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A Synopsis of the Section *Primigulella* Pilsbry of *Gulella* Pfr. (Mollusca, Streptaxidae)

by

BERNARD VERDCOURT, Ph. D., F.L.S., and

L. A. W. C. VENMANS, Ph. D.

INTRODUCTION

One of the writers (VERDCOURT, 1953) has already made some remarks concerning the members of this section which occur in the Usambara Mountains, Tanganyika. This short paper is a review of the section as a whole.

The section *Primigulella* is the most distinct section in the genus. It has a very characteristic appearance due to the numerous teeth and lamellae and to the shape of the specialised parietal angular lamella. The anatomy of the genus as a whole is too poorly known for one to conclude that the section merits generic rank, but it is probable that it does. It would not be wise to add to the already far too numerous minor generic splits without very good evidence. There is nothing wrong with large genera and some recent splitting seems to have been done merely on the grounds that certain genera are unwieldy. CONNOLLY (1930) gave the section *Conogulella* PILSBRY (1919) generic rank on the evidence of the radula — the lateral teeth are bicuspid. The radula of the totally distinct *Gulella usambarica* (Crn.) has quadriserrate cusps on the marginals (VERDCOURT, 1953) and it would be unwise to use radula characters until a very large number of species have been examined. There are undoubtedly many distinct kinds of radulae in the genus. During the preparation of a key to the East African *Gulellae*, still in an embryo state, the author (BV) came to the conclusion that the only other natural groups yet named were the *Microstrophia*-like section *Costigulella* and the section *Plicigulella*. *Mirigulella* Pilsbry, 1933, *Aenigmigulella* Pilsbry 1933, and *Thaumatogulella* Haas, 1951, have been proposed for single extraordinary shaped species. The sections *Molarella* Connolly, 1922,

and *Paucidentina* Martens, 1897, as at present constituted seem heterogeneous to an extreme.

VALUE OF CHARACTERS IN THE SECTION

Shape is of little value as was recognised long ago by PILSBRY (1919) when he sank *G. roccatii* (Pollon.) and inserted it into the

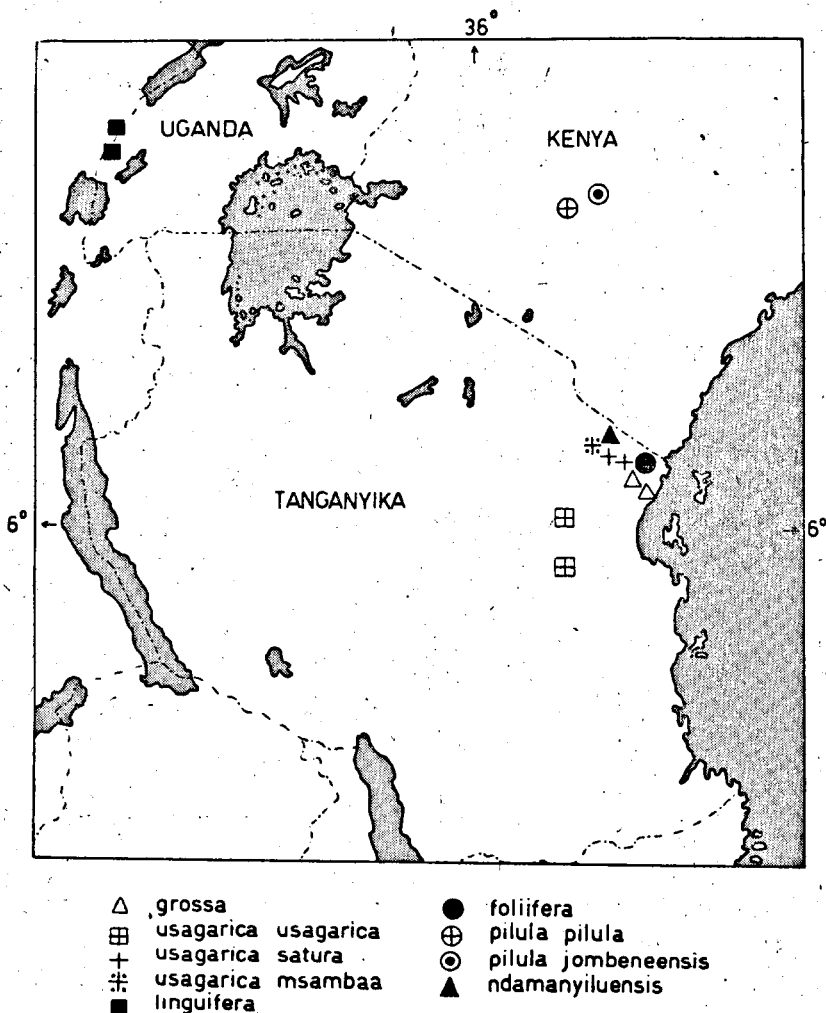


Fig. 1. Distribution of the species of *Gulella*, section *Primigulella*.

synonymy of *G. linguifera* (von Marts). The same type of shape variation is shown in a long series of *G. usagarica* ssp. *msambaa*. The arrangements of the lamellae and denticles are undoubtedly the most valuable characters, but as one writer (VERDCOURT, 1953, p. 36) has shown in the case of *G. grossa* some minor denticles may not be present in every shell of a species.

GEOGRAPHICAL DISTRIBUTION

As at present known the section is restricted to East Africa. The greatest amount of speciation has taken place in the Usambaras where there are five taxa. One is known from the Ulugurus but very likely further collecting would reveal other species. One species occurs on Mt. Kenya with a variety of it on the nearby Jombene Hills. A further species occurs on the Ruwenzories. The Ruwenzori and Kenya species are seemingly more closely related to each other than either is to the Tanganyika species. The section is noticeably absent from the geologically rather recent mountain Kilimanjaro. This may of course be due to lack of collecting but the snails in this section are quite large and conspicuous. The most likely place to find new species would probably be the montane forests of Sth. Tanganyika. Material from this area has recently been collected by an expedition from Bremen museum and may on working out prove to contain new species of this section. The authors were unable to see any of this material. A map of the distribution is given in Fig. 1.

LIST OF SPECIES

Primigulella Pilsbry (1919).

1. *grossa* (von Marts., 1892)
2. *usagarica* (Crosse, 1885)
- 2b. ssp. *satura* (Haas, 1936)
- 2c. ssp. *msambaa* Verdcourt, ssp. nov.
3. *foliifera* (von Marts., 1895)
4. *ndamanyiluensis* Venmans, sp. nov.
5. *linguifera* (von Marts., 1895) (Type of section)
6. *pilula* (Prest., 1911)
- 6b. var. *jombeneensis* (Prest., 1913)

KEY TO THE SPECIES AND VARIETIES OF PRIMIGULELLA

1. Shell large, 19—22 mm. tall, 2—3 parietal denticles besides the angular lamella the ultimate branches of which point towards the base of the shell 1. *grossa*

1. Shell smaller, 11—17.5 mm. tall, 1—2 (rarely 3), parietal denticles besides the main lamella the branches of which are oblique (2)
2. Two main columellar lamellae arcuate, arching downwards conspicuously 3. *foliifera*
2. Two main columellar lamellae more or less straight (3)
3. Larger species, 14-17.5 mm. long and about 10 mm. wide 2. *usagarica* and ssp.
3. Smaller species, 11-13.5 mm. long and 6-7 mm. wide (4)
4. Aperture narrow, noticeably contracted above 5. *linguifera*
4. Aperture more quadrate or oval, broader above (5)
5. A secondary mid-parietal denticle present, orifice of aperture not obstructed by teeth 4. *ndamanyiluensis*
5. Secondary parietal denticle usually absent or if present then very close to angular lamella, only rarely in the mid-position, aperture more obstructed by the teeth 6. *pilula* and vars.

ENUMERATION OF THE SPECIES

1. *Gulella grossa* (von Martens.)

Ennea grossa von Martens, in Sitz.-Ber. Ges. naturf. Fr. Berlin, p. 182 (1892) and in Beschalte Weichthiere, Deutsch-Ost-Africa, vol. 4 (1), p. 23, pl. 2 fig. 17-18 (1897). (NB. The date of the complete copy of vol. 4 is 1898 but PILSBRY gives 1897.)

This species is known only from the East Usambaras and was discussed by VERDCOURT (1953). There is an old record from near Tanga and if reliable no doubt refers to the extensive forest which formerly existed on the coast but has now been destroyed. The species was figured very well by its describer. There is a single paratype in the British Museum (Nat. Hist.). The writer's specimens are in the Coryndon Museum, Nairobi; Senckenberg Museum, Frankfurt; British Museum (Nat. Hist.); and in coll. VENMANS, nr. 5996 (3 specimens).

2. *G. usagarica* (Crosse)

Ennea usagarica Crosse in J. de Conchyl., vol. 33, p. 310 (1885) and in J. de Conchyl., vol. 34, p. 82, pl. 1 fig. 1 (1886).

This is the only difficult species in the section. One writer (VERDCOURT, 1953, p. 38) quite erroneously stated that CROSSE did not figure his species — a statement foolishly accepted *in litt.* while away from his own library. CROSSE figured the species a year after he described it as was pointed out to me by Dr. ADAM of Brussels and is mentioned by PILSBRY (1919). Several workers e.g. Dr. ADAM and Dr. BEQUAERT have doubted the correctness of the writer's (BV) identification of shells from Shume, West Usambaras as being the present species. Since then a specimen from Ukami and three hundred living specimens from the Uluguru mountains have been seen. The living material was collected under the direction of Mr. J. BOND

of the Tanganyika Forest Dept. It is hoped that some person will be able to undertake a thorough anatomical investigation of the material to supplement the brief anatomical notes included in this account. Examination of all this material has shown that the species is variable and that all the forms mentioned as well as the 'pointed' East Usambaras form figured by VERDCOURT (1953) are referable to one species divided into three subspecies. The correct names for these forms need discussion. The different forms must first be described. The Shume form has been adequately figured. The lamella at the junction of the base and outer lip extends far back into the aperture and is dilated and curved at the back. There is a small denticle above and below the main pair of columellar lamellae. The single shell from Ukami, leg. ROLLE (ex coll. RUSNOV via coll. T. PAIN) is very similar but lacks the extended portion of the lamella to the left of the base. The large number of shells from the Uluguru show some variation. All lack the extended portion of the basal lamella and there are only two columellar lamellae and no small denticles; there are 1-2 mid-parietal denticles and often no branches on the hollowed outer side of the main lamella. The outer lip denticle which in the Shume form is a broad slab is in this form either a similar slab, a bifid slab, or a single denticle. The very acuminate East Usambaras form is similar to the Uluguru form — the broad slab on the outer lip is reduced to a denticle and there are 1-2 minute denticles above it in the sinus. There are 1-3 parietal denticles and the angular lamella is very oblique being smooth on the hollowed outer side; the left hand basal denticle does not extend far into the aperture. There are two main lamellae only on the columella and an extreme right hand basal denticle is either present or absent. Which of these forms agrees with CROSSE'S original description? The original description mentions only two strong lamellae on the columella and also a blunt mamillate top. The Uluguru specimens agree in every way — save for the universal minute denticle hidden in the sinus of the outer lip which CROSSE does not mention. His figures are not good and the parietal lamella does not agree entirely with any specimens seen and is inaccurately drawn. The Ulugurus are not far from 'Usagara' which CROSSE gives as the type locality. His specimens originally came from DAMON'S naturalists shop. The nominate name is therefore fixed for the Uluguru specimens and DAMON'S material may have come from the nearby Nguru Mts.

Mr. GILBERT RANSON of the National Museum of Natural History at Paris has kindly compared the Uluguru specimens collected by BOND with the type of CROSSE'S species which is preserved there, and states that they are conspecific; there are only individual differences.

Mlle J. PARETIAS has very kindly made two drawings of the type which are reproduced here (Figs. 2 & 3). We are most grateful for this assistance.

The Shume form previously figured is here described as a new subspecies *msambaa* (kiswahili for 'an inhabitant of the Usambaras').

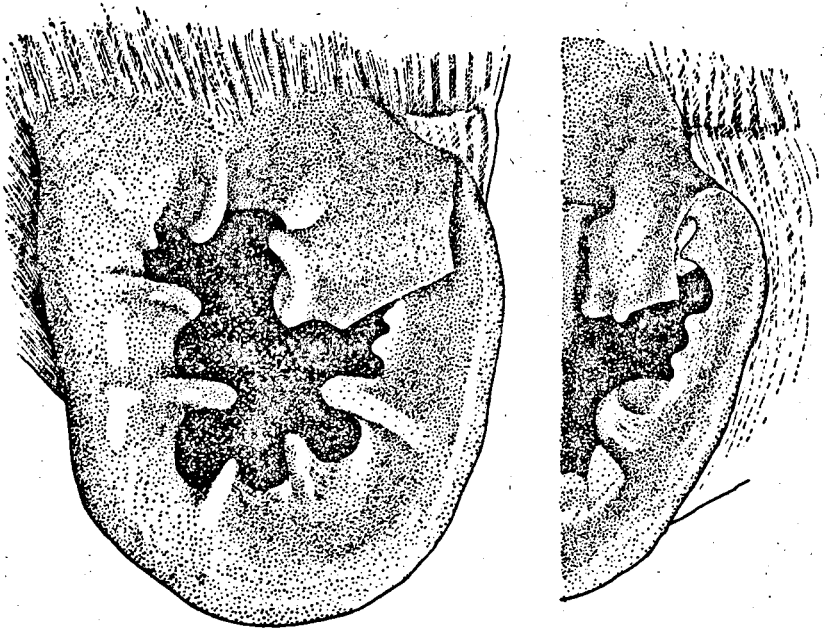


Fig. 2. *Gulella usagarica* (Crosse), type specimen in the National Museum of Natural History, Paris. Front view of the aperture. $\times 12$. J. Paretias del.

Fig. 3. *Gulella usagarica* (Crosse), type specimen. Denticulation of the outer lip. $\times 12$. J. Paretias del.

The Ukami specimen is intermediate between this subspecies and the typical form. The acuminate form, from the East Usambaras appears to agree well with the form described from Bumbuli in the West Usambaras by HAAS (*G. satura* Haas, 1936). It would have been thought that the latter would have turned out to be identical with the Shume form but HAAS's description and figure leave no doubt that they are different. This form is also reduced to a subspecies of *G. usagarica*. It is interesting to note that VON MARTENS (1897) mentions a specimen in PAETEL's collection which he states was wrongly labelled 'Usambara'. In the light of further know-

ledge it is possible that the original label was correct. The details he gives of it seem to accord better with the typical form, however, but are insufficient to be sure. The three forms may be distinguished as follows.

1. Two columellar lamellae and one denticle above the top one and another below the bottom one ssp. *msambaa*
1. Two columellar lamellae only (2)
2. Shell very blunt at apex ssp. *usagarica*
2. Shell acuminate at the apex ssp. *satura*

2a. *Gulella usagarica* subsp. *usagarica* (Crosse)

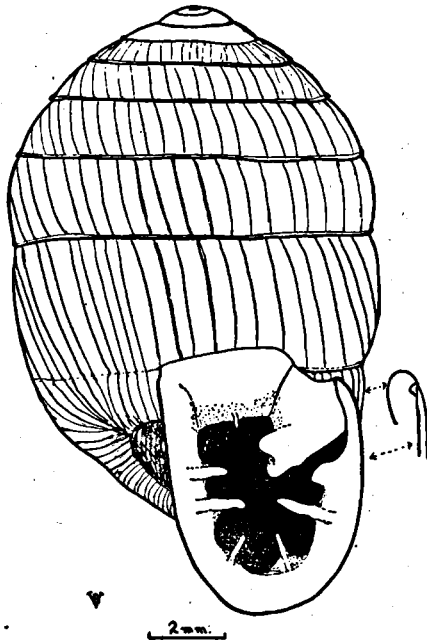


Fig. 4. *Gulella usagarica usagarica* (Crosse), Tanganyika, Uluguru Mountains, Bunduki. leg. I. Bond.

Bunduki, Morogoro District, Uluguru Mountains (BOND) (Fig. 4). Specimens have been deposited in the Coryndon Museum and in coll. VENMANS, nr. 6790 (4 specimens), and others will be distributed to other institutions. One of the authors (BV) has dissected several specimens and the genitalia and main muscular system are figured in Figs. 5 and 6. These figures are self-explanatory and little need be

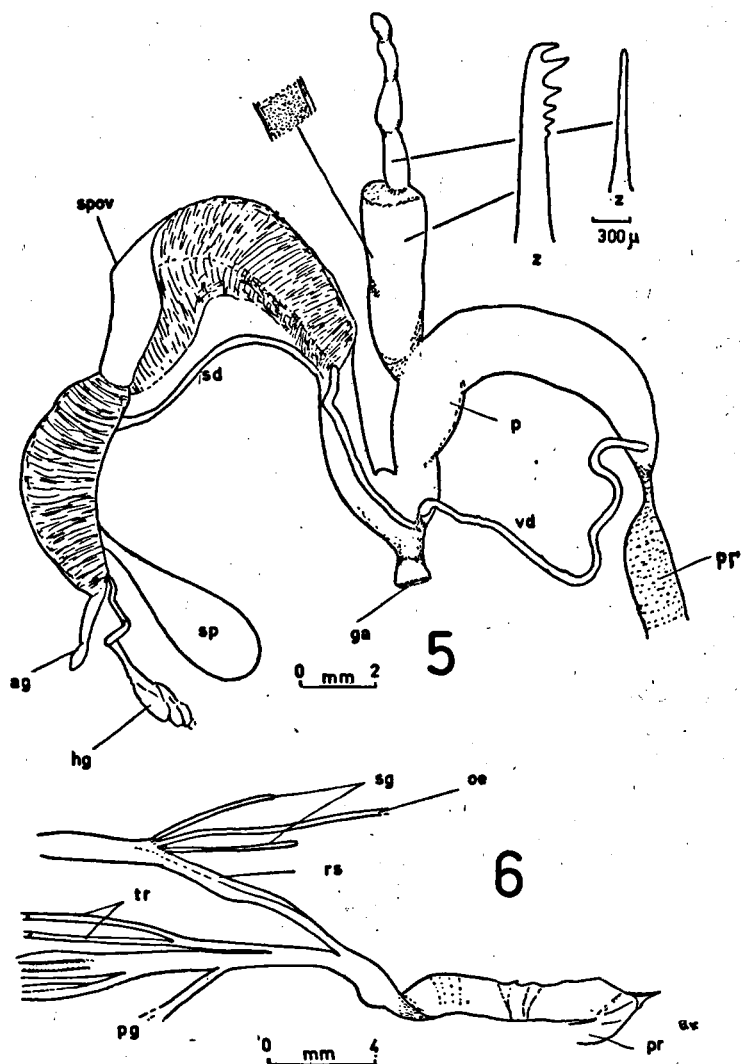


Fig. 5. Genitalia of *Gulella usagarica usagarica*

ag = albugen gland	p = penis
ga = genital aperture	pr = penial retractor
hg = hermaphrodite gland	sp = spermatheca
sp. ov. = spermoviduct	vd = vas deferens
s.d. = spermathecal duct	z = spinules

Fig. 6. Musculature of *Gulella usagarica usagarica*

oe = oesophagus	rs = odontophore
pg = pedal gland	sg = salivary glands
pr = penial retractor	tr = ocular tentacular retractors

said about them. THIELE (1911) has figured the genitalia of *G. grossa* and his figure shows a penis very different from that found in *G. usagarica*. The penis of *G. grossa* has a blunt-ended appendage a little below the retractor muscle, and at the base a narrow 'Muskelscheide'. The latter was not found in *G. usagarica* and the appendage is large and opens into the penis a quarter the way up from the base; it is terminated by a narrow organ equalling the appendage in length. The interior of the penis and the broad part of its appendix is covered by a dense mass of small brown spinules. Each is minutely serrate at the tip. The spinules extend into the narrow part of the appendix but cease to be serrate (fig. 5, z). *Varicostele bequaertiana* Pilsbry, 1919, has a somewhat similar penial appendix but the proximal broad part is very short indeed.

The radula is smaller than that of *G. grossa*, 5 mm. long and about 0.8 mm. broad. There are 50 — 66 rows and the formula is 32. c 32. Both THIELE (1911) and VERDCOURT (1953) agree that the formula for *G. grossa* is 36. c 36. The central tooth is widest anteriorly and the posterior end is pointed. The base is narrowed about the middle and is 45-54 μ long by 21-24 μ wide, the single cusp being 15 μ long and 6 μ wide. The first lateral is 72 μ long and 25 μ wide with a single cusp 15 μ long.

2b. *Gulella usagarica* ssp. *satura* (Haas)

G. satura Haas in Abhandl. der Senckenberg. Naturf. Ges., vol. 431, p. 16, pl. 1 fig. 2 a & b. (1936).

This is well figured by its author and other forms of it are figured by VERDCOURT (1953, fig. 1 c). It occurs on Bumbuli, W. Usambaras and near Amani at Ngambo and near Monga in the E. Usambaras. The latter specimens are deposited in the Coryndon Museum, Senckenberg Museum, Frankfurt a.M. and Museum of Comparative Zoölogy, Cambridge, U.S.A.

2c. *Gulella usagarica* ssp. *msambaa* Verdcourt, ssp. nov.

This differs from typical *usagarica* in having a small denticle above the top columellar lamella and another below the bottom one. The left hand basal denticle is extended and dilated. There is only one mid-parietal denticle and the angular lamella has a secondary lamella on the outer side. The labral slab is broad and never reduced to a mere denticle. The shell varies in shape from rather globose to oblong but is always very blunt. Height 14-17.5 mm., breadth 8-9 mm. The variety has already been figured (VERDCOURT, 1953, p. 40 fig. 2h.).

Holotype, Shume, W. Usambaras in Coryndon Museum; paratypes

in Musée du Congo Belge, Tervuren; Museum of Comparative Zoölogy, Cambridge, U.S.A.; Senckenberg Museum and coll. VENMANS, nr. 6158 (3 specimens from cedar plantation at Shume) and nr. 6381 (10 specimens from Mkusi, Lushoto, W. Usambaras).

This variety also occurs in dry forest at Mkusi near Lushoto, W. Usambaras. For an ecological study of these habitats see VERDCOURT (1953b).

3. *Gulella foliifera* (von Marts.)

Ennea foliifera von Marts., in Nachrichtsbl. D. Malak. Ges., vol. 27, p. 176 (1895) and in Beschalte Weichthiere, p. 24, pl. 2 fig. 20 (1897).

This species is known only from the East Usambaras but as with *G. grossa* there is a record from near Tanga, actually the type locality. The species was well figured by its author. The writer's (BV) speci-

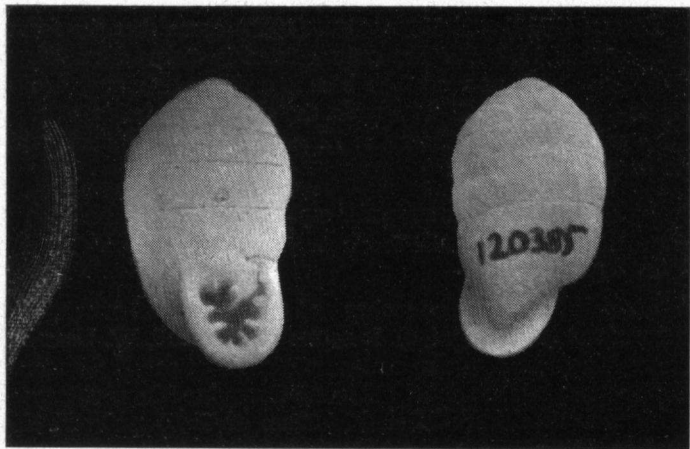


Fig. 7. *Gulella (Primigulella) ndamanyiluensis* nov. spec., holotype, Senckenberg Museum, no. 120385.

mens are in the Coryndon Museum; Senckenberg Museum; British Museum (Nat. Hist.); and in coll. VENMANS, nr. 6007 (1 specimen). The species is generally distributed but rather rare in the Amani district.

4. *Gulella ndamanyiluensis* Venmans sp. nov.

Gulella sp. Verdcourt in Basteria, vol. 17, p. 38 fig. 2f (1953).

Shell imperforate, ovate-cylindric, whitish, solid; summit rounded and obtuse; first two embryonic whorls smooth, rest of the shell with fine oblique, slightly outstanding riblets; suture not deep, very

narrowly bordered. Whorls $8\frac{3}{4}$, scarcely convex, regularly increasing, the last one somewhat ascending towards the end, strongly compressed dorsally and showing four spiral ribs; aperture subvertical, subquadrate but rounded basally, white within; peristome rather thick, well expanded, somewhat reflected, white. Angular lamella very strong, entering deeply, concave towards the outer lip and bearing a small denticle in the concavity and a fold parallel to the basal margin beneath it; on the other side of the angular lamella there is a somewhat larger denticle situated a little lower than its counterpart. Parietal lamella small, and somewhat immersed. There are three columellar lamellae, the middle one the strongest and entering most deeply, the upper one medium-sized and the lower one small, short and more remote from the edge. There are two medium-sized basal lamellae, the right hand one being a little longer. The palatal lip bears a rather strong somewhat entering lamella and above that two denticles of which the upper is the smaller. A rather thick and broad callus connects the upper end of the columella with the left side of the angular lamella.

Height of shell 11.5 mm.; major diameter 6.2 mm.; height of aperture 4.2 mm.; breadth of aperture 3.9 mm.

Type locality: Tanganyika, West Usambaras, Mt. Ndamanyilu, 5 miles west of Malindi, 5,800-7000 ft. alt. leg. B. VERDCOURT, 28.IX.1950.

Three specimens. Holotype in Senckenberg Museum, Frankfurt a. M., nr. 120385 (fig. 7); paratypes in Coll. VENMANS, nr. 6642 and in Museum of Comparative Zoölogy, Cambridge, U.S.A. The specimen in coll. VENMANS has a fourth small tooth at the upper end of the columella.

The new species is related to the Kenya *G. pilula* and var. *jombeneensis* as well as to *G. linguifera*. It closely resembles *G. usagarica* to which it is perhaps most closely related but differs very much in size. The aperture of the new species is figured in figs. 8 & 9.

5. *Gulella linguifera* (von Martens.)

Ennea linguifera von Martens in Nachrichtsbl. D. Malak. Ges., vol. 27, p. 176 (1895) and in Beschalte Weichthiere p. 24, pl. 2 fig. 19 (1897). *E. roccatii* Pollon. in Boll. Mus. Zool. Anat. Comp. Torino, vol. 21, no. 538, p. 3 (1906) and in Il Ruwenzori, Parte Scientif., vol. 1, p. 181, pl. 20 fig. 3 (1909); J. Thiele, Wiss. Ergebnisse D. Z. Afr. Exp. (1907-08), vol. 3, p. 179 (1911).

Gulella linguifera (Von Martens.); Pilsbry in Bull. Amer. Mus. Nat. Hist., vol. 40, p. 215, fig. 84 (1919).

This species was not well figured by VON MARTENS but a very adequate figure is given by PILSBRY. The material in the Coryndon

Museum from Bwamba Pass is part of the collection made by the late Prof. HALE CARPENTER. It includes one deformed umbilicate specimen. The arrangement of the columellar lamellae in a regular order of magnitude, with the largest nearest to the base, is characteristic. The late Dr. K. L. PFEIFFER identified a solitary shell collected near Monga in the E. Usambaras by B. VERDCOURT as this species. This specimen now in the Senckenberg Museum has been borrowed and is undoubtedly the East Usambara form of *G. usagarica* ssp. *satura*.

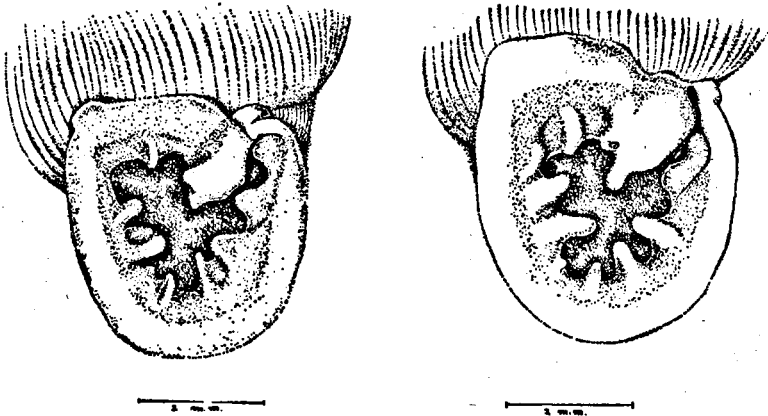


Fig. 8. *Gulella* (*Primigulella*) *ndamanyiluensis* nov. spec. Senckenberg Museum, Nr. 120385. Holotype.

Fig. 9. *Gulella* (*Primigulella*) *ndamanyiluensis* nov. spec. Coll. Venmans, Nr. 6642, Paratype.

6. *Gulella pilula* (Prest.)

Ennea pilula Preston in Ann. Mag. Nat. Hist., (8), vol. 7, p. 465, pl. 11 fig. 5 (1911).

There are two lots of this species in the Coryndon Museum. One lot agrees very well with the original description and they are probably paratypes. There is a small collection of original labels in the museum which indicates that quite a number of PRESTON's original specimens were once deposited there. The locality and collector agree in nearly every case. One author (BV) has found a few of these specimens stuck on tablets in show cases! These have been rescued but it is sad to relate that the vast majority appear to have been lost or broken. The other lot of twelve were collected by Mr. H. COPLEY at Thiba River Camp, Mt. Kenya, 6850'. They are bigger than the type and measure 11.5 — 13.5 mm. long; the variation in shape is con-

siderable. In the original description it mentions two denticles at the top of the columella but there is only one in these specimens. PRESTON's measurements of the aperture are, it seems, an error. He gives the width as 1.75 mm., whereas it is actually 5 mm. There is a paratype in the British Museum (Nat. Hist.).

6b. *Gulella pilula* (Prest.) var. *jombeneensis* (Prest.)

Ennea jombeneensis Preston in Proc. Zool. Soc. Lond., p. 213, pl. 33 fig. 8 & 8a (1913).

This form is known to us from the description and a paratype in the British Museum (Nat. Hist.). PRESTON mentioned that it differed from *G. pilula* in shape and texture. There is an extra basal denticle and a minute denticle just to the left of the parietal lamella. Bearing in mind the variation which occurs in this section these differences are only subspecific or less. The aperture measurements given by PRESTON are once again wrong. The Jombene Hills and Mweru are N.E. of Mt. Kenya. Also in the British Museum are some specimens bearing an MS name based on the locality Igembi Hills. These are not distinct from this form but one of the specimens has a small mid-parietal denticle. A good deal more material is required to study the variation in this species.

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