

Descriptions of four new higher taxa of “hunter snails” (Gastropoda: Stylommatophora: Streptaxidae) in the Afrotropics

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Abstract. Four new higher taxa are described in the family Streptaxidae: *Gerlachina* new genus, *Embertonina* new genus, Gulellinae new subfamily, and Primigulellinae new subfamily. These names were proposed, based on existing taxa, in an unpublished thesis in 2010. The thesis was disclaimed under the Code (ICZN 1999, Article 8.2), but the names have recently been used in other publications, which have in turn carried disclaimers. The present paper aims to resolve this by validly publishing the names and descriptions. The genera *Gerlachina* (2 species) and *Embertonina* (10 species) are endemic to the Seychelles and to Madagascar, respectively. The subfamilies Gulellinae and Primigulellinae are both Afrotropical in distribution and are considered species-rich.

Key words. Land snails, Africa, Madagascar, Seychelles, taxonomy, nomenclature

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INTRODUCTION

A large two-volume book on the Streptaxoidea, the “hunter snails”, has recently been published by Brown (2021, 2023). This is a worldwide, up-to-date, and attractively illustrated guide to the superfamily and treats well over 1,000 species—far more than any previous work. Despite many studies over the last 10 years, particularly concerning Asian genera (e.g. Siriboon *et al.* 2020), higher classification within the family Streptaxidae remains unsatisfactory. Many large genera are known or suspected to be polyphyletic, and revisionary work is needed to divide them.

The book by Brown (2021, 2023) includes several taxon names first proposed in an unpublished Ph.D. thesis on the systematics of streptaxids (Rowson 2010). This thesis included a disclaimer saying: “This thesis or copies of it are not to be considered published works for the purposes of the International Code on Zoological Nomenclature (ICZN 1999, Articles 8.2, 9.7). New taxon names and nomenclatural acts within it are disclaimed and are therefore not available in the sense of the Code (ICZN 1999, Article 8.3) until validly published elsewhere” (Rowson 2010: iv). Submitted as a hard copy in 2010, the Ph.D. thesis became widely accessible following its digitisation by Cardiff University in 2016. However, it is still considered unpublished

under the Code, as revised for the era of digital publication (ICZN 1999, Chapter 8, as amended).

In total, the thesis proposed (but disclaimed) names for four new genera and two subfamilies in Streptaxidae. These were based partly on anatomical work and a molecular phylogenetic analysis that was subsequently published (Rowson *et al.* 2010). Two of the genera have been published as *Tanzartemon* Tattersfield & Rowson, 2011 and *Dadagulella* Rowson & Tattersfield, 2013 (Tattersfield & Rowson 2011; Rowson & Tattersfield 2013). The present paper publishes the remaining four names to prevent uncertainty and the need for future disclaimers. It also makes them available for other classifications, for example, those by Bouchet *et al.* (2017: 361, 386) and MolluscaBase (MolluscaBase Eds 2024).

Although both volumes by Brown (2021, 2023) use these names, they each include a similar disclaimer: “New taxon names as set out by Rowson in his 2010 thesis and utilized in this book, are not to be considered published works for the purposes of the International Commission on Zoological Nomenclature (ICZN), and are used simply as logical guidelines without imputing nomenclatural status. This applies *mutatis mutandis* to the title of this book.” (Brown 2021, 2023: unnumbered copyright pages at front of volumes; see also comment by Brown 2021: 12).

If these disclaimers were not sufficient, the figures and text in Brown (2021, 2023) could constitute valid first descriptions of the new taxa (ICZN 1999, Article 13.1). However, these do not meet the other requirements for new names published after 1999; that is, they do not explicitly indicate that the names are intended to be new (ICZN 1999, Article 16.1) and do not fix the type species for genera, or the type genus for subfamilies (ICZN 1999, Articles 13.3 and 16.2). Both volumes of Brown use the term “type species”, but incorrectly, usually to mean either “type specimen” or “type locality”.

Publication of the following descriptions is therefore required to make the names valid and available. The subfamily placement of the two new genera follows MolluscaBase (MolluscaBase Eds 2024).

SYSTEMATICS

Superfamily Streptaxoidea J.E. Gray, 1860

Family Streptaxidae J.E. Gray, 1860

Subfamily Orthogibbinae Germain, 1921

Gerlachina new genus

Figure 1

ZooBank identifier. urn:lsid:zoobank.org:act:6C620FCE-711F-4CEB-B27C-F018B4A70E19

Previous citations. “*Gerlachina* gen. n.”: Rowson 2010: 180–181, etc. “*Gerlachina* sensu Rowson, 2010”: Brown 2021: 14; Brown 2023: 8, 228, 237–238. “*Gerlachinae*” (misspelling): Brown 2021: 12. All three works were disclaimed under the Code (ICZN 1999, Article 8.2).

Type species. *Pupa dussumieri* Dufo, 1840 (not “Férussac” as stated by Dufo (1840), who also misspelt the genus as “Puppa”).

Other included species. One, *Gibbus (Gibbulina) moreleti* H. Adams, 1868. The type species has been divided into four subspecies: *G. d. dussumieri*; *G. d. reservae* Gerlach & van Bruggen, 1999; *G. d. silhouettae* Gerlach & van Bruggen, 1999; and *G. d. praslina* Gerlach & van Bruggen, 1999.

Derivation of name. For Justin Gerlach, outstanding naturalist of Seychelles, in particular of the land-snail fauna. Suffix *-ina* from the superficially similar genus *Edentulina* L. Pfeiffer, 1856.

Gender. Feminine.

Geographic range. Granitic islands of the Seychelles (Mahé, Silhouette, and Praslin). *Gerlachina dussumieri* was recorded

from Madagascar by Fischer-Piette *et al.* (1994), but this was in error according to Emberton (1999).

Description. Shell: 11.0–20.0 mm high × 5.3–10.2 mm wide, pupimorph–bulimulimorph, brown. Embryonic whorls with spiral or radial sculpture. Later whorls with irregular growth ridges and weak ribs. Sutures rather shallow; umbilicus rimate. Peristome strongly reflected.

Body: colour of both species variable, changing with growth; rarely yellow in *G. dussumieri* (Gerlach & van Bruggen 1999; Gerlach 2006).

Salivary gland and radula: salivary glands united, soft, concave around buccal mass or oesophagus; both ducts leaving medially and evenly thick throughout their length. Radula (described by Gerlach & van Bruggen 1999) of a central tooth and up to 27 unicuspid aculeate teeth in each half row, decreasing in size laterally. The teeth of *G. moreleti* are broader and blunter, reflecting its herbivorous diet (Gerlach 2001). Remarkably, *G. dussumieri* has small palps, like true *Edentulina* (Gerlach 1999, 2001; Gerlach & van Bruggen 1999), which have not been recorded in *G. moreleti* (the material studied was retracted; see also Gerlach 2006: pl. 10).

Genital anatomy: both species are essentially similar. See Figure 1 for *G. moreleti*, and Martens & Wiegmann (1898), Schileyko (2000), and Gerlach & van Bruggen (1999) for dissections of *G. dussumieri*. Fertilisation pouch–spermathecal complex diverticulum strongly convoluted. Bursa copulatrix attending albumen gland, ovoid. Acini of prostate indistinct. Vagina short, muscular, expanded into “brood chamber” in *G. moreleti* (Gerlach & van Bruggen 1999); free oviduct long, muscular. Vas deferens little convoluted, passing through wall of apical part of penial sheath then free, undergoing hairpin bend to leave sheath and enter penis apically (at least in *G. moreleti*; not noted by earlier authors for *G. dussumieri* but probably same). Penial retractor muscle connected to columellar muscle, not diaphragm. Penis very elongate, tubular, often constricted at apical part of penial sheath. Penial sheath moderately thick, enclosing basal half of penis. Interior of penis with rhombic depressions or pads but without pilasters. Apical part of penis with long, usually multicuspid hooks in rhombic depressions, becoming unicuspid, smaller and less densely spaced towards atrium; divisible into three types (Gerlach & van Bruggen 1999). Gerlach & van Bruggen (1999) recorded a “long, simple” spermatophore from *G. moreleti*; this probably corresponds to the strands of sperm (?) found in several Streptaxidae (Rowson 2010). Eggs of *G. dussumieri* are lenticular and hard-shelled (Gerlach 2006) recalling those of *Gonidomus*

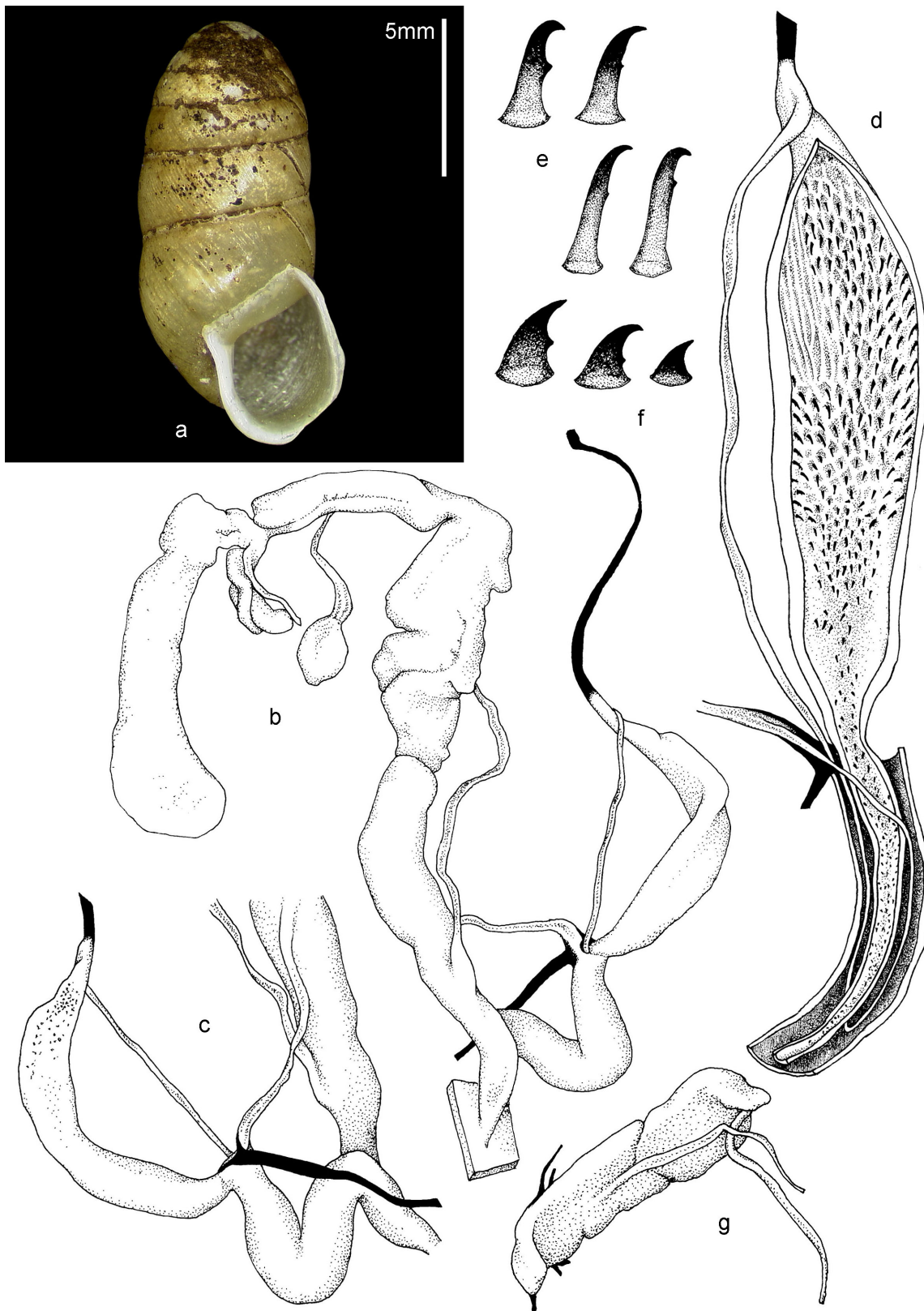


Figure 1. *Gerlachina moreleti* (H. Adams, 1868) (NMW.Z.2024.002.00012). Mon Plaisir, Silhouette Island, Seychelles. **a**, shell. **b–g**, anatomy (enlarged to various extents); **b**, genitalia; **c**, penis and vagina, ventral view; **d**, interior of penis; **e**, hooks from upper penis; **f**, hooks from lower penis; **g**, salivary gland. (BR dissection number 137).

Steenberg, 1936 and *Gonospira* Swainson, 1840. *Gerlachina moreleti* is ovoviviparous (Gerlach 2001).

Remarks. A phylogenetic analysis (published by Rowson *et al.* 2010) showed that *Gerlachina* comprises a pair of species genetically far closer to other endemic genera from the Seychelles than to *Edentulina*, to which they have been referred until now. This radiation of genera, which also occurs on the Mascarenes, corresponds to the subfamily Orthogibbinae.

Although *G. dussumieri* in particular resembles some small Madagascan and African *Edentulina* (see Bequaert & Clench 1936; Emberton 1999), it has a larger, differently shaped shell to that of any other Seychelles streptaxid.

Gerlachina moreleti has been recorded feeding on algae and detritus and has been called “the first herbivorous streptaxid” (Gerlach 2001, 2006). *Gerlachina dussumieri* is carnivorous, feeding on snails, slugs, and nemertine worms, but also on resin flowing from palm leaves (Gerlach 1999).

Subfamily Streptaxinae J.E. Gray, 1860

Embertonina new genus

Figures 2–4

ZooBank identifier. urn:lsid:zoobank.org:act:9333B3F1-1192-47B5-87DE-22FEF87FD15D

Previous citations. “*Embertonina* gen. n.”: Rowson 2010: 162–164, etc. “*Embertonina* Rowson, 2010”: Brown 2021: 12, 15, 31, 309; Brown 2023: 8. “*Embertoninae*” (misspelling): Brown 2021: 12. “*Embertonia* Rowson, 2010” (misspelling): Brown 2023: 306, 378–384. All three works were disclaimed under the Code (ICZN 1999, Article 8.2).

Type species. *Gulella sahia* Emberton, 2002.

Other included species. Nine, all originally described in *Gulella*: *G. minuscula* Emberton & Pearce, 2000 [*non Gulella minuscula* (Morelet, 1877) = *Dadagulella minuscula* (Morelet, 1877)]; *G. ambodipelomosiae* Emberton, 2002; *G. betampoa* Emberton, 2002; *G. kelimolotra* Emberton, 2002; *G. laninifia* Emberton, 2002; *G. matavymolotra* Emberton, 2002; *G. ruthae* Emberton, 2002; *G. taolantehezana* Emberton, 2002. *Gulella lincolni* Emberton & Griffiths, 2009, published after the thesis by Rowson (2010) was submitted, is now also added to this genus.

Derivation of name. In recognition of the extraordinary publications of Kenneth C. Emberton on the land-snails of Madagascar, including Streptaxidae. Suffix *-ina* from the superficially similar genus *Edentulina*.

Gender. Feminine.

Geographic range. North-east Madagascar, mainly in rain-forest, to approximately 1,000 m.

Description. Shell: 2.4–9.2 mm high × 1.1–4.0 mm wide, pupimorph, little tapering, and tightly coiled. Embryonic whorls smooth, with faint spiral or radial sculpture. Later whorls with moderate to strong radial ribs that extend from the suture over 5–100% of the whorl. Sutures rather deep; umbilicus perforate. Peristome slightly reflected; apertural teeth absent, save for a swelling on central columella of *E. matavymolotra*.

Body: preserved specimens are pale cream with pale tangerine-coloured tentacles and mantle edge.

Salivary gland and radula: salivary glands united, soft, not tumid, flattened, concave around buccal mass or oesophagus; both ducts leaving medially evenly thick throughout. Radula (Fig. 4) of a broad, flat central tooth and up to 20 unicuspid aculeate teeth in each half row. The inner 3 or 4 teeth have broad or slightly clavate tips, after which they decrease rapidly in size laterally.

Genital anatomy (based on two paratypes each of *G. sahia* and *G. taolantehezana*, both rather similar). Fertilisation pouch–spermathecal complex diverticulum convoluted, but not extremely so. Bursa copulatrix attending albumen gland, elongate or ovoid. Acini of prostate indistinct. One developing egg present in oviduct, covered in calcium carbonate granules. Vagina not attenuate, swollen basally. Vas deferens initially convoluted, passing under basal edge of penial sheath, where free and thinning rapidly; entering penis apically. Penial retractor muscle connected to columellar muscle, not diaphragm. Penis elongate, tubular, with slightly swollen and flattened apical part. Penial sheath moderately thick, enclosing at least basal part of penis, characteristically folded back on itself to some extent. Interior of penis with a few soft, longitudinal pilasters. Basal 60–75% of penis extremely densely covered in minute, simple hooks (at least 50 per mm²), although with one or two small regions in which hooks less dense and approximately 1.3–2 times as long. Apical part of penis devoid of hooks and with fine longitudinal pilasters obtaining from entry of vas deferens.

Remarks. The included species were all described in *Gulella* L. Pfeiffer, 1856 by Emberton (2002). However, they have a shell morphology and genital anatomy very unlike that of the type species of *Gulella* (see Rowson & Herbert 2016). A phylogenetic analysis (published by Rowson *et al.* 2010) shows that the type and only sequenced species of *Embertonina* is genetically far closer to the genera *Edentulina* and other members of Streptaxinae than to the type species of *Gulella*. In this analysis, *Edentulina* was resolved as paraphyletic. The type species of *Edentulina* is from Comoros (Köhler *et al.* 2023) but has not been sequenced. It is unclear whether the African and Madagascan members attributed

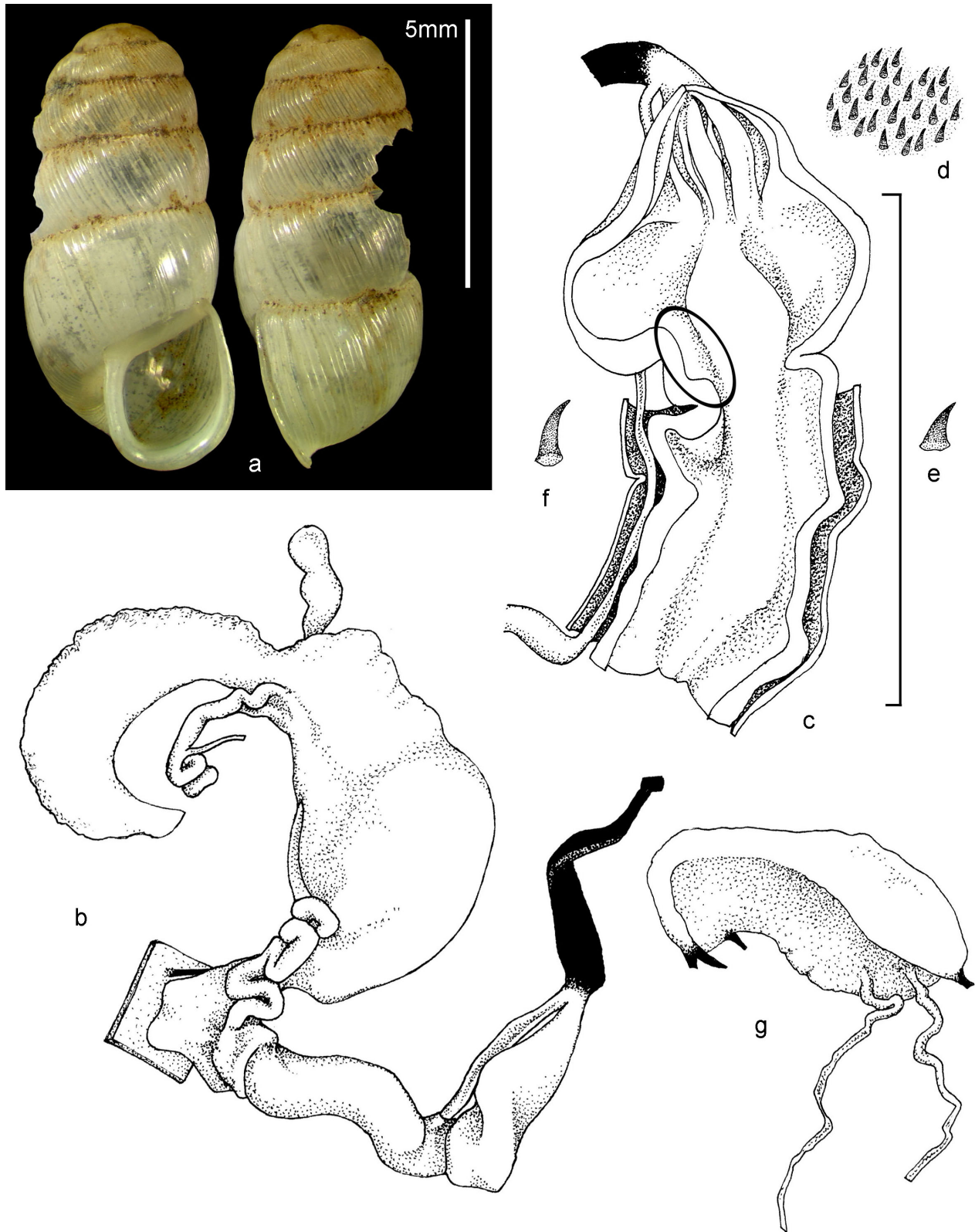


Figure 2. *Embertonina sahia* (Emberton, 2002) (UMFNH.273988, paratype). Station 256, S of Vohimar, northern Madagascar, 2 September 1995, leg. K.C. Emberton. **a**, shell (damaged by removal of body); **b–g**, anatomy (enlarged to various extents); **b**, genitalia; **c**, interior of penis; **d**, **e**, minute hooks as covering area indicated by bracket; **f**, larger hooks covering area indicated by oval; **g**, salivary gland. (BR dissection number 223).

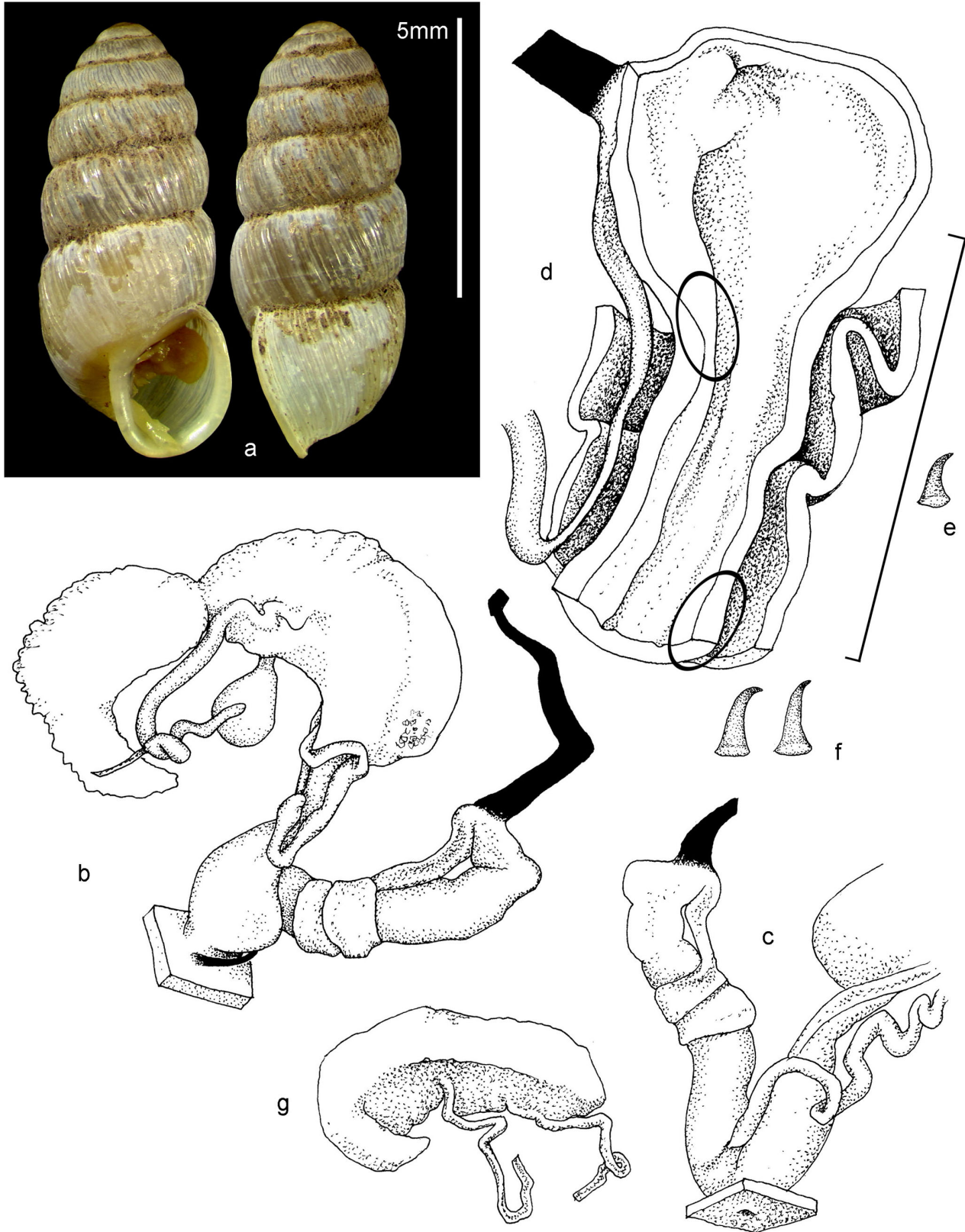


Figure 3. *Embertonina taolantehezana* (Emberton, 2002) (UMFNH.273993, paratype). Station 269, N of Sambava, northern Madagascar, 8 September 1995, K.C. Emberton). **a**, shell; **b–g**, anatomy (enlarged to various extents); **b**, genitalia; **c**, interior of penis; **d**, **e**, minute hook as covering area indicated by bracket; **f**, larger hooks covering area indicated by ovals; **g**, salivary gland. (BR dissection number 224).

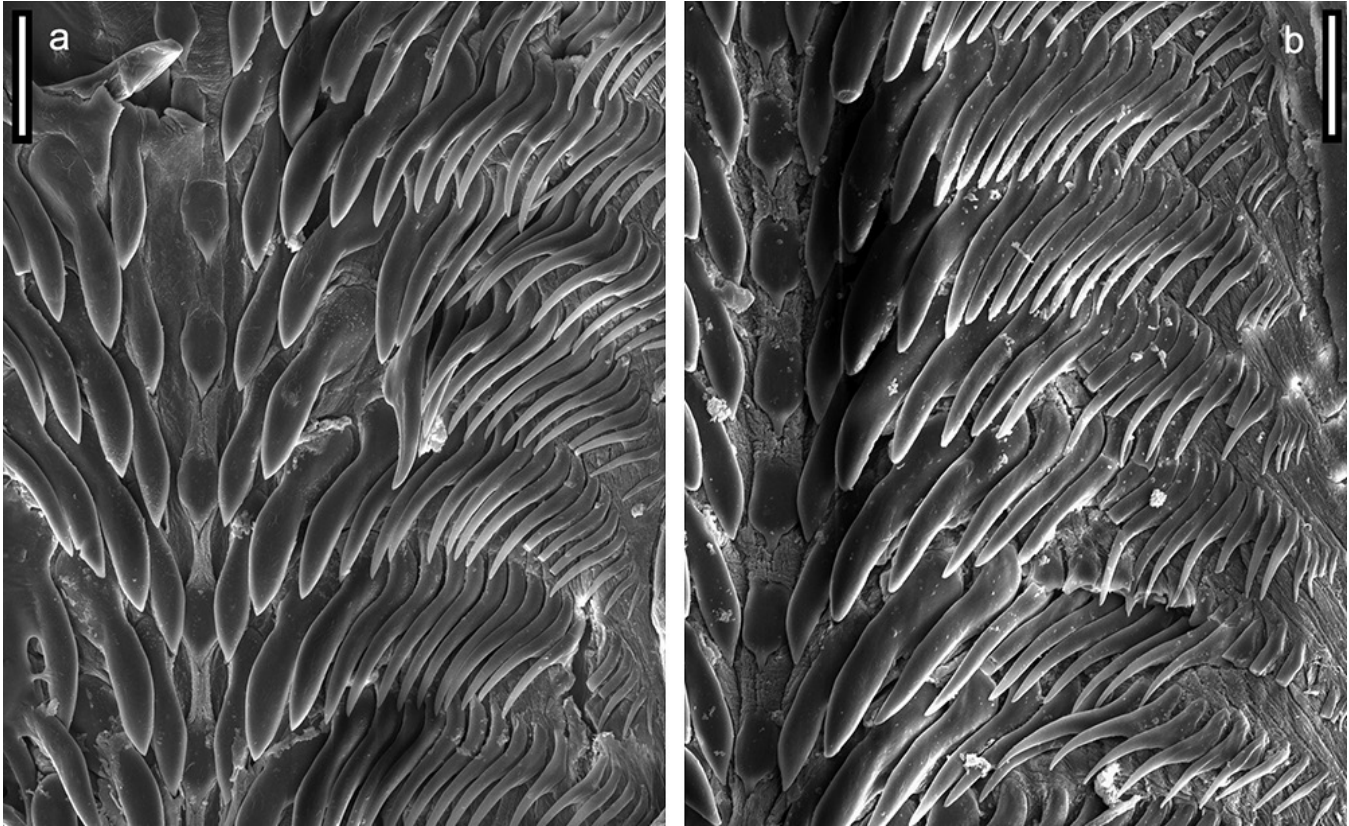


Figure 4. Central part of the radula of **a**, *Embertonina sahia* (Emberton, 2002); **b**, *E. taolantehezana* (Emberton, 2002); specimen details as in Figures 3 and 4. Scale bars: 50 μ m.

to this genus all belong to one group. Emberton (e.g. 1994, 1999, 2001, 2002) thoroughly reviewed all the Streptaxidae of Madagascar, describing three new genera and over 200 new species. He evidently did not consider the species of *Embertonina* to belong to *Edentulina*, a genus dealt with by Emberton (1999).

Indeed, the shells and anatomy distinguish *Embertonina* from all other Madagascan streptaxids. *Embertonina* differs from *Edentulina* by its much smaller size, generally more slender and less tapering shell, and generally greater coiling tightness (data from Emberton 1999, 2002). In the terminology of Emberton (2002), all *Embertonina* species have a recessed columellar baffle and a reflected sutural insertion of the apertural lip. The latter is lacked by all members of *Parvedentulina* Emberton & Pearce, 2000 (Emberton & Pearce 2000; Emberton 2002). *Embertonina* differs from the type species of *Makrokonche* Emberton, 1994 in being smaller and having fewer whorls, and from other *Makrokonche* in having a complete peristome (Emberton 1994). *Fischerpietteus* Emberton, 2003 has a very differently shaped, low-spined shell with no lip (Emberton 2003). The remaining Madagascan species that were classified by Emberton

(2001) in *Gulella* are all dentate and are thus easily distinguished from *Embertonina*. Emberton (2001) also noted that *G. sahia* was the only Madagascan *Gulella* with a shell more than 9.0 mm high. Anatomically, *Embertonina* differs from *Edentulina*, *Makrokonche*, and *Parvedentulina* in having the vas deferens passing directly the under the sheath base to the apex without forming a loop. It differs further from *Parvedentulina* in lacking the characteristic two large penial spines and having a longer bursa copulatrix duct (Emberton & Pearce 2000). The anatomy *Embertonina* is unlike that of *Gulella*, differing in the penial sheath, fertilization pouch-spermathecal complex, and salivary gland (Rowson & Herbert 2016). The radula of *Embertonina* (which was not included in the 2010 thesis) is of a common streptaxid form without obvious unique features.

Gulellinae new subfamily

ZooBank identifier. urn:lsid:zoobank.org:act:D17BA900-692A-4633-8698-89EF1F9039DF

Previous citations. “Gulellinae” Rowson 2010: 239–280. Brown 2021: 27–43; Brown 2023: 10–37. All three works were disclaimed under the Code (ICZN 1999, Article 8.2).

Type genus. *Gulella* L. Pfeiffer, 1856 (type species: *Pupa menkeana* L. Pfeiffer, 1853; South Africa).

Included genera. *Gulella* L. Pfeiffer, 1856 with many subgenera, as discussed by Rowson & Herbert (2016); *Austromarconia* van Bruggen & de Winter, 2003; *Dadagulella* Rowson & Tattersfield, 2013; *Pseudelma* Kobelt, 1904.

Geographic range. Most diverse in central, eastern and southern Africa, Comoros, and Madagascar; less diverse in West Africa, southern Arabia, and Asia. A few species introduced extraliminally.

Description. Streptaxidae with a small, pupiform, usually dentate shell, peristome usually incomplete parietally. Animal without tentacular palps, and a single salivary gland, with ducts equally thick throughout their length. Radula with a reduced central tooth, and usually with simple, blade-like laterals. Penis without a sheath or appendix, and with an apical (epiphallic) penial caecum. Vagina short, and hermaphroditic duct diverticulum large, unconvoluted.

Remarks. A neotype was designated for the type species of *Gulella* by Herbert & Rowson (2011). Its anatomy, and the makeup of the very large genus *Gulella sensu lato* was discussed by Rowson & Herbert (2016). Brown (2021, 2023) gave an overview of the diversity of shells in this subfamily. As acknowledged by recent authors (e.g. Brown 2021; Cole & Herbert 2022), the arrangement of genera within Gulellinae requires much more work.

Primigulellinae new subfamily

ZooBank identifier. urn:lsid:zoobank.org:act:3E223A5A-B5B9-4B85-B8A1-BC0F30F27A30

Previous citations. “Primigulellinae” Rowson 2010: 208–220. “Primigulellinae sensu Rowson 2010” Brown 2021: 552–589. Both works were disclaimed under the Code (ICZN 1999, Article 8.2).

Type genus. *Primigulella* Pilsbry, 1919 (type species: *Ennea (Gulella) linguifera* E. von Martens, 1895; Uganda).

Included genera. *Primigulella* Pilsbry, 1919; *Aenigmigulella* Pilsbry & Cockerell, 1933; *Juventigulella* Tattersfield, 1998; *Microstrophia* Möllendorff, 1887; *Mirellia* Thiele, 1933.

Known distribution. Central, eastern, and southern Africa, Comoros, and Mascarenes.

Description. Streptaxidae with a small, usually pupiform, usually strongly dentate shell; peristome complete and usually detached. Animal without tentacular palps, and a single salivary gland, with ducts often thickened centrally. Radula with a reduced central tooth, and short, simple, blade-like laterals. Penis with a reduced or absent sheath, often with

a robust appendix containing a spine. Vagina moderately short, and hermaphroditic duct diverticulum convoluted.

Remarks. This subfamily was proposed in the unpublished 2010 thesis by Rowson for *Primigulella*, *Aenigmigulella*, and *Juventigulella*, which had previously been included in *Gulella sensu lato*. These are clearly genetically distant from *Gulella* itself (Rowson *et al.* 2010). The study by Rowson *et al.* (2019) suggested that the genus *Mirellia* should be transferred to this subfamily. The 2010 thesis and Brown (2021) each suggest that certain African species currently included in other genera should be transferred to this subfamily.

The two new subfamilies in Streptaxidae add to the five others currently recognised by MolluscaBase (MolluscaBase Eds 2024), all which are represented in the Afrotropics: Streptaxinae J.E. Gray, 1860; Enneinae Bourguignat, 1883; Marconiinae Schileyko, 2000; Odontartemoninae Schileyko, 2000; and Orthogibbinae Germain, 1921. All await further revision, in particular that supported by more comprehensive molecular data on the relationships between genera.

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