



THE PENIAL ARMATURE OF THREE SPECIES OF EAST AFRICAN STREPTAXIDAE (GASTROPODA, STYLOMMATOPHORA)

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ABSTRACT: The penial armature of three species of East African Streptaxidae is described, namely *Edentulina ovoidea* (Bruguière, 1792), *Gonaxis vosseleri* (Thiele, 1911) and *Tayloria usambarica* (Craven, 1880). In each case the armature consists of a large number of small prickles contrasting with the arrangement found in many much smaller species of the family.

KEY WORDS: Gastropoda, Streptaxidae, *Edentulina*, *Gonaxis*, *Tayloria*, penial armature, Tanzania

INTRODUCTION

The organisation Frontier Tanzania which had been carrying out surveys of the coastal forests handed over to me several collections of molluscs for me to name. Among these were specimens of the Streptaxidae *Edentulina ovoidea* (Bruguière, 1792) (= *E. affinis* C. R. Boettger, 1913), *Gonaxis vosseleri* (Thiele, 1911) and *Tayloria usambarica* (Craven, 1880) with the animals preserved in spirit. I have already described (VERDCOURT 1961) the gross anatomy of the lower genital ducts of the first two species and close relatives of the third but unfortunately, despite the example of the classic account of West African Streptaxidae (DEGNER 1934), I gave no account of the internal penial armature. This new material has enabled me to rectify this for these few species. Future accounts of streptaxid anatomy should include this information. A complete survey is much needed in order to assess the relevance of the character to producing a phylogenetic classification of the family.

Edentulina ovoidea (Bruguière, 1792)

(Figs 1–6)

Edentulina ovoidea (including *E. affinis*) is a remarkably active carnivorous snail which as far as I have observed feeds mainly on urocyclid slugs (VERDCOURT 1980). The radula is well adapted for dealing with

large prey. A specimen collected alive in the East Usambaras in Kwangumi Forest, December 1996 proved unsatisfactory since it had clearly been thrown into spirit without drowning and the upper parts could not be removed from the shell and other parts were highly stretched and distorted. PETER TATTERSFIELD kindly passed on to me a specimen which had been properly prepared, collected in the Nguru Mts., Manyangu Forest Reserve, at 740 m. A comparison of the results demonstrates how very carefully interpretations must be made from single dissections of poorly prepared material. If I had only the animals available of the two specimens mentioned I would not have suspected they belonged to the same species. There is no doubt that the difficulty found in matching old accounts of anatomy with modern findings results from the easy distortion of soft tissues. In the highly distorted specimen the actual penis has been drawn out from the sheath into a long thin tube, only a small part of which before the upper break contained rows of minute prickles under 0.1 mm long. The sheath and vas deferens remained near to the atrial end. The properly prepared specimen has the gross genital anatomy much as I described it in 1961. The base of the penis near the atrium is thickened, brown and muscular and devoid of prickles; in the upper more inflated part there are many folds some of

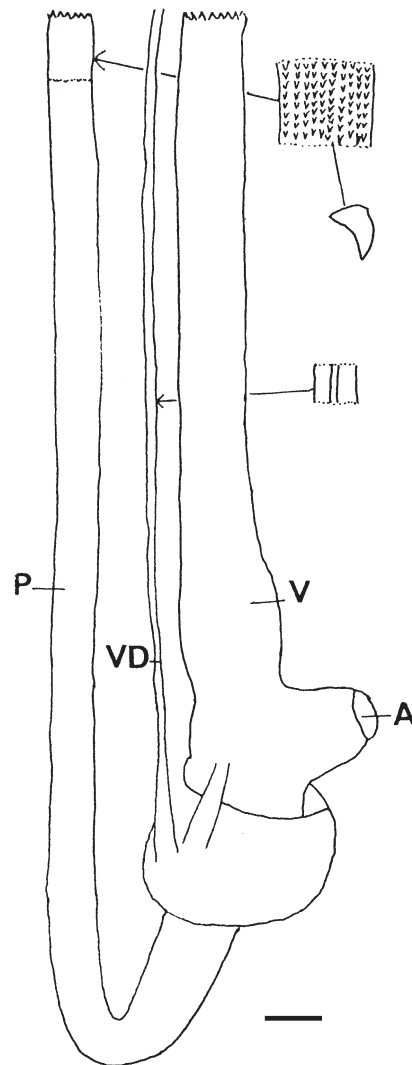


Fig. 1. *Edentulina ovoidea*. Tanzania, East Usambaras – proximal parts of genitalia of specimen preserved without drowning showing area of spinules and a single spinule: A – atrium, P – penis, V – vagina, VD – vas deferens. Scale bar – 1 mm

which are lobulate. The ± 80 minute prickles appear to be irregularly scattered over this upper part but in the very distorted material there is a regularity with the prickles more or less in rows so the apparent random disposition may be illusory. This very unspecialised arrangement of small uniform prickles is very different from that I found in a species of *Gonaxis* (*Marconia*) given to me for dissection by PETER TATTERSFIELD where there is a high degree of specialisation and great range in size (TATTERSFIELD 1999).

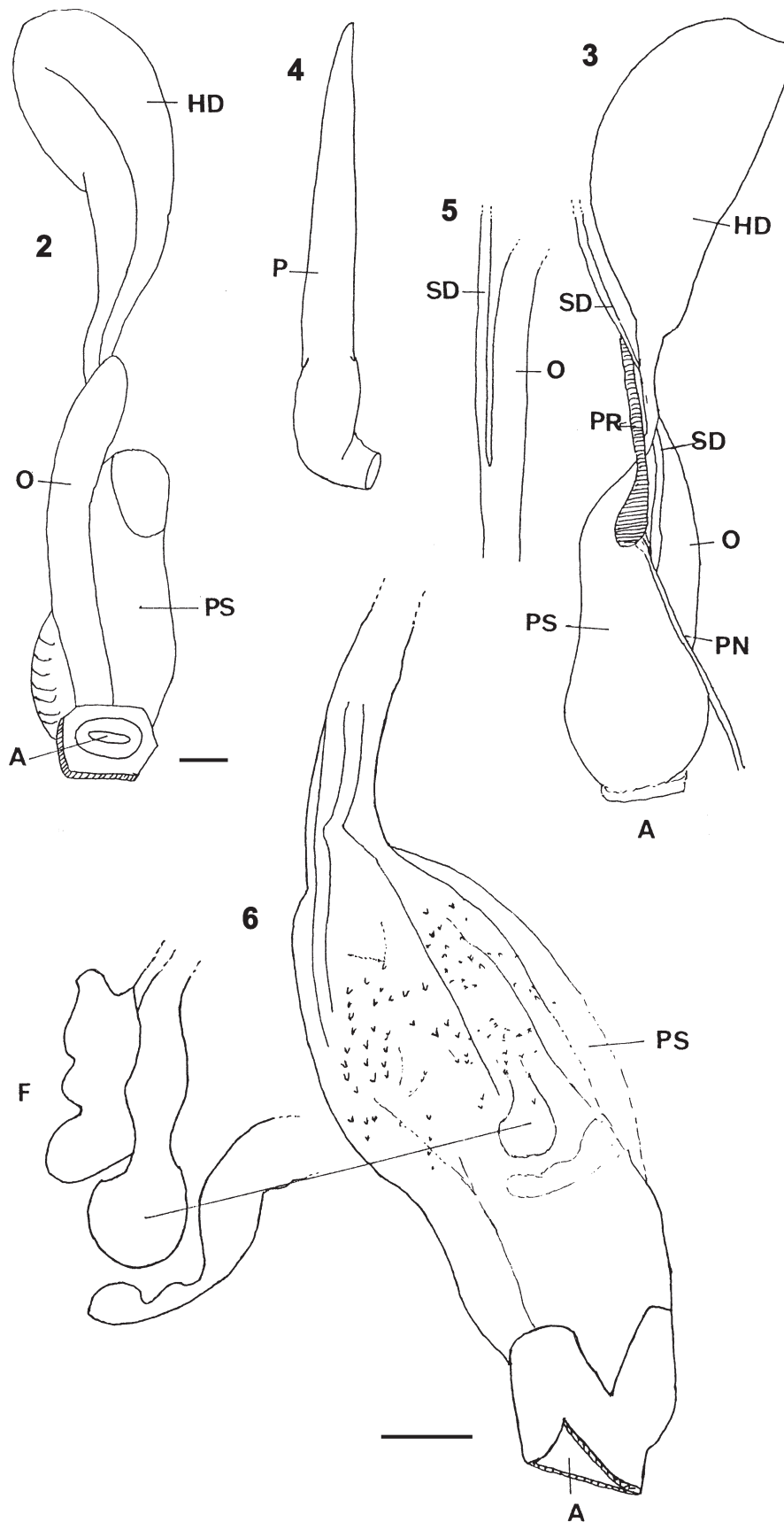
***Tayloria usambarica* (Craven, 1880)**

(Figs 7, 14)

A specimen of *Tayloria usambarica* was collected in the East Usambaras, in the Mtai Forest Reserve, between January and March 1997. The anatomy of this species, which belongs to the section *Colpanostoma* Bgt., does not appear to have been described apart from a note on the radula (VERDCOURT 1961). The

gross genital anatomy is very similar to that of *Tayloria urguessensis* (Preston, 1913) which I have figured (VERDCOURT 1961).

The radula is massive, about 2 cm long with the formula 7.1.7 the sixth tooth being the largest thus confirming my original investigation. These largest teeth are 0.86 mm long; I have not observed feeding in this species and cannot hazard a guess for what purposes these massive teeth are adapted. The penial complex is simple without appendages, the vas deferens and penial retractor joining the penis at the extreme apex. The penial sheath is not clearly differentiated but the walls are extremely muscular. Except where it is attached to the body wall the penial retractor is markedly broad and flattened, 2.4 mm wide. When opened the interior surface of the penis forms a uniform surface about 7×3 mm which is covered with over 1,000 short prickles, uniform in shape but rather larger in the third of the area nearest to the



Figs. 2-6. *Edentulina ovoidea*. Tanzania, Nguru Mts.: 2 - proximal parts of genitalia; 3 - as 2 but from reverse side; 4 - penis removed from the penial sheath; 5 - part of oviduct; 6 - penis opened to show spinules with enlargement of the lobulate folds. A - atrium, F - folds, HD - hermaphrodite duct, O - oviduct, P - penis, PN - penial nerve, PR - penial retractor, PS - penial sheath, SD - spermathecal duct. Scale bars - 2 mm

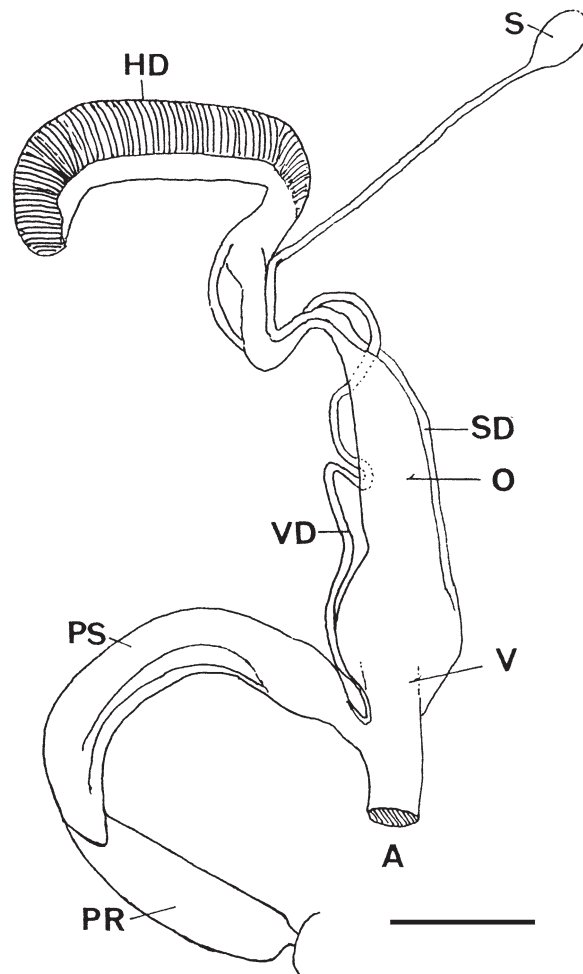


Fig. 7. *Tayloria usambarica*. Tanzania, East Usambaras – genitalia: A – atrium, HD – hermaphrodite duct, O – oviduct, PR – penial retractor, PS – penial sheath, S – spermatheca, SD – spermathecal duct, V – vagina, VD – vas deferens. Scale bar – 5 mm

atrium. The prickles vary in length from 64 to 94 μm and point towards the atrium.

Gonaxis vosseleri (Thiele, 1911)

(Figs 8–13)

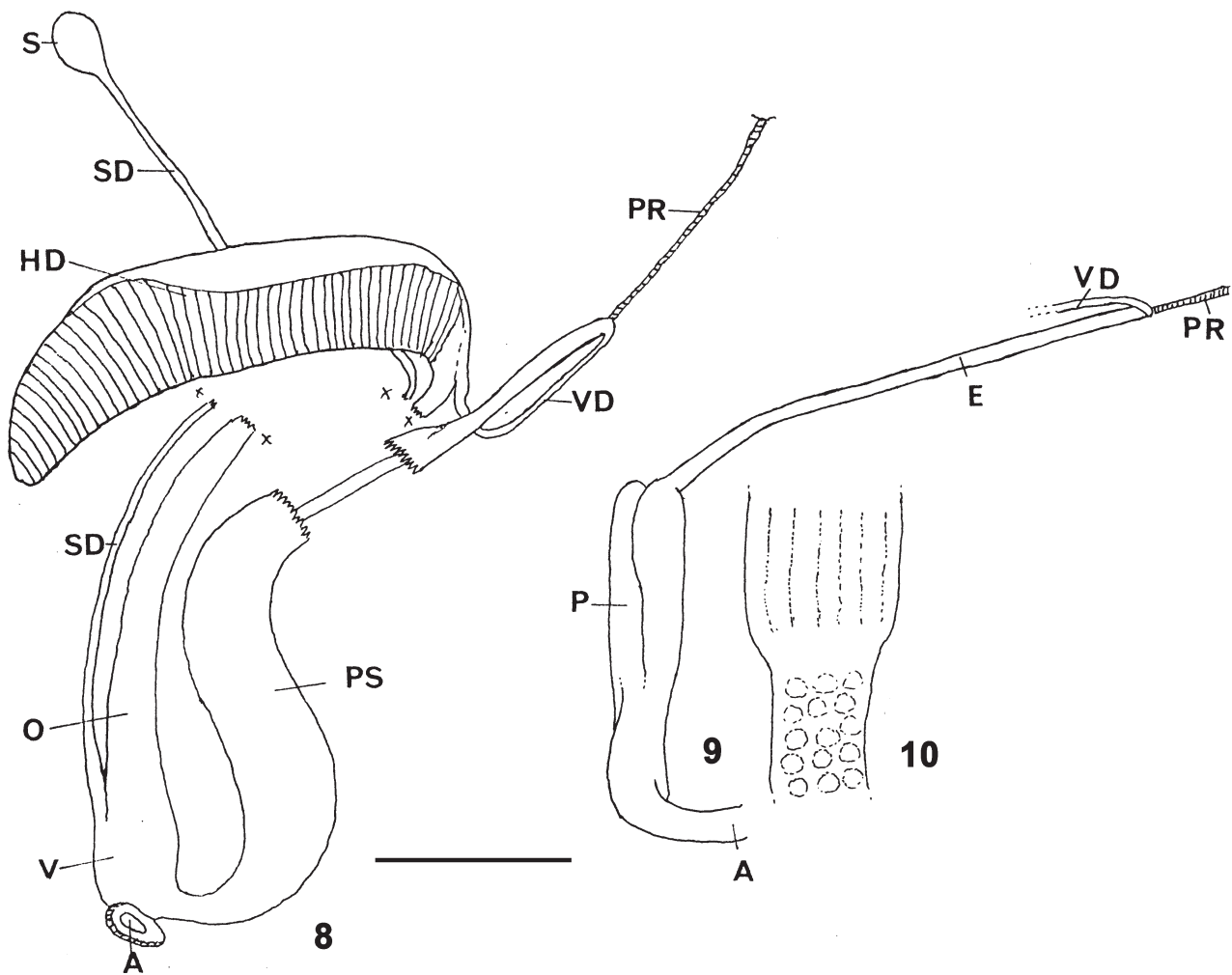
A specimen of *Gonaxis vosseleri* (described in *Streptaxis* and later made the type species of *Afristreptaxis* Thiele) was collected in the East Usambaras, Kwangumi Forest in December 1996. Dissection of it confirmed the gross genital anatomy I figured previously (VERDCOURT 1961) with the penial retractor and vas deferens attached to the apex of the narrow epiphallus. The basal very thick penial sheath

when opened reveals a thick muscular penis, the upper half of which is deeply grooved appearing as if composed of two tubular elements and somewhat wider than the lower half. Internally the penis has six grooves in the upper part and the lower area is coarsely shallowly rugose with raised rounded areas. The prickles are very small and numerous, about 2,000, 46–55 μm long, densest in the grooved area and sparser in the basal rugose part. The extreme apical millimetre above the grooved part is devoid of prickles but at the basal atrial end they extend right to the base.

DISCUSSION

Information on penial armature for *Gulella* and *Ptychotrema* has been given by the author (VERDCOURT & VENMANS 1956, VERDCOURT 1961, 1979, 1985, 1987, 1990) and summarised in the 1990 paper (note

on p. 349 and 352 of this paper for *usambarensis* read *usambarica*). The number of teeth varies from 3 to over 2,000 and they may be absent in some species if the absence in DEGNER's (1934) figure of *Ptychotrema*



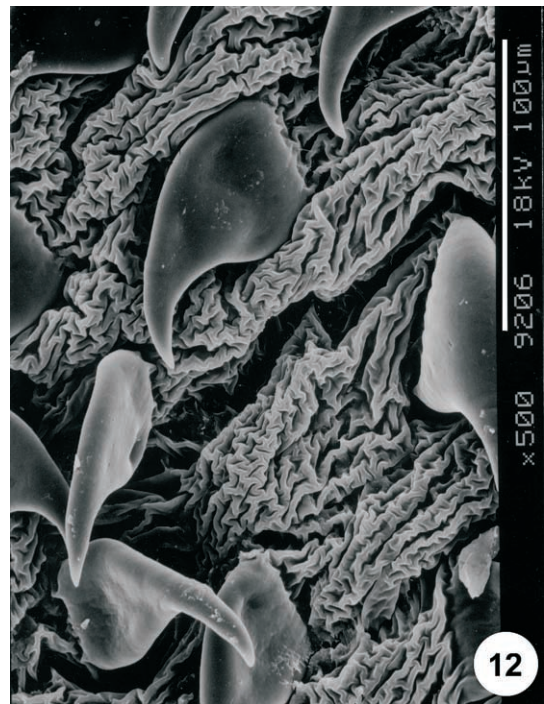
Figs. 8–10. *Gonaxis vosseleri*. Tanzania, East Usambaras: 8 – genitalia; 9 – penis; 10 – penis opened out. A – atrium, E – epiphallus, HD – hermaphrodite duct, O – oviduct, P – penis, PR – penial retractor, PS – penial sheath, S – spermatheca, SD – spermathecal duct, V – vagina, VD – vas deferens. Scale bar – 5 mm

mucronatum truly reflects the position. Two patterns are now evident; species where there are usually numerous small prickles of approximately uniform shape and size, and species with mostly fewer prickles some of which are much larger than the others. This latter state is well exemplified by several species of *Gulella*. Serrated spinules have so far as I know only been found in *Gulella* (*Primigulella*) *usagarica*

(Crosse). I think it is almost certain from the shell alone that *Primigulella* is a monophyletic group and examination of the penial armature in the other species would yield information by which to assess the value of the character. The value of the character will not be clear until many more species have been examined.

REFERENCES

- DEGNER E. 1934. Westafrikanischen Landschnecken 1. Streptaxiden, Helicarioniden, Vaginuliden. Zool. Jb. (Abt. Syst.) 65: 209–308.
- TATTERSFIELD P. 1999. Two new species of *Marconia* Bourguignat, 1889 (Gastropoda: Streptaxidae) from the Uluguru Mountains, Morogoro District, Tanzania. J. Conch. Lond. 36(6): 17–28.
- VERDCOURT B. 1961. Notes on the snails of north-east Tanganyika 9. A new species of *Gonaxis*... genus. Coryndon Memorial Museum Occasional Papers (Nairobi, Kenya) 8.
- VERDCOURT B. 1979. The identity of the European greenhouse *Gulella* (Pulmonata: Streptaxidae). J. Conch. Lond. 30: 101–104.



Figs. 11–12. *Gonaxis vosseleri*. Tanzania, East Usambaras: SEM photographs of penial armature from base of penis close to atrium. Scale bars: 11 – 200 μm, 12 – 100 μm

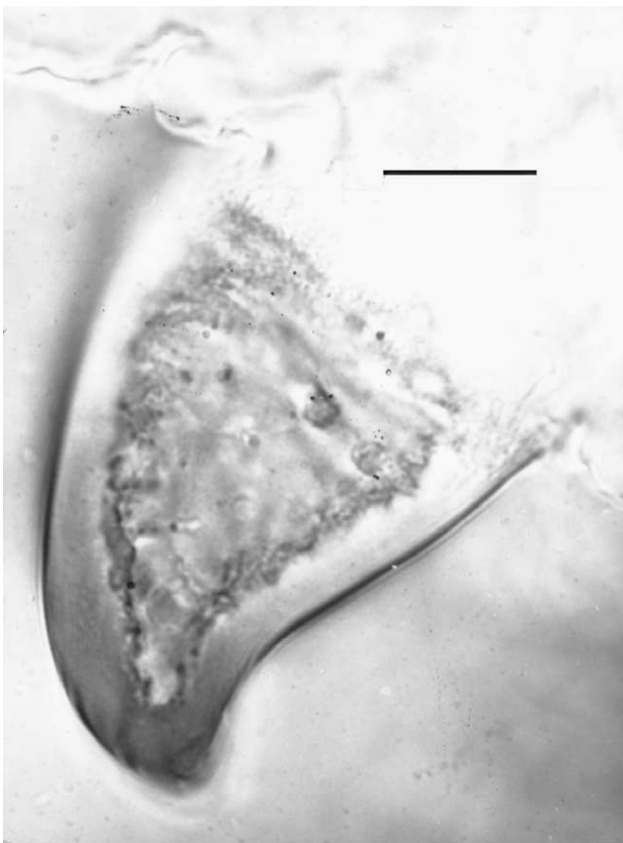


Fig. 13. *Gonaxis vosseleri*. Tanzania, East Usambaras: single penial denticle. Scale bar – 15 μm

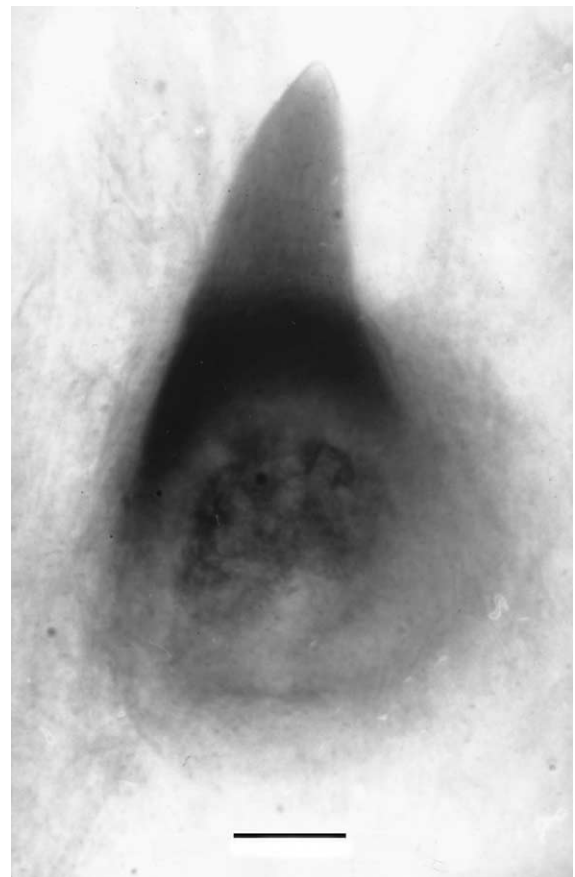


Fig. 14. *Tayloria usambarica*. Tanzania, East Usambaras: single penial denticle. Scale bar – 15 μm



- VERDCOURT B. 1980. Some notes on the larger Streptaxidae of the Usambara Mts., Tanzania. *Conch. Newsl.* 75: 274–278.
- VERDCOURT B. 1985. New taxa of *Gulella* L. Pfr. and *Ptychotrema* Mörch (Mollusca, Streptaxidae) from eastern Africa. *J. Conch. Lond.* 32: 109–121.
- VERDCOURT B. 1987. A note on *Gulella excrucata* Conolly (Streptaxidae). *Conch. Newsl.* 103: 48–51.
- VERDCOURT B. 1990. Two Ethiopian streptaxids (Gastropoda: Pulmonata: Streptaxidae). *J. Conch. Lond.* 33: 345–354.
- VERDCOURT B., VENMANS L. A. W. C. 1956. A synopsis of the section *Primigulella* Pilsbry of *Gulella* Pfr. (Mollusca, Streptaxidae). *Basteria* 20: 65–77.

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