

**Additional notes on *Gulella* (Gastropoda Pulmonata: Streptaxidae)  
from the Aldabra group, western Indian Ocean**

A.C. VAN BRUGGEN

Systematic Zoology Section, Leiden university, c/o Rijksmuseum van Natuurlijke Historie,  
P.O. Box 9517, 2300 RA Leiden, The Netherlands

The availability of new material and reconsideration of types and other specimens has necessitated the publication of the following notes,

Acknowledgements are due to Drs. P.B. Mordan of the Mollusca Section, British Museum (Natural History), London (abbreviated BM), and S. Tillier, Laboratoire de Biologie des Invertébrés Marins et de Malacologie, Muséum National d'Histoire Naturelle, Paris, for access to material, and to Dr. A.A. Shileyko, Zoological Museum of Moscow State University, Moscow, for depositing some valuable specimens in the Leiden museum. The abbreviation l/d stands for the ratio length/major diameter of shells; this has been calculated from micrometer readings, so that the figures do not always agree with those calculated from the measurements in mm.

**GULELLA GWENDOLINAE ON COSMOLEDO ISLAND**

At the Eighth International Malacological Congress in Budapest (1983), Dr. Shileyko, through the kind intervention of Dr. I.M. Likharev, confided to the present author some interesting streptaxid material. These specimens were obtained by Dr. Shileyko during his travels calling at various islands in the western Indian ocean (1983).

Among these specimens there are two shells of *Gulella gwendolinae* (Preston, 1910): "Cosmoledo Island, in dry leaves under *Tournefortia* sp. [Boraginaceae], 1.IV.1983, Coll. A.A. Schileyko" (Rijksmuseum van Natuurlijke Historie, Leiden). This may be detailed as Wizard Island of the Cosmoledo group (Shileyko, in litt. 12.V.1986).

Cosmoledo Island, one of the Aldabra group, is situated at 9°36'S 47°40' E at a distance of c. 110 km ESE. from Aldabra Id. and only slightly less so E. of Assumption Id., a small satellite of Aldabra proper. Cosmoledo atoll has a very limited surface above sea level (a total of 4.43 square kilometres), consisting of eight very small islands, of which Wizard Id. ("2 miles long") is the main south-eastern one (data mainly ex Watson, Zusi & Storer, 1963, and Lionnet, 1972). These windswept islands are comparatively arid (rainfall seasonal, average 1000 mm or less, fide Peake, 1971: 584) and support little vegetation (Wizard Island: "sandy, and open", Watson, Zusi & Storer, 1963: 191), an environment definitely hostile to terrestrial molluscs.

The measurements of the two shells are as follows, (1) 3.7 × 1.4 mm, l/d 2.61, length last whorl 1.9 mm, aperture length × width 1.2 × 1.1 mm, 6 whorls; (2) 3.6 × 1.4 mm, l/d 2.64, last whorl 1.9 mm, aperture 1.2 × 1.1 mm, 6 whorls. These may be summarized as 3.6-3.7 × 1.4 mm, l/d 2.61-2.64, last whorl 1.9 mm, aperture 1.2 × 1.1 mm, 6 whorls.

A comparison with the data in Van Bruggen (1975b: 163, table 2) shows that the two Cosmoledo shells evidently belong to the subspecies *G. gwendolinae aldabrae* Van

Bruggen, 1975. It also transpires that the Cosmoledo specimens are smallish and comparatively slender, and therefore most closely resemble shells from Assumption Id. S. of Aldabra proper, which latter is the type locality of the subspecies (see table 1). Undoubtedly the Cosmoledo population(s) at a distance of over a hundred kilometres from Aldabra and from Assumption, are completely isolated from other populations. Although the small sample from Cosmoledo ( $n = 2$ ) almost certainly contains a bias in the range of variation in measurements, these might be construed to indicate dispersal from or relationship to Assumption populations rather than those from Aldabra proper.

The meagre available records of land snails from Cosmoledo (Connolly, 1925: 265-266), viz., only *Gastrocopta tripuncta* (Morelet, 1882) = *G. seignaciana* (Crosse & Fischer, 1879) (according to Fischer-Piette & Vukadinovic, 1974, but not Adam, 1954) and *Tropidophora ligata* (Müller, 1774), both clearly non-endemics, have been recently repeated by Barnacle (1962) and Lionnet (1984). With *Gulella gwendolinae aldabrae* this makes a trio of terrestrial molluscs for Cosmoledo atoll—two minute shells (*Gastrocopta*, *Gulella*), the third one less than medium-sized (maximum c. 23 × 22 mm: *Tropidophora*). A further search might reveal another few non-endemic species with small shells.

The distribution of *Gulella gwendolinae* will be discussed below in the context of the taxon *G. dentiens*.

## GULELLA DENTIENS AND GULELLA GWENDOLINAE ALDABRAE

### *Gulella dentiens* (Morelet, 1883)

*Ennea dentiens* Morelet, 1883, J. Conchyl., Paris 31: 198, pl. 8 fig. 5 (coloured), "île Mayotte", Comoro Is. (by inference, see below); ibidem: 210.

*Ennea (Huttonella) dentiens* — Tryon, 1885, Man. Conch. (2) 1: 105, pl. 19 figs. 21-22 (coloured); Von Moellendorff & Kobelt, 1905, Syst. Conch. Cab. 1-12B (1): 131, pl. 19 fig. 5.

*Gulella dentiens* — Fischer-Piette & Vukadinovic, 1974, Mém. Mus. Natn. Hist. Nat. Paris (N.S.) (A, Zool.) 84: 59, fig. 18; Van Bruggen, 1975, Bull. Brit. Mus. (Nat. Hist.) (Zool.) 28: 173; Van Bruggen, 1978, Palaeoecol. Afr. 10: 173.

In a note added in the proof stage of the 1975 paper of the present author (Van Bruggen, 1975b: 173; see also Van Bruggen, 1978: 173) attention was drawn to *G. dentiens* from the Comoros as published by Fischer-Piette & Vukadinovic (1974): "*Gulella gwendolinae aldabrae* n. subsp. should be compared to *G. dentiens* (Morelet, 1883) ..."

In 1984 the lectotype of this taxon (fig. 1, BM 93.2.4.43) was studied in detail. The shell (Morelet's measurements evidently refer to one shell only, so that it could be con-

locality	length × maj. diam.	l/d	last whorl	aperture	whorls	n
Cosmoledo	3.6-3.7 × 1.4	2.61-2.64	1.9	1.2 × 1.1	6	2
Assumption	3.7-4.7 × 1.5-1.7	2.40-2.84	1.9-2.4	1.2-1.5 × 1.1-1.4	6-7	9
Aldabra	3.6-5.1 × 1.4-1.9	2.23-2.84	1.8-2.4	1.1-1.6 × 1.0-1.4	6-7	47

Table 1. Measurements in mm of shells of *Gulella gwendolinae aldabrae* Van Bruggen, 1975, from various localities throughout its range, the Aldabra group. Data for Aldabra and Assumption Is. taken from Van Bruggen (1975b: 162).

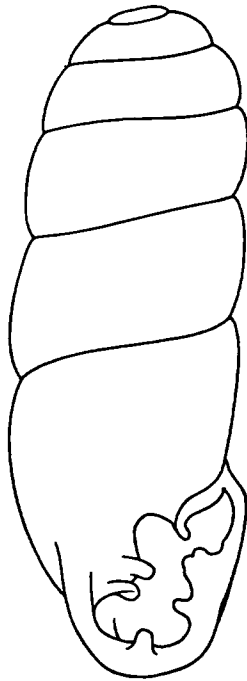


Fig. 1. Outline of lectotype shell of *Gulella dentiens* (Morelet), Mayotte, Comoros, BM 93.2.4.43; actual length 4.7 mm.

sidered the holotype rather than the lectotype) is labelled "E. dentiens Morlt. I. Mayotte". The type locality is not mentioned in the original description, but is inferred from the title of the paper ("Malacologie des Comores. Récolte de M.E. Marie à l'île Mayotte"), its introduction, and the explanation of the relevant plate (pl. 8, "Mollusques de Mayotte"). The lectotype is a fresh and shiny specimen glued onto a small piece of glossy black paper. The measurements are as follows, 4.7 × 1.7 mm (Morelet, 1883: 199, 4.5 × 2.0 mm), l/d 2.68, length last whorl 2.2 mm, aperture 1.4 × 1.4 mm. The shell is absolutely smooth with traces of growth striae; the suture is filiform. There are extremely faint traces of apical spiral sculpture. The apertural dentition shows superficial labral and basal processes; the labral complex corresponds to an external pit, the basal denticle to a small depression on the outside. The columellar complex bears two horizontal lamellae. The umbilicus is almost completely closed and the growth striae are hardly more pronounced in the umbilical area than elsewhere on the shell.

Evidently *G. dentiens* is a rare species. Fischer-Piette & Vukadinovic (1974: 59) in their study on the land molluscs of the Comoro Is., only mention a single shell from Mayotte: "C'est de cette île que nous avons notre seul échantillon (coll. Jousseume)." This shell is in the Paris museum and has the following measurements, 4.4 × 1.8 mm, l/d 2.41, last whorl 2.2 mm, aperture 1.5 × 1.4 mm. The good figure

in the recent Comoro paper (fig. 18 in Fischer-Piette & Vukadinovic, 1974) shows a hint at a deeply situated second basal denticle in the aperture; a scrutiny of the specimen reveals that this is a slip of the pen of the artist. The shell in question is slightly worn, but agrees well with the type. The two known shells of *G. dentiens* may be summarized as 4.4-4.7 × 1.7-1.8 mm, l/d 2.41-2.68, last whorl 2.2 mm, aperture 1.4-1.5 × 1.4 mm, 6 whorls.

The total range of measurements of *G. gwendolinae* (continent of Africa and western Indian Ocean islands) is 3.6-5.5 × 1.4-1.9 mm, l/d 2.00-3.09, aperture 1.1-1.9 × 1.0-1.5 mm, 5½-7 whorls (data computed from table 2 on p. 163 of Van Bruggen, 1975b). The measurements of the two shells of *G. dentiens* are entirely within this range, calculated from 93 specimens (sic!), i.e. particularly those of the subspecies *aldabrae* (see above and table 1).

A comparison with four paratypes of *G. gwendolinae* s.s. (BM 1911.10.12.138-140 and 1937.12.30.549-50; notwithstanding the numbering only four shells were present in 1983) shows that this species differs from *G. dentiens* by the more flaring apertural lip, the labral complex with two inrunning lamellae instead of a large indented top and a smaller lower denticle (both superficial). The suture of *G. gwendolinae* is (sub)crenulate and not filiform as in *G. dentiens*. Of course, the dimensions of the paratypes of *G. gwendolinae* show these to be larger than *G. dentiens*, but this difference disappears when Aldabra specimens are compared.

In view of the wide distribution of and its similarity to *G. gwendolinae*, *G. dentiens* might well be a link in the chain of that species. Incidentally, this would have dire consequences for the nomenclature, because Morelet's 1883 name is the oldest available, antedating Preston's 1910 name by 27 years. On the other hand, because of the differences discussed above and the very limited material of *G. dentiens* (and therefore a lack of knowledge of the variation in shell characters), it is deemed advisable for the time being to consider *G. dentiens* a species in its own right. It is obvious that the nominal taxa *G. dentiens* and *G. gwendolinae aldabrae* share a recent common ancestor.

#### A NOTE ON THE DISTRIBUTION OF THE GULELLA GWENDOLINAE COMPLEX

A short consideration of the distribution of the *Gulella gwendolinae* complex (fig. 2) in the light of the new record seems in order. The species is very widely distributed on the African continent, in fact much more widely than most of its congeners; its obviously interrupted range stretches from the coast of East Africa to as far west as Lake Chad in West Africa. Of the western Indian Ocean islands, it is only known to inhabit the Aldabra group (Aldabra, Assumption, Cosmoledo Is.), unless the nominal taxon *G. dentiens* from the Comoro Is. (Mayotte) represents a subspecies or is a synonym. For the time being no species of *Gulella* with a shell resembling that of *G. dentiens* are known from Madagascar (see checklist in Van Bruggen, 1980). The same applies to the Seychelles Is. (Van Bruggen, unpublished data).

There is an intrinsic difference between the Aldabra group and the Comoros. The former are at most (elevated) atolls, the later belong to the so-called 'high islands', defined by Peake (1971: 583) as "Granitic, possibly once connected to a continental area". Mayotte, where *G. dentiens* occurs, has several peaks of over 500 m with a maximum of over 700 m. The Aldabra group consists of coral limestone (nowhere reaching

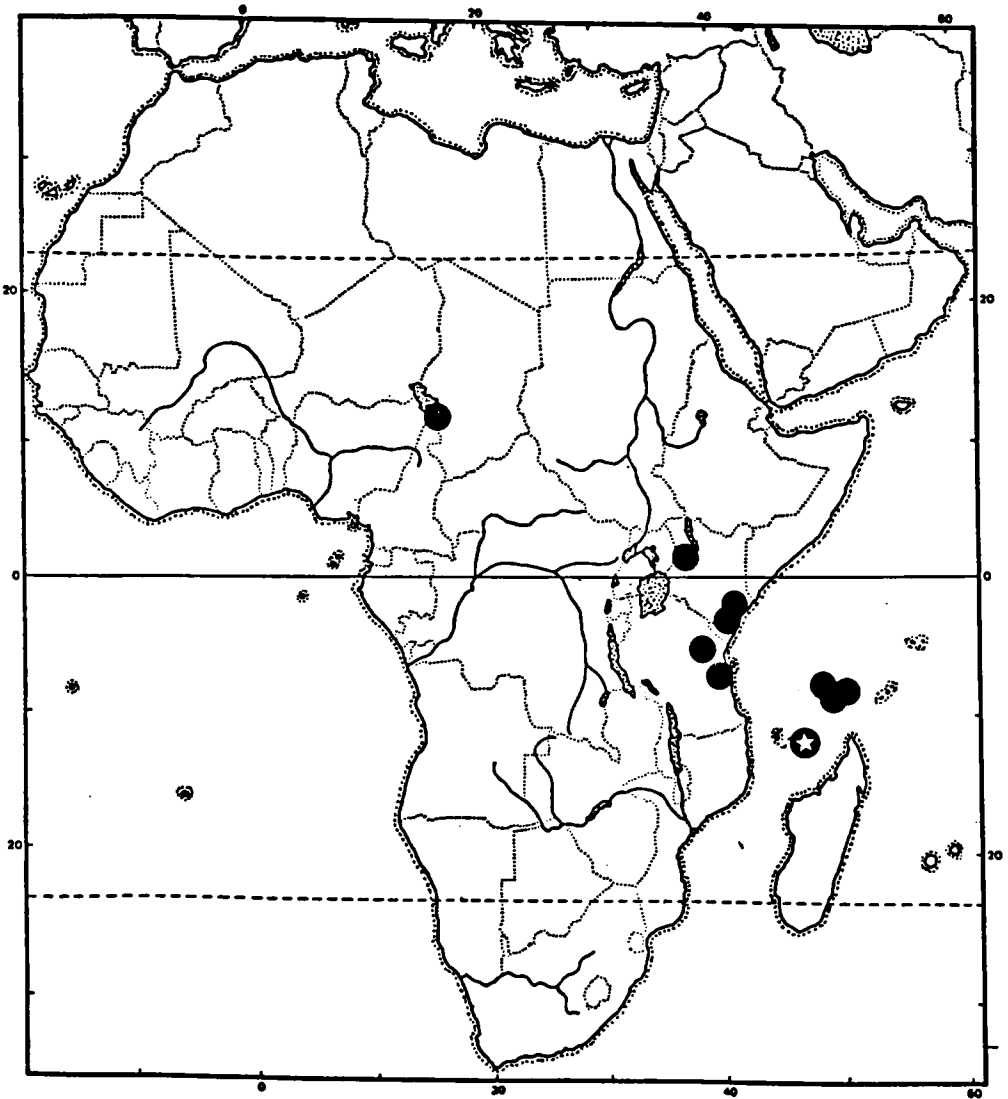


Fig. 2. Distribution of *Gulella gwendolinae* (Preston) (dots); the range of *G. dentiens* (possibly a subspecies or synonym), viz. Mayotte in the Comoros, has been indicated by a star.

beyond c. 8 m above sea level), although sand dunes on top of this may be as high as 25 m (data ex Watson, Zusi & Storer, 1963; for Aldabra see Stoddart et al., 1971). This implies that the Comoro Is. very probably are remains of the ancient super-continent Gondwanaland and as such may never have been completely submerged under the waters of the Indian Ocean.

The slightly elevated reefs of the Aldabra Is. are situated on the summits of high volcanic mountains on a flat sea bottom. The surface consists entirely of coral limestone, so that one may infer that at one time or another the islands must have been completely submerged, which would have made any terrestrial life impossible. Cogan, Hutson & Shaffer (1971: 322) in their discussion of the insect fauna of Aldabra state: "The most recent estimate of the last major submergence of Aldabra is in the region of 32 000 to 38 000 years ago. Those parts of the atoll which were not submerged, however, are considerably older than this, perhaps in excess of 100 000 years." Even so, notwithstanding the greater age of some (minor) parts of the Aldabra group, the islands must have emerged from the ocean without connections with any land mass.

Here again we meet with the dilemma: vicariance or dispersal? Occurrence on the ex-Gondwanaland Comoros and on the continent of Africa would be in accordance with the vicariance paradigm. But what of the populations now living on at least three of the Aldabra group? Van Bruggen (1975b: 164, 173) has postulated dispersal from Africa, although all possibilities investigated have been falsified. However, in this case vicariance seems to be out of the question, because of the much more recent age of the Aldabra group which must have arisen in splendid isolation as regards land connections.

There are many cases of animals and plants on Aldabra and its satellites which show (close) affinities with those of Africa (see quotations and discussion in Van Bruggen, 1975b: 162-163). The case of *G. peakei* is almost parallel to that of *G. gwendolinae*; while *G. p. peakei* Van Bruggen, 1975, is known from Quaternary deposits on Aldabra Id. (pre- and post 125,000 years BP), *G. p. continentalis* Van Bruggen, 1975, has been found to live in Zululand, NE. South Africa (Van Bruggen, 1975a, 1978). Extinction on Aldabra may have been caused by a deterioration of the climate, which may not have harmed the more widely tolerant *G. gwendolinae*. The wide range in continental Africa shows that the latter is able to adapt to a variety of climates with concomitant types of vegetation.

If indeed at one stage all islands of the Aldabra group have been completely submerged in the Indian Ocean, then the terrestrial fauna and flora must have originated de novo, for which we may only invoke dispersal .....

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