MISCELLANEOUS NOTES ON SOUTHERN AFRICAN GASTROPODA EUTHYNEURA (MOLLUSCA)

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With 14 text-figures and one plate

SUMMARY

The following new distribution records of southern African terrestrial molluscs seem to be of particular interest: *Pupilla fontana* (Krss.), *Rachis jejuna* (M. & P.), *Guppya rumrutiensis* (Prest.), *Xerocerastus burchelli* (Gray) (all four new for Rhodesia), *Euonyma damarica* Jaeck. (new for Cape Province) and *Streptostele herma* Conn. (common at Lundi, Rhodesia). *Xerocerastus schultzei* (Bttg.) has to be expunged from the Rhodesian list; existing records are based on misidentifications. The following synonymies have been established: *Achatina subcylindrica* Preston, 1909, and *A. s. deisenbecki* Blume, 1952, nov. syn. of *Archachatina (Tholachatina) transvaalensis* (Smith, 1878); *Helix (Nata) liparoxantha* Melvill & Ponsonby, 1892, nov. syn. of *Nata vernicosa* (Krauss, 1848); *Streptostele (Raffraya) meridionalis* Van Bruggen, 1966, nov. syn. of *S. (R.) herma* Connolly, 1912. The genital anatomy of *Achatina connollyi* Prest. and *Archachatina ustulata* (Lam.) is here described and figured for the first time; also the radula and jaw of *Pupilla fontana* (Krss.). N. Transvaal populations of *Fauxulus ponsonbyanus* (Mor.) are characterized by the comparatively frequent absence of a short fold at the base of the columella. The clausiliid *Macroptychia africana* (M. & P.) is a montane palaeogenic element in the South African fauna as witnessed by its derivation from an ancient group mainly centred outside the Ethiopian Region and by its distribution along the Eastern Escarpment from the eastern Cape Province to the N. Transvaal.

Continued research on the terrestrial molluscs of Africa south of the Zambezi has now led to the accumulation of a vast amount of data. While many of the results have formed the basis for a number of papers [1]), it was found that a number of stray notes could not be incorporated in these and forthcoming publications. For various reasons it has become necessary that certain records become available in print so that all miscellaneous notes have now been collated and are presented below. They partly reflect results of excursions and expeditions conducted in the period from 1 January 1962 to 1 April 1966. Furthermore some older material from various sources, specimens in the Rijksmuseum van Natuurlijke Historie (Leiden), the

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1) The present paper does not contain data on molluscs of the Kruger National Park, northern Zululand and the Eastern Escarpment in Rhodesia and Mozambique, nor on species of the genus *Gulella,* which will be (or have been recently) treated elsewhere.

Zoölogisch Museum (Amsterdam) and specimens collected more recently by Drs. D. S. Brown and U. de V. Pienaar and Messrs. T. B. Oatley, D. C. H. Plowes, J. S. Taylor and K. L. Tinley, have been included.

System and nomenclature of Zilch's manual (Zilch, 1959-1960) have been followed throughout; only the latest literature references have been given, except in a few cases where further references were deemed necessary.

The following abbreviations have been used: NM for Natal Museum, Pietermaritzburg, South Africa; RMNH for Rijksmuseum van Natuurlijke Historie; SAM for South African Museum (Natural History), Cape Town, South Africa; TM for Transvaal Museum, Pretoria, South Africa; l/d for the ratio length/major diameter of shells.

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CHONDRINIDAE

The genus *Fauxulus* Schaufuss, 1889, is mainly restricted to the region south of the Limpopo River, where it occupies a fairly narrow discontinuous area east of the escarpment from the western Cape Province to the Tugela River, Natal. Two species also occur outside this area in a discontinuous pattern, viz., *F. capensis* (Küst.), which has been found outside the coastal area at Kuruman and Kimberley, and *F. ponsonbyanus* (Mor.), which occurs outside the coastal area in the Transvaal (see below). In the area occupied by the genus two centres of speciation may be discerned, one in the SW. Cape Province and another in Natal.

Recently *Fauxulus milloti* Fischer-Piette & Bedoucha, a remarkable new sinistral species of the subgenus *Anisoloma* Ancey, 1901, was described from N. Madagascar (Fischer-Piette & Bedoucha, 1965). The species shows considerable differences as compared to the eight South African represent-

atives of the subgenus and occupies quite an isolated position in this assembly of species.

It now becomes clear that *Anisoloma* is the most primitive and ancient of the subgenera of *Fauxulus*; it is the only subgenus which has a fairly large number of representatives ranging over an enormous area from the eastern Cape Province to the N. Transvaal and one in Madagascar. The lamellae emerging on to the edge of the lip represent a primitive character (cf. juvenile shells of certain species); in *Anisoloma* nearly all lamellae reach the edge of the lip, in *Tomigerella* Pfeiffer, 1879, only the angular lamella and upper palatal plica do so and in *Fauxulus* s.s. only the angular lamella is extended that far.

Fauxulus (Anisoloma) ponsonbyanus (Morelet, 1889) (figs. 1, 2)

Fauxulus ponsonbyanus; Connolly, 1939: 385, pl. 12 fig. 6; Zilch, 1959: 159, fig. 544.

According to Connolly (1939) the only Transvaal record of *Fauxulus ponsonbyanus* was that from the Pepiti Falls near Sibasa, Zoutpansberg District. Two more localities in this district may now be added, so that it is confidently expected that the species will be found to occur in suitable forest formations throughout the district. The new records are: Hanglip Forest, Louis Trichardt, 4500 ft., 8-9 February 1965, leg. A. C. and W. H. van Bruggen (NM, RMNH); Matiwa Kop near Entabeni, 4300 ft., in forest, 11 February 1965, leg. A. C. and W. H. van Bruggen (NM). At both localities the species appears to be common among leaf litter on the forest floor.

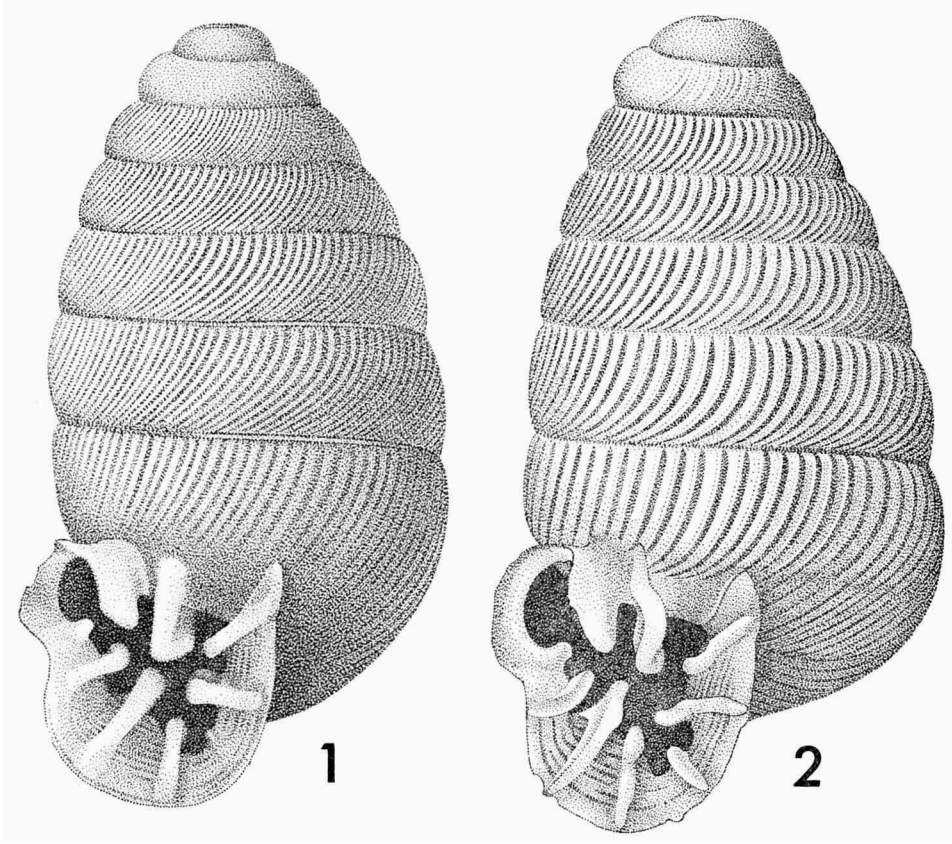
In certain respects Transvaal specimens differ from shells of Cape and Natal populations; in the former the short fold at the base of the columella is usually vestigial or altogether absent (figs. 1, 2). Although it is difficult to sharply delimit both forms, sorting resulted in 16 shells with vestigial or absent fold against five with a well developed fold in the one sample (Hanglip Forest) and in a six to one ratio in the other (Matiwa Kop sample). In the numerous examined specimens from Natal and the Cape Province (NM) this fold is always well-developed. This probably indicates that the isolated populations in the N. Transvaal represent a subspecies in statu nascendi and that possibly the above-described fold is in the act of disappearing in this area. All Transvaal populations are marginal populations at the northern limits of the distribution of the species. This may also account for the above abnormality because of reduced gene-flow.

PUPILLIDAE

Pupilla (Gibbulinopsis) fontana (Krauss, 1841) (figs. 3, 4)

Pupilla fontana; Van Bruggen, 1966a: 327.

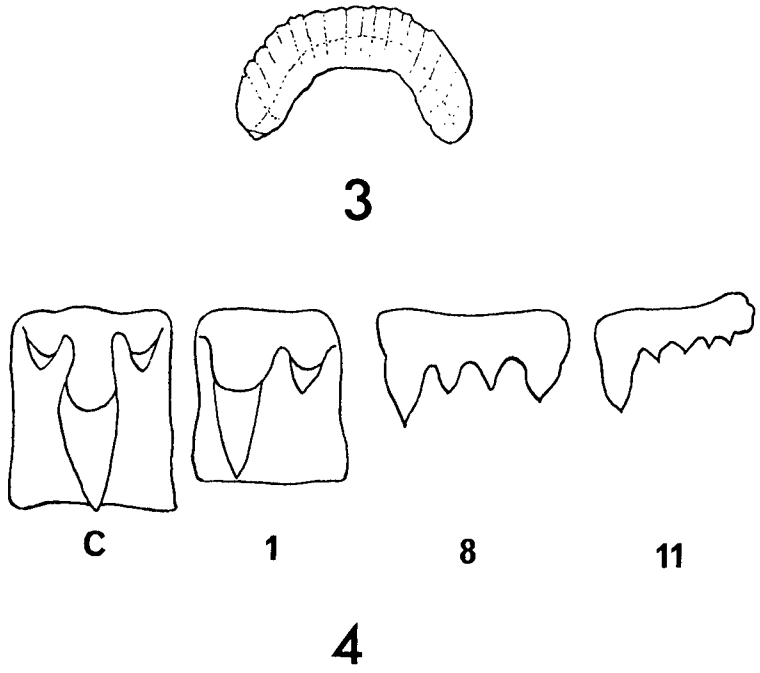
Pupilla fontana has now been collected in Rhodesia, where it was hitherto unknown (Connolly, 1939; Adam, 1954; Van Bruggen, 1966a). It was found to occur abundantly in the Zimbabwe National Park, Fort Victoria District, under stones inside the Temple Ruins, at 3700 ft., collected on 26 February



Figs. 1-2. *Fauxulus* (*Anisoloma*) *ponsonbyanus* (Morelet). 1, specimen from Hanglip Forest, Transvaal (RMNH) with vestigial fold at the base of the columella, actual length 3.6 mm; 2, specimen from Hilton Road, Natal, leg. W. Falcon (RMNH) with fully developed fold at the base of the columella, actual length 3.3 mm.

1963 by A. C. and W. H. van Bruggen (NM, RMNH, alcohol). A few specimens of *Trochonanina thermarum* (M. & P.) were obtained at the same time (see below sub Urocyclidae).

All stages of development are represented; adult shells are 2.5 to 3.0 mm long. The animal is dark grey. The radula and jaw have not been described before, so that two were extracted and studied; the slides are in the Leiden Museum. As far as is known few, if any, figures of radula and jaw of *Gibbulinopsis* have been published. Both jaw and radula are of the usual type found in the genus *Pupilla*. The former (fig. 3) is horseshoe-shaped, thin



Figs. 3-4. *Pupilla* (*Gibbulinopsis*) *fontana* (Krauss), Zimbabwe Ruins, Rhodesia (RMNH). 3, jaw; 4, radula elements. Figures highly enlarged.

and fragile and has a span of 0.25 mm. The latter measures approximately 0.75 × 0.25 mm and has about 80 transverse rows; the formula is 14-1-14. The rhachis or central tooth is tricuspid, the laterals are bicuspid and the marginals multicuspid, eventually losing their cusps almost altogether (fig. 4). Consequently the radula of *P. fontana*, a representative of the subgenus *Gibbulinopsis*, does not seem to differ greatly from that of *P.* (*P.*) *muscorum* (L.) (cf. e.g. Steenberg, 1925: 83-98 × (13-14)-1-(13-14), figs. 30, 31 and pl. 13 fig. 5).

ENIDAE

Rachis jejuna (Melvill & Ponsonby, 1893)

Rachis jejuna; Van Bruggen, 1966: 100; Van Bruggen, 1966a: 329, figs. 9, 10.

Five specimens from the Mateke Hills, Nuanetsi District (Rhodesia), about 80 miles NE. of Beit Bridge, 20-29 July 1962, leg. W. D. Haacke (TM, NM), effectively link the localities in the Kruger National Park (Van Bruggen, 1966a) with Gwelo, the first known locality for Rhodesia (Connolly, 1939: 436). The species now appears to occur more or less discontinuously from Tongaland (N. Zululand) to the centre of the Rhodesian plateau.

Conulinus carinifer (Melvill & Ponsonby, 1897)

Edouardia carinifera; Connolly, 1939: 425, pl. 13 fig. 27.

The following is a new distribution record for the species: Alexandria Forest, Alexandria District (eastern Cape Province), 22 November 1961, leg. A. C. van Bruggen (one shell, NM Moll. 4114).

Conulinus drakensbergensis (Smith, 1877)

Edouardia drakensbergensis; Connolly, 1939: 426.

Conulinus drakensbergensis was found to be common in the Mariepskop Forest Reserve, Pilgrims Rest District (E. Transvaal), NE. area (Nature Reserve), 4500 ft. (28-29 January 1966, leg. A. C. and W. H. van Bruggen) (NM). This fits perfectly into the pattern of distribution on the eastern slopes of the Drakensberg Range. The specimens are slightly narrower than those of Junod from the Shiluwane District (NM). Shells from the Hanglip Forest, Louis Trichardt, Zoutpansberg District (N. Transvaal), 4500 ft. (8-9 February 1965, leg. A. C. and W. H. van Bruggen) (NM) are even narrower and thus may not be referable to the present species. The mountains in the Zoutpansberg District are separated from the east facing slopes of the Drakensberg Escarpment by some ancient river valleys and a much drier area. This may account for the development of separate taxa in both areas.

Conulinus mcbeanianus (Burnup, 1905)

Conulinus mcbeanianus; Van Bruggen, 1966a: 330, figs. 13-15.

The known distribution of *Conulinus mcbeanianus* has now been extended to Rustenburg (W. Transvaal) where the species reaches its westernmost limit; two specimens were collected in the Rustenburg Kloof, 3700 ft., on 6 February 1965 by A. C. and W. H. van Bruggen (NM). The new locality has already been incorporated in the map in Van Bruggen (1966a: fig. 15).

From Rustenburg westward the rainfall decreases sharply and the habitat thus is no longer suitable for the present species which apparently requires a mean annual rainfall of over 20 inches.

Conulinus meridionalis (Pfeiffer, 1847)

Edouardia meridionalis; Connolly, 1939: 428, pl. 13 fig. 13.

Conulinus meridionalis appears to occur south of Port Elizabeth (Connolly, 1939) as well; three specimens were collected among bush and grass at Maitland River mouth (eastern Cape Province) on 2 April 1961 by A. C. van Bruggen (RMNH).

Rhachistia sticta (Von Martens, 1859)

Rhachistia sticta; Van Bruggen, 1966: 100; Van Bruggen, 1966a: 336.

Connolly (1939: 419) recorded *Rhachistia sticta* from only one locality in Rhodesia, viz., on the border of that country and Mozambique: "Three miles east of Umtali", which in fact is very probably inside Mozambique. However, the species has since been found to occur all over the Rhodesian Eastern Escarpment (unpublished data, Eastern Escarpment Expedition 1963, A. C. and W. H. van Bruggen). Up to the present records indicate that in southern Africa the species is only found in a narrow strip along the east coast from Zululand northwards; the localities in the Kruger National Park, eastern Transvaal, represent the westernmost limit of the species (Van Bruggen, 1966a). Early in 1965 we obtained some adult shells near Lundi, Nuanetsi District (Rhodesia), just north of the new bridge, at 1500 ft. (20 February 1965, leg. A. C. and W. H. van Bruggen) (NM); this expands the distribution of *Rhachistia sticta* considerably and unexpectedly westwards, bringing the westernmost record to about 275 miles from the coast. The Lundi area is zoogeographically of great interest; a number of animals and plants also occurring on the Eastern Escarpment have been found here and generally the area seems to have the character of an enclave in the subarid Rhodesian Lowveld. The Lundi River is a tributary of the Sabi River (called Save in Mozambique) "and carries along it vegetation which is more like that of the eastern Mashonaland" (Van Son, in litt.). The riverine forest belongs to the *Julbernardia-Brachystegia* woodland type of vegetation. Along the river the rainfall is much higher than north and south of the area; heavy mist on the hills around Lundi is also not uncommon. The climate is decidedly warmer than that of the adjoining districts, probably also because of the comparatively low elevation of around 2000 ft. Very probably the Lundi area has in the past been connected with the Eastern Escarpment, possibly in the Pleistocene or at least in one of

the periods of high rainfall when a continuous belt of forest covered most of central and eastern Rhodesia.

The Lundi shells measure 24.7 × 13.1 mm (lip slightly expanded, periphery rounded) and 19.7 × 10.5 mm (lip normal, periphery angulate) respectively; both have a damaged apex.

SUCCINEIDAE

Succinea africana Krauss, 1848

Succinea africana; Van Bruggen, 1966a: 338, figs. 20-24.

Succinea africana has so far been reported from the Kruger National Park (Van Bruggen, 1966a), near the Limpopo River (type locality) and the Victoria Falls (Connolly, 1939: 440). Although it is highly unsatisfactory to identify *Succinea* species on (empty) shells, the following specimens very probably belong to *S. africana*:

Acton Farm near Fort Victoria (Rhodesia), in long grass, 9 February 1959, leg. A. C. van Bruggen, one specimen in diapause (RMNH, alcohol), representing only the second record for Rhodesia;

Lourenço Marques (Mozambique), Polana Beach, washed down from the high shore (marine drive), 21-29 April 1959, leg. A. C. and W. H. van Bruggen, two shells (RMNH) — representing the first record for Mozambique. Both shells agree well with Connolly's figures (Connolly, 1939, pl. 15 figs. 1, 2) and Kruger National Park material; one shell is only half-grown, while the other measures 13.1 × 7.2 mm.

Succinea arboricola Connolly, 1912

Succinea arboricola; Van Bruggen, 1966: 109, 110; Van Bruggen, 1966a: 340, fig. 27.

A shell from Lundi, Nuanetsi District (Rhodesia), Rhino Hotel grounds, 1500 ft. (20 February 1965, leg. A. C. and W. H. van Bruggen) and two shells from Lundi, in forest 1½ miles north of the new bridge (20 February 1965, leg. A. C. and W. H. van Bruggen) (NM), have been identified with *Succinea arboricola*. These shells match the ones from the Kruger National Park (Van Bruggen, 1966a) perfectly and for the time being this interpretation of the species is accepted. *S. arboricola* has so far not been reported from Rhodesia, but the new localities seem to fit into a natural distribution pattern.

EUCONULIDAE

Guppya rumrutiensis (Preston, 1911)

Guppya rumrutiensis; Van Bruggen, 1966a: 344, fig. 28.

Guppya rumrutiensis was first introduced into the South African list in 1966 (Van Bruggen, 1966a) on the strength of a specimen from the Kruger

National Park. As already surmised the species seems to be widely distributed and has possibly been overlooked because of its minute size; additional material has been obtained in Tongaland (Van Bruggen, 1966a, footnote 3, data to be published elsewhere) and Rhodesia: three shells were found under a bush in leaf litter in the Passage Ruins, Khami Ruins near Bulawayo, at about 4000 ft., on 17 February 1965 by A. C. and W. H. van Bruggen (NM). These specimens were compared with the Kruger National Park and Tongaland material and found to agree well. *Guppya rumrutiensis* is new to the fauna of Rhodesia, while the above locality at the same time constitutes the westernmost locality for the species.

HELICARIONIDAE

Kaliella barrakporensis (Pfeiffer, 1852)

Kaliella barrakporensis; Connolly, 1939: 164; Fischer-Piette, Bedoucha & Salvat, 1966: 1, fig. 2.

Kaliella barrakporensis has in the Transvaal so far only been recorded from Pretoria (NM; Connolly, 1939); the species has now been found to occur in the N. Transvaal as well. Three shells were collected in the Hanglip Forest, Louis Trichardt, Zoutpansberg District, at 4500 ft. (8-9 February 1965, leg. A. C. and W. H. van Bruggen) (NM).

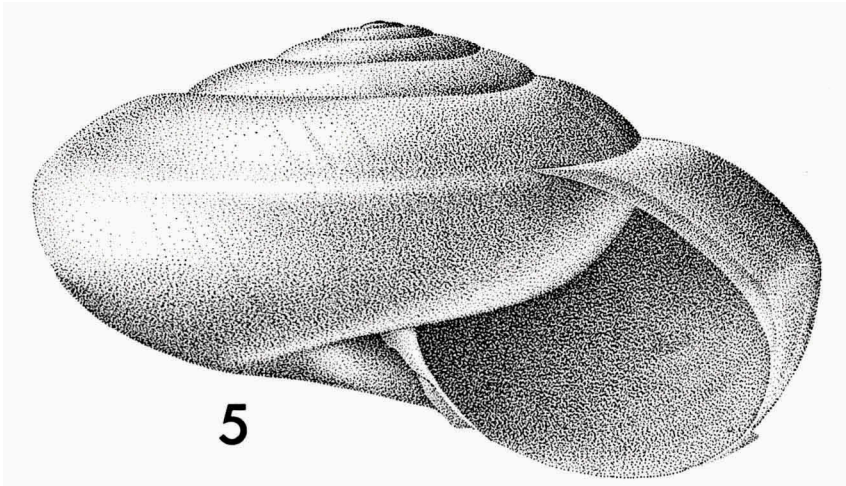
At one stage *K. barrakporensis* was considered an imported species not native to Africa. This is still the case in modern literature; Zilch (1959) does not even mention the occurrence of the genus in Africa. However, the present author has purposely not included the species in his study of the South African immigrant species (Van Bruggen, 1964a), because the distribution pattern in subtropical and tropical southern and eastern Africa, Madagascar and further east in the Indian Peninsula seems perfectly natural. In southern Africa the species occupies an almost continuous area along the east coast from the Natal south coast to Mozambique with a number of inland localities, such as Pretoria and the Hanglip Forest. Obviously it prefers a fair amount of rainfall combined with a sheltering type of vegetation. Many terrestrial species such as certain snails of tropical derivation in the Kruger National Park, appear to have an identical distribution in southern Africa.

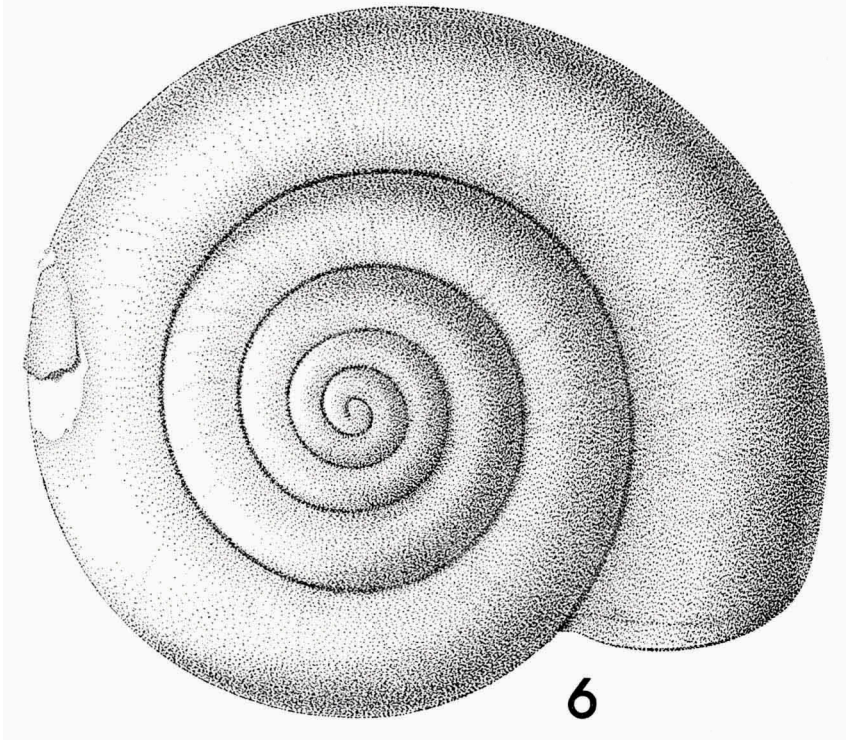
UROCYCLIDAE

Trochonanina (Zingis) thermarum (Melvill & Ponsonby, 1909) (figs. 5-8)

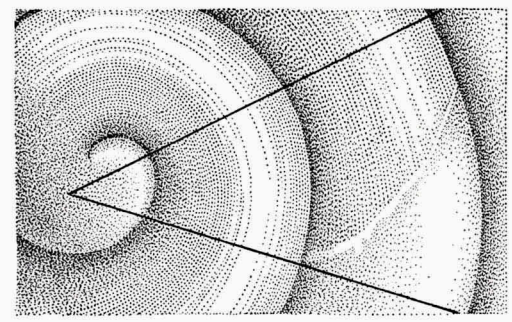
Trochonanina thermarum; Van Bruggen, 1966a: 349.

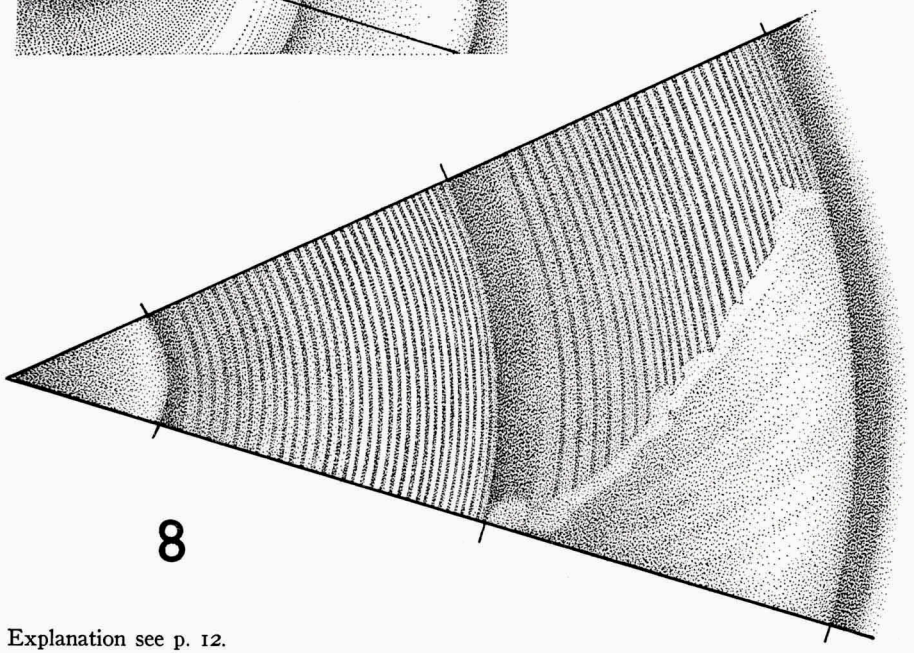
Three specimens of *Trochonanina thermarum* were obtained in the Zimbabwe Ruins, a new locality for the species: Zimbabwe National Park,





Figs. 5-8. *Trochonanina* (*Zingis*) *thermarum* (Melvill & Ponsonby), Zimbabwe Ruins, Rhodesia (NM). 5, 6, different views of shell; 7, 8 (on next page), details of apex. Actual size 12.0 × 21.2 mm.





Explanation see p. 12.

Fort Victoria District (Rhodesia), under stones inside the Temple Ruins, at 3700 ft. (26 February 1963, leg. A. C. and W. H. van Bruggen) (NM). The material consists of a juvenile (in alcohol), a subadult and an adult shell. The latter is 12.0 mm high with a major diameter of 21.2 mm and has 5¼ whorls; the shell is pale brown, transparent and only very bluntly angulate at the periphery (figs. 5-8). According to available data it is the largest shell on record.

Gudeella pinguis (Krauss, 1848)

Gudeëlla pinguis; Van Bruggen, 1966a: 350.

Gudeella pinguis appears to occur over much of Rhodesia, although Connolly (1939: 151) only records the Victoria Falls and Van Bruggen (1966a) adds the Matopos as a second locality. The following may be placed on

record: Lundi, Nuanetsi District, Rhino Hotel grounds, 1500 ft., 20 February 1965, leg. A. C. and W. H. van Bruggen (1, NM); Lundi, in forest 1½ miles north of the new bridge, 19-20 February 1965, leg. A. C. and W. H. van Bruggen (very common, NM, RMNH); Matopos National Park, SE. of Bulawayo, 2 miles east of Maleme Rest Camp, about 4000 ft., 15 February 1965, leg A. C. and W. H. van Bruggen (fairly common, NM); Passaford, Concession District, NNW. of Salisbury, under rocks in savanna, 3 May 1964, leg. T. B. & D. M. Oatley (1, NM).

SUBULINIDAE

Opeas lineare (Krauss, 1848)

Opeas lineare; Van Bruggen, 1966: 101, 109, 110; Van Bruggen, 1966a: 363.

Two new localities greatly contribute to our knowledge of the pattern of distribution of *Opeas lineare* in the Transvaal and Rhodesia: Sibasa, Zoutpansberg District (N. Transvaal), 20 March 1939, leg. R. H. Ivy (3, TM); Mateke Hills (Rhodesia), about 80 miles NE. of Beit Bridge, 20-29 July 1962, leg. W. D. Haacke (2, TM).

Xerocerastus burchelli (Gray, 1834)

Xerocerastus burchelli; Van Bruggen, 1966: 109, 110; Van Bruggen, 1966a: 367.

In the course of the last few years much additional material of the problematic and interesting subulinid *Xerocerastus burchelli* could be studied and the following notes on various populations may be presented.

Two shells from the Etosha Game Park (South West Africa), Ekuma River mouth, found among grass tufts on "grey-brown sandy-loam soil supporting Mopane shrub and tree savanna with *Terminalia prunioides* common", were collected on 27 December 1965 by K. L. Tinley (coll. K. L. Tinley, NM Moll. 4235). This constitutes a new record for South West Africa. Both shells are adult and measure 13.6 × 6.0 mm, l/d 2.27 and 14.3 × 5.7 mm, l/d 2.50; the larger specimen appears to be very slender indeed, such specimens having been found to occur occasionally in populations in the Kruger National Park (Shaluka, Van Bruggen, 1966a) and Bechuanaland (Tsane Pan, Van Bruggen, 1963: 264).

Two more populations in Rhodesia have now been sampled. Material was collected at Beit Bridge, under *Acacia nigrescens,* on 20 January 1964, by D. C. H. Plowes (NM, Umtali Museum); these specimens measure

16.2 × 7.8 mm, l/d 2.08	14.5 × 7.9 mm, l/d 1.84
15.5 × 7.7 mm, l/d 2.01	14.5 × 7.4 mm, l/d 1.96
14.9 × 7.5 mm, l/d 1.99	14.3 × 7.1 mm, l/d 2.01
14.8 × 7.3 mm, l/d 2.03	14.2 × 6.8 mm, l/d 2.09
14.7 × 7.3 mm, l/d 2.01	14.1 × 7.2 mm, l/d 1.96

The measurements may be summarized as follows: 14.1-16.2 × 6.8-7.9 mm, l/d 1.84-2.09, average of 10 l/d 1.99. This population is thus characterized by comparatively large and broad shells; the specimens have about the same length as those of certain Kruger National Park populations (Shaluka, block N 13), but are far less slender.

Ten miles west of Beit Bridge *X. burchelli* was collected under a baobab tree (*Adansonia digitata*) along the main road to Bulawayo on 13 February 1965 by A. C. and W. H. van Bruggen (NM Moll. 4234, RMNH); these shells measure

15.3 × 7.4 mm, l/d 2.07	14.8 × 6.7 mm, l/d 2.21
15.3 × 7.2 mm, l/d 2.12	14.6 × 6.8 mm, l/d 2.15
15.3 × 7.0 mm, l/d 2.18	14.5 × 7.2 mm, l/d 2.01
15.2 × 7.4 mm, l/d 2.05	14.5 × 7.1 mm, l/d 2.04
15.2 × 7.0 mm, l/d 2.17	14.5 × 7.0 mm, l/d 2.07
15.0 × 7.0 mm, l/d 2.14	14.3 × 7.0 mm, l/d 2.04
14.9 × 7.0 mm, l/d 2.13	14.0 × 6.9 mm, l/d 2.03

The above measurements may be summarized as follows: 14.0-15.3 × 6.7-7.4 mm, l/d 2.01-2.21, average of 14 l/d 2.10. The present population differs from the one sampled by Plowes in having shells of more or less the same size range, but with a much more slender contour.

The material from Tuli, 1937, leg. E. S. Perks (NM), originally identified as *X. schultzei* (Bttg.) (Van Bruggen, 1964), has on re-appraisal been found to belong to *X. burchelli*. The two shells are not quite adult and measure 13.1 × 6.4 mm, l/d 2.05 and 12.8 × 6.2 mm, l/d 2.06. Neither does *X. schultzei* occur at Beit Bridge. The latter species thus has to be expunged from the Rhodesian list, while *X. burchelli* will have to be included as a new species for that country. This does not affect the main results of research published some years ago (Van Bruggen, 1964).

Euonyma damarica Jaeckel, 1962

Euonyma damarica Jaeckel, 1962: 213, fig.

Euonyma damarica was described from flood debris of the Omaruru River near Okambahe, Damaraland (South West Africa). New material indicates that it occurs over much of South West Africa and adjacent areas in the south. Apart from a broken, but otherwise typical, specimen from Aiais, Great Namaqualand (South West Africa, SAM A30010), two subadult shells from Numies, Richtersveld, Little Namaqualand (Cape Province), May 1922, leg. G. E. Smith, don. W. Austen (NM Moll. 4225) were found in the Natal Museum. The largest of the latter measures 14.2 mm and has 10½ whorls (holotype: 12); it is a rather weathered shell, already marked

"N/S" by H. C. Burnup, late curator of molluscs at the Natal Museum. The spiral sculpture on the last few whorls is hardly noticeable, even under high magnification. Jaeckel (1962) supposed the species to be subterranean because of its occurrence in flood debris. Very few land molluscs in southern Africa lead a subterranean life (e.g., representatives of the family Ferussaciidae) and flood debris usually does not contain these species; the ephemeral character of many of the rivers in the arid wastes of South West Africa indeed increases the expectation of purely terrestrial molluscs being found in flood debris. Only twice subulinids have been found in caves in South Africa, viz., *Subulina octona* (Brug.) in the Cango Caves (only a single specimen of an immigrant species which normally does not occur underground, cf. Germain, 1920) and *Euonyma varia* Conn. (see below).

Euonyma varia Connolly, 1910

Euonyma varia; Van Bruggen, 1966a: 369.

Mr. Haacke submitted for examination a sample of subulinids collected in the Upper Grobler's Cave near Sterkfontein (Transvaal), about 300 ft. inside the cave and about 100 ft. deep, 23 May 1965, leg. R. B. Copley (TM, alcohol). The species, which appeared to be common locally, was identified as *Euonyma varia*; it does not normally occur underground as witnessed by material collected elsewhere by the present author and others. The species is common in the Sterkfontein cave; the body is yellow and the shells are up to 18 mm long.

ACHATINIDAE

Achatina schinziana Mousson, 1887

Achatina schinziana; Van Bruggen, 1966: 108, 110.

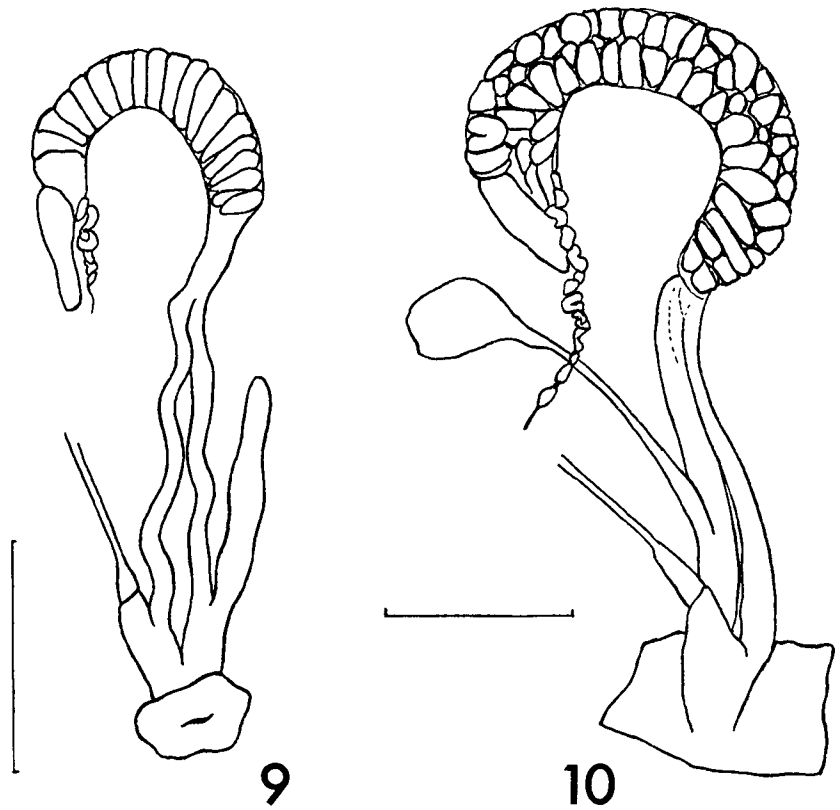
Mr. K. L. Tinley collected a shell of *Achatina schinziana* at the Ekuma River mouth, Etosha Game Park (South West Africa), 25 October 1965 (collection K. L. Tinley). It is encased in a matrix of green limestone, which may have occurred quite recently and measures 70.5 × 40.5 mm, l/d 1.74; the surface has a flame pattern. Although slightly aberrant in various minor respects, it undoubtedly belongs to *A. schinziana*. This is a new record for the species.

Achatina (Lissachatina) connollyi Preston, 1912 (fig. 9)

Achatina (*Lissachatina*) *connollyi*; Bequaert, 1950: 50; Van Bruggen, 1965: 80.

A. connollyi has so far only been found in the Victoria Falls Rain Forest on the south bank of the Zambezi R., Rhodesia. Although a limited search

along the banks of this river in 1963 and 1965 has not as yet revealed additional localities it seems hardly possible (e.g., because of the very limited area of the forest) that the species in question is endemic to the forest. The peculiar character of this forest and its composition have recently been extensively described by Wild (1964). In this part of southern Africa the



Figs. 9-10. Genitalia. 9, *Achatina* (*Lissachatina*) *connollyi* Preston, Victoria Falls, Rain Forest, Rhodesia, 23 October 1965, leg. A. C. and W. H. van Bruggen (NM), shell 45.5 mm long, scale 10 mm; 10, *Archachatina* (*Tholachatina*) *ustulata* (Lamarck), Wilderness, Cape Province, 14 March 1965, leg. J. S. Taylor (NM), shell 54.5 mm long, scale 10 mm.

Zambezi runs through a low rainfall area which is reflected in the fringing riverine forest. The so-called "Rain Forest" is "merely an unusually extensive area of riverine forest made possible by the continuous spray from the Falls" (Wild, 1964: 143). However, an analysis shows that among the herb flora there is an "unusually large proportion of apparently endemic species" (Wild,

1964: 144). Although many plant species undoubtedly occur elsewhere in the area, there is a number of possible endemics among these. This may be explained either by adaptation to the peculiar climate of the Rain Forest (which seemingly does not occur elsewhere in south-central Africa) or by the Rain Forest being a mere remnant of a once extensively distributed type of fairly wet riverine forest. The "apparently endemic" species among the land molluscs are *Succinea connollyi* Preston [2]), *Pseudopeas victoriae* Connolly, *Achatina connollyi* Preston and *Gulella magnolia* (Connolly). These species are all locally common and may be collected without undue trouble; only the *Gulella* leads a cryptic life under stones, logs and leaf litter. The representatives of the genera *Succinea* and *Achatina* show adaptations to a distinctly wet type of climate, such as a very thin and corneous rather than calcareous shell, comparatively large aperture, etc. It is quite clear that these species would have no chance of survival outside the Rain Forest, unless another patch of forest with the same type of climate is available, which does not seem to be the case [3]).

During vacation leave in November 1963 and 1965 a number of *Achatina connollyi* was collected (NM, RMNH). The species is well camouflaged on the forest floor where it was found in the wettest areas on grass and low herbs; the body is black with two parallel whitish stripes on the dorsum.

In order to obtain the genitalia two specimens were dissected. Although small, the genitalia (fig. 9) are not as compact as those of other small species such as *Archachatina ustulata* (Lamarck) (fig. 10); in *Achatina connollyi* this is caused by the comparatively long vagina. The penis is small and completely ensheathed; the vas deferens is as thick as the vagina, while the former springs from the middle of the penis sheath. The spermatheca is thick, clavate rather than bulbous, and practically ductless. The penial retractor muscle is very long and thin and in the two dissected specimens has its insertion centrally on the diaphragm. The genitalia are fairly characteristic for the genus as described by Mead (1950). These organs somewhat resemble those of *Achatina* cf. *ampullacea* Boettger as figured by Van Bruggen (1966: 106, fig. 3); however, in *Achatina connollyi* the insertion of the spermathecal duct is much lower down on the vagina. The shells of the

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2) *Succinea connollyi* probably also occurs in N. Zambia (material collected by T. B. Oatley).

3) If indeed a high proportion of the plant and animal species in the Victoria Falls Rain Forest is endemic to that particular forest, it will be necessary to impose and enforce strict measures for its protection, particularly in view of the very small size of this area.

two species are very different indeed; this likewise applies to the respective habitats (forest and semi-desert-like savanna).

On the other hand the genitalia of *Achatina connollyi* also agree fairly well with those of *Archachatina saskai* Knipper (Knipper, 1956, fig. 3), although Knipper's species belongs to another genus. It is as yet impossible to sharply draw the line between *Achatina* and *Archachatina,* at least in an anatomical sense (see also Mead, 1950: 280 sqq.).

Achatina (Lissachatina) immaculata Lamarck, 1822 (pl. 1)

Achatina (*Lissachatina*) *immaculata*; Van Bruggen, 1966: 101, 110, pl. 10; Van Bruggen, 1966a: 371, figs. 52, 53 (complete synonymy); Verdcourt, 1966: 103, fig. 7 (refers to *A. panthera* (Fér.) and *A. lamarckiana* Dohrn as synonyms; former also considered to be a synonym by Van Bruggen, 1966a, both papers dated September 30, 1966!).

Two new records for *Achatina immaculata* may be added to the list; the localities have already been incorporated on the map (Van Bruggen, 1966a, fig. 53). Three shells were collected in the Mateke Hills, about 80 miles NE. of Beit Bridge (Rhodesia), 20-29 July 1962, by W. D. Haacke (TM); all belong to the "*panthera*" type. In the collection of Mrs. Helen Boswell (Valhalla, Pretoria) [4]) there is a shell from Vilanculos, Inhambane District (Mozambique), August 1957, leg. Holderness. This shell obviously represents the var. *lamarckiana* Pfeiffer as witnessed by its measurements: 98.5 × 45.0 mm, l/d 2.19, aperture 51.0 × 32.0 mm, last whorl 69.0 mm, 7½ whorls. The status of the var. *lamarckiana* is not yet quite clear; it is either a valid subspecies or an ecological form. This problem will be considered elsewhere at a later date. The Vilanculos specimen was obtained in the dry season, which is beautifully illustrated by the thick epiphragm (pl. 1); the slit at the top is produced into a little funnel on the inside.

Archachatina (Tholachatina) montistempli Van Bruggen, 1965

Archachatina (*Tholachatina*) *montistempli* Van Bruggen, 1965: 81, figs. 1-6.

Some time ago Mr. T. Pain (London) has been kind enough to submit for identification a moderately large shell of *Archachatina.* A close comparison with the type material in the Natal Museum has shown that it fully agrees with and thus definitely belongs to *A. montistempli* Van Bruggen. Unfortunately the shell in question is of uncertain provenance, being merely labelled "Natal"; the only other data available are that it was obtained indirectly from the H. C. Burnup collection, now the basic mollusc collection of the Natal Museum. It is interesting to reflect here that Burnup and his correspondents obtained material from various then (first quarter of 20th century)

4) The bulk of the Helen Boswell collection is now in the possession of Mr. John du Pont, Newton Square, Penn., U.S.A.

easily accessible parts of the Natal Drakensberg Range; however, they never managed to get specimens from the Cathedral Peak area, the type locality of *A. montistempli*. Consequently the Pain shell represents a second but as yet unknown population and locality for the species.

The shell is considerably larger than paratype 1, the largest known specimen of *A. montistempli*. The following measurements may be compared: Paratype 1: 82.5+ × 32.0 mm, l/d 2.58+, aperture 33+ × 20.0 mm (length last whorl not available), 8½ whorls; Pain shell: 98.0 × 34.0 mm, l/d 2.88, aperture 35.0 × 20.0 mm, last whorl 56.0 mm, 8½ whorls.

These data more or less exclude the possibility of the Pain shell being derived from the Oqalweni Forest population, from which the type material was taken.

Archachatina (Tholachatina) omissa Van Bruggen, 1965

Archachatina (Tholachatina) omissa Van Bruggen, 1965: 85 figs. 7-11.

Some regrettable typographical errors have appeared in the above paper on South African Achatinidae. One major misprint should be corrected in the table of measurements on p. 88: the holotype shell has only 8¼ instead of 8½ whorls as shown in the printed text.

Archachatina (Tholachatina) transvaalensis (Smith, 1878) (fig. 11)

A reconsideration of available material at the Natal Museum and elsewhere has convinced the present author that *Achatina subcylindrica* Preston, 1909, is a synonym of *A. transvaalensis* Smith, 1878. The synonymy now runs as follows:

Achatina transvaalensis Smith, 1878, Quart. J. Conch. 1: 351, type locality "Eastern slope of the Drakensberg Mountains at Lydenburg Gold Fields", type in British Museum (Natural History), London; Craven, 1880, Proc. Zool. Soc. London 1880: 616, "Not rare at Leydenburg"; Von Martens, 1900, Sitz. Ber. Ges. Naturf. Fr. Berlin 3: 119, "Transvaal, auf dem Weg von der Delagoa-Bai nach Lydenburg"; Connolly, 1912, Ann. S. Afr. Mus. 11: 201, Lydenburg; Connolly, 1939, Ann. S. Afr. Mus. 33: 309, pl. 11 fig. 2, "East slope of Drakenfels [sic!] near Lydenburg", Barberton.

Cochlitoma transvaalensis; Pilsbry, 1904, Man. Conch. (2) 17: 99, original description copied.

Archachatina (Tholachatina) transvaalensis; Bequaert, 1950, Bull. Mus. Comp. Zool. Harvard 105: 202, no locality; Van Bruggen, 1965, Rev. Zool. Bot. Afr. 71: 80, no locality.

Achatina subcylindrica Preston, 1909, Ann. Mag. Nat. Hist. (8) 3: 182, pl. 7 fig. 8, type locality "Natal", type in Musée Royal de l'Afrique Centrale,

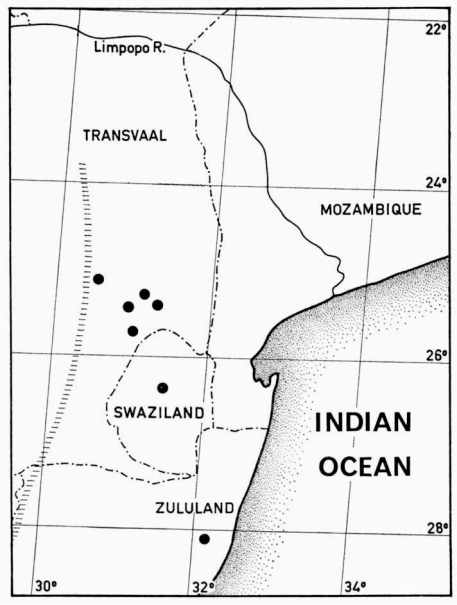

Fig. 11. Distribution of *Archachatina* (*Tholachatina*) *transvaalensis* (Smith), the approximate position of the Eastern Escarpment has been indicated by cross-hatching.

Tervuren; Conolly, 1912, Ann. S. Afr. Mus. 11: 201, "Natal"; Connolly, 1939, Ann. S. Afr. Mus. 33: 310, pl. 11 fig. 7 "Natal". Syn. nov.

Archachatina (*Tholachatina*) *subcylindrica*; Van Bruggen, 1965, Rev. Zool. Bot. Afr. 71: 80, no locality; Van Bruggen, 1966, Ann. Natal Mus. 18: 375, Kruger National Park, Machuluane Mountains.

Achatina subcylindrica deisenbecki Blume, 1952, Arch. Moll. 81: 61, fig., type locality Farm Friedenheim near Nelspruit, Transvaal, type in Naturmuseum Senckenberg, Frankfurt am Main. Syn. nov.

Archachatina (*Tholachatina*) *pentheri subcylindrica*; Bequaert, 1950, Bull. Mus. Comp. Zool. Harvard 105: 202, no locality.

This synonymy was already contemplated when the manuscript of the Kruger National Park paper was being completed (cf. Van Bruggen, 1966a: 376, footnote 6a); new material has now proved the validity of this hypothesis. The following additional material has become available:

Barberton Dist., 1943, leg.	45.2 × 19.4 mm, l/d 2.33, whorls 7¼
H. J. Puzey, SAM A30012	44.3 × 17.3 mm, l/d 2.56, whorls 7¾
	42.7 × 17.9 mm, l/d 2.39, whorls 7
	42.0 × 17.8 mm, l/d 2.36, whorls 7
	41.9 × 19.4 mm, l/d 2.16, whorls 7
Swaziland, SAM A30013	41.6 × 17.0 mm, l/d 2.45, whorls 8

The species is already known to occur in "Swazieland" (sic) because of two worn shells (leg. Penfold) in the old Natal Society collection, now incorporated in the Natal Museum's collections. Dr. U. de V. Pienaar recently submitted a half-grown specimen from Primkop near Plaston (E. Transvaal), 23 October 1965, leg. Biologist of the Kruger National Park, body yellow (NM, alcohol). Another half-grown but quite characteristic specimen was found in the Zoölogisch Museum, Amsterdam: Hluhluwe Game Reserve (Zululand), 25 October 1938, don. H. Engel, det. L. Forcart (alcohol). This is an interesting extension of the known range. The known localities, viz., Lydenburg, Plaston, Nelspruit, Kruger National Park (southern area), Barberton, Swaziland and Hluhluwe Game Reserve, indicate that the species occurs on higher ground (all over 1000 ft., possibly even much higher) along the eastern slopes of the Drakensberg Range in the eastern Transvaal, Swaziland and Zululand (fig. 11). The locality "Natal", although by no means impossible, should be treated with suspicion; no specimens with exact localities in this area have become known and recent investigations throughout Natal have not yielded any representatives of the species. An allied flammate species occurs in SE. Swaziland (Ingwavuma Road, 900-1200 ft., 8-10 January 1964, leg. A. C. and W. H. van Bruggen, NM), but so far only worn and empty shells have been collected. For the time being this material has proved unidentifiable.

Archachatina (Tholachatina) ustulata (Lamarck, 1822) (fig. 10, p. 17)

Archachatina (Tholachatina) ustulata; Bequaert, 1950: 202; Van Bruggen, 1965: 80.
Achatina ustulata; Mermod, 1951: 746, fig. 90.

Archachatina ustulata is endemic to the coastal forest region in the eastern Cape Province from the Gouritz River in the west to the Koega River in the east, without, however, reaching either of these rivers. All other recorded localities, viz., Durban, Pondoland and Port Nolloth (Connolly, 1939), are very probably based on misidentified or wrongly labelled material.

Recently the Natal Museum has received a number of additional specimens of this uncommon species, mainly through the efforts of its indefatigable correspondent Mr. J. S. Taylor. The species appears to be fairly common in indigenous forest around Wilderness in the George District; live specimens were obtained in the months October, November, December, March, April and May. This shows that the snail in question is probably only active during damp weather. The George District is situated in an area where 30 to 60% of the total annual rainfall is recorded in the summer (October to March); towards the west 30 to 45% and to the east 45 to 60% of the rainfall is

recorded in the summer, which means that the district is somewhat transitional between the Winter and Summer Rainfall Areas. Seasons are less sharply marked in sheltered localities and this may well apply to the temperate forest of the eastern Cape.

The largest shells of about two dozen specimens collected in two years from around Wilderness and some others have the following measurements:

Knysna, NM Moll. 1610, lip damaged, probably even larger than 88 mm	88.0 × 34.4 mm, l/d 2.56, whorls 8
Connolly, 1939: 302, largest shell	85.0 × 32.0 mm, l/d 2.66, —
Wilderness area, leg. J. Berlioz per J. S. Taylor, NM Moll. 4108, alc.	66.8 × 26.5 mm, l/d 2.52, whorls 7
George, 5.X.1924, leg. M. L. Winslow, NM Moll. 3719	56.6 × 21.8 mm, l/d 2.60, whorls 6½
Wilderness area, NM, alc.	55.6 × 23.6 mm, l/d 2.36, whorls 6¼
Wilderness area, NM Moll. 4217	55.0 × 22.5 mm, l/d 2.44, whorls 6¼
Wilderness area, NM, alc.	53.8 × 23.4 mm, l/d 2.30, whorls 6¼

Obviously large shells like the ones mentioned by Connolly (1939) and the above Natal Museum specimen are exceptional; normally adults fall within the range of 53 to 57 mm with 6¼ to 6½ whorls. The shell collected by Berlioz is already larger than normal and has at least half a whorl too much. It is quite possible that under very favourable conditions occasionally growth does not stop at a certain stage as normally seems to happen. *A. ustulata* is one of the slenderest representatives of the genus; the l/d ranges from 2.30 to 2.66 and averages 2.49 (seven specimens measured).

Two specimens from Wilderness were dissected in order to obtain the genitalia. The genitalia (fig. 10) are compact; the penis is small and completely ensheathed, while the thick vas deferens springs from the base of the penis sheath. The spermatheca is fairly large with a thin and long duct, the insertion of which varies. In the figured specimen it is inserted on the left, but in another more towards the right on the middle of the top of the vagina; this seems unusual, but is probably without real importance because it may be due to individual variation. The penial retractor muscle is attached to the base of the right tentacular retractor muscle. On the whole the genitalia are fairly typical for the genus, although attention should be drawn to the thick vas deferens, which springs from the bottom of the penis sheath, a character shared by the genitalia of *A. saskai* Knipper (Knipper, 1956, fig. 3). This species, however, has a spermatheca which is attached to the vagina almost without a duct.

The genitalia of *A. ustulata* may also be compared to those of *A. vestita* (Pfr.) (cf. Van Bruggen, 1966: 106, fig. 1); apart from the penis being

incompletely ensheathed, these differ only in minor detail, although the shells are easily told apart. Both species are forest dwellers and it seems quite possible that *A. ustulata* is a southern offshoot of the (sub)tropical *A. vestita*. Penial enlargement in itself is a derived character (see Mead, 1950: 280-287) which tends to confirm this hypothesis.

Burtoa nilotica (Pfeiffer, 1861)

Burtoa nilotica; Crowley & Pain, 1959: 1 sqq.; Van Bruggen, 1965: 80.

Two new localities may be added to the list given by Crowley & Pain (1959: 33) for *Burtoa nilotica arnoldi* (Sturany, 1898), viz., along main road south of Ngoma, Kafue National Park (Zambia), 1 November 1963, leg. A. C. and W. H. van Bruggen (NM, RMNH); Crocodile Pools road, Robins area, Wankie National Park (Rhodesia), 27 October 1965, leg. A. C. van Bruggen (NM, RMNH). Both localities are situated along the western limits of the species; all material definitely belongs to the subspecies *arnoldi*. In both cases a number of specimens was found in mopane forest (*Colophospermum mopane*, fam. Leguminosae); this may be an indication that *B. nilotica* is one of the very few molluscs that occur in this malacologically unattractive type of vegetation.

The species is not at all common in the southwestern districts of Rhodesia. According to Crowley & Pain (1959: 15) the southernmost record is "on the banks of the Amanze Inyama River in Matabele Land, about 22° S. lat.". In The Times Atlas **4**, pl. 92 (1956), however, the Manzamnyama River is shown to be situated at about 20° lat. South. In the Leiden Museum a shell was found labelled "45 miles South of Buluwayo, Rhodesia"; the specimen was obtained from H. B. Preston in 1914. This record undoubtedly constitutes the real southernmost record for *B. nilotica arnoldi* of which the shell in question is a typical representative measuring 95.5 × 64.0 mm. Unfortunately it is not easy to locate it exactly, but it certainly comes from well south of 20° lat. South (indeed close by 21° lat. South), possibly just beyond the Matopos area.

Clausiliidae

Macroptychia (Austrobalea) africana (Melvill & Ponsonby, 1899) (figs. 12-13)

Austrobalea africana; Connolly, 1939: 372, pl. 12 fig. 1.
Macroptychia (Austrobalea) africana; Zilch, 1960: 444, fig. 1578 (copy of Connolly's figure).

The clausiliid *Macroptychia africana* is one of the most interesting elements

in the South African fauna. A number of new localities has now come to light, enabling one to draw up a fairly complete picture of the distribution of the species, which now has to be extended to include the northern Transvaal.

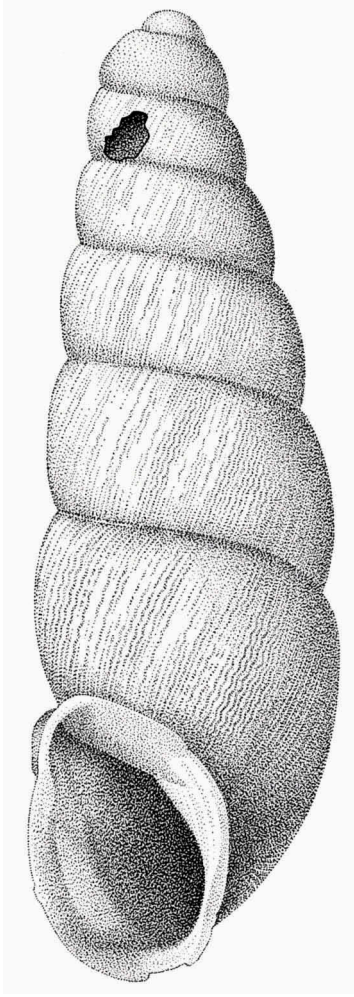

Fig. 12. *Macroptychia* (*Austrobalea*) *africana* (Melvill & Ponsonby), Mt. Mkolombe, Natal, March 1926, leg. H. P. Thomasset (RMNH), actual length 7.5 mm.

These new records are the following: Ingeli Forest, Mount Currie District (Cape Province), leg. W. Falcon (common, NM); Inhluzane, Impendhle District (Natal), leg. H. C. Burnup (1, NM); Mount Mkolombe, Estcourt District (Natal), March 1926, January 1927, leg. H. P. Thomasset (common, NM, RMNH); Indumeni Forest, Cathedral Peak area, Bergville District

(Natal), 4500 ft., 4 April 1962, leg. A. C. and W. H. van Bruggen (2, NM); Hanglip Forest, Louis Trichardt, Zoutpansberg District (Transvaal), 4500 ft., 8-9 February 1965, leg. A. C. and W. H. van Bruggen (5, NM, RMNH). The species appears to be new to the Transvaal. Available specimens (fig. 12)

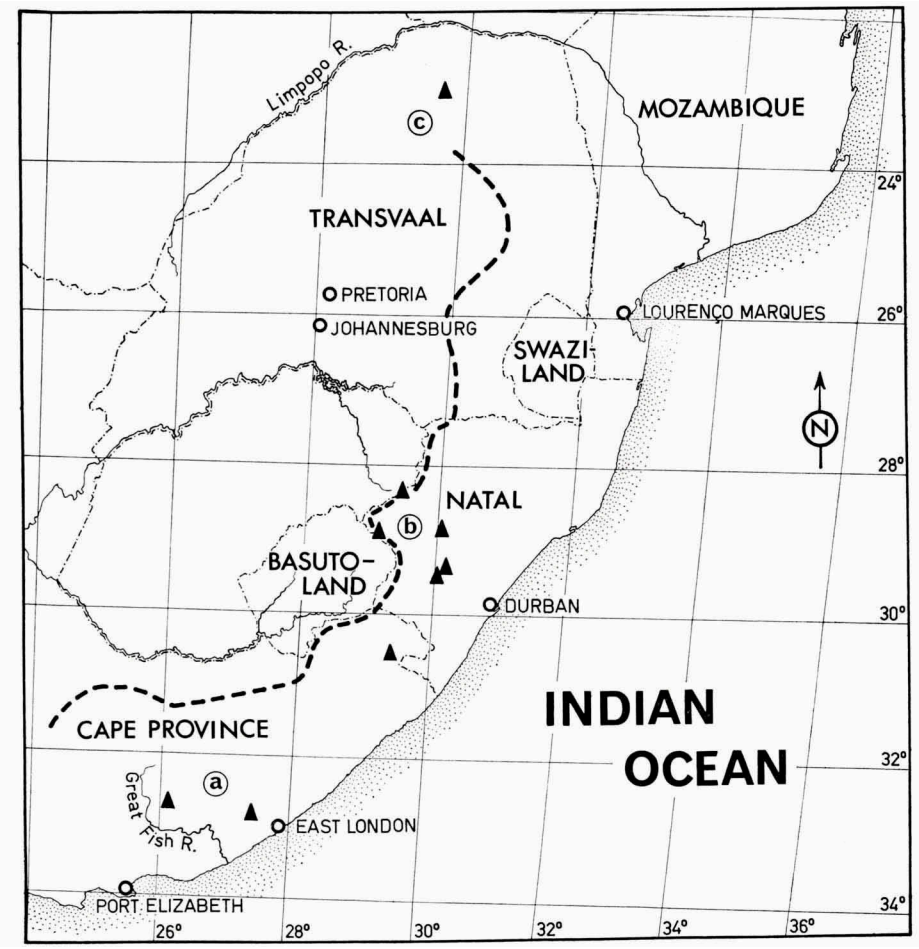

Fig. 13. Distribution of *Macroptychia* (*Austrobalea*) *africana* (Melvill & Ponsonby) (triangles), the approximate position of the Eastern Escarpment has been indicated by a broken heavy line. Explanation in text.

vary considerably in size, the largest shells measuring 8.0 mm (Hanglip Forest, largest shell on record), 7.9 mm (Karkloof), 7.8 mm (Mt. Mkolombe) and 7.3 mm (Ingeli Forest) respectively.

In 1962 my then colleague B. R. Stuckenberg published an important paper on "the distribution of the montane palaeogenic element in the South African invertebrate fauna" (Stuckenberg, 1962). The following may be quoted from this paper: "The palaeogenic invertebrates are among the most archaic animals in our fauna, and they contribute greatly to its temperate facies. Their antiquity is revealed by a discontinuous distribution in more than one zoogeographical region, and by their confinement, within the Ethiopian Region, to South Africa. These elements are mostly relict, primitive types belonging to ancient groups usually undergoing regional evolution along distinctive lines. Their concentration in South Africa is a well-known feature, especially since it is part of a clearly-defined pattern in the southern hemisphere, which shows a stock of ancient invertebrates and plants zoned in the southern parts of the continents". Silvicolous montane palaeogenic elements are restricted to the Eastern Escarpment south of the Zambezi. An examination of the map (fig. 13), which has been based on Connolly (1939) and the above data, reveals that *M. africana* is a good example of such a distribution pattern. All known localities are found in a discontinuous chain along the eastern slopes of the Drakensberg Range at altitudes from between 2000 to over 5500 feet. Moreover the species is only known to occur in the area between the Great Fish and Limpopo Rivers, which area has been called by Stuckenberg the Eastern Highlands Centre. *M. africana* has been found to occur in all three subcentres, viz., (a) the Amatola Range, (b) the Basutoland-Drakensberg Highlands and Eastern Plateau Slopes and (c) the Eastern Transvaal Subcentre (a-c on map fig. 13) [5]).

The family Clausiliidae has its headquarters in Asia and Europe, while one subfamily is mainly restricted to South America (Neniinae); North Africa is occupied by Palaearctic groups, which are also represented on the Azores. *Macroptychia* O. Boettger, 1877, to which both Thiele (1931) and Zilch (1960) subordinate *Austrobalea* Pilsbry, 1924, belongs to the subfamily Fusulinae, the other genera of which are mainly distributed in central and southern Europe, western Asia, Madeira and Porto Santo islands. The genus *Macroptychia* is represented solely by a small number of species in South Africa (only *M. africana*), East Africa, Abyssinia and South Arabia (one species only), presumably all in mountainous areas. This leaves a gap of over 1300 miles between the East African species and their lone and ancient relative in South Africa. The ancestors of the single South African rep-

5) Connolly's East African material (Connolly, 1930: 39, Kenya, Naivasha) of "*Austrobalea africana*" could not be traced during a recent visit to the British Museum (Natural History), London; it is most unlikely that it is identical with South African material. See also Verdcourt (1953: 73, specimen of "either *Balea* or *Austrobalea*" from E. Uganda).

resentative of the family Clausiliidae very probably have entered South Africa from the north and obviously *M. africana* is a relict species. Related species in the highlands of East Africa are also possibly relict species. One of the most significant intervals in the discontinuous pattern from NE. Africa to the South African localities is the Limpopo River valley, "which delimits in a decisive manner the northern distribution of many palaeogenic invertebrate groups" (Stuckenberg, 1962: 202). It appears that *M. africana* does not occur in the Rhodesian Eastern Escarpment; this is obviously a natural pattern in agreement with the above quotation. The arid and ancient Limpopo River valley is now and has probably been for quite some time a barrier of considerable ecological and zoogeographical significance, particularly for montane silvicolous elements among the invertebrates.

Rhytididae

When Connolly's monograph (Connolly, 1939) was published the African representatives of the ancient family Rhytididae were known to occur from the very tip of the continent, the Cape Peninsula, to as far north as Sibasa in the Transvaal. However, only one species, *Nata viridescens* (M. & P.), was known to reach as far north as Pretoria and Sibasa (cf. Watson, 1934: 152, "not known to occur north of latitude 25 degrees South."). Recent investigations (Van Bruggen, 1966a) have shown that *Nata vernicosa* also occurs further northwards, viz., in the Kruger National Park, and now it has even been found to reach its northern limit close by the Limpopo River in the northern Transvaal; in the latter locality it is accompanied by *Nata viridescens*.

Only two genera are recognised in southern Africa (Connolly, 1939; Zilch, 1960), viz., *Natalina* Pilsbry, 1893, and *Nata* Watson, 1934.

Natalina, undoubtedly the more primitive of the two, occurs from the southern Cape Province at about 34° Lat. S. to as far north as about 26° Lat. S. in Mozambique [6]); the species live in a narrow stretch of country between (and also on) the eastern slopes of the Drakensberg Escarpment and the coast, none of them at a distance of more than 150 miles from the shores of the Indian Ocean. Various centres of speciation within this genus may be distinguished, viz., the main NE. Cape - S. Natal centre and two minor centres in the southern Cape and Natal Drakensberg Range respectively. Only *Natalina caffra* (Fér.) shows a wider distribution from almost the tip of the continent into Zululand and possibly even further north.

6) Recently Dr. P. H. Boshoff obtained a damaged shell of *Natalina* spec. at Vila Luiza north of Lourenço Marques; this is well north of 26° Lat. S. and consequently the northernmost record of the genus (RMNH).

The genus *Nata*, which anatomically is much more specialised than *Natalina*, is distributed over a larger area than the latter, reaching further southwards because of its occurrence on the Cape Peninsula and occurring inland as far as the Zoutpansberg District at a distance of about 280 miles from the coast. In the eastern Cape Province and Natal it covers much the same area as *Natalina* does. About four species of *Nata* are known, which are more or less equally divided over the area, without any discernible centre of distribution.

The records from the Zoutpansberg District constitute the northernmost localities for the family, both genera and the two species in question.

Nata vernicosa (Krauss, 1848)

Nata vernicosa; Van Bruggen, 1966a: 376.

Nata vernicosa appears to occur as far north as the Zoutpansberg District, N. Transvaal, so that the species is now known to be distributed more or less continuously from the Cape Peninsula via Natal and Zululand to the N. Transvaal. No Swaziland records are as yet available and it is expected that the arid Limpopo River corridor constitutes the northern borderline for the family in southern Africa. The following new material may be placed on record: Hanglip Forest, Louis Trichardt, Zoutpansberg District (N. Transvaal), 4500 ft., 8-9 February 1965, leg. A. C. and W. H. van Bruggen (4, NM); Entabeni Forest, Zoutpansberg District (N. Transvaal), 3600-3800 ft., 10-11 February 1965, leg. A. C. and W. H. van Bruggen (1, NM); Mariepskop Forest Reserve, Pilgrims Rest District (E. Transvaal), NE. area (Nature Reserve), 4500 ft., 28-29 January 1966, leg. A. C. and W. H. van Bruggen (6, NM). The Mariepskop specimens are comparatively large; the biggest shell measures 12.0 × 20.6 mm (alt. × maj. diam.) and is thus the biggest on record. It appears that this specimen falls just outside the range of *N. liparoxantha* (M. & P.), which Connolly (1939: 101) suspected to be a synonym of *N. vernicosa*. Additional material has now convinced the present author that this is indeed so: *Helix (Nata) liparoxantha* Melvill & Ponsonby, 1892, Ann. Mag. Nat. Hist. (6) 10: 238 nov. syn. of *Helix vernicosa* Krauss, 1848, Südafr. Moll.: 76.

Nata (Natella) viridescens (Melvill & Ponsonby, 1891)

Nata viridescens; Connolly, 1939: 103, text-fig. 7; Zilch, 1960: 554, fig. 1937.

Three specimens of *Nata viridescens* from the Hanglip Forest (NM, same data as above specimens of *Nata vernicosa*) effectively fill the gap in distribution records in the Transvaal as given by Connolly (1939, Pretoria, Sibasa).

STREPTAXIDAE

Gonaxis gwandaensis (Preston, 1912)

Gonaxis gwandaensis; Van Bruggen, 1966: 103, 109, 110; Van Bruggen, 1966a: 378.

A shell from the Mateke Hills, Nuanetsi District (Rhodesia), about 80 miles NE. of Beit Bridge, 20-29 July 1962, leg. W. D. Haacke (TM), represents only the second record of *Gonaxis gwandaensis* for Rhodesia. The above locality is already shown on the map in Van Bruggen (1963, fig. 5). The specimen has the following maximum measurements: 16.7 × 12.3 mm.

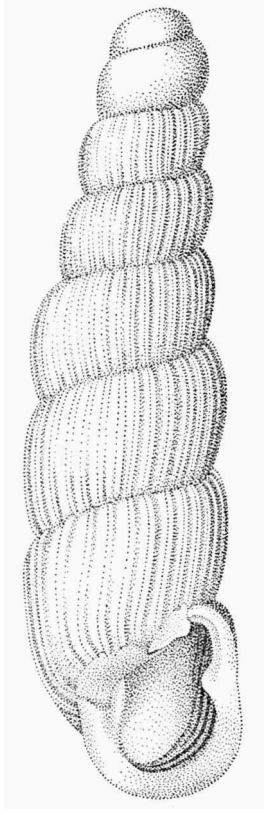

Fig. 14. *Streptostele (Raffraya) herma* Connolly, Lundi, Rhodesia, specimen no. 10 of table I (RMNH), actual length 3.9 mm. Note the epiphragm inside the aperture.

Streptostele (Raffraya) herma Connolly, 1912 (fig. 14)

Streptostele (Raffraya) herma Connolly, 1912: 89, pl. 2 fig. 3, "Victoria Falls"; Connolly, 1939: 17, "Victoria Falls".

Streptostele (Raffraya) meridionalis Van Bruggen, 1966a: 380, figs. 58, 60, 63, "Kruger National Park, between Semane Koppie and Ngirivane Windmill, block C 69" (type locality) and "Kruger National Park, Dzundweni Hill, block N 50". Syn. nov.

Recently *Streptostele herma* has been obtained at a new locality in Rhodesia, viz., at Lundi, Nuanetsi District, in forest 1½ miles north of bridge, 1500 ft., 19-20 February 1965, leg. A. C. and W. H. van Bruggen (NM, RMNH), and Lundi, Rhino Hotel grounds, 1500 ft., 20 February 1965, leg. A. C. and W. H. van Bruggen (NM, 1). Hitherto the species has always been rare in collections, only being known from the type locality, where notwithstanding repeated searches it has not been obtained in the last few years. Probably only the few shells in the British Museum (Natural History) and Natal Museum have so far been available to science. Many species of the genus are rare, but sometimes it is possible to collect adequate series once their real habitat has been discovered (vide e.g., Venmans, 1959, and Venmans & Watson, 1955). The genus reaches its southernmost limits in the Transvaal, which is also perhaps one of the reasons for the various species being rare in southern Africa. At Lundi 28 shells were obtained in a few hours collecting in leaf litter; some were quite fresh, though unfortunately only one live specimen was found. When after some two years the sample came to be examined the animal was found to have died and the aperture of the shell appeared to be closed by a thick, convex epiphragm with a hardly noticeable oblique slit in the top right hand corner; the epiphragm has exactly the same colour as the shell and has a somewhat granular surface (fig. 14). The animal, as seen through the subtransparent shell, is chestnut-brown with a yellow foot. All shells except one of 3.5 mm are adult. As soon as the labrum has been formed the parietal and labral teeth slowly increase in size by deposit of more shell matter. Therefore it is not quite possible to draw the line between juvenile and adult, which probably accounts for the variation in number of whorls.

Although all specimens belong to one single population, the shells are rather variable in size and shape as witnessed by table I. The measurements may be summarized as follows: 3.1-4.4 × 0.9-1.1 mm, l/d 3.44-4.10, average of 27: 3.72 (l/d computed from micrometer readings 3.50-4.06, average 3.72). Available data for *S. herma* are 4.0-4.5 × 1.1-1.3, l/d 3.46-3.63; this shows that the Lundi population as a whole has small, but fairly slender shells.

The variation in labral and parietal teeth is also considerable (see table I). It is interesting to note that this variation is not subject to size; the only conclusions that may be drawn from the last two columns of the table are that the parietal process as a rule is poorly developed (p.d. in 18, w.d. in 7, absent in 2 cases) and the labral tooth well developed (p.d. in 10, w.d. in 15, absent in 2 cases), but not as markedly as in the case of the parietal process.

In the light of the above data and of the general variability of the species

of the genus (Venmans, 1959; Venmans & Watson, 1955) it now becomes imperative to reconsider the status of the known southern African species of *Streptostele*. Van Bruggen (1966a: 384) gave a key to these species, five all told. Three of these, the "unnamed species", *S. inconspicua* Van Bruggen

TABLE I

Shell data of *Streptostele herma* Connolly, Lundi, population north of bridge; measurements in mm. Abbreviations: p.d. = poorly developed, w.d. = well developed, l/d microm. = l/d computed directly from micrometer readings, * = specimen taken alive (fig. 14).

No.	length maj × diam.	l/d	l/d microm.	length apert.	whorls	parietal tooth	labral tooth
1	4.4 × 1.1	4.00	3.89	1.1	7½	p.d.	w.d.
2	4.2 × 1.1	3.82	3.72	1.0	7½	p.d.	absent
3	4.1 × 1.1	3.73	3.67	1.0	7¼	p.d.	w.d.
4	4.1 × 1.1	3.73	3.88	1.0	7¼	absent	absent
5	4.1 × 1.1	3.73	3.88	1.0	7¼	p.d.	w.d.
6	4.1 × 1.0	4.10	4.06	1.0	7	w.d.	p.d.
7	4.0 × 1.1	3.64	3.76	1.0	7	p.d.	w.d.
8	4.0 × 1.1	3.64	3.76	0.9	7	p.d.	p.d.
9	4.0 × 1.0	4.00	4.00	1.0	7	w.d.	w.d.
*10	3.9 × 1.1	3.54	3.71	0.9	7	w.d.	w.d.
11	3.9 × 1.1	3.54	3.65	0.9	7	p.d.	p.d.
12	3.9 × 1.1	3.54	3.65	0.9	7	p.d.	p.d.
13	3.8 × 1.1	3.45	3.59	0.9	7	p.d.	w.d.
14	3.8 × 1.0	3.80	3.81	0.9	7	p.d.	p.d.
15	3.8 × 1.0	3.80	3.81	0.9	7	absent	p.d.
16	3.8 × 1.0	3.80	3.81	1.0	6¾	both fairly well developed	
17	3.7 × 1.1	3.36	3.53	1.0	6¾	both fairly well developed	
18	3.7 × 1.0	3.70	3.75	1.0	6¾	p.d.	p.d.
19	3.7 × 1.0	3.70	3.75	0.9	7	both fairly well developed	
20	3.6 × 1.0	3.60	3.56	1.0	6½	p.d.	p.d.
21	3.6 × 1.0	3.60	3.62	0.9	6½	both fairly well developed	
22	3.5 × 1.0	3.50	3.50	0.9	6½	p.d.	p.d.
23	3.4 × 0.9	3.78	3.67	0.9	6½	p.d.	w.d.
24	3.4 × 0.9	3.78	3.67	0.9	6¼	p.d.	fairly w.d.
25	3.4 × 0.9	3.78	3.60	0.9	6¼	p.d.	w.d.
26	3.4 × 0.9	3.78	3.60	0.9	6	p.d.	fairly w.d.
27	3.1 × 0.9	3.44	3.57	0.9	6	p.d.	p.d.

(no. 27, shell quite adult!)

and *S. sanctuarii* Van Bruggen seem to be well differentiated. *S. meridionalis* Van Bruggen was placed next to *S. herma* and separated on account of its well-developed labral tooth, the seven to eight flat whorls and its comparatively high l/d. As we have seen above, the well-developed labral tooth is a character subject to much variation. The number of whorls in *S. herma* varies from 6 to 7½, that of the two specimens of *S. meridionalis* from 7 to 8; the

whorls in specimens of *S. herma* from the Victoria Falls are somewhat convex and impressed at the suture, but it appears that this may be due to wear on the shell after the death of its occupant. The two specimens of *S. meridionalis* are indeed slightly more slender than specimens of about the same size of the above-discussed population. All in all the present author feels justified in considering *S. meridionalis* a synonym of *S. herma*; the distribution of the species as far as known at the present consists of five localities, viz., Kruger National Park (two localities), Lundi (both sides of the river), Victoria Falls (type locality).

It now becomes also necessary to revise the key to southern African *Streptostele* as published by Van Bruggen (1966a). Couplet 3 should run as follows:

3 a Shell well over 5 mm long, nine whorls; 5.4 × 1.3 mm, l/d 4.15 *S. sanctuarii* v. Br.
b Shell up to 4.5 mm long, six to eight whorls; 3.1-4.5 × 0.9-1.3 mm, l/d 3.46-4.10, but usually under 4.00 . . . . . *S. herma* Conn.

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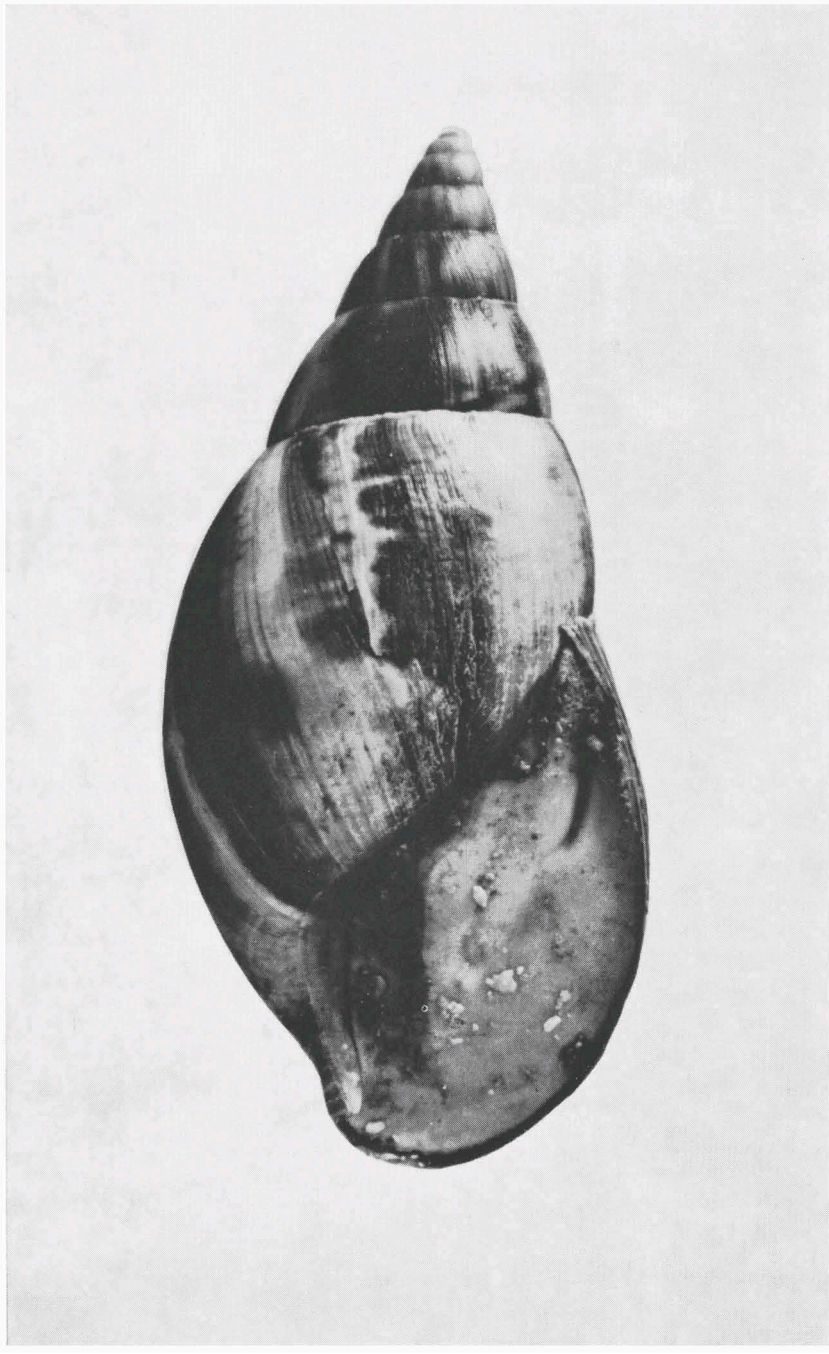

Achatina (*Lissachatina*) *immaculata* Lamarck in diapause, Vilanculos, Mozambique (collection Mrs. Helen Boswell, now in John du Pont collection). Photograph Laura M. Kelsall.