

***Gulella johannae* spec. nov. (Gastropoda, Pulmonata, Streptaxidae),  
a new land snail from the Drakensberg range  
in Limpopo Province, South Africa,  
with notes on *G. johannesburgensis* (M. & P.)**

A.C. van Bruggen

Bruggen, A.C. van. *Gulella johannae* spec. nov. (Gastropoda, Pulmonata, Streptaxidae), a new land snail from the Drakensberg range in Limpopo Province, South Africa, with notes on *G. johannesburgensis* (M. & P.).

Zool. Med. Leiden 80-1 (3), 10.iii.2006: 63-72, figs 1-4.— ISSN 0024-0672.

A.C. van Bruggen, National Museum of Natural History, P.O. Box 9517, 2300 RA Leiden, The Netherlands (bruggen@naturalis.nnm.nl).

Key words: Mollusca; Gastropoda; Pulmonata; Streptaxidae; *Gulella*, *Gulella johannesburgensis*; taxonomy; Drakensberg range; South Africa.

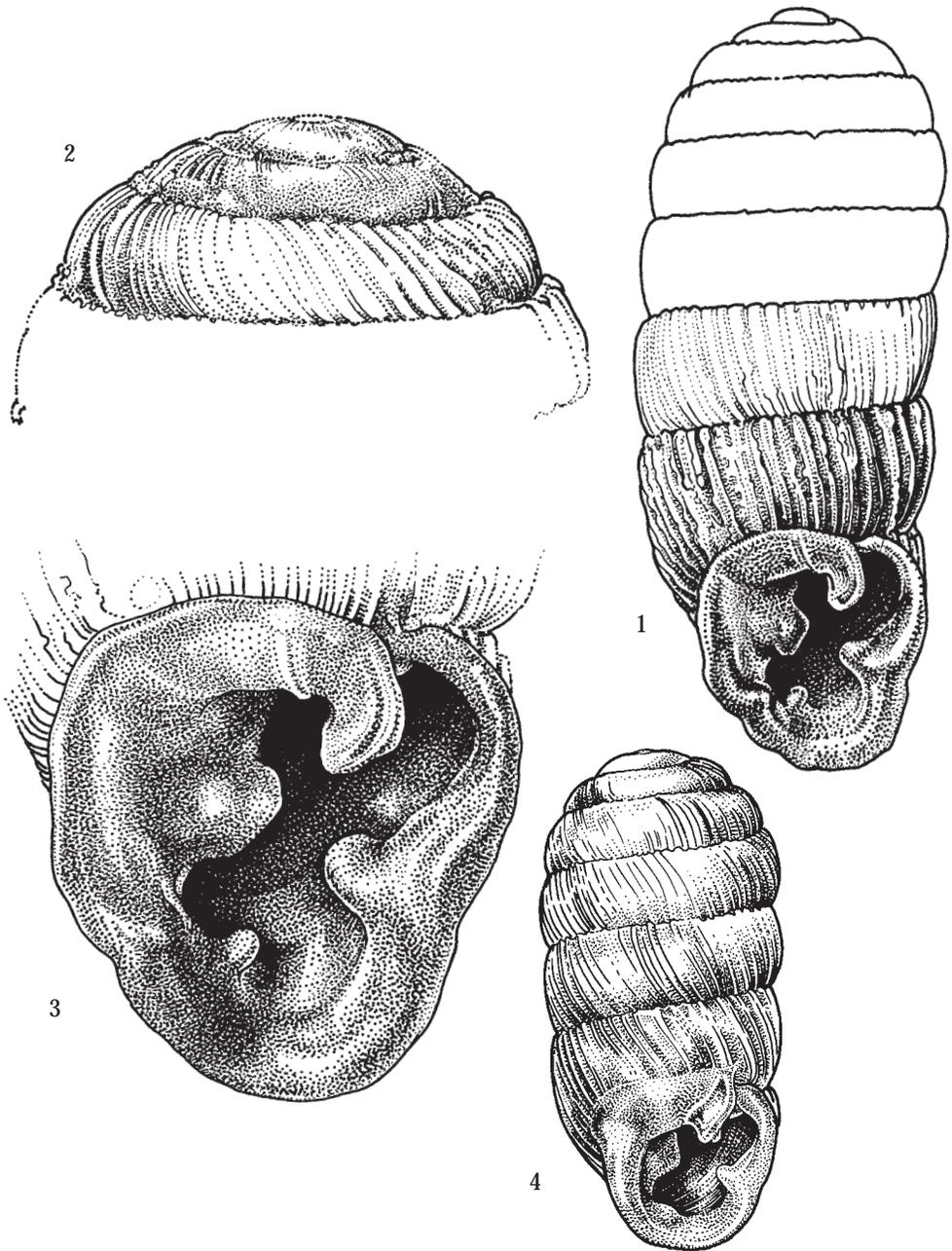
*Gulella* (s.l.) *johannae* n. sp. is described from a few forest localities in the Tzaneen District, Limpopo Province, South Africa. It is characterized by a cylindrical, costulate shell with an almost entire peristome and a four-fold apertural dentition consisting of a prominent angular lamella (delimiting an only here discontinuous peristome), a mid-labral denticle, a left basal denticle, and a mid-columellar process. The shell is somewhat similar to that of *G. johannesburgensis*, but is consistently larger and more slender and has more whorls, while at the same time the apertural dentition is better developed; the almost uninterrupted peristome also appears to be a significant character. This new taxon most likely is a restricted-range endemic on the eastern flanks of the northern Drakensberg escarpment. Numerical data of a lot of material identified and mostly also published as *G. johannesburgensis* show that probably not all specimens belong to this taxon so that more than one species may be involved here.

### Introduction

Obviously, there is no foreseeable end to restricted-range endemic species in sub-Saharan Africa of what is generally summarized as the streptaxid genus *Gulella* L. Pfeiffer, 1856 (sensu lato), a 'genus' that is almost certainly polyphyletic.

A survey by Miss Johanna L. Swaye (now Mrs Horn, University of KwaZulu-Natal, Pietermaritzburg, South Africa) of the invertebrate fauna of a number of forests in the northern Drakensberg range in Limpopo Province, South Africa, led to the discovery of a number of so far undescribed taxa in various groups (Swaye, 2004). Among the new species of terrestrial molluscs there is a fairly characteristic taxon of *Gulella* s.l. which was submitted for evaluation by Dr D.G. Herbert of the Natal Museum.

Abbreviations used are museum acronyms, BMNH for The Natural History Museum, London; NMSA for the Natal Museum, Pietermaritzburg, South Africa; RMNH for the National Museum of Natural History, Leiden; SAM for the South African Museum, Cape Town; l/d stands for the ratio length (height)/major diameter as an indication of the shape of the shell (this ratio is calculated from micrometer readings and may therefore differ from that calculated when these measurements are first converted into mm).



Figs 1-4. Shells of South African *Gulella*. 1-3. Holotype of *G. johannae* spec. nov., South Africa, Limpopo Province, Northern Drakensberg range, Tzaneen area, Forest Glens (Natal Museum, Pietermaritzburg, South Africa: NMSA W2648/T2017), actual size of shell  $6.4 \times 2.6$  mm; 1, front view; 2, apex with embryonic whorls; 3, aperture more highly enlarged. 4. *G. johannesburgensis* (M. & P.), "Johannesburg", RMNH (see text and table 2: loc. 1), actual size of shell  $4.3 \times 2.1$  mm. Inge van Noortwijk del.

## Description

### *Gulella johannae* spec. nov. (figs 1-3)

Material examined (all material collected in indigenous forest by Johanna L. Swaye).— **South Africa**, Limpopo Province, Northern Drakensberg range: New Agatha Forest, “23.98298°S : 30.07696°E”, 1580 m, L120 and 126, ii-iii.2001 (5 paratypes, NMSA W3/T2104; 2 paratypes RMNH 99961); Tzaneen area, Forest Glens, “23.96951°S : 29.91860°E”, leaf litter, 1620-1700 m, L99, ii-iii.2001 (type locality: holotype, Natal Museum, NMSA W2648/T2017, figs 1-3; 52 paratypes, NMSA V9985/T2018; 5 paratypes, RMNH 99588; 2 paratypes each to be deposited in the BMNH, the National Museum of Wales in Cardiff, the Institut Royal des Sciences Naturelles de Belgique in Brussels, and the Musée Royal de l’Afrique Centrale in Tervuren, Belgium); do., “23.96951°S : 29.91860°E”, L138 (3 paratypes, NMSA W61/T2105); do., “23.96951°S : 29.91860°E”, L149a (2 paratypes, NMSA W31/T2106); do., “23.96951°S : 29.91860°E”, i.2002, MM139 (1 paratype, NMSA W1938/T2107); Baccarat Forest, “23.91044°S : 30.01574°E”, 1300 m, L177 and 178, ii-iii.2001 (1 paratype, NMSA W30/T2108, accompanied by an immature shell excluded from the type series, NMSA W2893); Swartbos, “23.88189°S : 29.99411°E”, 1400 m, L134, ii-iii.2001 (1 paratype, NMSA W9/T2109); Grootbosch Forest, “23.76551°S : 30.00253°E”, 1500 m, L111, ii-iii.2001 (1 paratype, NMSA W26/T2110).

Diagnosis.— A species of *Gulella* s.l. characterized by a more or less cylindrical, costulate shell with smooth apex,  $7\frac{1}{2}$  -  $8\frac{3}{4}$  whorls, and four-fold apertural dentition consisting of a prominent angular lamella (delimiting an only here discontinuous peristome; the rim of the aperture is therefore almost entire), a mid-labral denticle (with a faint upper cusp), a left basal denticle, and a mid-columellar process.

Description.— Shell (fig. 1) medium-sized, cylindrical, greatest width about the middle, with somewhat flattened apex, costulate, (semi)transparent. Umbilicus subrimate to closed. Spire produced, sides almost parallel, tapering to a somewhat flattened, weakly subacute, apex. Whorls  $7\frac{1}{2}$  -  $8\frac{3}{4}$ , hardly convex, sculptured with well-marked, fairly close, somewhat oblique and fairly coarse costulae with smooth interstices; the body whorl in front view exhibits about 22 costulae. Sutures not very deeply impressed, crenellate. First two whorls of shell (apex, fig. 2) smooth, faintly pitted or granulate. Aperture (fig. 3) slightly more than one third of height of shell, more or less quadrate, little obstructed by dental processes, peristome well reflected, only discontinuous at the top of the aperture (so that the rim of the aperture is almost entire), white and glossy, dentition four-fold. On the right of paries a strong vertical angular lamella (forms sinus = gap in here discontinuous labrum); a mid-labral denticle with almost obsolete upper cusp, corresponding to external depression; a left basal denticle, corresponding to a very small external depression; a mid-columellar shelf-like horizontal process.

Measurements of shell (table 1): 5.7-7.7 × 2.5-2.9 mm, l/d 2.16-2.88, length of last whorl 2.6-3.2 mm, aperture 1.7-2.2 × 1.6-2.1 mm, number of whorls varies from  $7\frac{1}{2}$  to  $8\frac{3}{4}$ , costulae in front view on last whorl c. 20-c. 24 (n = 34). For dimensions of holotype shell see table 1. The New Agatha Forest sample is noticeable because this population obviously consists of slender giants: 6.2-7.7 × 2.6-2.8 mm, l/d 2.33-2.88, last whorl 2.9-3.2 mm, aperture 1.9-2.2 × 1.6-2.1 mm, whorls  $8\frac{1}{4}$  -  $8\frac{3}{4}$ , costulae c. 22-24 (n = 7).

Table 1. Measurements in mm of shells of the type series (n = 34) of *Gulella johannae* nov. spec.; the holotype is indicated by an asterisk.

Locality	Length × maj. diam.	l/d	Length last whorl	Aperture height × maj. diam.	Number of whorls	Number of costulae on last whorl in front view
W61	5.7 × 2.6	2.22	2.6	1.8 × 1.6	7½	c. 22
W1938	5.7 × 2.6	2.19	2.6	1.7 × 1.6	7½	c. 20
W61	5.8 × 2.7	2.16	2.9	1.9 × 1.8	7½	c. 23
type locality	5.9 × 2.5	2.35	2.7	1.8 × 1.7	7½	c. 23
Baccarat						
Forest	5.9 × 2.7	2.19	2.7	1.8 × 1.7	7½	c. 21
W31	5.9 × 2.7	2.19	2.7	1.8 × 1.7	7¾	c. 22
type locality	5.9 × 2.7	2.19	2.8	2.0 × 1.7	7¾	c. 24
type locality	6.0 × 2.5	2.40	2.6	1.9 × 1.7	8	c. 23
type locality	6.1 × 2.6	2.39	2.8	1.9 × 1.6	8	c. 22
type locality	6.1 × 2.6	2.33	2.8	1.9 × 1.8	<8	c. 22
Swartbos	6.1 × 2.6	2.33	2.7	1.8 × 1.7	7¾	c. 22
type locality	6.1 × 2.7	2.26	2.9	2.0 × 1.9	8	c. 23
type locality	6.1 × 2.7	2.28	2.6	1.7 × 1.7	7½	c. 23
type locality	6.2 × 2.5	2.50	2.7	1.8 × 1.7	8	c. 23
type locality	6.2 × 2.6	2.38	2.9	2.0 × 1.7	8	c. 22
W31	6.2 × 2.6	2.41	2.7	1.7 × 1.6	8	c. 22
New Agatha						
Forest	6.2 × 2.7 <sup>1</sup>	2.32	2.9	1.9 × 1.7	8¼	c. 24
type locality	6.3 × 2.6	2.49	2.8	2.0 × 1.7	7½	c. 24
type locality	6.3 × 2.7	2.35	3.0	2.1 × 1.9	7¾	c. 23
type locality	6.4 × 2.6	2.50	2.8	2.0 × 1.7	8	c. 23
type locality	6.4 × 2.6	2.51	2.7	2.0 × 1.9	8	c. 21
*type locality	6.4 × 2.6	2.45	2.9	1.9 × 1.9	8	c. 22
W61	6.4 × 2.6	2.45	2.7	1.7 × 1.7	8	c. 21
type locality	6.4 × 2.7	2.39	2.8	1.9 × 1.7	7¾	c. 24
type locality	6.5 × 2.6	2.50	2.7	2.0 × 1.7	8¼	c. 23
type locality	6.5 × 2.6	2.50	2.8	2.0 × 1.8	>8	c. 22
type locality	6.7 × 2.7	2.49	2.9	2.0 × 1.7	8¼	c. 22
New Agatha						
Forest	6.7 × 2.7	2.51	3.0	2.1 × 1.9	8¼	c. 24
New Agatha						
Forest	7.2 × 2.6	2.74	3.0	2.1 × 1.9	8¼	c. 24
New Agatha						
Forest	7.2 × 2.7 <sup>2</sup>	2.67	2.9	2.1 × 1.6	8¼	c. 23
Grootbosch						
Forest	7.2 × 2.9	2.47	3.0	2.1 × 1.9	8¼	[shell worn]
New Agatha						
Forest	7.4 × 2.8 <sup>1</sup>	2.62	3.0	2.2 × 2.0	8¼	c. 24
New Agatha						
Forest	7.6 × 2.7	2.77	3.2	2.2 × 1.9	8¼	c. 22
New Agatha						
Forest	7.7 × 2.7	2.88	3.1	2.2 × 2.1	8¼	c. 22

<sup>1</sup> Peristome almost completely closed.<sup>2</sup> Teeth not yet fully developed (subadult).

Notes.— The usually almost obsolete cusp on the labral process in the aperture may be considered a process in itself, so that the apertural dentition in that case should be interpreted as five-fold instead of four-fold. One should note that the peristome is almost entire (i.e. with only the interruption of the sinus) only in fully adult shells.

Anatomy.— Unknown.

Distribution.— So far only known from indigenous forest (1300-1700 m a.s.l.) in a very restricted area in the Northern Drakensberg range in the Tzaneen area (Limpopo Province, South Africa), roughly between 23°45'-24°00'S and 29°45'-30°10'E.

Etymology.— The species is named after Mrs Johanna L. Swaye for her consistent efforts to sample and interpret the invertebrate forest floor fauna of the Drakensberg range in the Limpopo Province of South Africa.

### Discussion: *Gulella johannae* and *G. johannesburgensis*

In the absence of anatomical and molecular data, perceived relationships are deduced from similarity in shell morphology.

In Connolly's "suggested arrangement" (Connolly, 1939: 19-23) the new taxon keys out to Group 3 (i), i.e. species with a costulate, more or less cylindrical, shell with three to five-fold dentition. In this assemblage *G. johannae* spec. nov. clearly belongs to the *G. johannesburgensis* group, which consists of *G. johannesburgensis* (Melvill & Ponsonby, 1907), *G. drakensbergensis* (Melvill & Ponsonby, 1893) and *G. miniata* (Krauss, 1848). The *G. johannesburgensis* group itself seems closely allied to the *G. infans* (Craven, 1880) group sensu lato, differing only by the presence of an additional basal denticle (which at times, however, may even be absent).

Among the species described since Connolly (1939) there are no taxa with costulate shells and a (simple) four-fold apertural dentition. The new species are enumerated by Van Bruggen (2004: 48, inclusive of his *G. herberti*), but an additional four new species have since been added by Burse & Herbert (2004: *G. hamerae*, *G. dejae*, *G. latimerae*, *G. newmani*).

The shell of *Gulella johannesburgensis* resembles that of the here described new species. *G. johannesburgensis* is restricted to South Africa and is a widely distributed (scattered records from Limpopo Province, Gauteng, Mpumalanga, Free State, KwaZulu-Natal), but still poorly understood, taxon about which so far little has been published (Connolly, 1939: 40; Herbert & Kilburn, 2004: 164). The shell is not very strongly costulate and the aperture is little obstructed by a four-fold dentition consisting of an angular lamella, a mid-labral tooth, a weak left basal process (which may be completely reduced), and a hardly prominent columellar lamella. Adequate figures are found in Melvill & Ponsonby (1907, pl. VI fig. 2), Aiken (1995a: 3, unnumbered fig.; 1995b: 5, unnumbered fig.), and Herbert & Kilburn (2004: 164, unnumbered fig. of shell without basal denticle). The specimen figured by Melvill & Ponsonby represents type material; the localities of the other three figures are unknown although the figure in Herbert & Kilburn most likely represents a KwaZulu-Natal shell. Fig. 4 depicts a 'topotype' from old material (RMNH, see below).

The following material (all from within the borders of South Africa) identified as *G. johannesburgensis* in the National Museum of Natural History (RMNH) was studied (n = 14): (1) – Gauteng, Johannesburg, ex H.B. Preston, 1911 (old catalogue no. 55a): 1 shell,

fig. 4; (2) – Free State, Bloemfontein, ex H.C. Fulton, Reg. No. 239 (old catalogue no. 55b): 2 shells without basal denticle (this may be original material collected by Major Connolly, vide Connolly, 1939: 30); (3) – Free State, Bloemfontein, leg. M. Connolly, ex H.C. Burnup colln., ex colln. W. Falcon, don. Mrs. H. Boswell via A.C. van Bruggen (abbreviated F→B→vB→RMNH): 1 shell with basal denticle very poorly developed (this most likely is original material collected by Major Connolly, vide Connolly, 1939: 30); (4) – KwaZulu-Natal, Zululand, Mfongosi, F→B→vB→RMNH: 1 shell; (5) – Mt. Mkolombe near Estcourt, 28°53'S 30°08'E, iii.1926, leg. H.P. Thomasset et al., F→B→vB→RMNH: 5 shells; (6) – Moorleigh School between Estcourt and Winterton, 4.ix.1976, leg. H.E. van Hoepen, don. A.C. van Bruggen: 2 shells; (7) – Rietvlei between Greytown and Mooi River, leg. G.E. Pennington, F→B→vB→RMNH: 2 shells. In addition the following shells (also all from within the borders of South Africa) were studied (n = 7): (8) – Mpumalanga, Standerton, leg. M. Connolly (according to Connolly, 1939: 30): 4 shells of which only one shows a mere trace of a basal denticle (SAM); (9) – Limpopo Province, Sibasa Dist., Pepiti Falls, leg. C. Harries: 3 shells (BMNH 1937.12.30.1000-1002).

This more or less covers the distribution of the species. On the whole these are plateau localities with limited rainfall, in South Africa roughly characterized as 'highveld'.

Table 2. Measurements in mm of shells identified as *Gulella johannesburgensis* (n = 21). Numbered localities (loc. 1, etc.) refer to the list in the text. In one badly worn shell the number of costulae in front view could not be counted. Specimens identified by an asterisk (\*) representing highveld material are thought to be the real *G. johannesburgensis*

Locality	Length × maj. diam.	l/d	Length last whorl	Aperture height × maj. diam.	Number of whorls	Number of costulae on last whorl in front view
loc. 9	3.7 × 1.9	2.00	1.9	1.2 × 1.3	6	c. 20
loc. 9	3.7 × 1.9	2.00	1.9	1.4 × 1.3	6¼	c. 20
loc. 9	4.2 × 2.0	2.09	2.2	1.4 × 1.4	6¼	c. 23
*loc. 1	4.3 × 2.1	2.09	1.9	1.4 × 1.5	6¼	c. 20
*loc. 2	4.4 × 2.0	2.22	2.0	1.4 × 1.4	6¾	c. 20
*loc. 3	4.5 × 2.0	2.25	2.1	1.6 × 1.5	6¾	c. 19
loc. 5	4.7 × 2.1	2.21	2.3	1.5 × 1.5	6¾	c. 22
*loc. 8	4.7 × 2.1	2.24	2.2	1.6 × 1.9	6½	-
*loc. 2	4.7 × 2.2	2.14	2.1	1.5 × 1.5	7	c. 19
loc. 5	4.9 × 2.2	2.17	2.3	1.7 × 1.5	6½	c. 22
loc. 5	4.9 × 2.2	2.17	2.4	1.7 × 1.6	6¾	c. 21
*loc. 8	4.9 × 2.2	2.18	2.4	1.7 × 1.8	>6	c. 23
*loc. 8	4.9 × 2.2	2.26	2.2	1.6 × 1.6	6½	c. 23
loc. 5	4.9 × 2.3	2.13	2.4	1.6 × 1.6	6¾	c. 21
*loc. 8	4.9 × 2.3	2.14	2.5	1.8 × 1.8	>6	c. 22
loc. 5	5.1 × 2.2	2.34	2.4	1.8 × 1.7	6¾	c. 23
loc. 4	5.2 × 2.2	2.40	2.5	1.9 × 1.7	7	c. 20
loc. 7	5.5 × 2.7	2.00	2.7	1.9 × 2.0	6½	c. 20
loc. 6	5.7 × 2.9	1.94	3.0	2.2 × 2.2	6½	c. 21
loc. 7	5.7 × 2.7	2.14	2.6	1.9 × 2.1	6¾	c. 21
loc. 6	5.9 × 3.0	1.98	3.1	2.2 × 2.2	6½	c. 23

Connolly (1939: 30), however, also mentions material from one of the escarpment forests, i.e. Pepiti Falls (loc. 9, see above), but states "the race at Pepiti Falls is almost void of striation except just below the sutures, the base of labral denticle is broader, columellar lamella less prominent, and basal process a mere tubercle, situate low down the columella." At the same time these three shells (BMNH 1937.12.30.1000-1002) are the smallest known among what has been identified as *G. johannesburgensis* (see table 2).

Shell measurements (table 2) may be summarized as follows: 3.7-5.9 × 1.9-3.0 mm, l/d 1.94-2.40, length of last whorl 1.9-3.1 mm, aperture 1.2-2.2 × 1.3-2.2 mm, number of whorls varies from 6 to 7, costulae in front view on last whorl c. 19-c. 23. It appears that there is a wide variation in size and shape, but the only preliminary conclusions that may be drawn are that material from the type locality and not too distant stations (Johannesburg, Standerton, Bloemfontein, n = 8) has smallish and comparatively squat shells, while KwaZulu-Natal specimens (n = 10) are normally somewhat to considerably larger. One should also note that the few shells of over 5.2 mm long (the last four of table 3, all from KwaZulu-Natal) are noticeably less slender than the smaller ones. The variation in shells leads to the suspicion that material named and mostly also published as *G. johannesburgensis* does not always represent this taxon; in fact, more than one spe-

Table 3. Comparison of shell measurements in mm of *Gulella johannesburgensis* (n = 21, abbreviated *jhb*) and *G. johannae* n. sp. (n = 34, *joh*). The highveld material sensu stricto (n = 8), here considered to represent the real *G. johannesburgensis* (see text) is also shown separately as *jhbH*

Taxon	Length × maj. diam.	l/d	Length last whorl	Aperture height × maj. diam.	Number of whorls	Number of costulae on last whorl in front view
<i>jhb</i>	3.7-5.9 × 1.9-3.0	1.94-2.40	1.9-3.1	1.2-2.2 × 1.3-2.2	6-7	c. 19-23
<i>jhbH</i>	4.3-4.9 × 2.0-2.3	2.09-2.26	1.9-2.5	1.4-1.8 × 1.4-1.9	>6-7	c. 19-23
<i>joh</i>	5.7-7.7 × 2.5-2.9	2.16-2.88	2.6-3.2	1.7-2.2 × 1.6-2.1	7½-8¾	c. 20-24

Table 4. Comparison of mean and average values of shell measurements in mm of *Gulella johannesburgensis* (n = 21, abbreviated *jhb*) and *G. johannae* n. sp. (n = 34, *joh*). The highveld material sensu stricto (n = 8), here considered to represent the real *G. johannesburgensis* (see text) is also shown separately as *jhbH*

Taxon	Length × maj. diam.	l/d	Length last whorl	Aperture height × maj. diam.	Number of whorls	Number of costulae on last whorl in front view
<i>jhb</i> mean	4.8 × 2.4	2.17	2.5	1.7 × 1.7	6½	c. 21
<i>jhb</i> average	4.8 × 2.3	2.15	2.3	1.7 × 1.7	6½	c. 21
<i>jhbH</i> mean	4.5 × 2.3	2.17	2.0	1.5 × 1.4	6½	c. 19
<i>jhbH</i> average	4.5 × 2.1	2.17	2.0	1.5 × 1.5	6¾	c. 19
<i>joh</i> mean	6.7 × 2.7	2.52	2.9	1.9 × 1.8	8+	c. 22
<i>joh</i> average	6.3 × 2.6	2.42	2.8	2.0 × 1.7	8	c. 22

cies may be involved here. However, the above quoted material from the highveld conforms to the type material<sup>1</sup> and therefore represents the real *G. johannesburgensis*. The differences with the shells of *G. johannae* spec. nov. are consistent – these are usually over 6 mm long, more slender and have far more whorls. For comparison of numerical data of the two taxa see tables 3 and 4.

Incidentally, Melvill & Ponsonby, the authors of *Ennea johannesburgensis*, in their original description (1907) state on p. 95: “More than a dozen examples of this species have been inspected, besides one or two that were received a few years since from Mr. Johnson, shortly after his first arrival in South Africa. One of these slightly exceeds 6 mm in length.” However, the largest shell I have examined does not reach 6 mm (table 2), on the contrary, the largest highveld specimen measures only 4.9 mm. The original authors probably did not take exact micrometer measurements.

In addition, the virtually complete peristome of fully adult shells of *G. johannae* spec. nov., resulting in an almost free aperture, always easily separates this taxon from *G. johannesburgensis*. In most species the peristome is (sometimes widely) interrupted in the parietal area and this probably is the plesiomorphic condition in the Streptaxidae. A free aperture would then represent the apomorphic character state. The new species therefore may be in the act of developing a free aperture.

#### Discussion: *Gulella johannae* spec. nov. on the eastern escarpment

Only a few taxa of *Gulella* s.l. have been recorded from the forests along the eastern escarpment in the South African provinces of Mpumalanga and Limpopo. These are the following: *Gulella sibasana* Connolly, 1922 (Connolly, 1939: 32 - Sibasa Dist.), *G. harriesi* Burnup, 1926 (Connolly, 1939: 93 - Sibasa Dist.; Aiken, 1995b: 20, Hennops River; NMSA/RMNH: Hanglip Forest, near Louis Trichardt, picnic spot area, in leaf litter, c. 1500 m, 8-9.ii.1965, leg. A.C. & W.H. van Bruggen), *G. inobstructa* Van Bruggen, 1965 (Magoebaskloof), *G. verdcourti* Van Bruggen, 1966 (Magoebaskloof), *G. incurvidens* Van Bruggen, 1972 (Mariepskop), *G. wendalinae* Van Bruggen, 1975 (Mariepskop; Aiken, 1981: 320, Abel Erasmus Pass; Aiken, 1995b: 7, “Abel Erasmus pass north of Origstad, Strydom Tunnels”). Depending on how one wants to define eastern escarpment forests, there are three more species that may qualify, i.e. *G. crassilabris* (Craven, 1890) (Connolly, 1939: 32 - Lydenburg, Potgietersrus = Mokopane, Pruizen, Belfast, Hartebeespoort; RMNH: Hell’s River, tributary of Oliphants River near Loskop dam, under dense

<sup>1</sup> It might be worthwhile to try to obtain live material of *G. johannesburgensis* at its type locality in order to properly establish the status of this taxon. The species was described in 1907 on material collected by Messrs J. McBean and Johnson from “Johannesburg”. In those days Johannesburg was not yet the sprawling metropolis of today and by reference to old maps it might be possible to guess where the original material was obtained. The city still has a number of green spaces, although it is not unlikely that the old type locality is now covered by e.g., an urban district consisting of high-rise buildings, etc. However, the gardens in many suburbs still harbour native plants, particularly trees, so that the species may have survived the influence of human impact here. Aiken (1995a: 3; 1995b: 5) already gives a precise locality in Greater Johannesburg: “Berrario” [recte: Berario] near Northcliff, Roodepoort. Also, the species is certain to have had a fairly wide local distribution so that a survey of patches of original highveld around the city should yield live material.

thorn trees, 15.xi.1975, leg. H.E. van Hoepen, see also Aiken, 1981: 320), *G. perspicua* (Melvill & Ponsonby, 1893) (Connolly, 1939: 33 - Middelburg, Barberton; Aiken, 1981: 320, Waterval Boven; Aiken, 1995a: 3-4, Lower Sabie, Wyliespoort, Strydom Tunnels), and *G. herberti* Van Bruggen, 2004 (Mbabane, Barberton).

There is more unidentified material from the Mpumalanga/Limpopo eastern escarpment forests in the Natal Museum. The Leiden Museum holds material from that area collected by the late Dr H.E. van Hoepen, certainly containing as yet undescribed taxa. However, the new species *G. johannae* is not represented.

*G. johannae* spec. nov. is possibly another restricted-range endemic (category no. 1 of Swaye, 2004: 99, "site endemics", i.e. those species that are restricted to only one forest locality, or "local endemics, including all species restricted to the forests of only one mountain chain"); such species are not uncommon along the Drakensberg escarpment in southern Africa. However, exact distributions are only available for the KwaZulu-Natal escarpment forests (fide Herbert & Kilburn, 2004).

### Additional notes

Two juvenile shells tentatively attributed to this new taxon and therefore excluded from the type series (NMSA V9989, Forest Glens, "23.97330°S : 29.91682°E", L154) both show traces of juvenile/immature apertural dentition through the transparent shell. One measures 2.2 mm, has 4+ whorls and does not show any apertural dentition. The other is also 2.2 mm high and has slightly less than 5 whorls, but displays a small but marked mid-basal process in the aperture. Two immature shells (c. 7 whorls) from the type locality (type lot, therefore almost certainly belonging to *G. johannae* spec. nov.), both c. 2.6 mm high, do not exhibit any apertural dentition. Juvenile dentition in *Gulella* may or may not be of taxonomic significance; indeed, many species do not display this phenomenon. Juvenile apertural dentition in this group is discussed by Van Bruggen (2000: 230-232, see also Herbert & Kilburn, 2004: 154).

One shell from New Agatha Forest (NMSA: 5.6 × 2.7 mm, l/d 2.09, length last whorl 2.7 mm, aperture 1.7 × 1.7 mm, 7+ whorls, costulae c. 21) is too small and too squat with too few whorls and was therefore excluded from all calculations. Obviously this is an abnormal specimen; it is not to be considered a paratype.

Note added in proof in January 2006: When looking through unidentified material of *Gulella* in the Leiden Museum in September of last year Dr D. Herbert discovered a sample that he referred to the above new species. In checking I agreed so that this new locality should be added to the somewhat limited range of *Gulella johannae* spec. nov.: "Magoebas Kloof W. of Tzaneen, leg./don. H.E. van Hoepen" (1 shell). The specimen was collected in the second half of the 70s of last century in forest not far from the road Tzaneen-Haenertsburg and is therefore probably the first of the new species to be deposited in a collection.

### Acknowledgements

Thanks are due to Dr D. Herbert (NMSA) for submitting the material for evaluation and for donating paratypes to the Leiden Museum, to Dr P.B. Mordan and Mr J. Ablett

(BMNH), and the authorities of the South African Museum (SAM) for lending vital material. Figures 1-4 are due to the professional skill of Mrs Inge van Noortwijk (RMNH).

### References

- Aiken, D.W., 1981. Differentiation of the radula of South African species of the genus *Gulella* into three types (Gastropoda Pulmonata: Streptaxidae).— J. Conch. London 30: 317-323.
- Aiken, D.W., 1995a. The genus *Gulella* in South Africa.— Strandloper 243: 1-10.
- Aiken, D.W., 1995b. The Streptaxidae of South Africa.— Spec. Publ. Conch. Soc. S. Afr. 6: 1-23.
- Bruggen, A.C. van, 2000. Studies on the Streptaxidae (Mollusca: Gastropoda Pulmonata) of Malaŵi 5. Description of *Gulella meredithae* spec. nov.— Zool. Med. Leiden 74: 225-235.
- Bruggen, A.C. van, 2004. *Gulella herberti* spec. nov. (Gastropoda, Pulmonata, Streptaxidae), a new species from Swaziland, southern Africa.— Basteria 68: 45-50.
- Burse, M.L., & D.G. Herbert, 2004. Four new narrow-range endemic species of *Gulella* from Eastern Cape, South Africa (Mollusca: Pulmonata: Streptaxidae).— Afr. Invertebr. 45: 249-262.
- Connolly, M., 1939. A monographic survey of South African non-marine Mollusca.— Ann. S. Afr. Mus. 33: i-iii, 1-660.
- Herbert, D., & D. Kilburn, 2004. Field guide to the land snails and slugs of eastern South Africa: 1-336. Natal Museum, Pietermaritzburg.
- Melville, J.C., & J.H. Ponsonby, 1907. Descriptions of fifteen terrestrial Mollusca from South Africa.— Ann. Mag. Nat. Hist. (7) 19: 94-101.
- Swaye, J.L., 2004. The invertebrates of indigenous forests in Limpopo Province, South Africa: diversity, biogeography and conservation: i-xix, 1-244. Unpublished M.Sc. thesis, University of KwaZulu-Natal, Pietermaritzburg.

Received: 4.v.2005

Accepted: 29.viii.2005

Edited: E. Gittenberger