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## NOTES ON EAST AFRICAN LAND AND FRESHWATER SNAILS, 12-15

by

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With 16 text-figures and three plates

The following notes mostly concern the description of new species from East Africa in connection with renewed work on a check-list of the non-marine Mollusca of that area which has been in preparation during the past 25 years. A fairly complete manuscript has been available for many years but additional material and further research continually render it in need of revision. Previous notes in this series were published in *Basteria*, the last being Verdcourt (1978).

A number of the professional photos have been kindly made by Mr. A. 't Hooft of the Department of Systematics and Evolutionary Biology of the University, Leiden; Dr. A. C. van Bruggen of the same university department has made the paper ready for the press.

The following abbreviations are used in the text: BM, British Museum (Natural History), London; MRAC, Musée Royal d'Afrique Centrale, Tervuren; NM, National Museum, Nairobi (formerly Coryndon Museum); RMNH, Rijksmuseum van Natuurlijke Historie, Leiden. In the genitalia drawings the following abbreviations have been used: A - atrium; C - caecum; CD - common duct; CG - calcareous gland; E - epiphallus; F - flagellum; P - penis; PA - penial appendage; PIL - pilaster; PR - penial retractor; S - spermatheca; SD - spermathecal duct; SP - spermatophore; U - uterus; V - vagina; VD - vas deferens; W1 - wall 1; WII - wall 2.

### 12. A NEW SPECIES OF *RHACHISTIA* (ENIDAE) FROM THE KENYA COAST

In January 1958 I found on the Kenya coast opposite the island of Lamu a single specimen of a colourful enid snail which was unlike any I had seen before in East Africa. Attempts to name the species proved inconclusive.

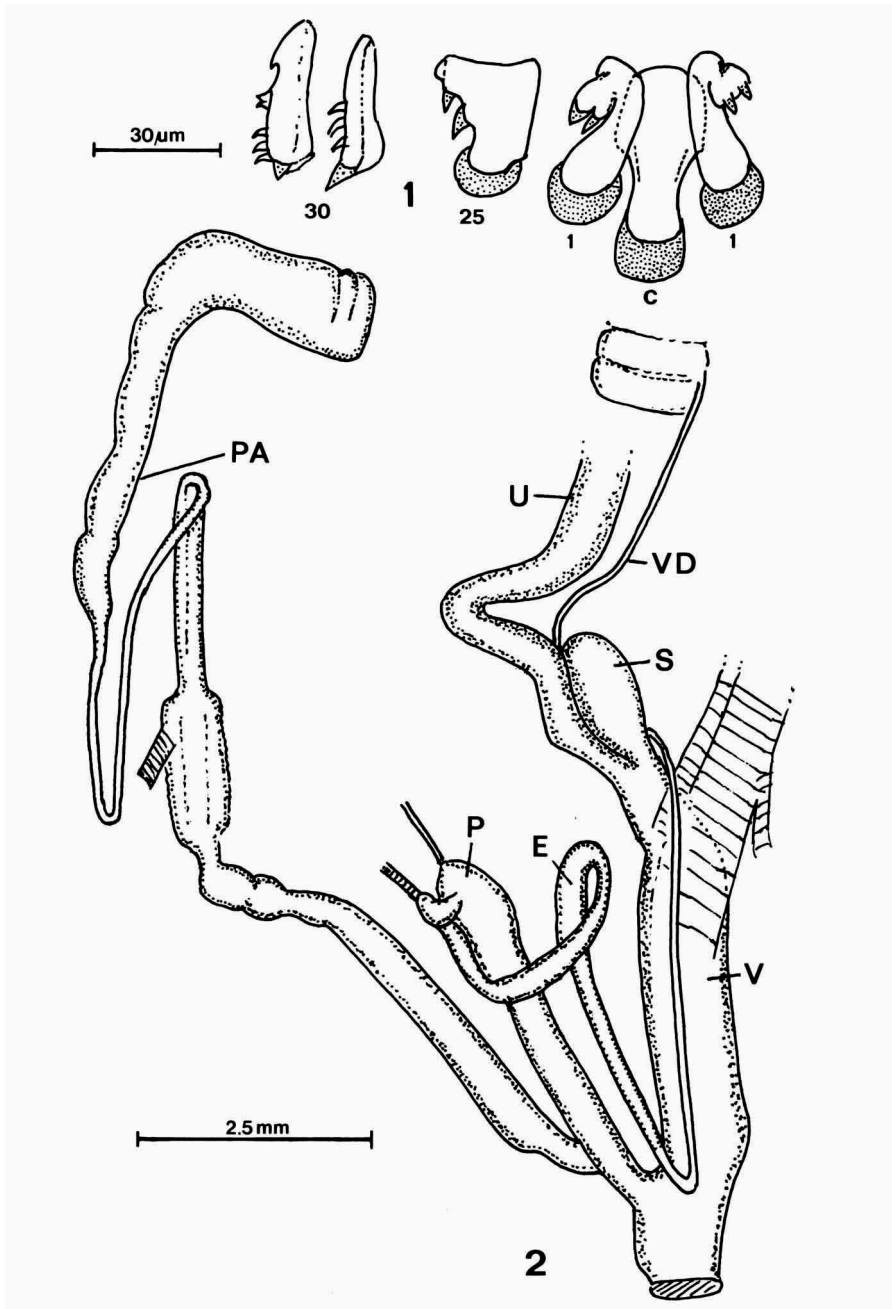
In November 1961 R. M. Polhill found another single specimen at Marafa, 40 km NW. of Malindi, some 125 km SSW. of my locality, which specimen differed in only slight details of the pattern and clearly belonged to exactly the same taxon. Since then no other material has turned up and I have decided to describe it to avoid the possibility of the material being overlooked. The taxonomy of this group is greatly confused by the variation in colour pattern found in many of the

species. Until a general revision has been carried out including anatomical studies these problems will remain. I can only claim that I do not think the taxon described below is merely a colour form of some already described species. It is considerably broader in contour than the very variable *Rhachidina braunsi* (Von Martens) which exists in a multitude of colour forms on the coast. *R. boehmi* (Von Martens) has similarly positioned bands but is white with black bands and is a species of a quite different zoogeographical region. I suspect the true affinity lies with the snail described from a specimen collected at Magila, Tanga District, Tanzania by O. Neumann as *Buliminus (Rhachis) melanacme* (Pfeiffer) var. *neumanni* (Von Martens, 1897: 76). I examined the type of this at Berlin some twenty years ago but have seen no other material to match it. The type measures 13 × 9 mm. The upper half of the body whorl, the rest of the spire and an area around the umbilicus are dark purple-brown; the lower half of the body whorl is white with a single rather narrow dark purple-brown band below the periphery. Spiral striae are almost absent. In the species described beneath the spiral striae are evident and the area around the umbilicus is not dark.

***Rhachistia carnea* sp. nov.** (figs. 1, 2; pl. 1 figs. a, b)

Shell (pl. 1 figs. a-b) ovoid-conic, very narrowly umbilicate, thin, fairly glossy. Colouration: apex missing from both specimens but apical two whorls probably entirely pale to medium horn-coloured; in the type the upper part of the body whorl and the next 1½ whorls above are pale flesh-pink which was much brighter in the fresh specimen but has since faded; the lower margin of this pink area on the body whorl is demarcated by a rich brown narrow peripheral band which forms the upper of the two bands on the body whorl; this band continues upwards forming a sutural band but finally becomes obscure dissolving into a series of obscure dashes; on the two whorls above the body whorl there is a pale brown mid-band which although continuous is actually a row of joined rather obscure spots; the pink colouration is not uniform but there are very faint transverse bands of slightly darker colour; the base of the body whorl is yellowish cream with a very distinct band below the periphery; in the other specimen the colouring is similar save that the peripheral demarcating band is much more obscure and consists of obscure dashes joined by a very faint line. Spire produced, the sides almost straight, actual apex probably broadly rounded; apical angle about 50°. Whorls 4-5, but exact number not known, moderately convex, smoothly rounded and not keeled at the periphery, all covered with very close very fine transverse striae crossed by close fine spiral striae giving a fine decussation visible only under a lens; suture moderately impressed. Aperture ovate-oblong, the peristome sharp save near columella where it is strongly reflected over the umbilicus.

Dimensions of holotype: height 15 + mm, breadth 10 mm, height of aperture 8.5 mm, breadth 6 mm; paratype: height 15 + mm, breadth 9.5 mm, height of aperture 8.5 mm, breadth 6 mm.



Figs. 1-2. *Rhachistia carnea* sp. nov. 1, selected teeth from radula; 2, part of genital anatomy.

Distribution. Kenya: Coast Province. Kilifi District, 40 km NW of Malindi, Marafa, 60 m alt., November 1961, R.M. Polhill 216 (BM, paratype); Lamu District, mainland, Mkwewe, January 1958, B. Verdcourt (RMNH, holotype).

The specimen from Mkwewe contained a hardened but partly extended body showing that it had probably died of desiccation whilst moving in hot midday sun to a place where no shade was available. As much as possible of this body was snipped off and soaked for several days in disodium hydrogen phosphate ( $\text{Na}_2\text{HPO}_4$ ). In this way a little could be made of the genital anatomy and a radula and jaw prepared. Some details of these are described below.

The jaw is slightly arcuate, very pale horn-coloured and devoid of gross sculpture, 1.32 mm across and 0.3-0.32 mm deep; the ends are rounded. It displays insufficient diagnostic characters to make illustration worthwhile. The radula measures about 3.8 mm long, 1.73 mm wide, narrowed towards the nascent end and contains about 95 rows of teeth. The formula is 46.c.46, about 6 of the teeth on either side of the central being true laterals but the change is very gradual. The cusps of all but the outer teeth are large and rounded. Selected teeth from a row are shown in fig. 1. They very closely resemble the figure given by Peile (1938: 52, fig. 2) of the radula of *Rhachistia bengalensis* (Lamarck) which has influenced me in my generic placing of the new species. Peile also reproduces Godwin-Austen's drawing of the genitalia of *R. bengalensis* but the details are difficult to make out. The epiphallus and flagellum are different from the Kenya species, the anatomy of which is figured in fig. 2. Since the reconstituted material was not ideal this figure probably contains errors; there may well have been a small flagellum, possibly what I have taken to be a retractor muscle. It seemed wisest to obtain as much information as possible from the fragmentary animal despite the strong chance of misinterpretation. The penial appendage is of a very characteristic shape and is I hope not far from the actual shape.

It seems likely that this colourful species is rare since no other specimens have been found in museum collections. It may be restricted to the northern coasts of Kenya, an area which has not been explored very thoroughly for molluscs.

### 13. A NOTE ON THE ANATOMY OF *STREPTOSTELE LENTA* (E. A. SMITH)

The collection of numerous specimens of *Streptostele lenta* in spirit in 1964 enabled some details of the anatomy of this species to be made out. *S. lenta* was described from the Mau Escarpment, based on material collected by W. Doherty who probably worked on the building of the Mombasa to Kampala railway. Details of the specimens are as follows.

Kenya: Naivasha District, W. end of Lake Naivasha, lakeside grove of *Acacia xanthophloea*, on fallen rotting trunks in more shaded places, 1860 m, 21 March 1964, R.M. Polhill 239 (animal white with salmon pink tentacles and tentacle muscles; dry and spirit material and preparations in RMNH). These specimens have been compared with the types of *S. lenta* and of *S. exasperata* Preston both of

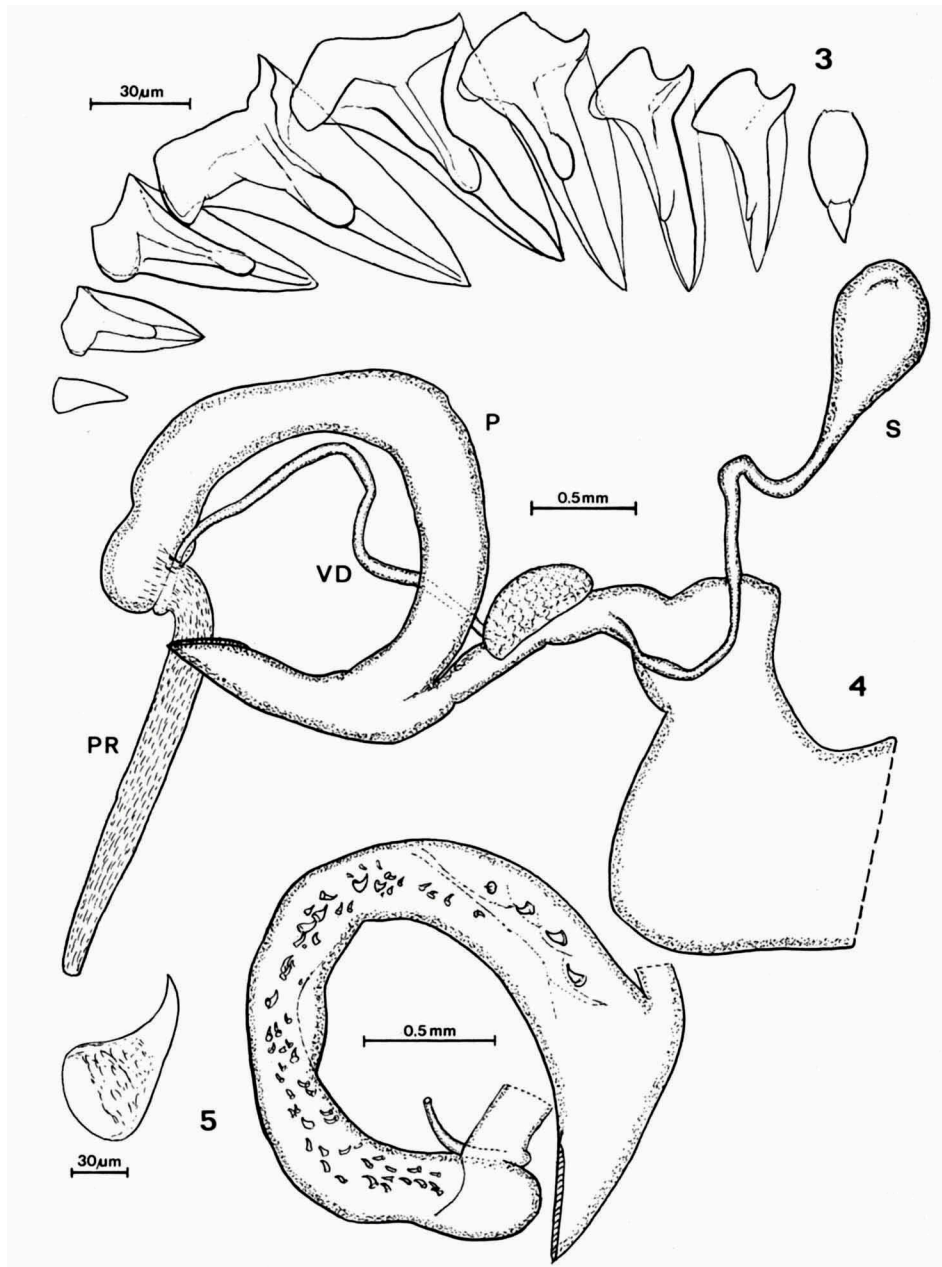
which species they resemble. Although slightly less silky in appearance than *S. lenta*, I do not think they can be distinguished from it.

The species is ovoviviparous and the specimen dissected contained two embryos, one 1.5 mm long and the other 2.5-3 mm long. The radula is already well-developed in these embryos, the largest having 26 rows and formula 5.c.5. The adult radula has 43 rows and formula  $(1 + )7.c.7(+1)$ . Details of the teeth are shown in fig. 3 in which a complete half-row of the radula is depicted. The teeth closely resemble those of *S. exasperata* (Adam, 1965: fig. 3) which also has 8 teeth in each half row with the 4th the largest. Pilsbry (1919: fig. 67) figures the radula of *Varicostele bequaertiana* Pilsbry. This has 17 teeth in each half row with the 10th the largest. Ortiz de Zárate López & Ortiz de Zárate Rocandio (1955: fig. 5R) figure the radula of *Streptostele* (*Tomostele*) *truncata* Germain in which each half row has 8 teeth of which the 3rd is the biggest. Thiele (1911: fig. I & II) figures the radulae of *S. buchholzi* Von Martens and *Varicostele subvaricosa* (Von Martens). In all these radulae the central tooth is well-marked as distinct from the genus *Gulella*.

The genital anatomy is shown in part in fig. 4 and the internal penial armature in fig. 5. The spinules are small and numerous and there is no penial appendage. Pilsbry (1919: fig. 67) figures a distinctive basal penial appendage for *Varicostele bequaertiana*; Ortiz de Zárate López & Ortiz de Zárate Rocandio (1955: fig. 5) figure a small rounded penial appendage for *S. buchholzi* and numerous small spinules but no appendage for *S. truncata* and few spinules.

#### 14. A NEW *TROCHOZONITES* PFEIFFER (UROCYCLIDAE) FROM THE USAMBARA MTS., TANZANIA

In a small collection of snails collected by Messrs. Enghoff, Lomholdt and Martin in the East Usambara Mts. were several specimens preserved in spirit of a very elegant *Trochozonites* which does not appear to be referable to any of the rather numerous described species. The collection sent on loan from the University Zoological Museum, Copenhagen, to Dr. A. C. van Bruggen at Leiden was partly passed on to me for examination. Both the fauna and flora of the East Usambaras contain marked West African elements and the occurrence of this species is in no way surprising, but it had entirely eluded the searches of earlier collectors, e.g. A. E. Craven, L. Conradt, K. L. Pfeiffer and myself. Unfortunately the material had been thrown into spirit without prior drowning and the animals were contracted into the shell; I obtained permission from Dr. J. Knudsen, head of the Mollusca Department at Copenhagen to break one of the shells which enabled me to study the genital anatomy and radula. Unfortunately the jaw was inadvertently lost but was unlikely to have had any characters of significance. The species is described below. There is considerable disagreement in the literature over the gender of *Zonites* and the derived word *Trochozonites*, some treating it as masculine, others as feminine. Consultation with more erudite colleagues results in the use of masculine gender.



Figs. 3-5. *Streptostele lenta* (E. A. Smith). 3, half row of teeth from radula; 4, part of genital anatomy; 5, penis, cleared to show disposition of the armature spinules with one of these enlarged (on the left).

***Trochozonites usambarensis* sp. nov.** (figs. 6-8; pl. 1 fig. c)

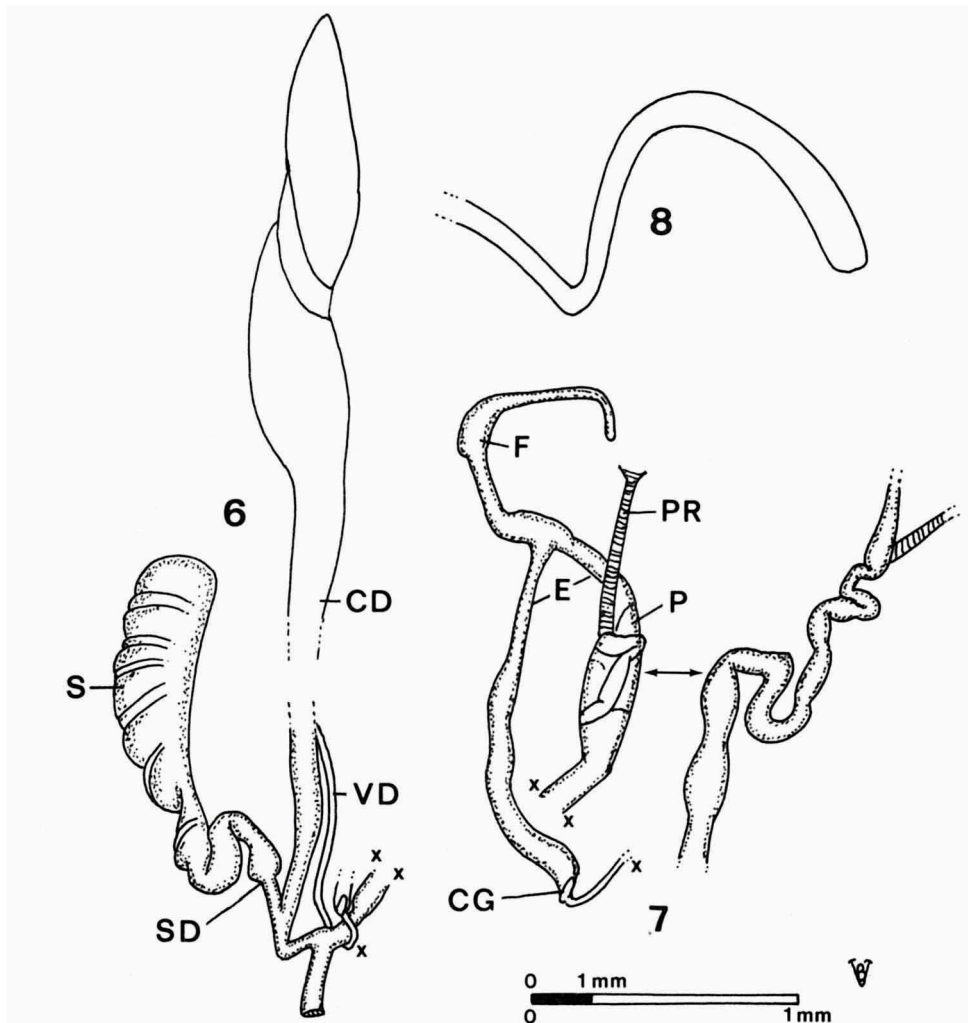
Shell (pl. 1 fig. c) conical, elegant, resembling that of *T. plumaticostatus* Pilsbry and *T. adansoniae* (Morelet) in general shape, medium horn-coloured, probably quite shining in life (all material spirit-collected), moderately thin, very narrowly umbilicate. Spire very raised, acutely narrowed to a slender rounded apex, the apical angle  $72^{\circ}$ - $76^{\circ}$ , the sides straight above but slightly concave toward the apex. Whorls  $6\frac{1}{2}$ , moderately convex, the convexity of the lower whorls at a maximum near the upper suture but the whorl more flattened near the lower one, giving a faintly pagodiform appearance, fairly gradually enlarging, the last one very sharply keeled at the periphery; on the upper side the curvature of the body whorl is convex all the way to the keel but underneath it appears a little pinched since the curvature changes at about 0.3 mm from the keel itself so that the convex base is sinuate at this point and very narrowly concave just before the edge of the keel. Apical two whorls with distinctive fine spiral beaded sculpture consisting of lines of raised dots in spirals (not due to decussation); rest covered with very narrowly raised crisp transverse oblique ribs which are occasionally irregular and sometimes anastomose, about 11-13 per mm, not crossed by any traces of spiral element. Suture well marked. Umbilicus about 0.5 mm wide, partly covered by the slightly thickened and reflected pale columella. Base with transverse growth lines which become stronger and very sinuate towards the keel (in fact the upper sculpture just crosses the keel then peters out), crossed by irregularly spaced wavy impressed spiral striae varying from 0.4 mm apart to 9 per mm and with more or less imperceptible secondary spiral striae between them; no primary spirals within 1 mm of the centre of the umbilicus. Aperture subquadrate with angles between parietal wall and top of outer lip, between bottom of outer lip and base (i.e. corresponding to the keel) and between columella and parietal wall but basal margin smoothly rounded into columella.

Dimensions. — Holotype major diameter 8 mm, minor diameter 7.5 mm, height 7.5 mm; aperture breadth 4.5 mm, height 3 mm. Other specimens are  $7.9\text{--}8.5 \times 7.8 \times 6.2\text{--}7.5$  mm, aperture  $5 \times 3\text{--}3.5$  mm.

Distribution. — Tanzania: E. Usambara Mts., Amani, 1000 m alt., 30 January 1977, Enghoff, Lomholdt & Martin (holotype and three paratypes in Zoologisk Museum, Copenhagen, one paratype in RMNH).

The preserved animal has the sole, rear of body, fringe and flanks buff save for the deep blackish grey caudal appendage; front of body blackish grey; mantle with dense small grey spots making a dense shading, save for the mantle collar.

Penial complex (genitalia: figs. 6-7) considerably convoluted, enclosed within a thin membrane, the penial retractor attached to the upper folds and not terminating a second flagellum; primary flagellum long and quite stout; epiphallus long and dilating towards its junction with the vas deferens where there is a small internal calciform sac; spermatheca longer than duct; remnant of coiled sper-



Figs. 6-8. *Trochozonites usambarensis* sp. nov., genital anatomy. 6, female part; 7, male parts with right hand figure showing penial complex unraveled; 8, part of spermatophore. The long scale refers to fig. 8, the short one to figs. 6 and 7 save that the right hand part of fig. 7 is rather more enlarged.

matophore smooth (fig. 8); stimulatory organ not present; apparently not ovoviviparous.

The radula is 1.94 mm long and 0.66 mm wide with a formula ca.  $35:2+9:c:9+2:ca. 35, \times \pm 130$ . The teeth are very similar to those of other species of the genus and of *Trochonanina*, *Thapsia*, etc. The central teeth are rather narrow with the apical head about equalling the main cusp which itself protrudes well below the lower margin of the base; the lateral cones are narrow



and not divergent, and the laterals very slender with two marked curved cusps like a lobster's pincers.

In all the species whose anatomy is figured by Ortiz de Zárate López (1951) the penial retractor is attached at the end of a caecum or second flagellum although this is sometimes very short. In *T. usambarensis* the penial retractor is attached to the side of the apex of the penial complex and does not terminate a caecum. This separates it from<sup>1)</sup> *T. ibuensis*, *lindstromi*, *T. folini*, *T. hystrix*, *T. suturalis*, *T. bifilaris*, *T. multisulcatus*, *T. hintzi*, *T. pooensis* and *T. nostii*; *T. ibuensis* and *T. lindstromi* also differ in having a small stimulating organ; *T. lindstromi*, *T. suturalis*, *T. ibuensis*, *T. bifilaris*, *T. multisulcatus* and *T. nostii* at least are ovoviviparous. In its shell *T. usambarensis* seems to differ from all others in having the apical whorl with a spiral beaded sculpture of close rows of raised dots. Other species of the genus are tabulated beneath, showing the salient points in which they differ from the new species here described.

Species	Main characters in which they differ from <i>T. usambarensis</i>
<i>T. adansoniae</i> (Morelet)	transversely ribbed to the apex, with strong close oblique ribs on the lower whorls with minute spirals between them
<i>T. adoxa</i> Connolly	very characteristic depressed shape with convex sides to the spire and more or less smooth apical whorls
<i>T. aillyi</i> Pilsbry	apical whorls pitted and rest with strong oblique ribs with granulose intervals
<i>T. bellulus</i> (Von Martens)	spirally striate apical whorls, then vertical riblets and with 4 spiral keels on the last 3 whorls, crossing the oblique laminae, there being hairs at the intersections
<i>T. bifilaris</i> (Dohrn)	spirally striate apical whorls and (1-)2(-3 or 5) spiral keels and often 1-3 unequal brown bands on the main whorl which are also finely decussate (referred to <i>Sitala</i> by Thiele on evidence of the radula)
<i>T. buhambaensis</i> Preston	more or less pitted apical whorls and very similar to <i>T. medjensis</i> save for stronger growth lines
<i>T. calabaricus</i> (Pfeiffer)	very depressed, the apical whorls spirally striate and transversely wrinkled and the rest bearing 5 strong spiral costae; the base has a characteristic sculpture according to D'Ailly of "petits grains perceptibles seulement au microscope plus au moins disposés en spirales remplacent les stries mince onduleuses de la plupart des <i>Trochizonites</i> "
<i>T. conicus</i> (Chaper)	sculpture of apical whorls not known but otherwise apparently similar to <i>percostulatus</i>
<i>T. conulus</i> Thiele	10 spiral threads on the body whorl but the types are worn
<i>T. expatriatus</i> Preston	apical whorls and growth lines as in <i>T. medjensis</i> but closer
<i>T. folini</i> (Morelet)	apical whorls with fine spiral striae but has distinctive small piliform processes arranged on the rest in setiform spirals; strong furrow present beneath the suture
<i>T. hintzi</i> Thiele	sculpture of embryonal whorls not known; 4-8 spiral threads on the main whorls crossed by oblique ribs
<i>T. hystrix</i> d'Ailly	apical whorls spirally striate; rest of whorls with transverse ribs bearing 5 hairs of which the middle one is very long

<sup>1)</sup> Authorities for these names are given in the table beneath.

- T. ibuensis* (Pfeiffer) apical whorls with fine spiral striae and the rest with fine spiral striae cutting the transverse sculpture; base with very fine granular sculpture due to spiral and radial striae (var. *tumidulus* (Von Martens) is similar)
- T. kemp* Preston types are worn juveniles; apical whorls smooth and rest with close oblique striae; spire with very concave sides
- T. leptaleus* E. A. Smith shell-shape very characteristic with upper part of spire prominent with concave sides; apical whorls minutely pitted; rest with very spaced strong ribs
- T. lindstromi* d'Ailly apical whorls finely spirally striate; shell a characteristic shape almost lacking a keel
- T. medjensis* Pilsbry apical whorls minutely pitted and rest of shell smooth save for growth lines
- T. meruensis* d'Ailly alpine species described from 3000 m; the single specimen known has the apex destroyed; the shell is described as densely plicate-costate; I noted the type had a very well marked thin expanded keel with the base canaliculate below it
- T. monticola* Thiele sculpture of spiral threads reticulated by oblique threads and very fine microscopic spiral striae
- T. multisulcatus* (Germain) embryonal whorls described as having 'fines stries longitudinales subverticales'; there are 6-12 spiral lines (7 in original description) on the whorls
- T. nostii* apical whorls spirally striate; rest with wide spiral and transverse sculpture forming a reticulation
- Ortiz de Zárate López
- T. palmarum* (Morelet) shell very small; apical whorls spirally striate, the rest finely transversely striate, the striae bearing short projections
- T. percarinatus* apical whorls finely spirally striate, the rest with not well marked transverse striae bearing short projections; remarkable well marked furrow beneath the suture (considered a variety of *folini* by d'Ailly)
- (Von Martens)
- T. percostulatus* shell ribbed to apex as in *T. adansoniae*
- Dupuis & Putzeys
- T. pilosus* d'Ailly apical whorls spirally striate, the rest with oblique lamellae bearing short hairs
- T. plumaticostatus* Pilsbry apical whorls finely spirally striate; rest with undulating riblets bearing triangular cuticular appendages in spiral series
- T. poensis* shell of very characteristic shape rather like *T. adoxa* with convex sides and more or less mamillate apex; apical whorls very finely spirally striate then fine transverse striae crossing the spirals; 2-3 spiral keels on rest of shell
- Ortiz de Zárate López
- T. prestoni* Connolly closely resembles *T. medjensis* in having a more or less smooth shell
- (= *suturalis* Preston) save for growth lines
- T. quinquefilaris* (Germain) embryonal whorls with a reticulate sculpture according to description; body whorl with 5 keels together with spiral and longitudinal striae
- T. reticulatus* d'Ailly apical whorls spirally striate; next few beautifully reticulate with spiral and transverse striae; rest simply transversely striate
- T. sharpei* E. A. Smith very similar to *T. medjensis* with smooth apical whorls and marked growth lines
- T. suturalis* d'Ailly apical whorls spirally striate and rest with very strong regular transverse striae
- T. talcosus* (Gould) presumably has apical whorls spirally striate and lectotype figured by Johnson (1964: pl. 37 fig. 5) has 3 spiral lines on the main whorls; material in the BM, possibly paratypes, from the Cuming collection certainly has the apical whorls spirally striate and 3-4 spiral lines on the main whorls with fine spiral striae between

<i>t. theeli</i> d'Ailly	shell with very concave sides; apical whorls "tenuissime subgranulatum spiraliter striati", the next 4 with distant oblique scarcely perceptible lamellae with obtuse tubercles, the rest with oblique folds cut by spiral lines and the base elegantly decussate-granulate by radial and spiral lines
<i>T. trifilaris</i> Dupuis & Putzeys	apical whorls spirally striate the rest with very faint oblique sculpture crossed by 3 spiral threads — race <i>ituriensis</i> Pilsby is merely larger with fewer whorls
<i>T. turbinatus</i> d'Ailly	described from a specimen with the apical whorls destroyed
Undescribed species from Kenya, Teita Hills	apical whorls quite coarsely spirally striate and rest with close transverse striae
<i>Sitala leroyi</i> Bourguignat (= <i>mamboiensis</i> E. A. Smith) (removed to <i>Sitala</i> from <i>Trochozonites</i> on anatomical grounds)	apical whorls very finely spirally striate; rest with fine transverse growth lines and spiral striae; the only other snail of similar shape in the East Usambaras but differing totally in sculpture and anatomy

*T. usambarensis* seems well characterised by the spiral beaded apical sculpture and the position of the penial retractor muscle.

#### 15. SIX NEW SPECIES OF *THAPSIA* (UROCYCLIDAE) FROM EAST AFRICA

A glance at the list of names given in Adam's useful paper (1960) and his admonishments to the author of another paper published the previous year should be enough to deter anyone from describing casual species of *Thapsia* of which the anatomy is unknown.

Having returned to working on my check-list of East African non-marine Mollusca I find certain distinctive species in several genera are undoubtedly undescribed. Of 41 described species of *Thapsia* recorded from East Africa (Verdcourt, unpubl. MS), many described by Preston, very few are in any way distinctive. Most of Preston's species are so similar to each other that it is impossible to be certain of the identity of a specimen resembling them even with all the types available. Study of pl. 3 in Preston (1914) shows a series of shells which appear virtually indistinguishable, an impression which is not dissipated by study of the specimens themselves. Short of recollecting all these species in their type localities and investigating them anatomically nothing can be accomplished. Many of them were described from localities visited by game wardens on foot safari with porters in the early years of this century. Some of these localities have scarcely been visited since and certainly no molluscs have been recollected in them; it would be very expensive to arrange expeditions to them. It is likely that many if not most of these supposed species will prove to be synonymous with others having very similar shells described earlier from Ethiopia and elsewhere. Curiously, however, some of the most distinctive East African species which really are easily identifiable from their shells appear to be undescribed; these I have decided to describe even though only one is known anatomically. Many of the species occurring in East and Central Africa are small in size but five of those described here are large and one is very similar in size to the largest West African taxa. The sixth described is very small.

***Thapsia usambarensis* sp. nov.** (pl. 2 fig. a)

Shell (pl. 2 fig. a) somewhat elevated zonitoid, very deep chestnut brown, shiny, fairly thin, narrowly umbilicate; spire very depressed conic with slightly convex sides, the apex obtuse, slightly prominent, forming an angle of about  $135^\circ$ . Whorls  $5\frac{1}{2}$ , slightly convex, moderately enlarging, the body whorl smoothly rounded. Apical whorls smooth save for faintest wrinkles at  $\times 25$ , rest of the whorls with close fine growth wrinkles at about 10 per mm and some exceedingly fine almost obsolete spiral lines visible at  $\times 40$  and not continuous; base of shell with similar sculpture. Suture shallow, strongly margined, whitish, rather obscurely coarsely crenellate beneath. Umbilicus 0.8 mm wide appearing filled and not visible within but probably excentric and hidden by the columella which is strongly reflected over it. Aperture broadly and obliquely lunate, the peristome thin; inner lip finely roughened.

Dimensions. — Holotype: larger diameter 11.5 mm; shorter diameter 10 mm; height 7 mm; breadth of last whorl 2.7 mm, last but one 1.75 mm; aperture width 6 mm, height 4.5 mm. Largest but very worn paratype measures  $12 \times 10.5 \times 7$  mm.

Distribution. — Tanzania: Lushoto District, W. Usambara Mts., Shume area, Sungwe Mt., along an old railway tramline passing through some old cypress [*Juniperus procera*] plantations, in shade with deep leaf litter and practically no flora, 1950, M. Gane (holotype in RMNH formerly L.A.W.C. Venmans collection No. 7147); Shume, B. Verdcourt (paratypes in NM).

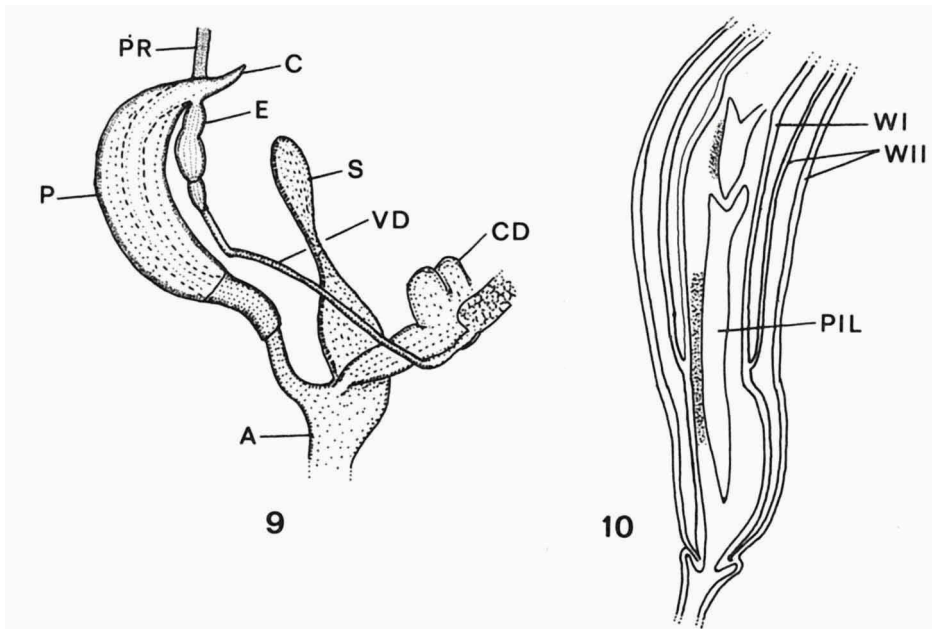
The holotype shell (not quite mature) was brought to me in 1950 by Mr. M. Gane of the former Tanganyika Forestry Department; after comparing it with specimens in many museums I decided it was an undescribed species (designated CQ in my card index of Usambara Molluscs) but hesitated to describe it without more material. I gave the single shell to Dr. L. A. W. C. Venmans for his collection which after his death passed to the Leiden Museum. During a recent visit to Leiden I noticed it and borrowed it for further study. Two paler shells from W. Usambaras, near Lushoto, Mkusi, B. Verdcourt (NM), probably represent a distinct variant of this species with the umbilical area quite pale and the crenellations near the suture much stronger and a pale line margining the suture; the material is inadequate.

*T. troglodytes* (Morelet) and *T. pellucida* (Gould) are much larger; *T. oscitans* Connolly has a very pale shell and quite strong spiral striae; *T. calamechroa* (Jonas) is similar in size to *T. usambarensis* but is almost colourless and has strong spiral striae; *T. thomensis* (Dohrn) has a much more domed spire. It is to the Tanzanian species *T. lasti* (E. A. Smith) that *T. usambarensis* is most closely related. The type set of *T. lasti* is by no means uniform there being three dark syntypes, the largest  $15 \times 8$  mm and three almost colourless syntypes about  $12 \times 7$  mm; in all, faint spiral striae are present above and rather stronger ones beneath in the dark specimens. I am not convinced that only one species is represented and hereby choose the largest dark specimen BM 85.5.25.5 as lectotype of *Hyalinia*

*lasti* E. A. Smith; it clearly differs from *T. usambarensis* in its stronger spiral striae. Of other E. African species *T. eminiiana* (E. A. Smith) has a relatively much higher distinctly helicoid shell with no spiral striae. *T. simulata* E. A. Smith has an almost colourless shell and lacks the umbilical columella reflection so marked in *T. usambarensis*.

***Thapsia grandis* sp. nov.** (figs. 9, 10; pl. 2 fig. b)

Shell (pl. 2 fig. b) elevated zonitoid, deep chestnut brown, shiny (but not so much so as in previous species), fairly solid, narrowly umbilicate. Spire depressed conic with straight sides, the apex obtuse forming an angle of  $145^\circ$ . Whorls  $5\frac{1}{2}$ , slightly convex, enlarging rather rapidly, the body whorl slightly but quite distinctly obtusely angled above the periphery. Apical two whorls virtually smooth save for subsutural wrinkles on last half whorl, then next  $1\frac{1}{2}$  whorls with close fine growth wrinkles, 6-10 main ones per mm crossed by very fine spiral striae only just visible at  $\times 25$  but on the rest of the whorls the spiral element quickly becomes very much more evident, easily visible under a  $\times 5$  hand lens; these spiral striae are wavy, about 20 per mm and quite deeply incised this being the reason for the less glossy appearance compared with *T. usambarensis*; these spiral striae become fainter near the peripheral keel but become stronger again on the base of the shell towards the umbilicus. Suture not deep and with a more or less crenellate margin. Umbilicus about 1 mm wide the columella smoothly reflected over it. Aperture broadly obliquely lunate, the peristome thin, slightly



Figs. 9-10. *Thapsia grandis* sp. nov., part of genital anatomy of specimens from Mazumbai collected by Walker (after Van Mol).

receding, sharp save near the columella which is whitish, rather thick and almost straight in its upper part; inner lip finely roughened.

Dimensions. — Holotype: larger diameter 23 mm; shorter diameter 20 mm, height 12.5 mm; breadth of last whorl 7 mm, last but one 3.5 mm; aperture width 12.5 mm, height 9.5 mm. A paratype measures  $21.5 \times 19 \times 12$  mm and another (in spirit) is very slightly smaller than the holotype.

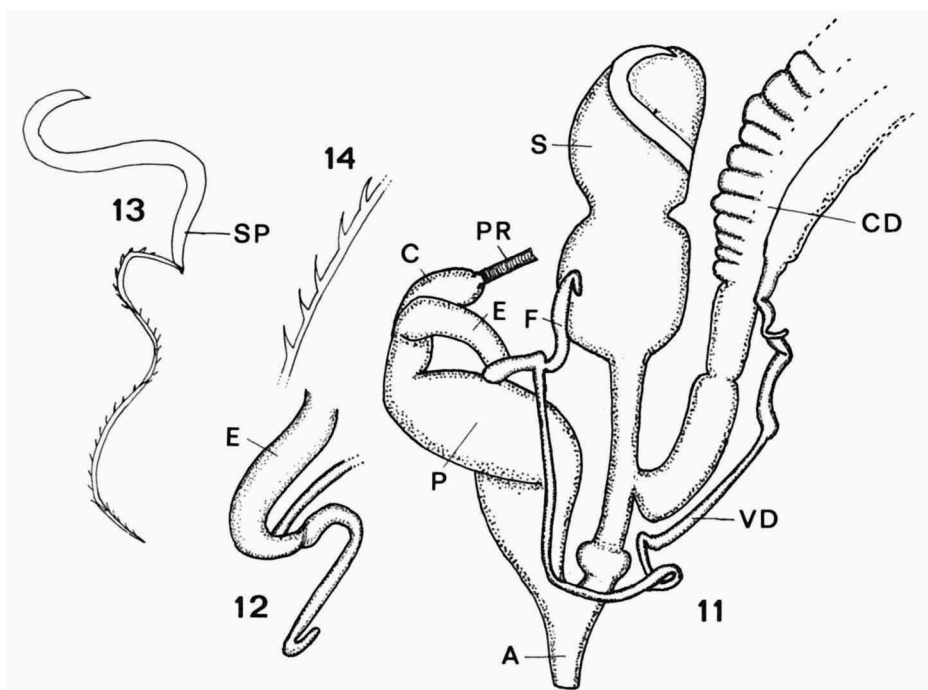
Distribution. — Tanzania: Lushoto District, W. Usambara Mts., Mazumbai, evergreen rain-forest, J. A. Allen (holotype in RMNH, paratype in BM); same locality, Mazumbai Estate, near Soni, leaf-litter of montane forest, 1300 m alt., 1972, J. A. Allen (paratypes in spirit in MRAC); same locality, 1969, Walker 414 (MRAC).

A broken much paler shell also collected by J. A. Allen is unquestionably the same species and no more than a colour variant; it measures 17.5 mm in width. The locality is given as Kenya, Tsavo West National Park 24 km s. of Mtito Andei, 1050 m alt., but this is in dry *Acacia* - *Commiphora* woodland, a very different habitat from the Usambaras locality and must be treated with grave doubt until confirmed although the collector was adamant when I first expressed doubt. In view, however, of an exactly similar record of *T. microsculpta* (see p. 232) the possibility that the fragment actually came from Mazumbai seems very likely. Judging by the shells alone *T. grandis* does seem genuinely related to the West African *T. troglodytes* (Morelet), *T. pellucida*<sup>1)</sup> (Gould), etc., but differs in being much darker (even the broken shell just mentioned). Dr. J. J. van Mol has dissected the Walker material sent to him and also the spirit material collected by Allen; the latter he kindly loaned to me to examine. I have copied Van Mol's unpublished drawing (figs. 9, 10) and give a copy of his description, both taken from the Walker specimen. Animal pale beige; foot fringe and caudal region pale grey. Caudal appendage long and tapering, deeper grey; tentacles grey. Mantle beneath shell with large sparse black spots. Pallial lobes long, narrow and tapering. Spermathecal duct dilated at the base, the wall thick, lined with small cylindrical papillae aligned transversely; the duct then narrowed before the spermathecal sac; flagellum absent; epiphallus in two parts, the first longitudinally ridged, the second part dilated, with strong papillae in imbricated lozenge arrangement. Caecum dilated at the base and narrowed at the apex. Upper part of penis enveloped in a very thick muscular sheath with a peripheral layer of longitudinal fibres and a thick internal layer of transverse fibres; penial gland lacking; internal structure of penis: middle part with large folds of the wall forming a longitudinal pilaster terminating above in a fork, wall entirely covered with small pointed papillae arranged in longitudinal and transverse rows having the aspect of a radula; upper part short with a strong longitudinal complicated pilaster and big papillae in longitudinal rows; towards the base the reflexed wall forms a sort of imperfect penial papilla; basal part slender, smooth.

<sup>1)</sup> Adam equates *troglodytes*, *pellucida* and *africana* Pfeiffer, Gould's name being the earliest, but Johnson (1964: pl. 37 fig. 7) depicts the type of *pellucida* as distinctly keeled.

Whilst working at the same time on a loan of Zaïre Bradybaenidae from MRAC, I found a large white-shelled *Thapsia* from Togo which had been misidentified as a helcid (MRAC 797009, Binaparba, leg. De Roo). Since it was well-preserved in spirit I dissected it for comparison with *T. grandis* (figs. 11-14). Comparisons in the British Museum (Natural History) indicate that this Togo specimen is probably near *T. calamechroa* Jonas but unfortunately the shell has been damaged by the alcohol; it seems, however, to lack spiral striae. It certainly is not *T. troglodytes*, the types of which have strong decussate sculpture above although it closely matches Cameroon material so misnamed. It may be undescribed. The body is pale but the mantle speckled with black; the mantle lobes are narrowly triangular and the right hand ocular retractor passes between the male and female parts. Some quite marked differences separate it from *T. grandis* as follows: the spermathecal duct is narrow at the base; the oviduct is so arranged that there is a distinct vagina; a distinct flagellum is present; the penial retractor is situated at the end of the caecum. The penial complex was not dissected but left for further studies by a more competent histologist. Radulae and jaws were prepared from the Togo animal and one of the spirit specimens of *T. grandis* collected by Allen.

The jaw of the Togo species is finely striate in the direction of the longest dimension particularly in the sinuous declivities on either side of the short



Figs. 11-14. *Thapsia* sp., part of genital anatomy of a specimen collected in Togo by De Roo. 11, basal genitalia; 12, epiphallus; 13-14, spermatophore.

rounded median projection; these are not present in *T. grandis*. The radula of *T. grandis* has about 100 rows of teeth with a formula ca.  $60:3+14:c:14+3$ :ca. 60; that of the Togo species is very similar with about 110 rows of teeth with a formula ca.  $40:3+13:c:13+3$ :ca. 40; but the ectocones of the lateral teeth are more pronounced particularly in the outer laterals where the ectocone appears as a notch on the mesocone. The radula and spermatheca slides are preserved at Tervuren together with the animals from which they were obtained.

***Thapsia microsculpta* sp. nov. (pl. 3 fig. a)**

Shell (pl. 3 fig. a) depressed helicoid, pale creamy horn-coloured, shining but not polished-glossy, fairly thin, very narrowly umbilicate. Spire depressed-conic with very slightly convex sides, the apex slightly prominent, obtuse, forming an angle of  $140^\circ$ . Whorls  $5\frac{3}{4}$ , slightly convex, fairly gradually enlarging, the body whorl smoothly rounded with only an imperceptible trace of a keel above the periphery. Apical two whorls smooth, rest with extremely fine close growth lines, without proper spiral striae but with spiral bands of faint, exceedingly close, short, vertical wrinkles, about 35 per mm laterally, 0.06-0.11 mm long. The sculpture on the base of the shell is similar but less marked. Suture shallow, margined, whitish, not crenellate. Umbilicus about 0.5 mm wide, the columella only narrowly slightly recurved over it. Aperture broadly rounded-lunate, the peristome thin, slightly receding.

Dimensions. — Holotype: larger diameter 14 mm; shorter diameter 11.8 mm; height 8 mm; aperture width 7.5 mm, height 6.1 mm.

Distribution. — Tanzania: Lushoto District, W. Usambara Mts., Mazumbai Estate, near Soni, leaf-litter of montane forest, ca. 1300 m alt., 1972, J. A. Allen (holotype and paratype in MRAC, paratype in RMNH).

A shell of what is unquestionably the same species was in a tube together with the fragment of *T. grandis* previously mentioned labelled Kenya, Tsavo West National Park, 24 km S. of Mtito Andei, 1050 m alt., J. A. Allen. This shell measures  $13 \times 11.5 \times 8$  mm. As in the case of *T. grandis* this is a most unlikely locality for a rain-forest species and must be viewed with suspicion; in fact I feel quite certain that both shells in the tube came from Mazumbai and not Tsavo.

***Thapsia buraensis* sp. nov. (fig. 15)**

Shell (fig. 15) depressed zonitoid, horn-coloured, polished-glossy, moderately thin, narrowly umbilicate. Spire slightly raised with straight sides, the apex obtuse, forming an angle of  $154^\circ$ . Whorls  $5\frac{1}{2}$ , slightly convex, fairly gradually enlarging, the last whorl smoothly rounded with no trace of a keel. Apical  $1\frac{1}{2}$  whorls more or less smooth, the rest with fine transverse growth lines varying from 4-10 per mm, particularly well marked and raised on upper part of whorl just below the suture which is not itself crenellate and much more obscure on lower part of whorl but becoming better marked on the base of the shell; spiral

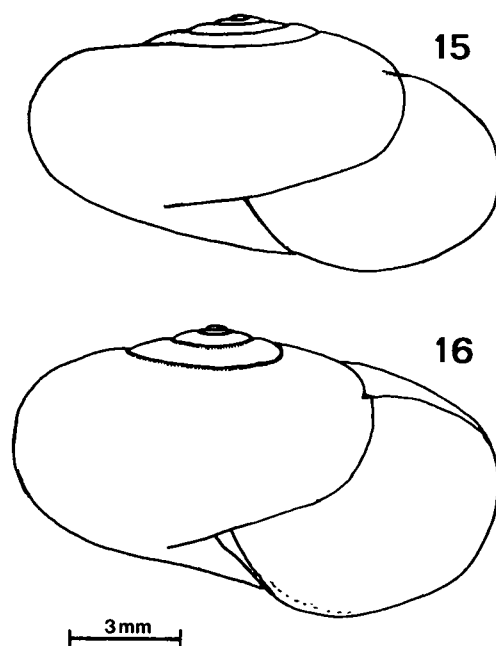


sculpture totally absent. Suture not deep, margined, the surface rugulose. Umbilicus about 1 mm wide, the columella slightly thickened at the top and very narrowly recurved over the umbilicus. Aperture broadly obliquely lunate, the peristome thin, slightly receding; inner lip finely roughened.

Dimensions. — Holotype (the largest shell): larger diameter 13.5 mm, shorter diameter 11.5 mm, height 6.5 mm; breadth of last whorl 4 mm, aperture width 7.5 mm, height 5.5 mm.

Distribution. — Kenya: Bura Hills, Vuria Peak, damp *Schefflera*, *Xymalos*, *Agauria* degraded forest, 2175 m alt., 17 April 1960, Polhill & Verdcourt (holotype and paratype in NM).

This is clearly closely related to *T. ulugurensis* described below but the shell is much more compressed and so different in side view that the two are undoubtedly distinct species. There are well-known floristic and faunistic links between the hills of the Teita area of Kenya and the W. Usambara and Uluguru Mts. A similar species may well turn up in the W. Usambara Mts. Two living specimens were collected but very unfortunately could not be found in spirit material now preserved at the BM; they were probably mislaid during the transfer of this material from Nairobi.



Figs. 15-16. *Thapsia* spp. 15, *T. buraensis* sp. nov., holotype, Kenya, Bura Hills, collected by Polhill & Verdcourt. 16, *T. ulugurensis* sp. nov., holotype, Tanzania, Uluguru Mts., collected by Bond.

***Thapsia ulugurensis* sp. nov. (fig. 16)**

Shell (fig. 16) depressed zonitoid, horn-coloured, polished-glossy, moderately thin, narrowly umbilicate, very similar to *T. buraensis* in most characters but much more inflated. Spire slightly raised with very slightly concave sides, the apex obtuse, forming an angle of  $151^\circ$ . Whorls  $5\frac{1}{4}$ , slightly convex, fairly gradually enlarging, the last whorl smoothly rounded with no trace of a keel. Apical  $1\frac{1}{2}$  whorls finely transversely wrinkled, the rest with fine transverse growth lines exactly as in last species, 4-10 mm, particularly well-marked and raised on upper part of whorl just below the suture and also on lower part of shell but more obscure on the very rounded periphery of the body whorl; spiral sculpture totally absent. Suture not deep, margined, not truly crenellate but surface of that portion separating the later whorls crossed by the sculpture. Umbilicus about 1 mm wide, the columella thickened at the top and narrowly recurved over it. Aperture broadly lunate, almost  $\frac{3}{4}$  circular, the peristome thin; inner lip finely shagreened.

Dimensions. — Holotype: larger diameter 13.8 mm, shorter diameter 11.5 mm, height 8 mm, breadth of last whorl 4.5 mm, aperture width 8 mm, height 7 mm.

Distribution. — Tanzania: Uluguru Mts., Bunduki, debris on floor of evergreen forest, leg. J. Bond (holotype, paratype and fragments in NM).

When I first tried to name this species soon after it was collected some twenty years ago I considered it could be *T. lasti* (E. A. Smith) from the description. This had been collected by J. Last in the Nguru Mts. and never rediscovered. Later when able to examine the type in the BM it became clear that it was not that species which differed in having more whorls, a narrower body whorl, a higher spire and traces of spiral striae. There the matter rested until the fresh Usambara material required naming and I considered it advisable to re-examine some of the material I had left in the National Museum, Nairobi. I am grateful to the authorities for sending it on loan to me. As previously pointed out *T. ulugurensis* differs from *T. buraensis* in its much higher, less compressed shell; the holotype is almost certainly not adult and the species may attain rather larger dimensions than indicated in which case the differences between the two would be even more marked.

***Thapsia microleuca* sp. nov. (pl. 3 figs b-d)**

Shell elevated-zonitoid, creamy white, shiny, fairly thin, narrowly umbilicate. Spire depressed, conic with straight sides, the apex obtuse forming an angle of  $130^\circ$ . Whorls  $4\frac{1}{2}$ , slightly convex, enlarging rather slowly, the body whorl smoothly rounded at the periphery or with an almost imperceptible trace of a keel. Apical whorls smooth, rest with rather irregular, fine growth lines at about 0.04-0.055 mm apart and crossed by fine incised very close very regular spiral striae only visible at about  $\times 25$  and the shell appearing more or less smooth

under a  $\times 10$  hand lens. Using a scanning electron microscope the spiral striae are seen to be less regular than supposed, slightly wavy, 6.9-12  $\mu\text{m}$  apart. There are at the junction of the 2nd and 3rd whorl about 40 spiral striae on the whorl at an average of 9-10 per 0.01 mm; similar rather more wavy striae occur on the base of the shell but many are further apart (up to 20  $\mu\text{m}$ ). Suture shallow, narrowly margined, opaque white. Umbilicus about 0.3 mm wide with the columella thickened and slightly shortly reflected over it. Aperture broadly lunate; peristome thin, receding.

Dimensions. — Holotype: larger diameter 4.0 mm; shorter diameter 3.6 mm; height 2.33 mm; aperture width 1.9 mm, height 1.5 mm. Largest shell measures: larger diameter 4.25 mm; shorter diameter 3.84 mm; height 2.47 mm.

Distribution. — Kenya: North Kavirondo District, Kakamega Forest, in forest floor debris, Dec. 1956, B. Verdcourt (holotype and paratype in RMNH, paratypes in MRAC, BM and NM); same locality, Majorie Powell (NM).

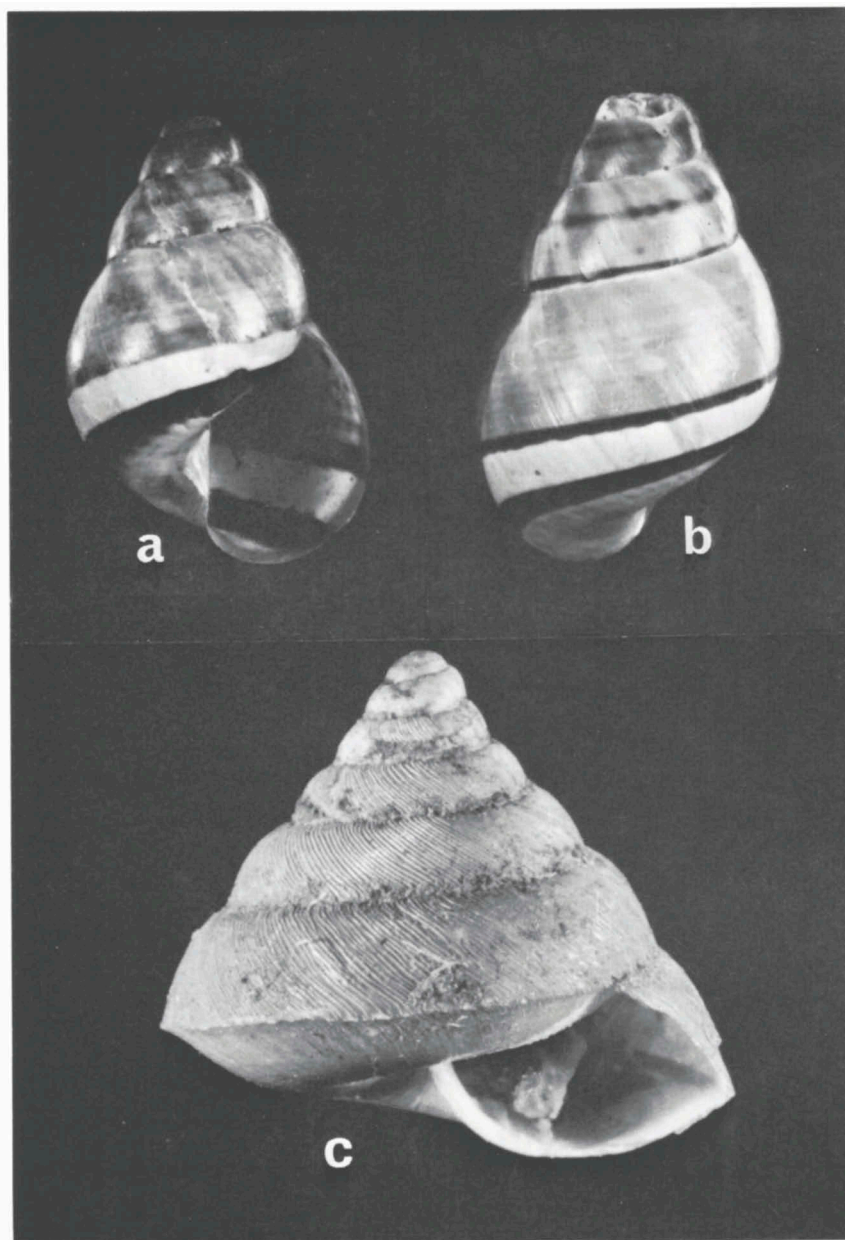
*T. microleuca* is closely similar to a number of other species but I have found nothing else which is a genuine white when fresh although doubtless albino forms exist of most species. I know of no mollusc which has albino forms which exist in populations which contain none of the coloured form. *T. masakaensis* (Preston) is larger and horn-coloured and probably the type is not adult; the type set of *T. usitata* (Preston) consists of three small juveniles and one larger but probably still immature shell which also differs from *T. microleuca* in being horn-coloured, slightly larger, having rather feebler spiral sculpture and a wider body whorl (in plan view). *T. aranea* (Preston) has a much larger darker shell as also has the horn-coloured *T. insimulans* E. A. Smith. *T. mime* (Preston) is much the size of *T. microleuca* but deep horn-coloured with rather closer spiral sculpture and the columella kinked on the outer side just before the junction with the body whorl rather than smoothly reflected; *T. insulsa* (Preston) is also the same size but horn-coloured and with a more smoothly rounded columella expansion. A worn paratype of *T. aequatoriale* (Bttgr.) is very similar in size and is white though probably due to wear but the spiral striae are much closer together. The only *Thapsia* reported in the literature from Kakamega are those found by Babault and described by Germain (1923); he mentions a *T. karamwegasensis* Germain which differs markedly from *T. microleuca* in shape and sculpture, *T. densesculpta* (Preston) in which he includes *T. mime*, already mentioned above, and *T. yalaensis* Germain both also differing in shape and sculpture. Preston describes *densesculpta* as having a pale greenish straw-coloured shell and gives the dimensions as  $7 \times 6 \times 3.5$  mm which certainly is not in accord with the type of *T. mime*.

Other species occur in the Usambara Mts. including *T. curvatula* Von Martens and a small species from Mkusi,  $7.2 \times 6.2$  mm (leg. B. Verdcourt). This latter much resembles a host of other small species which it would be madness to try and characterise without knowledge of the animal; similar shells occur in the Uluguru Mts. and have been variously referred to *T. mixta* E. A. Smith, *T. columellaris* (Pfeiffer), *T. pinguis* (Krauss), *T. hanningtoni* (E. A. Smith), etc. Yet

other unidentified species from Tanzania are too characterless and too similar to the plethora described by Preston or are in too poor a condition to be describable. They include a very pale whitish horn-coloured species ( $9 \times 8 \times 4.5$  mm) from N. Kilosa District, Ukaguru Mts., J. Bond; a more or less helicoid species with a horn-coloured very narrowly umbilicate shell devoid of spiral sculpture,  $11.5 \times 9.8 \times 6.5$  mm, from the same locality collected by the same collector and almost certainly new; specimens from Bunduki, leg. J. Bond, closely resembling *T. masukuensis* (E. A. Smith); a yellow-brown species ( $11.2 \times 9.5 \times 6.5$  mm) from Mahali Mts., Kungwe, S. Ridge, J. A. Cooke, in company with a very small species; and many others.

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Figs. a, b. *Rhachistia carnea* sp. nov.;  $\times 4$ . a, paratype, Kenya, Marafa; b, holotype, Kenya, Mkowe. Fig. c. *Trochozonites usambarensis* sp. nov., holotype, Tanzania, Amani;  $\times 10$ . Photo c by A. 't Hooft.

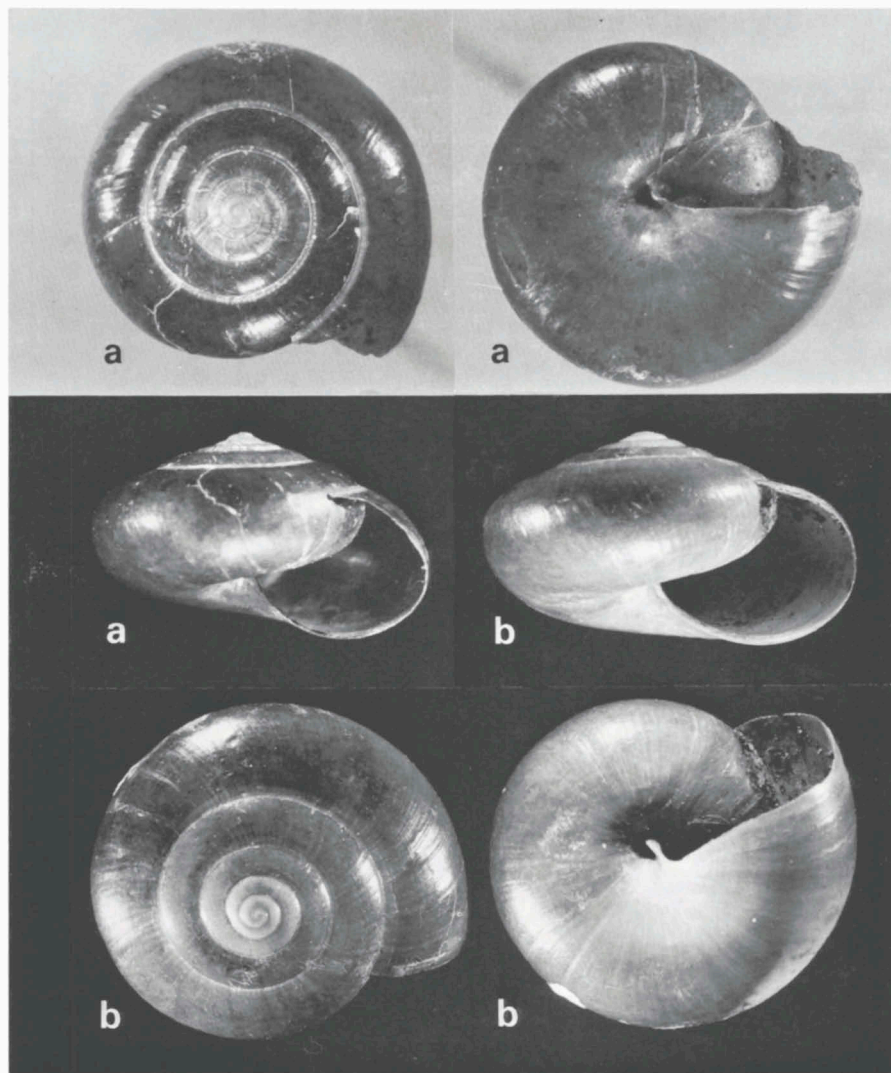


Fig. a. *Thapsia usambarensis* sp. nov., holotype, Tanzania, W. Usambara Mts;  $\times 3.7$ .  
 Fig. b. *Thapsia grandis* sp. nov., holotype, Tanzania, W. Usambara Mts.;  $\times 2$ . Photos  
 by A. 't Hooft.

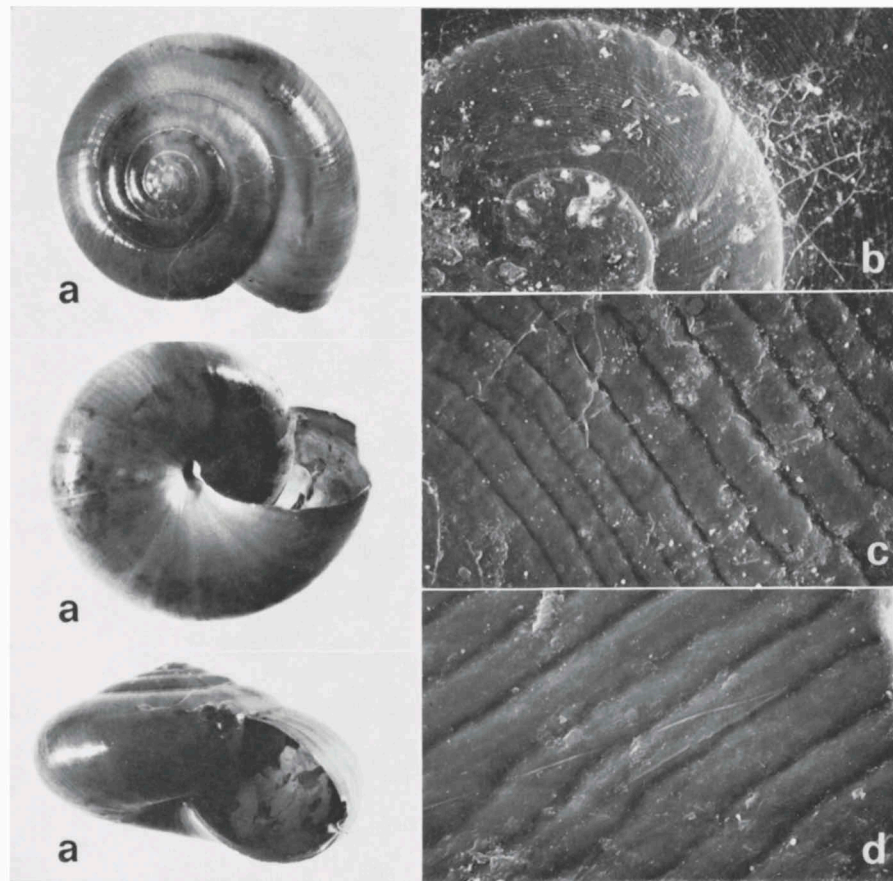


Fig. a. *Thapsia microsculpta* sp. nov., holotype, Tanzania, W. Usambara Mts., photo courtesy Tervuren museum, slightly more than  $\times 3$ . Figs. b-d. *Thapsia microleuca* sp. nov. paratype, Kenya, Kakamega Forest, S.E.M. photos of sculpture; b,  $\times 55$ , c-d,  $\times 550$ .