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Notes on the genus *Conulinus* MARTENS (Enidae).

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With 10 figures.

CONNOLLY (1939: 421) has shown that this name can be used for a small group of species closely akin to *Cerastua* STRAND (= *Cerastus* ALBERS non DEJEAN) and that the type of *Conulinus* is *Buliminus ugandae* MARTENS as selected by WOODWARD (1896: 59). ZILCH (1959: 194) keeps *Conulinus* and *Edouardia* GUDE together under the former name and gives the type as *C. conulus* (REEVE) which is a true *Edouardia*. It is possible that when extensive comparative anatomical data concerning all the tropical African Enidae are available, *Conulinus* will prove to be no more than a subgenus of *Cerastua*; it does, however, appear to be distinct from *Edouardia* and it is clearly very different from the narrow members of that genus which occur in East Africa. The following published names belong to *Conulinus: Buliminus ugandae* MARTENS, 1895; *Mabilliella daubenbergeri* DAUTZENBERG, 1908; *Pachnodus rutshuruensis* PILSBRY, 1919; *Conulinus nyiroensis* CONNOLLY, 1925 and *Conulinus carpenteri* CONNOLLY, 1927. Since then material has been collected which does not appear to be referable to the typical forms of any of these species and one new taxon is described later in this paper. Also, I have been unable to agree with some of CONNOLLY's conclusions.

The differences between the species are rather subtle and mainly limited to details of shell shape and sculpture. The following key will, it is hoped, aid in identification, each species being treated in more detail in the descriptive section which follows it. I have included locality details of several unidentified species or variants in the hope that some collector will attempt to obtain more material.

Key to the species of *Conulinus*.

1. Base of the columella truncate; shell large, 17×12 mm., whorls below the smooth apex with quite strong spaced ribs *daubenbergeri*.
— Base of columella not truncate 2

2. Shell broader and more globose, 10·5-11·5 mm. wide when quite adult; not strongly ribbed but close striae visible, particularly in worn shells *rutshuruensis*.
— Shell narrower with a more pronounced spire, mostly under 9·5 mm. wide but sometimes attaining 10 mm. when fully adult 3

3. Shell with rather strong spaced costae or with closer clear-cut striae 4
— Shell with much less evident ribs or striae, practically smooth when fresh. . *ugandae.*

4. Shell narrower with more rounded sides, 13×8 mm.; ribs spaced and clearly raised (Sudan) .... *carpenteri.*
— Shell with a conical spire 5

5. Shell with clear close incised striae (Uraguess) *C.* sp.
— Shell with marked spaced ribs (Marsabit) *C.* sp.

Conulinus (MARTENS).

1895 *Buliminus (Conulinus)* MARTENS, Nachrbl. dtsch. malak. Ges., **27**: 180 and in Deutsch Ost-Afrika, Beschalte Weichthiere, 64 (1897).

Conulinus daubenbergeri (DAUTZENBERG).

Fig. 8.

1908 *Mabilliella daubenbergeri* DAUTZENBERG, J. de Conch., **56**: 10, pl. 1 f. 11-13.
1910 *Mabilliella daubenbergeri,* — D'AILLY in SJÖSTEDT, Kil.-Meru-Exped., **6**: 19, pl. 1 f. 26.
1936 *Cerastus daubenbergeri,* — HAAS, Abh. senckenb. naturf. Ges., **431**: 22.

I examined the type of this species in Paris several years ago. The shell is a pale yellowish-horn colour and the last whorl is inflated; all the whorls are quite strongly ribbed and spiral striae are not evident.

Among material given by K. L. PFEIFFER to H. WATSON were some bodies said to be those of *daubenbergeri* and although I have not seen the associated shells the material is from the type locality. The body is dark leaden-grey; mantle mostly black with a mottling of white spots and lines. There does appear to be a difference separating this species from *ugandae* and *rutshuruensis*; the common duct joining the penis and the penial appendage to the atrium is considerably longer in *daubenbergeri* and the penial caecum is swollen distally. CONNOLLY (1925) and GERMAIN (1923) record this species from Kakamega, Yala and Uraguess in Kenya but all of these records are based on misidentifications. Material from the third locality is reported under the unpublished name *percivali* PRESTON by GERMAIN who gives a figure under this name (pl. 2 f. 56). I have only seen *daubenbergeri* from Tanzania.

Distribution: Tanzania, Masai District: Ngorongoro, Oldeani, KOHL-LARSEN (SMF 186540-1/3+1). Mt. Meru, 3000-3500 m., upper part of rain forest, SJÖSTEDT (Nat. Hist. Mus. Stockholm). Kilimanjaro, 1500 m., DAUBENBERGER (holotype, Muséum Nat. d'Hist. Nat., Paris); Kilimanjaro, Marangu, 5-8000 ft., COLLINS (National Museum, Nairobi); Kilimanjaro, rain forest above Marangu, c. 2200 m., K. L. PFEIFFER (animals in British Museum (Nat. Hist.) and shells in SMF 104636/10); Kilimanjaro, Kibonoto, 2000-2500 m., in rain forest, SJÖSTEDT (Nat. Hist. Museum, Stockholm).

Conulinus rutshuruensis (PILSBRY).

1919 *Pachnodus rutshuruensis* PILSBRY, Bull. Amer. Mus. nat. Hist., 40: 307, f. 156.
1925 *Conulinus rutshuruensis,* — CONNOLLY, Ann. Mag. nat. Hist., (9) **15**: 478.

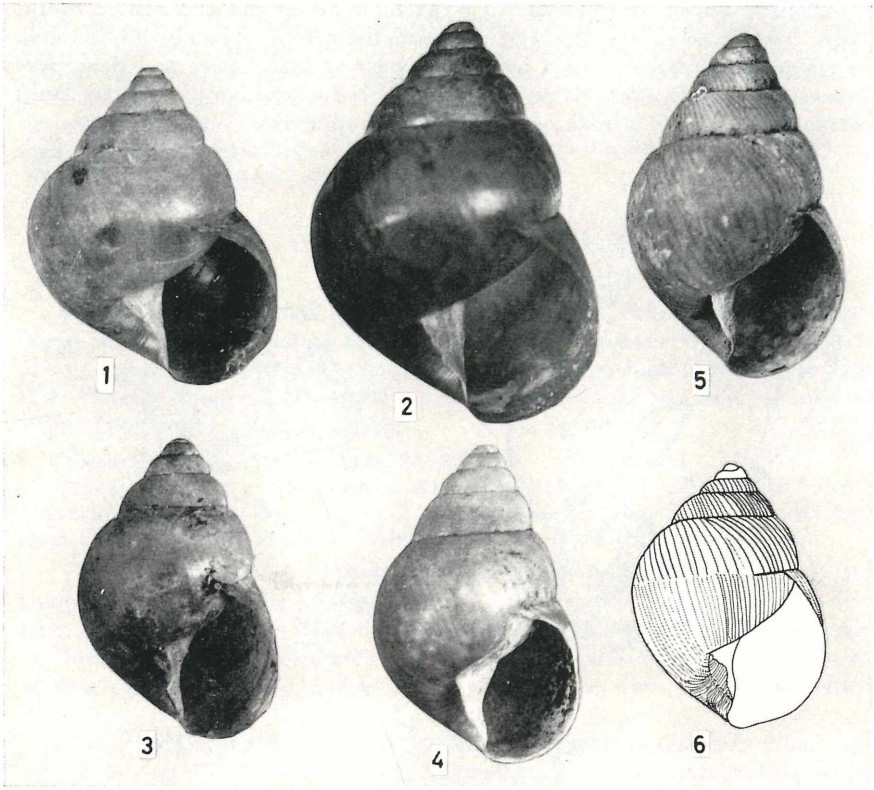

Fig. 1. *Conulinus rutshuruensis rutshuruensis* (PILSBRY). — Uganda, Entebbe, HALE CARPENTER; ×3.
Fig. 2. *Conulinus rutshuruensis major* n. subsp., holotype. — Kenya, Nandi Forest; ×3.
Figs. 3-4. *Conulinus ugandae ugandae* (MARTENS). — Kenya, Thika, Chania Gorge, B. VERDCOURT; ×3.
Fig. 5. *Conulinus* n. sp. — Kenya, Marsabit, B. VERDCOURT; ×3.
Fig. 6. *Conulinus ugandae* (MARTENS) var. ? — Kenya, Marsabit; ×3.

rutshuruensis rutshuruensis.

Figs. 1, 10.

The material cited below, mostly in the National Museum, Nairobi, matches PILSBRY's original description very well but I have not seen the type. Through the kindness of Dr. R. KILIAS I have been able to examine the worn holotype of *Buliminus ugandae* MARTENS of which only a very worn paratype exists in the British Museum (Nat. Hist.). Monyonyo, the type locality, is in the Mengo District of Uganda close to the other localities mentioned, with the exception of Bwamba and it was thought that it might prove to be the earliest name for the species under consideration. This supposition proved to be incorrect and MARTENS' figure showing a narrower shell is accurate.

The Isuria specimens measure 13·5-14 mm. in height and 10·5 mm. in width; those from Entebbe are 15×11·5 mm. and those from Bwamba 14×11 mm. Mr. HARRIES collected several living specimens at Mara River and these have been examined. The body is grey in front with the hind body, sole and flanks whitish. The mantle is black with white lines and marks.

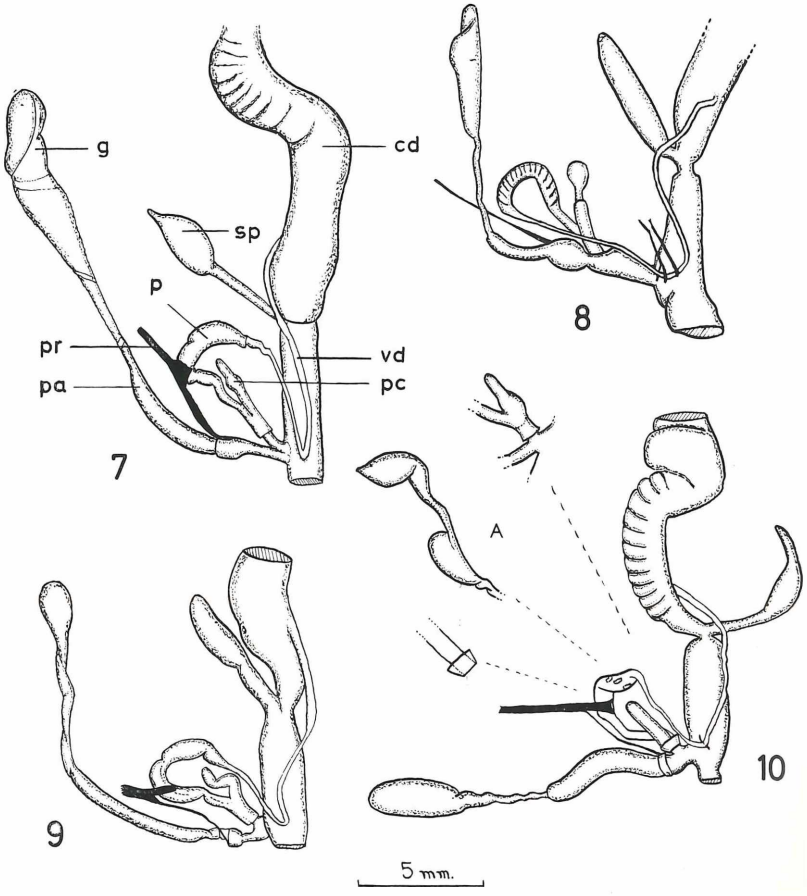

Fig. 7. *Conulinus ugandae ugandae* (MARTENS), part of genitalia. — Kenya, Karura Forest, POLHILL 66.

Fig. 8. *Conulinus daubenbergeri* (DAUTZENBERG), part of genitalia. — Tanzania, Kilimanjaro, K. L. PFEIFFER.

Fig. 9. *Conulinus ugandae ugandae* (MARTENS), part of genitalia. — Kenya, Thika, Chania Gorge, POLHILL 107.

Fig. 10. *Conulinus rutshuruensis rutshuruensis* (PILSBRY), part of genitalia and (A) spermatheca from a second individual. Kenya, Isuria Escarpment, HARRIES. — *cd* common duct, *g* gland of penial appendage, *p* penis, *pa* penial appendage, *pc* penial caecum, *pr* penial retractor and branch, *sp* spermatheca, *vd* vas deferens.

Distribution: Congo Republic, Rutshuru, BEQUAERT (holotype and paratypes in Acad. Nat. Sci. Philadelphia). Ituri Forest, Penge, BEQUAERT (Acad. Nat. Sci. Philadelphia). Uganda, Jinja and Kampala (fide CONNOLLY). Entebbe, HALE CARPENTER (British Museum, (Nat. Hist.) and National Museum, Nairobi). Bwamba Forest, HALE CARPENTER (British Museum (Nat. Hist.) and National Museum, Nairobi — wrongly determined as *daubenbergeri* by CONNOLLY). Kenya, Narok District, Mara River, Isuria Escarpment, Governor's Camp, C. W. P. HARRIES (British Museum (Nat. Hist.), National Museum, Nairobi and SMF 186548/3).

rutshuruensis major n. subsp.

Fig. 2.

Shell ovate with conical spire, dark horn-coloured, covered with a velvety bloom which when rubbed off reveals the shiny shell beneath. Upper $2^1/_2$ whorls almost smooth but seen to be minutely wrinkled under high powers; rest with faint scarcely raised ribs and growth lines crossed by very fine close microspiral striae. Umbilicus narrow and deep.

Dimensions: Height 17 mm. breadth 11·5 mm.

Distribution: Kenya, Nandi Forest, Kapsabet, inside rotting logs, Mrs. D. POWELL (holotype in SMF 186549, paratypes in the National Museum, Nairobi, British Museum (Nat. Hist.) and Musée de l'Afrique Centrale, Tervuren).

This subspecies clearly differs from the typical one by its larger size and compared with the type of *daubenbergeri,* apart from the lack of columellar truncation, has a more produced spire with straight sides, is much less rounded and inflated in its general outline and also has smoothish upper whorls with evident spiral striae; the darker almost plum colour when fresh is an added distinction.

It is certain that the material recorded and figured by GERMAIN (1923: 64, pl. 3 f. 74, pl. 4 f. 90) from Kenya, Kakamega, Yala R. as *daubenbergeri* belongs properly to *rutshuruensis* but all his material was juvenile and I have seen no adult material from Kakamega. In his text he states that BABAULT found only young specimens 6 mm. long but if his f. 90 is $\times 3$ as stated then the shell it depicts must be 11 mm. long. Until some adequate material is available it will not be certain to which subspecies it belongs but it is probably the larger one. CONNOLLY (1925) copied GERMAIN's localities and determinations.

Conulinus ugandae (MARTENS).

1895 *Buliminus ugandae* MARTENS, Nachrbl. dtsch. malak. Ges., **27**: 180 and in Deutsch Ost-Afrika, Beschalte Weichthiere, 65, pl. 3 f. 33 (1897).

ugandae ugandae.

Figs. 3, 4, 7, 9.

The type is a narrow shell and only the slightest differences between it and the Kenya material can be detected e. g. a faintly less marked circum-umbilical ridge. I can see no reason for considering the Kenya shells worthy of a different name. The type material is exceedingly poor and no further material has been found in Uganda; in fact all the material found in Uganda has proved to

be *rutshuruensis* and the question arises whether the type material is not perhaps an abnormally narrow freak of that species after all. Only extensive collections from Uganda will decide this point. It is not likely that Stuhlmann's material was wrongly localised. The following description is drawn up from Thika material.

Shell shortly ovate-turriform, rather narrowly and deeply umbilicate, the whorls visible within to the apex, rather thin, more or less smooth, pale corneous brown, with a mat covering but very shiny beneath; sides of the spire slightly convex, summit more or less acute save for the extreme apex which is blunt; apical angle about 50° Whorls 6, convex, the first 2¼ practically smooth, but actually with exceedingly fine transverse striolae, rest with rather irregular, obscure, low, curved ribs which are strongly sinuate near the suture but nowhere really clear cut and crisp; suture marked. Aperture irregularly pyriform, outer edge rounded, slightly receding to the base; columella strongly reflected over the umbilicus, almost truncate at the base, there being a fold and groove caused by the marked compression of the body around the umbilicus. This circumumbilical ridge is characteristic of the genus and also occurs in certain species of *Cerastua*.

Dimensions (mm.)

	Length	Breadth
Thika	14·5	9
	14	9·7
	14	9·5
	14	8·5
	13	9·5
Nairobi	12·5	8·5
Sagana	15	10
	14	9
	11·5	8·5

Distribution: Uganda, Monyonyo, STUHLMANN (holotype in Zool. Museum, Berlin and paratype in British Museum (Nat. Hist.)). Kenya, Thika, Chania Gorge, in riverine forest of *Newtonia, Filicium, Ficus, Adina, Heywoodia* etc., 19 Sept. 1953, B. & L. VERDCOURT (SMF 186550-1/6 and in British Museum (Nat. Hist.) and National Museum, Nairobi) and same locality, B. VERDCOURT (National Museum, Nairobi) and same locality, 18 June 1960, R. M. POLHILL 107 (National Museum, Nairobi). Ngong Hills, 8 May 1960, R. M. POLHILL 63 (National Museum, Nairobi). Nairobi, Karura Forest, May 1960 and 7 June 1960, R. M. POLHILL 66 and 94 (National Museum, Nairobi). Mt. Kenya, R. Sagana, H. COPLEY (National Museum, Nairobi 1305, 1306).

Mr. POLHILL collected living material in the Karura Forest and a diagram of the genitalia is given in fig. 7. The hind body is greyer than in *rutshuruensis* from Isuria and the mantle is blacker with more dendritic marks. The same collector also collected living material in the Chania Gorge, Thika; here the animal is white and the mantle black with white dendritic marks.

When I first found this snail in Kenya I identified it with PILSBRY's *rutshuruensis* but realised that it did not really match the description very well; although closely allied it is relatively narrower and has a more exserted spire, the ribs are more pronounced but the spiral striae are fainter. These differences

although small, indicate a different taxon. *C. ugandae* is as a rule actually narrower than *rutshuruensis* but although it is only a matter of about 1 mm., and often not even that, the shape is different even when the dimensions are identical.

ugandae nyiroensis CONNOLLY.

1925 *Conulinus nyiroensis* CONNOLLY, Ann. Mag. nat. Hist., (15) 9: 478, pl. 28 f. 19.

The type set of four shells are, I am certain, juvenile and measure only 10·5-11×6·5-7·5 mm. The spire is rounded and the surface rather shiny and finely striate, probably due to the slightly worn condition of the specimens. Compared with juveniles of *u. ugandae* there is scarcely any difference in shape but until further material is obtained from Mt. Nyiro, a locality only once or twice visited by zoological collectors who have paid any attention to molluscs, my association of the two as subspecies will not be confirmed.

Distribution: Kenya, Northern Frontier Province, Mt. Nyiro, 8300 ft., collector? (holotype and paratypes in British Museum (Nat. Hist.)).

ugandae n. subsp. ?

In the collections of the British Museum (Nat. Hist.) there is a single shell which is almost identical with *ugandae* in size but has clear close striae. CONNOLLY had identified this shell with *ugandae*. PRESTON had given the shell a manuscript specific epithet meaning ‚brother'. GERMAIN (1923: pl. 2 f. 56) figures a *Conulinus* from Uraguess associating it with the nomen nudum *C. percivali* PRESTON.

Distribution: Kenya, Northern Frontier Province, Mathews Range, Uraguess, ? PERCIVAL (British Museum (Nat. Hist.)).

ugandae forma ?

Fig. 6.

Whilst reading through some of the late H. WATSON's correspondence, I noticed one letter which indicated that there were some shells of a ‚*Xerocerastus*' from Marsabit in the Zoological Museum in Amsterdam. WATSON had intended to monograph that genus. It was, however, highly improbable that any species belonging to it could occur in Kenya and I wrote to Mrs. VAN DER FEEN asking if the material could be sent on loan. Examination of the specimens she kindly sent showed them to belong to a species of *Conulinus* but not exactly matching the specimens collected on Marsabit by myself. Until more material is available from the mountain forests of the Northern Frontier Province of Kenya it is best to leave these forms, known only from a few poor shells, unnamed. They may be only subspecies or varieties of *C. ugandae* with more developed striation. This present form is characterised as follows. Shell ovate- globose with a short spire. No adults were available but there are 5¼ whorls in the largest specimens. The ribs are quite marked, 3-7 per mm.

Dimensions: Height 11 mm., breadth 8·5 mm.

Distribution: Kenya, Northern Frontier Province, Mt. Marsabit, collector not stated but received by the Zoological Museum, Amsterdam from J. R. LE B. TOMLIN.

Conulinus carpenteri Connolly.

1927 *Conulinus carpenteri* Connolly, Proc. malac. Soc., **17**: 171, f. 1 B.

This species has a rather distinctive, narrowly oval shell with rounded sides. The sculpture consists of strong spaced ribs and fine spiral striae.

Dimensions: Height 13·1 mm., breadth 8·4 mm.

Distribution: Sudan Republic, Didinga Mts., Nagichot, Hale Carpenter (holotype and paratypes in British Museum (Nat. Hist.)).

Conulinus sp.

Two small juvenile shells bearing a manuscript name of Preston's referring to ‚a little fountain' are similar in many respects to *C. carpenteri* but are narrower with a more pointed spire. Without more material its identity cannot be decided.

Distribution: Kenya, between the Igembi Hills and Nyeri (British Museum (Nat. Hist.)).

Conulinus n. sp.

Fig. 5.

This species is represented by only three worn shells quite insufficient for associating with a new name. The shell is narrowly ovate with a conical spire; lower whorls quite strongly ribbed, 3-5 per mm.; umbilicus narrow and deep.

Dimensions: Height 14·8-15 mm., breadth 9·2-9·5 mm.

Distribution: Kenya, Northern Frontier Province, Mt. Marsabit, Aug. 1957, B. Verdcourt (National Museum, Nairobi).

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