

Original description.

" Shell oblong-turrited, fairly solid, densely and irregularly granulated, white; spire elongate, apex obtuse, brown; suture weakly impressed; whorls 7 1/2 the first 3 1/2 smooth, flesh-coloured, convex, following distinctly flattened, last scarcely 1/3 the length, below the periphery blackish, compressed below; columella compressed, weakly twisted, obliquely subtruncate, white; aperture oblique, rounded-oval, peristome scarcely thickened, slightly expanded, white, margins joined by a thick white callus, the right [outer lip] strongly arcuate, weakly produced basally " (PFEIFFER, 1857, p. 257).

This species has a most distinctive ornament of granules throughout the lower three whorls which are almost perfectly cylindrical in outline, the spire then tapering rapidly to the brown apex. In the type the majority of the shell is white but in the specimens from Kribi with the periostracum preserved the ground colour is light horn-coloured. The aperture is entirely white and there is the usual thin subtransluscent band in the parietal callus below the insertion of the outer lip, which is scarcely reflected.

Genital anatomy.

This remains unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, BMNH, ?Gaboon	79.0	35.0	31.0	19.0	8¼
T.P. coll., Kribi, Cameroons (ex PRESTON).	73.0	34.0	32.0	18.5	7½
MRAC 497, Cameroons (ex PRESTON) ...	69.0	33.0	29.5	17.0	7¾

Specimens examined.

Kribi, S. Cameroons (MRAC, T.P. coll.); 25 miles inland from Kribi (MRAC), Gaboon (Type) (BMNH).

Remarks.

This species has been confused in the past mainly due to PFEIFFER's habit of not figuring his new species. The type was however figured in KOBELT (1893). This species is very close to *P. leaiana* and, in particular, *P. connectens* from some forms of which it can only be distinguished by its granular sculpture and cylindrical

outline. It is because these two features are apparently constant that we nave retained this as a separate species. It is possible that *P. connectens* is only a form of this species however. Too few specimens have been seen to settle this point.

Pseudachatina pyramidata KOBELT 1893. Plate III, fig. 2.

1893 *Pseudachatina downesii* var. *pyramidata* KOBELT, p. 16, pl. 8., figs. 2-3.
1904 *Pseudachatina pyramidata* PILSBRY, p. 210, pl. 4, figs. 14-15.

Type.

ZMB, Lectotype.

Type locality.

Unknown.

Original description.

" The shape is almost strictly conical. The sculpture consists of rather regular, oblique riblets, with no trace of tubercles; but on the median whorls is a girdle beset with little knots above the suture, bounded by a distinct groove above. The last whorl is visibly angular with a few incised spiral furrows, and scarcely any markings; whilst the upper whorls are chequered with red and white as in *buckholzi*. The aperture is yellowish-white, bluish below; the callus with a distinct band above; the peristome reflexed and bordered with brown " (KOBELT 1893, p. 16).

Genital anatomy.

The genital anatomy is totally unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
MRAC 504	68.5	32.5	29.5	18.0	7¾
T.P. coll., Gaboon	68.5	32.5	29.0	18.0	7¾
BMNH (ex ROLLE), Gaboon	57.0	27.0	24.0	14.0	7¼
BMNH 1904.12.13.6 Nr. Efulens, Cameroons	69.0	33.0	31.5	16.5	7½
BMNH, R. Gaboon	70.0	30.5	29.5	14.5	7¾
BMNH, R. Gaboon	67.0	32.0	29.5	15.5	7¼
BMNH, R. Gaboon	71.0	31.5	29.0	16.0	8

The last three are labelled "As var. beta., Mon. Hel. Viv. 6.p. 206" in PFEIFFER's handwriting.

Specimens examined.

Gaboon (T.P. coll., BMNH, MRAC); Nr. Efulens, Cameroons (BMNH).

Remarks.

This is a very distinctive little species. The very regularly conical outline of the spire and the distinctive chestnut colouring serve to separate it immediately from all other species in the *leaiana* complex. It is almost smooth and highly polished when the periostracum is not preserved. This latter quite alters the appearence of the shell as it is very thick and fibrous. It is the same deep chestnut as the lower whorls.

Pseudachatina pyramidata form **kobeltiana** PILSBRY. Plate III, fig. 3.

1904 *Pseudachatina pyramidata kobeltiana* PILSBRY, p. 210, pl. 7, fig. 37.

Type.

Holotype, ANSP 58063.

Type locality.

Near Efulens, Cameroons.

Original description.

"Large and solid, elongate, with conspicuously convex lateral outlines. *Surface smoothish,* with no tubercles, ribs or waves. Last two whorls rich red-chestnut, with *a conspicuous white band below the suture,* the base darker. Preceeding three whorls decorated with broad red-brown flames on a nearly white ground, the apex purple. Whorls fully 8 1/2, slightly convex, impressed and weakly plicate below the suture, and with a convex girdle limited by a furrow above it. Last whorl indistinctly angular in the middle. Aperture oblique, white within, *outer lip broadly expanded and reflexed, widely brown bordered.* Columella and *parietal callus opaque* white, the latter not noticeably thinned out near the outer lip" (PILSBRY 1904, p. 210).

Genital anatomy.

The genital anatomy remains totally unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
BMNH 1904.12.13.5 Nr. Efulens, Cameroons	87.0	36.5	36.0	19.5	8¼
Holotype, ANSP	92.5	35.0	38.0	20.5	8½

Specimens examined.

Holotype and Efulens (BMNH).

Remarks.

This too, is a very distinct form and quite obviously very close to *P. pyramidata.* The only well localised specimen was collected along with a specimen of the typical form of *P. pyramidata* and so there is no geographical evidence to support retaining it as a sub-species. It is possible that it may have a different ecology and as it is so readily separated from the typical form of the species the authors have retained the name. The italics in the description are original.

Pseudachatina sodeni KOBELT 1893. Plate I, fig. 3.

1848 *Bulimus downesii* RVE (non GRAY), pl. 29, fig. 177a (non fig. 177b).

1876 *Pseudachatina downesii* v. MARTS. (non GRAY), p. 259, pl. 2, fig. 3.

1893 *Pseudachatina downesii* var. *sodeni* KOB., p. 16, pl. 8, fig. 1.

1893 *Pseudachatina downesii* KOB. (non GRAY), pl. A, fig. 1.

1896 *Pseudachatina sodeni* D'AILLY, p. 20, pl. 4, fig. 6.

1904 *Pseudachatina sodeni* PILS., p. 209, pl. 4, figs. 18-19.

1916 *Pseudachatina sodeni* GERMAIN, p. 101.

1921 *Pseudachatina sodeni* DAUTZENBERG, p. 104.

1959 *Pseudachatina downesii* LOPEZ & ROCANDIO (non GRAY), p. 27, pl. 3, figs. 90-91.

Type.

(ZMB), Lectotype.

Type locality.

Unknown.

Original description.

" Thin, very large and richly coloured, the sculpture composed more of continuous ribs, often forked above and below, than of warts. The last whorl measures 44 mm high behind, is smooth, streaked with reddish-brown, the streaks not confluent at the base. The columella has only a thin transluscent deposit. Throat livid bluish-red, the thin expanded peristone brownish and only quite lightly thickened within. The columella is not truncated as in typical " *downesii* ", but tapers obliquely. A second specimen also in the Berlin Museum is thicker, with peristome more obese, and measures 95 by 46 mm but otherwise quite similar " (KOBELT 1893, p. 16).

This is the largest species of the genus and examples commonly exceed 100 mm in height. The outline of the spire is regularly conical and the apex purplish or occasionally yellowish. The ornament is very irregular and consists mainly of vermiform ribs. The sutures are not usually puckered nor strongly impressed and the last whorl is devoid of a keel. The whorls of most examples are indistinctly flammulated with chestnut on a white or yellowish ground but some examples are richly coloured like the type. The aperture is large and in our experience invariably tinged yellow within. The columella is twisted and weakly truncated. The outer lip is flared and thickened with callus. The parietal callus is thick and yellow with the usual transluscent band below the insertion of the outer lip. In this respect the description of the type is misleading as the type appears to be somewhat immature. There is a relatively thin horn coloured periostracum and the shell in old individuals is very thick and heavy.

Genital anatomy.

The genital anatomy is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Lectotype (from lit.)	95.0	44.0	—	—	—
BMNH 1928.5.8.47, Victoria, Cameroons.	90.5	40.0	41.5	23.5	8¼
BMNH 1937.12.30.3682, Cameroons (ex SJÖSTEDT)	111.0	43.5	45.5	24.0	8½
BMNH 1937.12.30.3683, Cameroons (ex SJÖSTEDT)	90.0	38.0	21.0	21.0	8½
T.P. coll. (apex damaged)	113.0	44.5	44.0	27.5	—
ZIU, Isowi, Cameroons (ex JUNGNER)	101.5	42.5	42.5	25.5	8¼
RM, Etomé, Cameroons (ex DUSÉN)	103.0	45.0	45.5	26.5	8¾

Specimens examined.

Victoria, Cameroons (BMNH); Etomé, Cameroons (RM, MRAC); Isowi, Cameroons (ZIU); Cameroons (T.P. coll., RM); Fernando Po (BMNH); Gaboon (BMNH). It is also recorded from Yaoundé, Cameroons by DAUTZENBERG, 1921.

Remarks.

P. sodeni is at first sight merely a very large form of *P. leaiana* but it differs in having a proportionately larger aperture with a more strongly reflected outer lip and in always having a yellow aperture. The shell is also much thicker and heavier than in typical *P. leaiana.* There can be no doubt that this is a distinct species but in the form *elegantula* nov., described below there are specimens which differ from *P. leaiana* only in having a very large aperture. These two species

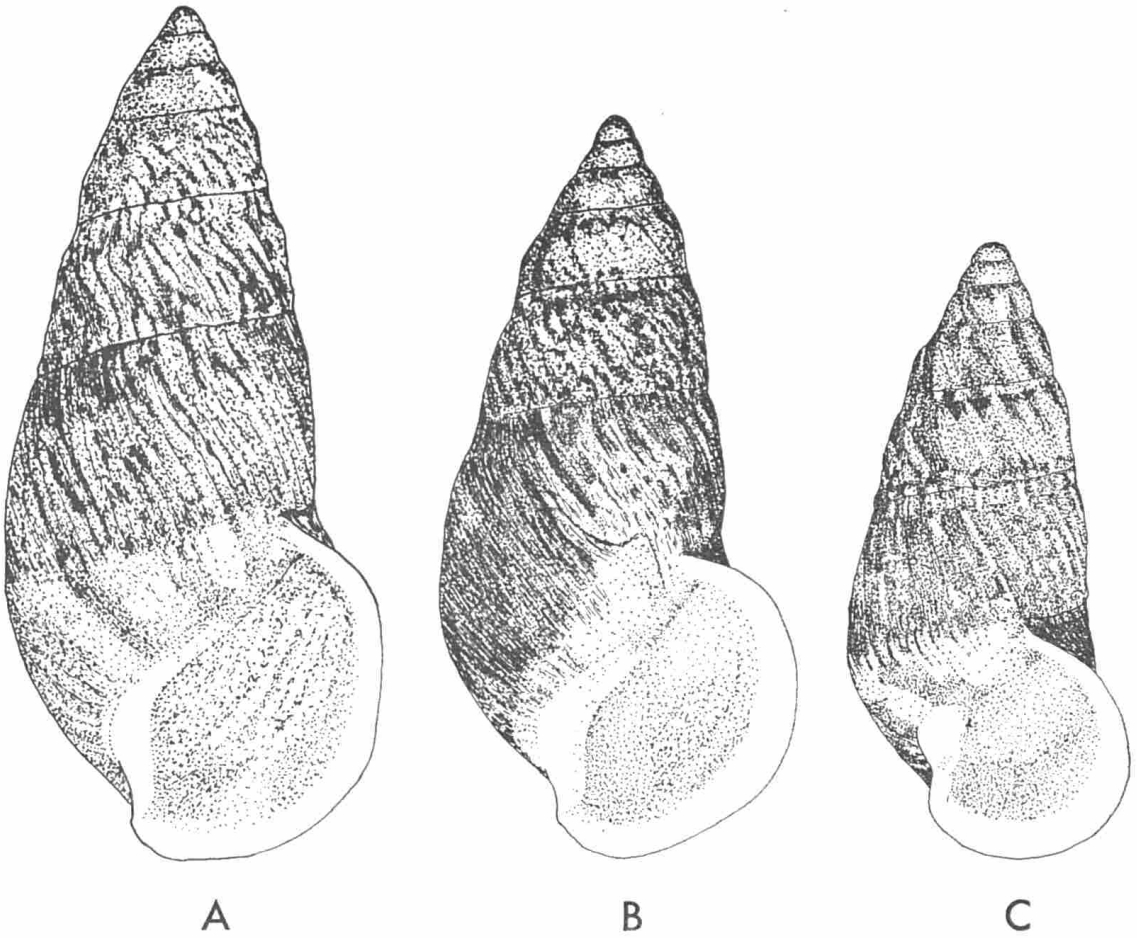


Fig. 6. — *Pseudachatina sodeni* KOBELT and *P. sodeni* f. *elegantula* nov. Three examples to show transition from typical *P. sodeni* to f. *elegantula.* A. Typical *P. sodeni,* RM, Isowi, Cameroons; B. Smaller typical *P. sodeni,* RM, Isowi, Cameroons; C. f. *elegantula,* Paratype, T.P. coll. Compare C with text-figure 1.

are obviously closely related and together with the various forms of *P. connectens* they form the core of the "*leaiana* complex" within which the limits of the forms are almost impossible to be certain of. Undoubtedly future workers will differ from our interpretation in at least the same degree as we differ from previous interpretations. However, there does not seem to be sufficient ground for assigning the variety of forms to one very variable species.

Pseudachatina sodeni form **elegantula** nov. Plate I, fig. 2.

Type.

Holotype, BMNH 1904.5.7.26.

Type locality.

Santa Isabella, Fernando Po.

Original description.

A form of *P. sodeni* with less thick and solid shell, with weaker ornament and smaller in size. The outline of the spire is very regular and similar to that of typical *P. leaiana.* It has in general very much weaker ornament often reduced to longitudinal striae only, as in the type, and the aperture is less flared and less brightly coloured. However the aperture retains the characteristics of *P. sodeni* sufficiently for it to be distinct from large examples of *P. leaiana. P. sodeni* grades into *P. leaiana* through this form but the gradation is incomplete in that the apertures are always distinct.

Genital anatomy.

This is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype	77.5	38.5	35.0	20.5	8¼
Paratype, Gaboon, BMNH 1937.12.30.3672	74.0	36.0	34.0	20.5	7¾
Paratype, Victoria, Cameroons, BMNH	86.5	44.5	40.5	25.5	8¼
Paratype, Etomé, Cameroons, RM (ex Dusén)	89.0	43.0	41.0	26.5	8¼

Specimens examined.

Etomé, Cameroons (RM); Victoria, Cameroons (BMNH) (ex ROLLE); Cameroons (RM); Gaboon (MRAC, BMNH); Fernando Po (MRAC, BMNH); Prince's Is. (BMNH); no locality (MCANDREW coll., CZM, T.P. coll., C.P. coll., T.E. CROWLEY coll.).

Remarks.

Little can be added to the remarks on the nominate race. This is apparently quite a distinct form and it differs mainly in the weaker development of the features characteristic of the nominate race and small examples come very close to *P. leaiana.* Text-figure 6C shows a small example of this sort. The remaining specimens show the gradation to typical *P. sodeni* (fig. 6A).

Pseudachatina connectens D'AILLY 1896. Plate II, fig. 2.

1896 *Pseudachatina dennisoni* var. *connectens* D'AILLY, p. 92, pl. 4, figs. 1-3.

1904 *Pseudachatina dennisoni* var. *connectens* PILS., p. 211, pl. 3, figs. 11-13.

Type.

The adult specimen figured by D'AILLY is in Stockholm (RM) and is selected as Lectotype. This specimen is very atypical of the species and hence the present authors have figured one of the Paralectotypes also in the collection at Stockholm.

Type locality.

Bomana, Cameroons.

Original description.

" Upper whorls and apex flesh-coloured, peristome flesh or roseate, or sometimes white, the columella pure white; rest of the shell of a more or less deep rose, brown or nearly white. The suture is usually margined by an impressed line. The last whorl may be rounded, as in REEVE's figure (*P. dennisoni,* fig. 177b), but at the other end of a series of forms it is strongly angular, as in the shell figured (fig. 11). The base in all the specimens has a dark fleshy-brown

zone, more or less sharply defined at its upper edge, which is not visible above the suture. The sculpture is composed of coarser ribs, here and there broken into tubercles, and chalky white at the summits" (D'AILLY 1896, p. 92).

The shells of the typical form of this species are very variable in shape colour and ornament. The outline of the spire is more distinctly shouldered than in any other species and for the size of the shell the sculpture is stronger and coarser than on any other species. The shell is quite thick and solid and is covered with irregular vermiform ribs which rarely break up into granules. The aperture is moderate, well rounded, and with a strongly reflected outer lip. The aperture may be a variety of colours but the columella is usually bluish-white. The body of the shell is usually a brown or horn colour but several examples have the bright red or rose colour mentioned in the original description. The periostracum is moderately thick and dark brown in colour.

Genital anatomy.

The apical genital organs are much the same as in *P. gravenreuthi* and a full account of these is given under that species. These organs are of little diagnostic value as they vary according to the sexual state of the animal at the time of preservation. The difference in the prostate in the two specimens dissected was probably due to this cause. Both the specimens dissected were from the RM collections and the bottles containing them also contained shells which could be attributed to this species. The vagina in RM 018 (not figured) was abruptly truncated proximally and tapered gradually below the insertion of the spermathecal duct. It was 20 mm long and 3-3.5 mm at its widest. The spermathecal duct was inserted nearly half way up the vagina and was nearly as wide as the vagina at that point. The penis sheath was 12 mm long and the vas deferens inserted at a quarter of its length from the genital atrium. The penis sheath diameter was 4 mm but this would have been increased due to the body being retracted before preservation. The penis was 48 mm long and the first 15 mm doubled back on itself. The diameter was 2.5 mm. The wall of the penis sheath was 1 mm thick but this too is due to retraction The papillae on the inside of the retracted penis are coarser and longer than those of *P. gravenreuthi* and the longitudinal grooves were less distinct.

The jaw and radula.

The jaw is very distinctly arcuate with two distinct angles marking the central portion from the lateral portions. There are fine striae running concentrically and ridges in an anterioposterior direction. These ridges are strongest at the lateral angles but become as fine as the concentric striae at the margins. There is a distinct group of ridges centrally and the regions on either side of this are smoother. The radula differs in no important respect from that of *P. gravenreuthi.* The laterals and marginals are if anything even more indistinctly bicuspid.

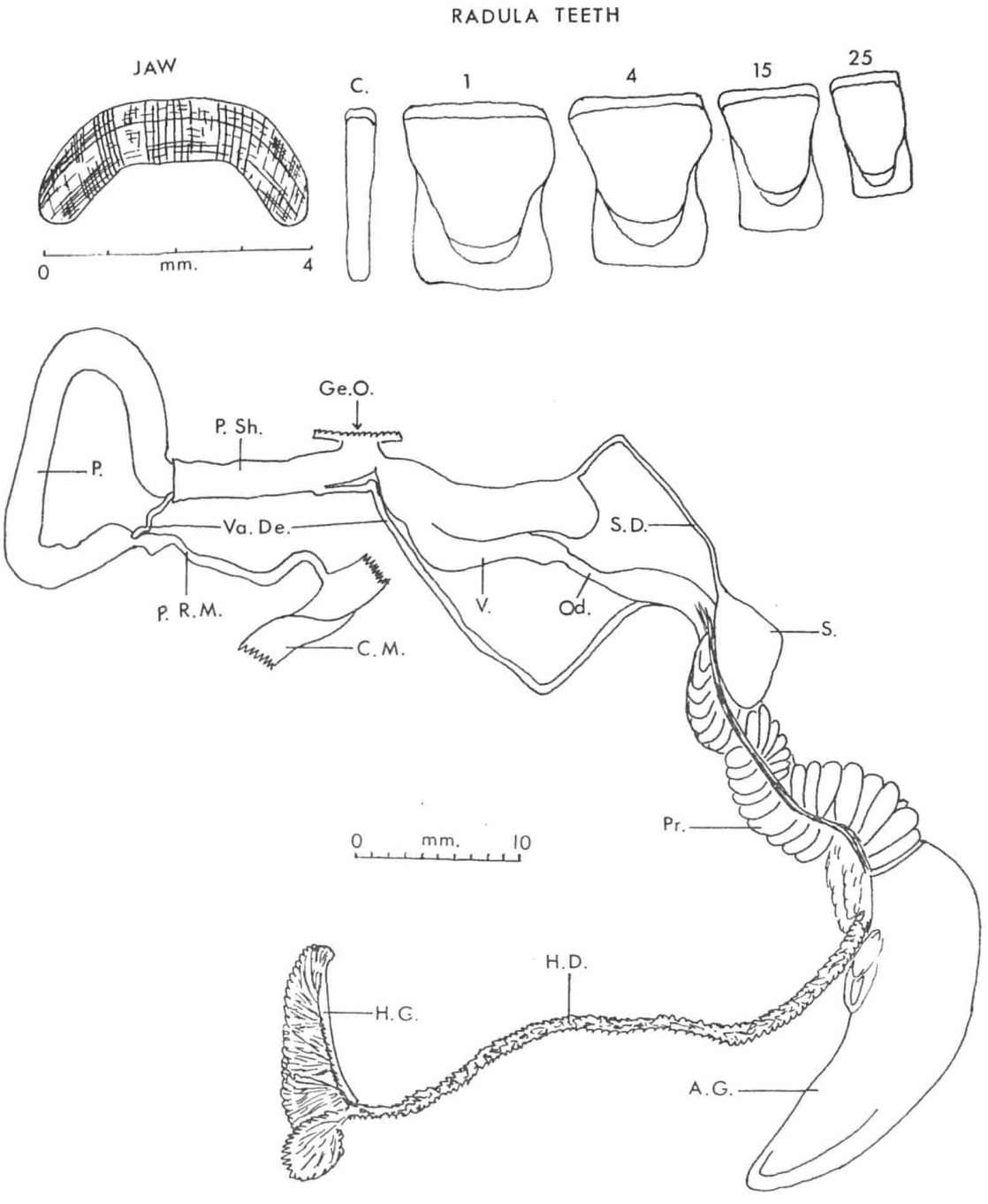


Fig. 7. — *Pseudachatina connectens* D'AILLY. Anatomy. RM 022 (genital anatomy) & RM 018 (jaw & radula). Genital anatomy X 2.5, jaw X 10, radula teeth c. X 300. Symbols as in text-fig. 3.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Lectotype, Bomana, Cameroons, RM	73.0	37.5	33.0	22.0	7½
Paralectotype, Bomana, Cameroons, RM	88.0	36.5	35.5	21.5	8¼
Paralectotype, Bibundi, Cameroons, RM (plate II, fig. 2)	77.5	35.5	34.0	20.5	7½
Paralectotype, Bonge, Cameroons, ZIU .	71.5	34.0	30.5	20.0	7½
Paralectotype, Isowi, Cameroons, ZIU...	70.0	35.5	30.5	17.5	7¾
Paralectotype, Isowi, Cameroons, ZIU...	70.5	35.5	32.0	20.5	7¼

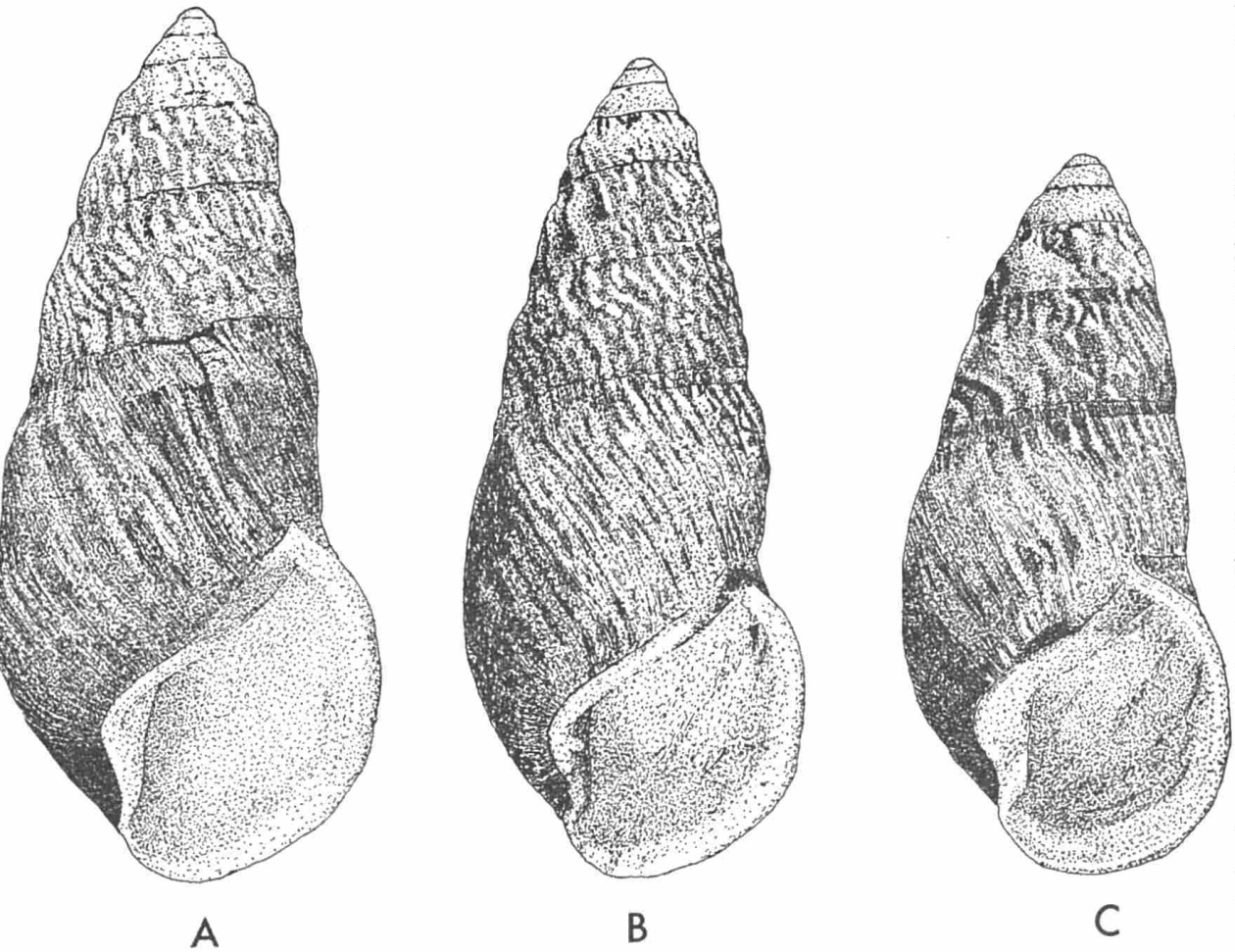


Fig. 8. — *Pseudachatina connectens* D'AILLY. Three typical examples. Compare with D'AILLY's type (D'AILLY 1896, pl. 4, fig. 1.) and text-figures 9 and 10. A. & B. Paratypes, RM, Bomana, Cameroons; C. Paratype, RM, Bibundi, Cameroons.

Specimens examined.

Bibundi, Cameroons (RM, ZIU); Isowi, Cameroons (ZIU); Bomana, Cameroons (RM); Bonge, Cameroons (ZIU); Old Calabar (MHNB); Gaboon (BMNH); no locality (T.P. coll.).

Remarks.

D'AILLY chose a very apt name for this species since it appears to be connected to all the other forms in the "*leaiana* complex" which have irregular ribbing. This species has no connection at all with *P. dennisoni* (= *P. gabonensis*) but the specimen figured by D'AILLY is very similar in outline to the specimen figured by REEVE (1848, fig. 177b) and referred to by PFEIFFER (1857, p. 257) as *P. dennisoni*. This is almost certainly what led D'AILLY to describe the present species as a variety of *P. dennisoni*. As remarked earlier the type is very atypical and so we have figured a more typical example for comparison. Textfigure 8 shows three fairly typical examples with coarse irregular ribbing.

Pseudachatina connectens form **colorata** nov. Plate II, fig. 3.

1963 *Pseudachatina elongata* (pars) PAUL (non PFFR.), p. 200.

Type.

Holotype, C.P. coll.

Type locality.

All the known specimens of this species have been imported into Great Britain with bananas and are believed to have come from Likomba Plantation, Nr. Tiko, S. Cameroons. As this cannot be directly confirmed no type locality is designated.

Original description.

A moderate species with a fairly regular taper to the spire and a strongly reflected lip tinged pink or purplish. The apex is pink, orange or purple with the usual pitted sculptured and the colouring becomes fainter on the next two whorls. These are ornamented with fine longitudinal and spiral striae and flecked and flammulated with both chestnut and white marks on a pale ground. From the third and fourth whorls on distinct oblique striations and strong plications appear and the flammules become stronger in the more strongly coloured examples. The last whorl or, in the type the last two, are almost unicolourous pale chestnut with a darker band below the periphery on the last. The periostracum is moderately thick, filamentous, and brown in colour. The aperture is relatively large as in *P. sodeni* but the outer lip is always a pinkish or purple colour never

yellow. The parietal callus is white or bluish-white in the purple examples. The columella is slightly twisted and distinctly truncated and there is the usual translucent band in the parietal callus below the insertion of the outer lip.

Genital anatomy.

So far this remains unknown as all the examples died before coming into the authors' hands.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, C.P. coll.	82.5	39.5	39.0	22.0	8
Paratype, T.P. coll.	73.0	37.0	35.0	21.5	7½
Paratype, BARTHOLOMÉ coll.	81.0	37.5	36.5	20.0	8
Paratype, BARTHOLOMÉ coll.	77.5	37.5	37.0	21.0	7½
Paratype, MRAC (immature)	71.0	33.5	33.5	16.0	7½

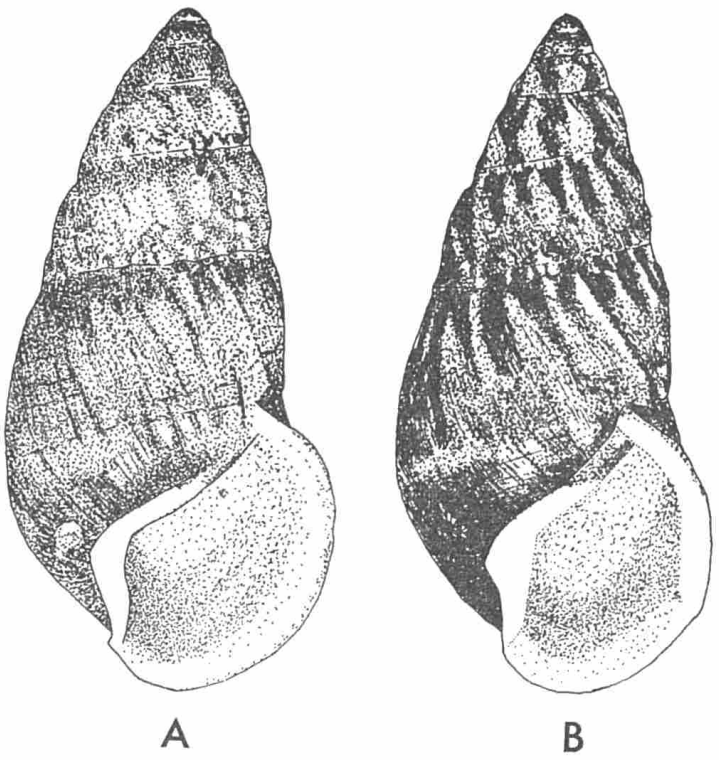


Fig. 9. — *Pseudachatina connectens* f. *colorata* nov. and *P. connectens* D'AILLY. Two examples to show transition from typical *P. connectens* to *P. connectens* f. *colorata*. A. Fairly typical *P. connectens*, ZIU, Isowi, Cameroons; B. Holotype of *P. connectens colorata*, C. P. coll. Compare B with plate II, fig. 6.

Specimens examined.

The holotype and four paratypes above. All were imported with bananas.

Remarks.

This is a very distinct form which we feel is worthy of a form name in the absence of any information upon which to base a sub-species. It is apparently connected with *P. connectens* via forms such as the one in text-figure 9A. It differs from *P. connectens* however in having an ornament of predominant coarse oblique plicae which never break up into granules and are not very irregular in their development. It has a proportionately larger aperture and much brighter colouring than in any typical example of *P. connectens.* It is similar to the next form dealt with, *P. connectens plicata,* but differs in lacking the livid white plications of that form, and in being more brightly coloured.

Pseudachatina connectens form **plicata** nov. Plate II, fig. 6.

Type.

Holotype, T.P. coll. (ex PRESTON).

Type locality.

Dibonga Sanaga Rinie, S. Cameroons.

Description.

A moderate species with a regularly turrited outline to the spire. The apex is mauvish with spiral lines giving way to pitted sculpture on the 2nd-3rd whorls. Whorls 3-4 pale pinkish with whitish flecks and, near the suture, chestnut spots; sculpture of oblique fine striae. The following whorls have very distinct, short, irregular plicae which are livid white on an off-white ground. On the last whorl the plicae die out or, where present, are confined to the suture. The shell becomes chestnut coloured towards the base of the body whorl. The suture is impressed and puckered and the whorls moderately inflated. The periostracum is thin, filamentous, and pale horn coloured. The aperture is rounded and moderately large; the columella white, twisted and truncated. The outer lip is reflected, tinged pink outside and produced into an incipient external tooth; parietal callus thick, white, with the usual subtransluscent band below the insertion of the outer lip.

Genital anatomy.

This is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, T.P. coll., Rinie, Cameroons ..	87.5	42.5	40.0	23.5	8
Paratype, C.P. coll., Rinie, Cameroons .	71.5	34.5	33.0	20.5	7¾

Specimens examined.

The holotype and paratype above and some specimens intermediate between the nominate race and this form is BMNH and McANDREW coll., CZM.

Remarks.

This form is most closely related to the preceding form from which it differs in having short oblique livid white plicae and in lacking the extremely bright colouring. In the McANDREW coll. (CZM) there are two specimens which are very similar to the nominate race in general shape and size but have very strong plicae as in the present form. In the BMNH collections there are a further three specimens which agree very well with those in the McANDREW coll. and have short and very bright purplish markings just above the suture in all the middle whorls. The occurrence of these somewhat intermediate specimens suggests that this is only a form of *P. connectens* although the Holotype of *P. connectens plicata* differs considerably in outline and in having a proportionately larger aperture, features which it shares with *P. connectens colorata.* There is no locality for the McANDREW coll. specimens, the BMNH specimens originate from Gaboon.

Pseudachatina connectens form **rollei** BLUME 1920. Plate II, fig. 4.

1986 *Pseudachatina downesii* var. *grandinata* D'AILLY (non PFR.), p. 89. pl. 4, figs. 4-5.

1904 *Pseudachatina downesii* var. *grandinata* PILSBRY (non PFR.), pl. 3, figs. 8-9.

1920 *Pseudachatina rollei* BLUME, p. 128.

1951 *Pseudachatina rollei* ZILCH, p. 45.

Type.

SMF 69849, Lectotype.

Type locality.

Debundscha, Cameroons.

Original description.

" Shell long, turrited oval, solid, apex obtuse. The uppermost 2 whorls furnished with distinct hair pits, the third whorl grooved, from there down the entire spire sculptured with densely crowded wrinkle-like folds, arranged more regularly on the last whorl. Folds becoming separated and gradually weaker towards the aperture. Colouring white, on the base of the last whorl a brown band, epidermis present only in the channels between the wrinkle-like folds. 9 whorls, the uppermost four swollen, the rest strongly flattened, somewhat impressed below the crenulate suture; the wrinkle-like folds develop tubercles arranged like a spiral string of beads and almost 3 mm high on the penultimate whorl below the suture and on the last above the suture between the last and penultimate whorls. The last whorl measured behind just about equals half the shell length, in front scarcely less, columella straight, only slightly twisted, obliquely truncated below. Aperture very slightly oblique, moderate, oval, coloured whitish within with a darker zone towards the base where the black band shows through. The outer rim tolerably strongly reflected in the middle part, thickened by a lip. The margins joined by a callus becoming thicker below, the top showing the penetrating dark basal band. Callus, columella and aperture flesh-coloured " (BLUME 1920, p. 128).

Genital anatomy.

This is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, SMF 69849 (from lit.).....	109.5	41.0	42.0	27.0	9
ZIU, Isowi, Cameroons.....	97.0	39.0	38.5	23.0	8¾
ZIU, Isowi, Cameroons.....	85.0	35.0	32.5	21.0	8
ZIU, Isowi, Cameroons.....	73.5	34.0	32.5	20.0	7¾
T.P. coll., Fermé Suissie, Cameroons ...	87.0	32.5	33.5	18.5	8
BMNH 1928.5.8.48, Victoria, Cameroons.	100.0	39.5	40.5	19.0	8¾

Specimens examined.

Bibundi, Cameroons (RM, ZIU); Isowi, Cameroons (ZIU); Itoki, Cameroons (RM); Debundscha, Cameroons (RM); Victoria, Cameroons (BMNH); Fermé Suissie, Cameroons (T.P. coll.); Cameroons (RM).

Remarks.

A quick comparison of text-figures 8 and 10 will show the close resemblance between some examples of this form and others of the nominate race. We have

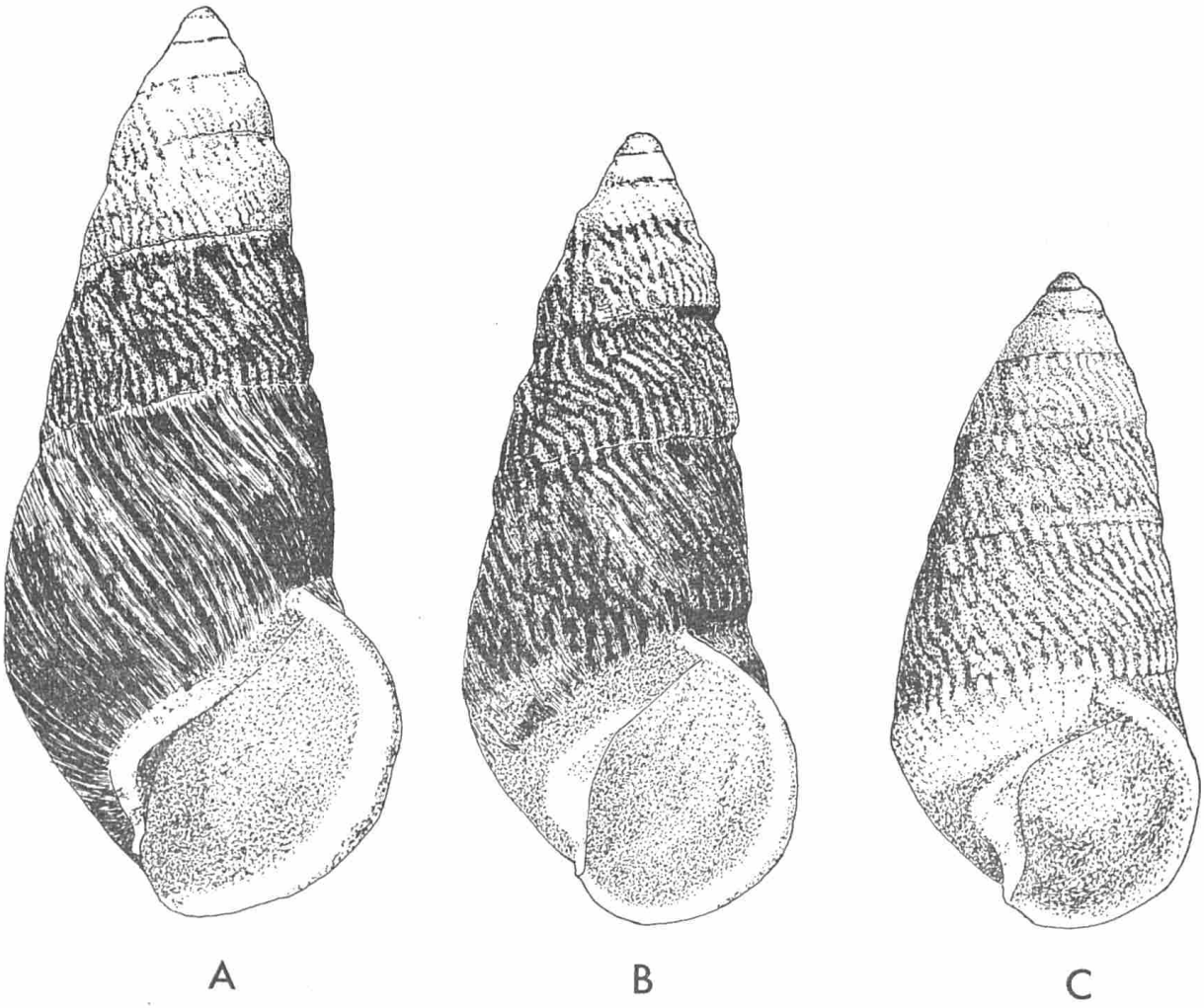


Fig. 10. — *Pseudachatina connectens* f. *rollei* BLUME. Three examples to show the close similarity to *P. connectens* and size variation within a single population. A., B. & C. ZIU, Isowi, Cameroons. Note finer ornament than in typical *P. connectens* and compare with type, plate II, fig. 4.

retained the name however as there seems to be a pair of parallel forms with coarse and fine ribbing. Extreme examples of the nominate race are short, fat with coarse granular ornament and rounded outer lips. The type of f. *rollei* (plate II, fig. 4) is near the opposite extreme being tall and thin with fine irregular " vermiform " ribbing and the examples from Fermé Suissie has a slightly concave portion to the outer lip. Typical examples of both forms are easily distinguished on these characters but we cannot exclude the possibility that these are extremes of a very variable species. The examples in text-figure 10 probably all came from a single population and illustrate the variation in size within it.

Pseudachatina granulata nov. sp. Plate II, fig. 5.

Pseudachatina kribiensis PRESTON, Ms.

Type.

Holotype, BMNH 1937.12.30.3674.

Type locality.

7 miles inland from Kribi, S. Cameroons.

Description.

A moderately large species with a fairly regular outline to the spire, the taper gradually increasing in amount towards the apex but the spire is not shouldered. The apex is purplish and distinctly pitted to the naked eye for the first 2 1/2 whorls. The next two whorls are finely obliquely striate appearing shiny. They are yellowish in colour and very faintly flammulated with a slightly darker shade. On the following two whorls the ornament is of coarse irregular striae and ribs which in typical examples break up into a granular ornament. This granular ornament dies out by the beginning of the last whorl which has irregular longitudinal striae only and is usually covered by the moderate horn coloured periostracum. The ground colour is pale yellow or flesh coloured with a deep chestnut colour in a band below the periphery on the last whorl. The sutures are puckered and moderately impressed with the last three whorls having a slightly shouldered appearance, and laterally slightly flattened. Aperture moderately large, pinkish internally, with columella only slightly twisted and distinctly truncated basally. The outer lip is reflected and the parietal callus has a thin transluscent band where the darker chestnut colour shows through.

Genital anatomy.

As with *P. nodosa* some of the specimens were collected alive and still have the bodies inside, but they are completely dried up and so the anatomy is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, BMNH 1937.12.30.3674, Kribi.	87.5	42.0	39.0	23.0	8
Paratype, BMNH 1911.8.22.241 (slightly juvenile)	70.0	37.0	34.5	21.5	7
Paratype, C.P. coll., Kribi	80.0	39.5	37.5	21.0	7¾
Paratype, T.P. coll., Kribi	87.0	41.5	38.5	23.0	8

Specimens examined.

Holotype and Paratypes as above. All of these come from the type locality.

Remarks.

The types that are in the British Museum (Nat. Hist.) are in a box labelled "*P. gabonensis* Type of *P. kribiensis* PRESTON, Ms". The authors have been unable to trace any manuscript of PRESTON's which mentions the species *P. kribiensis* and it is quite possible that one did not exist. The species is, in our opinion, quite distinct and bears no relation whatsoever to *P. gabonensis* but is closer to the "*leaiana* complex". The granular ornament is finer than that developed on *P. grandinata* PFFR. and that species is further distinguished by its cylindrical spire which is distinctly shouldered. The moderately inflated whorls of this species separate it from the group of forms around *P. connectens* D'AILLY which it perhaps most closely approaches. This form fits into the "*leaiana* complex" undoubtedly, but its relationship to the other species is not at all clear and so it has been left out of the diagram in text-figure 2.

Pseudachatina pulchra nov. sp. Plate III, fig. 1.

1963 *Pseudachatina elongata* (pars) PAUL (non PFEIFFER), p. 200.

Type.

Holotype, C.P. coll.

Type locality.

The holotype was introduced with bananas and is believed to have come from Likomba Plantation, Nr. Tiko, W. Cameroons.

Description.

A relatively tall and thin species with a regular taper to the spire. The apex is purplish or white, giving way to pale pinkish tints until the fourth whorl. The third and fourth whorls are darker below. In the holotype the remaining whorls are brightly flammulated with a deep chestnut colour on a white background and with a white-margined suture. In the paratype these whorls are unicolourous with the periostracum becoming darker towards the base. The usual apical sculpture is present giving way on the third and fourth whorls to fine longitudinal striae and faint white nodes appear at the upper suture. These nodes become more prominent on the next two whorls but die out on the body whorl where the longitudinal striae become coarser and less regular. The whorls are slightly inflated and the sutures moderately impressed and slightly puckered. The periostracum is moderate and a light horn colour. The aperture is relatively small and sub-oval, white within and with a scarcely reflected outer lip. The columella is straight and weakly truncated. The parietal callus is white and relatively thin. The usual transluscent band below the insertion of the outer lip is present.

Genital anatomy.

Unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype	82.0	36.0	34.0	19.0	8¼
Paratype, T.E. CROWLEY coll.	79.0	34.5	33.0	19.0	8

Specimens examined.

The holotype and paratype above.

Remarks.

These specimens are apparently quite distinct and cannot be placed in any existing species. In the colouring and the possession of white tubercles at the suture on the middle whorls they resemble *P. wrighti buckholzi* but differ from that species in the tall thin outline, the small aperture and scarcely reflected lip; in the slightly impressed suture and weakly inflated whorls. The striae on the last whorl are stronger than any the authors have seen on a specimen of the "*wrighti* complex". The colour and white-margined suture of the holotype are similar to those of *P. pyramidata kobeltiana* but the shell is much thinner in this spe-

cies and the proportions of the aperture are different. The general shape of the shell is unlike that of any other species.

There is no similarity to *P. elongata* under which name the holotype was recorded by one of us (PAUL 1963, p. 200). This identification was arrived at by comparing the specimen with specimens in T. PAIN's collection which were so labelled. The difficulty in identifying this specimen and the other specimen mentioned by PAUL was partly responsible for the present study. The other specimen, which was described as arriving alive in december 1962, is *P. connectens colorata* nov.

B. THE WRIGHTI COMPLEX

Pseudachatina wrighti wrighti (G.B. SOWERBY sen.) 1853. Plate IV, fig. 1.

1853 *Bulimus wrighti* G.B. SOW. sen.
1855 *Pseudachatina wrighti* H. & A. ADAMS, p. 134.
1856 *Pseudachatina wrighti* SHUTT., p. 90, pl. 9, figs. 1-2.
1859 *Pseudachatina wrighti* PFR., p. 596.
1860 *Pseudachatina wrighti* ALBERS, p. 205.
1876 *Pseudachatina wrighti* PFR., p. 20, pl. 113, figs. 1-4.
1881 *Pseudachatina wrighti* PFR., p. 205.
1893 *Pseudachatina wrighti* KOBELT, p. 9, pl. 4, figs. 1-4.
1904 *Pseudachatina wrighti* PILS., p. 206, pl. 1, figs. 1-5.

Type.

The specimen figured in the original description was in the collection of T.L. TAYLOR, and now appears to be lost. A specimen in the MCZ collections (MCZ 58822) is labelled as being one of SOWERBY's originals. However *P. wrighti* was based on one shell the figure of which differs markedly from the MCZ specimen.

There is some doubt as to whether SOWERBY's pamphlet constitutes a valid publication but the present authors are accepting it as such until it can be proved not to be valid. We are therefore designating the original figure as representative of the Holotype. However, should the pamplet be proved invalid then the species should be referred to SHUTTLEWORTH who was the next author to describe and figure it. The original specimen of SHUTTLEWORTH's figures is refigured here (plate IV, fig. 1) as the authors had only photostat copies of SOWERBY's pamphlet which were unsuitable for publication. Should SOWERBY's pamphlet prove to be invalid the specimen figured here would become the Lectotype.

Type locality.

No locality was given in the original description and as far as the authors are aware none has been designated subsequently. The majority of the localised spe-

cimens seen by the authors have come from Old Calabar and this is therefore designated as the type locality.

Original description.

" Oval, smooth, moderately solid; whorls seven, full, short, bordered at the sutures by a cord-like, granulated ridge; apex dark, round, obtuse; aperture rather open, terminating in a short canal; inner lip thinly spread over the body-whorl and ending in a tortuous columella; outer lip reflected. The upper part of each whorl is whitish with large, softened, reddish black spots; the white surface and black spots blended into the brownish pink colour which covers each whorl as far as the suture. Below the suture, as seen in the last, the whorls are black-appearing bluish inside the aperture and through the inner lip " (G.B. SOWERBY sen. 1853). The missing parenthesis in the last sentence of the above description is original.

This is a distinct species and immediately stands out from all those preceding because of its smooth and beautifully rounded whorls. The apex is bluish-purple or whitish and the succeeding whorls are whitish with either flammules or spots of chestnut near the suture. The sculpture is confined to fine weak oblique longitudinal striae and even finer spiral lines. The last whorl is approximately half the total height and deep brown below the periphery. The aperture is large, white and the outer lip is thickened in mature examples. The columella is only moderately twisted but distinctly truncated and white. The outer lip is slightly reflected and weakly flared. The parietal callus is white, transluscent below the insertion of the outer lip.

Genital anatomy.

This is totally unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
BMNH 59.9.15.4, ?Prince's Is.	71.0	38.0	35.5	20.0	7½
BMNH, Prince's Is.	77.0	40.0	38.0	20.5	7¾
BMNH, Prince's Is.	61.0	33.5	30.5	18.5	7¼
BMNH, Old Calabar	67.5	34.5	33.0	18.5	7½
C.P. coll., No loc.	74.0	36.5	35.5	19.0	7¾
T.P. coll., Old Calabar	74.5	36.5	36.0	21.0	7¾
MHNB 114 (plate IV, fig. 1)	75.0	40.5	37.0	23.0	7½

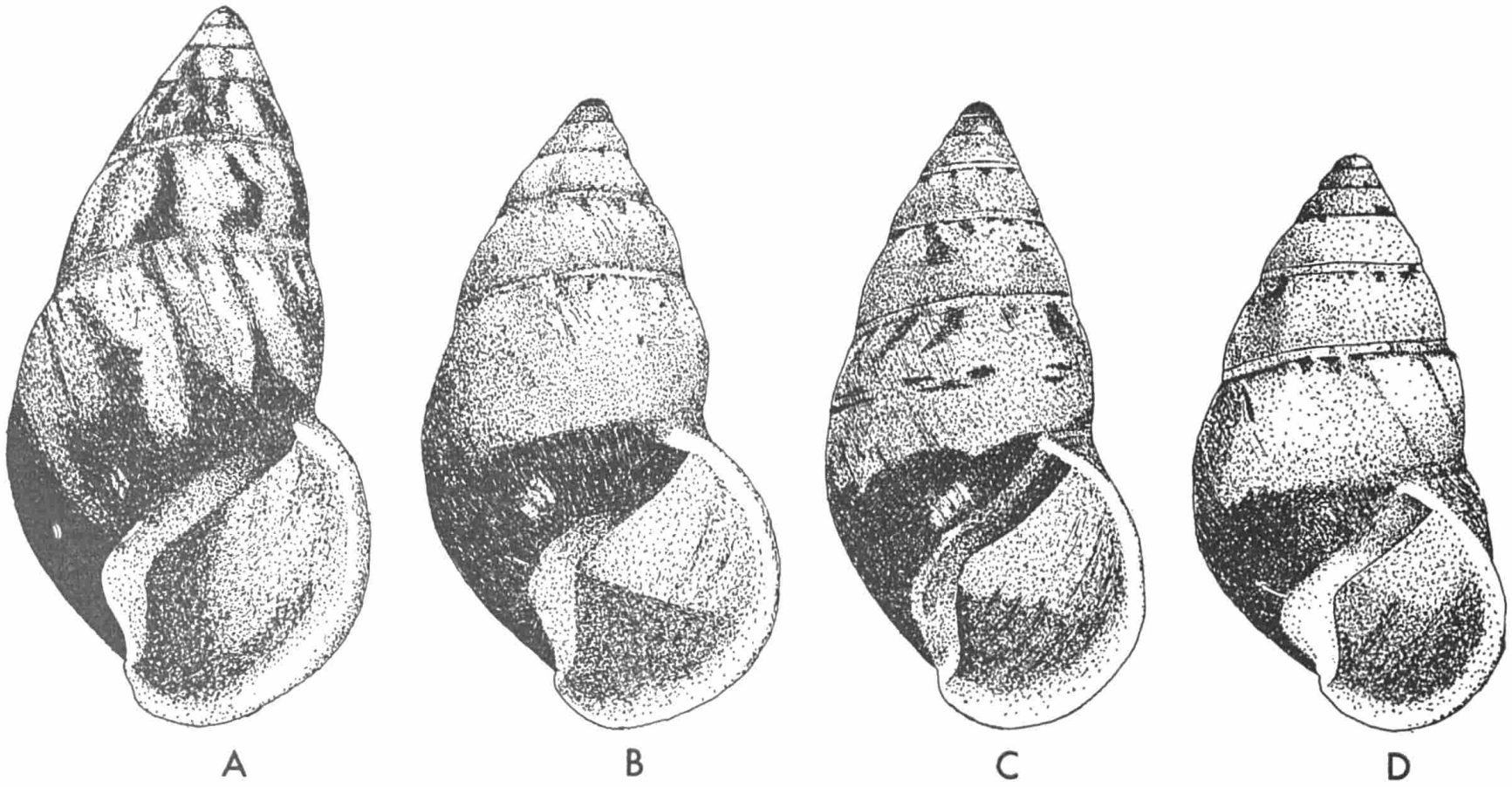


Fig. 11. — *Pseudachatina wrighti wrighti* (Sow.). Four examples to show variation in shape and colouring. A. Highly flammulated colour variant, McAndrew coll., CZM 713; B. Variant lacking flammules, Shuttleworth coll., MHNB 114; C. Flecked variant, T.P. coll.; D. Flecked variant, RM, Old Calabar. Compare A with text-figure 12A.

Specimens examined.

Old Calabar (T.P. coll., RM, NMW, BMNH); ?Fernando Po (S.P. WOODWARD coll., CZM); ??Gaboon (MRAC, NMW); ?Prince's Is. (BMNH); No loc. (T.P. coll., C.P. coll., SAUL & MCANDREW colls. CZM., BMAG, BMNH).

Remarks.

As can be seen from the text-figures there are two distinct colour variants of this species. Fig. 11A is a large example with flammules developed throughout the whorls. It is very close to the large form of *P. wrighti buckholzi* KOB. in text-fig. 12A. The other three examples have only a few flecks of chestnut above the periphery at which there is a very distinct change in colour, from pale above to dark chestnut below. They form an example of flammulated and non-flammulated variants in the Achatinidae and probably have similar mutual relationships to those between banded and bandless forms of Helicidae. This is a distinct and common species at the northern end of the range of the genus. There is some doubt as to the validity of the more southerly localities, especially Gaboon.

Pseudachatina wrighti form **buchneri** KOBELT 1893. Plate IV, fig. 3.

1893 *Pseudachatina wrighti* var. *buchneri* KOB., p. 11, pl. 4, figs. 5-6.
1904 *Pseudachatina wrighti* var. *buchneri* PILS., p. 206, pl. 4, figs. 16-17.
1951 *Pseudachatina wrighti* var. *buchneri* ZILCH, p. 45.

Type.

SMF 69838, Lectotype.

Type locality.

Old Calabar, W. Nigeria.

Original description.

" Conical-turrited, the last two whorls with spiral furrows; basal colour unusually distinct in the mouth and reaching out on the lip. Aperture less than half as long as the shell. Length 60, dia. 33, alt. apert. 28 mm " (KOBELT 1893).

The shell in this form is much thinner than in the nominant race and there is no colouring above the periphery of the whorls, the upper whorls being a uniform yellowish horn colour. There is a thin periostracum and the aperture is relatively small. Below the periphery of the last whorl, which is perfectly rounded, there is a deep chestnut colour darkening downwards. Since the shell is subtransluscent this colour shows through on the inside of the aperture.

Genital anatomy.

Unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
T.P. coll.	75.0	32.5	30.5	17.0	8½

Specimens examined.

Old Calabar (T.P. coll.).

Remarks.

This is a very distinctive form and the authors regard it as worthy of notice and so have retained the name. Although there are at least two colour variants recognised under the nominant race this form stands out as it varies distinctively in several details of the shell shape as well as in the striking colour pattern. Without a larger series of specimens the authors cannot, however, completely discount the possibility that it is merely a variant of no taxonomic significance. Indeed there is a specimen at Cambridge (CZM 713) which has the following measurements: H. 74.0; D. 36.0; H.A. 32.0; W.A. 19.0; Wh. 8. It has the colour pattern of this form whereas the outline of the shell, whilst it is less tumid than that of the nominate race, is more similar to the nominate race than the present form. As there are no ecological or anatomical data available and only one localised specimen (T.P. coll.) it is very unwise to raise this form to subspecific rank.

Pseudachatina wrighti form **minor** nov. Plate IV, fig. 2.

1904 *Pseudachatina wrighti* PILSBRY, pl. 1, figs. 4-5 (non figs. 1-3 = *P. wrighti* (SOW.).

Type.

T.P. coll., Holotype.

Type locality.

Old Calabar.

Description.

A small, globular form with sutures relatively weakly impressed and neatly beaded. The apex is drawn out slightly giving the outline of the spire a slightly concave appearance. Ground colour white with chestnut flammules which do not cross the beading at the suture and are confluent below the periphery of the last whorl. Aperture rounded, bluish-white within. Columella distinctly twisted, white; outer lip reflected, white; parietal callus white except for a thin transluscent band below the insertion of the outer lip where the chestnut colour shows through.

Genital anatomy.

This is unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, T.P. coll., Old Calabar	57.5	33.0	29.5	18.5	7
Paratype, BMAG	52.5	29.5	26.5	16.5	7
Paratype, RM, Old Calabar (columella damaged)	54.0	32.5	29.0	19.0	6¾
Paratype, T.E. CROWLEY coll.	57.0	28.0	25.0	17.0	7
Paratype, S.P. WOODWARD coll., CZM ...	60.0	31.5	30.0	17.0	7½
Paratype, T.P. coll., No loc.	61.0	33.0	29.5	18.5	7¼

Specimens examined.

The above specimens and a specimen in the MRAC collections without locality.

Remarks.

The authors have examined a considerable number of examples of the various forms of the nominate race of this species and these stand out as a distinct group. Their distinctiveness is sufficient to warrant drawing attention to them by giving them a form name though there is no information at present to justify raising them to subspecific rank on ecological or geographical grounds. They can be distinguished from the nomimant race by their small size, their more perfectly rounded aperture, the outline of the spire and their generally more strongly twisted columella.

Pseudachatina wrighti buckholzi KOBELT 1893. Plate IV, fig. 4.

1893 *Pseudachatina downesii* var. *buckholzi* KOB., p. 16, pl. 8, figs. 5-6.
1904 *Pseudachatina buckholzi* PILS., p. 217, pl. 7, figs 35, 36, 38.
1951 *Pseudachatina downesii* var. *buckholzi* ZILCH, p. 45.

Type.

SMF 69844, Lectotype.

Type locality.

Bidundi, Cameroons (Johann-Albrecht).

Original description.

" Relatively smooth, but with a number of whitish tubercles, some of them prolonged downwards below the sutural impression, and bounded by a sharply incised furrow. Colouring extremely handsome; broad red-brown stripes alternating with narrower yellowish white ones, and coalescing on the lower half to the last whorl. The aperture is beautifully bluish, the lower half of the throat darker. The parietal callus has the characteristic dark band, broadly reflexed peristome with a lighter lip. Length 80, dia. 43, alt. apert. 35 " (KOBELT 1893).

Large examples of this subspecies conform quite well to the above description. The most characteristic feature is the elongated white tubercles below the suture which in highly coloured examples show up very well. The general shape of the shell is slightly more elongate than the nominate subspecies and the colouring like that of the flammulated variants. A specimen in the T.P. coll. is smaller and almost without any colouring above the periphery of the whorls. The white tubercles are developed though they are less conspicuous. The tubercles tend to die out in some forms which approach the nominant subspecies.

Genital anatomy.

Unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
T.P. coll.	69.5	35.5	32.0	20.0	7¾
RM	70.0	37.5	33.5	22.0	8
RM, Bibundi, Cameroons	84.0	39.0	36.5	21.5	8
T.P. coll., Kumba, Cameroons (Albino)	83.0	39.0	38.0	23.0	7¾

Specimens examined.

" Cameroons " (T.P. coll.); Bibundi, S. Cameroons (RM); No locality (RM).

Remarks.

From the very scanty information about the geographical range of this subspecies it would seem to be the only form within the " *wrighti* complex " to extend into the Cameroons. Equally it is apparently absent from the Old Calabar

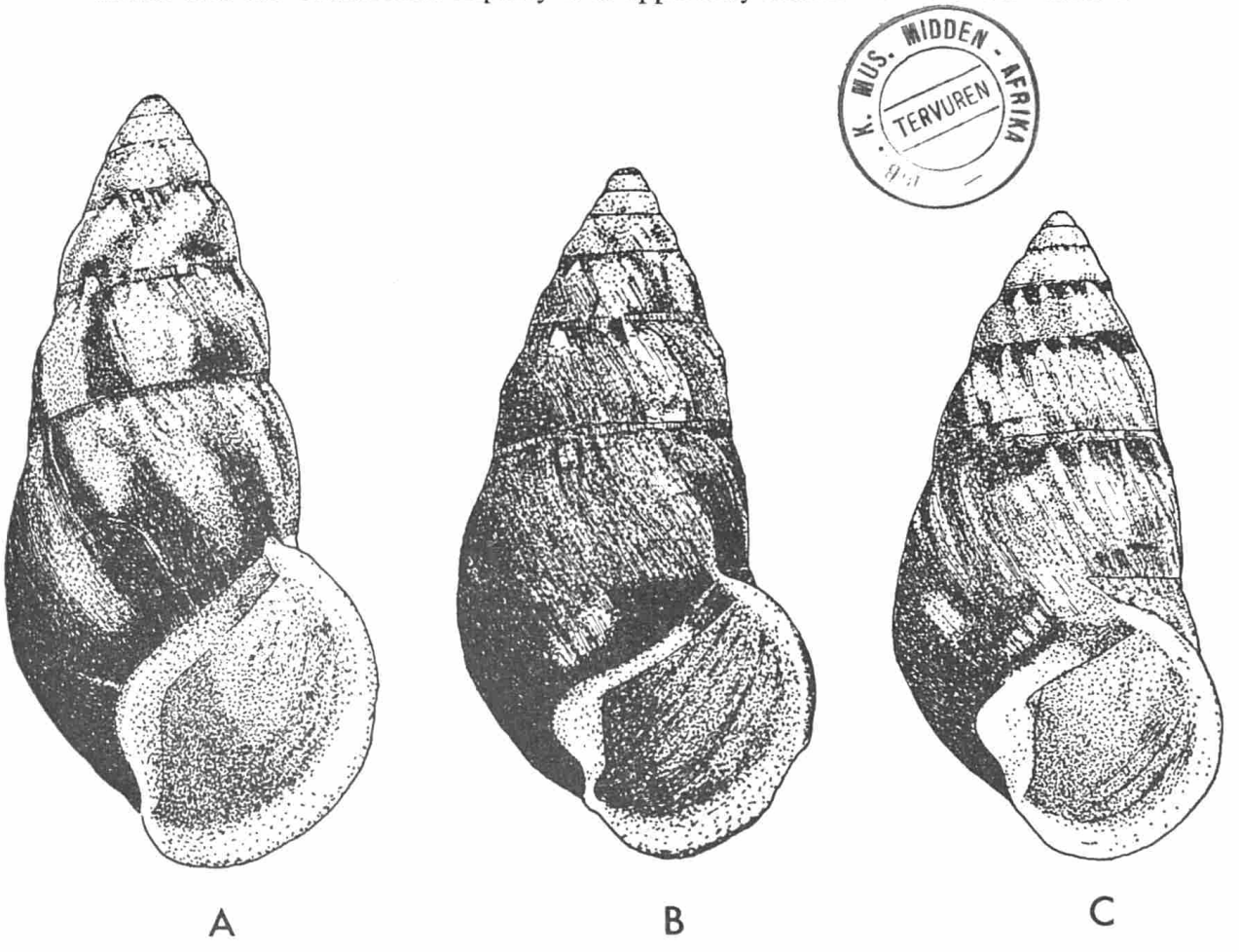


Fig. 12. — *Pseudachatina wrighti buckholzi* KOBELT. Three examples to show variation and gradation to typical *P. wrighti*. A. Weakly costate, flammulated example, RM, Bibundi, Cameroons; B. Typical example, RM; C. Typical example, T.P. coll.

region whence the vast majority of the specimens of the " *wrighti* complex " come. This is the main reason for the description of this form as a subspecies although it must be admitted that the evidence is mainly negative. However D'AILLY (1896) examined nearly 200 examples of this genus from all over the Cameroons and the only forms from the " *wrighti* complex " all belong to the subspecies *buckholzi*.

This form was originally described as a variety of *Pseudachatina downesii* but the smooth nature of the whorls, apart from the white tubercles, and the discovery of forms of *P. wrighti* s.s. which are similar in all essentials except the white tubercles, indicates that this subspecies belongs to the "*wrighti* complex". As with the nominate subspecies flammulated and non-flammulated examples occur, some of the latter being almost pure albino.

C. The gabonensis complex

Pseudachatina gabonensis Shuttleworth 1856. Plate V, figs. 1-2 & 5.

1848 *Bulimus downesii* Reeve (non Gray), pl. 29, fig. 177b (non fig. 177a = *P. sodeni* Kob.).

1851 *Achatina downesii* Deshayes (non Gray), in Férussac, p. 190, pl. 122, figs. 1-3.

1856 *Pseudachatina gabonensis* Shutt., p. 86, pl. 8, figs. 5-6.

1857 *Pseudachatina dennisoni* Pfr., p. 257.

? 1858 *Achatina gabonensis* Morelet, p. 21.

1859 *Pseudachatina dennisoni* Pfr., p. 497.

1859 *Pseudachatina gabonensis* Pfr., p. 498.

1881 *Pseudachatina dennisoni* Pfr., p. 266.

1881 *Pseudachatina gabonensis* Pfr., p. 266.

1893 *Pseudachatina nachtigali* Kob., p. 12, pl. 3, figs. 1-2.

1893 *Pseudachatina gabonensis* Kob., p. 21, pl. 9, figs. 1-2 (non figs. 3-6 ? = *P. elongata* Pfr.).

1904 *Pseudachatina nachtigali* Pils., p. 206, pl. 2, figs. 5-6.

1904 *Pseudachatina dennisoni* Pils., p. 211, pl. 7, fig. 40.

1904 *Pseudachatina gabonensis* Pils., p. 214, pl. 6, figs. 26-29.

? 1905 *Pseudachatina dennisoni* O. Böttger, p. 174.

? 1921 *Pseudachatina dennisoni* Dautz., p. 104.

1951 *Pseudachatina nachtigali* Zilch, p. 45.

The authors have put a mark of interrogation against some references not confirmed by specimens.

(Non *P. dennisoni* d'Ailly 1896 = *P. wrighti buckholzi* Kob.)

Type.

P. gabonesis: No type was designated but the original of Shuttleworth's figures (MHNB 110) is here selected as Lectotype.

P. nachtigali: Holotype, SMF 69840.

P. dennisoni : No type was selected by PFEIFFER but he referred to the original specimen of REEVE, 1848, pl. 29, fig. 177b. This specimen was in the DENNISON collection which was sold by auction in 1865. It is possible that it was bought by Hugh CUMING just before his death as he is known to have bought some specimens of *Pseudachatina* at the sale (fide MELVILL 1895, p. 64). However this specimen could not be traced in the BMNH collections, where the CUMING collection is now housed, and must be presumed lost. There are however some specimens in the BMNH collections labelled as *P. dennisoni* in PFEIFFER's handwriting and there is no doubt that these specimens are synonymous with *P. gabonensis* SHUTT.

Original descriptions.

P. gabonensis. — " Shell elongate ovate turrited, rather solid, coarsely and remotely plicate, slightly glossy; pale flesh coloured or roseate, painted with wide purplish-rose streaks, the base pale chestnut or purplish. Spire raised, the apex brown, obtuse; whorls 8, convex, the last about two fifths the total height, obsoletely angular; suture linear, broadly margined and plicate. Columella straightened, somewhat twisted inwards, the base obliquely, lightly truncate. Aperture lunar oval, peristome simple, acute, narrowly effusely spreading, bordered with pale flesh colour or whitish, the margins joined by a thin callus, thickened outwardly at the base of the columella " (SHUTTLEWORTH 1856, p. 86).

P. dennisoni. — " Shell ovate-conical, rather solid, sculptured with strong, distant folds with smaller ones interposed, roseate under a deciduous tawny epidermis, generally ornamented with blackish triangular streaks and an interrupted sutural band. Spire conical, the apex obtuse, blackish; suture undulating, not margined. Whorls 7 1/2 moderately convex, the last swollen above, subcarinate below the middle, blackish. Columella compressed, white twisted. Aperture oblique, sinuate-oval, the peristome thin, narrowly expanded, margins joined by a white callus " (PFEIFFER 1857, p. 257).

P. nachtigali. — " Shell imperforate, ovate-turrited, solid, obliquely roughly striate and costulate, here and there obliquely spirally lineated; uniformly yellowish-white, and the third and fourth whorls marked with pale brown streaks. Whorls 8, separated by a rather irregular suture; first two bearing crowded hair-pits, next 2 convex; from the fourth on they are impressed below the suture and sculptured with short riblets; further down the impressed zone is bounded by a sharp line, and over the suture a tuberculate girdle also appears, which continues at the periphery of the last whorl and becomes evanescent near the outer lip; the last whorl being rendered indistinctly angular thereby. Behind the lip and along the columella callus it is coloured yellowish, and shows some dark growth striae; anteriorly it descends slowly, and is somewhat compressed around the umbilical region. Aperture only slightly oblique, rounded-oval, rather large, white. Columella arcuate, strongly excised, much shorter than the mouth, scarcely truncate below. The strong columellar plate is washed with flesh colour above, this

colour running inwards band-like. Outer lip beautifully rounded, broadly reflexed, thickened within " (KOBELT 1893, p. 12).

This is a fairly distinct species but rather variable. The apex may be white or purplish and carries the distinctive sculpture of hair-pits. This pitted sculpture is developed for the first 2 1/2-3 whorls and is followed by a sculpture of fine oblique longitudinal and spiral striae. The lower whorls have broadly spaced sinuous ribs or undulations with fine longitudinal striae between them. The shell ground colour may be white, yellowish, flesh-coloured or even pale mauve. Flammules may or may not be developed and vary in colour from pale chestnut to deep blackish-purple, the latter being typical of PFEIFFER's " species ". The whorls may be distinctly shouldered, giving the spire a turrited appearance, or they may be gently convex. The suture, in general, is impressed. Young examples have a distinct keel but this may or may not be present in adult shells. The last whorl does not exceed 1/3 the height. The aperture is moderate, whitish or pinkish within. The outer lip is reflected but not flared. The columella is short subtruncate and twisted slightly. The parietal callus has the usual thin transluscent band below the insertion of the outer lip.

Genital anatomy.

This remains completely unknown.

Measurements.

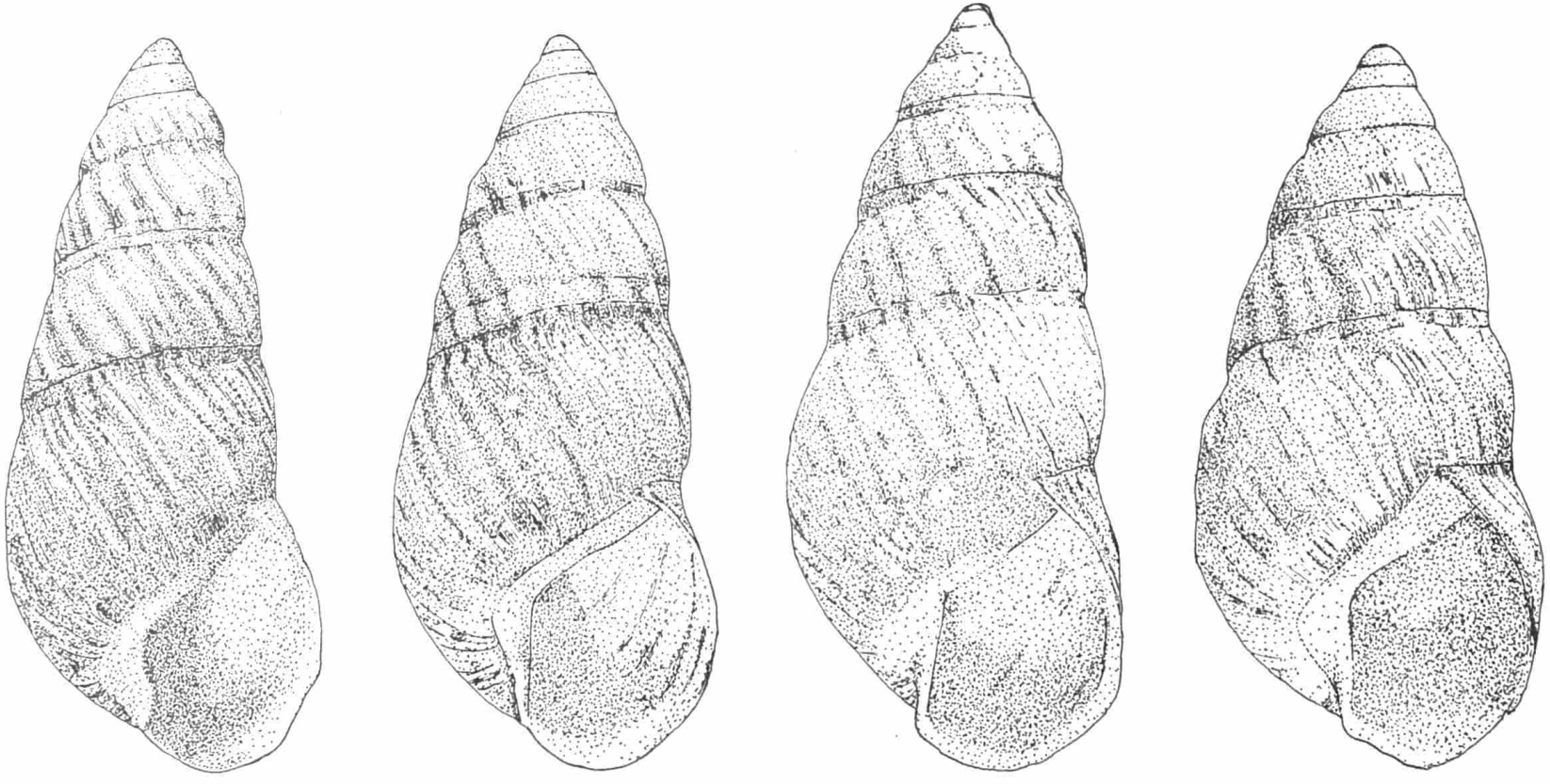
	H.	W.	H.A.	W.A.	Wh.
P. gabonensis, Lectotype, MHNB 110....	86.0	38.0	34.5	20.0	8¼
Paralectotype, MHNB 107	80.5	37.5	33.0	20.0	8¼
Paralectotype, MHNB 108	78.5	37.0	33.0	19.0	8¼
Paralectotype, MHNB 112	79.0	36.0	32.5	18.5	8
T.P. collection	76.5	34.5	33.0	19.0	8
P. dennisoni, " Metatype ", BMNH	81.0	34.0	33.0	16.5	8¼
" Metatype ", BMNH	70.5	34.0	29.0	17.5	8¼
" Metatype ", BMNH	70.0	34.5	32.0	16.5	7¾

Specimens examined.

Gaboon (MRAC, BMNH, SHUTT. coll. MHNB, T.P. coll.); No locality (T.P. coll., C.P. coll., MCANDREW coll., CZM, SHUTT. coll. MHNB).

Remarks.

In June 1856 SHUTTLEWORTH described the species *P. gabonensis* from a series of twelve shells from Gaboon. The authors have seen six of these shells including the specimen figured by SHUTTLEWORTH which is therefore designated as Lectotype. The other specimens are accepted as paralectotypes. These speci-



transition towards *P. nachtigali* KOBELT. A. Thin form, T.P. coll.; B.Fig. 13. — *Pseudachatina gabonensis* SHUTT. Four examples to show McANDREW coll., CZM 714; C. Lectotype, SHUTTLEWORTH coll., MHNB 110, Gaboon; D. Tumid example approaching *P. nachtigali*, Lectoparatype, SHUTTLEWORTH coll., MHNB 107, Gaboon. Compare D with type of *P. nachtigali*, plate V, fig. 5.

mens are in general only weakly flammulated and some have no flammules at all. In *Malacozool. Blatter* for the same year PFEIFFER described *P. dennisoni*. The relevant part of this publication appeared in January 1857 so there can be no doubt that SHUTTLEWORTH's species takes precedence. PFEIFFER did not figure a specimen of his species but referred the reader to REEVE's figure of DENNISON's specimen mentioned above. The specimens in the BMNH collections labelled as being *P. dennisoni* by PFEIFFER are "Metatypes" and may possibly have been syntypes. They are highly flammulated examples but there is no doubt that they are merely colour variants of SHUTTLEWORTH's species. The authors have not been able to examine the only known specimen of *P. nachtigali* KOB. but through the kindness of Dr. A. ZILCH have an excellent photograph of this specimen (plate V, fig. 5). It would seem that this is only a more inflated example of SHUTTLEWORTH's species. Text-figure 13 shows a series of shells from a relatively thin example, fig. 13A, to a relatively tumid example, fig. 13D, which is close to the type of *P. nachtigali*.

This species gives its name to the third distinct complex within the genus and is closely related to the other species within it. For an account of the difference between the forms see the discussion under the following species. This complex as a whole apparently occupies the southernmost area of the range of the genus and only one example has been seen from north of Gaboon.

Pseudachatina elongata PFEIFFER 1865. Plate V, fig. 4.

1865 *Pseudachatina elongata* PFR., p. 832.

1868 *Pseudachatina elongata* PFR., p. 206.

1881 *Pseudachatina elongata* PFR., p. 266.

1893 *Pseudachatina elongata* KOBELT, p. 17, pl. 6, figs. 1-2, pl. 12, fig. 1.

? 1893 *Pseudachatina gabonensis* KOBELT (non SHUTT. 1856), pl. 9, figs 3-6 (non figs. 1-2).

1904 *Pseudachatina elongata* PILS., p. 213, pl. 2, figs. 1-3.

(non *P. elongata* PAUL 1963 = *P. pulchra* nov. & *P. connectens colorata nov.*)

Type.

Lectotype, BMNH 196552.

Type locality.

Gaboon river, Gaboon.

Original description.

" Shell imperforate, oblong-turrited, solid, irregularly obliquely plicate, and having a granulate girdle above the suture; reddish tawny. Spire turrited, the apex rather obtuse; suture white margined, crenate. Whorls 7 1/2, the upper convex, the rest nearly flat, last whorl obtusely carinate in the middle, more than 1/3 the length. Columella callous; subtruncate-twisted. Aperture a little oblique, oblong-oval; peristome simple, the margins joined by a thick white callus, right narrowly expanded " (PFEIFFER 1865, p. 832).

This is a moderately tall species with a variable outline to the spire. The apex is usually brown and the rest of the shell a pale yellow colour. The suture is often, though not always, white margined, puckered, but rarely deeply impressed. The whorls may be flattened or rounded and usually have a distinctly shouldered outline giving the spire a turrited appearence. The ornament of the middle whorls varies from fine sinuous striae running longitudinally to broad, widely spaced sinuous ribs with intercalated striae running in the same general direction. In some examples this may be accompanied by fine spiral striae. The aperture is generally distinctly oval, though rounded in the Lectotype. The columella is straight and truncated basally. The outer lip is white, reflected and somewhat flared in the Lectotype. It is very occasionally margined exteriorly with the shell ground colour but white within. The parietal callus is thin and substransluscent throughout. The last whorl is between 1/3 and 1/2 the total height.

Genital anatomy.

The genital anatomy is completely unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Lectotype, BMNH, Gaboon, R.	80.0	38.0	35.5	23.5	8
Paralectotype, BMNH, Gaboon, R.	84.0	37.5	37.0	20.0	8
Paralectotype, BMNH, Gaboon, R.	81.0	35.5	35.5	19.5	7½
T.P. coll.	83.0	33.5	31.0	17.0	8½
" Prince Edward Is. ", Gaboon, BMNH 59.9.15.5	78.0	35.5	36.5	19.0	7½
Prince's Is., BMNH	85.0	35.5	39.0	18.5	8
Original KOB. 1893, pl. 6, figs. 1-2	85.5	35.0	37.5	18.5	7¾

Specimens examined.

Gaboon river (BMNH); Prince's Is. (BMNH); No locality (BMNH, T.P. coll.).

Remarks.

This species is closely related to *P. gabonensis* and *P. striata* and these are the only species with which it could be confused. The ribbing of *P. striata* is much more regular and dictinct. The flammules on the third and fourth whorls serve to distinguish the latter *P. gabonensis* can be distinguished by lacking the reflected or flared outer lip of this species and in having the aperture smaller proportionately. This species belongs in the "*gabonensis* complex" and occurs along the southern limit of the range of the genus.

Pseudachatina striata nov. sp. Plate V, fig. 3.

Type.

Holotype, BMNH, 1904.12.13.15.

Type locality.

Nr. Efulens, S. Cameroons.

Description.

A relatively small species with 7 1/2 whorls and inflated fourth and fifth whorls giving the outline of the spire a distinctly shouldered appearance. Apex white, distinctly spirally striate, followed by a pitted sculpture and giving way finally on the fourth to fifth whorls to a sculpture of strong, fine, oblique, sinuous ribs, with an occasional fine granularity in the unworn spaces between the ribs. The colour of the fourth and fifth whorls is pale reddish with pale, whitish flammules. The lower whorls are the same colour becoming paler gradually with deep olive brown at and above the keel, which is indistinct on the last whorl. The sculpture becomes finer on the last half-whorl. The aperture is white inside with both the lip and the columella tinged with brown externally. The columella is only slightly twisted, short and truncated basally. The outer lip is gently reflected but not flared. The parietal callus is thick, white and opaque except for the usual thin band below the insertion of the outer lip, where the olive brown ground colour below the periphery shows through. The periostracum is moderately thick, brownish horn-coloured. The suture is moderately impressed, the whorls very slightly shouldered and flattened laterally.

Genital anatomy.

This, unfortunately, is known.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, BMNH 1904.12.13.15, Nr. Efulens	67.5	34.5	31.0	18.5	7½
Paratype, BMNH 1904.12.13.16, Nr Efulens	65.5	35.5	29.5	19.0	—
Paratype, T.P. coll., Gaboon?	73.0	31.5	30.0	17.0	8

Specimens examined.

The Holotype and two Paratypes mentioned above.

Remarks.

This form is apparently quite distinct from the preceding two species in the "*gabonensis* complex". The colouring of the first four whorls and the distinctive ornament serve to separate it from these species. Some modification of the description might be expected in view of the limited material for description and the general variability of species within this genus.

Pseudachatina vignoni (MORELET) 1860. Plate V, fig. 7.

1860 *Achatina vignoni* MORELET, p. 189.

Type.

Holotype, BMNH 1893.2.4.1942.

Type locality.

MORELET stated the specimen came from "in sylvis guineensis". This locality is probably around the Cameroons or Gaboon which is where captain VIGNON did most of his collecting.

Original description.

"Shell imperforate, oblong-turrited, solid, white under the lost epidermis, shiny, and with a broad blackish-purple streaks confluent towards the base; spire elongate, apex obtuse; whorls seven, fairly convex, first violaceous, minutely granulated and spirally impressed, following longitudinally striate, plane below the suture, margin subplicate, last slightly flattened medially, then carinate; columella straight, slightly twisted, vertical, obliquely truncate; aperture moderate, bluish white, subcanaliculate towards the truncation, outer margin thin, scarcely straightened" (MORELET 1860, p. 189).

This is a small species, judging by the only specimen known, which is slightly immature. The outline of the spire is regularly conical, with a purplish bulbous apex distinctly sculptured to the naked eye. The surface sculpture is mainly of fine longitudinal striae and the ground colour white with many fine thin blackish brown flammules which do not reach up to the suture in the last whorl. The suture is impressed and the striae are more strongly developed below it. The whorls are moderately inflated with the last three somewhat shouldered and flattened. The last whorl is distinctly keeled up to the aperture, perhaps a feature of immaturity. The columella is white, straight and abruptly truncated. The outer lip is angular and not at all reflected. The parietal callus is virtually undeveloped and the periostracum is thin and light horn coloured. As the shell is slightly immature the characters of the aperture are of little diagnostic value.

Genital anatomy.

This is totally unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype	48.5	28.0	26.5	16.5	7¼

Remarks.

This species has been generally accepted as a species of the related genus *Pseudotrochus* and was considered as a synonym of *P. auripigmentum* (RVE) by PILSBRY among others. The Holotype shows beyond any doubt that it has the bulbous sculptured apex of a typical *Pseudachatina* and was placed with the other species of that genus in the British Museum (Natural History) collections by the late Major CONNOLLY. The colouring of this specimen is far brighter than that of any other known to the authors. It is a very distinct form which may belong in this complex and hence has been described with these species.

D. THE OTHER SPECIES

Pseudachatina nodosa PRESTON 1909. Plate IV, figs. 5-6.

1909 *Pseudachatina nodosa* PRESTON, p. 180.

1909 *Pseudachatina nodosa* var. *eminens* PRESTON, p. 180.

Types.

P. nodosa, MRAC 505, Holotype.

P. nodosa var. *eminens*, MRAC 506, Holotype.

Type locality.

Bitze, R. Ja, Cameroons.

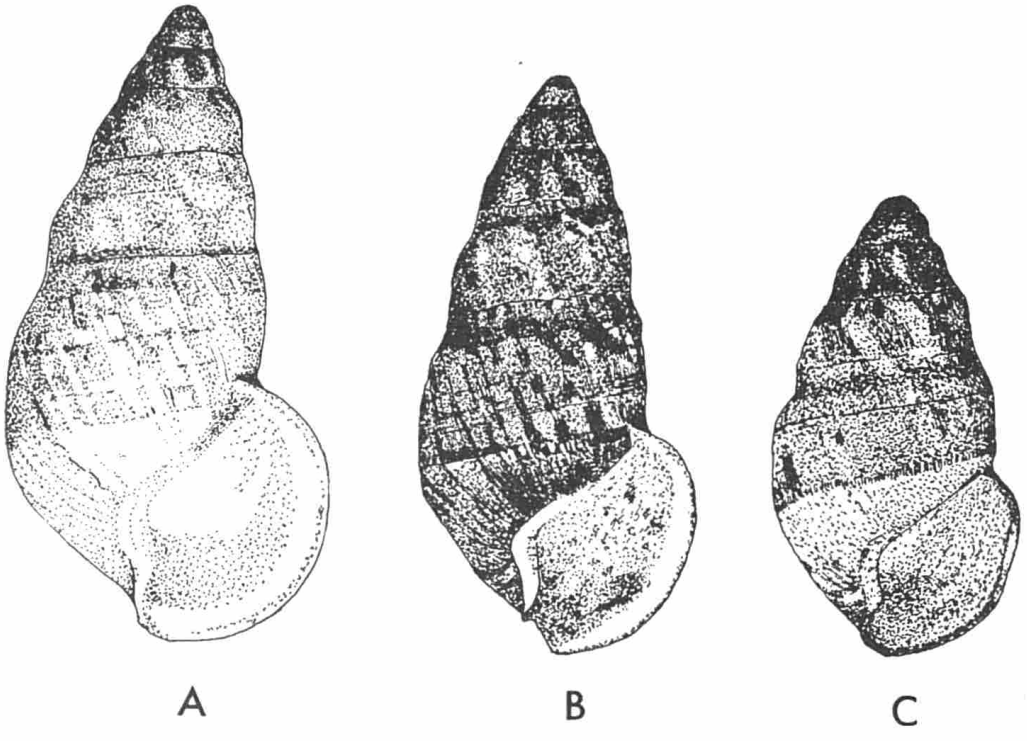


Fig. 14. — *Pseudachatina nodosa* PRESTON. Three examples to show transition from var. *eminens* to typical *P. nodosa*. A. Large example approaching var. *eminens;* B. Intermediate example; C. Typical *P. nodosa*. All three Paratypes, T.P. coll., Bitze, Cameroons. Compare with types plate IV, figs. 5-6.

Original descriptions.

" Shell ovate-conic, moderately thin, painted above with broad brownish-purple transverse flame-markings, between which the pale flesh-colour of the shell is visible, covered on the lower whorls with a thin scaly, yellowish-brown periostracum; whorls 7 1/2, the first three granulated with fine spiral striae crossed by irregular transverse lines, the remainder irregularly coarsely nodulous, the last bearing two obsolete keels about 9 mm apart, the lower one situated at the periphery; sutures crenulate, somewhat lightly impressed; columella obliquely curved, a thick callus, the outer margin of which is tinged with purple, joining it with the

lip above; peristome expanded, scarcely reflexed, livid purple; aperture obliquely inversely auriform; interior of the shell bluish-white, a broad purple band appearing on the upper portion of the parietal wall " (PRESTON 1909, pp. 183-184).

Var. *eminens*. — " Much more elongate than the typical form, the keels on the last whorl even more obsolete, and the columella is less curved " (PRESTON 1909, p. 184).

This is a very distinct species and cannot be mistaken for any other due to its extreme development of nodular ornament. The outline of the spire tapers fairly regularly and is somewhat turrited due to the distinct nodes on the last three to four whorls. The apex is reddish-brown with the spiral element of the reticular ornament very prominent. The next two whorls are reddish-brown with whitish flammules, giving way to a whitish ground colour on the lower whorls. At the same point the ornament changes from fine sinuous oblique striae to irregular nodes and rugae. The whorls assume a shouldered appearance here too. The aperture is bluish-white within and the outer lip completely bordered with brown. reflected but not thickened. The columella is twisted and indistinctly obliquely truncated. The parietal callus is white with a transluscent band beneath the insertion of the outer lip and bordered with brown. The periostracum is relatively thin, scaly and deep brown to horn coloured. The var. *eminens* is only a larger variant of the same species.

Genital anatomy.

Although several of the original specimens were collected alive the bodies were allowed to dry out and since there is no way of softening them without damaging the shells the anatomy unfortunately remains unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, MRAC 505, Bitze, Cameroons (*P. nodosa*)	61.5	31.0	29.5	17.0	7½
Holotype, MRAC 506, Bitze, Cameroons (var. *eminens*)	85.5	37.5	36.0	20.0	8¼
(?Var. *eminens*), BMNH 1937.12.30.3673	86.0	35.5	37.0	20.0	8¼
Paratype, BMNH 1937.12.30.3680, Gaboon	81.0	36.0	34.0	18.0	8¼
Paratype, T.P. coll., Bitze, Cameroons	76.0	39.5	34.0	20.5	8¼
Paratype, T.P. coll., Bitze, Cameroons	69.0	33.0	30.0	18.5	7¾
Paratype, T.P. coll., Bitze, Cameroons	54.0	27.5	26.0	14.5	7

Specimens examined.

Holotype and Paratypes, Bitze, R. Ja, Cameroons (MRAC, T.P. coll., BMNH). Paratype from 25 miles inland from Kribi (MRAC); Gaboon (BMNH).

Remarks.

PRESTON described both variants of this species together and in many cases there are specimens belonging to both forms together in collections. No-one including PRESTON himself seems to have taken the variety as a separate form. The authors cannot but agree with this opinion. The var. *eminens* is only a large form, or more correctly a few large shells, and no importance can be attached to it as the series of measurements above show. Text-figure 14 shows three paratypes ranging in size from 54-76 mm. The type of the nominant race comes between fig. 14C and 14B in height and the type of the variety is larger than fig. 14A but fits on the beginning of the series nicely. This species is very distinct as remarked earlier and is variable in the strength of colouring as well as the size. The original of text-fig. 14A is almost entirely unicolourous and a pale horn colour whereas that of 14B is mainly dark brown, with several flammules on the upper whorls.

Pseudachatina gravenreuthi KOBELT 1893. Plate III, figs. 5-6.

(1893) *Pseudachatina gravenreuthi* O. BÖTTGER, Ms.

1893 *Pseudachatina gravenreuthi* KOBELT, p. 18, pl. 6, figs. 3-4, pl. 7, figs. 1-6.

1893 *Pseudachatina gravenreuthi* var. *preussi* KOBELT, p. 21, pl. 16, figs. 5-6.

1896 *Pseudachatina gravenreuthi* D'AILLY, p. 94.

1896 *Pseudachatina gravenreuthi* var. *preussi* D'AILLY, p. 94.

1904 *Pseudachatina gravenreuthi* PILS., p. 212, pl. 5, figs. 20-21, 24-25.

1904 *Pseudachatina gravenreuthi* var. *preussi* PILS., p. 213, pl. 5, figs. 22-23.

1951 *Pseudachatina gravenreuthi* ZILCH, p. 45.

1951 *Pseudachatina gravenreuthi* var. *preussi* ZILCH, p. 45.

Types.

P. gravenreuthi, SMF 69845, Lectotype.

P. gravenreuthi var. *preussi*, SMF 69847, Lectotype.

Type locality.

Buea, Cameroons.

Original descriptions.

" Shell long ovate with turrited spire, rather solid but not especially thick, the middle whorls sculptured with a few short ribs and tubercles elsewhere only finely and obliquely striate, part of the striae rib-like below the suture. The colour is yellowish horn-coloured. Markings generally restricted to the third and fourth whorls, consisting of oblique stripes, forked above. Lower half of the last whorl only slightly darker, often marked with small light flecks. The fibrous brown epidermis is mostly well preserved on the last two whorls. There are also specimens with more handsome colouring than the above. Whorls nine, the initial two convex, with the usual sculpture, next two also convex, and beautifully marked with brown stripes, sometimes bordered with yellow or white; remaining whorls flattened, parted by an impressed, yellow-white bordered, irregularly crenulate suture, and with a row of tubercles or a tuberculate keel also above the suture. Aperture oblique, ovate, arcuate above, bluish within, with a liver brown border. The columella is twisted, strongly excavated, shortly and obliquely truncate below. Outer lip simple, expanded or at most very shortly reflexed. The margins are connected by a quite thin bluish or brownish callus " (KOBELT 1893, p. 18).

Var. *preussi*. — " Conspicuously smaller, hardly exceeding 60 mm long and 30 wide with a whorl less than typical *gravenreuthi*. Taken at the same localities as the latter " (KOBELT 1893, p. 18).

This is a moderate sized species with a very regular outline to the spire. The apex is brownish and the fourth and fifth whorls are usually distinctly flammulated. The lower whorls are pale yellowish under the filamentous or scaly periostracum, occasionally they are flammulated. The lower whorls are flattened and the suture hardly impressed at all though slightly puckered. The aperture is oval, bluish-white or even purple within. The columella is twisted and distinctly truncated, yellowish at the base. The outer lip is scarcely reflected, thin and tinged yellow externally. The parietal callus is thin, transluscent, especially below the insertion of the outer lip.

Genital anatomy.

The authors have been very fortunate in being able to examine five examples of this species, preserved in alcohol. Three of these were from the collections examined by D'AILLY and are in a very poor state and no information could be gained from them. The other two, however, were excellently preserved, the bodies being extented before immersion and neither had been in alcohol for more than 10 years so distortion is probably minimal. One of us (C.P.) removed one of the bodies from the shell himself so there can be no doubt as to identification. This material is the best we have seen of any species within the genus and the anatomical characters listed at the beginning of the paper are largely based on these dissections. In view of all this a fairly full account of the anatomy is given below.

The hermaphrodite gland is large multilobed and arborescent. It is connected by a fairly thick hermaphrodite duct to the inside of the albumen gland just above the prostate. No tallus could be distinguished. The prostate is large, occupying almost a whole whorl. It has two distinct rows of lobes separated by a median septum. In addition there is a slight change in the distal half of the upper row where the lobes are darker and covered by a wrinkled integument. The spermatheca is attached to the prostate at its distal end and is sac-like. It is connected by a thin spermathecal duct to the middle of the vagina. Distally it swells out and is slightly larger than the vagina at the insertion. The larger of the two tubes leaving the base of the prostate is the oviduct which narrows and then swells again to form the vagina. The vagina is an elongate muscular organ 20 mm long and 3.5 mm at its broadest. The upper part is much narrower however, being only about 1.5 mm. The circular muscle strands of the relaxed vagina are about 2-3 per mm. The walls of the vagina are approximately 1 mm thick and the inside is distinctly grooved. One groove passes down from the insertion of the spermathecal duct with which it is continuous.

The vas deferens passes down from the prostate all the way to the penial-vaginal angle where it is held in place by a pair of muscle strands passing between the penis and the vagina. It is a thin tube about 1 mm in diameter for most of its length. In these extended specimens it was bent only where it reverses its direction at the penial-vaginal angle. It is inserted into the penis sheath about 1/3 the way up and emerges at the proximal end to continue to the proximal end of the penis. Within the penis sheath it is loosely held in position by strands of connective tissue. The penis sheath is about 20 mm long relaxed and the walls 1/4 mm thick. It is composed of an outer layer of circular muscle fibres and an inner layer of longitudinal muscle fibres. The outer fibres are approximately 6-7 per mm while the inner ones are slightly finer. The penial retractor muscle is provided with a central bundle of muscle strands, usually 6 in number and an outer sheath of circular muscle fibres continuous with the outer layer of the penis. It attains the same diameter as the penis at its insertion but is thinner throughout most of its length. It is inserted proximally near the base of the columella muscle. The penis is 50-55 mm long and is bent back on itself after 13 mm from the insertion of the penial retractor and vas deferens. The penis is 3.5 mm thick with walls about 1.25 mm. The internal surface is minutely papillated and the wall thrown into folds and grooves similar to the inside of the vagina. The penis and the vagina combine distally to form a short genital atrium, and no penial prepuce could be distinguished. The animal is brownish anteriorly, whitish in the middle and reddish brown behind.

The jaw and radula.

The jaw is arcuate, about 4 mm across and minutely striated. The striae are grouped into bundles and raised somewhat. There is a slight angle running concentrically round the jaw about 0.2 mm from its union with the buccal mass.

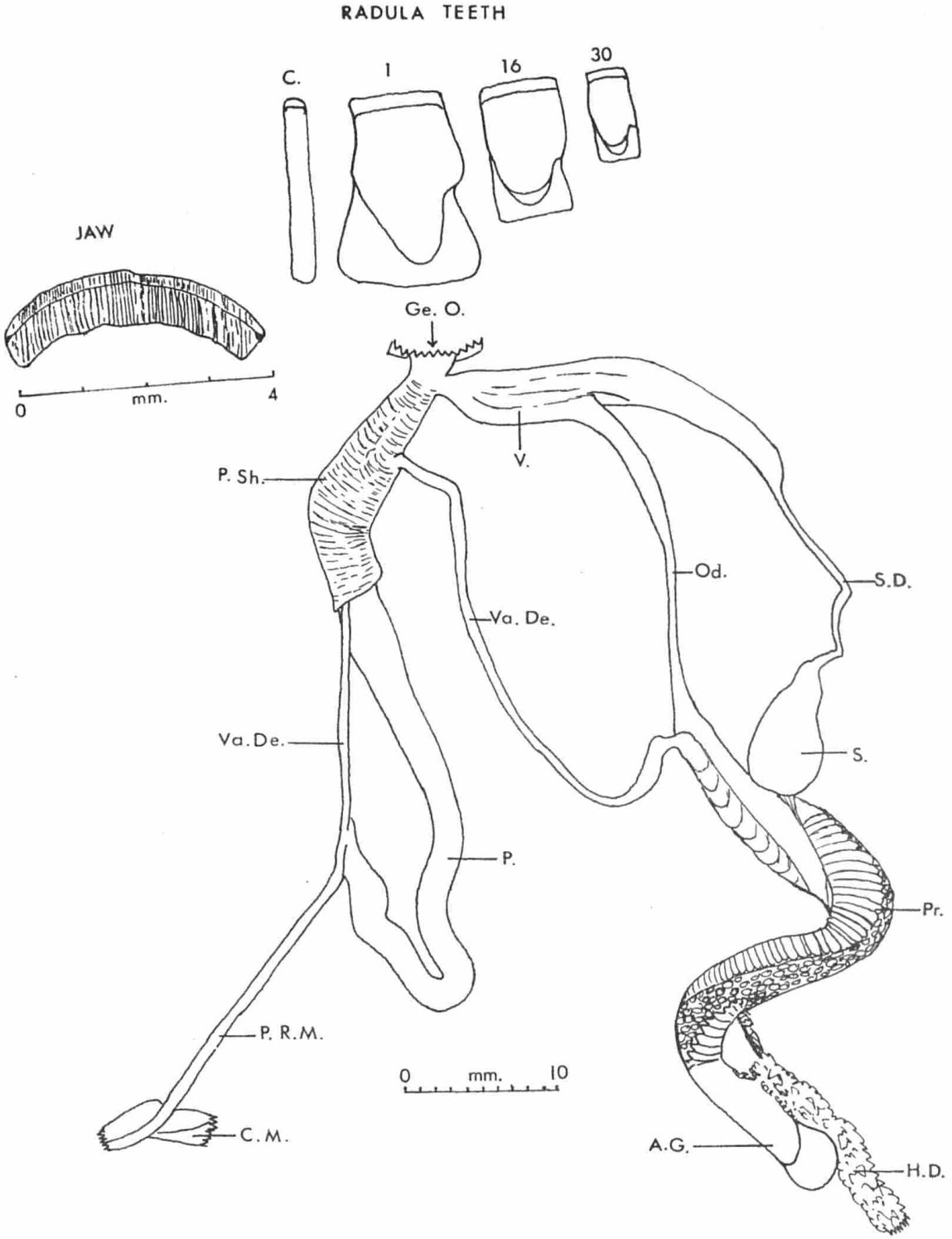


Fig. 15. — *Pseudachatina gravenreuthi* KOBELT. Anatomy. RM 3787. Genital anatomy X 2.5, jaw X 10, radula teeth c. X 300. Symbols as in text-fig. 3.

The radula is broad, 5.5 mm wide and 11 mm long with 110 teeth in a row. The central is degenerate and the laterals merge imperceptibly into the marginals. The teeth are crudely bicuspid with the endocones totally undeveloped and the exocones rudimentary. The marginals are on the whole merely smaller editions of the laterals.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Paratype, MRAC 494	64.5	32.5	31.0	17.0	7½
Paratype, BMNH 1902.3.13.58, Buea ...	75.5	36.0	35.5	20.0	7¾
Paratype, BMNH 1937.12.30.3675, Buea	77.5	34.0	34.5	19.0	8
Paratype, BMNH 1937.12.30.3676	73.5	35.5	34.0	21.0	7½
RM, Etomé, Cameroons	68.5	32.0	33.0	18.5	7½

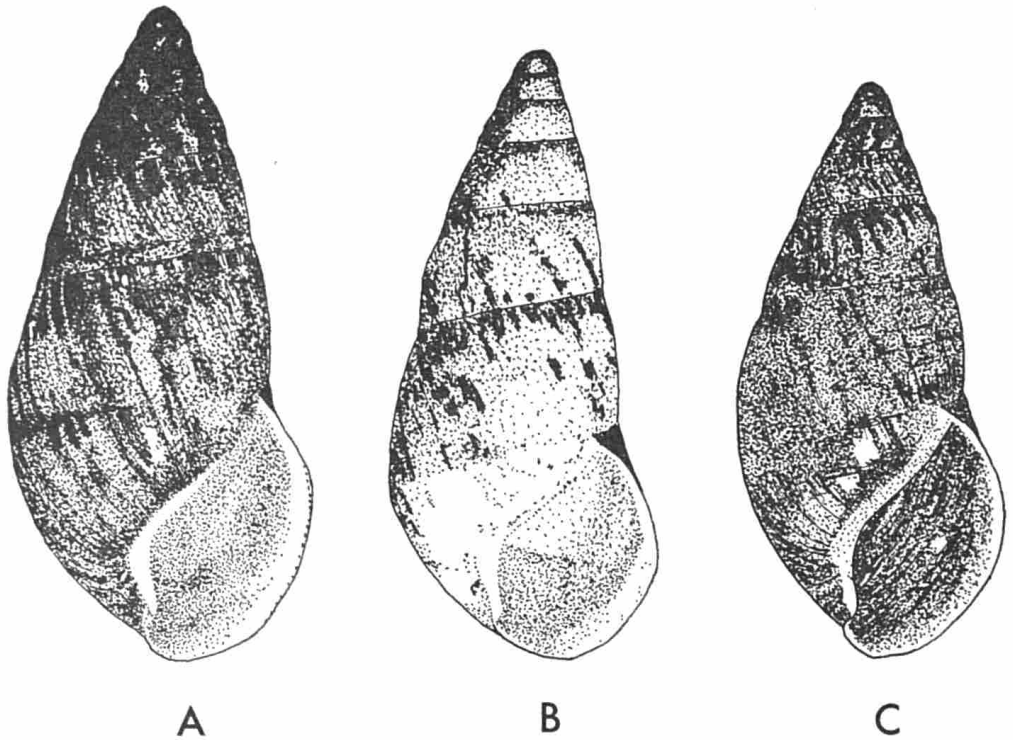


Fig. 16. — *Pseudachatina gravenreuthi* KOBELT and *P. gravenreuthi* f. *daillyana* PILS. A. Typical *P. gravenreuthi,* T.P. coll.; B. Typical f. *daillyana,* T.P. coll., Old Calabar; C. Example approaching *P. gravenreuthi* var. *preussi,* RM, Buea, Cameroons. Compare with figures of types, plate III, figs. 4-6.

Specimens examined.

Paratypes, Buea, Cameroons (BMNH, MRAC); Topotypes (BMNH, RM); Etomé, Cameroons (RM); ? Tiko, Cameroons (TURK coll.); No locality (T.P. coll.).

Remarks.

This is quite a distinct species and is not easy to confuse with any others. Like the preceding species it does not belong in any of the complexes but its smooth whorls perhaps show affinities to the *wrighti* complex. As with *P. nodosa* a variety was described at the same time and this bears the same relationship to the nominant race, only in reverse. It is namely a smaller version of the species and of no taxonomic importance. The text-figure above shows one specimen (fig. 16 A) which agrees well with the type and another which is half way between the nominate race and the variety *preussi* (fig. 16C). Fig. 16B is an example of the next form *P. gravenreuthi* form *daillyana* PILS. to show its points of difference.

Pseudachatina gravenreuthi form **daillyana** PILSBRY 1904. Plate III, fig. 4.

1904 *Pseudachatina daillyana* PILS., p. 214, pl. 1, figs. 7-8.

Type.

Holotype, ANSP 32833.

Type locality.

There is no locality on the labels of the type and paratype. The specimen in the T.P. coll. (ex CONNOLLY) is from Old Calabar so this is designated as the type locality.

Original description.

" Shell moderately solid, the spire long, with nearly straight lateral outlines. Surface smoothish, with some low, inconspicuous oblique waves and ripples only. Pure white under a fibrous, dirty yellow cuticle, which in large part persists on the last two whorls. First 4 1/2 whorls convex with simple suture, the following whorls less convex, impressed below, this border becoming obsolete on the last whorl, which is more or less angular at the periphery, the angle sometimes weakly tuberculate. Aperture small, oblique pure white or faintly pink-tinted throughout. Outer lip well expanded and reflexed. Parietal callus rather thick, white " (PILSBRY 1904, p. 214).

Only one other specimen has turned up which confirms the original description to which there is nothing to add.

Genital anatomy.

This is totally unknown.

Measurements.

	H.	W.	H.A.	W.A.	Wh.
Holotype, ANSP 32833	88.0	36.0	35.5	20.0	8¼
Paratype, ANSP 32833/1.....	85.0	33.5	33.5	17.5	8¼
T.P. coll., Old Calabar	73.5	31.5	30.0	18.0	8

Specimens examined.

The three specimens above.

Remarks.

This form is quite clearly closely related to the nominate race and at the same time quite distinct from it. It is perhaps a subspecies with a more northerly distribution but it is unwise to infer distribution patterns on one localised specimen. As a result the authors have listed it as a form of the species to which it is most closely similar but with increased information it may be possible to elevate it to a subspecies. It can be distinguished from *Pseudachatina gravenreuthi* by its completely white colour, its taller and thinner spire and smaller aperture.

E. Species not recognised

Pseudachatina guineensis Hidalgo 1910. Plate V, fig. 6.

1910 *Pseudachatina guineensis* Hidalgo, p. 509.

1923 *Pseudachatina guineensis* Azpeitia Moros, p. 96.

1924 *Pseudachatina guineensis* Azpeitia Moros, p. 174, pl. 1, fig. 1.

Type.

Azpeitia collection. Present whereabouts unknown to authors.

Type locality.

Cabo San Juan, Spanish Guinea.

Original description.

" Shell imperforate, pyramidal, with fairly obtuse apex, fairly solid, almost smooth beneath the fibrous epidermis; reddish-flesh coloured, with broadly spaced, oblique, simple, purple flammules, not continuous above the suture, and on the last whorl, with a broad blackish-purple band around the columella; 7 whorls, scarcely convex, first weakly ornamented with very narrow transverse striae, the remainder weakly flattened and margined at the suture, last with an angular girdle below the periphery, beneath which it is strongly convex; aperture oval, interior of same colour, with thin, sharp, scarcely reflected lip, more completely arcuate below, columella rather short, twisted, fairly sharp below, white " (HIDALGO 1910, p. 509).

Measurements.

The Holotype was stated to measure 50 mm in height by 22 mm in width.

Remarks.

AZPEITIA's figure (AZPEITIA 1924, pl. 1, fig. 1, reproduced here pl. V, fig. 6) shows a small shell of pinkish or mauvish colour with faint flammules of a darker colour. Unfortunately the colour photograph was produced by processes of printing in half tone three times using different colours and this has obscured the details necessary to be certain of the identification. The general shape of the shell is similar to that of *P. gabonensis* SHUTT. and the system of colouring described, i.e. purplish flammules on a pinkish or flesh coloured ground, is known in forms of that species to which PFEIFFER gave the name *P. dennisoni*. It is possible that this species belongs in the *gabonensis* complex and indeed it could be a small example of *P. gabonensis* SHUTT. On the other hand the shell also resembles *P. vignoni* (MORELET) in size and shape but not colouring. *P. vignoni* has abundant blackish flammules, but as it is only known from a single specimen the variation in its colour is unknown. The authors feel that without examining the type it is impossible to settle the status of this species.

Pseudachatina perelongata ROLLE 1902.

1902 *Pseudachatina perelongata* ROLLE, p. 211.
1904 *Pseudachatina perelongata* PILSBRY, p. 214.

Type.

The type was in the Berlin Museum but now appears to be lost.

Type locality.

Old Calabar.

Original description.

" Shell very long, turrited, solid, moderately plicate-striate, decussate with evanescent spiral lines, covered with a rough, deciduous, straw-coloured cuticle. Whorls 9, a little convex, separated by a distinctly margined and sub-crenulate suture, subangular below the suture; last whorl impressed below the suture, then somewhat angular at the periphery. Aperture moderately oblique, oblong-oval, the peristome rather expanded, white-lipped, more effuse basally. Columella rather straight, moderately twisted, subtruncate at base, forming a fairly deep sinus with the basal margin " (ROLLE 1902, p. 211).

Measurements.

The Holotype was stated to have following measurements: H. 99.5 mm, W. 39.7 mm, H.A. 38.9 mm, W.A. 25.0 mm.

Remarks.

Dr. KILIAS has been unable to trace the Holotype and only specimen of this species and as there was no figure of it in the original paper the authors have no idea of what is was like. PILSBRY regretted the absence of any description of the colour and suggested it might be similar to his species *P. daillyana.* There has been a tendancy to accept this synonymy in the past but it cannot be proved until the type of *P. perelongata* is found. In general descriptions of species of *Pseudachatina* are inadequate for identification.

Pseudachatina atopocochlioides DUPUIS 1922.

1922 *Pseudachatina atopocochlioides* DUPUIS, p. 83, fig. 1.

Type.

DUPUIS coll. We have, as yet, been unable to trace this specimen.

Type locality.

Gaboon.

Original description.

" Spire regularly conical, comprising 8 whorls, with very indistinct microscopic sculpture; all the surface is smooth, the first whorls shiny becoming more

and more dull on the last three. They show from place to place irregular, obsolete swellings, corresponding to the periods of growth. On the last whorl, they form several feeble tubercles on the peripheral keel. This keel is rounded, fairly large, the last whorl is flattened and excavated slightly below it, up to the peristome. In the last three whorls the portion below the suture is in the form of a flattened line, showing several traces of weak folds, but not crenulated.

" The summit of the spire is pale reddish brown, passing into very pale salmon on the following whorls, the last being a greyish yellow. The sutural band is paler, greyish, the keel is whitish.

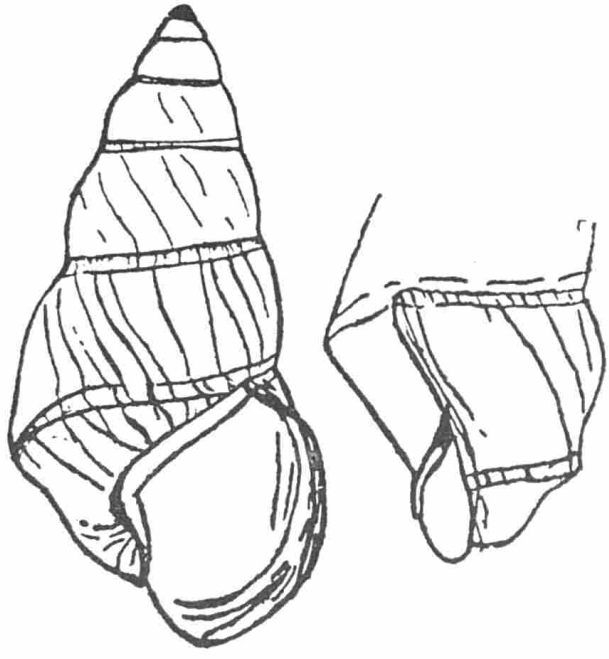


Fig. 17. — A copy of figure 1 in DUPUIS 1922, enlarged to natural size. The type of *P. atapocochlioides.*

" The columella is twisted, very narrowly truncated at its extremity. The parietal callus is thick, the peristome reflected, except at its upper part, and sharp at the exterior margin, thickened towards the interior of the aperture. It is more or less quadrangular. Height of the shell : 70 mm. Greatest width (at the level of the keel) 35 mm. Aperture height 31 mm, width including the peristome 19 mm.

" The external margin of the aperture is oblique when compared with the axis of the spire. The columella, in descending and twisting projects strongly towards the exterior and the point where it joins the lower margin of the peristome " (DUPUIS 1922, p. 83).

Remarks.

When the manuscript of the present studies was almost complete one of us (T.P.) was sent a copy of the paper by DUPUIS describing this species. As yet we have been unable to trace this type but this does not necessarily mean that it is lost. Rather than delay the entire paper we decided to publish this brief note. From DUPUIS' description it would seem that, if this is indeed a species of *Pseudachatina,* then it is a distinct species which is probably related to the *gabonensis* complex. There is in the BMNH collections a small specimen from the Abanga river (Ogooué river), Gaboon (reg. 1908.6.11.5) which may possibly belong to this species. It is smaller that the type and lacks a distinct keel but the last whorl is angular. It measures 51.5 mm in length by 28.5 mm width, the aperture is 22.0 mm by 15.0 mm and it has 7 whorls. DUPUIS' figure (text-fig. 17) is inadequate to be sure of the characters of his species and so its exact nature cannot be settled until we trace the type.

POSTSCRIPT

The present studies cannot be considered as anything more than an interim report on a slowly changing state of knowledge. If they succeed in no more than speeding up this rate of change the authors will deem them to have been worthwhile. We would therefore welcome any information on *Pseudachatina,* especially in the fields of ecology and geographical distribution, or the loan of further specimens for study, and we will willingly undertake to identify specimens.

Undoubtedly some authors will criticise our description of *forms* rather than *subspecies.* However, we feel that for as long as subspecies are accepted as being geographically or ecologically isolated races within a species, it will be impossible to describe subspecies in the complete absence of any such geographical or ecological information. " Morpho-subspecies " cannot exist, by definition, and so we have the choice of either ignoring many distinct races, or describing them. We have described *forms* in the hope that their description will stimulate interest in them and eventually provide the information necessary to settle whether they can be considered as subspecies or not.

We have entertained the possibility of describing subgenera for the complexes we recognise, which are undoubtedly as distinct as some other subgenera within the Achatininae. We have rejected this possibility for the present, as some species apparently do not fit into the complexes and it is unwise to describe new subgenera for each of these " odd " species. Further information may fit these into the distinct complexes (e.g. *P. gravenreuthi* may fit into the *wrighti* complex) but for the present they remain " odd ".

Pseudachatina is a particularly difficult genus from the point of view of taxonomy and needs much more study. It is hoped that the present studies will form a useful basis for further work.

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PLATES

(All figures natural size)

PLATE I

Fig. 1. — *Pseudachatina teauana* (GRATELOUP), Holotype.

Fig. 2. — *Pseudachatina sodeni* form *elegantula* nov., Holotype.

Fig. 3. — *Pseudachatina sodeni* KOBELT, Lectotype.

Fig. 4. — *Pseudachatina downesii* (GRAY). Fig. 99, Conchological illustrations.

Fig. 5. — *Pseudachatina martensi* D'AILLY, Lectotype.

Fig. 6. — *Pseudachatina liljevalli* D'AILLY, Lectotype.

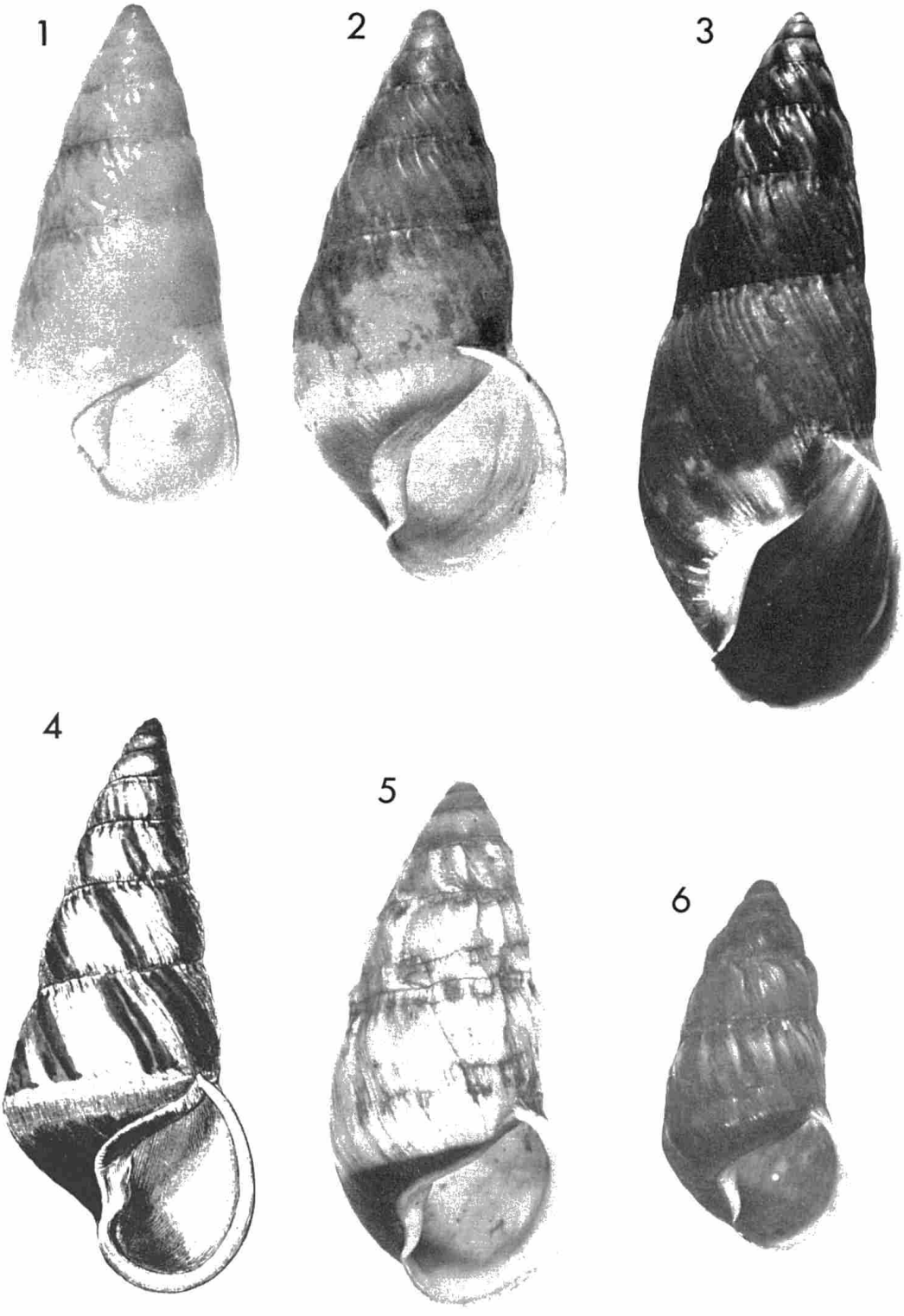
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PLATE II

Fig. 1. — *Pseudachatina grandinata* PFEIFFER, Holotype.

Fig. 2. — *Pseudachatina connectens* D'AILLY, Paralectotype.

Fig. 3. — *Pseudachatina connectens* form *colorata* nov., Holotype.

Fig. 4. — *Pseudachatina rollei* BLUME, Lectotype.

Fig. 5. — *Pseudachatina granulata* nov., Holotype.

Fig. 6. — *Pseudachatina connectens* form *plicata* nov., Holotype.

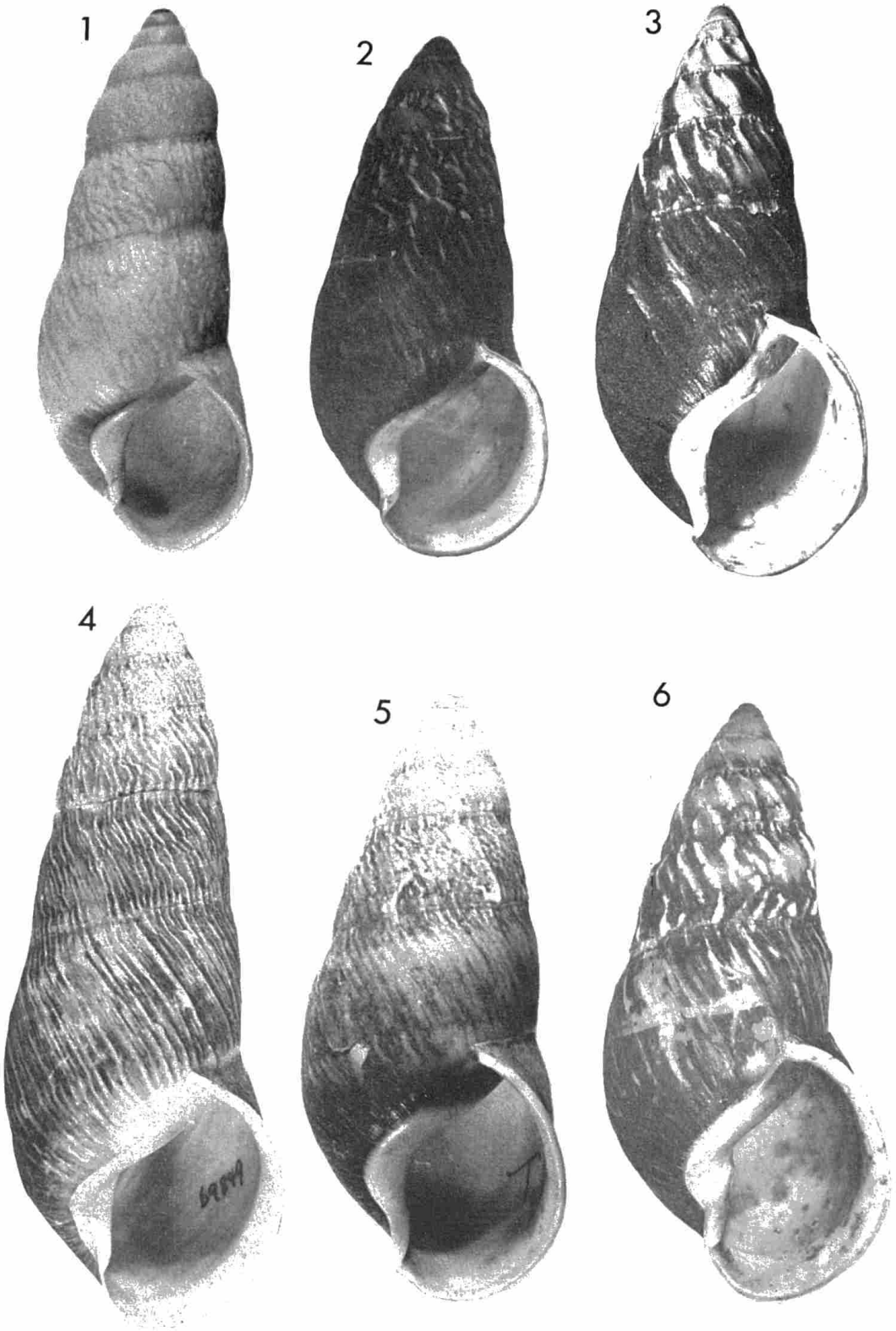
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PLATE III

Fig. 1. — *Pseudachatina pulchra* nov., Holotype.

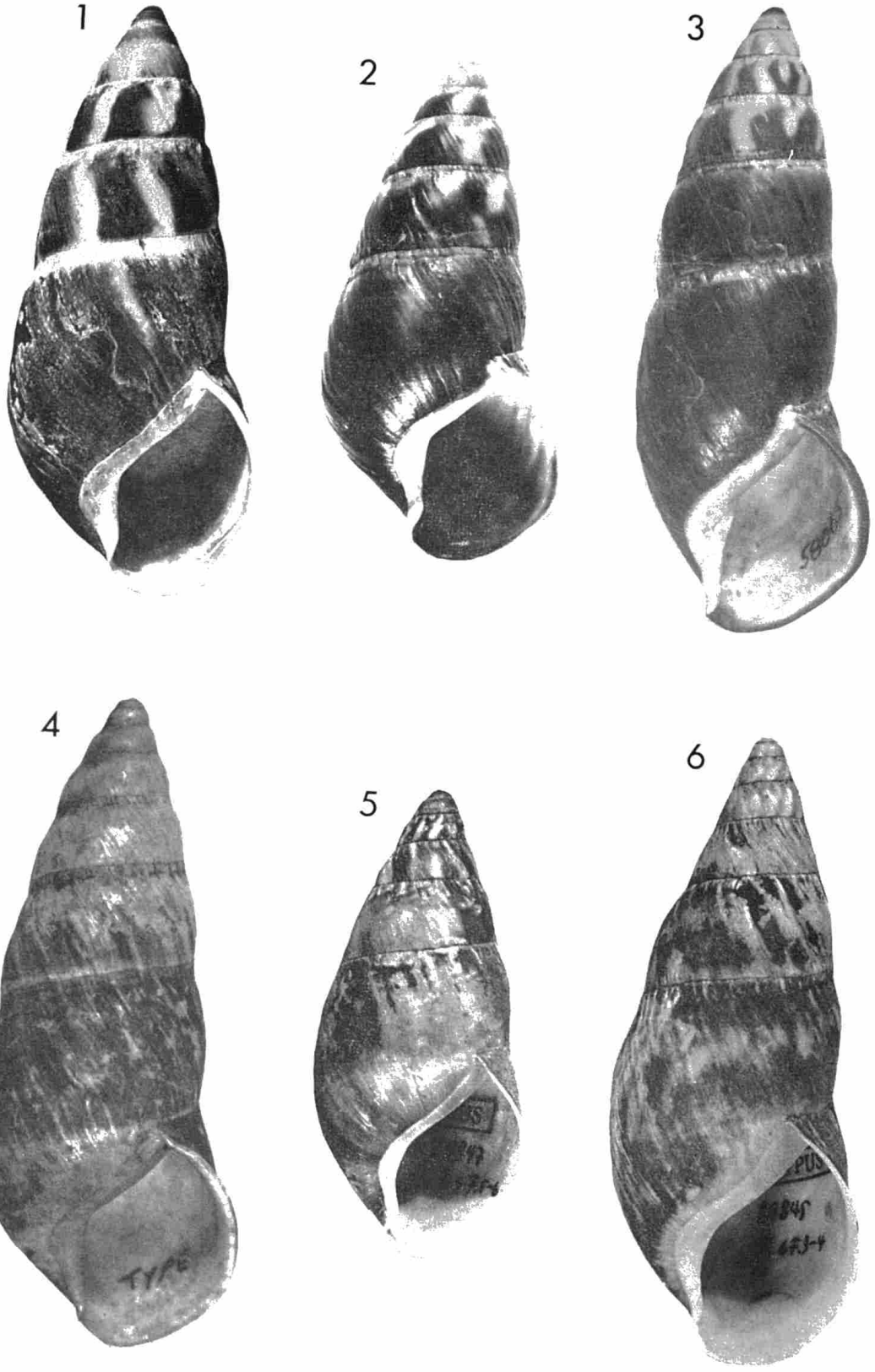
Fig. 2. — *Pseudachatina pyramidata* KOBELT, Lectotype.

Fig. 3. — *Pseudachatina pyramidata kobeltiana* PILSBRY, Holotype.

Fig. 4. — *Pseudachatina daillyana* PILSBRY, Holotype.

Fig. 5. — *Pseudachatina gravenreuthi* var. *preussi* KOBELT, Lectotype.

Fig. 6. — *Pseudachatina gravenreuthi* KOBELT, Lectotype.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TYPE

PLATE IV

Fig. 1. — *Pseudachatina wrighti wrighti* (Sow.), Shutt. coll., MHNB.

Fig. 2. — *Pseudachatina wrighti* form *minor* nov., Holotype.

Fig. 3. — *Pseudachatina wrighti* var. *buchneri* Kobelt, Lectotype.

Fig. 4. — *Pseudachatina wrighti buckholzi* Kobelt, Lectotype.

Fig. 5. — *Pseudachatina nodosa* var. *eminens* Preston, Holotype.

Fig. 6. — *Pseudachatina nodosa* Preston, Holotype.

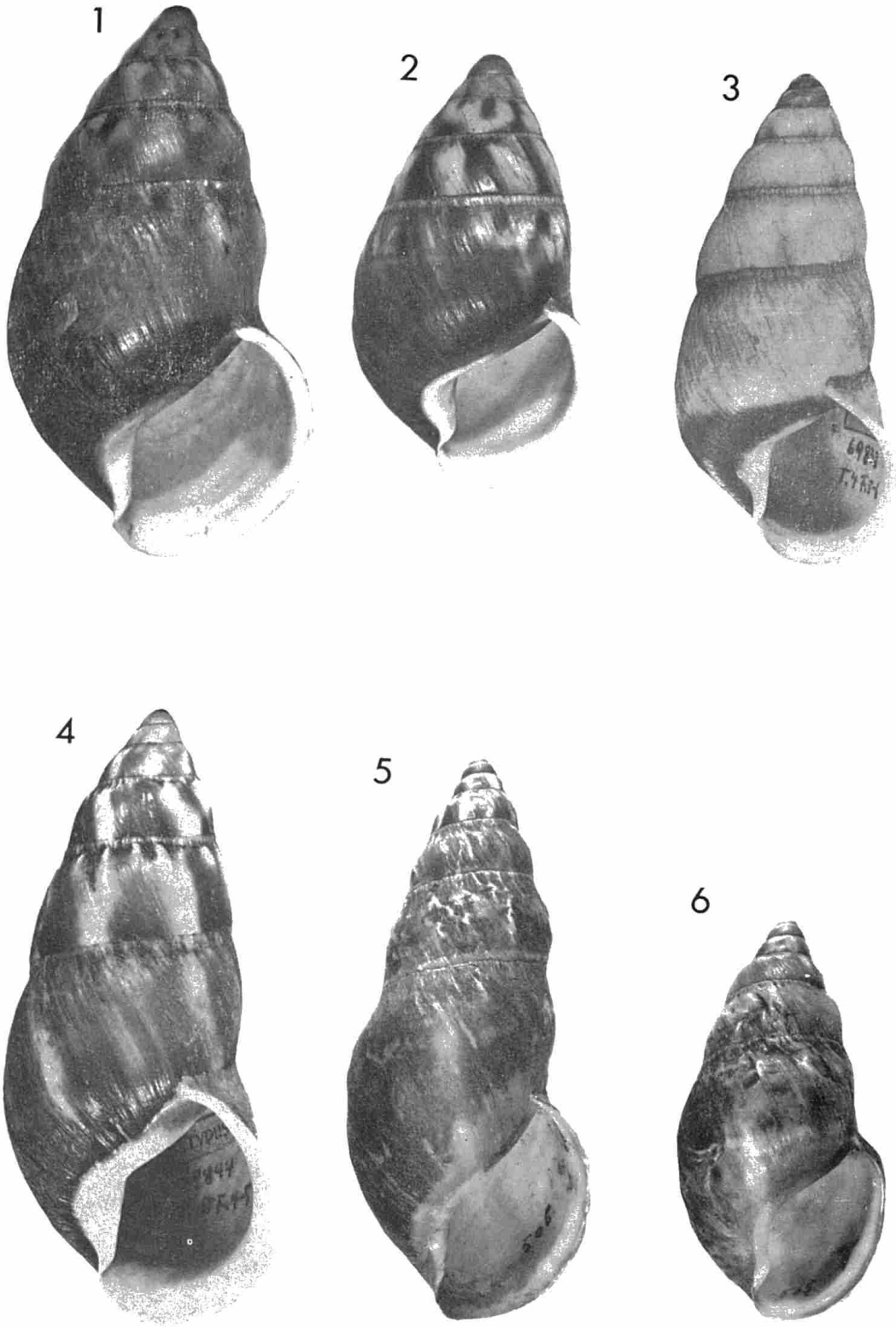
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PLATE V

Fig. 1. — *Pseudachatina gabonensis* SHUTTLEWORTH, Lectotype.

Fig. 2. — *Pseudachatina dennisoni* PFEIFFER, « Metatype ».

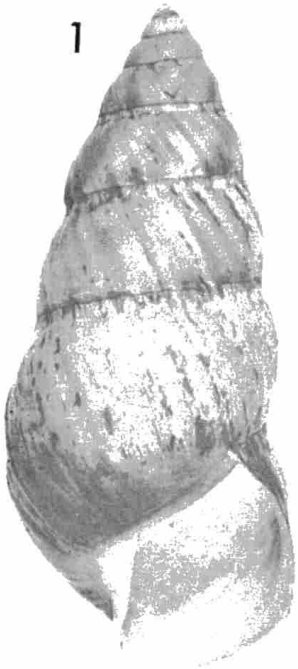
Fig. 3. — *Pseudachatina striata* nov., Holotype.

Fig. 4. — *Pseudachatina elongata* PFEIFFER, Lectotype.

Fig. 5. — *Pseudachatina nachtigali* KOBELT, Holotype.

Fig. 6. — *Pseudachatina guineensis* HIDALGO, Holotype (figure copied from AZPEITIA 1924, pl. 1, fig. 1).

Fig. 7. — *Pseudachatina vignoni* (MORELET), Holotype.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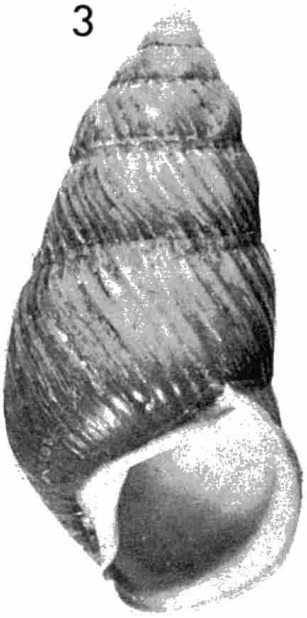
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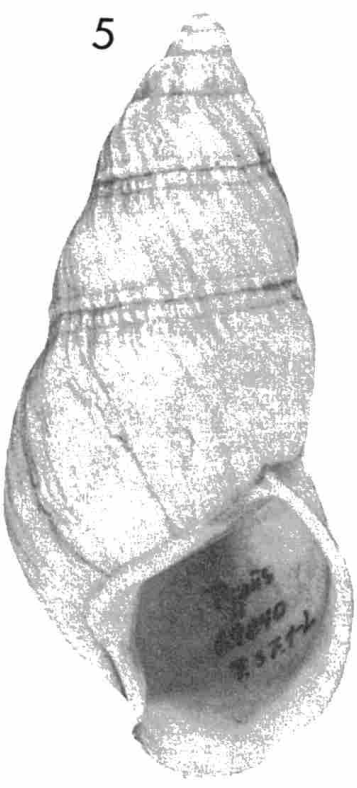
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