

# Dr William ADAM's iconography of Central and West African *Gulella* species (Gastropoda Pulmonata: Streptaxidae).

## Part 1: nominal taxa

by A.C. VAN BRUGGEN & J.L. VAN GOETHEM

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### Abstract

When Dr William ADAM (1909-1988) died, he left a number of figures of shells of the genus *Gulella* (family Streptaxidae) with no, or only minimal, manuscript notes. The high quality of the figures, drawn by Mrs. J. VAN MELDEREN-SERGESSELS, precluded storage in the Institute archives without further comment. The present authors have supplied summary notes on the 26 Central and West African nominal taxa depicted; the distribution of many of these taxa (mainly based on material from the National

Parks of Congo, identified by Dr ADAM) is shown to be more extensive than originally known. *Gulella excruciatula* CONNOLLY, 1931, is considered a synonym of *Ennea decussatula* PRESTON, 1913. The following nominal taxa are illustrated (in seven cases by type material, indicated by an \*) and treated: *Gulella arthuri*\*, *G. avakubiensis*, *G. bistrilicina*, *G. brevis*, *G. camerani*, *G. cara*, *G. chapini*, *G. coarti*, *G. conospira*, *G. decussatula*, *G. disseminata*\*, *G. haullevillei*, *G. lamyi*\*, *G. lessensis*, *G. masisiensis*, *G. mikenensis*\*, *G. opoboensis*\*, *G. osborni*, *G. planidens*, *G. polloneriana*\*, *G. pupa*, *G. sankuruensis*\*, *G. sexdentata*, *G. socialis*, *G. ugandensis*, and *G. vicina mediafricana*. The following subspecies and/or varieties are synonymous with their respective nominal species: *G. conospira polynematica*, *G. masisiensis palatidens* and *G. opoboensis liberiana*. Attention is drawn to summary radula data for *G. decussatula* and *G. lessensis*. *Gulella bernardi* is proposed as nom. nov. for *Gulella sexdentata* (TAYLOR, 1880) non *Gulella sexdentata* (VON MARTENS, 1869).

**Key-words:** Gastropoda, Pulmonata, Streptaxidae, *Gulella*, Africa, systematics.

### Résumé

L'iconographie d'espèces du genre *Gulella* (Gastropoda Pulmonata: Streptaxidae) provenant d'Afrique centrale et occidentale, laissée par le Dr William ADAM. 1ère Partie: taxons nominaux. L'héritage scientifique du Dr William ADAM (1909-1988) contient entre autres une série de dessins de coquilles appartenant au genre *Gulella* (famille des Streptaxidae), la plupart sans notes manuscrites. Vu la très haute qualité des dessins, réalisés par Mme J. VAN MELDEREN-SERGESSELS, il est exclu d'archiver ces documents sans les valoriser. Les auteurs présentent des données succinctes sur 26 taxons nominaux du genre *Gulella*, de l'Afrique centrale et occidentale. Pour nombre d'entre eux, la répartition géographique (basée principalement sur du matériel des Parcs Nationaux du Congo, identifié par le Dr ADAM) se révèle nettement plus large que connue. *Gulella excruciatula* CONNOLLY, 1931 est considéré comme un synonyme d'*Ennea decussatula* PRESTON, 1913. Les taxons nominaux suivants sont traités et illustrés pour sept cas par leur matériel type, indiqué par un \*): *Gulella arthuri*\*, *G. avakubiensis*, *G. bistrilicina*, *G. brevis*, *G. camerani*, *G. cara*, *G. chapini*, *G. coarti*, *G. conospira*, *G. decussatula*, *G. disseminata*\*, *G. haullevillei*, *G. lamyi*\*, *G. lessensis*, *G. masisiensis*, *G. mikenensis*\*, *G. opoboensis*\*, *G. osborni*, *G. planidens*, *G. polloneriana*\*, *G. pupa*, *G. sankuruensis*\*, *G. sexdentata*, *G. socialis*, *G. ugandensis* et *G. vicina media-*

*fricana*. Les sous-espèces et/ou variétés suivantes sont synonymes de leurs espèces nominales respectives: *G. conospira polyne-matica*, *G. masisiensis palatidens* et *G. opoboensis liberiana*. Des données succinctes des radules sont présentées pour *G. decus-satula* et *G. lessensis*. *Gulella bernardi* nom. nov. est proposé pour *Gulella sexdentata* (TAYLOR, 1880) non *Gulella sexdentata* (VON MARTENS, 1869).

**Mots-clefs:** Gastropoda, Pulmonata, Streptaxidae, *Gulella*, Afrique, systématique.

## Introduction

When Dr William ADAM (1909-1988), late curator of molluscs of the Royal Belgian Institute of Natural Sciences (Brussels), died, he left a considerable and valuable heritage of manuscripts, manuscript notes and figures. Most of the figures were intended to be illustrations for a number of papers on African terrestrial molluscs in various stages of planning, three of which have now been published (*vide* ADAM, VAN BRUGGEN & VAN GOETHEM, 1993, 1994, 1995). No more reasonably complete or even somewhat advanced manuscripts on this subject were found among Dr ADAM's papers. However, there is a series of figures of shells of a number of mainly Central and West African species of the large genus *Gulella* L. PFEIFFER, 1856, drawn by Mrs Jacqueline VAN MELDEREN-SERGYSELS, the artist who for many years closely cooperated with Dr ADAM. This series of drawings, many of which were made more than forty years ago, may be divided into two parts, *viz.* (1) figures of identified nominal taxa, and (2) figures of as yet undescribed taxa. The quality of the drawings and their informative value precluded simple storage without further ado in the archives of the Brussels Institute. We owe it to the memory of the late Dr ADAM and to honour the talent and diligence of Mrs VAN MELDEREN-SERGYSELS to foster publication of these drawings.

This paper features the figures of identified nominal taxa. The drawings are accompanied by notes, some of which (*viz.* those on *G. decussatula* and *G. lessensis*) are extracted from, sometimes meagre, manuscript notes by Dr ADAM, who was in the process of building up a data base on the genus *Gulella*. Unfortunately this was too little advanced to be suitable for publication. Therefore, most of the data below was generated *de novo*, which implies that treatment of the various taxa is uneven - some problems have been solved, others have been indicated.

## Abbreviations used

### Museums

AMNH	American Museum of Natural History, New York
BM	The Natural History Museum [formerly British Museum (Natural History)], London
IRSNB	Institut royal des Sciences naturelles de Belgique, Brussels

MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Mass., U.S.A.
MRAC	Musée royal de l'Afrique centrale, Tervuren, Belgium
NM	Natal Museum, Pietermaritzburg, South Africa
NRS	Naturhistoriska Riksmuseet, Stockholm
RMNH	Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, the Netherlands
SAM	South African Museum, Cape Town

### Geography

D.R.Congo Democratic Republic of Congo (formerly Zaïre)

*ex* The addition of 'ex' to a national park acronym (*e.g.* *ex* PNV) indicates a locality in the area immediately adjoining the national park in question.

PNG Garamba National Park, D.R.Congo

PNU Upemba National Park, D.R.Congo

PNV Virunga National Park [formerly Albert National Park, officially divided into three sectors, *i.e.* the northern (north of Lake Edward), central (around and south of Lake Edward), and southern (from the Rutshuru River to Lake Kivu) sectors], D.R.Congo.

### Shell

alc. specimens in alcohol

ap. aperture

l/d the ratio length/major diameter as an indication of the shape of the shell. (In a number of cases the l/d has been calculated from micrometer readings, so that the l/d values do not always agree with those calculated from the dimensions in mm.)

lw. last whorl (body whorl) in front view

wh. number of whorls

## The genus *Gulella* L. PFEIFFER, 1856

As regards taxonomy, a note of warning may be sounded. In general the system of ZILCH (1960) has been followed and where appropriate his 'subgenera' of *Gulella* have been quoted. This does not imply acceptance of these taxa as systematic units. Some characteristic species are easily classified with some of the more aberrant 'subgenera', but in practice it appears that there are all sorts of intermediates and a definitive classification has to await incorporation of anatomical (and perhaps also other) characters. At the moment it is even almost impossible to properly delineate *Gulella* as a genus. PILSBRY (1919: 180, 214) defines the genus as streptaxids with more or less pupoid shells with reflected peristome in the adult and the aperture usually toothed, but without deeply entering palatal folds and no spiral furrows on the back. ZILCH (1960: 569) gives the following characterization (translated from the German): 'Shell transparent,

elongate-ovate to ovate-cylindrical; numerous, slowly increasing, weakly convex whorls, with oblique axial costulation to almost smooth; body whorl rounded below, rimate; aperture somewhat irregularly circular to ovate, circular-triangular or quadrate; labrum expanded and flaring, more or less obstructed by parietal lamella, columellar lamella, basal and palatal folds, the last-mentioned short, corresponding to outside pits (not furrows), the ends more or less closely together and connected by a parietal process.'

The following 26 Central and West African nominal taxa of *Gulella s.l.* are treated below in alphabetical order:

*G. arthuri* (DAUTZENBERG, 1890); *G. avakubiensis* PILSBRY, 1919; *G. bistrilicina* PILSBRY, 1919; *G. brevis* (THIELE, 1911); *G. camerani* (POLLONERA, 1906); *G. cara* PILSBRY, 1919; *G. chapini* PILSBRY, 1919; *G. coarti* (DAUTZENBERG & GERMAIN, 1914); *G. conospira* (VON MARTENS, 1892); *G. decussatula* (PRESTON, 1913); *G. disseminata* (PRESTON, 1913); *G. haullevillei* (DAUTZENBERG & GERMAIN, 1914); *G. lamyi* (DAUTZENBERG & GERMAIN, 1914); *G. lessensis* PILSBRY, 1919; *G. masiensis* PILSBRY, 1919; *G. mikenensis* (PRESTON, 1913); *G. opoboensis* (PRESTON, 1914); *G. osborni* PILSBRY, 1919; *G. palatidens* PILSBRY, 1919; *G. planidens* (VON MARTENS, 1892); *G. polloneriana* PILSBRY, 1919; *G. pupa* (THIELE, 1911); *G. sankuruensis* DARTEVELLE-PUISSANT, 1936; *G. sexdentata* (VON MARTENS, 1869); *G. socialis* PILSBRY, 1919; *G. ugandensis* (E.A. SMITH, 1901); and *G. vicina mediafricana* PILSBRY, 1919.

The shell of the various nominal taxa is succinctly diagnosed with the range of its measurements, followed by the distribution (with museum specimens cited where appropriate) and additional notes, if any.

The main shell characters used in distinguishing taxa of *Gulella* are the following (N.B. Intraspecific variation in these characters may at times be considerable):

(1) Size, *i.e.* length or height of the shell; this varies from about 1.5 to 22.0 mm.

(2) Shape; this varies from ovate or obovate to subcylindrical or cylindrical, while the apex may be (sub)mammillate to subacute or acute - shells with a tapering spire and clavate shells also occur in *Gulella*. The equation  $l/d$  (length divided by major diameter) gives a measure of the shape of the shell. At times the whorls may be very convex and the widest point may be situated anywhere between the lower third or the middle of the length of the shell.

(3) Surface sculpture, which may be separated into spiral and axial elements, the former not frequently met with and usually only on the apex, although some taxa have persistent, though increasingly obsolete, spiral sculpture on the other whorls as well. Costulation varies from completely absent (resulting in smooth shells, sometimes to such a degree that even growth striae are not detectable) to very pronounced, sometimes with typically outstanding, costulae. Costulate shells normally have smooth(ish) or slightly pitted apical whorls; even almost completely smooth shells have some traces of costulation behind the

labrum, *i.e.* around the normally very narrow umbilicus. The sutures are also part of the surface sculpture; these vary from filiform to (sub)crenellate.

(4) Apertural dentition. Some taxa are edentate, *i.e.* have no traces of apertural dentition in the adult shell. Otherwise, apertural dentition varies from one (an angular lamella occurs in almost all taxa with dentition and, in many cases, is the only process present) to twelve or more processes, clockwise usually in discernible patterns in four areas, *i.e.* on the outer lip or labrum (labral or palatal processes), the base of the aperture (basal processes), the columellar area (columellar processes) and the parietal area (parietal processes) of which the most noticeable is the angular lamella). Some large (complexes of) processes may correspond to depressions on the outside of the aperture. Individual processes may greatly differ in position, size and shape. Generally PILSBRY's terminology (1919: 169, fig. 59) has been followed.

It is perhaps appropriate to here summarily dwell on the evolution of the apertural dentition in the genus, or for that matter in the family Streptaxidae. An aperture without any dentition at all, probably represents the plesiomorphic character state. On the other hand, such patterns may also be the result of a secondary reduction in dentition. The next stages are the presence of a single process, normally an angular lamella, followed by a two-fold dentition consisting of angular lamella and (upper) labral/palatal process. Taxa with such types of dentition abound throughout Africa. Apertures with a prolific dentition all around the margin of the aperture should then be considered examples of an apomorphic condition. Taxa with such types of apertural dentition are also widely spread among *Gulella s.l.*, but are certainly not as common as those without processes or with single and two-fold patterns. As regards distribution, there is a vague hint of biogeographical implication here, simple dentitions being met with in peripheral and marginal situations [*e.g.* southern South Africa (CONNOLLY, 1939), far western Africa, Comoro Is. (FISCHER-PIETTE & VUKADINOVIC, 1974), Madagascar], and intricate patterns being seemingly restricted to central Africa *s.l.* Would this indeed be true or is it rather a too simplistic explanation?

There is a complication as regards the development of the apertural dentition in the course of the life of the individual snail. Most species do not display juvenile dentition, particularly the ones with simple patterns in the aperture. However, juvenile dentition is known among a number of taxa, most (if not all) with (considerably) more than two processes in the aperture. In these cases there must be a succession of formation and, usually, resorption of processes during the growth of the animal in question. Would this be an apomorphic character state?

This paper accurately reflects current streptaxid knowledge, which generally is rather limited, to say the least; anatomical details are hardly available and some species have never been collected outside their type locality.

## Review of the species illustrated

*Gulella (Paucidentina) arthuri* (DAUTZENBERG, 1890)  
(Figs 1-4)

*Ennea (Huttonella) arthuri* DAUTZENBERG, 1890: 127, pl. 1 figs 2a-d; VON MÖLLENDORFF & KOBELT, 1904: 285, pl. 33a figs 22-24; KOBELT, 1910b: 155.

*Gulella (Paucidentina) arthuri*; PILSBRY, 1919: 223; CONNOLLY, 1928: 534; DEGNER, 1934a: 261; DEGNER, 1934b: 373; DARTEVELLE-PUISSANT, 1936: 60.

*Gulella arthuri*; RICHARDSON, 1988: 55.

The following varieties have been described:

*Gulella (Paucidentina) arthuri* var. *eximia* DEGNER, 1934a: 261, fig. 34.

*Gulella arthuri* var. *eximia*; RICHARDSON, 1988: 55.

*Gulella (Paucidentina) arthuri* var. *cardiostoma* DEGNER, 1934a: 263, fig. 35; DEGNER, 1934b: 373.

*Gulella arthuri* var. *cardiostoma*; RICHARDSON, 1988: 55.

*Gulella arthuri cardiostoma*; DE WINTER, 1996: 145.

Shell diagnosis. - Shell small and shining, more or less cylindrical, with (more or less) obsolete costulation, and with (sub)crenellate sutures. The aperture shows a two-fold dentition, consisting of an angular lamella and a labral process in the form of a swelling on the outer lip. Measurements: 3.3 x 1.4 mm, l/d 2.36, lw 1.7 mm, ap. 1.1 x 1.1 mm (holotype, figs 1-2).

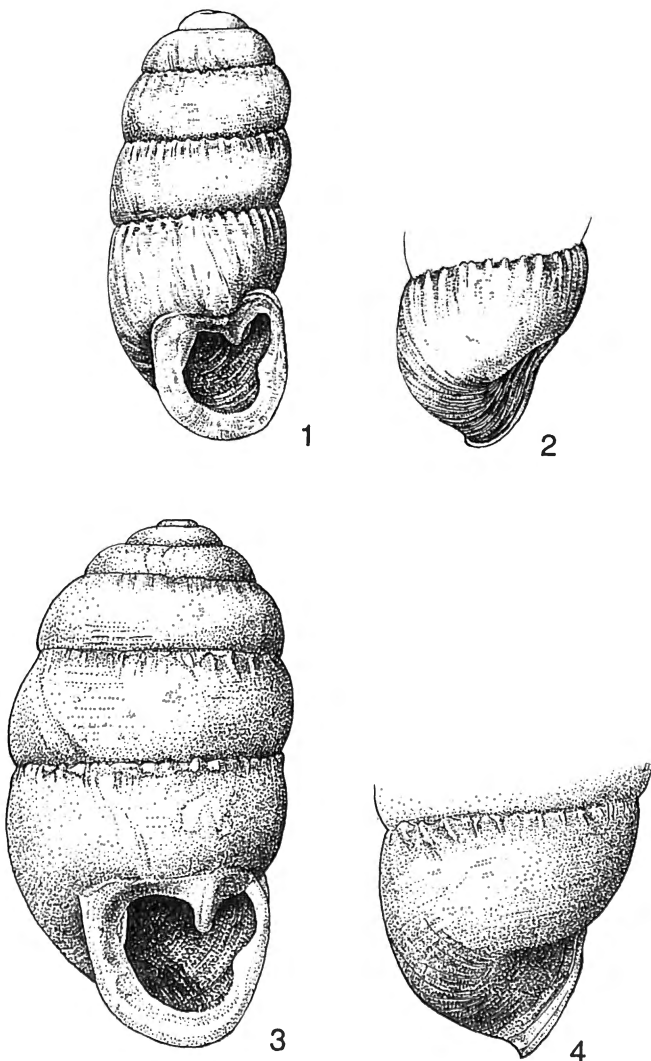
Distribution. - Senegal.

Notes. - DAUTZENBERG (1890) only gives measurements of one shell, but this is consistently done throughout the paper that contains the original description of *Ennea arthuri*. The type material (IRSNB) consists of a glass tube with a single shell pasted on to a piece of cardboard with the figures from the original description and, in addition to other data, also the word 'TYPE'. Therefore the original specimen should be considered the holotype. In the type specimen the costulation is more obsolete than shown in figs 1-2, the shell gives the impression of being smooth; in that respect the original figures (DAUTZENBERG, 1890: pl. 1 figs 2a-d) are better than the ones reproduced here.

The type locality (DAUTZENBERG, 1890: 128), "Jardin botanique de Dakar" may be a secondary locality, *i.e.* the shells may have been imported with plants from elsewhere in (West) Africa. In any case, Dakar is the northwesternmost locality for any streptaxid in continental Africa. The species was named after the famous French malacologist Arthur MORELET (1809-1892).

There is a lot of confusion regarding this taxon. Smallish shells with the above-described simple apertural dentition from widely separated areas in the western parts of the West African forest belt have been recorded as *G. arthuri*, and two varieties have also been recognized (vars *cardiostoma* and *eximia*). Such specimens hail from the following countries: Senegal, Sierra Leone, Liberia, Ivory Coast. Undoubtedly there will be more as yet unpublished West African material under this name in various collections. Figs 3-4 depict a shell of 4.0 x 2.2 mm, l/d 1.82, from Liberia. Comparison with figs 1-2 (holotype) shows that identification with *G. arthuri* is at most doubtful. The confusion as regards the status and distribution of this species may only be solved by the examination of series from a variety of localities from all over West and Central Africa, preferably also taking into account data from the radula and genitalia.

The name *Ennea arthuri* PRESTON, 1913, *non* DAUTZENBERG, 1890, for an East African taxon is a junior homonym replaced by *Gulella odhneriana* DUPUIS, 1923.



Figs 1-4. - Shells identified as *Gulella arthuri* (DAUTZENBERG). - Figs 1-2, holotype, Senegal, Dakar, 3.3 x 1.4 mm (IRSNB), see comments in text. - Figs 3-4, Liberia, Du River, 4.0 x 2.2 mm (NRS); these figures show little resemblance to those of the holotype (identification doubtful, see text).

*Gulella (Avakubia) avakubiensis* PILSBRY, 1919  
(Fig. 5)

*Gulella (Avakubia) avakubiensis* PILSBRY, 1919: 234, fig. 102; DEGNER, 1934b: 377; ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE, 1956: 118, fig. 22; ZILCH, 1960: 570, fig. 1996; VERDCOURT, 1962: 8; RICHARDS & OLD, 1969: 41; VERDCOURT, 1983a: 181; RICHARDSON, 1988: 55.

Shell diagnosis. - Shell small, subcylindric to obovate, with noticeably convex whorls and subacute apex, distantly costulate with prominent costulae, but apex solely with spiral sculpture (which may persist as far as the body whorl), sutures (sub)crenellate to (sub)filiform. Aperture with two-fold dentition consisting of an angular lamella and an (upper)labral swelling.

Measurements: 2.8-3.4 x 1.7-2.0 mm, l/d 1.50-1.83, 5-6 whorls.

Distribution. - Liberia, Northwest D.R.Congo, Central East D.R.Congo, Uganda [Fernando Poo?].

Material examined/recorded: Liberia: Banga (DEGNER, 1934a). D.R.Congo: Bozene (MRAC, R. RAEMAEEKERS leg.); Gemena (MRAC, R. RAEMAEEKERS leg.); Ituri Forest, Avakubi (type loc., holotype AMNH 2150); northern half of northern sector PNV (IRSNB, also alc.); Rutshuru area outside southern sector PNV (ex PNV, IRSNB, also alc.). Uganda: Entebbe (VERDCOURT, 1962, 1983a).

Notes. - Two Northwest D.R.Congo shells (Bozene, Gemena) measure 3.1-3.3 x 1.7-1.8 mm, l/d 1.82-1.83. PILSBRY (1919: 234) records the holotype shell (Avakubi) as 3.2 x 2.0 mm, l/d 1.60. Material from the PNV and direct surroundings is fairly variable as shown by the metric data of the following five shells:

2.8 x 1.9 mm, l/d 1.50, lw 1.4 mm, ap. 1.1 x 0.9 mm, wh. 5 (ex PNV 511);  
3.2 x 1.9 mm, l/d 1.70, lw 1.4 mm, ap. 1.1 x 0.9 mm, wh. 5<sup>1</sup>/<sub>4</sub> (ex PNV 511);  
3.2 x 1.9 mm, l/d 1.65, lw 1.6 mm, ap. 1.2 x 1.1 mm, wh. 5<sup>1</sup>/<sub>4</sub> (ex PNV 476);  
3.3 x 1.9 mm, l/d 1.71, lw 1.4 mm, ap. 1.1 x 1.0 mm, wh. 5<sup>1</sup>/<sub>2</sub> (ex PNV 476);  
3.4 x 1.9 mm, l/d 1.83, lw 1.4 mm, ap. 1.2 x 1.0 mm, wh. 5<sup>1</sup>/<sub>2</sub> (PNV 877, fig. 5).

Finally, VERDCOURT (1962: 8) gives 3.2 x 2.0 mm, l/d 1.60, for a shell from Entebbe (Uganda).

Hypsometrical distribution in the PNV (and ex PNV) varies from 800-1280 m.

The Fernando Poo (Bioko) specimens mentioned by ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE are only doubtfully classified with the present species. One shell (IRSNB, Basilé, Bubi, Rio Bireberico, IX.1947, leg. A. ORTIZ DE ZÁRATE) measures 3.7 x 2.1 mm, l/d 1.76, 6<sup>1</sup>/<sub>2</sub> whorls. Spiral striation on the protoconch is unclear. Incidentally, from a biogeographical point of view occurrence on Fernando Poo is quite acceptable.

The 'subgenus' *Avakubia*, characterized by small shells with spiral striation on the apex and two-fold apertural dentition, hitherto encompasses two species only, i.e. the above and *G. (A.) acuminata* THIELE, 1933, described from Cameroon (probably 'Johann-ALBRECHTS-HÖHE'). The two species are easily distinguished by its larger size and more slender and acute shape (5.0 x 2.3 mm, l/d 2.17, 6<sup>1</sup>/<sub>2</sub> whorls) of *G. acuminata*. In addition, Dr A.J. DE WINTER has found shells in Cameroon that undoubtedly should be classified with *Avakubia*, but obviously represent at least two different taxa from the two discussed here.

*Gulella (Plicigulella) bistruplicina* PILSBRY, 1919  
(Figs 6-7)

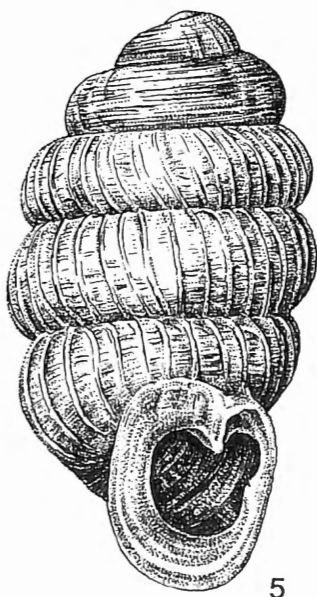
*Gulella (Plicigulella) bistruplicina* PILSBRY, 1919: 217, fig. 85; GERMAIN, 1920: 20, 25, fig. 8; CONNOLLY, 1939: 72; VERDCOURT, 1957: 125-129; ZILCH, 1960: 571, fig. 2002; RICHARDS & OLD, 1969: 43; VERDCOURT, 1983a: 232; RICHARDSON, 1988: 59; VAN BRUGGEN, 1996: 332.

Shell diagnosis. - Shell medium-large, subcylindrical, weakly or more noticeably costulate, sutures crenellate. Aperture with ten-fold dentition, consisting of angular lamella; large, more or less bicuspid, labral complex (corresponding to a deep depression on the outside of the lip); two basal (i.e., one inner and one more superficial) processes; a simple superficial columellar denticle and a large three-cusped columellar lamella; and a small, somewhat deeply situated, parietal denticle.

Measurements: 5.7-6.7 x 2.8-3.1 mm, l/d 1.90-2.39, 6<sup>3</sup>/<sub>4</sub>-7+ whorls.

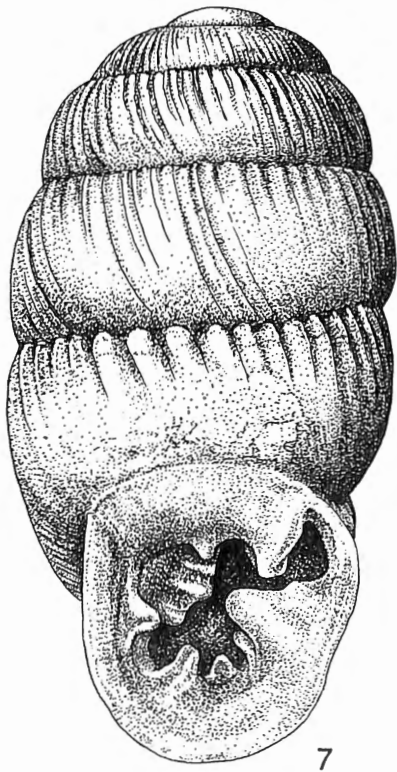
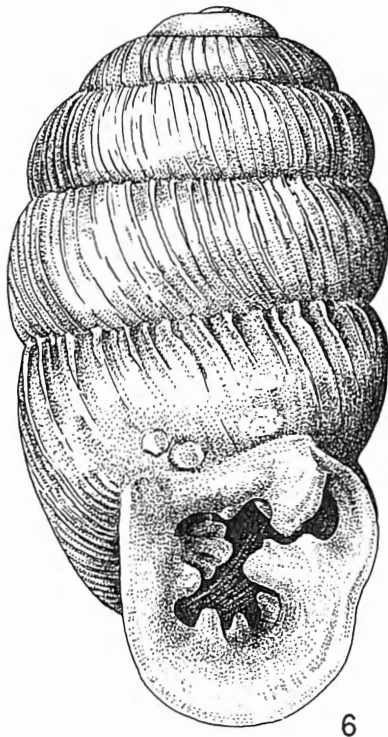
Distribution. - Northern and East D.R.Congo, Uganda (fide VAN BRUGGEN, 1996: 332).

Material examined/recorded. - D.R.Congo: Gemena (R. RAEMAEEKERS colln., IRSNB); Ituri Forest, Penge (type loc., lectotype AMNH 2153; paralectotypes MRAC, NRS); PNG (fig. 7, IRSNB, also alc.); PNV (IRSNB); PNU (fig. 6, IRSNB).



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Fig. 5. - *Gulella avakubiensis* PILSBRY, D.R.Congo, PNV 877, 3.4 x 1.9 mm (IRSNB).



Figs 6-7. - *Gulella bistruplicina* PILSBRY, D.R.Congo. - Fig. 6, PNU 1937c, 5.7 x 3.0 mm (IRSNB). - Fig. 7, PNG 909, 6.1 x 3.1 mm (IRSNB).

Notes. - This species is one of the few streptaxids that has been found in both the northern (PNG, PNV) and southern national parks (PNU). The northern parks cover a general spectrum from lowland to montane forest, while the southern reserve, situated in southeastern Shaba (formerly Katanga) may be generally characterized as belonging to the savanna-woodland mosaic so common in south-central and eastern Africa. The type locality and various other northern localities are in the tropical rainforest. The differences in general ecology between these northern and southern reserves are therefore quite considerable and it appears that the species involved are obviously widely tolerant of environmental factors. Other species that show a similar distribution pattern are *G. lessensis* and *G. osborni* (see below).

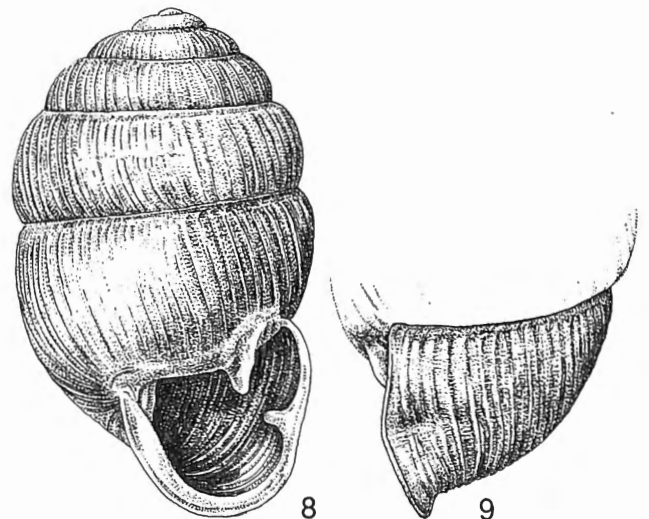
*G. bistruplicina* is not a common species as witnessed by the meagre results of intensive and long-lasting surveys; the taxon is represented by only two samples in the PNG and in the PNV collections.

*Gulella (Paucidentina) brevis* (THIELE, 1911)  
(Figs 8-9)

*Ennea curvilamella* VON MARTENS, 1897, non SMITH, 1890: 16.  
*Ennea brevis* THIELE, 1911: 181, pl. 4 fig. 15.

*Gulella brevis*; PILSBRY, 1919: 224; CONNOLLY, 1922: 501; THIELE, 1933: 284; DARTEVELLE-PUISSANT, 1936: 61; VERDCOURT, 1962: 11; 1983a: 234; RICHARDSON, 1988: 60.

Shell diagnosis. - Shell medium-large, obovate, with fine, little prominent, costulation with almost straight and perpendicular costulae, and with subcrenellate to filiform sutures. The large and open aperture exhibits only two processes (an angular lamella and a labral process) and is otherwise little obstructed, although the columellar lip may be slightly incrassate at its base.



Figs 8-9. - *Gulella brevis* (THIELE), D.R.Congo, PNV 877, 6.0 x 3.5 mm (IRSNB).

Measurements: 5.4-7.4 x 3.2-4.2 mm, l/d 1.64-1.81.

Distribution. - Eastern D.R.Congo mountains eastward to Uganda.

Material examined/recorded: D.R.Congo: N.Kivu, Nya Muzinga (MRAC 80054-61); Mukule (PILSBRY, 1919: 224); southern sector PNV (IRSNB). Uganda: Butumbi, Migere [type loc., para(lecto)type (?), MRAC 18090]; near Kigezi (MRAC 17940); 'S.W. Uganda' (ex PRESTON, MRAC 134469).

Notes. - The following selected measurements are from shells and literature records:

Butumbi	5.4 x 3.3 mm, l/d 1.64	MRAC 18090 [para(lecto)type?]
Mukule	5.8 x 3.2 mm, l/d 1.81	PILSBRY, 1919: 224 (wh. 6½)
PNV 877	6.0 x 3.5 mm, l/d 1.71	IRSNB (figs 8-9)
SW. Uganda	6.3 x 3.5 mm, l/d 1.80	MRAC 134469
N. Kivu	7.4 x 4.2 mm, l/d 1.76	MRAC 80054-61 (wh. 7½)

Hypsometrical distribution data are limited to PILSBRY (1919: 224) recording 1800-2000 m for specimens from Mukule (D.R.Congo). Obviously the species is not common in various areas; during extensive collecting activities only four shells in three samples were obtained in the southern sector of the PNV.

*Gulella (Paucidentina) camerani* (POLLONERA, 1906)

(Figs 10-14)

*Ennea camerani* POLLONERA, 1906: 3; 1909: 182 (4), pl. 20 (4) fig. 5; KOBELT, 1910a: 54; KOBELT, 1910b: 159.

*Gulella camerani*; PILSBRY, 1919: 224, figs 92a-d; VERDCOURT, 1962: 25; 1983a: 236; RICHARDSON, 1988: 62.

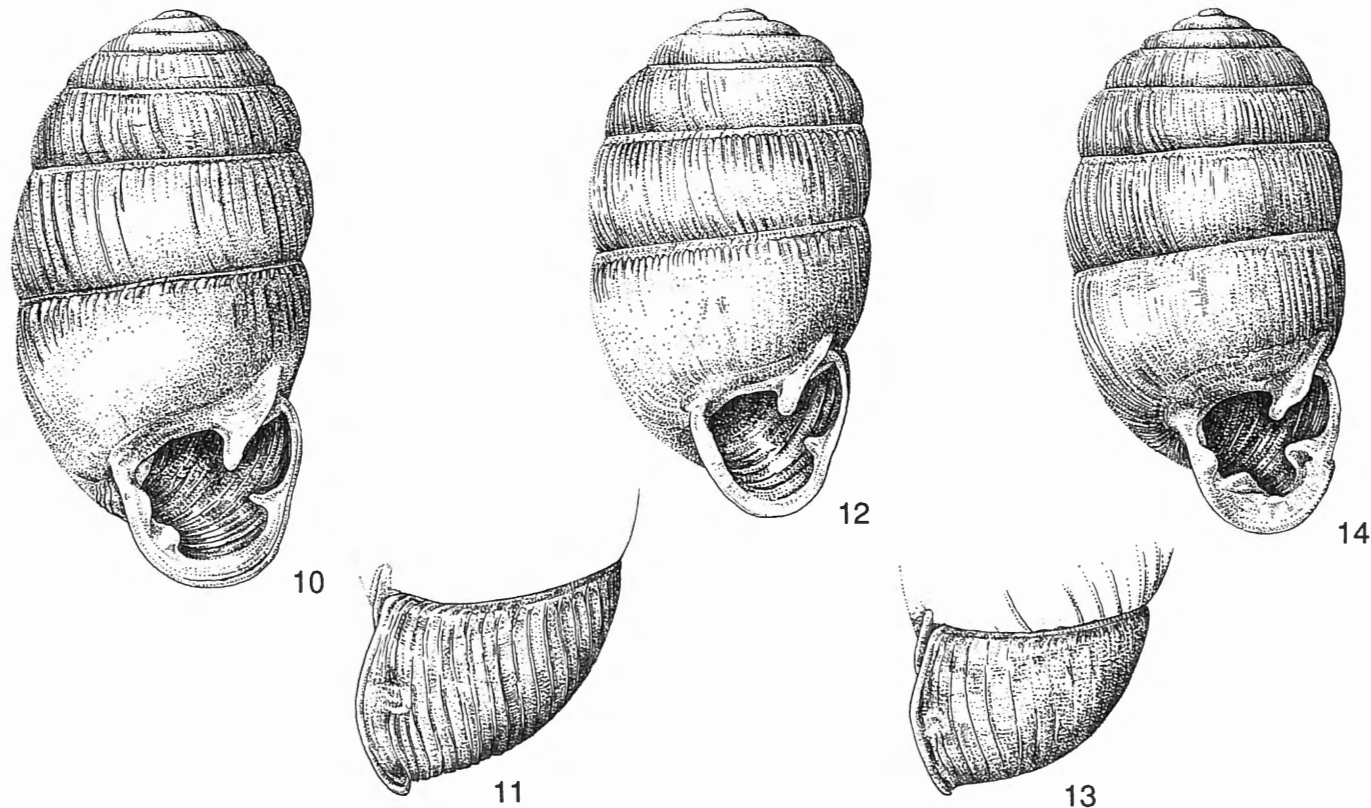
Shell diagnosis. - Shell fairly large, subcylindrical to slightly obovate, with fine, little prominent, costulation, sutures filiform. Aperture with four-fold dentition, consisting of angular lamella; a mid-labral denticle; two superficial left basal-columellar processes, the superficial one in the form of a vertical swelling, the more deeply situated one a tubercle. The left basal-columellar processes may also be altogether absent (figs 12-13) or be well-developed, the inner being in the lower position (fig. 14). Measurements: 6.0-8.9 x 3.3-4.5 mm, l/d 1.78-1.98.

Distribution. - Eastern D.R.Congo mountains eastward to Uganda.

Material examined/recorded: D.R.Congo: Mt. Ruwenzori, western slopes, Butagu Valley, 1800/2000/2200 m (PILSBRY, 1919; MRAC 17705-7; NRS); *do., do.*, Lamia Valley (PILSBRY, 1919); *do.*, eastern slopes, Mobuku valley (POLLONERA, 1906, 1909, type loc.); PNV northern sector (IRSNB, also *alc.*). Uganda: Ruwenzori Mt., Bwamba (VERDCOURT, 1962); Kigezi (IRSNB; MRAC 17948).

Notes. - As shown in the figures, apertural dentition in this species is subject to a lot of variation; the minimum number of processes is two (angular and labral processes), the maximum four (see above). Some individual shell measurements are the following (see under Material examined/recorded):

PNV 2413	6.0 x 3.3 mm, l/d 1.82	IRSNB (figs 12-13)
Butagu	7.1 x 4.0 mm, l/d 1.78	MRAC 17705-7
Butagu	7.2 x 4.0 mm, l/d 1.80	MRAC 17705-7
Kigezi	7.4 x 4.1 mm, l/d 1.80	MRAC 17948
Mobuku	7.5 x 4.0 mm, l/d 1.88	original diagnosis
Butagu	7.6 x 3.9 mm, l/d 1.95	MRAC 17705-7



Figs 10-14. - *Gulella camerani* (POLLONERA), D.R.Congo. - Figs 10-11, PNV 2720, 8.9 x 4.5 mm (IRSNB). - Figs 12-13, PNV 2413, 6.0 x 3.3 mm (IRSNB). - Fig. 14, PNV 2350, 8.2 x 4.3 mm (IRSNB).

PNV 2350 8.2 x 4.3 mm, l/d 1.91 IRSNB (fig. 14)

PNV 2720 8.9 x 4.5 mm, l/d 1.98 IRSNB (figs 10-11)

Hypsometrical distribution varies from 800 to 2200 m, but most records are from >1000 m.

The species was obviously named after Dr Lorenzo CAMERANO (1856-1917), Professor of Zoology and Comparative Anatomy at the University of Turin and closely associated with the Turin museum.

*Gulella (Tortigulella) cara* PILSBRY, 1919  
(Fig. 15)

*Gulella (Tortigulella) cara* PILSBRY, 1919: 232, fig. 100; RICHARDS & OLD, 1969: 43; RICHARDSON, 1988: 63.

Shell diagnosis. - Shell small, obovate, costulate, sutures subcrenellate to filiform. Aperture with five-fold dentition, consisting of angular lamella; a bicuspidate labral complex; a deeply situated left basal process; and a little prominent columellar lamella.

Measurements: 2.7-2.8 x 1.5-1.6 mm, l/d 1.69-1.87, 6<sup>1</sup>/<sub>4</sub>-6<sup>1</sup>/<sub>3</sub> whorls; holotype 2.7 x 1.5 mm, l/d 1.80, figured shell 2.7 x 1.6 mm, l/d 1.69 (fig. 15).

Distribution. - Eastern D.R.Congo (Ruwenzori complex). Material examined: D.R.Congo: Mt. Ruwenzori, western slope in Butagu Valley, 2200 m (holotype, AMNH 2157); PNV, Ruwenzori between Kiondolire and Kalange, 1750-2200 m, in moss under trees (IRSNB, fig. 15); PNV, Ruwenzori, Kerere, between Mahungu (2300 m) and Kiondo (4300 m), in moss (IRSNB); PNV A807, Musabaki (IRSNB, alc.).

Notes. - This is obviously a mountain dweller, because all records for this species are from considerable altitudes, *i.e.* 1750-4300 m.

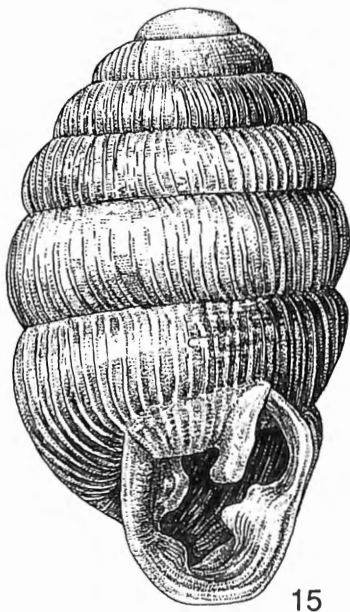


Fig. 15. - *Gulella cara* PILSBRY, D.R.Congo, PNV, Ruwenzori between Kiondolire and Kalonge, 2.7 x 1.6 mm (IRSNB).

The Latin adjective *carus* means 'precious', 'rare' or 'expensive'. *Notate bene*, there also exists a *Gulella (Molarella) carea* (PRESTON, 1913); according to VERDCOURT (1983a) this species is only known from Kenya. The Latin verb *careo* means 'to be absent', 'to miss', 'to lack' or 'to be in want of'. What PRESTON intended to convey with this specific epithet is unclear.

*Gulella (Paucidentina) chapini* PILSBRY, 1919  
(Figs 16-17)

*Gulella (Paucidentina) chapini* PILSBRY, 1919: 227, figs 95a-b; THIELE, 1933: 284; RICHARDS & OLD, 1969: 42; RICHARDSON, 1988: 66.

Shell diagnosis. - Shell large, subconical (tapering), and smoothish, sutures filiform. There is a faint costulation on the surface of the whorls, more pronounced behind the hardly reflected peristome and also traces of spiral striation. Aperture somewhat triangular, without dentition. Measurements: 9.0-10.2 x 3.8-4.2 mm, l/d 2.37-2.43, 8 whorls.

Distribution. - Northeastern D.R.Congo: Ituri Forest, Medje (holotype AMNH 2009; 'paratype', MRAC 17699, figs 16-17).

Notes. - The species is not otherwise represented in the rich D.R.Congo collections of both IRSNB and MRAC; obviously, it is a rare and localized species so far only known from a very limited number of specimens (only two?) from the type locality. Incidentally, PILSBRY (1919: 227) on the one page mentions '1 specimen . . .' and also 'The single specimen . . .', so that the shell AMNH 2009 obviously is the holotype. This also implies that



Figs 16-17. - *Gulella chapini* PILSBRY, D.R.Congo, Medje, 10.2 x 4.2 mm (MRAC 17699).



the here figured specimen MRAC 17699 (figs 16-17), although very probably collected together with the holotype, cannot be considered a paratype.

The shell of *G. chapini* is characterized by its peculiar subconical shape and the high l/d value. It closely resembles that of *G. masiensis* (see below). Attention is also drawn to the somewhat similar West African taxon *G. conica* (VON MARTENS, 1876).

This taxon was named after the famous American ornithologist Dr James P. CHAPIN (1889-1964), discoverer of the Congo peacock (*Afropavo congensis*), which is sympatric with *G. chapini*. Herbert LANG and James CHAPIN were the leaders of the American Museum Congo Expedition 1909-1915, which resulted in PILSBRY and BEQUAERT's magnificent non-marine mollusc treatises on D.R.Congo (PILSBRY, 1919; PILSBRY & BEQUAERT, 1927; see also *sub G. osborni*).

***Gulella (Paucidentina) coarti***  
(DAUTZENBERG & GERMAIN, 1914)  
(Figs 18-19)

*Ennea coarti* DAUTZENBERG & GERMAIN, 1914: 10, pl. 3 figs 1-2.

*Gulella (Gulella) coarti*; PILSBRY, 1919: 234; RICHARDSON, 1988: 66.

Shell diagnosis. - Shell small, smooth, subcylindrical to obovate, sutures filiform. Aperture with three-fold dentition, consisting of angular lamella; an upper/mid-labral tubercle; and a superficial columellar swelling. Measurements: 3.5-4.2 x 1.6-2.1 mm, l/d 1.75-2.10, 5<sup>3</sup>/<sub>4</sub>-6<sup>1</sup>/<sub>4</sub> whorls.

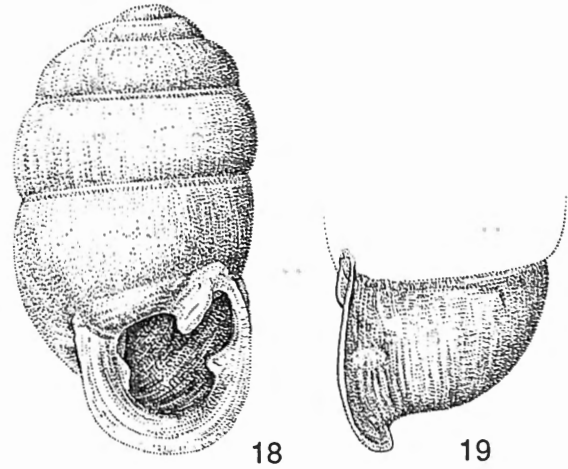
Distribution. - Southeastern D.R.Congo (Shaba = formerly Katanga).

Material examined/recorded: D.R.Congo: Lukonzolwa (8°50'S 28°40'E, type loc., DAUTZENBERG & GERMAIN, 1914); Kasapa road, Luamabwe River, leg. J.L. VAN GOETHEM, 17.IV.1972 (T. 170, MRAC 797159); Mulinga, near Sampwe, Kundelungu, 1450 m (*ex* PNU 2237c, IRSNB, also *alc.*, figs 18-19).

Notes. - The *ex* PNV specimens measure 3.5-3.7 x 1.9-2.0 mm, l/d 1.75-1.95, wh. 5<sup>3</sup>/<sub>4</sub>-6 (n=10); the VAN GOETHEM shells are slightly larger and somewhat more slender: 3.9-4.2 x 2.0-2.1 mm, l/d 1.86-2.10, wh. 5<sup>3</sup>/<sub>4</sub>-6<sup>1</sup>/<sub>4</sub> (n=3).

The species should be compared to three East African taxa, *i.e.* *G. pervitrea* (PRESTON, 1913), *G. baccata* (PRESTON, 1913), and *G. marionae* (PRESTON, 1910). The first of these is larger (6.7 x 3.2 mm, l/d 2.08, wh c. 7<sup>1</sup>/<sub>2</sub>), shows no axial sculpture behind the peristome, and has a more elongate aperture. *G. baccata* has a basal or subcolumellar tubercle in the aperture, and *G. marionae* is more slender (3.6 x 1.6 mm, l/d 2.25, wh. 6<sup>1</sup>/<sub>4</sub>) with in the aperture noticeably more developed angular, palatal and columellar processes, and in addition a poorly defined subcolumellar tubercle.

Obviously this taxon was named after a Mr COART, presumably an acquaintance of DAUTZENBERG and/or



Figs 18-19. - *Gulella coarti* (DAUTZENBERG & GERMAIN), D.R.Congo, PNU 2.237c, 3.5 x 1.9 mm (IRSNB).

BEQUAERT. There are no relevant data in the original description; incidentally, COART was not the collector of the type material.

***Gulella (Conogulella) conospira*** (VON MARTENS, 1892)  
(Figs 20-21)

*Ennea conospira* VON MARTENS, 1892: 182; D'AILLY, 1896: 19 [*Ennea (Gulella?)*]; VON MÖLLENDORFF & KOBELT, 1904: 232, pl. 28, figs 20-21 [*Ennea (Gulella?)*]; BOETTGER, 1905: 161 [*Ennea (Gulella?)*]; KOBELT, 1910a: 54 [*Ennea (Gulella?)*]; 1910b: 159 [*Ennea (Gulella?)*]; GERMAIN, 1916: 187 [*Ennea (Enneastrum?)*].

*Gulella (Conogulella) conospira*; PILSBRY, 1919: 233; THIELE, 1933: 314, fig. 57; CONNOLLY, 1942: 330; ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE, 1956: 126, fig. 25; ZILCH, 1960: 570, fig. 1997; VERDCOURT, 1983a: 181; RICHARDSON, 1987: 67.

*Ennea (Gulella?) conospira* var. *minor* D'AILLY, 1896: 19, pl. 1, figs 6-9.

*Gulella conospira* var. *minor*; CONNOLLY, 1942: 330; ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE, 1956: 126.

*Gulella (Conogulella) conospira polynematica* PILSBRY, 1919: 233, figs 101a-b; THIELE, 1933: 315; VERDCOURT, 1962: 10; RICHARDS & OLD, 1969: 42; VERDCOURT, 1983a: 233 (var. *polynematica*); RICHARDSON, 1987: 68.

*Gulella conospira polynematica*; SCHOUTEDEN, 1935: 290; RICHARDSON, 1987: 68.

*Conogulella conospira polynematica*; CONNOLLY, 1930: 38, fig. 2a; 1942: 330.

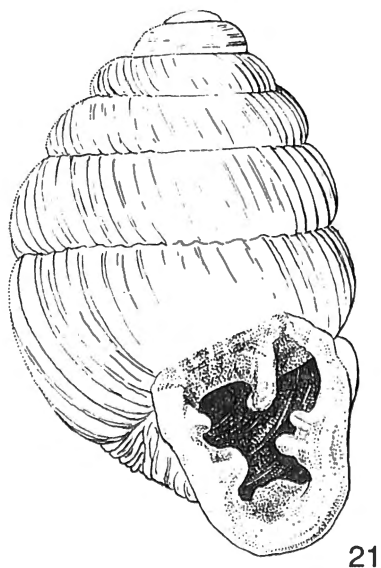
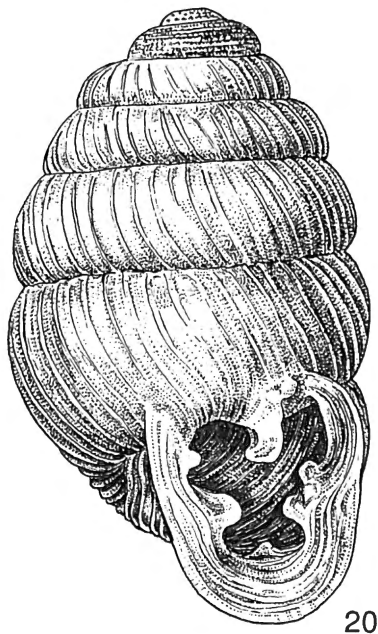
Shell diagnosis. - Shell small to medium-sized, squat and more or less obovate, apex subacute, with spiral sculpture, costulation consisting of distant costulae (somewhat more so on the body whorl), sutures filiform to subcrenellate. Aperture with six-fold dentition, consisting of angular lamella; two labral processes on a common base; a deeply situated basal tubercle; two superficial columellar processes, the upper a small tubercle, the lower being much larger and opposite the lower labral process.

Measurements: 4.8-9.2 x 3.0-5.5 mm, l/d 1.52-1.72, 6<sup>1</sup>/<sub>4</sub>-6<sup>3</sup>/<sub>4</sub> whorls.

Distribution. - West and Central Africa (Nigeria, Fernando Poo, Cameroon, D.R.Congo, Uganda).

Notes. - D.R.Congo material is from Penge (type loc., lectotype of var. *polynematica*, AMNH 2156), Moto and Lemba (SCHOUTEDEN, 1935: 290), Bozene (R. RAEMAEEKERS colln. in IRSNB), and the PNV (figs 20-21, widespread in northern half of northern section, IRSNB).

The shell is subject to a lot of variation in size (see measurements). South Nigeria material (n=8, BM)



Figs 20-21. - *Gulella conospira* (VON MARTENS), D.R.Congo. - Fig. 20, PNV 1192, 5.4 x 3.2 mm (IRSNB). - Fig. 21, PNV 1319, 4.8 x 3.0 mm (IRSNB).

measures 6.9-9.2 x 4.0-5.5 mm, l/d 1.62-1.72, 6<sup>1</sup>/<sub>2</sub>-6<sup>3</sup>/<sub>4</sub> whorls, while some Uganda specimens (n=5) are much smaller, 5.0-5.4 x 3.2-3.4 mm, l/d 1.56-1.64, all with 6<sup>1</sup>/<sub>4</sub> whorls. In size the D.R.Congo shells are close to those from Uganda: 4.8-5.4 x 3.0-3.2 mm, l/d 1.60-1.67, <6<sup>1</sup>/<sub>4</sub>-6<sup>1</sup>/<sub>4</sub> whorls (largest and smallest shells only).

CONNOLLY (1930, 1942) considered *Conogulella* a genus in its own right because of the radula which is characterized by bicuspid teeth (confirmed by ORTIZ DE ZARATE & ORTIZ DE ZARATE, 1956). This is indeed rare among taxa of *Gulella*. AIKEN (1981) has studied the radula of 48 southern African species, among which only one had teeth other than unicuspid (*G. browni* VAN BRUGGEN, 1969: all laterals tricuspid). VERDCOURT (1953: 39; 1990: 352) described the radula of *G. usambarensis* (CRAVEN, 1880) as showing peculiar serrations on the cusp of the lateral teeth (bar the first one). Until further knowledge of the radula has accumulated, it is perhaps best to consider *Conogulella* a subdivision of *Gulella*.

The differences between the typical form and the var. *polynematica* are of such a nature (intensity of the spiral sculpture) that the latter should be considered a synonym of the former. Examination of more abundant material than D'AILLY (1896) had at his disposal shows that the var. *minor* fits into the normal range of variation of shell measurements.

*Gulella (Gulella) decussatula* (PRESTON, 1913)  
(Figs 22-26)

*Ennea decussatula* PRESTON, 1913: 201, pl. 33 figs 1-1a; SCHOUTEDEN, 1936: 502.

*Gulella decussatula*; PILSBRY, 1919: 222; VERDCOURT, 1962: 20; VERDCOURT, 1963: 11-13; VERDCOURT, 1983a: 235; RICHARDSON, 1988: 73.

*Gulella excruciatula* CONNOLLY, 1931: 312, pl. 11 fig. 4; VERDCOURT, 1962: 16, 18; VERDCOURT, 1983a: 235; VERDCOURT, 1987: 48; RICHARDSON, 1988: 79. **Syn. nov.**

Shell diagnosis. - Shell large, subcylindrical to ovate, costulate, sutures crenellate. Aperture with five-fold dentition, consisting of angular lamella; a small upper labral denticle; a larger lower labral lamella; a mid-labral denticle; and a large half-superficial columellar process. The costulation varies from quite pronounced to subobsolete. The labral complex may also consist of two processes on a common base, of which the upper process at times may be very small indeed.

Measurements: 8.8-13.6 (-14.8) x 5.0-7.4 mm, l/d 1.67-2.24 (see table below).

Radula. - Radula without central tooth (radula notes by Dr W. ADAM; VERDCOURT, 1987: 49-50, gives a complete description in his discussion of the anatomy of the species).

Distribution. - Central-East Africa.

Material examined/recorded: D.R.Congo: Shaba (= formerly Katanga), PNU and ex PNU (fig. 26, widely distributed, also alc., IRSNB); Shaba, Muhila plateau, Laula valley (7°28'20"S 29°12'30"E, leg. F. MALAISSE,

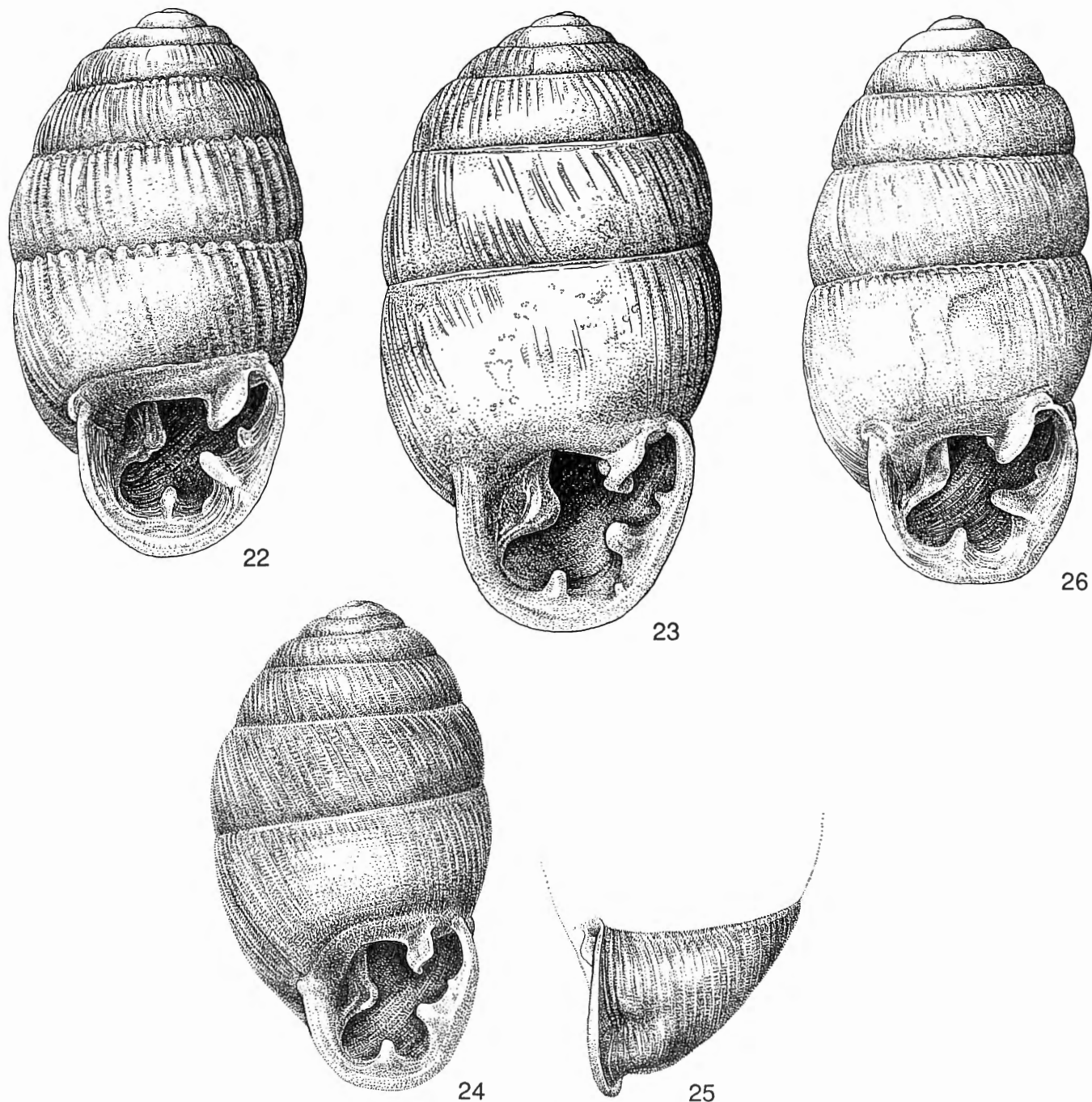
IRSNB, alc.); Kibishie Island, "Exploration Lac Tanganika" (Sta. 377, IRSNB). Uganda: Kigezi (lectotype, MRAC 18276; 1, probably paralectotype, fig. 22, IRSNB); Bwamba Pass (BM); Mt. Elgon (fig. 23, NRS); Ndaruga River Valley (BM), Taru Desert (BM); Yala (figs 24-25, NRS).

Notes. - Examination of abundant material of *G. decussatula*, among which the type, and specimens of *G. excruciatata* from the type locality (Uganda, Mt. Elgon, NMS, probably paratypes) has convinced the authors that this

nominal taxon falls within the normal range of variation of the former.

Surprisingly, it has never turned up in the PNV, although the Uganda localities are not all that far away from the Ruwenzori complex in D.R.Congo. Hypsometrical distribution varies from c. 700 to c. 3000 m a.s.l. The PNU and ex PNU specimens were mainly collected in gallery forest.

The material varies a lot in size and shape and also, but less, in surface sculpture and apertural dentition. The



Figs 22-26. - *Gulella decussatula* (PRESTON). - Fig. 22, Uganda, Kigezi, 10.8 x 5.8 mm (IRSNB). - Fig. 23, Uganda, Mt. Elgon, 12.8 x 7.0 mm (NRS). - Figs 24-25, Kenya, Yala, 11.1 x 6.3 mm (IRSNB). - Fig. 26, D.R.Congo, PNU 874, 11.7 x 5.8 mm (IRSNB).

following table gives details of specimens measured; attention is particularly drawn to the range of variation in the PNU/ex PNU material.

Kigezi <sup>1</sup>	10.8-11.7 x 5.6-5.9 mm	l/d 1.83-2.09	n=2
Mt. Elgon <sup>2</sup>	12.1-12.8 x 6.5-7.0 mm	l/d 1.83-1.86	n=2
Yala	11.0-12.5 x 6.1-6.7 mm	l/d 1.67-1.87	n=19
Kibishie Is.	14.8 x 7.4 mm	l/d 2.00	n=1
(ex) PNU	8.8-13.6 x 5.0-6.1 mm	l/d 1.76-2.24	n=>250

<sup>1</sup> Type locality of *G. decussatula*; <sup>2</sup> type locality of *G. excruciatata*.

***Gulella (Wilmattina) disseminata* (PRESTON, 1913)**  
(Fig. 27)

*Ennea disseminata* PRESTON, 1913: 202, pl. 33 fig. 2.

*Gulella (Wilmattina) disseminata*; ADAM & VAN GOETHEM, 1978: 54, figs 41-46 (complete synonymy); VERDCOURT, 1983a: 234; TATTERSFIELD, 1996: 165, 166, 170, 171, 180.

*Gulella disseminata cymatonotus* PILSBRY, 1919: 221, fig. 89a-b; RICHARDS & OLD, 1969: 41.

Shell diagnosis. - Shell small, subcylindrical, obsoletely costulate, sutures crenellate. Aperture with four-fold dentition, consisting of angular lamella, large labral complex (corresponding to an extensive and deep outside depression), left basal denticle (corresponding to a small outside depression), and a large subvertical columellar complex. Measurements: 2.8-4.4 x 1.6-1.9 mm, l/d 1.82-2.53, lw 1.7-2.2 mm, aperture 0.8-1.4 x 0.5-1.4 mm, 5<sup>3</sup>/<sub>4</sub>-7<sup>1</sup>/<sub>2</sub> wh (ADAM & VAN GOETHEM, 1978).

Distribution. - Central and Eastern D.R.Congo eastward to western Kenya.

Notes. - VERDCOURT (1962: 16, footnote) queried its reference to *Wilmattina*. ADAM & VAN GOETHEM (1978: 54-57, figs 41-46) treated this species in depth. Our fig. 27 depicts a paralectotype of *G. d. cymatonotus* PILSBRY, 1919, a form which was already synonymized with the nominal species by ADAM & VAN GOETHEM. These authors

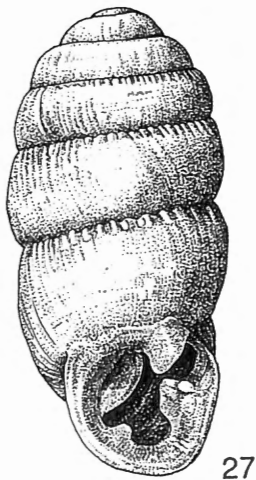


Fig. 27. - *Gulella disseminata cymatonotus* PILSBRY, paralectotype, D.R.Congo, Rutshuru, 3.3 x 1.6 mm (NRS).

(pp. 5-6, 52-63) have also discussed the status of *Wilmattina* PILSBRY & COCKERELL, 1933. Their opinion to subordinate it to *Gulella* rather than to *Ptychotrema* MÖRCH, 1852 (PILSBRY, 1919), *Ennea* H. & A. ADAMS, 1855 (ZILCH, 1960), or *Parennea* PILSBRY, 1919 (RICHARDSON, 1988), is followed here.

***Gulella (Gulella) haullevillei***  
(DAUTZENBERG & GERMAIN, 1914)  
(Figs 28-30)

*Ennea haullevillei* DAUTZENBERG & GERMAIN, 1914: 9, pl. 3 fig. 13.

*Gulella haullevillei*; PILSBRY, 1919: 235; RICHARDSON, 1988: 88.

Shell diagnosis. - Shell large, subcylindriform, almost smooth, with, however, crenellate sutures. Aperture with seven-fold dentition, consisting of angular lamella; a bicuspidate labral complex (of which the lower process is squarish and also the larger of the two); a deeply situated mid-left basal denticle; a duplex columellar complex; a mid-parietal tubercle.

Measurements: 8.4-10.0 x 4.2-5.2 mm, l/d 1.79-2.11, 7 whorls.

Distribution. - Central and SE. D.R.Congo (Shaba = formerly Katanga).

Material examined/recorded: D.R.Congo: Boteke (NRS, fig. 28); Shaba, PNU (widely distributed, fig. 30, IRSNB); Shaba, Lukafu River (NRS, fig. 29).

Notes. - There is some variation in apertural dentition, particularly in the columellar (figs 28-29 versus fig. 30) and less so in the labral complex (figs 28-30 all represent different, but not clearly separated, patterns). The parietal tubercle may be reduced in size (fig. 28).

Obviously this taxon was named after a Mr. HAULLEVILLE, presumably an acquaintance of DAUTZENBERG and/or BEQUAERT. There are no relevant data in the original description; incidentally, HAULLEVILLE was not the collector of the type material.

***Gulella (Gulella) lamyi* (DAUTZENBERG & GERMAIN, 1914)**  
(Fig. 31)

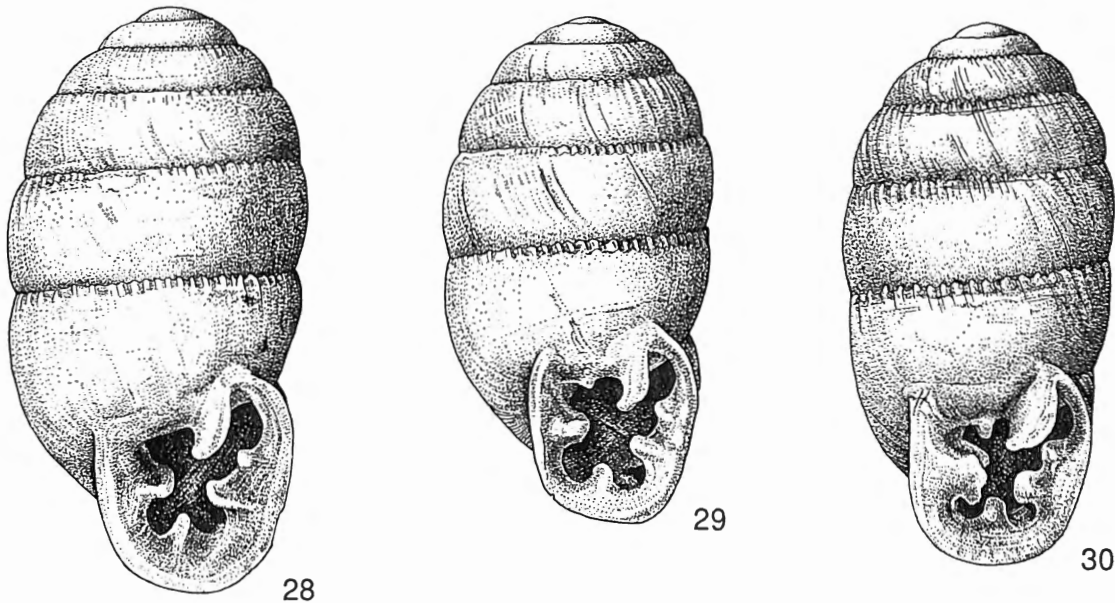
*Ennea lamyi* DAUTZENBERG & GERMAIN, 1914: 6, pl. 2 figs 9-11.

*Gulella lamyi*; PILSBRY, 1919: 235; GERMAIN, 1936: 147, figs 42-43; RICHARDSON, 1988: 96.

Shell diagnosis - Shell medium-sized, subcylindriform to barrel-shaped, sutures crenellate. Aperture with seven-fold dentition, consisting of angular lamella, two labral ridges on a common base, a mid-basal lamella, and a three-fold columellar complex consisting of a fairly large horizontal lamella with single small denticles below and above it, the upper one the larger.

Measurements: 5.8 x 2.9 mm, l/d 2.00, aperture 2.0 x 1.6 mm, 6 whorls (holotype, fig. 31).

Distribution. - Southeastern and eastern D.R.Congo, Shaba (= former Katanga) and Kivu.



Figs 28-30. – *Gulella haullevillei* (DAUTZENBERG & GERMAIN), D.R.Congo. - Fig. 28, Boteke, 10.0 x 5.2 mm (NRS). - Fig. 29, Shaba [Katanga], Lukafu River, 8.4 x 4.7 mm (NRS). - Fig. 30, PNU 2554, 8.8 x 4.2 mm (IRSNB).

Material examined/recorded: D.R.Congo, Shaba, Lukonzolwa (holotype, fig. 31 MRAC 17689). Notes. - Although DAUTZENBERG & GERMAIN (1914: 7) record 'un seul exemplaire', which therefore automatically becomes the holotype, there is a second identical shell in the same sample - whether this may be considered a paratype is a moot point (not according to the letter of the Code!). Moreover, the type is labelled 'Vieux Kassongo' and dated 16/12/1910. The original description reads 'Stn. 98, Lukonzolwa (Katanga), 12-I-1912' and the dimensions given in the description are 5.5 x 3.1 mm. There is no doubt about the identity of the specimen; one should

compare our fig. 31 with DAUTZENBERG & GERMAIN'S (1914) figs 9-11 on pl. 2 and with GERMAIN'S (1936) figs 42-43 on p. 148. The discrepancy in measurements may be explained by the results of more modern and refined methods (micrometer readings). Lukonzolwa at 8°45'S 28°40'E on the west shore of Lake Mweru is situated in Shaba, while Vieux Kas(s)ongo is much further north in Kivu province (4°30'S 26°35'E, *vide* PILSBRY, 1919: 20). GERMAIN in his Kivu mollusc paper (1936: 148-149, figs 42-43) refers to the type locality "Lukonzolwa, sur les bords du lac Moero, dans le Katanga", "Je figure le type de cette espèce" (figs 42-43). Although no reference is made to a specific locality in Kivu, it is likely that the species is represented in the described collections from the 'province du Kivu' (localities are cited for all other species!). Obviously it is a rare taxon; *G. lamyi* has not been found in the abundant streptaxid material from PNA, PNG or PNU. This restricts presently known distribution to two localities in Shaba and Kivu respectively. This species was named after the famous French malacologist Edouard LAMY (1866-1942) of the Paris museum.

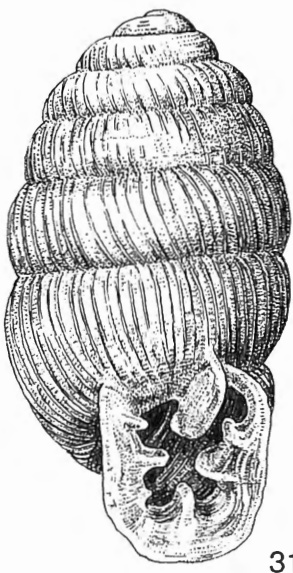


Fig. 31. – *Gulella lamyi* (DAUTZENBERG & GERMAIN), holotype, D.R.Congo, "Vieux Kassongo", 5.8 x 2.9 mm (MRAC 17689).

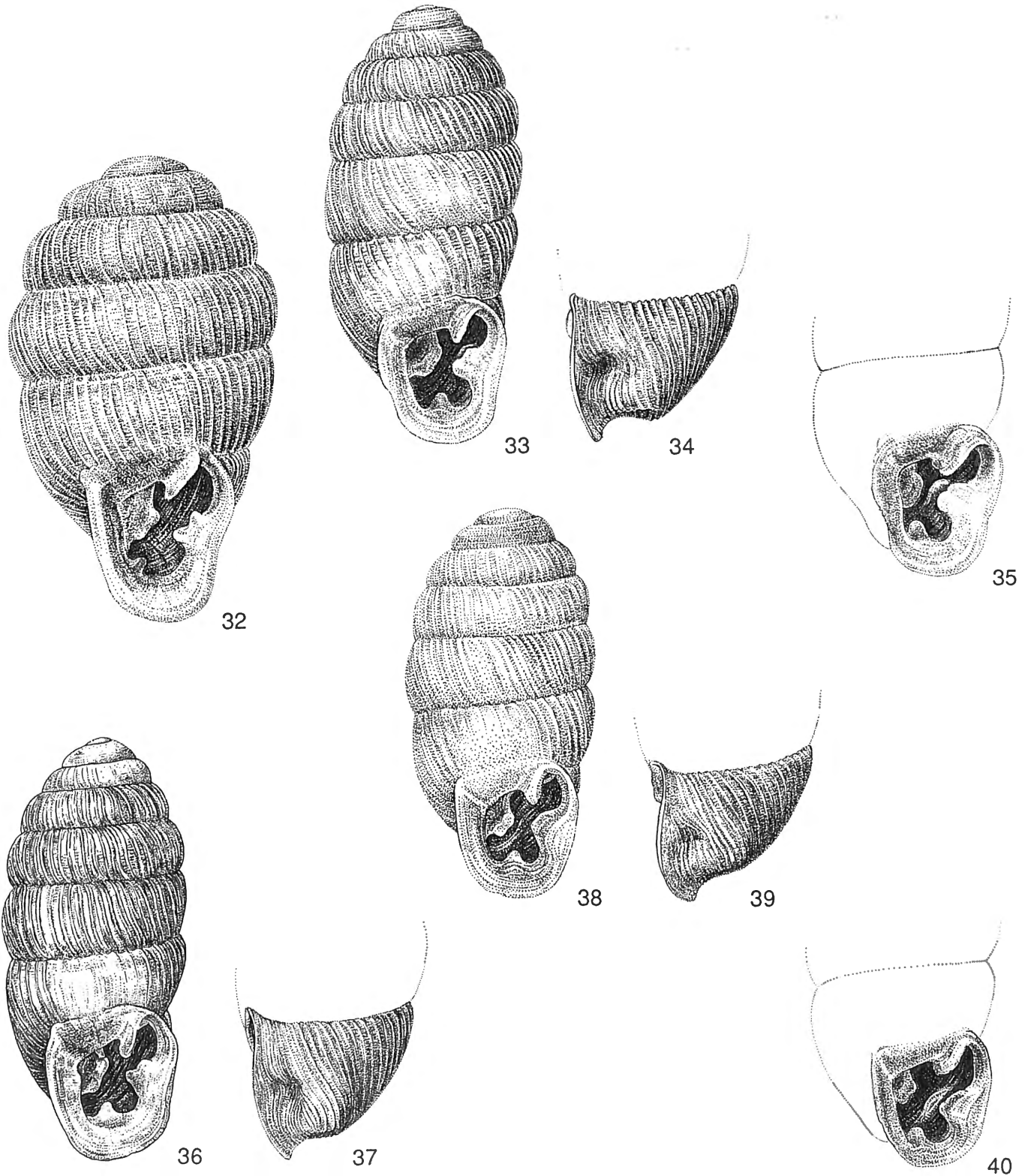
*Gulella (Tortigulella) lessensis* PILSBRY, 1919  
(Figs 32-40)

*Gulella (Tortigulella) lessensis* PILSBRY, 1919: 222, fig. 91a-b; CONNOLLY, 1922: 515; SCHOUTEDEN, 1935: 291; VERDCOURT, 1963: 11; RICHARDS & OLD, 1969: 41; VERDCOURT, 1983a: 233; RICHARDSON, 1988: 98; TATTERSFIELD, 1996: 165, 166, 171, 180. *Gulella lessensis*; SCHOUTEDEN, 1935: 291.

Shell diagnosis. - Shell small, subcylindric, costulate, with filiform to subcrenulate sutures. Aperture with five-fold dentition, consisting of angular lamella; a labral complex consisting of two tubercles on a common base; a left basal tubercle; a large, mammillate columellar

complex. Figs 33-35 show a shell with very small tubercles in the labral complex, the basal denticle more in a mid-basal position, and a columellar complex that is not mamillate. Figs 36-37 depict a shell where the labral complex has a mere indication of two processes, so that

it might be interpreted as bicuspidate. Finally in the shell of figs 38-40, the labral complex is completely without division or any protruding swelling or tubercle. Fig. 32 depicts a small and ovate shell of 4.0 x 2.3 mm, l/d 1.74 (Malaba, loc. PNV A1236, IRSNB); this specimen has



Figs 32-40. - *Gulella lessensis* PILSBRY, D.R.Congo. - Fig. 32, PNV A1236, Malaba, 4.0 x 2.3 mm (IRSNB). - Figs 33-35, ex PNV A511, Abyalose, 5.1 x 2.1 mm (IRSNB). - Figs 36-37, PNU 2563c, 5.0 x 2.2 mm (IRSNB). - Figs 38-40, PNU 2047, 4.7 x 2.2 mm (IRSNB).

the basal denticle not in the middle of the base but rather in a subcolumellar position.

Measurements: 4.0-5.3 x 2.2-2.5 mm, l/d 1.74-2.12, aperture 1.3-1.9 x 1.3-1.6 mm,  $5\frac{3}{4}$ - $7\frac{1}{4}$  whorls.

Radula. - The radula shows a small central tooth with about 15 lateral teeth. There are no differences between those from the north (PNV) and the south (PNU) [from radula notes by Dr W. ADAM].

Distribution. - Eastern and southeastern D.R.Congo, western Kenya.

Material examined/recorded: D.R.Congo: Lesse, Semliki Forest (type loc., holotype, AMNH 2161); Moto Mines (ex PUTZEYS, MRAC 18077-18086); PNV (figs 32-35, widely distributed in the northern sector between 750 and 1275 m, also just outside the PNV limits, IRSNB); PNU [Pelenge, gallery forest, 1250 m, locs. PNU 2047 (figs 38-40) and 2097; Ganza, gallery forest of the Kamandula and the Lukoka Rivers, 860 m, loc. PNU 2410; Ganza, lime outcrop on the left bank of the Lukoka River, 860 m, loc. PNU 2553; Ganza, gallery forest of the Kisamba River, left tributary of the Lukoka River, c. 900 m, loc. PNU 2563 (figs 36-37), all IRSNB]. Uganda: Entebbe; Bwamba Forest (VERDCOURT, 1983a). Kenya: W. Kenya, Kakamega Forest (TATTERSFIELD, 1996).

Notes. - The species was originally based only on the holotype. It appears to be widely distributed in the Ruwenzori area *s.l.* (PNV and immediate surroundings inclusive of *ex* PNV). However, in the PNU, it was only obtained in two localities (*s.l.*, *viz.* Pelenge and Ganza) - one of the few species of streptaxid to be found in both these two widely separated national parks. In 1948-1949 Dr ADAM spent a year and a half intensely collecting molluscs in the PNU, obtaining only a total of 19 specimens, so that the species is obviously local and rare in this part of the country. As regards distribution see also *sub G. bistruplicina* and *G. osborni*.

Hypsometrical distribution varies between c. 700 and 1300 m a.s.l.

***Gulella (Paucidentina) masisiensis* PILSBRY, 1919**  
(Figs 41-46)

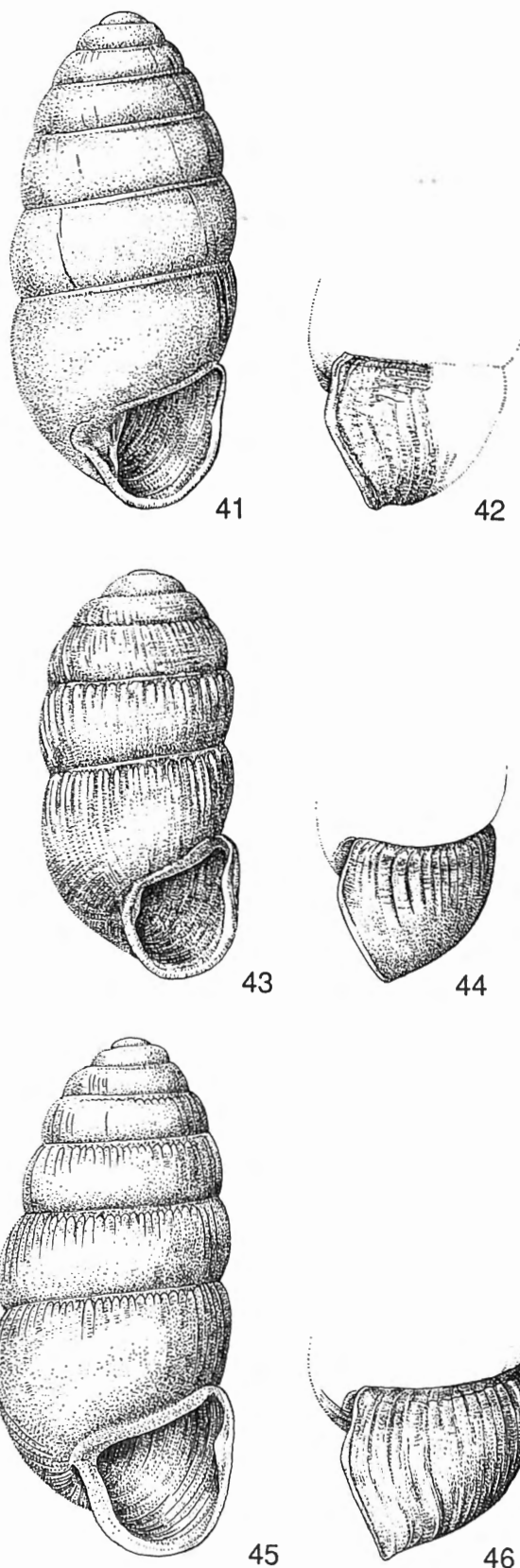
*Gulella (Paucidentina) masisiensis* PILSBRY, 1919: 226, figs 94a-b; THIELE, 1933: 284; RICHARDS & OLD, 1969: 42; RICHARDSON, 1988: 101.

*Gulella (Paucidentina) masisiensis palatidens* PILSBRY, 1919: 227, figs 94c; RICHARDSON, 1988: 101.

Shell diagnosis. - Shell large, subcylindriform, slightly tapering, apex very slightly subacute, smooth (no trace of costulae or even growth striae), with filiform sutures. Aperture with no dentition but a very faint swelling on the upper half of the labrum which is only slightly reflected, columella slightly incrassate, with a faint twist. Measurements: 6.3-9.0 x 2.9-4.4 mm, l/d 1.91-2.28,  $7\frac{1}{4}$ -8 whorls.

Distribution. - Central-Eastern D.R.Congo.

Material examined/recorded: D.R.Congo: Gemena (RAEMAËKERS colln., MRAC); Mayumba, Tshinfuku-Zoba,



Figs 41-46. - *Gulella masisiensis* PILSBRY, D.R.Congo. - Figs 41-42, PNV 2418, 9.0 x 4.4 mm (IRSNB). - Figs 43-44 (*G. m. palatidens*), Gemena, 6.7 x 3.1 mm (IRSNB). - Figs 45-46 (*G. m. palatidens*), PNV 1535, 8.2 x 3.9 mm (IRSNB).

VIII.1937, leg. E. DARTEVELLE (MRAC 274922); Nsendwe, ex PUTZEYS (MRAC 18098-9); Walikale (type loc. *G. m. palatidens*, PILSBRY, 1919: 227); Mbisi near Masisi (type loc., holotype AMNH 2163); PNV (northern and central regions, also alc., IRSNB).

Notes. - One of the depicted shells (figs 41-42) was accidentally destroyed after having been drawn.

There seems to be no reason to recognize the subspecies *G. masisiensis palatidens* because the diagnostic characters (shell slightly more tapering than typical form, with in addition a palatal swelling or denticle) are obviously part and parcel of the normal range of variation.

*Gulella (Gulella) mikenensis* (PRESTON, 1913)  
(Figs 47-48)

*Ennea mikenensis* PRESTON, 1913: 209, pl. 34 figs 10-10a; SCHOUTEDEN, 1936: 502.

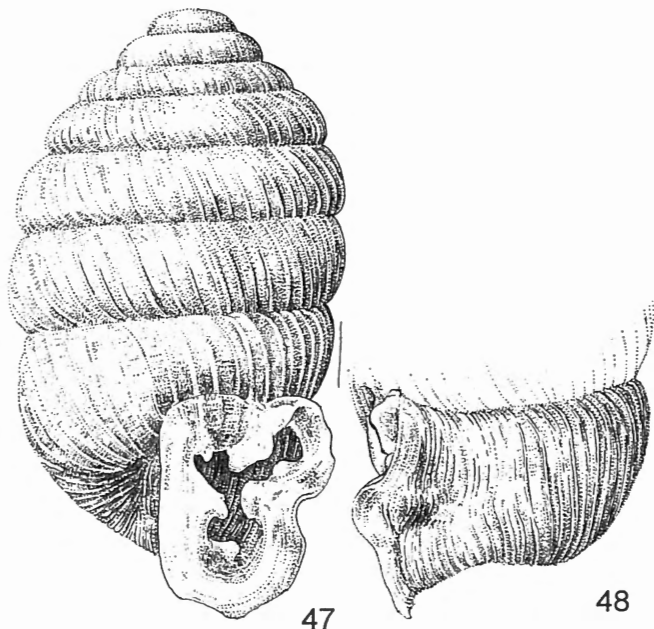
*Gulella mikenensis*; PILSBRY, 1919: 235; RICHARDSON, 1988: 103.

Shell diagnosis. - Shell small, costulate, obovate to (sub)cylindriform, apex somewhat tapering, sutures (sub)crenellate. Apertural dentition six-fold, consisting of angular lamella; a double labral complex; a deeply situated basal process; a columellar lamella; and a parietal denticle to the left of the angular lamella.

Measurements: 3.7 x 2.0 mm, l/d 1.85, 8 whorls (lectotype, figs 47-48).

Distribution. - D.R.Congo, Kivu, Mt. Mikeno, Burunga, 6500 ft. (= c. 2200 m, original description: '6000 ft.' = c. 2000 m) (type loc., MRAC 18074, lectotype, figs 47-48).

Notes. - Notwithstanding intensive PNV collecting efforts in the general area of the type locality, *G. mikenensis* is still only known from its lectotype shell.



Figs 47-48. - *Gulella mikenensis* (PRESTON), lectotype, D.R.Congo, Kivu, Burunga, Mt. Mikeno, 3.7 x 2.0 mm (MRAC 18074).

*Gulella (Conogulella?) opoboensis* (PRESTON, 1914)  
(Figs 49-50)

*Ennea opoboensis* PRESTON, 1914: 135, fig.; SCHOUTEDEN, 1936: 502.

*Gulella opoboensis*; PILSBRY, 1919: 233; McCLELLAND, 1926: 26; DEGNER, 1934a: 253; CONNOLLY, 1942: 330; ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE, 1956: 107, 128; RICHARDSON, 1988: 109. *Gulella opoboensis* var. *liberiana* DEGNER, 1934a: 253, fig. 29a-c; RICHARDSON, 1988: 110.

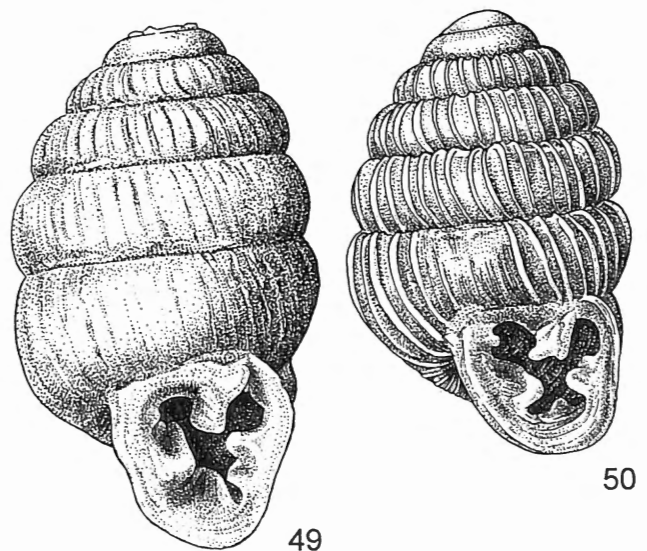
Shell diagnosis. - Shell small, obovate, somewhat tapering, costulate, with filiform sutures. Aperture with six-fold dentition consisting of angular lamella; a labral complex with two lamellae, the upper usually larger than the lower; a mid-basal process, which may be (slightly) bifid; a superficial columellar complex; a swelling in the columellar-parietal angle.

Measurements: 3.1-5.1 x 2.0-2.6 mm, l/d 1.57-1.96.

Distribution. - Liberia, Southern Nigeria, Fernando Poo. Notes. - The paratype figured (IRSNB, fig. 49) in reality is a paralectotype, because SCHOUTEDEN (1936: 502) has designated a lectotype (MRAC 18097: 3.7 x 2.2 mm, l/d 1.68). The var. *liberiana* (fig. 50) is characterized by a palatal complex with the lower cusp larger than the upper (instead of the other way round) and the basal denticle bifid (instead of undivided). It appears that the taxon is subject to some variation in apertural dentition and it is suggested that the var. *liberiana* is untenable. The size and shape of the shell also show some notable variation (e.g. a seeming size cline from west to east), although a note of caution is sounded here because of the small number of specimens recorded:

Liberia	3.1-3.4 x 2.0-2.2 mm,	l/d 1.57-1.65
Nigeria	3.4-3.9+ x 2.1-2.3 mm,	l/d 1.62-1.70
Fernando Poo	3.8-5.1 x 2.3-2.6 mm,	l/d 1.65-1.96

DEGNER (1934a: 253) describes and figures genitalia and radula of Liberia material. Whether *G. opoboensis* belongs



Figs 49-50. - *Gulella opoboensis* (PRESTON), D.R.Congo.- Fig. 49, 'paratype', Nigeria, Opobo Dist., 3.9+ x 2.3 mm (IRSNB). - Fig. 50, Liberia, Kailahun, subsp. *liberiana* DEGNER, 3.3 x 2.1 m (IRSNB).



to *Conogulella* cannot yet be ascertained. The shell has no apical spiral sculpture and there are no bicuspid teeth in the radula.

*Gulella (Silvigulella) osborni* PILSBRY, 1919  
(Fig. 51)

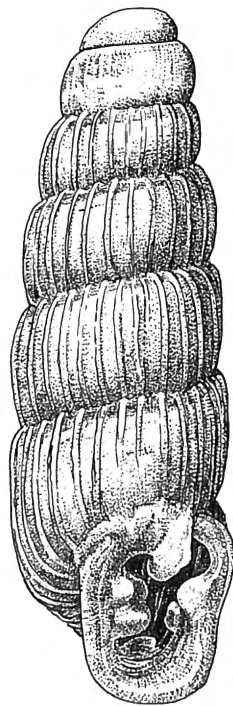
*Gulella (Silvigulella) osborni* PILSBRY, 1919: 229, fig. 97; ZILCH, 1960: 571, fig. 1999; VERDCOURT, 1962: 4; RICHARDS & OLD, 1969: 43; VERDCOURT, 1983a: 232; VAN BRUGGEN & MEREDITH, 1984: 161; RICHARDSON, 1988: 110; TATTERSFIELD, 1996: 165, 166, 170, 171, 180.

Shell diagnosis. - Shell small, clavate (*Streptostele*-like), costulate (costulae distant and pronounced) with smooth apex, with crenellate sutures. Aperture with five-fold dentition, consisting of angular lamella; a labral complex; a deeply situated squarish mid-basal process; and a half-superficial, more or less bifid columellar complex. Measurements: 2.6-3.3 x 0.9-1.0 mm, l/d 2.89-3.30.

Distribution. - Probably widely distributed in the forest belt of West, Central and Central/East Africa.

Material examined: D.R.Congo: Rutshuru, gallery forest along Rutshuru River (type loc., holotype AMNH 2154); PNV (IRSNB); Lake Tanganyika, Sta. 152, inlet south of Cap Tembwe, 6.III.1947 (IRSNB); PNU (fig. 51, IRSNB). Uganda: Lake Mutanda (IRSNB); on the Uganda-D.R.Congo border (MRAC 17651).

Notes. - There is some variation in apertural dentition and size/shape of the shell. This is probably a complex of taxa, which are widely distributed in Central Africa (unpublished data, RMNH), as far east as western Kenya (Kakamega Forest), and as far south as Angola (unpub-



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Fig. 51. - *Gulella osborni* PILSBRY, D.R.Congo, PNU 2563c, 3.0 x 1.0 mm (IRSNB).

lished data, RMNH) in the west, and Malawi (VAN BRUGGEN & MEREDITH, 1984: 161) in the east. D.R.Congo material of this group is also recorded from the PNV (widespread and fairly common in the northern half of the the northern section, one locality in the southern half of the central section, and also in the Rutshuru area ex PNV, all IRSNB) and the PNU (six localities, all in gallery forest, IRSNB, fig. 51). As regards distribution see also sub *G. bistruplicina* and *G. lessensis*.

Hypsometrical distribution is from 750 to 1320 m a.s.l. (PNV 750-1250 m, PNU 860-1320 m a.s.l.).

The taxon was named after Dr Henry FAIRFIELD OSBORN (1857-1935), noted vertebrate palaeontologist and President of the Board of Trustees of the American Museum of Natural History. OSBORN was one of the instigators of the American Museum Congo Expedition 1909-1915 which resulted in the magnificent D.R.Congo non-marine mollusc treatises by PILSBRY (1919) and PILSBRY & BEQUAERT (1927).

The dealer H.B. PRESTON distributed his material of this taxon to various museums and collectors under the manuscript name *Streptostele ariel*.

*Gulella (Gulella) planidens* (VON MARTENS, 1892)  
(Figs 52-53)

*Ennea laevigata* DOHRN (pars); SMITH, 1881: 281, pl. 32 fig. 6; SMITH, 1899: 580.

*Ennea laevigata sensu* SMITH, DAUTZENBERG & GERMAIN, 1914: 8; GERMAIN, 1916: 247.

*Gulella laevigata sensu* SMITH, PILSBRY, 1919: 218.

*Gulella cf. laevigata sensu* SMITH, CONNOLLY, 1925: 120.

*Ennea planidens* VON MARTENS, 1892: 179; 1897: 21, 283, pl. 2 fig. 16; VON MÖLLENDORFF & KOBELT, 1904: 206, pl. 26 figs 5-6.

*Ennea quinquedentata* BOETTGER, 1913: 349, pl. 15 fig. 7; GERMAIN, 1916: 247.

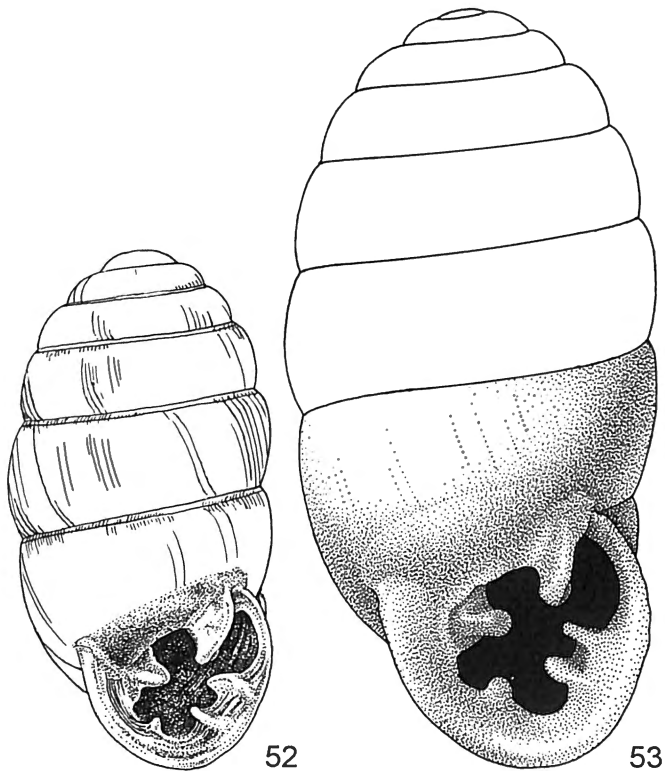
*Gulella planidens*; CONNOLLY, 1939: 51; ZILCH, 1961: 95; VERDCOURT, 1962: 21; BINDER, 1969: 74, figs 8-10; VAN BRUGGEN, 1973: 421; VERDCOURT, 1983a: 235; VAN BRUGGEN, 1988: 11; RICHARDSON, 1988: 114.

Shell diagnosis. - Shell comparatively large, smooth, almost cylindrical, smooth, sutures filiform. Apertural dentition five-fold, consisting of angular lamella; two (sub)equal palatal processes; a left-basal denticle; and a more or less horizontal columellar lamella.

Measurements: 7.5-10.2 x 3.8-5.0 mm, l/d 1.95-2.30.

Distribution. - West, Central and East Africa, as far west as Senegal, northeastward to (continental) Tanzania, and southward to Zimbabwe and Mozambique.

Notes. - ADAM's figure (fig. 52) was found filed under *G. laevigata*; from his notes it appears that he overlooked CONNOLLY (1939: 52), who clearly explains the position. In this context it is perhaps expedient to literally repeat what CONNOLLY wrote as regards the nomenclatorial position of the names involved here: "This species has been confused owing to SMITH having misidentified and figured it in 1881 as *laevigata* DOHRN., in which, in point



Figs 52-53. - *Gulella planidens* (VON MARTENS). - Fig. 52, D.R.Congo, PNU 1472c, 8.8 x 4.4 mm (IRSNB). Fig. 53, Zimbabwe, Mt. Selinda, Chirinda Forest, 7.9 x 4.0 mm (RMNH) [Fig. 53 Mr H. HEIJN del.]. (This is the first ever streptaxid collected in the field by the senior author, 14-26 January, 1959; vide VAN BRUGGEN, 1961, which initiated a life-long fascination with the family.)

of fact, the upper labral denticle, instead of being single and narrow, is clearly bifid; the true *laevigata* has never been figured under its own name, but in 1893 SMITH redescribed it (P.Z.S., p. 633, pl. LIX, fig. 2) as *karongana*, the figure of which gives a perfect representation of DOHRN's species; its distribution appears to be confined to the immediate vicinity of Lake Nyasa [= Lake Malawi], but *planidens*, which was described from the Belgian Congo [= D.R.Congo], ranges through Tanganyika [= continental Tanzania], Rhodesia [= Zambia and Zimbabwe], and Nyasaland [= Malawi] into Portuguese East Africa [= Mozambique]. This confusion makes it difficult to interpret pre-1939 literature records of *G. laevigata*.

VAN BRUGGEN (1973) states that this is 'probably the most widely distributed species in the genus if not in the family.' The following countries may be enumerated: Senegal, D.R.Congo (PNU, fig. 52), Tanzania, Malawi, Zambia, Zimbabwe (fig. 53), Mozambique. So far there are no records from Uganda and Kenya, although these countries would perfectly fit into this distribution pattern. Although VAN BRUGGEN (1973: 421; 1988: 11) mentions twice Uganda, this has not been substantiated (*vide e.g.*,

VERDCOURT, 1983a: 235). Two other very widely distributed species are *G. sexdentata* (see below) and *G. farquhari* (MELVILL & PONSONBY, 1895) (*vide* VAN BRUGGEN, 1992).

Measurements of four Senegal specimens (Niokolo-Koba National Park) are 8.0-9.4 x 4.1-4.7 mm, l/d 1.95-2.19 (BINDER, 1969). For East Africa VERDCOURT (1962) gives 7.5-9.2 x 3.8-4.0 mm, l/d 1.97-2.30. Measurements in southern Africa are 8.8-10.2 x 4.4-5.0 mm, l/d 2.00-2.23, 7-8 whorls.

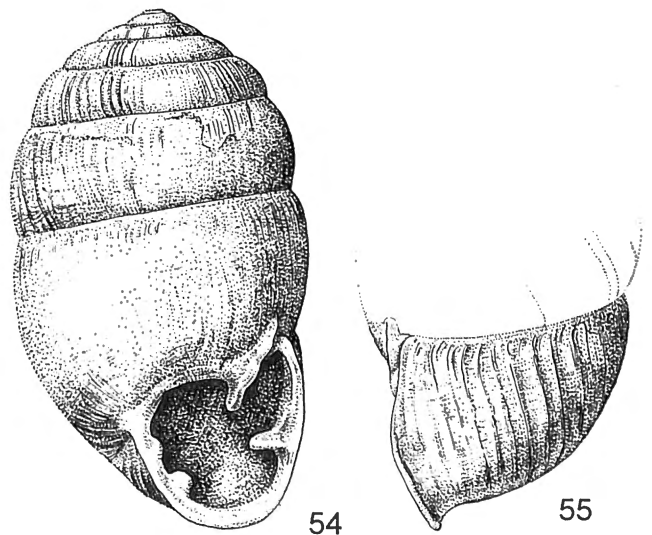
According to CONNOLLY (1939: 53) *G. quinquedentata* (type locality Kipatimu, Tanzania) is a synonym of *G. planidens*, a synonymy in which the present authors fully concur. The var. *wilkinsoni* VERDCOURT, 1983b (= *reductidantata* VERDCOURT, 1965 *nec* VERDCOURT, 1956), is characterized by a single instead of a double process on the outer lip. Because of the poorly developed apertural processes the holotype shell in the figure (VERDCOURT, 1965: fig. 1 on p. 167) looks like a not quite full-grown specimen, although one doubts whether the second palatal process would have developed had the snail lived somewhat longer. So far this variety has only been recorded from Tanzania.

BINDER (1969: 76, figs 9-10) describes and figures radula and genitalia of Senegal material.

*Gulella (Paucidentina) polloneriana* PILSBRY, 1919  
(Figs 54-55)

*Gulella (Paucidentina) polloneriana* PILSBRY, 1919: 225, figs 93a-b; RICHARDS & OLD, 1969: 42; RICHARDSON, 1988: 116.

Shell diagnosis. - Shell medium-sized, obovate, smooth or with faint costulation, well-marked behind the aperture, sutures more or less filiform. Apertural dentition four-fold, consisting of angular lamella; a mid-palatal denticle; and two columellar denticles.



Figs 54-55. - *Gulella polloneriana* PILSBRY, paratypes, D.R.Congo, Medje, 7.4 x 4.2 mm (MRAC 17657-17658).

Measurements: 7.4-8.6 x 3.9-4.4 mm, l/d 1.79-1.95, 7½-8 whorls.

Distribution. - Northeastern forest areas of D.R.Congo: Avakubi, Ituri Forest (type loc., lectotype AMNH 2155); Mbisi near Masisi and Mukule, 1800-2000 m (AMNH); Medje, Ituri Forest (paratypes, AMNH 1987; 2 paratypes MRAC 17657-58, ex AMNH, figs 54-55); Penge (AMNH; NRS, 3 paratypes).

Notes. - PILSBRY (1919: 226) considers this taxon close to *G. camerani* (see above), but stresses the following differences: 'differing from that [*i.e. G. camerani*] markedly in sculpture, and in the shape of the outer lip tooth, which is more compressed, the outside marked with a linear impression over it, while in *camerani* there is a much larger rounded pit. *Ennea baccata* PRESTON appears to be a related but smaller species. In the specimens from Mukule the columellar tubercles are weaker than in the others, and the upper one is sometimes obsolete. The lower columellar tooth is not so large and pliciform as in *G. camerani*.' This species has not yet been identified from outside the four original localities, all fairly close together in a limited area of eastern D.R.Congo.

The species was named after the well-known Italian malacologist Carlo POLLONERA (1849-1923).

*Gulella (Pupigulella) pupa* (THIELE, 1911)  
(Fig. 56)

*Ennea amicta* var. *brevior* VON MARTENS, 1897: 14.

*Ennea (Pupigulella) pupa* THIELE, 1911: 182, pl. 4 fig. 20.

*Gulella (Pupigulella) pupa*; DEGNER, 1934b: 374; ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE, 1956: 105, 108, fig. 16 (var. *mueriensis*); VERDCOURT, 1962: 5; VERDCOURT, 1983a: 232.

*Gulella (Pupigulella) pupa ituriensis* PILSBRY, 1919: 228, fig. 96; CONNOLLY, 1922: 498; RICHARDS & OLD, 1969: 43.

*Pupigulella pupa*; ZILCH, 1960: 569, fig. 1991.

Shell diagnosis. - Shell small to medium-sized, subcylindrical, finely costulate, sutures subcrenulate to filiform. Aperture wide open, somewhat flaring with reflected lip, without dentition. Faint traces of spiral sculpture may sometimes be discerned, e.g. on the body whorl.

Measurements: 5.0-7.5 x 2.6-3.5 mm, l/d 1.67-2.14, wh 5+-6½.

Distribution. - Liberia, Cameroon, Fernando Poo, eastern and southeastern D.R.Congo, western Uganda and Tanzania [type locality for *Ennea amicta* var. *brevior* in VON MARTENS, 1897: 14, "Bundeko (östlich vom Issango-Fluss)", interpreted by THIELE, 1911: 182, as "Butumbi", which is the general area SE. of Lake Edward].

Notes. - The edentate aperture with flaring lip is characteristic for this taxon which represents what may be termed a plesiomorphic character state as regards its apertural dentition.

PILSBRY's subspecies *G. pupa ituriensis* differs only in minor details from the nominate form (PILSBRY, 1919: 228, fig. 96) and does not seem tenable (B. VERDCOURT agrees with this, *in litt.*). His material shows the following measurements: 5.5-7.5 x 3.2-3.5 mm, l/d 1.72-2.14, wh 5½-6½.

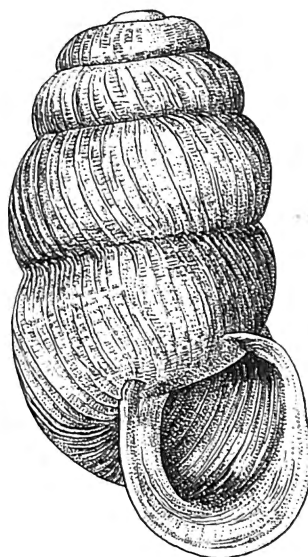


Fig. 56. - *Gulella pupa* (THIELE), D.R.Congo, PNU 960c, 5.0 x 2.6 mm (IRSNB).

The holotype (AMNH 2162) is from D.R.Congo, Penge, Ituri Forest. However, CONNOLLY (1922: 498), in describing two shells from Bitze (Cameroon), identifies the one with *G. pupa s.s.* and the other with *G. pupa ituriensis*. His remarks may be quoted in full: "My two shells differ noticeably in sculpture, which may be described as ordinary and regular, though closer on the last than on the penultimate whorl, in the typical form, while in *ituriensis* it is coarser and more oblique on the 3rd and 4th, and almost obsolete on the front of the last whorl, except for showing very strongly near the crenulate suture. If my identification of the two forms is correct, and the difference in sculpture is constant, it should be quite sufficient to establish them as distinct species."

A shell from Fernando Poo with 5½ whorls measures 5.2 x 2.9 mm, l/d 1.79, is described as the var. *mueriensis* by ORTIZ DE ZÁRATE & ORTIZ DE ZÁRATE (1956: 108, fig. 16). These measurements are within the range of variation of the species (see above) and the few other characters (mainly concerning the sculpture) do not really seem to be diagnostic of a separate taxon - the fact that this variety is described from Fernando Poo is perhaps the only reason not to synonymize it yet.

A random selection of PNV and PNU material identified as *G. pupa* shows the following individual measurements:

5.0 x 2.6 mm, l/d 1.92, lw 2.9 mm, ap. 2.0 x 1.8 mm, wh. 5+ (PNU 960, fig. 56)

5.2 x 2.8 mm, l/d 1.84, lw 3.0 mm, ap. 2.1 x 1.9 mm, wh. 5¼ (ex PNV 512)

5.4 x 3.2 mm, l/d 1.67, lw 3.4 mm, ap. 2.4 x 2.0 mm, wh. 5+ (PNU 1355)

5.7 x 3.0 mm, l/d 1.89, lw 3.3 mm, ap. 2.3 x 2.3 mm, wh. 5½ (PNV 1253)

5.8 x 3.1 mm, l/d 1.86, lw 3.2 mm, ap. 2.2 x 2.0 mm, wh. 5¼ (PNU 1356)

6.0 x 3.2 mm, l/d 1.85, lw 3.5 mm, ap. 2.3 x 2.1 mm, wh. 5¼+ (PNU 1355)

6.1 x 3.1 mm, l/d 1.96, lw 3.4 mm, ap. 2.4 x 2.0 mm, wh. 5¼+ (PNU 1356)

6.2 x 3.1 mm, l/d 1.99, lw 3.4 mm, ap. 2.3 x 2.1 mm, wh. 5<sup>1</sup>/<sub>4</sub>+ (PNU 1355)

6.5 x 3.1 mm, l/d 2.10, lw 3.4 mm, ap. 2.5 x 1.9 mm, wh. 5<sup>3</sup>/<sub>4</sub> (PNV 1253)

6.7 x 3.4 mm, l/d 1.94, lw 3.8 mm, ap. 2.8 x 2.3 mm, wh. 5<sup>3</sup>/<sub>4</sub> (PNV 512)

This shows that, notwithstanding the great distance between the localities, the (few) measured PNV and PNU specimens do not seem to differ significantly in metric data:

PNV 5.2-6.7 x 2.8-3.4 mm, l/d 1.84-2.10, lw 3.0-3.8 mm, ap. 2.1-2.8 x 1.9-2.3 mm, wh 5<sup>1</sup>/<sub>4</sub>-5<sup>3</sup>/<sub>4</sub> (n=4);

PNU 5.0-6.2 x 2.6-3.2 mm, l/d 1.67-1.99, lw 2.9-3.5 mm, ap. 2.0-2.4 x 1.8-2.1 mm, wh 5+ - >5<sup>1</sup>/<sub>4</sub> (n=6).

All in all, at the time it seems best to consider all above material simply as *G. pupa* without distinguishing subspecies and/or varieties.

### *Gulella (Paucidentina) sankuruensis*

DARTEVELLE-PUISSANT, 1936

(Fig. 57)

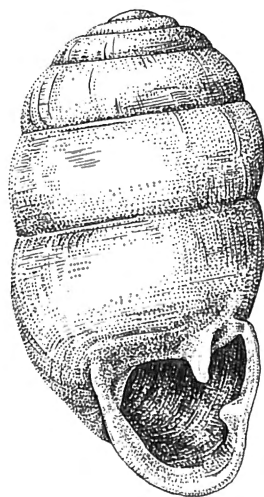
*Gulella (Paucidentina) sankuruensis* DARTEVELLE-PUISSANT, 1936: 60, figs 2-5; RICHARDSON, 1988: 120.

Shell diagnosis. - Shell medium-sized, subcylindrical, smooth, sutures filiform. Aperture with two-fold dentition consisting of angular lamella and palatal denticle.

Measurements: 6.5-7.5 x 3.4-4.1 mm, l/d 1.71-1.92, 7<sup>1</sup>/<sub>4</sub>-7<sup>1</sup>/<sub>2</sub> whorls.

Distribution. - South-central D.R.Congo: Kondwe (in original description 'Kondué'), Sankuru (type loc., holotype + 11 paratypes MRAC 85461-72, holotype fig. 57; 4 paratypes IRSNB *ex* MCZ); Malela near Pania-Mutombo (MRAC, paratypes; IRSNB, 4 paratypes *ex* MCZ).

Notes. - The shell of this species looks somewhat like that of *G. arthuri* (see above), but is, considerably larger and differently shaped, *i.e.* with lower l/d values. *G. sankuruensis* has not yet been identified from outside its two original localities.



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Fig. 57. - *Gulella sankuruensis* DARTEVELLE, holotype, D.R.Congo, Sankuru-Kondwe, 7.2 x 3.8 mm (MRAC 85461).

### *Gulella (Gulella) sexdentata* (VON MARTENS, 1869) (Figs 58-61)

*Ennea laevigata* DOHRN var. *sexdentata* VON MARTENS, 1869: 154; PFEIFFER, 1876: 504; PFEIFFER & CLESSIN, 1878: 19; TRYON, 1885: 99.

*Ennea sexdentata*; VON MARTENS, 1897: 22, 283 (+ var. *liederi*); GERMAIN, 1918: 254.

*Gulella sexdentata*; CONNOLLY, 1925: 117; GERMAIN, 1935: 4; CONNOLLY, 1939: 62; VERDCOURT, 1962: 24 (+ var. *liederi*); VAN BRUGGEN, 1973: 421; VERDCOURT, 1983a: 236 (+ var. *liederi*); AIKEN, 1981: 320; RICHARDSON, 1988: 121; VERDCOURT, 1990: 351; AIKEN, 1995: 12, fig.

*Ennea hanningtoni* SMITH, 1890: 161, pl. 6 fig. 4; VON MARTENS, 1897: 22; VON MÖLLENDORFF & KOBELT, 1904: 220, pl. 27 fig. 12; KOBELT, 1910a: 54; KOBELT, 1910b: 160.

*Gulella hanningtoni*; GERMAIN, 1935: 4.

Shell diagnosis. - Shell comparatively large, almost cylindrical in shape, smooth to smoothish, sutures subcrenulate to filiform. Apertural dentition six-fold, consisting of angular lamella; three labral lamellae [the upper slightly smaller than the other two and occasionally (almost) completely reduced, cf. fig. 61]; a left-basal denticle; and a superficial, almost horizontal columellar lamella. Sometimes very faint traces of spiral sculpture, as shown in fig. 59, may be observed in fresh specimens.

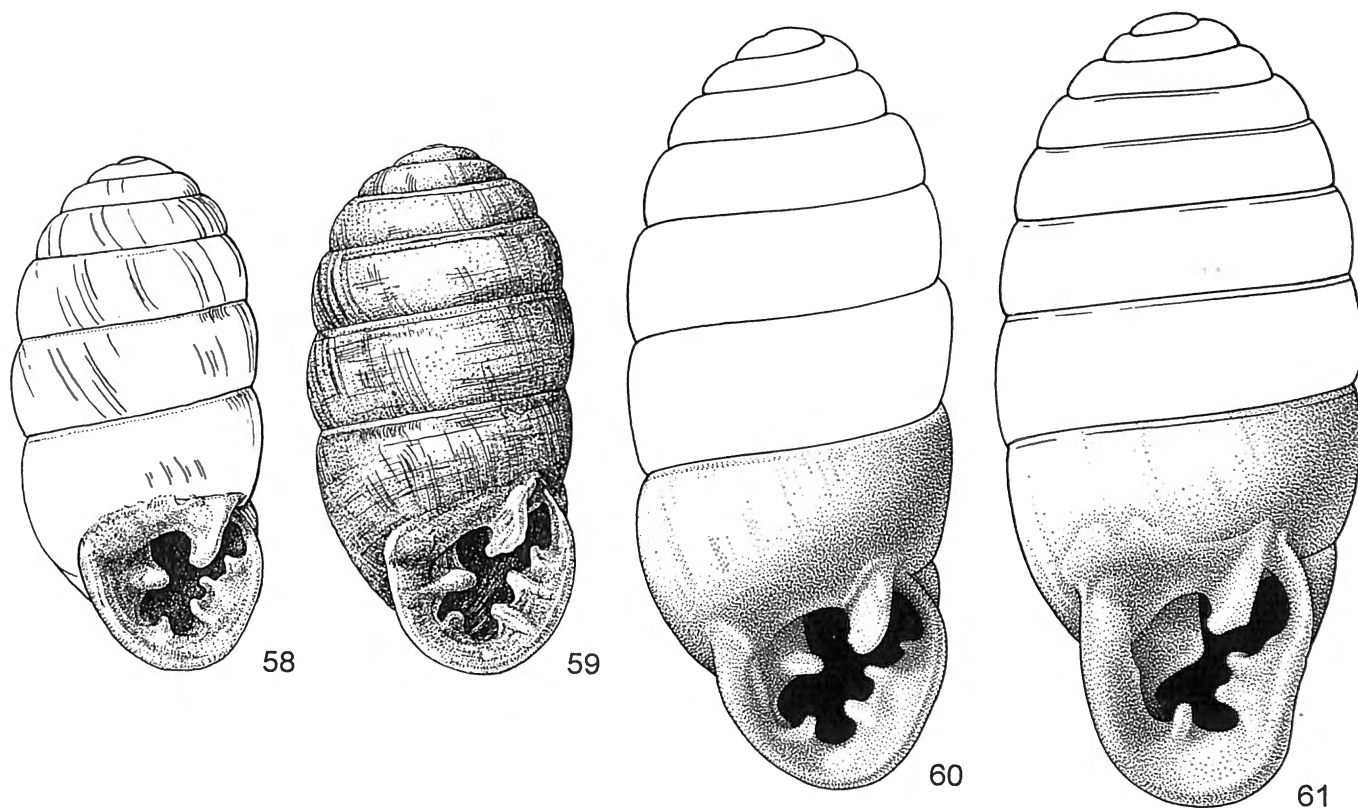
Measurements: 7.2-12.0 x 4.0-6.0 mm, l/d 1.81-2.39.

Distribution. - Central and East Africa southward to Zululand.

Notes. - The var. *liederi* (VON MARTENS, 1897) is characterized by a slightly aberrant columellar complex: ". . . with upper columellar tooth stronger and with a protuberance." . . . "The main columellar element . . . is really an internal lobe with the thickened edge reaching right out to the peristome." (VERDCOURT, 1962: 24). As regards size (12.0 x 6.0 mm, l/d 2.00) this form fits into the normal pattern of variation.

*G. sexdentata* is one of the more widely distributed species of *Gulella*. Essentially a species of East Africa, it reaches its southern limits in an attenuated pattern in eastern Zimbabwe/Mozambique/South Africa and its northeastern limits in Tanzania. Its northwestern limits are as yet not fully understood; it is here recorded for the first time from D.R.Congo. The detailed distribution from south to north is now as follows: South Africa: Natal-Zululand [Tugela River mouth, leg. W.G. RUMP, 1929, NM, fig. 61 (this locality is on the northern shore of the Tugela River<sup>1</sup> which forms the traditional boundary between Natal and Zululand - the southernmost record of the species at slightly > 29° Lat. S)], Transvaal [eastern Transvaal: Barberton, Sibasa (CONNOLLY, 1939; AIKEN, 1995)]; Swaziland (Mbabane, NM); Mozambique: Gogoi nae Espungabera (NM), Chiluvo Forest (fig. 60, NM,

<sup>1</sup> The southern shore of the Tugela River mouth was explored by A.C. & W.H. VAN BRUGGEN on 3.I.1964; no *Gulella* were found here, although other terrestrial molluscs did occur abundantly in the coastal bush sampled.



Figs 58-61. – *Gulella sexdentata* (VON MARTENS). - Fig. 58, Mozambique, Zangwe R. basin, 8.7 x 4.1 mm (NRS). - Fig. 59, D.R.Congo, PNU 2407c, 9.1 x 4.4 mm (IRSNB). - Fig. 60, Mozambique, Chiluvo Forest, 9.6 x 4.2 mm (NM). - Fig. 61, South Africa, KwaZulu-Natal (Zululand), Tugela River mouth, 8.7 x 4.1 mm (NM) [Figs 60-61 Mr H. HEIJN del.].

RMNH, also alc.), Dondo Forest (NM), Mtisherra R. valley (BM, NM), Zangwe R. Basin (fig. 58, NRS); Zimbabwe: Gwelo, Sebakwe R. (SAM); D.R.Congo: Shaba: PNU, 20 localities (fig. 59, IRSNB, duplic. RMNH), "Exploration Lac Tanganika" Sta. 39, Tembwe Bay and Cape Tembwe on the western shores of Lake Tanganyika (IRSNB); Tanzania: Central Tanzania (BM), Zanzibar (VERDCOURT, 1962, 1983a).

The species has so far not been recorded from Malawi (VAN BRUGGEN & MEREDITH, 1984; VAN BRUGGEN, 1993), Zambia (VAN BRUGGEN, 1988), Uganda, and Kenya (VERDCOURT, 1983a).

The following detailed metric data for the various regions show that there are no easily discernible differences:

Central and East Africa: 9.1-12.0 x 4.0-6.0 mm, l/d 1.94-2.37;

PNU: 7.2-9.6 x 4.0-4.4 mm, l/d 1.81-2.20, 6-7<sup>1</sup>/<sub>4</sub> whorls;

South of the Zambezi River: 8.2-10.7 x 4.0-4.5 mm, l/d 1.89-2.39, 6<sup>3</sup>/<sub>4</sub>-7<sup>3</sup>/<sub>4</sub> whorls.

Mean values seem to roughly indicate a trend, viz. that the Central and East African populations have somewhat larger and more slender shells than elsewhere (subject to confirmation by measurements of more specimens):

Central and East Africa 11.0 x 5.0 mm, l/d 2.15

PNU 8.4 x 4.2 mm, l/d 2.00

Southern Africa 9.5 x 4.2 mm, l/d 2.14

*G. sexdentata* may be characterized as a forest dweller, although it has also been found in more open types of vegetation such as gallery forest and savanna-woodland.

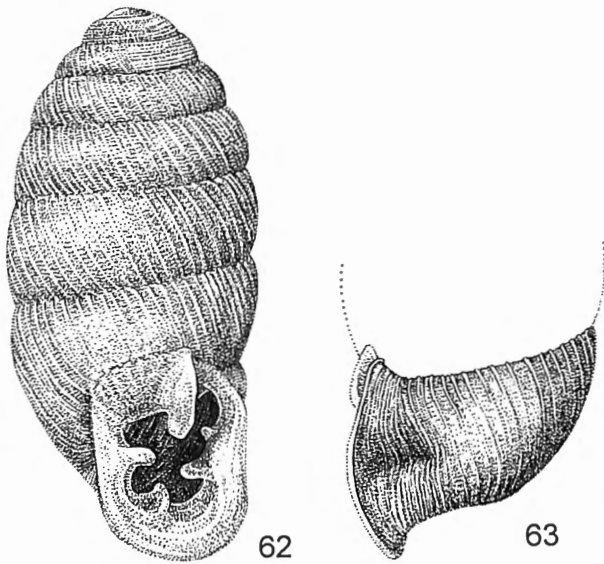
*Pupa (Ennea) sex-dentata* TAYLOR, 1880, from Zanzibar (TAYLOR, 1880: 144) is a species of *Gulella* and therefore a junior homonym of *Gulella sexdentata* (VON MARTENS, 1869); for further comments refer to VERDCOURT (1962: 25, "Needs a new name"). We now have pleasure in proposing the name *Gulella bernardi* nom. nov. for this taxon in honour of our colleague Dr Bernard VERDCOURT.

*Gulella (Gulella) socialis* PILSBRY, 1919  
(Figs 62-63)

*Gulella socialis* PILSBRY, 1919: 219, figs 88a-b; RICHARDS & OLD, 1969: 41; RICHARDSON, 1988: 122.

Shell diagnosis. - Shell medium-sized, subcylindrical and slightly tapering, costulate, but apical whorls with spiral sculpture, sutures crenellate. Aperture with five-fold dentition, consisting of angular lamella; two labral denticles, the upper smaller than the lower; one mid-left basal process; and a superficial, almost horizontal, columellar lamella.

Measurements: 6.8-7.2 x 3.1-3.3 mm, l/d 2.18-2.25 (n=3), viz., 6.8 x 3.1 mm, l/d 2.19, 7 whorls (holotype); 7.2 x 3.2 mm, l/d 2.25 (NMS); 7.2 x 3.3 mm, l/d 2.18 (PNV, figs 62-63).



Figs 62-63. - *Gulella socialis* PILSBRY, D.R.Congo, PNV 511c, 7.2 x 3.3 mm (IRSNB).

Distribution. - Northeastern and south-central D.R.Congo: Avakubi, Ituri Forest (type locality: holotype, AMNH 2149); PNV 511c = PNV 512, Abyalose, west of Djuma River, 800 m (1, IRSNB); PNV A2502, Utuhe, at the foot of a tree (1, IRSNB); Malela, Chief Kasende, 5°40'S 23°45'E, 2nd Harvard African Exped. 1934, ex J.C. BEQUAERT (1, NRS).

Notes. - According to PILSBRY (1919: 220), *G. socialis* is apparently nearest to *G. consociata* (SMITH, 1890), which is known from Kidete in Tanzania (VERDCOURT, 1983a: 235). *G. socialis* obviously is a rare species, so far only known from four shells (see above) from two different areas in D.R.Congo.

***Gulella (Molarella) ugandensis* (SMITH, 1901)**  
(Figs 64-65)

*Ennea ugandensis* SMITH, 1901: 93, fig. 1; VON MÖLLENDORFF & KOBELT, 1904: 225, pl. 28 fig. 6; KOBELT, 1910a: 55; 1910b: 162; CONNOLLY, 1922: 500; McCLELLAND, 1926: 27.

*Ennea optata* PRESTON, 1911: 464, pl. 11 fig. 4 (for further references vide RICHARDSON, 1988: 129).

*Gulella ugandensis*; CONNOLLY, 1929: 166; VERDCOURT, 1962: 6; ADAM, 1965: 38, pl. 4 fig. 3; VERDCOURT, 1970: 45; 1983a: 232; RICHARDSON, 1988: 128; TATTERSFIELD, 1996: 165, 166, 171, 180.

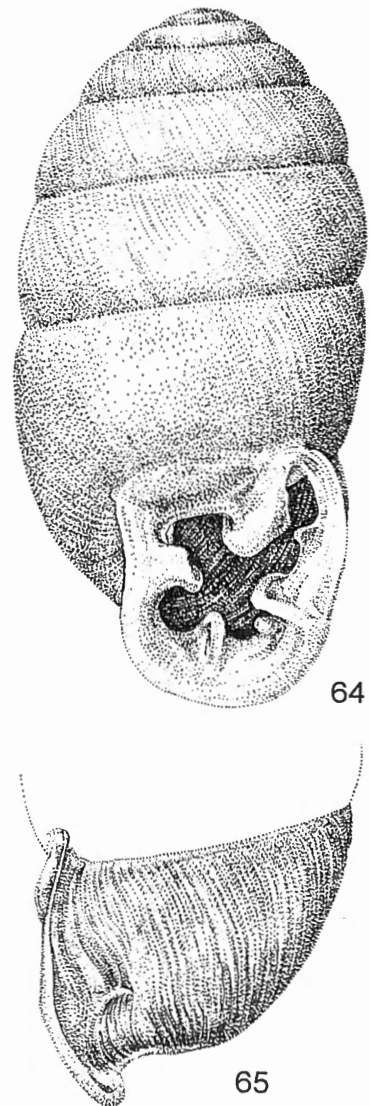
Shell diagnosis. - Shell large, subcylindriform to ovate, smoothish with obsolete costulation, sutures filiform. Aperture with seven-fold dentition, consisting of angular lamella; a labral complex, i.e. an upper labral tubercle on a common base with a large lamella, under which a somewhat more deeply situated smaller process; a mid-left basal process; a superficial, more or less horizontal columellar complex, consisting of a shelf with a tubercle or swelling on it.

Measurements: 10.0-15.7 x 5.5-7.8 mm, l/d 1.83-2.15, 7-8 whorls.

Distribution. - Eastern D.R.Congo to central Kenya.

Notes. - In D.R.Congo *G. ugandensis* is restricted to a cluster of localities in the northern tip of the PNV Nord sector, where it is uncommon. In addition there are records from Uganda and the Kenya highlands (inclusive of the Kakamega Forest, *vide* TATTERSFIELD, 1996).

The shell of this taxon is subject to much variation in size, sculpture and apertural dentition, which may be of a geographical nature (*vide e.g.*, VERDCOURT, 1970). Some of the subspecies are certainly valid (*elgonensis* VERDCOURT, 1970; *brathayi* VERDCOURT, 1983b = *cheranganiensis* VERDCOURT, 1970, *nec* GERMAIN, 1934). *G. optata* (PRESTON, 1911) is considered a synonym (VERDCOURT, 1962: 6). According to VERDCOURT (1970) *G. moloensis* ADAM, 1965, is certainly closely allied, if not another form of the same taxon; more than a decade later he (VERDCOURT, 1983a: 232) simply lists ADAM's name as a synonym. *G. sellae* (POLLONERA, 1908) also seems to



Figs 64-65. - *Gulella ugandensis* (SMITH), D.R.Congo, PNV 2613c, 11.9 x 5.8 mm (IRSNB).

belong to this assemblage, which VERDCOURT (1970) appropriately calls the '*G. sellae-ugandensis* group'. *G. ugandensis* is restricted to uplands; hypsometrical distribution records vary from between <2000 and 3000 m.

*Gulella (Plicigulella) vicina mediafricana* PILSBRY, 1919  
(Fig. 66)

*Gulella (Plicigulella) mediafricana* PILSBRY, 1919: 217, fig. 86a-c; RICHARDS & OLD, 1969: 43.

*Gulella (Plicigulella) vicina mediafricana*; VAN BRUGGEN, 1980: 47; VERDCOURT, 1983a: 232; RICHARDSON, 1988: 131; VAN BRUGGEN, 1996: 333, 336.

Shell diagnosis. - Shell medium-sized, (sub)cylindrical, costulate, with subcrenellate sutures. Aperture with ten-fold dentition, consisting of angular lamella; a large labral complex with two subequal squarish processes; two deeply situated mid-basal denticles; a superficial, triangular left basal denticle; a large tripartite columellar complex; a mid-parietal denticle.

Measurements: 5.5-6.1 x 2.6-2.9 mm, l/d 2.10-2.12, 6<sup>3</sup>/<sub>4</sub> whorls.

Distribution. - Eastern D.R.Congo to Kenya highlands. Material examined/recorded: D.R.Congo: Beni, gallery forest of the Semliki River (type loc., lectotype AMNH 2159); Lesse, Semliki forest (MRAC 17700, paratype); PNV, northern half of northern sector plus Rutshuru area ex PNV (fig. 66, widespread and fairly common).

Notes. - The general consensus now is that this form belongs to the *Gulella vicina* (SMITH, 1899) complex. This taxon is very widely distributed from southern Africa (as far south as Mt. Selinda on the eastern escarpment of Zimbabwe) to northern Kenya (Samburu/Taru Desert area),

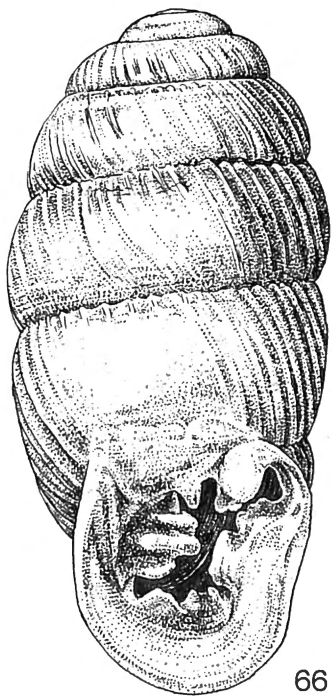


Fig. 66. - *Gulella vicina mediafricana* PILSBRY, D.R.Congo, PNV 1130c, 6.1 x 2.9 mm (IRSNB).

westward to Uganda and eastern D.R.Congo, and a number of subspecies has been recognized (see e.g., VAN BRUGGEN, 1980: 46-49). As a rule these subspecies are easily defined by size, sculpture and apertural dentition; all are included in the key by VAN BRUGGEN (1996: 331-333), who also discusses the status of *Plicigulella*.

#### Acknowledgements

Acknowledgements are due to the curators in charge of the Mollusca at the Tervuren and Stockholm Museums at the time when the material was lent to Dr ADAM. The senior author acknowledges the assistance of the curators in charge of the molluscan collections of the museums in New York (AMNH), London (BM; a succession of visits in the period 1967-1994 to the hospitable Mollusca Section of this museum has yielded considerable data on the African Streptaxidae, much of which is incorporated below), Cambridge Mass. (MCZ), and Cape Town (SAM). Mrs D. OORTMAN (IRSNB) put the finishing touches to the manuscript and Mr H. VAN PAESSCHEN (IRSNB) kindly composed the plates. In addition, the authors owe a debt of gratitude to Dr B. VERDCOURT (Royal Botanic Gardens, Kew, U.K.), who graciously agreed to referee the manuscript and to contribute his expertise on the subject, and to Dr A.J. DE WINTER (RMNH), who was quite prepared to share his considerable knowledge of the land molluscs of West Africa. However, the authors are, of course, entirely responsible for all opinions expressed in this paper. All figures were drawn by Mrs J. VAN MELDEREN-SERGYSSELS except for figs 53 and 60-61 which were drawn by Mr H. HEIJN in his period of employment as staff artist with the Systematic Zoology Section of Leiden University. Dr G. MANGANELLI (University of Siena, Italy) is acknowledged for contributing data on POLLONERA.

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<sup>3</sup> PRESTON did not designate holotypes. SCHOUTEDEN's paper (1936) should be interpreted as selection of lectotypes.

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A.C. VAN BRUGGEN  
 Sectie Systematische Dierkunde  
 Instituut voor Evolutionaire en  
 Ecologische Wetenschappen (E.E.W.)  
 c/o Nationaal Natuurhistorisch Museum  
 P.O.Box 9517  
 NL-2300 RA LEIDEN  
 The Netherlands

J.L. VAN GOETHEM  
 Afdeling Malacologie  
 Koninklijk Belgisch Instituut voor  
 Natuurwetenschappen  
 Vautierstraat 29  
 B-1000 BRUSSELS  
 Belgium