

**An interesting achatinid (Gastropoda, Pulmonata, Achatinidae)
and other land snails from Benguera Island
off central Mozambique**

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A medium-sized achatinid from Benguer[u]a Is. in the post-Pleistocene Bazaruto Archipelago off central Mozambique is identified as *Cochlitoma churchilliana* (M. & P., 1895) sensu lato, thereby considerably extending the range of this species (complex?) northward. Variation in apex, size, shape and colour of the shell of this complex is discussed in detail. Also included are first records for this island of various small species of land snails from leaf litter. Of these four, i.e. *Nesopupa farquhari* Pilsbry, 1917 (Vertiginidae), *Trachycystis rivularis* (Krauss, 1848) (Charopidae), *Cecilioides pergracilis* Connolly, 1939 (Ferussaciidae), and *Curvella amicitiae* Van Bruggen, 1968 (Subulinidae), are new records for the Mozambique list.

Key words: Gastropoda, Caenogastropoda, operculate land snails, Pulmonata, Achatinidae, *Cochlitoma*, synonymy, variation, distribution, Vertiginidae, Charopidae, Ferussaciidae, Subulinidae, faunistics, Bazaruto Archipelago, Mozambique.

Omnia dubia

The first African exploits of the well-known Leiden malacologist Dr E. Gittenberger have been a complete success in so far that he managed to collect some valuable and interesting material in both Mozambique and Botswana (vide Van Bruggen, 2006). Twice he and his wife visited the Bazaruto Archipelago (2005, 2006) situated NE of Vilanculos, on the central Mozambique coast, where they collected land mollusc material on Ilha Benguer[u]a (formerly Ilha de Santo Antonio) at Marlin Lodge (on the western shore of the island) in leaf litter under shrubs in the sand dune area (fig. 1). Downs & Wirminghaus (1997: 593) have summarily described the vegetation of Benguera Is.; it appears that the Gittenberger material was obtained in evergreen dune forest/secondary dune forest.

All material has been deposited in the National Museum of Natural History, Leiden (abbreviated RMNH). Other abbreviations used are l/d for the ratio length/maximum major diameter of the shell as an indication of its shape, and l/lw for the ratio length/length last whorl of the shell.

Apart from small shells of leaf litter dwelling species, their material also included shells of a beautiful achatinid. Initially this material defied proper identification; unfortunately, notwithstanding a thorough search in 2006, no live-collected material is available. There is a total of ten medium-sized, fairly slender shells, all with a flame pattern (figs 2-4, table 1). A careful scrutiny of the literature (also including Verdcourt, 2006) and material has finally led to the conclusion that the shells represent one of the northernmost populations of *Cochlitoma churchilliana*. Full synonymy of this taxon is shown below.

Cochlitoma churchilliana (Melvill & Ponsonby, 1895) sensu lato

Achatina churchilliana Melvill & Ponsonby, 1895: 164, pl. 12 fig. 3; Connolly, 1939: 308, pl. 11 fig. 5.

Archachatina churchilliana – Sirgel, 2000: 218, figs 10-13; 2002: 139, fig. 1; 2004: 271, figs 1-3; Herbert & Kilburn, 2004: 145, 6 unnumbered figs.

Cochlitoma churchilliana – Mead, 2004: 421.

Achatina zuluensis Connolly, 1939: 308, pl. 10 fig. 2.

[*Achatina* (*Lissachatina*) *craveni* non Smith, 1880 – Van Bruggen, 1969: 35, fig. 11, should be *Archachatina zuluensis*, rectified in Van Bruggen & Appleton, 1977: 27]

Archachatina zuluensis – Van Bruggen & Appleton, 1977: 25, figs 5-7; Sirgel, 2000: 216, fig. 9; 2002: 139; 2004: 271.

Cochlitoma zuluensis – Mead, 2004: 423, figs 13, 20-22.

Archachatina sanctaeluciae Van Bruggen, 1989: 169, figs 4-5; Sirgel, 2000: 216, figs 7-9; 2002: 139, fig. 1; 2004: 271.

Cochlitoma sanctaeluciae – Mead, 2004: 422.

Locality data of the new material:

- Mozambique, Bazaruto Archipelago (NE. of Vilanculos), Ilha Benguer[u]a (formerly Ilha de Santo Antonio), at Marlin Lodge in litter under shrubs, 18.VII.2005, leg./don. E. Gittenberger (RMNH: 3 shells).

- Mozambique, ibidem, STA EG0612, 26.VII.2006, leg./don. E. Gittenberger (RMNH: 7 shells).

Three seminal papers by Sirgel (2000, 2002, 2004) have greatly contributed to clarify the status of the achatinids described s.n. *Achatina churchilliana*, *A. zuluensis* and *Archachatina sanctaeluciae*. His findings may be summarized as follows. (1) The shells of all three taxa do show considerable overlap in apex, size, shape and colour pattern, in fact all are intergrading. (2) The genitalia of all three forms are similar. (3) Breeding experiments have shown that these taxa in second and third generations sometimes exhibit shells that can be identified as belonging to other (conchological) taxa than the parent generation. In my view Sirgel has convincingly shown that the above three names are synonyms. However, molecular data are still lacking. Also, there are indications (e.g. in Herbert & Kilburn, 2004: 146) that the three forms are not always syntopic; they may be subject to different predator pressure in the various habitats resulting in colour morphs being selected against. Mead (2004) in his list on pp. 421-423 appears to entertain some doubt as to the validity of the three taxa, at least he does not (yet?) consider them synonymous. The above is the reason why these taxa are shown here s.n. *Cochlitoma churchilliana* sensu lato.

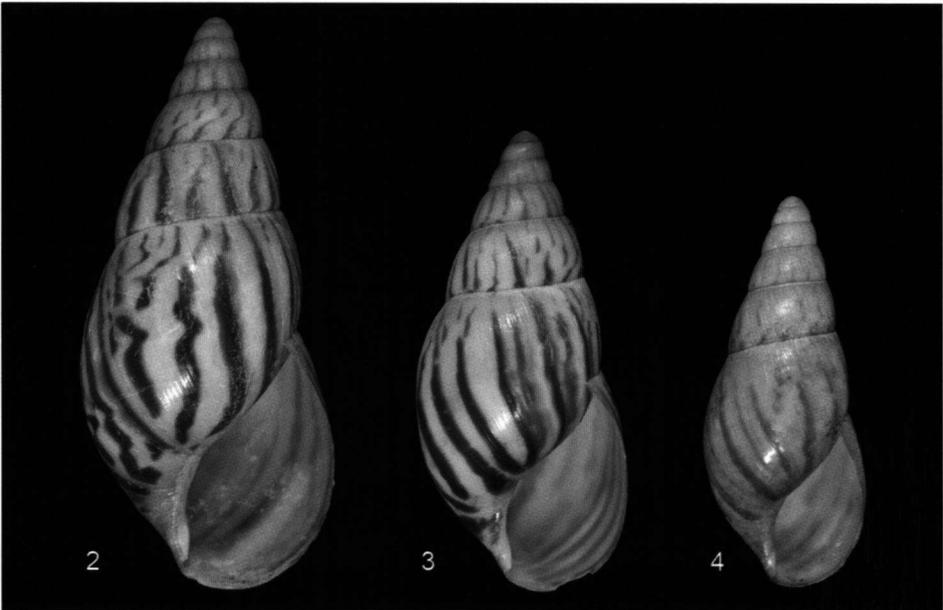
Generally there is a wide range in measurements in *C. churchilliana*, i.e. 59.0-83.6 × 27.4-39.9 mm, l/d 1.66-2.46, l/lw 1.33-1.65, whorls 7-8 ½. In his 2002 and 2004 papers Sirgel has shown that in captivity the *sanctaeluciae* form may grow to a great size encompassing more than 9 whorls in the process considerably increasing its l/d, while the l/lw more or less stays the same:

Early stage	68.5 × 30.2 mm, l/d 2.27, length last whorl 40.5 mm, l/lw 1.69
Adult shell	93.5 × 36.0 mm, l/d 3.47, length last whorl 56.0 mm, l/lw 1.66

In achatinids it is difficult to establish which shells are adult because there is no thickening of the outer lip. Table 1 shows the metric data of the four largest Benguera specimens and includes those of a much smaller shell (2006c, fig. 4) that could be taken to be adult. These measurements are all within the known range for what is considered to be *C. churchilliana* s.l. The smallest shell (i.e. 2006c) is an odd one; because of the fact that it has 7 ½ whorls it might be considered adult, in which case it is outside the range of *C.*



Fig. 1. Habitat of the here discussed land snails of Benguera Is., Bazaruto Archipelago, Mozambique – all material was collected in evergreen dune forest/secondary dune forest. Photo E. Gittenberger, VII.2006.



Figs 2-4. Shells of *Cochlitoma churchilliana* s.l. from Benguera Is., Bazaruto Archipelago, Mozambique (approximately natural size). 2, specimen no. 2006a (see table 1); 3, no. 2005b; 4, no. 2006c. Photos J. Goud.

churchilliana s.l. and might even qualify as a separate taxon. Indeed, had this specimen been found as a single shell and submitted for identification as such, it might have been considered a representative of a possibly undescribed taxon characterized by a smallish and slender shell with a comparatively high number of whorls. However, in view of the intraspecific variation of the taxon here discussed, it is taken to be an aberrant specimen.

Specimen	Shell length × max. maj. diam.	l/d	Length last whorl	l/lw	Aperture length × width	Ratio length shell/height aperture	Number of whorls
2006a	75.0 × 32.3	2.32	49.1	1.51	31.9 × 20.3	2.35	8+
2005a	74.1 × 29.5	2.51	48.0	1.54	31.4 × 17.6	2.36	7 ¼
2005b	60.0 × 27.0	2.22	43.0	1.39	29.6 × 17.1	2.03	7 ¼
2006c	52.3 × 21.6	2.42	33.1	1.58	22.4 × 13.6	2.33	7 ½

Table 1. Metric data of the four largest shells and a smaller specimen of *Cochlitoma churchilliana* s.l. from Benguera Is.

The northern limits of the range of *C. churchilliana* s.l. are hitherto unknown. Herbert & Kilburn (2004: 145) state "Inhabits the Zululand coast, from the Mtunzini area northwards into southern Mozambique (Maputo area), inland to Ndumo Game Reserve." The distance between Maputo and the Bazaruto Is. in a straight line is just under 600 km, an enormous extension of the range of this taxon. In the south it does not seem to occur south of the Thukela (formerly Tugela) River in KwaZulu-Natal. This also implies that the complex does occur in suitable habitat in coastal Mozambique between Maputo and the Bazaruto Is. In addition, it is likely to occur further north as well. So far similar shells have not been recorded from coastal Tanzania (see e.g. Verdcourt, 2006).

A last question here is the age of the Bazaruto Archipelago. Downs & Wirminghaus (1997: 591) state "The coastal plain of south eastern Africa is characterized by a number of sand-dune bands, each representing a former shoreline of younger age eastwards as the sea level fell (Hobday 1976). Present-day coastal dunes are estimated to have formed as recently as 5000 years ago (Fairbanks, 1989) when the sea rose to its present level. Offshore islands such as those of the Bazaruto Archipelago were isolated from the mainland by the rising sea-level at this time and represent fragments of previous peninsulas. The islands of the Bazaruto Archipelago were attached to the mainland from 90,000 to 10,000 years ago (Ramsay, pers. comm). The sea level attained its present level 6500 years ago (Ramsay, pers. comm)." This is confirmed by a more recent paper by Cooper & Pilkey (2002: 164), who write in their abstract "Two barrier island systems from southern Mozambique (Inhaca and Bazaruto) are described. Both systems comprise a composite barrier island or barrier island chain that developed on a steep continental margin as a result of initial (Pleistocene) spit progradation." This implies that the above discussed populations of *C. churchilliana* on Benguera Is. have been isolated from those on the mainland for at least 10,000 years or, in other words, are post-Pleistocene. Here is great scope for a molecular approach. Indeed, it is vital to collect live material here, study the genital anatomy and perform a proper DNA analysis.

At the same time some other material and leaf litter samples were taken more or less at the spot where the achatinid shells were found. The following species are put on record here.

Sta EG.0612 (see above, 7 species): *Nesopupa farquhari* Pilsbry, 1917 (RMNH 104361/62,

Vertiginidae), *Gastrocopta damarica* (Ancey, 1888) (RMNH 104358, Chondrinidae), *Afroguppya rumrutiensis* (Preston, 1911) (RMNH 104355, Euconulidae), *Cecilioides pergracilis* Connolly, 1939 (RMNH 104360, Ferussaciidae), *Curvella amicitiae* Van Bruggen, 1968 (RMNH 104359, Subulinidae), *Achatina immaculata* Lamarck, 1822 (RMNH 104357, Achatinidae), *Cochlitoma churchilliana* (see above).

Sta EG.0613, 0.5 km SE of Marlin Lodge in litter under shrubs and trees, 27.VII.2006, leg./don. E. Gittenberger (all RMNH, no achatinids found; 10 species): *Tropidophora calcarea* (Sowerby, 1847) (RMNH 14363, Pomatiidae), *Truncatella marginata* Küster, 1855 (RMNH 14367, Truncatellidae), *Melampus parvulus* Pfeiffer, 1856 (RMNH 14368, Ellobiidae), *Nesopupa farquhari* Pilsbry, 1917 (RMNH 104373, Vertiginidae), *Gastrocopta damarica* (Ancey, 1888) (RMNH 104364, Chondrinidae), *Trachycystis rivularis* (Krauss, 1848) (RMNH 104375, Charopidae), *Afroguppya rumrutiensis* (Preston, 1911) (RMNH 104369, Euconulidae), *Cecilioides pergracilis* Connolly, 1939 (RMNH 104372, Ferussaciidae), *Curvella amicitiae* Van Bruggen, 1968 (RMNH 104371, Subulinidae), *Gulella perissodonta* (Sturany, 1898) (RMNH 104370, Streptaxidae; vide Van Bruggen, 2006: 123). The presence of two semi-marine species, *Truncatella marginata* and *Melampus parvulus*, in the material of the last station is an indication that this is not far from the land-sea boundary.

So far the only known published record of land molluscs of the Bazaruto Archipelago is that of *Gulella perissodonta* in Van Bruggen (2006). Therefore all above species are new to this island group. Four taxa, i.e., *Nesopupa farquhari*, *Trachycystis rivularis*, *Cecilioides pergracilis*, and *Curvella amicitiae* are new to the Mozambique list.

According to Herbert & Kilburn (2004: 114) *Nesopupa farquhari* occurs from the Eastern Cape Province in South Africa to the Mozambique border in KwaZulu-Natal – therefore this is a considerable range extension for this taxon. This name may be a synonym of *N. bisulcata* (Jickeli, 1873), a species widely distributed in East and Central Africa.

Herbert & Kilburn (2004: 236) state that *Trachycystis rivularis* (and probable synonyms *T. ordinaria* Melvill & Ponsonby, 1908, and *T. persimilis* Connolly, 1932), is widely distributed in South Africa in (inland) KwaZulu-Natal, Gauteng, Mpumalanga and Limpopo Province “on bushy hills”. So far this complex has not been recorded from Zimbabwe and Mozambique. There do not seem to be coastal records, let alone from dune vegetation at sea level – this indeed makes the Bazaruto shell unusual.

Cecilioides pergracilis is a representative of a subterranean group of which the shells are difficult to identify. Presumably adult shells (whorls c. 5-5+) of the Bazaruto material measure 3.0-4.7 × 0.9-1.4 mm, l/d 3.33-3.57. Compared to metric data in e.g. Van Bruggen & Van Goethem (2001: 155-156, figs 2-12) and Van Bruggen & Rolan (2003: 97, fig. 21) these are very slender shells and indeed are best classified with *C. pergracilis*. The distribution of this taxon (see Van Bruggen & Rolan, 2003, and Herbert & Kilburn, 2004) covers much of south-central Africa, reaching as far as northern Kenya (Verdcourt, 2006). The Benguera record neatly fits into this pattern.

Curvella amicitiae is a widely distributed taxon (Herbert & Kilburn, 2004: 138) known from KwaZulu-Natal (e.g., coastal localities), the Kruger National Park, and Zimbabwe, so that the Mozambique records are not unexpected.

Dr Dai Herbert, in reviewing the manuscript, noted material in the Natal Museum (Pietermaritzburg, South Africa), possibly belonging to *C. churchilliana* (and also other small species discussed above), from Pomene Bay (= Ponta da Barra Falsa) at 22°55-56' S, 35°35' E, and also Xai Xai at “25.11324°S: 33.74019°E”. This would fill the gap between the Bazaruto Archipelago and Maputo Province in Mozambique.

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