

SOME NEW AND PREVIOUSLY KNOWN EARTHWORM SPECIES FROM CAPE YORK PENINSULA (ANNELIDA: OLIGOCHAETA: MEGASCOLECIDAE)

B.G.M. JAMIESON

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Ten new species, in five genera, are described from the Cape York Peninsula, Queensland: *Diploptrema attenuata* sp. nov.; *D. scheltingai* sp. nov.; *Neodiploptrema mcdonaldii* sp. nov.; and *Terrisswalkerius mcilwraithi* sp. nov., from the McIlwraith Range; *Diploptrema acropetra* sp. nov., *Neodiploptrema altanmoui* sp. nov., *N. paripunctata* sp. nov., and *Kayarmacia adelphicus* gen. et sp. nov., from Cape Melville National Park; *Terrisswalkerius carbinensis* sp. nov., from Mt Carbine Tableland, and *T. miseriae* sp. nov., from Mt Misery. *Kayarmacia* (= *Rhododrilus*) *queenslandicus* Michaelsen, 1916, is redescribed from the Alice-Mitchell R. National Park, near the type-locality; it is clearly the sister-taxon of *K. adelphicus*. The phylogenetic and biogeographic affinities of these species are briefly discussed. □ *Megascolecidae*, *phylogeny*, *biogeography*, *Oligochaeta*, *Cape York Peninsula*.

B.G.M. Jamieson, Zoology Department, University of Queensland, Brisbane 4072, Australia; 21 March 1997.

The oligochaete fauna of the Cape Melville National Park and of the McIlwraith Range, in North Queensland, has not previously been described. As a result of the assiduous collecting of Mr K.R. McDonald, new megascolecid species from these areas, from Mt Carbine Tableland and from Mt Misery, in the wet tropics, are described. A new genus *Kayarmacia* is erected for one of the new species from Cape Melville and for *Rhododrilus queenslandicus* Michaelsen, 1916, from the Alice-Mitchell River National Park which is redescribed from new material.

Subfamily Acanthodrilinae

Genus *Diploptrema* Spencer, 1900. Emend.  
Jamieson & Dyne, 1976

*Diploptrema acropetra* sp. nov. (Figs 1-4; 39)

TYPE LOCALITY. 14°43'54"S 144°46'45"E, Rocky Peak, Cape Melville National Park, altitude 450m, on sandstone plateau, base of trees where pigs had been digging, edge of *Banksia robur* swamp, K.R. McDonald, P.J. Lethbridge, 4 Apr 1995.

MATERIAL EXAMINED. HOLOTYPE. QMG212027 (includes microscope slide of right genital seta of IX). PARATYPES. P1-9 QMG212028-212036. OTHER MATERIAL. Several not designated types, QMG213391.

DESCRIPTION. Length 38-55mm (H, P1-9), 43mm (H). Width (midclitellar) 1.7-2.4mm (H, P1-9), 2.3mm (H). Segments (longest and short-

est specimen P3 and 9) 163-169, H 166. Pigmentless huff in ethanol. Prostomium large, epilobous 1/2, closed, the lateral margins of the dorsal tongue strongly convergent and concave (H, P1, P3-5) but in P2 prolobous with longitudinal grooves on the peristomium giving an impression of an epilobous condition. Peristomium longer than segment II; neither it nor the prostomium bisected ventrally. Dorsal pores poorly visible, commencing on or behind the clitellum (H, P1-5). Setae 8 per segment, commencing on II; in XII,  $aa: ab: bc: cd: dd = 7.2: 1.0: 6.6: 0.7: 29.2$ ; or  $13.6: 1.9: 12.5: 1.3: 55.1\%$  (H); ventral setal couples of XVIII absent; those of XVII and XIX modified as enlarged penial setae; ventral setae of X forming genital setae. Nephropores not visible. Clitellum (poorly developed in the holotype); in XIII-XVII, annular, but interrupted ventrally in XVII by the prostatic porophores (P1). Male pores not visible. Prostatic porophores 2 pairs, in XVII and XIX, each an elliptical papilla centred approximately in *ab* lines; penial setae protuberant from one or both pairs (H, P1-5); seminal grooves not apparent (H) or a faint outwardly curved (parenthetic) groove connecting the prostatic pores on each side (e.g., P4). Genital tumescences: unilateral in X, (H, P1), left (P1, 2); also paired in XI (P2); or absent in X and left only in XI (P3). Genital markings: an unpaired midventral elliptical to rounded oblong pad between the ventral setal couples (in *aa*) in each of intersegmental furrows 13/14-15/16, 16/17, 17/18, 20/21-23/24; those in 16/17 and

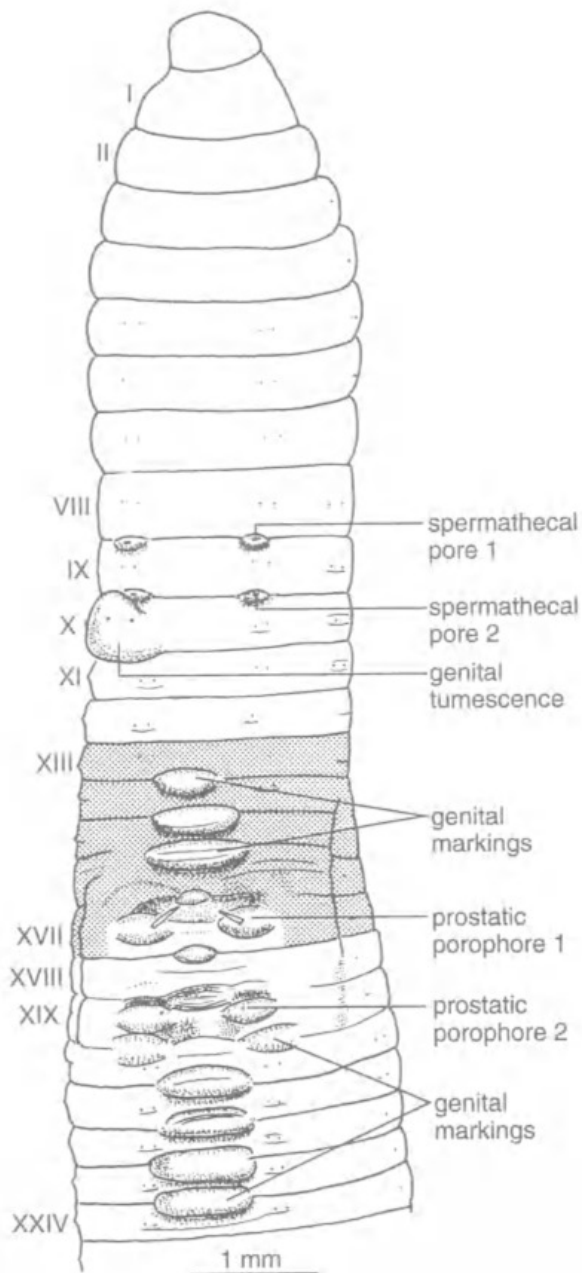


FIG. 1. *Diplotrema acropetra* sp. nov. Holotype, QMG212027. Ventral view of forebody and clitellar region (clitellum drawn from Paratype 1). Note that in this species the spermathecal pores are transposed one segment posterior to the normal megascolecid location.

17/18 small; a suggestion of a pad in 18/19 (H). Female pores not visible. Spermathecal pores 2 pairs, in 8/9 and 9/10 (H); this unusual location being confirmed in P1-9.

Septa 8/9 and 9/10 the thickest, fairly strongly thickened. Dorsal blood vessel single, continuous

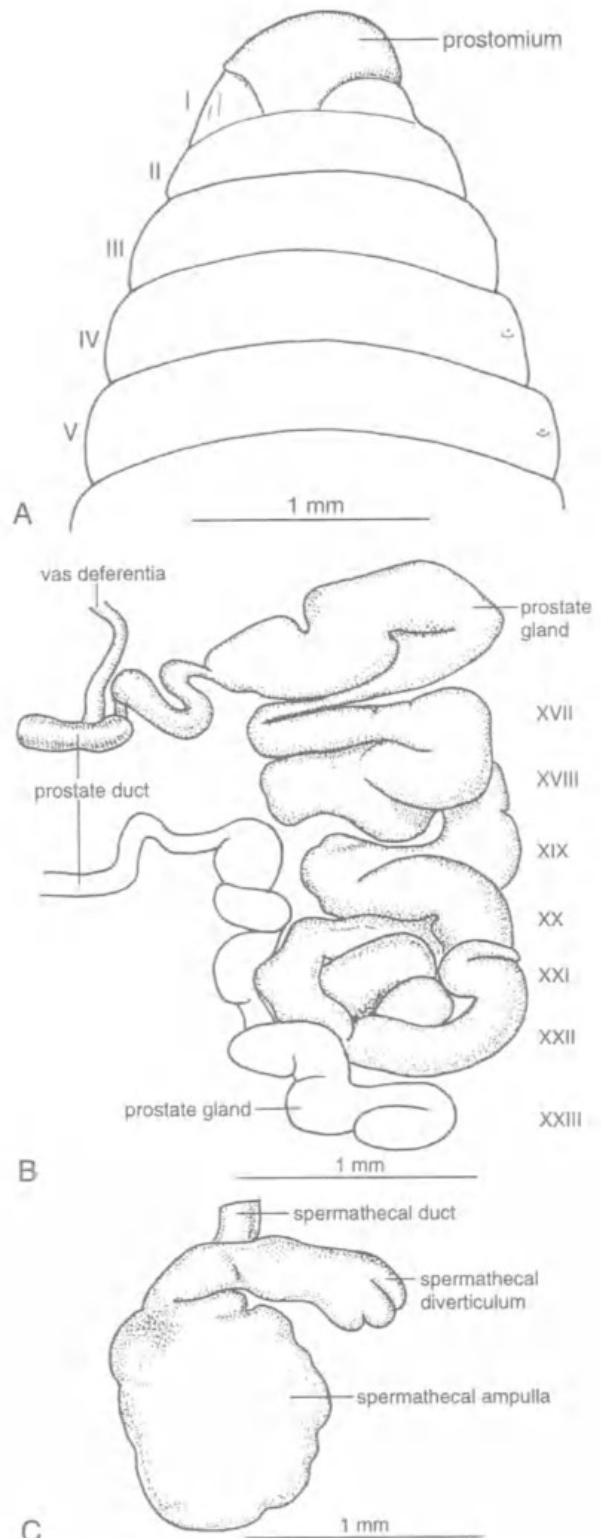


FIG. 2. *Diplotrema acropetra* sp. nov. Holotype, QMG212027. A, dorsal view in region of prostomium. B, right prostates, with penial setae omitted; only the anterior prostate is shaded. C, right spermatheca of IX.

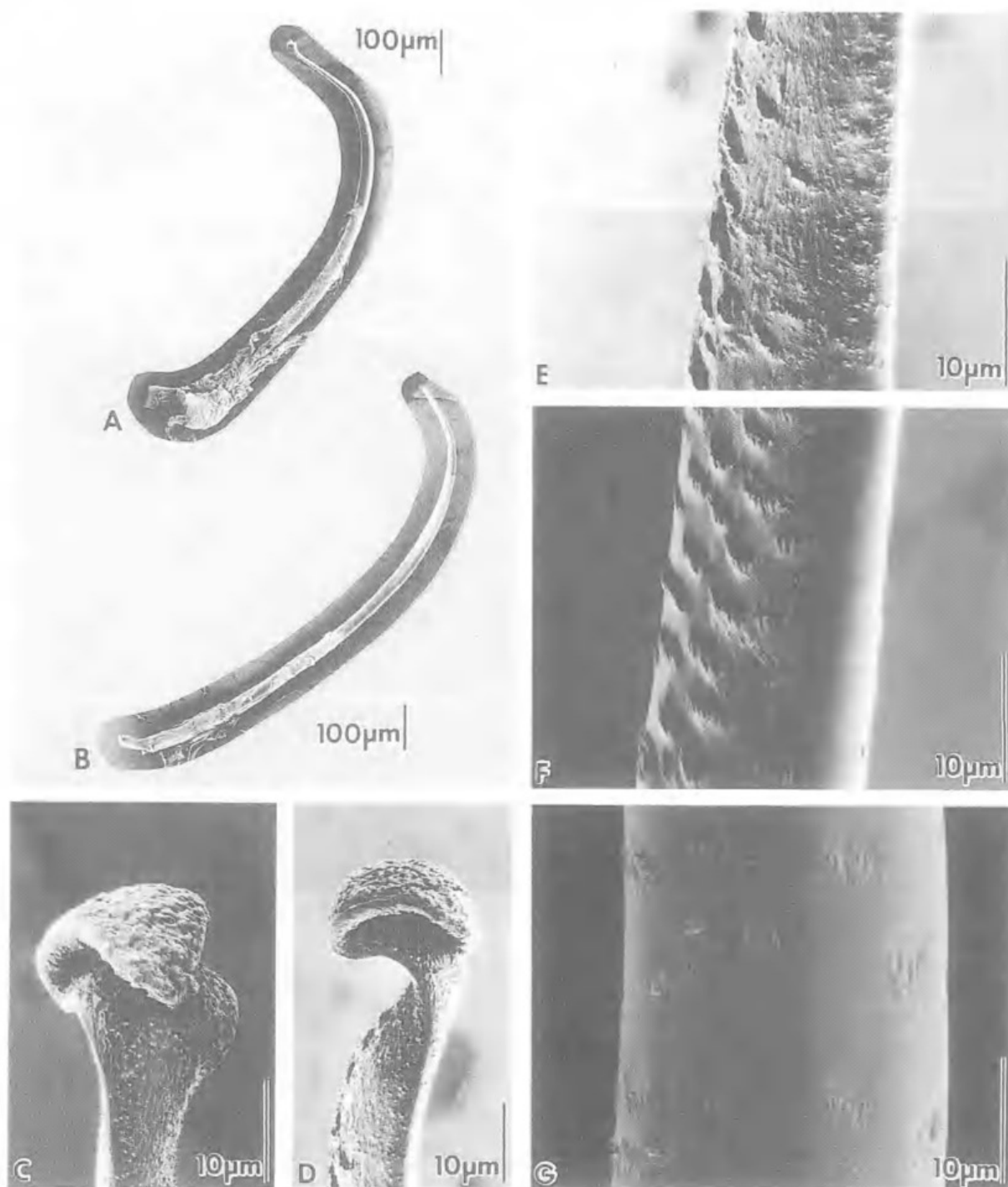


FIG. 3. *Diplotrema acropetra* sp. nov. Holotype, QMG212027. A and B, two right penial setae of XIX. C and D, different views of the tip of seta show in A. E-G, successively more posterior to near basal regions of same.

onto the pharynx. Last hearts in XIII; in XI-XIII stout, laterooesophageal, the connectives to the supraoesophageal vessel being wide, those to the dorsal vessel scarcely apparent; commissurals in X anteriorly slender, with dorsal connectives only. Gizzard very large, an elongate, glossy,

muscular cylinder about three times longer than wide, in V, but its posterior end at the level of segment X. Oesophagus segmentally dilated, and longitudinally compressed, in each of XIV-XVI; the walls in these segments with numerous closely situated, deep, internal lamellae but

lumen not constricted off from that of the oesophagus. Intestine commencing with abrupt expansion in XVIII. Dorsal typhlosome very well developed from about XXIX posteriad. Holonephric throughout; at least two pairs of nephridia anterior to the gizzard are convoluted, not tufted, and each nephridium sends a duct anteriorly to the pharynx. Typical nephridia each with preseptal funnel and slender, avascular duct discharging preseptally in the vicinity of the dorsal setal couples (*cd*). Metandric; large seminal funnels, with spermatozoal iridescence, in XI only. Seminal vesicles racemose, in XII only. Flattened ovaries, with many egg strings, in XIII. Two pairs of thickly tubular prostates, with ectal ducts discharging in XVII and XIX. The anterior pair is very much the larger and winds from XVII to XXII; the tortuous muscular duct is joined near its ectal end by the thick, vas deferens, the width of which, greatly exceeding that of a normal vas, suggests that it is a sperm reservoir. Posterior prostates winding from XIX to XXIII; the ectal duct shorter, though still long, less tortuous and poorly muscularized. Both pairs of prostate ducts overlain by penisetal follicles. Penial setae curved through a right angle or slightly less; the tip widened reflexed 'dorsally' for a short distance before curving 'ventrally' to a V-shaped tip, the tip thus having the appearance of a poised cobra; in frontal view this may give the spurious appearance of a ladle-shape; sculpturing in the midregion consisting of palisades of pointed scales in incomplete circlets, the circlets being spaced longitudinally at approximately  $10\mu\text{m}$  intervals; the scales sparser basally; some groups of scales continuing to, but not including, the modified tip; alternatively the scales may form small obliquely arranged groups, each group consisting of a small protuberant semicircle of pointed teeth which overlie a depression, so that the seta resembles a grater; length of a well developed right penial seta 1mm (H). Genital setae present at the tumescences in X or X and XI; each with the usual diplotreman appearance, a stout seta with four opposed longitudinal series of long notches and the tip slightly expanded below the terminal point; the seta gently curved; the longitudinal notches confined to approximately the ectal third; length right seta of IX (measured in a straight line from tip to base) = 0.9mm; greatest width, near base,  $60\mu\text{m}$ . Spermathecae two pairs, transposed

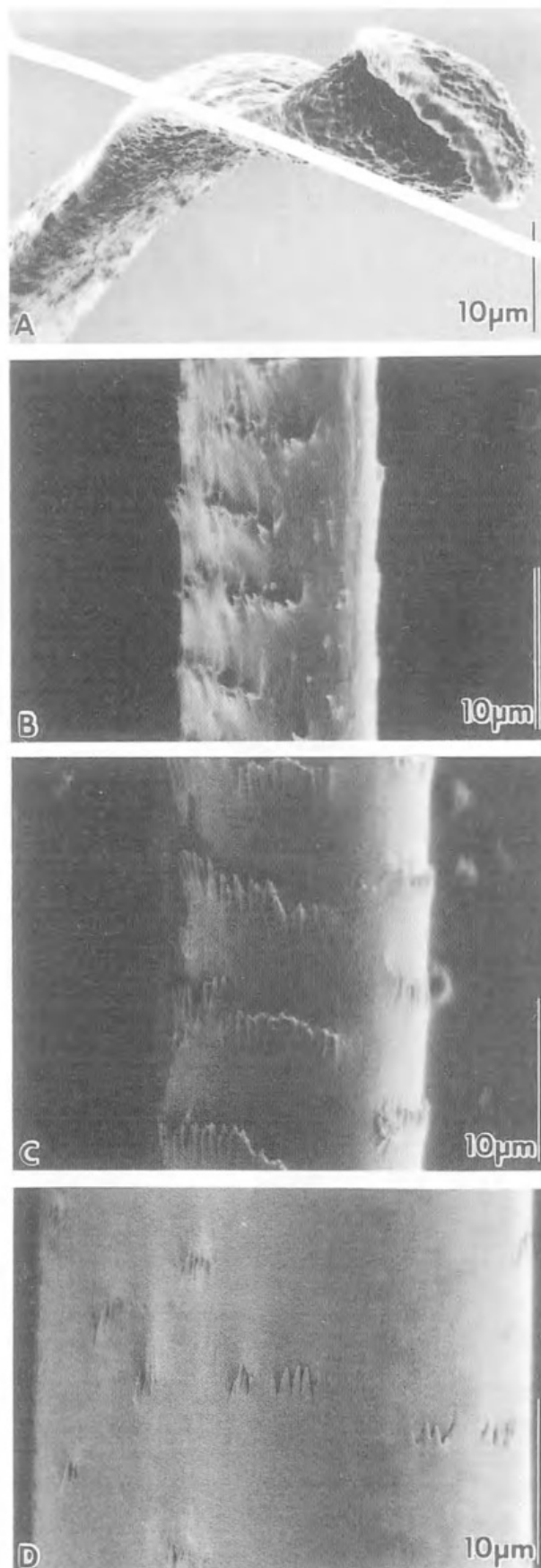


FIG. 4. *Diplotrema acropetra* sp. nov. Holotype, QMG212027. A-D, Tip and successively more posterior regions of a penial seta of XVII.



posteriorly one segment, relative to the usual megascolecid condition, so that the posterior pair is in X, the anterior pair in IX. The posterior pair of spermathecae, in X, very much larger than the anterior pair; each posterior spermatheca with a sacciform ampulla, a short narrow duct; and a large multiloculate and apically lobed diverticulum, containing sperm bundles, which joins the junction of ampulla and duct and is elongated at approximately a right angle to the duct. Length right spermatheca of X = 1.5mm; length ampulla = 1.0mm; ratio length spermatheca: length duct (including base of diverticulum) = 3.5; length of diverticulum lateral of duct = 0.6mm. The diverticula of the anterior spermathecae are small 'rosettes' of loculi.

**ETYMOLOGY.** From the Greek *acros*, peak, and *petros*, a rock.

**REMARKS.** Transposition of the spermathecae, from the usual position in VIII and IX to IX and X, is unknown elsewhere in *Diploctrema*. This correlates with the unusual slender condition of the commissural blood vessels, and suppression of testes and funnels in X, giving the metandric condition. As the prostatic porophores are in their normal segments of XVII and XIX, it is clearly not due to interpolation of a segment, as occurs in some species of the closely related genus *Acanthodrilus*, in New Caledonia (Jamieson & Bennett, 1979).

Rocky Peak is an isolated upland plateau of Battle Camp sandstone, adjacent to the Deighton Tableland. The swampy habitat is the most northerly location of a habitat type dominated by *Bankia robur*.

***Diploctrema attenuata* sp. nov. (Figs 5-8; 39)**

**TYPE LOCALITY.** Peach Creek, McIlwraith Range, 13°44'17"S 143°20'15" ± 5"E, altitude 500-520m in bank of stream in notophyll vine forest, on Kintore adamallite granite, K.R. McDonald, A.J. Stewart, W.E. Martin, 26 Sep 1995 and, K.R. Mc., A.J. S., 23 Sep 1996.

**MATERIAL EXAMINED.** HOLOTYPE. QMG212000. (Includes microscope slides of left and right anterior penial seta and left genital setae of VIII). PARATYPES. 1-8 QMG212038-45; P9 QMG212046; P10-12 QMG212019-212021; P13-17 QMG213386-213390; P18-20 QMG211972; P21-23 QMG213402-213404. OTHER MATERIAL. Several not designated types QMG211980, 212022.

**DESCRIPTION.** Length 106-163 (a live specimen 230) mm, H 115mm. Width (midclitellar)

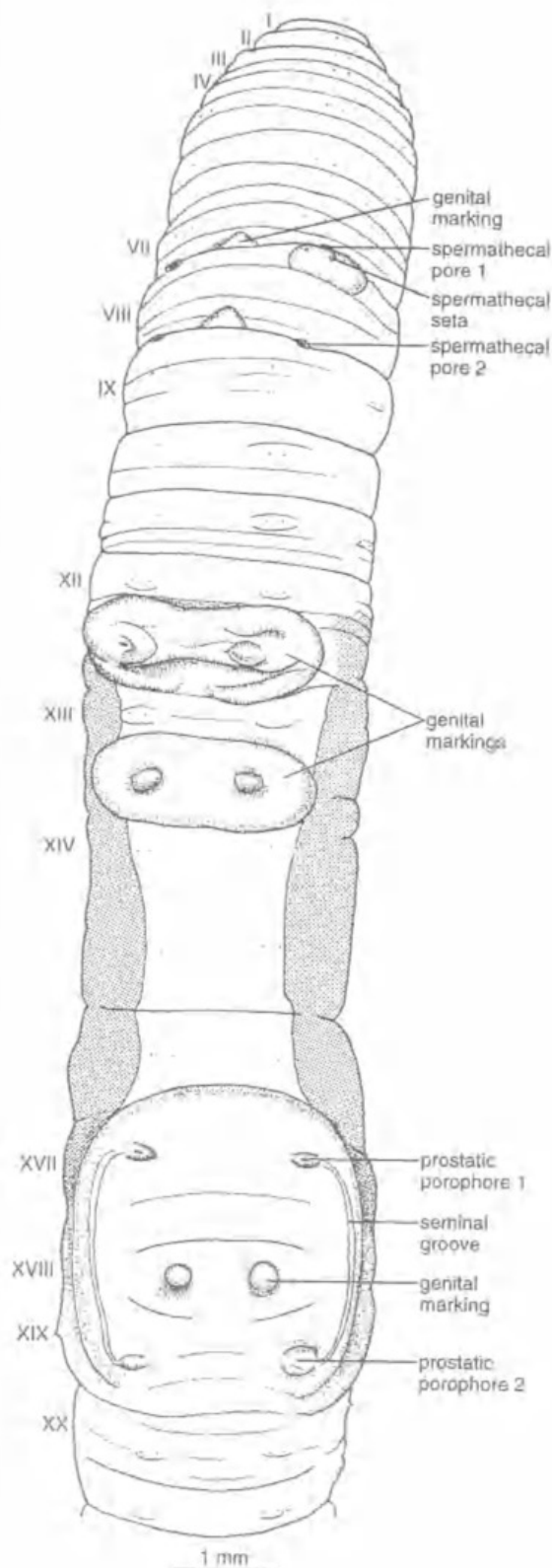


FIG. 5. *Diploctrema attenuata* sp. nov. Holotype, QMG212000. Ventral view of forebody and clitellar region.

2.0- (H) 2.5mm. Segments 140-256, H 155. Uniformly circular in cross-section throughout. Pigmentless buff in alcohol, clitellum, when tumid, pale pink; in life, blood red throughout. Prostomium small, probolous, slightly indenting the peristomium which is about as long as segment II. Dorsal pores absent. Setae 8 per segment, commencing on II; ventral setal couples absent from XVIII; those of XVII and XIX modified as enlarged penial setae; genital setae present in VIII, with the usual diplotreman ornamentation consisting of notches.  $aa: ab: bc: cd: dd = 4.8: 1.0: 4.3: 0.8: 11.6: = 16.8: 3.5: 15.1: 17.9: 40.5\%$ . Nephropores not visible. Clitellum well-developed, saddle-shaped, extending over 1/2XII-XVII, with a midventral gap that extends to, or slightly beyond, *b* lines. Male pores not visible. Prostatic pores 2 pairs, in XVII and XIX, each pore on a minute oval papilla which is equatorial and slightly lateral of *b* lines relative to adjacent segments; the papillae of a side linked by a weakly developed slightly parenthetic seminal groove; the entire male genital area forming a raised, almost square area, slightly longer than wide, with rounded vertices. Genital markings: a broad, unpaired midventral pad extending laterally beyond *b* lines, intersegmental in 10/11 (P1, P3, 4, 6-9), 11/12 (P8), 12/13 (H, P2), 13/14 (H, P2), 14/15 (P2) but extending almost to the setal arcs of each adjacent segment; each pad bearing a pair of approximately hemispheroidal papillae median of *a* lines; highly diagnostic is a similar pair of papillae, on a less distinct transversely oval area, segmentally situated on XVIII (all specimens); a transverse segmental pad frequently present in XX (P1, 3, 6-9). Further markings a midventral postsetal triangular slight tumescence in VII and VIII (H, P2, 6, 7, 9). An unpaired oval-rectangular genital tumescence on the left side straddling and extending beyond *ab*, in the anterior half of VIII, with two punctuations representing genital setae. Female pores small transverse slits presetally in *a* (P1) or *b* (H) lines. Spermathecal pores 2 pairs, in 7/8 and 8/9, slightly lateral of setae *b*; inconspicuous but definite orifices visible by parting the intersegment (H, P1-9).

Septa 5/6-8/9 strongly thickened, the last two the thickest. Dorsal blood vessel single, continuous onto the pharynx. Last hearts in XIII; those in X-XIII, latero-oesophageal, with connectives to the dorsal and supraoesophageal vessels; commissurals in IX anteriorly slender, not heart-like, though in IX, at least, possibly latero-oesophageal. Gizzard small, compressible though with

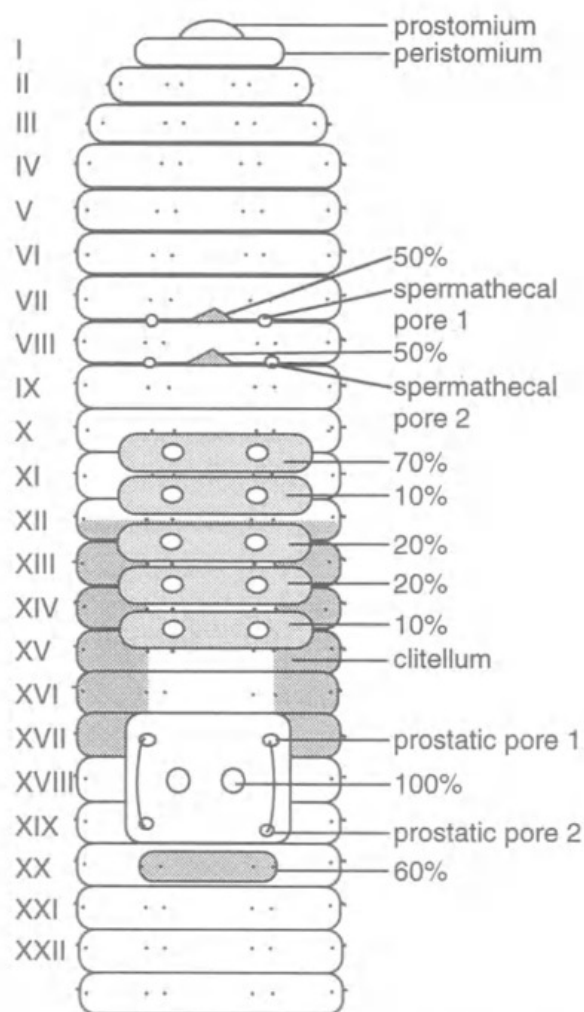


FIG. 6. *Diplotrema attenuata* sp. nov. Diagram showing distribution of genital markings in the holotype and 9 paratypes.

some muscular sheen, almost vestigial, in V. Oesophagus suppressed in VI by backward extension of septum 5/6; segmentally slightly swollen, and vascularized in VII to IX; a simple tube from X(?), XI to 1/2XIX in which the intestine commences with abrupt expansion; typhlosole absent. Ventrolateral masses in XIII give the spurious impression of calciferous glands but are not connected to the oesophagus and disintegrate on manipulation. Holonephric throughout; nephridia not seen in a few anterior segments and no tufting detected; nephridia with preseptal funnel near nerve cord and slender duct discharging in line with the dorsal setal couples (*cd*); caudally the body of the nephridium has the appearance of a convoluted sac but bladders are absent. Holandric; large sperm masses, and very large iridescent sperm funnels free in X and XI. Two pairs

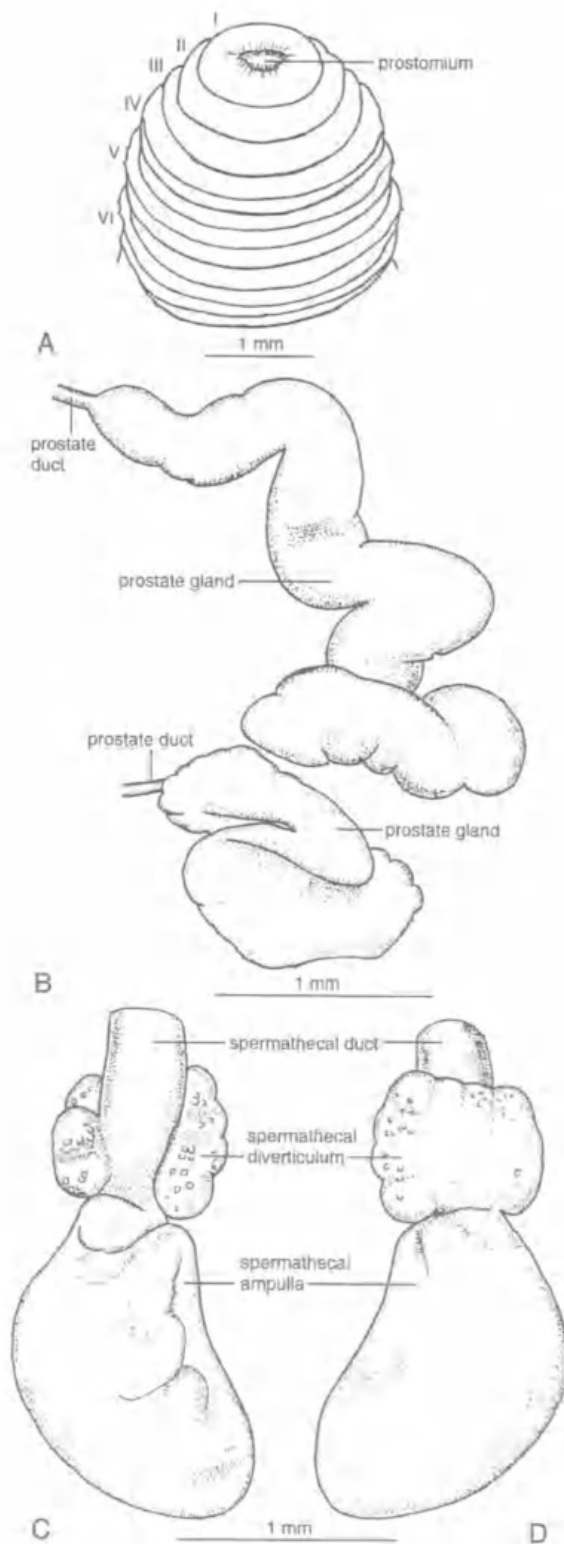


FIG. 7. *Diploptrema attenuata* sp. nov. Holotype, QMG212000. A, dorsal view in region of prostomium. B, right prostates, with penial setae omitted. C and D, ventral and dorsal views of the left spermatheca of IX.

of large, racemose seminal vesicles which fill the length of their segments, in XI and XII. Moderately large, flattened bushy ovaries, and funnels, in XIII; small, multichambered, berry-like masses on each side of the oesophagus in XIV are presumably ovisacs. Prostates two pairs, with ducts discharging in XVII and XIX; those in XVII considerably the larger and with the form of tortuous thick tubes which end in XVIII; those in XIX flattened and strap-like in their midregion, and approximately S-shaped; each prostate with a short slender duct which is obscured by the large penisetal follicles. Male genital field of XVII-XIX represented internally by diffuse glandular modification of the body wall but no bursae present. Paired, conjoined vasa deferentia with closely adpressed bends, and spermatozoal iridescence, traced on each side to immediately behind the ectal end of the duct of the anterior prostate, but termination not seen. Penial setae strongly curved throughout their lengths; the tip not widened, reflected dorsally or not and ending bluntly in a rounded swelling with a pitted surface; sculpturing (best developed in the midregion) consisting of pointed scales, contiguous side by side, in incomplete circlets; the circlets spaced longitudinally at approximately  $15\mu\text{m}$  intervals; the scales stopping short of the modified tip near which they are in small groups rather than circlets; length of a well developed right penial seta  $1.3\text{mm}$  (P10). Genital setae present at the tumescences in VIII; each with the usual diplotreman appearance, a stout seta with four opposed longitudinal series of long notches and the tip slightly expanded below the terminal point; length left seta  $=0.5\text{mm}$  (incomplete?); greatest width, near base,  $=25\mu\text{m}$ . Spermathecae 2 pairs, the posterior somewhat the larger, each with a large irregularly ovoid ampulla and straight broad, well demarcated muscular duct of about half its length; a multiloculate diverticulum, with a form reminiscent of a clenched fist, sessile dorsally on the duct at the junction of the latter with the ampulla, the few main loculi being laterally situated and filled with innumerable very small, iridescent sperm balls; length left spermatheca of IX  $=2.3\text{mm}$ ; length ampulla  $=1.4\text{mm}$ ; ratio length spermatheca: length duct  $=2.6$ ; greatest dimension of diverticulum (transversely)  $=0.8\text{mm}$  (H).

ETYMOLOGY. Named for its unusually attenuated form.

REMARKS. The genital field, particularly the two knob-like genital markings median to the

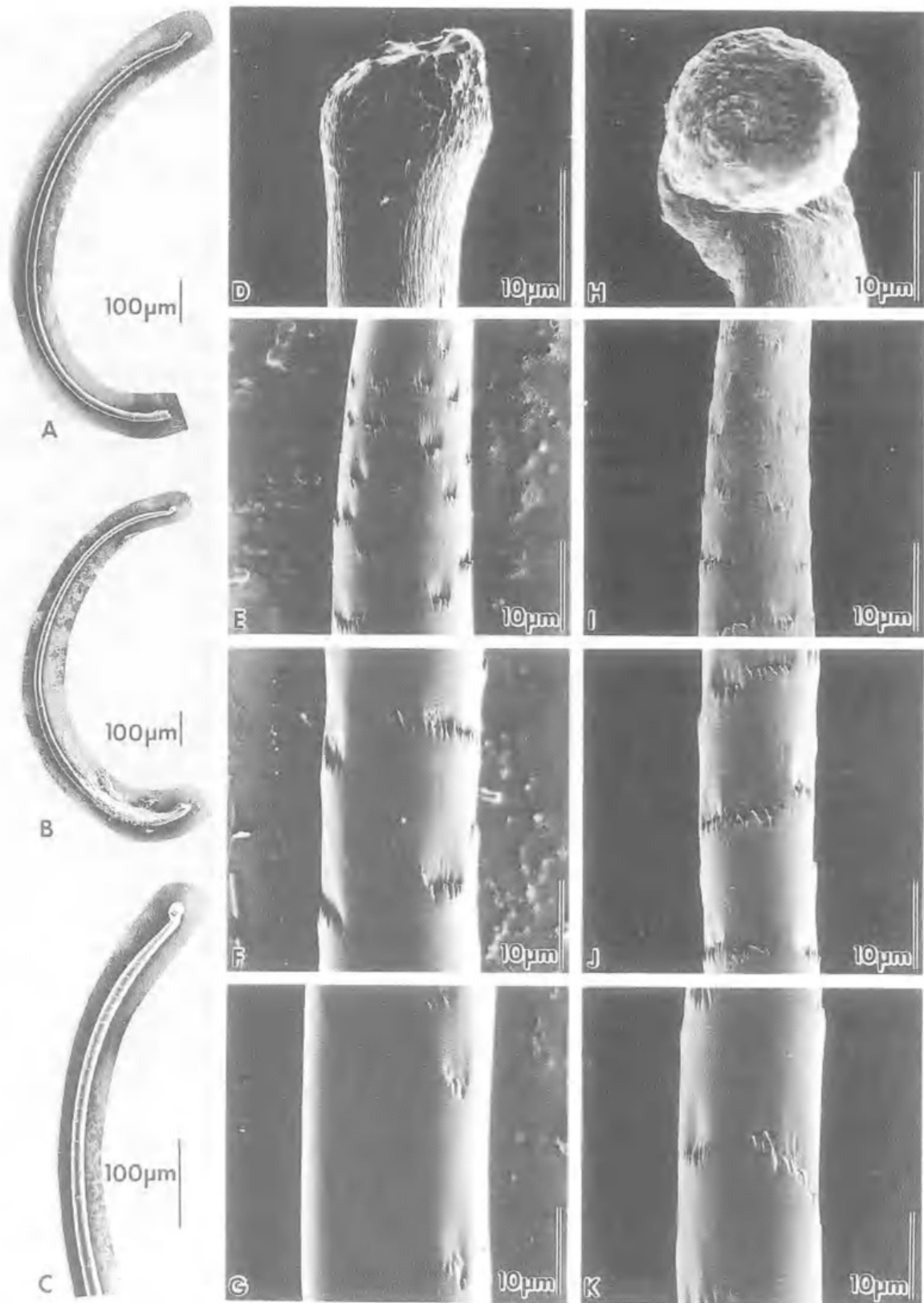


FIG. 8. *Diplotrema attenuata* sp. nov. Paratype 10, QMG212019. Scanning electron micrographs. A, a right penial seta of XVII. B and C, a right penial seta of XIX. D-G, appearance of seta shown in A from the tip to near the base. H-K, same for seta shown in B and C.



seminal grooves on segment XVIII, is diagnostic of *D. attenuata*. The male genital field of this species, when fixed, is emphasized by the fact that the body is almost always dorsally arched anteriorly and posteriorly to it. The body is also contorted elsewhere.

The absence of dorsal pores is attributable to an amphibious existence in earthworms. It is unknown in other published species of *Diploptrema* with the exception of *D. cornigravei* (Michaelsen, 1907) and possibly *D. macleayi* (Fletcher, 1890), both inadequately described species from Western and North Western Australia, respectively.

***Diploptrema scheltingai* sp. nov.**  
(Figs 9-11; 39)

**TYPE LOCALITY.** 13°44'17"S 143°20'15"E, Peach Creek, McIlwraith Range, altitude 500-520m. In moist upper root horizon down to about 25cm, notophyll vine forest with fan and feather palms, stream bank, sandy loam, on Kintore adamallite granite. K.R. McDonald, A.J. Stewart, 25-27 Sep 1996.

**MATERIAL EXAMINED.** HOLOTYPE. QMG212001 (includes microscope slide of left genital seta of VIII). PARATYPES. P1 & 2 QMG212003-212004; P3 QMG211981; P4 QMG213401; P5 QMG213406.

**DESCRIPTION.** Length 74 (H)-104 (P3)mm. Width (midclitellar) 5mm (H, P3). Segments 188 (P3)-204 (H). Uniformly circular in cross-section throughout, pigmentless buff in ethanol, including clitellum. Prostomium prolobous but deeply indenting the peristomium dorsally; peristomium longer than segment II; first dorsal pore in 11/12 but not definitely perforate until 17/18. Setae 8 per segment, commencing on II; in XII, *aa: ab: bc: cd: dd* = 5.0: 1.0: 4.8: 1.0: 21.4; or 12.5: 2.5: 12.1: 2.4: 53.5%; ventral setal couples of XVIII absent; those of XVII and XIX modified as enlarged penial setae; setae *a* and *b* of VIII forming genital setae. Nephropores visible in the postclitellar body, a pair in each segment, each pore a faint spot anterior to each seta *b*. Clitellum well-developed, extending over XII-XVII, interrupted ventrally by the male field in XVII, with doubtful midventral development anterior to the field (H), or interrupted between the ventral setal couples throughout, i.e., saddle-shaped (P1-3). Male pores not visible. Prostatic pores 2 pairs, in XVII and XIX, each pore on a minute oval papilla which is in line with the ventral setal couple (*ab*) of adjacent segments; the papillae of a side linked by a parenthetic seminal groove; the pore accompanied by one or more minute punctuations pre-

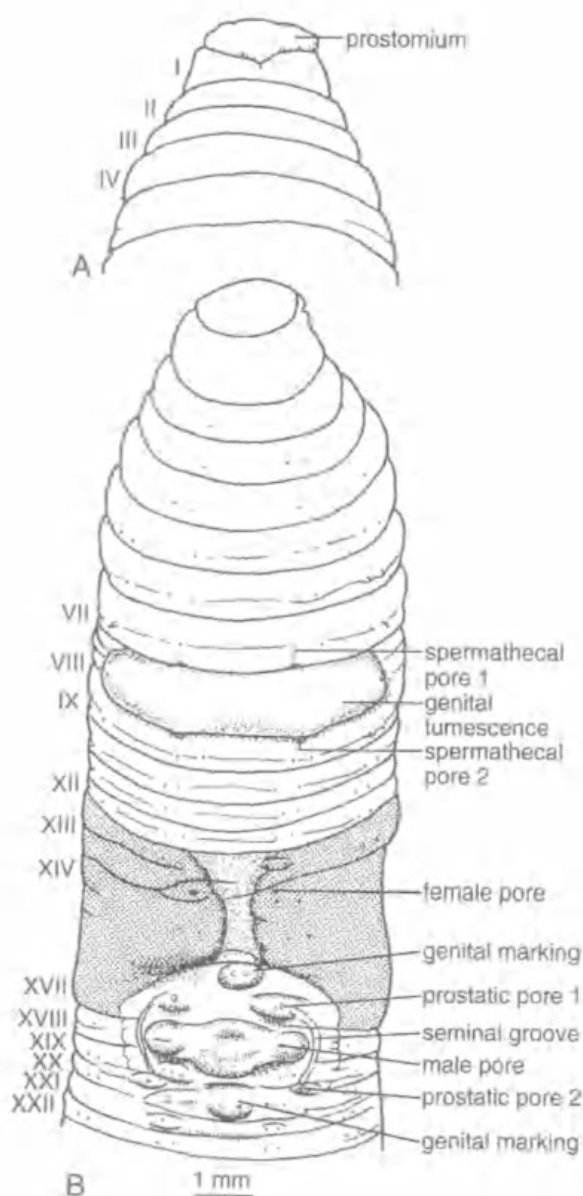


FIG. 9. *Diploptrema scheltingai* sp. nov. Holotype, QMG212001. A, dorsal view in region of prostomium. B, ventral view of forebody and clitellar region.

sumably representing penial setae, but the latter not protuberant; the posterior end of each seminal groove continuous onto a small transversely elliptical papilla which is centred lateral to *b* lines at the posterior limit of XIX; the male genital area depressed relative to the anteriorly bounding clitellum. Genital markings: a pair of rounded papillae in *ab* of XVIII, filling the segment longitudinally, the summit of each with a pore-like marking which from internal examination appear to be the male pore. The two papillae connected



by a prominent transverse bar which is widened midventrally so as to impinge strongly on segments XVII and XIX, the widened region bearing a median elliptical protuberance (H, P1-3). Further genital markings a small transversely elliptical pad anterior to the prostate pores of XVII (H, P1) and a similar pad in XX with tumid lateral extensions which include the ventral setal couples (H, P1, P3). A strongly protuberant genital tumescence in VIII fills, and expands the segment longitudinally, and takes in seta *c* on each side (H, P1-3); genital setae present. Female pores a pair of small transverse slits, each with narrow border, presetally slightly lateral of *a* lines of XIV (H). Spermathecal pores 2 pairs, in 7/8 and 8/9, in or very slightly lateral of setae *a*; inconspicuous but definite orifices, closely apposed to the genital tumescence.

Septa 7/8-12/13 strongly thickened; 9/10-11/12 slightly thickened. Dorsal blood vessel single, continuous onto the pharynx. Last hearts in XIII; those in X-XIII, latero-oesophageal, with connectives to the dorsal and supraoesophageal vessels. Gizzard very large, an elongate, glossy, muscular, cylinder; in V. Oesophagus lacking calciferous glands; but very wide and vascular, without intersegmental constriction, in XVI and XVII (H, P1). Intestine commencing, with abrupt expansion, in XX; a very large dorsal typhlosole commencing in XXII-XXIII, consisting of two distinct laminae (H, P1). Holonephric, a large nephridium present on each side throughout but in caudal segments several longitudinal zigzagged ducts are present on each side running from one segment to the next; tufting absent. Holandric; testes, large sperm masses, and very large iridescent sperm funnels free in X and XI. Seminal vesicles racemose, in IX and XII; similar in size in the two segments (H, P1). Small ovaries, with few egg strings, in XIII. Somewhat flattened tubuloracemose prostates, two pairs, in XVII and XIX, restricted to these segments; those in XIX considerably larger than those in XVII (H), or the anterior pair slightly larger (P1); each gland folded on itself at least twice, and, especially

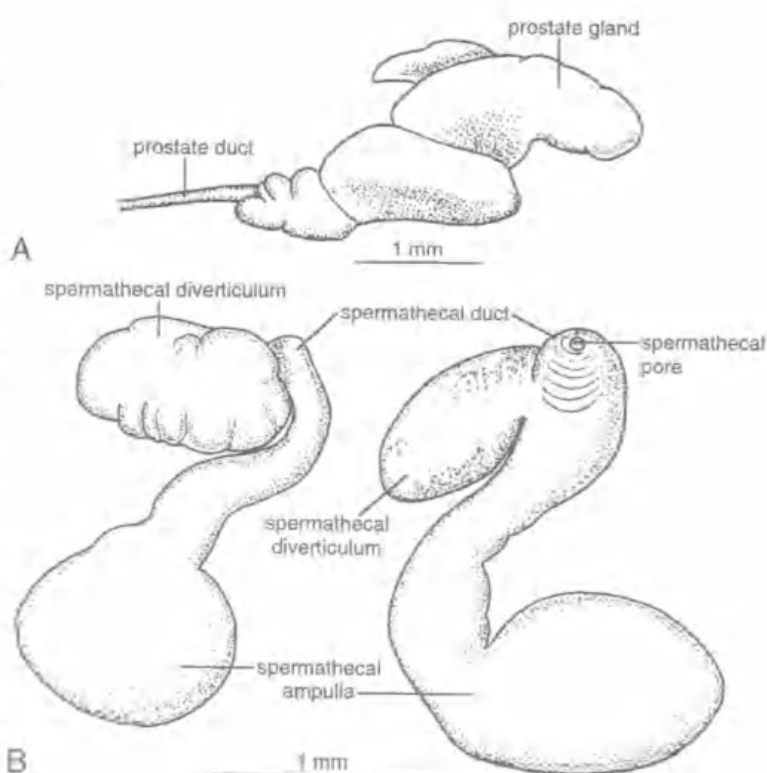
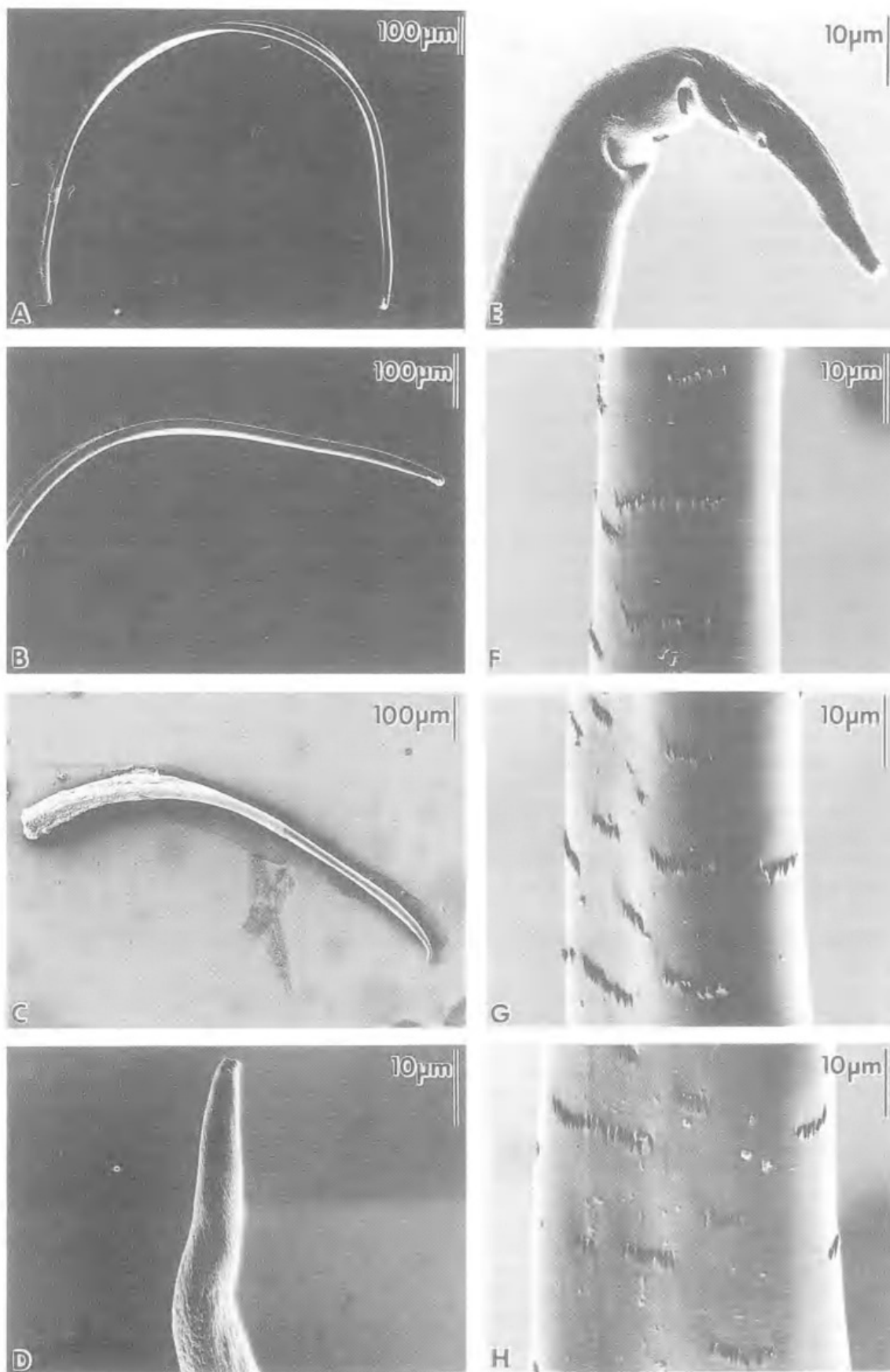


FIG. 10. *Diplotrema scheltingai* sp. nov. Holotype, QMG212001. A, right prostate of XIX. B, approximately dorsal and ventral views of right spermatheca of IX.

ectally, incised, so as to appear racemose; a narrow central lumen present but the surrounding glandular tissue very thick; the duct moderately long, and slender, medianly directed, and accompanied by two large follicles of penial setae (H, P1). The duct of each anterior prostate (examined closely in the holotype) discharges at a large bursa median to which is a smaller bursa associated with the penisetal follicles. The larger bursa overlies a more posteromedian smaller bursa, in XVIII, into which discharge the two thick, conjoined vasa deferentia of its side, these curving medianly in a wide arc. The posterior prostate ducts do not appear to terminate at bursae but there are internal protrusions of the body wall near the point of entry of the penisetal follicles into the body wall (H). Penial setae curved through from 30° to 180°; the tip tapering to a smooth, simple point and bent to a varying extent; sculpturing consisting of many unevenly spaced

FIG. 11. *Diplotrema scheltingai* sp. nov. Holotype, QMG212001. Scanning electron micrographs. A-C, two right penial setae of XIX. D, Tip of C. E-H, appearance of seta shown in A and B from the tip to near the base.



groups each of several contiguous pointed teeth; near the tips the groups are extensive circumferentially at fairly regular longitudinal intervals of approximately  $1.7\mu\text{m}$  (H). Genital setae, in VIII, gently curved but a short basal region more strongly curved in the same direction; more slender relative to length than usual for *Diplotrema* but with the usual longitudinal notching and expansion of the tip below the terminal point; length (straightened) =  $1.8\text{mm}$ ; greatest width, near base, =  $51\mu\text{m}$  (H). Spermathecae 2 pairs, in VIII, and IX, the posterior pair slightly the larger; each with an ovoid ampulla and longer, slender fairly well demarcated duct which is joined near its swollen ectal end by a large, ellipsoidal, multiloculate diverticulum containing many minute iridescent balls of sperm; length left spermatheca of VIII =  $2.6\text{mm}$ ; length ampulla =  $1.1\text{mm}$ ; ratio length spermatheca: length duct = 1.7; greatest dimension of diverticulum =  $0.9\text{mm}$ .

**ETYMOLOGY.** Named for my colleague and friend, David Scheltinga.

**REMARKS.** The tripartite transverse bar on segment XVIII is distinctive of *D. scheltingai*. The fact that the nephridia, though apparently only one pair per segment (preservation being inadequate for certain determination of their condition), have multiple longitudinal ducts possibly merits placement of this species in *Neodiplotrema*. The validity of separating *Neodiplotrema* from *Diplotrema* is uncertain as it is possible that the meronephric condition of the latter taxon has evolved more than once from the holonephric *Diplotrema* condition.

#### Genus *Neodiplotrema* Dyne, 1996

The definition of *Neodiplotrema* as recently defined by Dyne (1996) differs from that of *Diplotrema* only in the description of the excretory system: 'Meronephric, avesiculate; anterior tufted nephridia present'. It is shown below that tufted nephridia may be absent.

The three new species, *Neodiplotrema altanmoui*, *N. mcdonaldi* and *N. paripunctata*, represent a significant extension of the known range of the genus to the east of the northern continuation of the Great Dividing Range. Previously the genus was known only from monsoonal semi-deciduous vine forests in the Lockerbie, Iron Range and Weipa areas, and Thursday Island (Dyne, 1996), that is western or northern flowing catchments at the tip of the Cape York Peninsula.

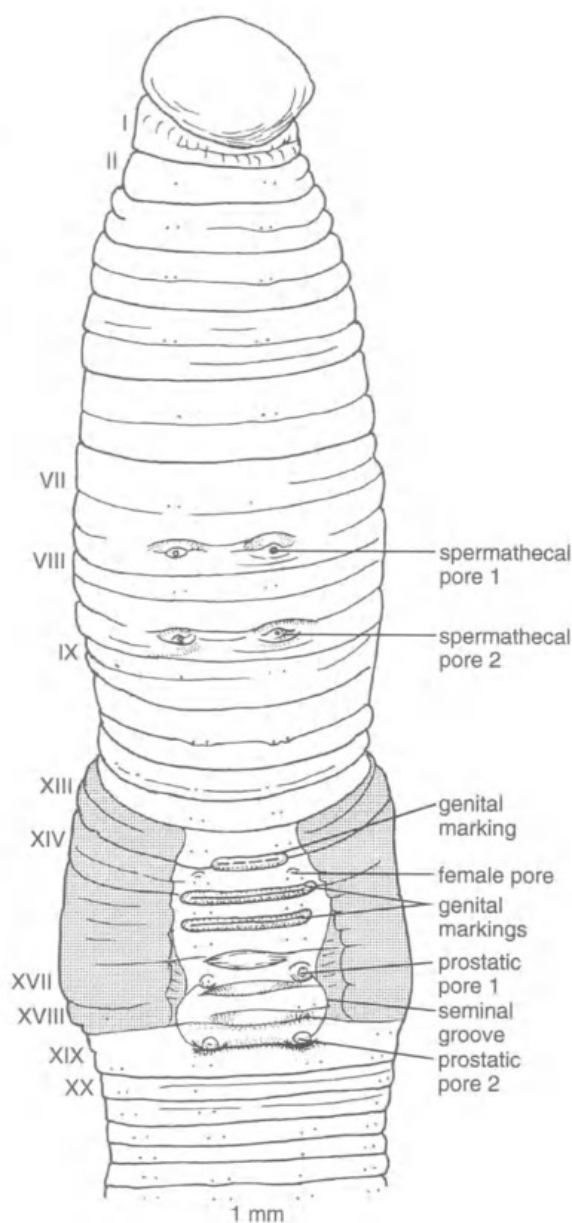


FIG. 12. *Neodiplotrema altanmoui* sp. nov. Holotype, QMG211986. Ventral view of forebody and clitellar region.

In the newly demonstrated localities the genus is sympatric with *Diplotrema*.

#### *Neodiplotrema altanmoui* sp. nov. (Figs 12-16; 39)

**TYPE-LOCALITY.**  $14^{\circ}33'31''\text{S}$   $144^{\circ}38'08''\text{E}$ , Altanmoui Section, Cape Melville National Park, alt. 560-570m, vine forest on sandstone escarpment, under logs and rocks on forest floor, K. McDonald, P.J. Lethbridge, 8 Apr 1995. Formalin fixation.

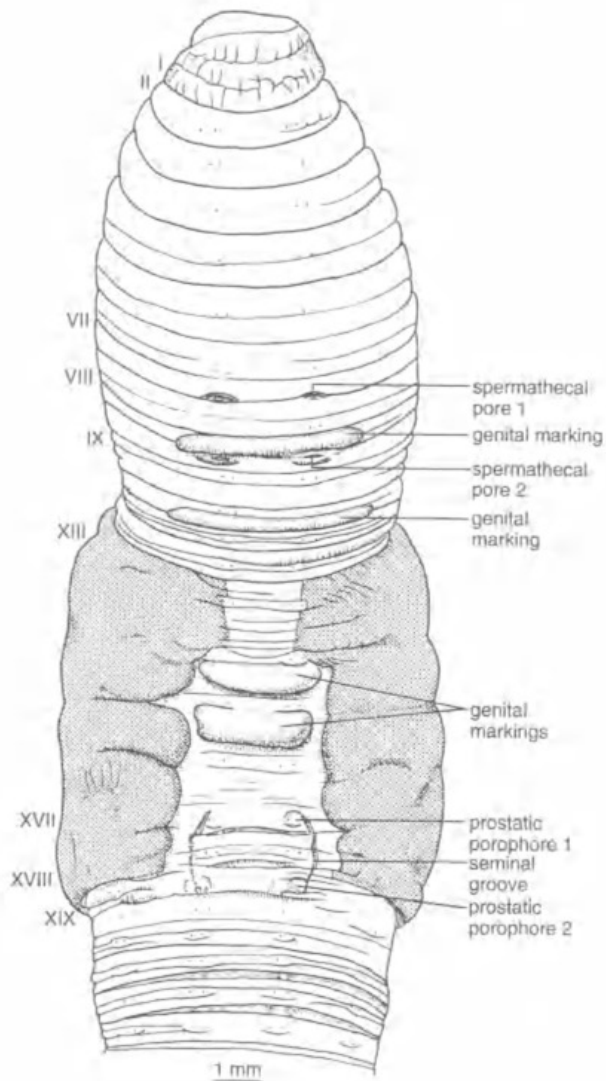


FIG. 13. *Neodiploptrema altanmoui* sp. nov. Paratype 3, QMG211987. Ventral view of forebody and clitellar region.

MATERIAL EXAMINED. HOLOTYPE. QMG211986. PARATYPES. P1 and 2 QMG212023.

Same data, in mesophyll vine forest, under rock, Paratype 3 QMG211987.

DESCRIPTION. Length 140mm. Width (mid-clitellar) 7.6mm. Segments 258 (H). Circular in cross-section, pigmentless in alcohol. Prostomium wide and prolobous but a suggestion of a narrow continuation onto the much fissured peristomium, a middorsal groove being wider than the others (H, P3). First dorsal pore 12/13 (H, P3). Setae 8 per segment, in regular longitudinal rows throughout; ventral seta couples of XVIII present; those of XVII and XIX modified as enlarged penial setae; no genital setae (H, P3); in XII, *aa*:

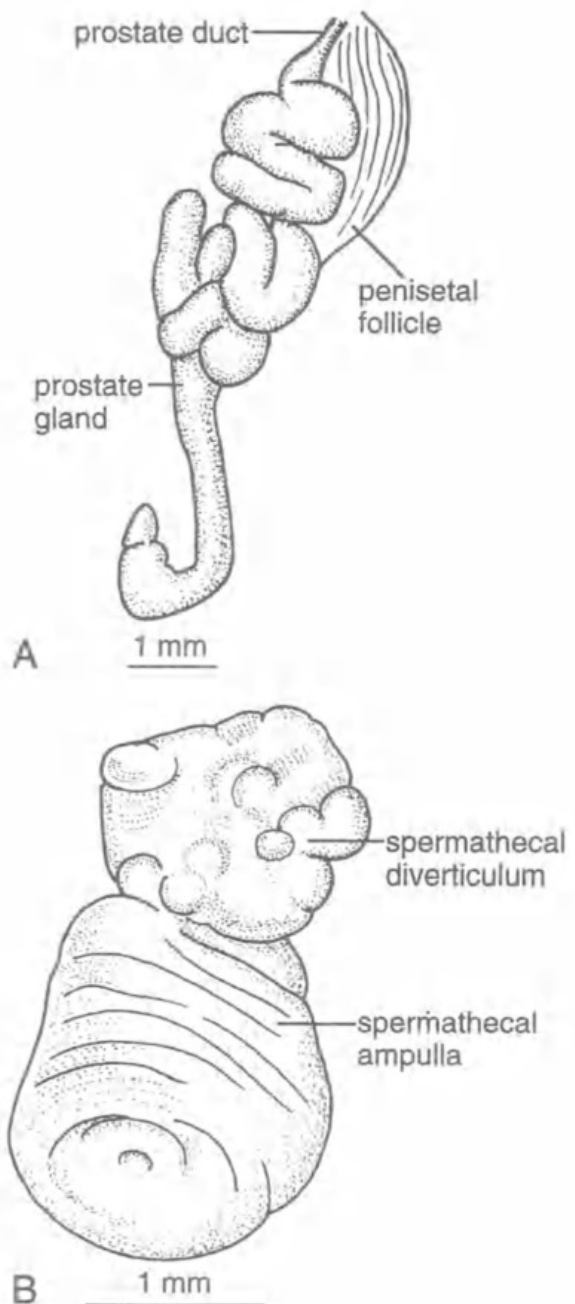


FIG. 14. *Neodiploptrema altanmoui* sp. nov. Paratype 1, QMG212023. A, right prostate of XIX. B, right spermatheca of IX.

*ab*: *bc*: *cd*: *dd* = 6.3: 1.0: 7.1: 1.0: 48.3; or 8.7: 1.4: 9.8: 1.4: 66.4% (H). Nephropores sporadically visible as a transverse series of minute ovals anteriorly in their segments. Clitellum saddle-shaped, protuberant, over XIII-XVIII; ventral margins well above *b* lines (H, P3). Prostatic pores 2 pairs, in XVII and XIX, coincident with the penial seta orifices, in *ab*, on small subcircular

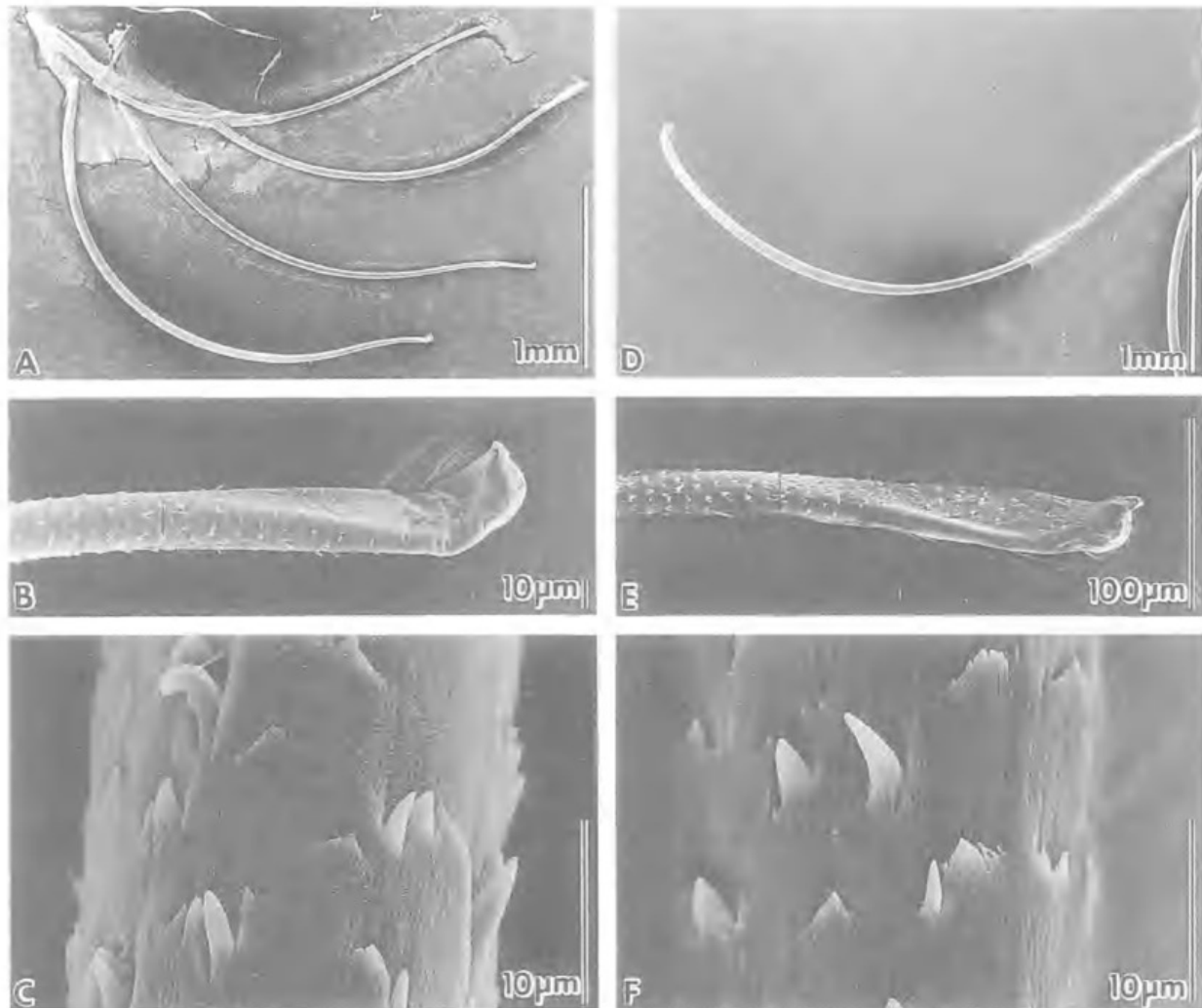


FIG. 15. *Neodiplotrema altanmoui* sp. nov. Holotype, QMG211986. Scanning electron micrographs. A, right penial setae of XVII. B, ectal region of a penial seta. C, detail of sculpturing of same. D, penial setae of XIX. E, ectal region of a penial seta of XIX. F, detail of sculpturing of same.

porophores; seminal grooves, joining the prostatic porophores of a side, forming parentheses with their midpoint, and presumably the male pores, lateral of *b* lines at the equator of XVIII (H, P3), the grooves deeply incised in P3, faint (owing to maceration?) in H; the anterior prostate pores 2.3mm, ca. 0.1 body circumference apart (H). Genital markings indefinite in the macerated holotype, whitish somewhat keratinized-looking transverse unpaired midventral ridges in intersegments 13/14, 14/15 and 15/16 (the most pronounced), XX and XXI, including the ventral setal couples; clearly visible in the better preserved P3 in which they consist of a narrow ventral band or pad posterior in each of VIII and X and extending well laterally of *b* lines, with their anterior borders at but not including the setal

arc; that in VIII posteriorly abuts closely on the spermathecal pores of 8/9; other markings two much larger but transversely less extensive pads one at each of intersegments 14/15 and 15/16 extending shortly lateral of *b* lines, each abutting the ventral setal couples of the previous segment but posteriorly not reaching the following setal arc. Female pores minute transverse slits, each with a crescentic anterior border, immediately anterior to the ventral setal couples, almost in *b* lines (H). Spermathecal pores 2 pairs, in 7/8 and 8/9, in *ab*, definite pores filled with coagulum and with anterior and/or posterior crescentic lips; those of each pair conjoined by a narrow band medianly.

Septa 5/6-10/11, especially 8/9 and 9/10, strongly thickened. Dorsal blood vessel single,



continuous onto the pharynx; last hearts in XIII; those in X-XIII latero-oesophageal, with well developed connectives to the supraoesophageal vessel and much thinner connectives to the dorsal vessel; commissurals in IX and anteriorly slender with dorsal connectives only. Gizzard large, stoutly cylindrical, firm and muscular in V. Oesophagus lacking calciferous glands; transition from oesophagus to intestine indefinite in terms of appearance of the gut wall and presence of fine, silty contents, but not widening until XX (P2, 3); a low, narrow dorsal typhlosole commencing behind the prostates (P1, 3). Meronephric throughout, nephridia commencing in II; very conspicuous, profusely divided tufts present in III and IV, very large and restricted to IV in P3, a thick duct of each tuft running anteriorly, to the wall of the buccal cavity. In the midbody, shortly behind the prostates, approximately 8 astomate micromeronephridia on each side and a median, not especially enlarged but more convoluted, meronephridium for which a preseptal funnel was demonstrated sporadically. Caudally (P2), the medianmost nephridium is greatly enlarged relative to those lying more laterally and has a conspicuous preseptal funnel. Holandric; seminal funnels large in X and XI, only those in XI with spermatozoal masses and iridescence and accompanied on the anterior septum by extensive masses of rounded testicular follicles; in X, funnels lacking spermatozoal iridescence and testes not recognizable (H, P1) but in P2 and P3 there are sperm masses, and funnels are iridescent, in X and XI. Racemose seminal vesicles in IX and XII, those in XII the larger and visible dorsally (H, P3). Bushy ovaries with few oocytes, in XIII (P2) or large, undulating laminae with many oocytes (P3). Prostatic glands two pairs of simple, much convoluted tubular organs; both pairs extending back into XXV; the anterior pair somewhat longer than the posterior pair but both pairs well developed; or the anterior pair in XVII and XVIII, the posterior pair in XIX and XX (P3); each with a short slender, slightly muscular duct (P1); or the glands restricted to segments XVII and XIX (H). Penial setae with two posteriorly joined muscular follicles on each side, each containing two setae, presumably corresponding to *a* and *b* follicles, at each prostate duct; length of a well developed setae (measured in a straight line from base to tip) = 1.9mm. The setae bowed

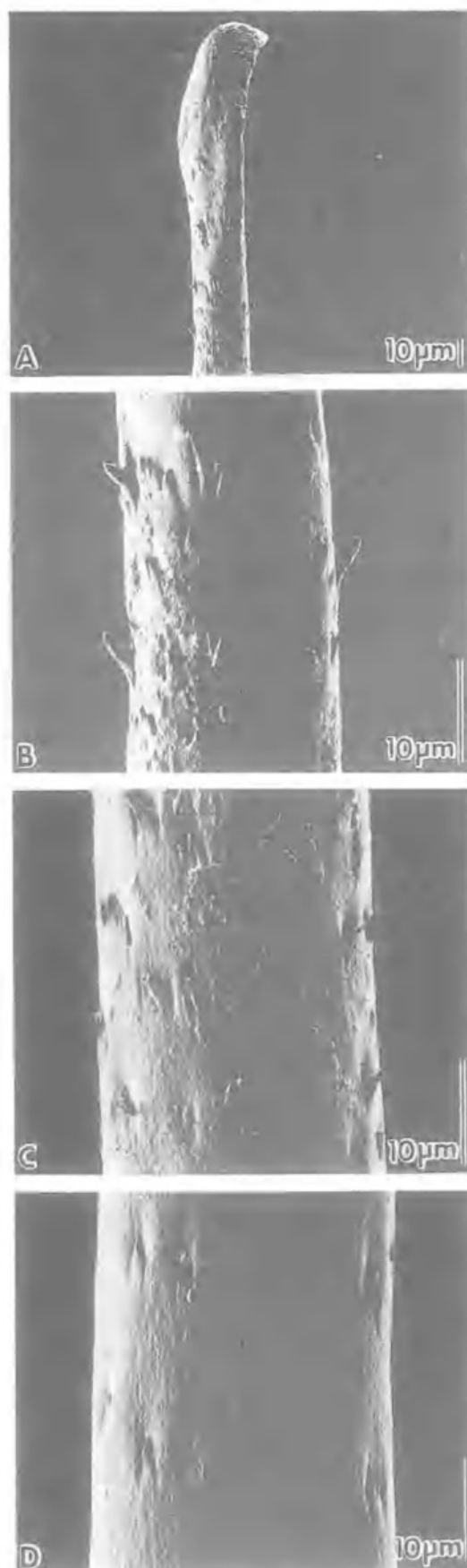


FIG. 16. *Neodiplotrema altanmoui* sp. nov. Right anterior penial seta of paratype 3, QMG211987. A, tip of seta. B-D, progressively more posterior regions of the anterior ornamentation.

through varying degrees, maximally about 90°; the ectal region of the shaft ornamented with circumferential rows of single- or multiple-pointed ectally directed teeth; the tooth rows closely spaced along the seta, approximately 10 µm apart; cross section of the seta circular excepting at the tip which forms an elongate spatula, only slightly concave, with thickened margins, and a knoblike, pointed tip; scattered teeth continuing into the spatulate region; the latter sometimes bent 'dorsoventrally', possibly because of compression during copulation. No notable difference in form observed between setae of XVII and XIX (P2); setae of P3 closely similar but with more protuberant thorn-like scales. Spermathecae 2 pairs, in VIII and IX, each organ consisting of a rounded diverticulum sessile on the body wall and obscuring beneath it all but a small ental region of the wide duct and a large saclike ampulla which in the holotype has a series of encircling annuli or pliae; the margins of the diverticulum irregularly and indistinctly lobed owing to many internal sperm chambers (H, P1, 3); in IX, length right spermatheca = 3.3mm; length ampulla 2.0mm; ratio length spermatheca: length duct (with superior diverticulum) = 2.5 (P1).

ETYMOLOGY. After the type-locality.

REMARKS. The *N. altanmoui* specimens were located in moist mesophyll vine forest on the Jurassic Dalrymple sandstone and moist soil where the sandstone escarpment boundary met the Permian Altanmoui granites. It occurs at the headwaters of Wakooka Creek, an eastwards flowing coastal stream arising in the Altanmoui Range. The feather palm forest along drainage lines was dominated by *Archontophoenix* sp. and at an altitude of 540 metres is the highest of this vegetation type in the Laura basin (Cooktown to Princess Charlotte Bay) by a large margin (K.R. McDonald citing J.P. Stanton pers. comm.).

*N. altanmoui* resembles the sympatric *N. paripunctata* and *N. exigua* Dyne, from Lockerbie East, and differs from all other known species of the genus in having seminal vesicles in segments IX (in addition to those in XII). It differs from *N. exigua* in the lobed multiloculate spermathecal diverticulum whereas the latter species has a sacciform, blunt diverticulum and in the more anterior origin of the intestine. The male genital field was not developed in *N. exigua*. *N. al-*

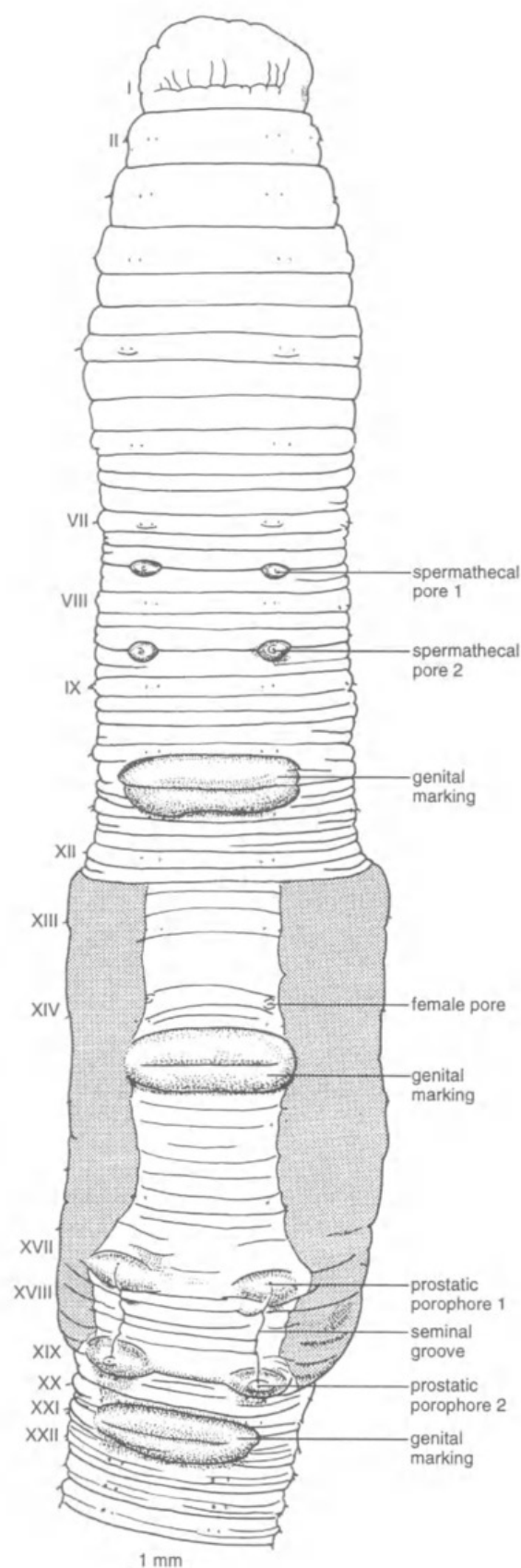


FIG. 17. *Neodiplotrema mcdonaldi* sp. nov. Holotype, QMG212005. Ventral view of forebody and clitellar region.

*tanmoui* further resembles *N. paripunctata* in the form of the spermathecae, with a rosette-like arrangement of loculi of the spermathecal diverticulum on the short spermathecal duct. Differences from the latter species are numerous and include the distinctive setal ratios, the strong denticulation of the penial setae, and the absence of the paired, apposed genital markings posteriorly in XV.

***Neodiploptrema mcdonaldi* sp. nov.**  
(Figs 17-19; 39)

**TYPE LOCALITY.** 13°44'17"S 143°20'15"E  $\pm 5'$ , Peach Creek, McIlwraith Range, alt. 500-520m. In creek bank, in pig diggings and/or in moist upper root horizon, Notophyll vine forest with fan and feather palms, on Kintore adamallite granite, K.R. McDonald, A.J. Stewart, 23-27 Sep 1996.

**MATERIAL EXAMINED.** HOLOTYPE, QMG212005. PARATYPES. P1-4 QMG212006-212009; P5 QMG212010 (includes microscope slide of left posterior penial seta); P6 & 7 QMG212011-212012; P8 QMG212013; P9-12 QMG212014-17; P13 QMG212018.

**DESCRIPTION.** Length 91-134mm, H 112mm. Width (midclitellar) 4.6-5.0mm, H 4.9mm. Segments 139-264, H 210. Circular in cross-section throughout. Pigmentless pale brownish grey in ethanol. Prostomium more than half the width of the peristomium; prolobous; first dorsal pore in 10/11 (H) or 12/13 (P2); peristomium shorter than segment II. Setae 8 per segment, commencing on II, in XII, *aa: ab: bc: cd: dd* = 8.3: 1.0: 9.5: 1.2: 22.6; or 15.2: 1.8: 17.5: 2.3: 41.6% (H). Ventral setal couples absent from XVIII; those of XVII and XIX modified as enlarged penial setae; genital setae not demonstrable. Nephropores not recognizable. Clitellum well-developed, saddle-shaped, extending over XIII-XIX, with a mid-ventral gap that extends to, or slightly lateral of, *ab* lines. Male pores not visible. Prostatic pores 2 pairs, in XVII and XIX, each pore on a strongly protuberant oval papilla which is equatorial in line with the ventral setal couples (*ab*) relative to adjacent segments; the papillae of a side linked by a clearly developed narrow seminal groove which is bent medially (not forming parentheses) and is transversely incised by intersegmental furrows 17/18 and 18/19 and an intrasegmental groove of XVIII; the entire male genital area wider than long and not depressed. Genital markings: a broad, unpaired midventral pad extending laterally well beyond *b* lines, intersegmental in 10/11 and 14/15 and 21/22 but extending almost to the setal arcs of each adjacent segment; each pad traversed by a groove corre-

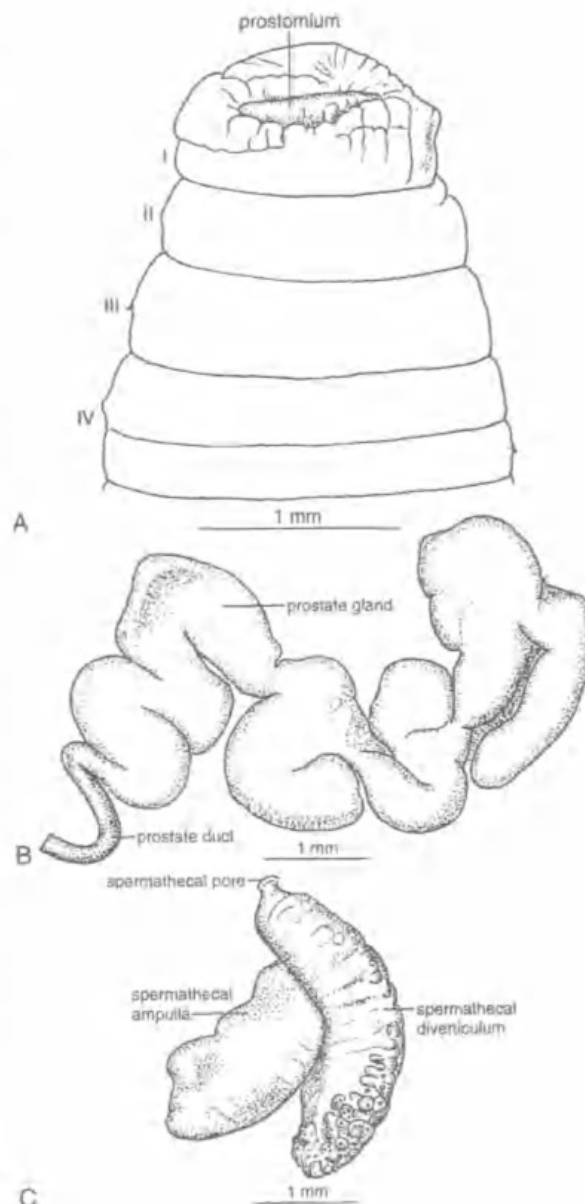


FIG. 18. *Neodiploptrema mcdonaldi* sp. nov. Holotype, QMG212005. A, dorsal view in region of prostomium. B, right prostate of XVII, with penial setae omitted. C, right spermatheca of IX.

sponding with the intersegmental furrow. Further markings a suggestion of a small papillae posteromedian to the prostatic porophores of XVII. Genital tumescences absent. Female pores, with elliptical borders, a pair near the anterior margin of XIV, in *ab*. Spermathecal pores 2 pairs, in 7/8 and 8/9, in or slightly lateral of setae *b*; each on a conspicuous elliptical papilla which is wider than a setal couple.

Septa 6/7-9/10 strongly thickened. Dorsal blood vessel single, continuous onto the pharynx.

Last hearts in XIII; those in XI-XIII large, with conspicuous supraoesophageal and smaller dorsal connectives; those in X slender, though still apparently laterooesophageal; in IX anteriorly slender, with dorsal connective only. Gizzard moderately large and firmly muscular, in V, widening anteriorly. Oesophagus with a pair of lateral blood red dilations, with many closely situated circumferential vascular striae which correspond with low internal lamellae, in each of I/2XII-XV; not pinched off from the oesophagus but true, sessile, calciferous glands as indicated by white granular contents which effervesce vigorously in dilute acid whereas the contents of the adjacent oesophagus and the intestine do not (H). Intestine commencing in XVII; a very deep bilaminar typhlosole commencing in XX (P5). No anterior tufted nephridia present. At least four micromeronephridia on each side in the intestinal region; no funnels seen. Caudally with three or four meronephridia on each side, of which at least the median one has a preseptal funnel. Holandric; large seminal funnels with spermatozoal iridescence in X and XI. Large racemose seminal vesicles a pair in each of XI and XII, each vesicle a compact mass, with a single connection to the anterior septum of its segment, divided into many small iridescent loculi. Dendritic ovaries with many egg strings in XIV. Prostate glands flattened very tortuous wide tubes investing the intestine, a pair in each of XVII and XIX; with a narrow S-shaped duct the ental fourth of which is transitional to the structure of the gland. Penis setal follicles immensely long and conspicuous, the posterior pair extending posterolaterally to join the body wall in XXIV. Penial setae exceedingly thin and filiform; a long ectal region ornamented with many long slender sinuous scales directed obliquely towards the tip and standing well up from the surface; each scale itself consisting of three or more parallel pointed strands; length of a well developed right posterior penial seta (straightened) = 6.7 mm. Genital setae not demonstrable. Spermathecae two pairs, in VIII and IX, the diverticulum (so identified by presence of sperm chambers) a tongue-shaped mass so large as to be visible on opening the specimen dorsally, resembling a seminal vesicle, its outer and terminal aspect with numerous small protuberant

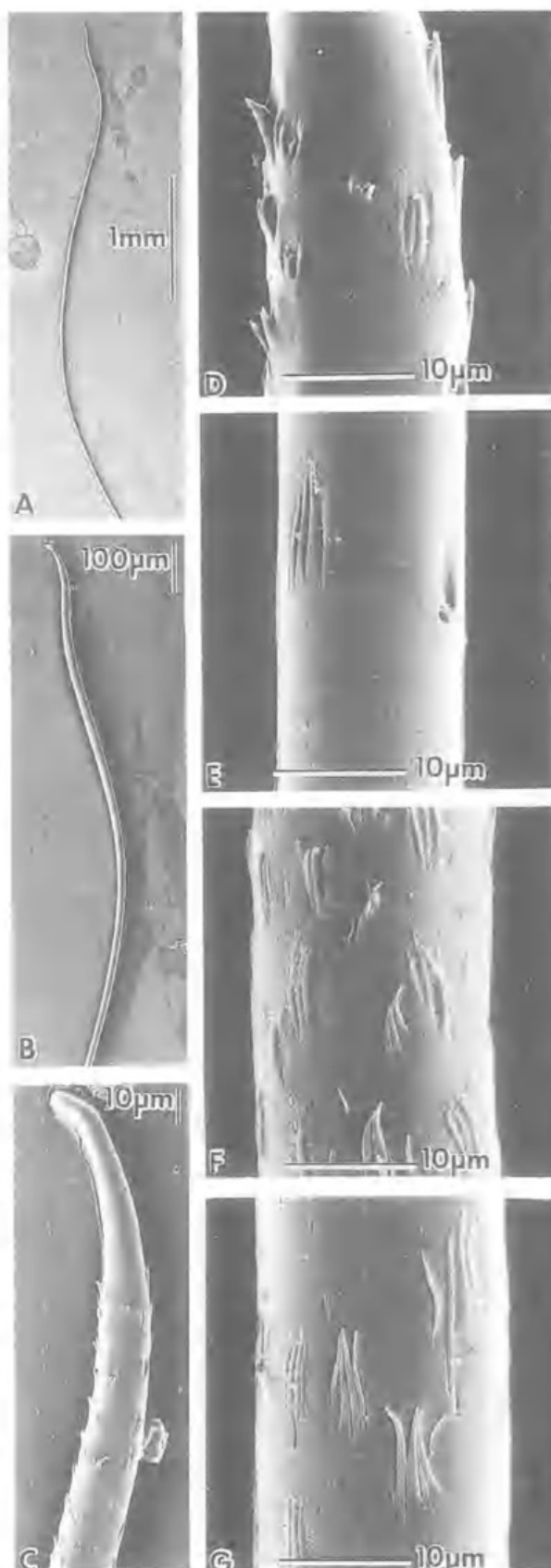


FIG. 19. *Neodiploptrema mcdonaldi* sp. nov. Holotype, QMG212005. Scanning electron micrographs of a right penial seta of XIX. A, seta, excepting base. B, higher magnification. C-G, appearance of seta from the tip to near the base.



chambers containing sperm balls; the ampulla a slightly smaller pointed sac appearing to be an appendage of the diverticulum; the duct a short narrow ectal continuation from the diverticulum. Length right spermatheca of IX, from pore to tip of diverticulum = 3mm; ratio length spermatheca: length duct = 17:1; length ampulla = 2mm.

**ETYMOLOGY.** Named for Keith McDonald who first collected this species.

**REMARKS.** *Neodiploptrema mcdonaldi* is distinguished from all other species of the genus by the large mammillated spermathecal diverticulum which exceeds the length of the ampulla and by the sinuous hair-like penial setae. A similar type of spermatheca occurs in *Diploptrema ridei* and, though less similar, in *D. shandi*. Close relationship of *N. mcdonaldi* to *D. ridei*, from Cape York and Melville Island, deserves consideration in view of considerable similarities of their genital fields.

***Neodiploptrema paripunctata* sp. nov.**  
(Figs 20-23; 39)

**TYPE LOCALITY.** 14°33'27"S 144°38'08"E, Altanmoui Section, Cape Melville National Park, altitude 52010 m, in mesophyll vine forest, with feather palms, along creek, located from pig diggings, K. McDonald, P.J. Lethbridge, 7 & 10 Apr 1995.

**MATERIAL EXAMINED.** HOLOTYPE, QMG213360. PARATYPE, P1 QMG213361.

**DESCRIPTION.** Length 150mm. Width (mid-clitellar) 3.8mm. Segments 171 (H). Colour brown in ethanol with a pale grey-brown clitellum. Prostomium prolobous. Peristomium with anterior parallel grooves; approximately as long as segment II; not bisected ventrally. First open dorsal pore 18/19, but occluded pores present on the remaining, more anterior, segments of the clitellum (H). Setae 8 per segment, in regular longitudinal rows throughout; ventral setal couples of XVIII present immediately median to the seminal ridges; those of XVII and XIX modified as enlarged penial setae; genital setae absent; in XII,  $aa: ab: bc: cd: dd = 3.6: 1.0: 4.2: 1.0: 18.0$ ; or  $10.6: 2.9: 12.4: 2.9: 52.9\%$  (H). Nephropores not visible. Clitellum saddle-shaped, protuberant, XIII-XIX; ventral margins well above *b* lines. Prostatic pores 2 pairs, in XVII and XIX, coincident with the protuberant penial setae, in line with the ventral setal couples (*ab*) of other segments; the pores on each side on small porophores which are not distinguished from a tumid parenthetic ridge which bears a simple seminal groove. A

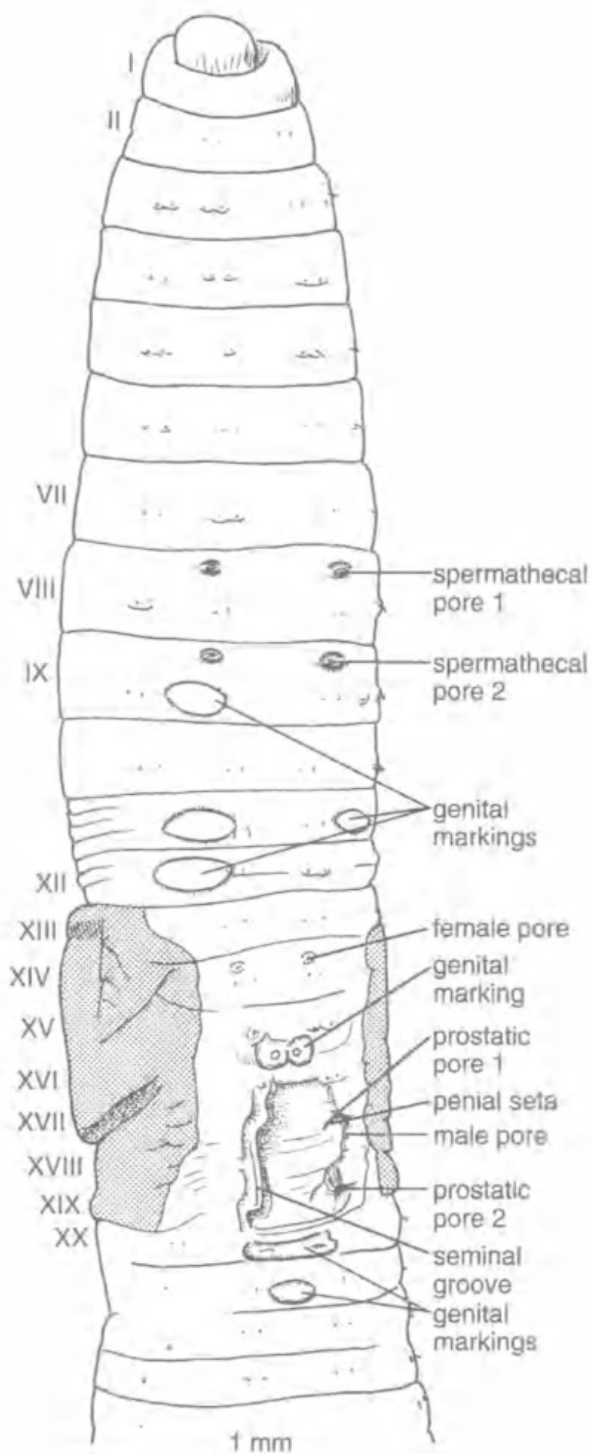


FIG. 20. *Neodiploptrema paripunctata* sp. nov. Holotype, QMG213360. Ventral view of forebody and clitellar region.

deep midventral depression present between the seminal grooves. Male pores a pair of minute orifices, on the seminal ridges, at the level of



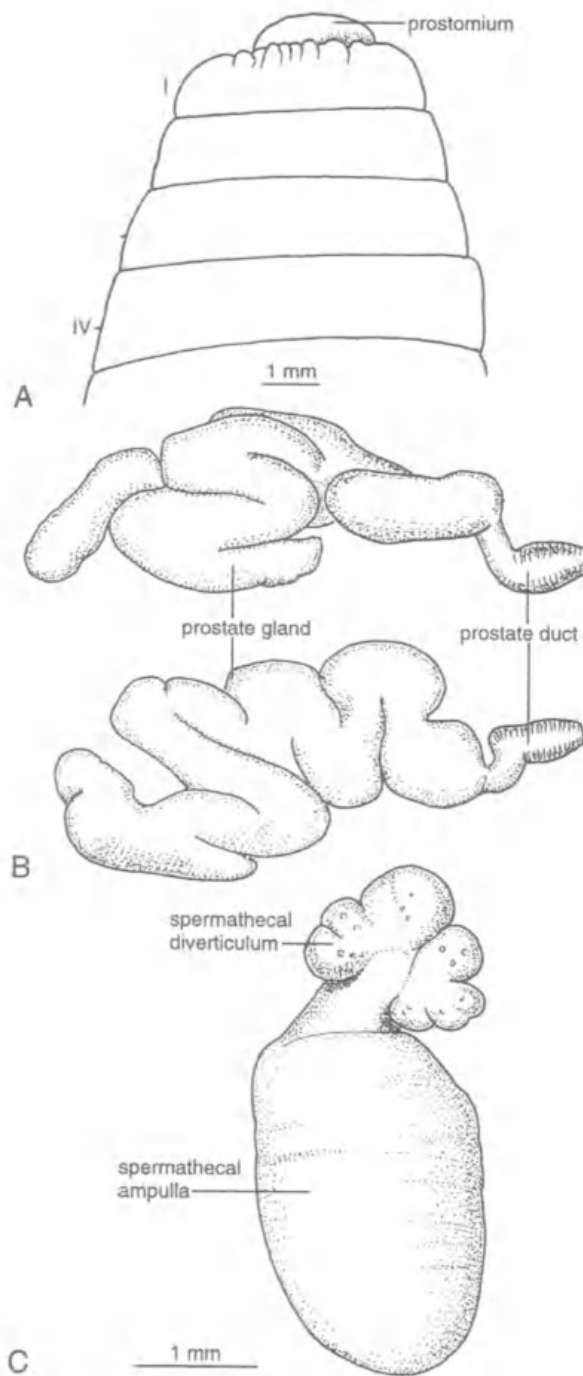


FIG. 21. *Neodiploptrema paripunctata* sp. nov. Holotype, QMG213360. A, dorsal view in region of prostomium. B, left prostates; penial setae omitted. C, right spermatheca of IX. B and C same scale.

17/18 and shortly lateral of *b* lines. Female pores in small oval fields anterior to the ventral setal couples (*ab*) of XIV. Spermathecal pores 2 pairs, a short distance posterior (relaxation artefact?) to 7/8 and 8/9, in *b* lines. Genital markings paired or

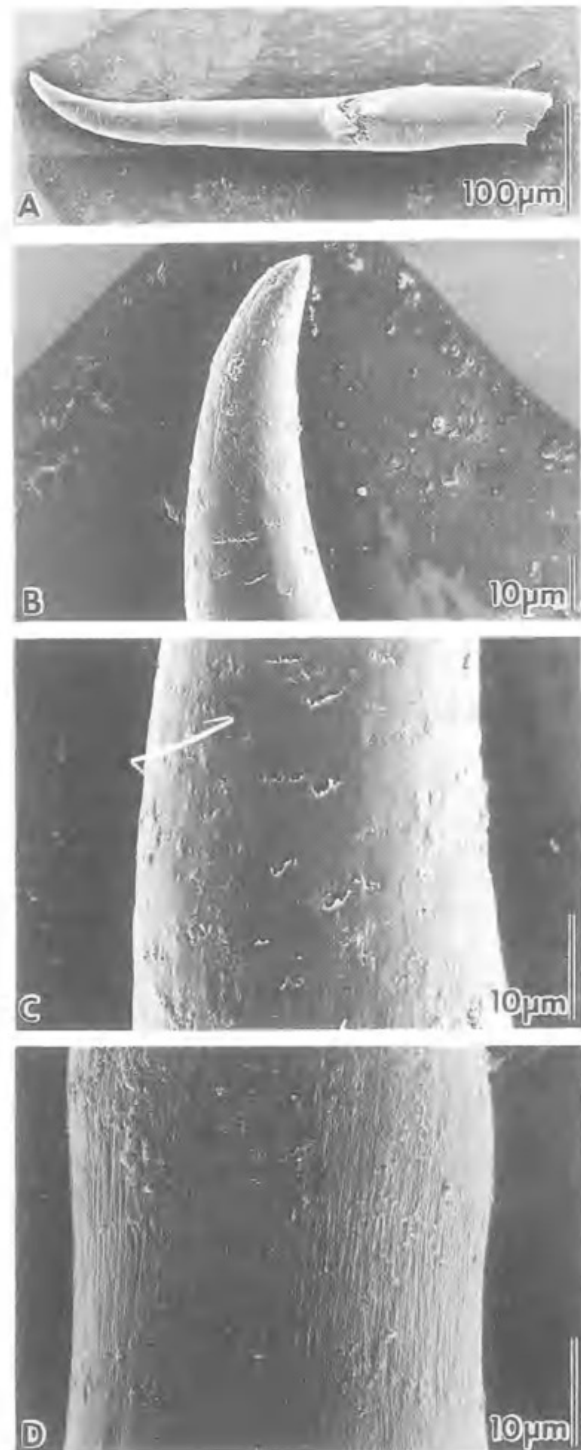


FIG. 22. *Neodiploptrema paripunctata* sp. nov. Holotype, QMG213360. Scanning electron micrographs of a ventral seta of VIII. A, seta, showing node typical of somatic setae. B-D, appearance of seta from the tip to near the base.

unilateral pale non-protuberant oval patches, bordered by brown pigment, lateral of or just including setae *b*, in IX, XI and XII (H, P1) and in X

(P1); a pair of medianly contiguous papillae mid-ventrally in 15/16 (H, P1); a midventral transverse postsetal pad in XX (H, P1); a small indistinct midventral oval pad in the posterior half of XXI (H).

Septa 7/8-11/12 fairly strongly thickened. Dorsal blood vessel single, continuous onto the pharynx; last hearts in XIII; those in X-XIII latero-oesophageal, with supra-oesophageal connective larger than the dorsal connective; commissurals in IX, and anteriorly, slender and with dorsal connectives only. Gizzard very large, cylindrical, slightly widening anteriorly, moderately firm and muscular, in VI(?), i.e., anterior to the diaphanous septum 6/7. Oesophagus lacking calciferous glands. Intestine commencing in XIX, not reaching full width until XXIV. A pair of moderate-sized, conical anterolateral diverticula on the intestine in XXVIII. No typhlosole found. Large tufted nephridia in II and IV send composite ducts to the wall of the buccal cavity and are accompanied laterally by many micromeronephridia; in the oesophageal region at least 12 micromeronephridia on each side, apparently all astomate and with no enlargement of the median pair; caudally with 8 meronephridia on each side, the medianmost one enlarged as a megameronephridium with a preseptal funnel; the lateral nephridia apparently lacking funnels (H). Holandric; iridescent seminal funnels in X and XI. Seminal vesicles in IX and XII; sacciform, those in IX subdivided into two or more portions, and accompanied by a row of small vesicles; those in XII each forming an exceptionally large lobulated sac. Ovaries not detectable. Two subequal pairs of thickly tubular very tortuous prostates in XVII and XIX, limited to their segments, their surfaces minutely mammillated; the ectal duct with a stout, muscular ectal region and a shorter less muscular region, bent relative to this, which is narrow at its origin from the gland. Vasa deferentia not traceable. Penisetae follicles overlying the prostate ducts. Penial setae curved in an arc, the tip strongly reflexed on itself or with a scroll-like expansion; ornamentation, on the shaft, consisting of weakly developed jagged transverse lines, each encircling less than one fourth of the circumference, and spaced longitudinally at approximately 10  $\mu$ m intervals or these jagged lines very few and scarcely visible; length of a well developed left penial seta of XVII = 2.5mm; greatest width approximately 35  $\mu$ m (H). Ventral setal couples of VIII and IX unmodified. Spermathecae two pairs, in VIII and IX; each with a large ovoid ampulla and a

short narrower but poorly demarcated duct which is hidden except for its ectal end by a rosette-shaped multiloculate diverticulum which is incised slightly or deeply into approximately 8 large loculi in which many minute iridescent sperm balls are visible. Length right spermatheca of IX = 8.2mm; length ampulla = 2.9; ratio of length spermatheca: length duct = 5.3; diameter of diverticulum 1.6mm (H).

ETYMOLOGY. *paripunctata*, referring to the paired anterior oval patches.

REMARKS. The pair of closely apposed genital markings in 15/16 is distinctive of *N. paripunctata*. This and the absence of large denticulations of the penial setae, is among features distinguishing *N. paripunctata* from the sympatric *N. altanmoui*. Intestinal diverticula are known in pheretimoids, in the Megascolecinae, but have not previously been observed in the Acanthodrilinae.

#### **Kayarmacia gen. nov.**

DIAGNOSIS. A pair of combined male and prostatic pores, associated with penial setae, on XVII. Spermathecal pores 1 pair, in intersegmental furrow 7/8. Gizzard in V. Oesophagus lacking calciferous glands. Holonephric; nephridia avascular. Holandric. Prostate a single pair of tortuous tubes, each with an exceptionally long tortuous muscular duct which opens in common with the equally thick and muscular ectal end of the vas deferens (ejaculatory duct). Spermathecae a pair in VIII; diverticulum, with nacreous sperm masses.

DESCRIPTION. Small worms, less than 75mm long. Dorsal pores (always?) present. Setae 8 per segment, closely paired; the lateral couple (*cd*) narrower than the ventral couple (*ab*). Clitellum anterior to the male pores; annular. A pair of combined male and prostatic pores, associated with penial setae, on XVII. Genital markings present in the vicinity of the male pores. Genital tumescence and modified ventral setae present or absent in the spermathecal region. Female pores presetal in XIV. Spermathecal pores 1 pair, in intersegmental furrow 7/8.

Dorsal blood vessel single. Last hearts in XIII, those in X-XIII large, heart-like and latero-oesophageal, the connective to the supra-oesophageal vessel larger than that to the dorsal vessel; commissurals in IX anteriorly slender, with dorsal connective only. Gizzard large,

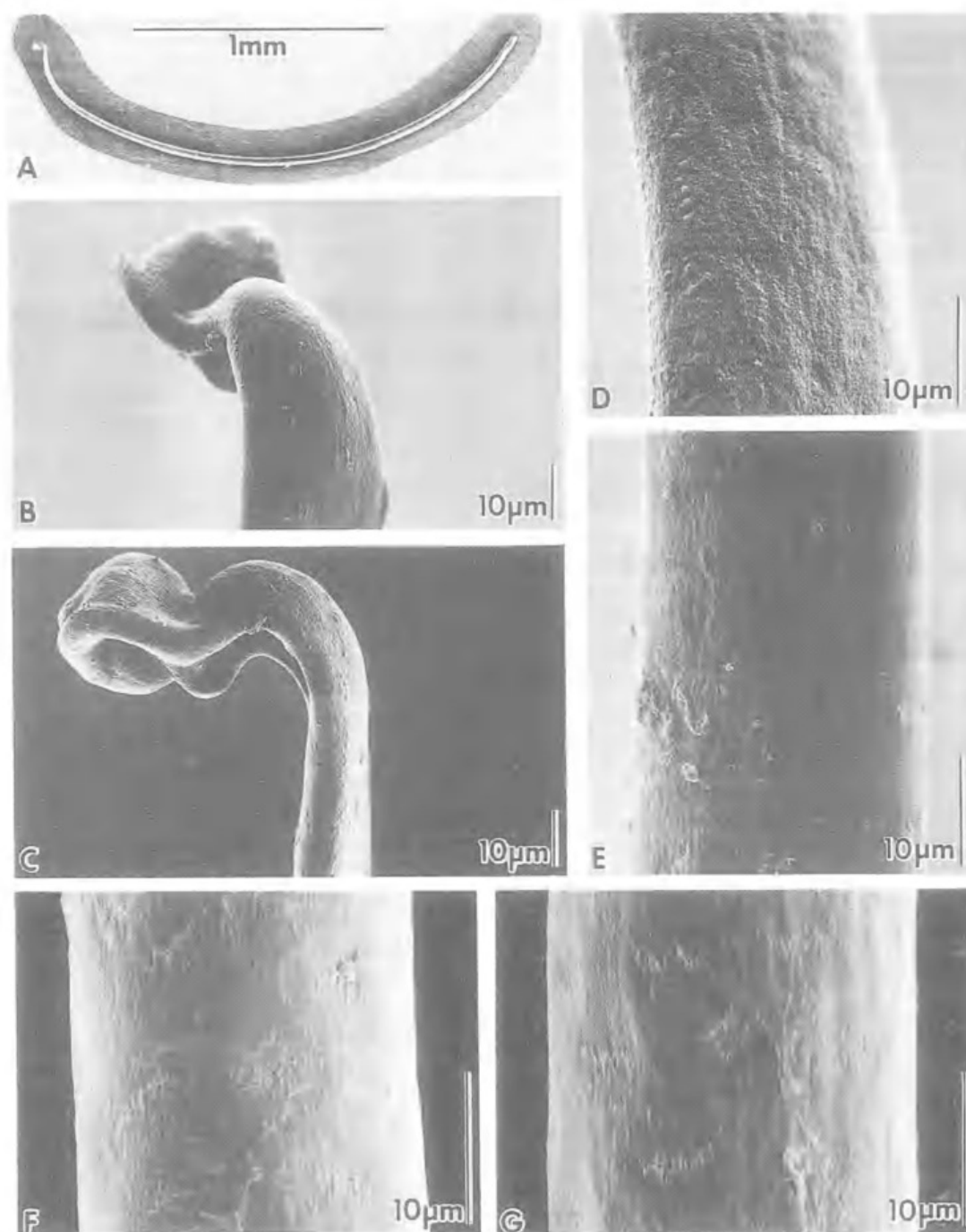


FIG. 23. *Neodiploptrema paripunctata* sp. nov. Holotype, QMG213360. Scanning electron micrographs of a left penial seta of XVII. A, seta. B-E, appearance of seta from the tip to near the base. F and G, ornamentation of the posterior regions of a left penial seta of XIX.

strongly muscular in V. Oesophagus lacking calciferous glands. Intestine commencing in XVII. Holonephric; avascular ducts apparently discharging in mid *bc* or *c* lines; true anterior tufting not developed. Holandric. Racemose seminal vesicles in IX and XII. Ovaries in XIII. Prostate glands extending through several segments; a

single pair of tortuous tubes, each with an exceptionally long tortuous muscular duct which winds forwards to open at the male pore in common with the equally thick and muscular ectal end of the vas deferens (ejaculatory duct). Spermathecae a pair in VIII, opening at the anterior border; diverticulum, with nacreous sperm masses.

ETYMOLOGY. *Kayarmacia*, based on the name of the collector, K.R. McDonald. Gender masculine.

TYPE SPECIES. *Kayarmacia adelphicus* sp. nov.

OTHER SPECIES. *Kayarmacia queenslandicus* (Michaelsen, 1916).

DISTRIBUTION. Cape York Peninsula.

REMARKS. *K. adelphicus* is chosen as the type species for *Kayarmacia* as identification of *K. queenslandicus* with Michaelsen's species, though made with confidence, is subjective and later changes to its synonymy, though unlikely, would cause confusion if were selected as the type species.

Michaelsen (1916) placed the Alice River specimens in *Rhododrilus*, features of this genus being of location of male pores in segment XVII, presence of a gizzard, and absence of nephridial bladders. However, these are insufficient reasons for considering *R. queenslandicus* to be congeneric with the New Zealand type species of the genus, *Rhododrilus minutus* Beddard 1889, as the latter species has four pairs of spermathecal pores and, more significantly, has the male and prostatic pores located separately on XVII. The mere presence of male and prostatic pores on XVII whether combined or separate is not unique to one genus, as it is seen *inter alia* in the acanthodriline genus *Microscolex* and is the typical condition in the Ocnodrilinae and Eudrilidae. Nevertheless, it is likely that location on XVII represents a microscolecine reduction from an acanthodrilin arrangement of male pores (male pores on XVIII, prostatic pores on XVII and XIX) and that *Kayarmacia* is referable to the subfamily Acanthodrilinae and not to the Megascoclecinae.

The thickening of the distal ends of the vasa deferentia and their opening in common with the unusually long prostate ducts distinguishes *Kayarmacia* from other megascoclecine genera. Inclusion in the Ocnodrilidae, a family in which male and prostate ducts may be swollen, is precluded by several features, including the non-ocnodriline condition of the oesophagus. Native Ocnodrilidae are unknown from Australia.

*Rhododrilus glandifera* Jamieson, 1995, is excluded from *Kayarmacia* by location of the spermathecal pores in intersegmental furrow 8/9, not 7/8, and, more significantly, the absence of thickening of the vasa deferentia, and the minute size of the apparently separate prostate ducts. That *R. glandifera* is congeneric with *Rhododrilus* is, nevertheless, doubtful and placement in that

genus must be regarded only as provisional. It may well have closer affinities with *Diplolema* than does *Kayarmacia*.

***Kayarmacia adelphicus* sp. nov.**  
(Figs 24-27; 39)

TYPE LOCALITY. (1) 14°16'54"S 144°27'30"E, Cape Melville National Park, along creek bank, closed canopy, altitude ca. 100m, K.R. McDonald, L.A. Jackson, 24 Feb 1995. (2) Same, 14°16'54"S 144°27'30"E, 18 Feb 1995.

MATERIAL EXAMINED. HOLOTYPE. (1) QMG-213378 ex211497 (part) (includes microscope slide of male ducts). PARATYPES. (1) P1-5 QMG211497 (with several not designated types); (2) P6 & 7 QMG211495.

DESCRIPTION. Length 25-39mm, 28mm (H). Width (midclitellar) 1.8-(H)2.6mm. Segments 102 (H). Pigmentless greyish buff in ethanol. Prostomium proepilobous (H) or epilobous 1/2. Peristomium approximately as long as segment II. Dorsal pores sporadically visible from shortly anterior to the clitellum (verified by exudation of alcohol when specimen is placed in water). Setae closely paired; in XII, *aa: ab: bc: cd: dd* = 8.2: 1.0: 7.7: 0.9: 18.1; or 18.1: 2.2: 16.9: 1.9: 40.0%. Clitellum in XIII-anterior XVII; annular but ventrally interrupted from the anterior third of XVI posteriorly, to about mid *bc* by the male field; setae and intersegmental furrows present on it. A pair of large, globose but anteriorly pointed strongly protuberant papillae each bearing the combined male and prostatic pore on XVII; in *ab*; the walls of the papillae diaphanous and revealing internally the large penial setae which support its anterior protrusion (H), or the penial setae strongly protuberant (P1, 2). Genital markings a pair of indistinct swellings, at setae *ab* of XVI and XVIII; a midventral elliptical papillae postsetally in XVIII or (P6) in XVI. Genital tumescence and modified ventral setae developed on the right side in VII (H) or paired in IX (P1, 2). Female pores minute, immediately anterior to setae *a* of XIV. Spermathecal pores 1 pair, in intersegmental furrow 7/8, shortly lateral of *b*; each a lateral slit in an oval papilla.

Septa 8/9 and 9/10 the thickest, moderately strongly thickened. Dorsal blood vessel single. Last hearts in XIII, those in X-XIII large, heart-like and latero-oesophageal, the connective to the supraoesophageal vessel larger than that to the dorsal vessel; commissurals in IX anteriorly slender, with dorsal connective only. Gizzard very large, strongly muscular but compressible, ellip-



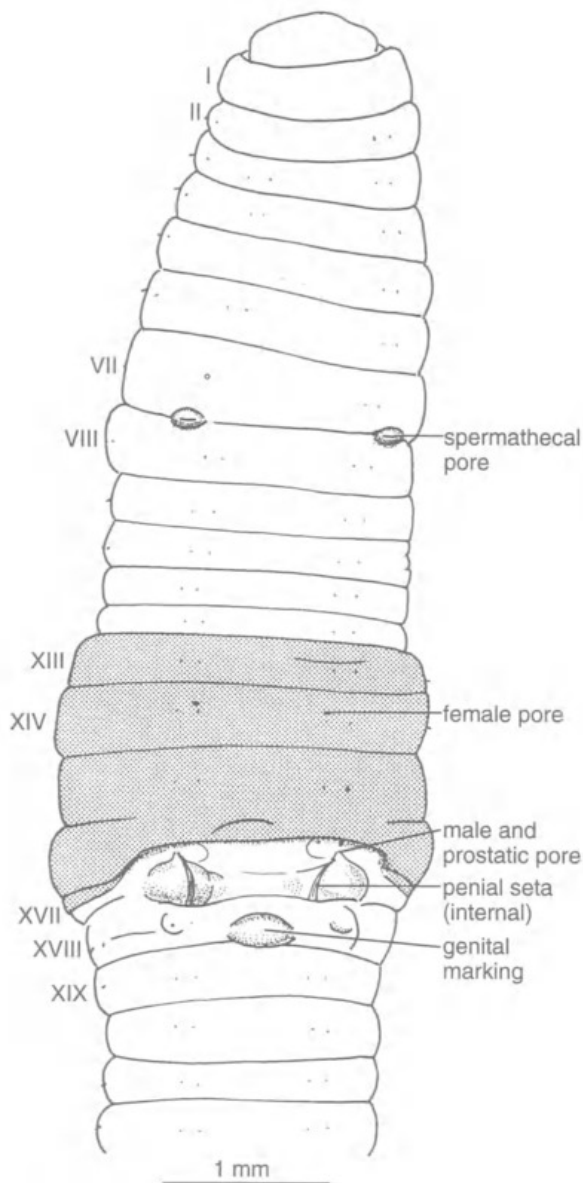


FIG. 24. *Kayarmacia adelphicus* gen. et sp. nov. Cape Melville National Park, holotype, QMG213378. Ventral view of forebody and clitellar region.

soidal though widening anteriorly, in V. Oesophagus lacking calciferous glands. Intestine commencing, with abrupt expansion, in XVII (H, P2). Holonephric; nephridial bodies commencing in II; avascular ducts apparently discharging in mid *bc*; anterior tufting not developed. Holandric; iridescent sperm funnels in X and XI. Large, several lobed racemose seminal vesicles in IX and XII (H, P2). Small ovaries, with few oocytes, in XIII. Prostate glands visible externally through the body wall in the holotype extending from XVII to XXVIII; a single pair of tortuous tubes, each with an exceptionally long tortuous muscu-

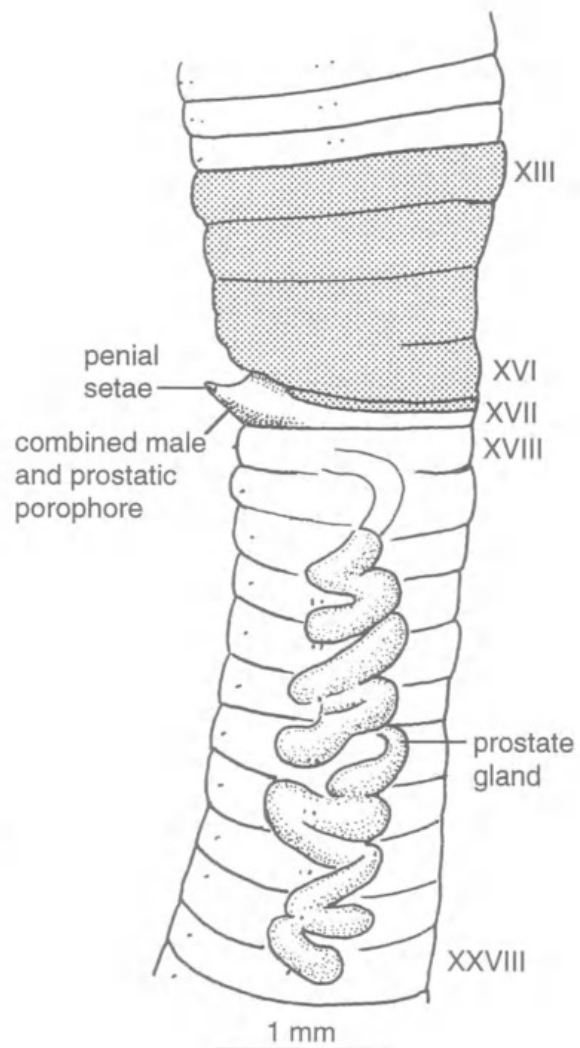


FIG. 25. *Kayarmacia adelphicus* gen. et sp. nov. Cape Melville National Park, holotype, QMG213378. Lateral view of male genital region, showing prostate gland seen through body wall.

lar duct which winds forwards to open at the male pore in common with the equally thick and muscular ectal end of the vas deferens (ejaculatory duct) (H, P2); the prostate duct and ejaculatory duct pass separately but in contact to the tip of the male porophore (confirmed in cleared mount). Penial setae, only 1 on each side; stout, ectally curved to form a hook; length 1.2mm, greatest, basal, width ca. 70µm; ornamentation consists of droplet-like or many wart-like elliptical prominences on the 'dorsal' and 'ventral' surfaces of the curvature, the sides of the latter being smooth; on the ventral surface, however, the prominences are reduced to minute scattered but densely situated points or cicatrices. Genital setae present on right



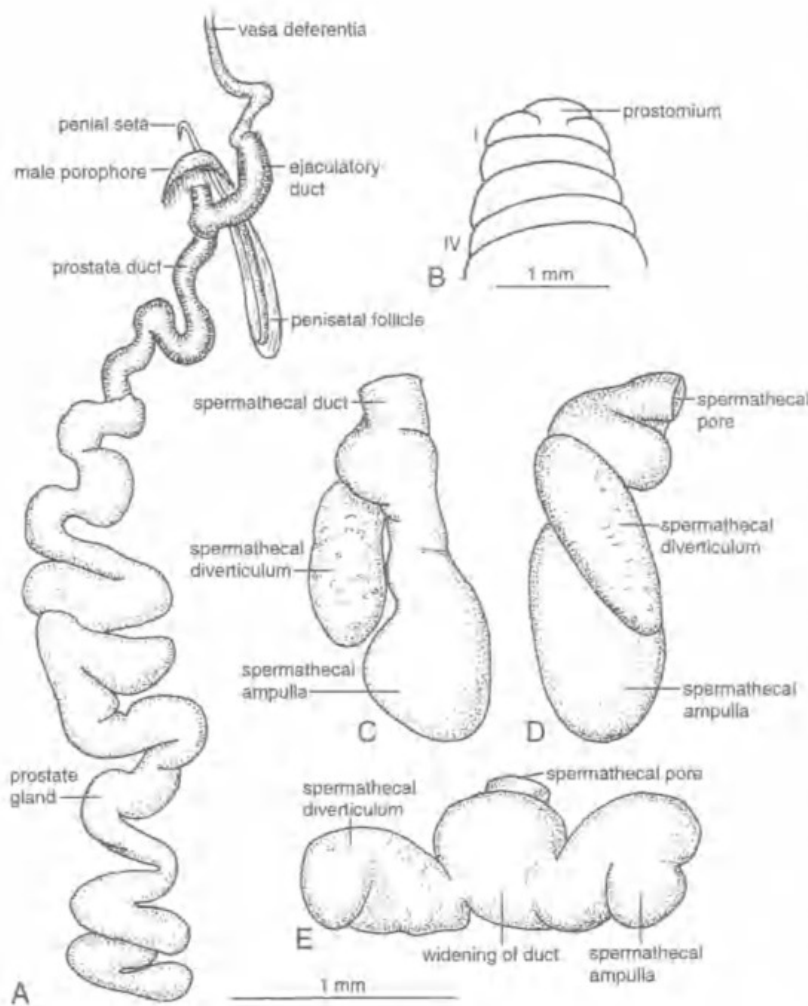


FIG. 26. *Kayarmacia adelphicus* gen. et sp. nov. Cape Melville National Park, holotype, QMG213378. A, left prostate and male duct, with penisetal follicle. B, dorsal view in region of prostomium. C and D, two views of left spermatheca. E, Paratype 2, QM G211497, left spermatheca. A-C-E same scale.

in VII (H) or bilateral in VIII (P2); length of left genital seta of VIII, 0.76mm; shaft gently curved but a short basal region strongly curved; tip pointed, very slightly expanded beneath the point; ornamentation four (?) longitudinal series, each of about five large gouges or notches. Spermathecae a pair in VIII, opening at the anterior border; each with a large ovoid ampulla; the duct of which consists of three regions in longitudinal succession: an ental third which is approximately tubular and is well demarcated from the ampulla, a swollen intermediate region which receives the diverticulum, and an ectal third which forms a wide, short, muscular, tubular duct. Diverticulum elongate ellipsoid, filled with nacreous sperm masses but uniloculate, with a narrow connection to the spermathecal duct. Length left spermatheca

= 1.7mm; length ampulla = 0.88mm; ratio length spermatheca: length duct = 2.1; length diverticulum = 1.0mm (H). In P2, the swollen part of the duct is approximately as large as the ampulla.

**ETYMOLOGY.** *adelphicus*, from the Greek Adelfhos, brother, referring to its putative adelpho-group relationship to *K. queenslandicus*.

**REMARKS.** *Kayarmacia adelphicus* is morphologically very close to the prior *K. queenslandicus* (q.v.) but geographical separation by the Great Dividing Range suggests that the presence in it of genital setae, whereas these appear always to be absent from *K. queenslandicus*, indicates vicariation of the two taxa from a common ancestor. Strong support for recognizing the two as separate species is seen in the very different ornamentation of the penial setae. It consists of scattered droplet-like prominences in *K. adelphicus* contrasting with tooth rows which 'ventrally' are united in extensive transverse rows in *K. queenslandicus*. The distinctive structure of the male and prostatic ducts seen in both species is here regarded as a generic character. The genital

setae, with longitudinal series of large gouges or notches, are of the type seen also in *Diplotrima* and the New Caledonian genus *Acanthodrilus* and indicate relationship with these genera.

This species was found in humic sandy soil under closed canopy on a creek bank near the edge of the Cape Melville Altanmoui granite boulder fields.

***Kayarmacia queenslandicus*** (Michaelsen, 1916). New combination (Figs 28-30; 39)

*Rhododrilus queenslandicus* Michaelsen, 1916: 4-6, Pl. 1, fig. 9-11.

**MATERIAL EXAMINED.** SYNTYPES. ca. 15°S., Cape York, banks of Alice River, a single much dis-

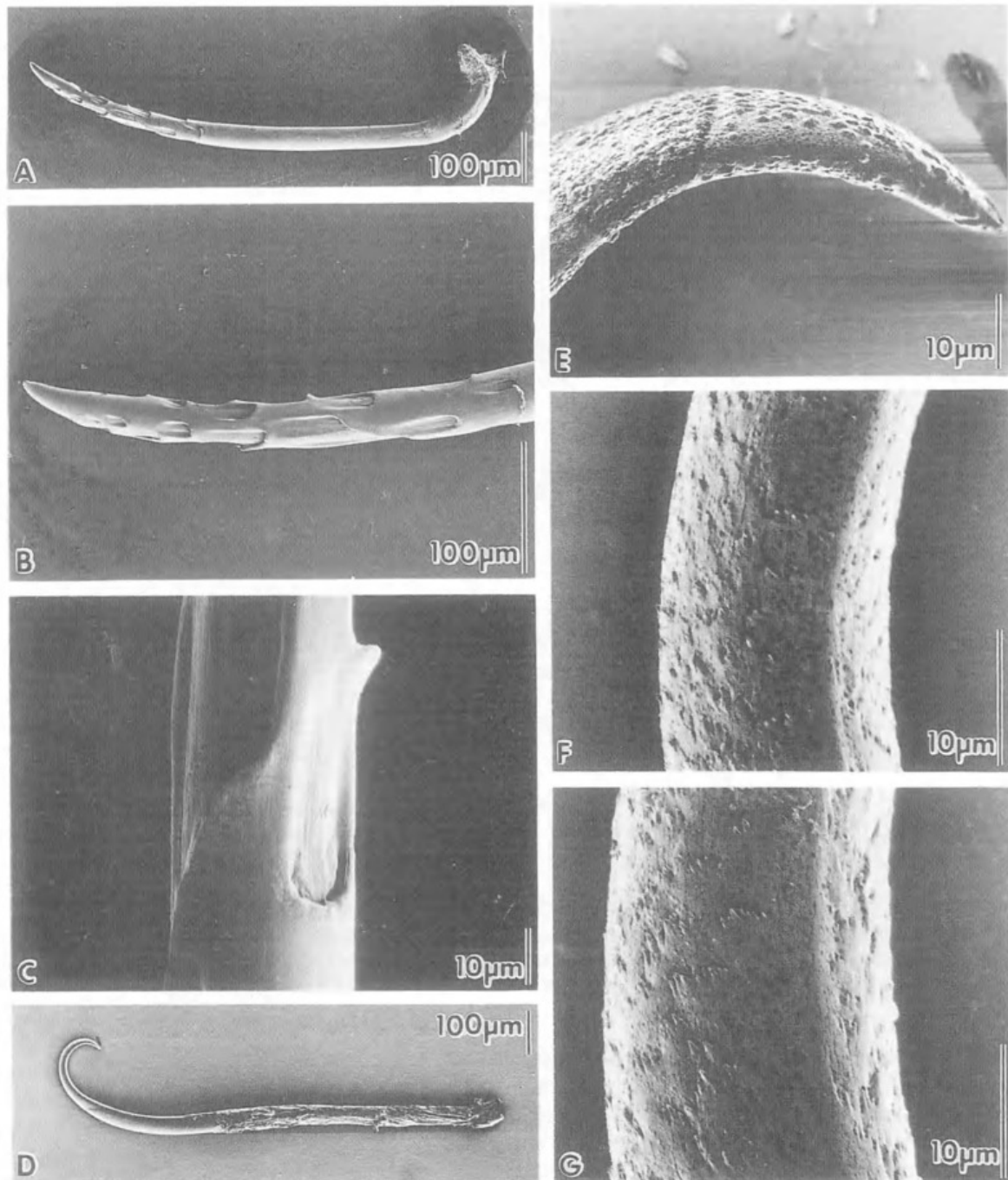


FIG. 27. *Kayarmacia adelphicus* gen. et sp. nov. Cape Melville National Park. A, paratype 2, QMG211497, left genital seta of VIII. B and C, tip and shaft of same. D, Holotype, QMG213378, right penial seta. E-G, appearance of seta shown in D from the tip to near the base.

sected specimen labelled 'Kap York, Mjöberg, Alice River, Hamburg Museum V8487. NEW MATERIAL. 15°27'45"S 142°10'12"E, Emu Lagoon, Alice-Mitchell Rivers National Park, altitude 222m, top-soil on sandy levee bank, open woodland, K.R. McDonald, 9 Feb 1993. ex QMAcc#2344, specimens 1-6 QMG213385.

**DESCRIPTION.** Length 49-75mm. Width (mid-clitellar) 1.2-1.9mm; greatest width (forebody) 2.3mm. Segments 124-143 (shortest and longest specimens, S3 and 5). Pigmentless in ethanol; clitellum greyish buff. Prostomium epilobous, ca. 1/4; small, broad and open. Peristomium approximately as long as segment II. Dorsal pores spo-

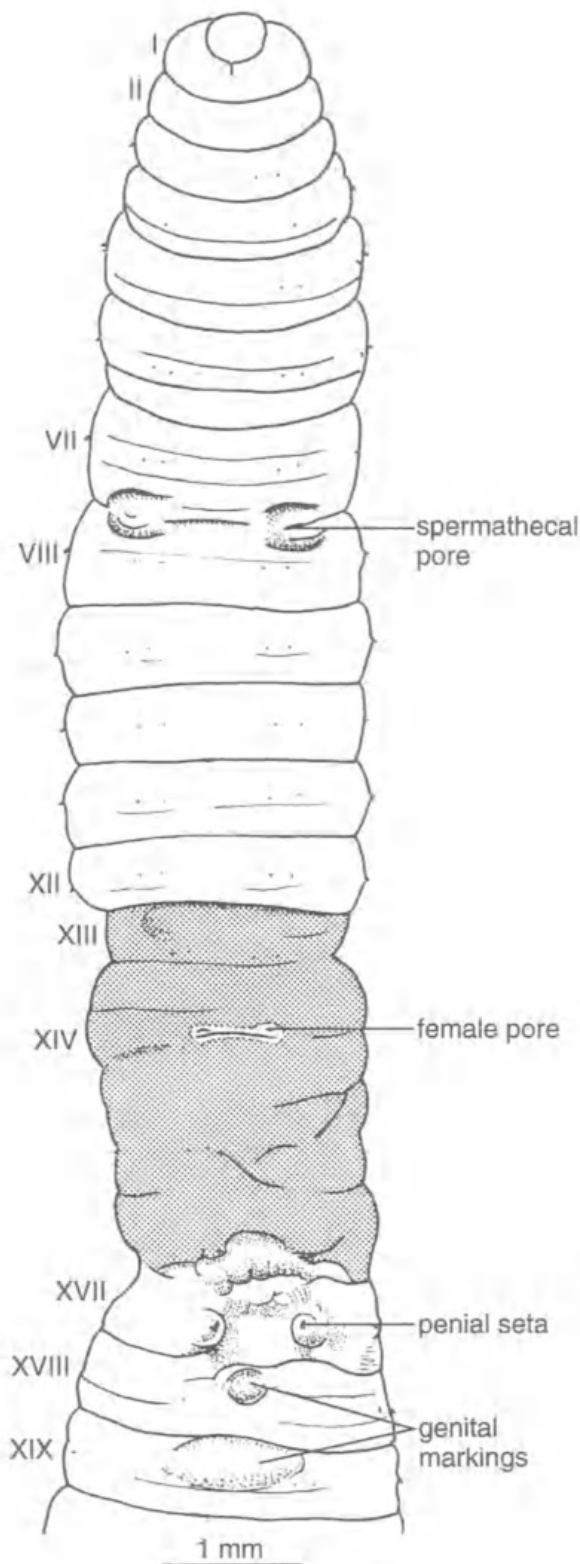


FIG. 28. *Kayarmacia queenslandicus* (Michaelsen, 1916). Emu Lagoon, Alice-Mitchell Rivers National Park, specimen QM Acc#2344, QMG213385. Ventral view of forebody and clitellar region.

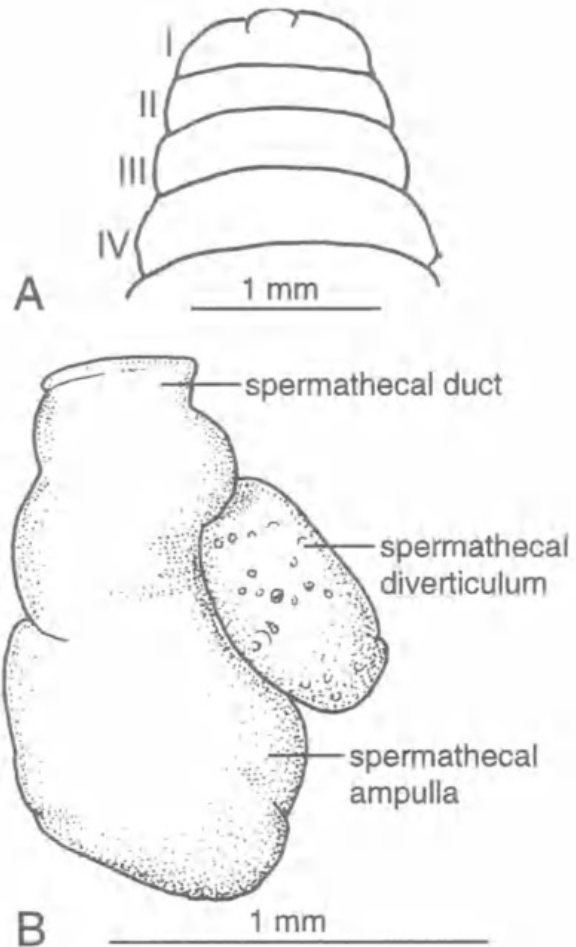


FIG. 29. *Kayarmacia queenslandicus* (Michaelsen, 1916). Emu Lagoon, Alice-Mitchell Rivers National Park, specimen QM Acc#2344, QMG213385. A, dorsal view in region of prostomium. B, right spermatheca.

radically visible from shortly anterior to the clitellum (verified by exudation of alcohol when specimen is placed in water). Setae closely paired; in XII,  $aa: ab: bc: cd: dd = 6.6: 1.0: 6.1: 0.7: 26.1$ ; or  $13.6: 2.1: 12.5: 1.5: 54.2$ . Clitellum annular, XIII-XVI; setae normally developed. Male genital field: a deep transversely elliptical depression in XVII, preceded posteriorly in XVI by a midventral, transverse glandular elevation, and extending somewhat onto XVIII median to a pair of strongly protuberant combined male and prostatic porophores, the median borders of which project ventromedially over the depression, the lateral borders of which are poorly distinguished from the lateral region of the segment; from the summit of each papilla, in setal line *a*, projects a penial seta; etc. An indistinct hemispheroidal midventral genital markings

present presetally in XVIII; a larger indefinite tumescence presetally in XIX (S1), or a hemispheroidal midventral genital marking present post-setally in XVIII. Female pores a pair of deep punctuations very shortly anterior median to seta *a* of XIV. Spermathecal pores 1 pair, in intersegmental furrow 7/8, in or shortly lateral of *b*; each with a large approximately ellipsoidal epidermal elevation surrounding it which extends well laterally of *b* and to or median of *a* and is bounded anteriorly by a crescentic groove.

Septa 5/6 (S2), 6/7 (S1)-8/9 the strongest, moderately strongly thickened. Dorsal blood vessel single, continuous on to the pharynx. Last hearts in XIII; those in X-XIII large and heart-like with large connective to the supraoesophageal vessel and slender connective to the dorsal vessel; those in IX anteriorly slender, with dorsal connective only. Gizzard large, strong, glossy, muscular though compressible. Oesophagus lacking calciferous glands; segmentally slightly swollen and vascularized in VIII-XVI, especially vascular in X-XIV (S1) or XI-XVI (S2). Intestine commencing in XVII but not sharply demarcated from the oesophagus (S1, 2). Typhlosome absent. Holonephric. Nephridia of II, III and especially IV enlarged and much lobed though not truly tufted; connection to the gut not detected (S2). Other nephridia with avascular ducts discharging anterior to the lateral setal couples, specifically in *c* (S1). Large male funnels in X and XI (S1, 2), with spermatozoal iridescence in S1. Seminal vesicles in IX and XII, racemose, much divided, those in XII the larger (S1); in IX only (immature) in S2. Paddle-shaped ovaries in XIII. Prostates tubular, extending from XVII to XXIV (S1, 2); zigzagged in S1, almost straight and very slender owing to immaturity in S2; at maturity (S1) the duct extending from XVII-1/2XIX, with an abrupt bend in XIX; the short portion ental to the bend not noticeably muscular, the remaining, more ectal portion forming a wide, muscular, glossy tube extending forwards to the male porophore; vasa deferentia in XVI and XVII forming a muscular tube of similar appearance but slightly wider (ejaculatory duct), a short region ental to this, also in XVI, is more slender and represents the posterior portion of the unmodified more anterior region of the conjoined vasa deferentia. Penial seta ca. 0.96mm long; only one on each side; the tip curved in a hook as in *K. adelphicus* (S2), extending from XVII into anterior XIX (S1, 2); the curved apical portion ornamented 'dorsally' and 'ventrally' by extensive finely toothed transverse rows but the sides

smooth; the ventral tooth rows linked up transversely so as to straddle much or the whole of the ventral surface. Spermathecae a pair in VIII, opening at the anterior border, not fully mature in S2; in S1 each with a large ovoid ampulla; the duct of which consists of three regions in longitudinal succession: an ental third which is approximately tubular and is well demarcated from the ampulla, a swollen intermediate region which receives the diverticulum, and an ectal third which forms a wide, short, muscular, tubular duct. Diverticulum elongate ellipsoid, with numerous nacreous sperm masses which possibly represent non-protuberant sperm chambers, and with a narrow connection to the spermathecal duct. Length left spermatheca = 1.5mm; length ampulla = 0.9mm; ratio length spermatheca: length duct = 2.5; length diverticulum = 0.7mm.

**REMARKS.** The type locality is the Alice River, which Michaelsen (1916) wrongly thought to be a tributary of the Coleman River. Michaelsen's material was collected from the banks of the river but he recognized its at least potentially 'limnische Lebensweise'. The stated absence of dorsal pores would correlate with an amphibious existence. The water table is at the surface and in the rainy season most of the area, excepting the levee banks, is covered by water (K. R. McDonald, pers. comm.). However, in the new material dorsal pores are sporadically demonstrable though possibly vestigial.

Identification of the new material as *Rhododrilus* (now *Kayarmacia*) *queenslandicus* is based on close morphological similarity and collection near the type locality. The identification appears to be confirmed by the unusual ornamentation of the penial setae in which transverse rows of scales are present dorsally and ventrally on the apical curvature but the sides are smooth. The above account is derived solely from the new material. Michaelsen's description of *Rhododrilus queenslandicus* accords closely but some points of disagreement require mention. The clitellum is said to occupy XIII-XVII, in XIII and posterior XVII being less well developed, whereas in the Emu Lagoon specimens it ends with segment XVI. No accessory genital markings were present. The thickened end of the male duct was shown to open into the prostate duct whereas in the Emu Lagoon material these two ducts were shown to be closely apposed at the male pore but actual fusion has not been demonstrated. Two penial setae were seen in each follicle whereas one only is present on each side in



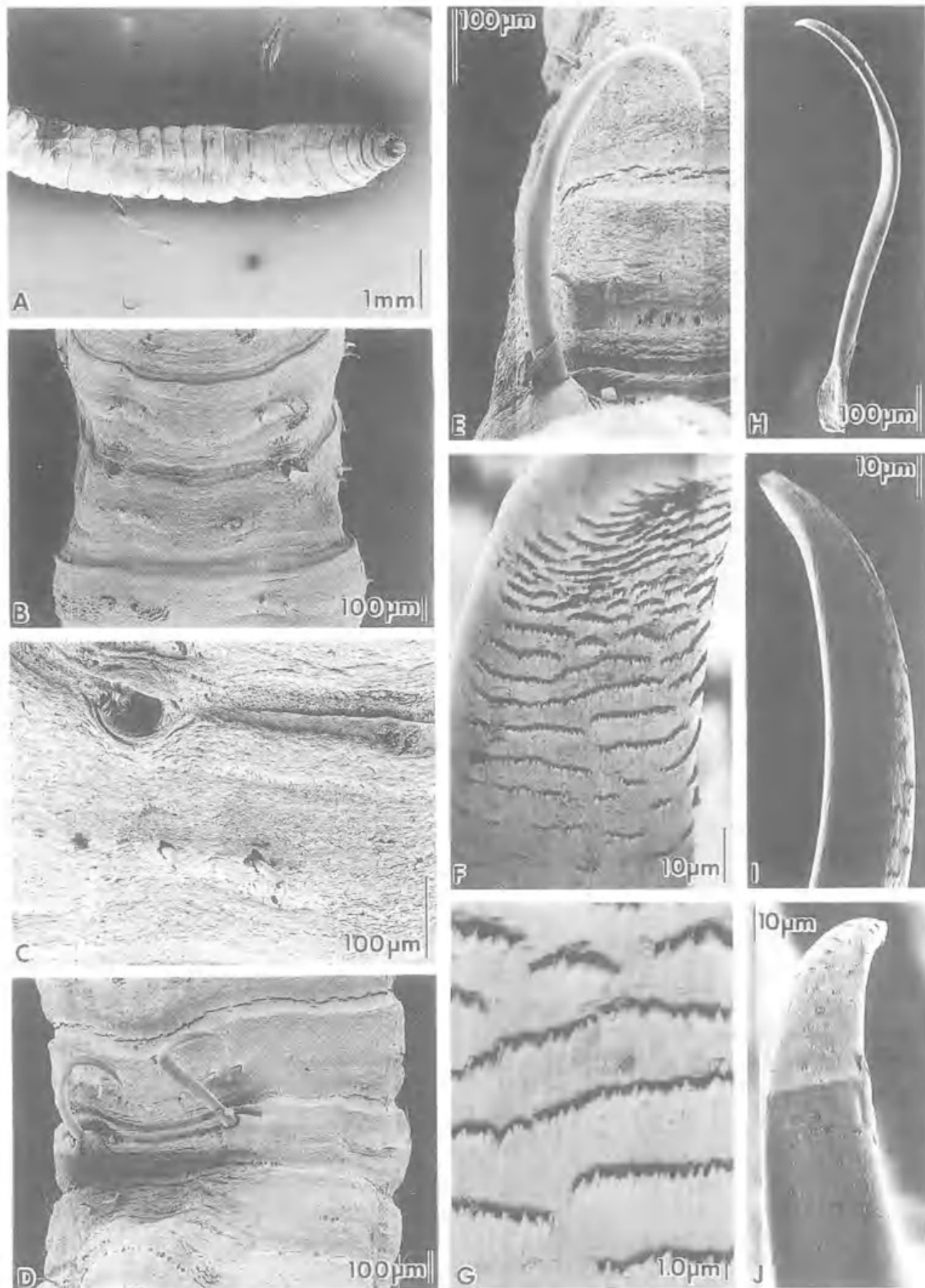


FIG. 30. *Kayarmacia queenslandicus* (Michaelsen, 1916). Emu Lagoon, Alice-Mitchell Rivers National Park, specimen QM Acc#2344, QMG213385. A, ventral view. B, region of spermathecal pores. C, a right spermathecal pore. D, penial setae *in situ*. E, right penial seta *in situ*. F, ventral ornamentation of penial seta. G, same, higher magnification. H, penial seta of specimen 2. I, dorsal ornamentation of a penial seta of same. J, dorsal ornamentation of a penial seta of specimen 6.

the new material. Although the description of the spermathecae given by Michaelsen differs in some regards relative to that given here for the Emu Lagoon material, the differences are doubtfully significant and his illustration agrees well with that for the latter; the very wide duct illustrated for the type corresponds with the wide middle region of the duct in the new material. In view of the close similarities of the new material with the types, including the ventral ornamentation and smooth sides of the setal curvature, these differences of description do not appear to merit specific separation.

The close similarity of the material here identified as Michaelsen's *Rhododrilus queenslandicus* and the new species *Kayarmacia adelphicus* is discussed in the account of the latter. The specimen of *K. queenslandicus* in which the genital marking in XVIII is postsetal, as in *K. adelphicus*, further narrows the gap between the two taxa. If genital setae were found in *K. queenslandicus* retention of *adelphicus* as a distinct species would still be supported by the difference in ornamentation of the penial setae.

Subfamily MEGASCOLECINAE  
Genus *Terrisswalkerius* Jamieson, 1995

*Terrisswalkerius carbinensis* sp. nov.  
(Figs 31 & 32; 39)

TYPE LOCALITY. 16°30'30"S 145°16'30"E., Mt Carbine Tableland, 980m, Notophyll vine forest on granite, K.R. McDonald and C. Hoskins, 22 Jan 1996.

MATERIAL EXAMINED. HOLOTYPE. QMG212025. PARATYPES. P1, 3-9, QMG213392-213399; P2 QMG212026; P10 QMG213400.

DESCRIPTION. Length 25-51mm; H 46mm; Width 2- (H) 3mm. Segments 69-145; H 147. Pigmentless buff in ethanol, clitellum pale brown. Prostomium broad and prolobous but the peristomium describing a wide V posterior to it. Dorsal canalicula absent. Peristomium slightly shorter than segment II; not bifid ventrally. First dorsal pore 4/5. Setae 49 in XII; 54 caudally (12 segments from posterior end); aa: ab: bc: cd: yz: zz = 2.1: 1.0: 0.8: 0.6: 0.6: 0.8; thus ventral break (aa) pronounced; dorsal break (zz), except anteriorly, hardly perceptible; all lines approximately straight. Nephropores clearly visible on the clitellum in a straight lateral series, in setal lines 12, anteriorly in their segments. Clitellum annular, XIV-XVII; intersegmental furrows weakly represented; dorsal pores almost occluded; setae present. male pores minute, each with a narrow

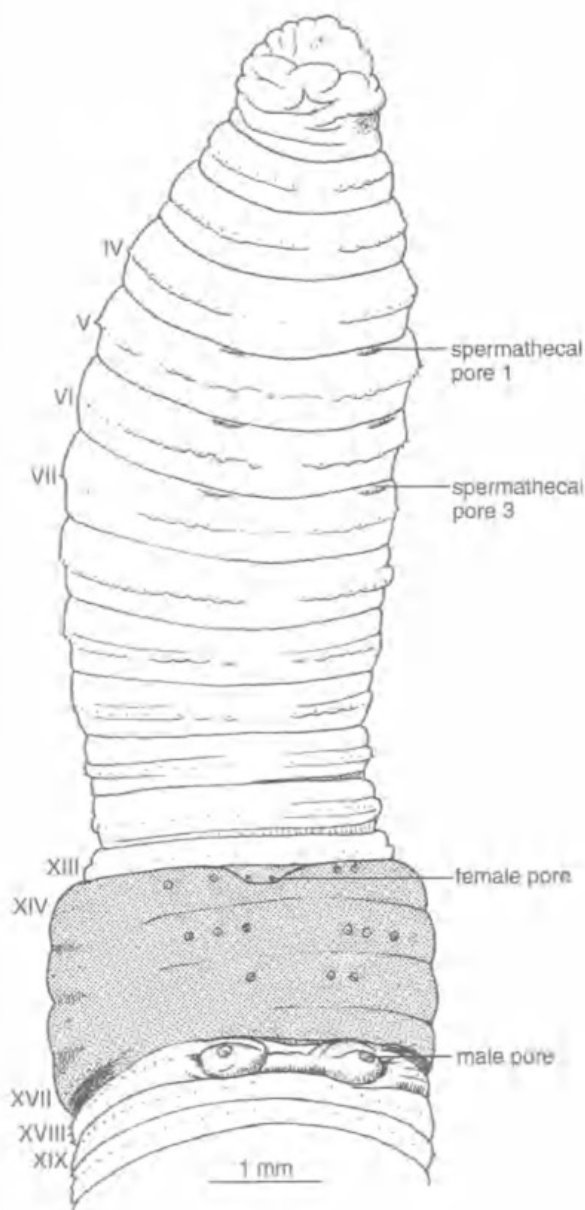


FIG. 31. *Terrisswalkerius carbinensis* sp. nov. Holotype, QMG212025. Ventral view of forebody and clitellar region.

pale border immediately lateral to setal line *b*, on a conspicuous oval papilla which extends from median to *a* to approximately *c* line; the papillae is an evaginated structure representing the termination of the unusually muscular prostate duct. Female pores a pair, presetally in *a* lines, in a pale field at the anterior border of the clitellum, in XIV. Spermathecal pores not visible but their sites indicated by a short transverse glandular ridge; approximately in *c* lines, immediately behind intersegmental furrows 4/5, 5/6 and 6/7.

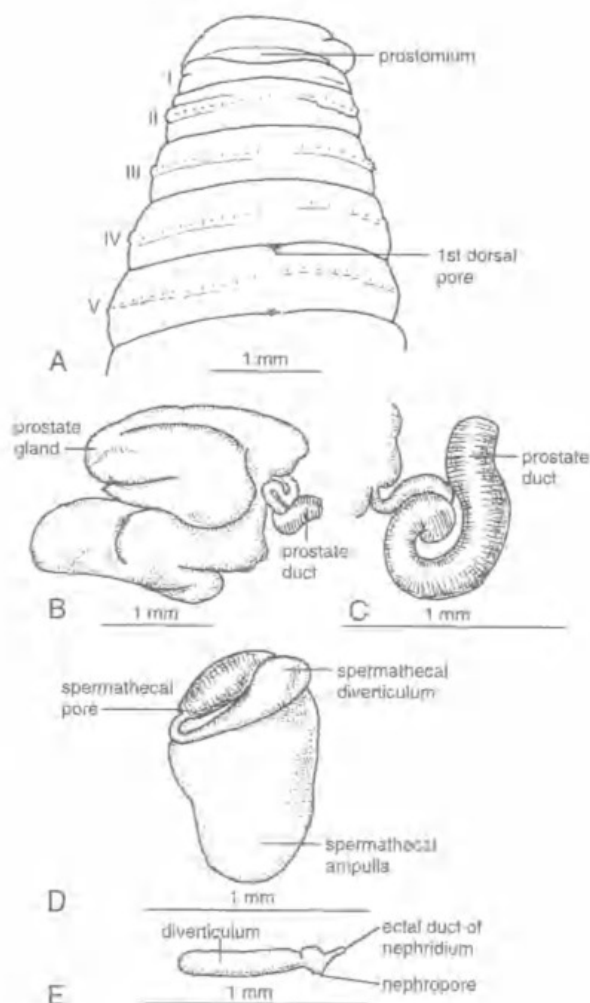


FIG. 32. *Terrisswalkerius carbinensis* sp. nov. Holotype, QMG212025. A, dorsal view in region of prostomium. B, left prostate. C, duct of same. D, right spermatheca of VII. E, left nephridium in anterior intestinal region.

Septa 7/8-12/13 strongly thickened. Dorsal blood vessel single, continuous onto the pharynx. Last hearts in XII. Gizzard a very large, glossy, firmly muscular anteriorly slightly widening cylinder; anterior to septum 6/7; its posterior end at the level of segment IX; septum 5/6 attached to it near its anterior limit but apparently not investing it. Large pharyngeal glands in two or more preceding segments to not envelope the gizzard. Oesophagus greatly dilated and obliquely striated in XVI; the striations coinciding with numerous deep internal lamellae projecting into the lumen of what is here considered an unpaired calciferous gland. Intestine commencing in XIX in which it is constricted by the prostates. Nephridia simple stomate, vesiculate, holonephridia; the first blad-

ders anteriorly in II elongate pyriform, adiverticulate; anteriormost nephridia forming a thick coiled tube but not tufted; bladders in the intestinal region with a small expansion where the duct approaches the nephropore and large lateral digitiform portion constituting a diverticulum. Compacted sperm masses and well developed nacréous seminal funnels paired in each of X and XI; seminal vesicles a pair of large smooth sacs in IX and a pair of racemose, deeply dissected masses in XII; no pseudovesicles in XIII. Large laminar ovaries with many strings of large oocytes, and compact oviducal funnels, in XIII; ovisacs absent. Prostates large, tubuloracemose, with very thick addressed sections in a zigzagged configuration which are closely addressed so as to give the entire gland a racemose appearance; both embracing the oesophagus and intestine at their juncture and meeting dorsally above the gut; each with a long much coiled muscular, anteriorly strongly widening duct; vasa deferentia joining the duct near its ental end. Spermathecae 3 pairs, in V, VI and VII, each with an ovoid strongly flattened ampulla and a short stout duct of about one third its length which is joined at the pore by a single, elongate clavate diverticulum, often bent through a large angle near its slender base, with spermatozoal iridescence; length right posterior spermatheca (straightened) = 1.5mm; ratio total length: length duct = 4.2; ratio length: length diverticulum (straightened) = 1.8.

ETYMOLOGY. Named for the type locality.

REMARKS. *T. carbinensis* shares with *T. montislewisi* (Jamieson, 1976), *T. barronensis* (Fletcher, 1887) and *T. raveni* (Jamieson, 1976) the presence of three pairs of spermathecal pores in 4/5, 5/6 and 6/7. The last two species differ from it in their long and tortuous spermathecal diverticula and location of the spermathecal pores in the vicinity of setal lines *d-e*. *T. montislewisi* is similar to *T. carbinensis* in having a short, clavate diverticulum uniting with the spermathecal duct at the body wall but the pores are more ventral, in line with the ventral setal couples (*ab*), and its prostate ducts are not as tortuous. The male porophores in *T. carbinensis* differ from those of *T. montislewisi* in appearing to be partly formed by evagination of the muscular prostate ducts.

***Terrisswalkerius mcilwraithi* sp. nov.**  
(Figs 33-36; 39)

TYPE LOCALITY. Peach Creek, McIlwraith Range, 13°44'17"S 143°20'15"E, alt. 500-520m, notophyll

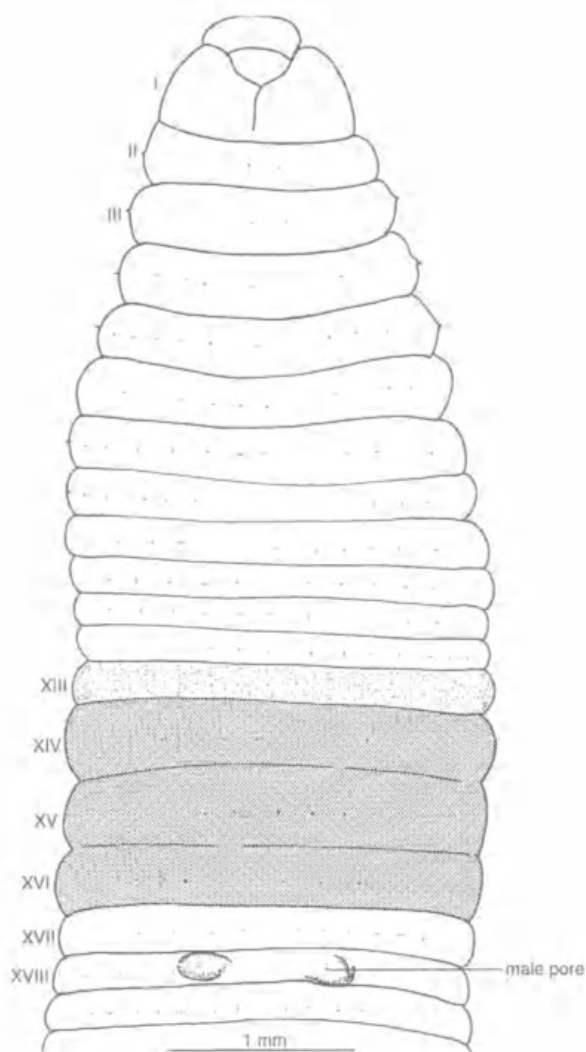


FIG. 33. *Terrisswalkerius mcilwraithi* sp. nov. Holo-type, QMG211995. Ventral view of forebody and clitellar region.

vine forest with fan and feather palms, bank of creek, in loose upper horizon, on Kintore adamallite granite, K.R. McDonald, 26 & 27 Sep 1996.

**MATERIAL EXAMINED, HOLOTYPE.** (1) QMG211995. **PARATYPES.** (1) P1, used for SEM (+ immature non-type), QMG211996; P2-4 QMG211997-211999; P5, QMG212024 (used for DNA study); P6, QMG212037.

**DESCRIPTION.** Length 25 (P5), 31 (P3), 34mm (P2; holotype and paratype 1 are posterior amputees). Width (midclitellar) 2.0-2.3mm, wider in the forebody. Segments 125 (P4), 137 (P3), 139 (P2). Colour in life chocolate brown, darker anterior to the clitellum; pale brown ventrally; clitellum pinkish brown; in ethanol reddish brown, clitellum and ventral surface whitish.

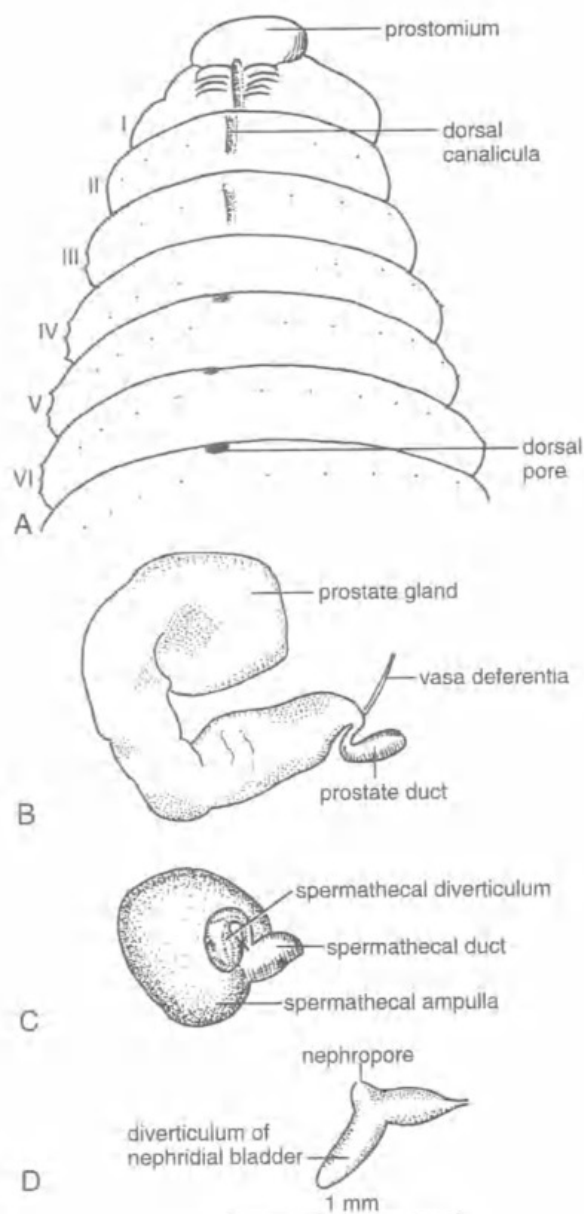


FIG. 34. *Terrisswalkerius mcilwraithi* sp. nov. Holo-type, QMG211995. A, dorsal view in region of prostomium. B, left prostate. C, left spermatheca. D, left nephridial bladder of XX. A-D same scale.

**Behaviour:** saltatory by rapid 'flicking' movements when disturbed. Prostomium epilobous 1/3, broad, transversely elliptical; in the holotype giving the impression of being almost tanylobous owing to transverse plications of the peristomium posterior to it but this feature less obvious or absent in paratypes. A deep, wide dorsal canalicula or gauge bisects the peristomium dorsally and impinges on the posterior extremity of the prostomium; this groove is present segmentally



in II and III (but not intersegmentally) and a middorsal darker pigmented but not incised line is present throughout the postclitellar region. Peristomium not shortened, longer than segment II, with V-shaped midventral anterior indentation continuous with a midventral groove. First dorsal pore 4/5. Setae in XII 28 (H, P3), 36 (P2, P4); in XX 28 (P2), 30 (H), 32 (P3), 36 (P4); caudally (12 segments anterior to the posterior extremity) 36 (P4), 40 (H, P2), 42 (P3). The ventral break (*aa*) only slightly wider than the adjacent setal couple (*ab*); the dorsal break (*zz*) slightly less than twice the adjacent couple (*yz*); *ab* not significantly narrower than other intervals of the same side; setae *a* and *b* absent in XVIII; *a* line fairly straight throughout; *z* lines check. The setal surfaces are cicatrized as is common in earthworms. Nephropores visible in a straight series on the clitellum, lateral, in setal lines 10, anteriorly in their segments. Clitellum annular, XIII-XVII (paratypes 2 and 3) or weak in XIII and absent in XVII (H, P1); intersegmental furrows and setae retained; dorsal pores occluded. Male porophores a pair of scarcely protuberant whitish ellipses in XVIII centred slightly lateral of *b* lines (H, P1-3); a central male pore visible on each only in P2; the pores 0.5 mm apart. Accessory genital markings absent. Female pores on XIV, from internal investigation, but not visible externally. Spermathecal pores one pair, in 7/8, slightly lateral of *b* lines inconspicuous slits demonstrable only with difficulty by parting the intersegmental furrow, very approximately 0.7 mm apart.

Septa 12/13 and 13/14, slightly thickened, the remainder delicate. Last hearts in XII. Gizzard a large, glossy, firmly muscular, anteriorly slightly widening cylinder; anterior to septum 7/8 but segmental position indeterminable owing to extreme attenuation of septa by posterior projection of the gizzard. Very large pharyngeal glands, forming a lobe on each side, envelope the anterior region of the gizzard. Oesophagus vascular in X-XV; enlarged in XIV and XV in which it has a pair of large circumferential vessels connecting to the supraoesophageal vessel but no true calciferous glands present. Intestine commencing, with abrupt expansion, in XVII. Nephridia stomate vesiculate, exonephric holonephridia commencing in II; those in II tufted, but not large, and attached to the buccal cavity though enteronephry not proven; those in III only slightly tufted and like the remaining, simple nephridia, exonephric; bladders not demonstrable anterior to IV; those in the intestinal region conspicuous by virtue of an obliquely vertical, outwardly leaning sac on each

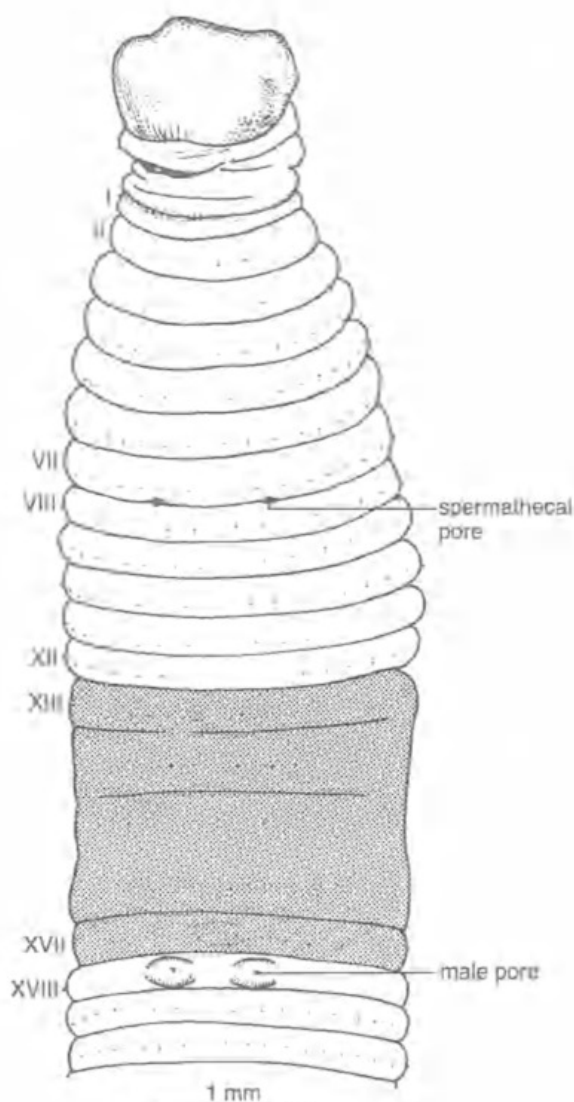


FIG. 35. *Terrisswalkerius mcilwraithi* sp. nov. Paratype 2, QMG211997. Ventral view of forebody and clitellar region.

side which is the lateral diverticulum of each bladder and often has a brownish, chloragogenous appearance. Very large compacted sperm masses and well developed nacreous seminal funnels a pair in each of X and XI; seminal vesicles a pair of large elongate lobulated sacs in XII and a small pair in IX; no pseudo-vesicles in XIII. Small ovaries with few egg strings, and large oviducal funnels, in XIII; ovisacs absent. Prostates tubuloracemose, confined to XVIII, the gland a flattened band coiled one on itself in a horizontal plane, with the wide ental end anterior; duct moderately long, muscular, bent once and strongly widened ectally; vasa deferentia joining the gland shortly before its junction with the duct;

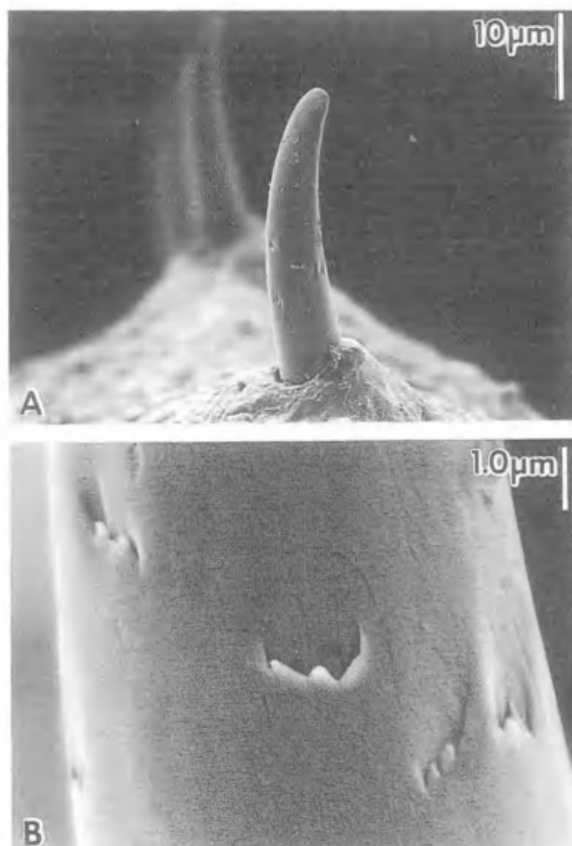


FIG. 36. *Terrisswalkerius mcilwraithi* sp. nov. Paratype 1, QMG21 1996. Scanning electron micrographs. A, a seta. B, sculpturing of same.

penial setae absent. Spermathecae one pair, with large, subspheroidal ampulla and clearly demarcated, stout, fusiform muscular duct; the comma-shaped uniloculate diverticulum, with spermatozoal iridescence, joining the junction of ampulla and duct; length left spermatheca = 0.8mm; ratio total length: length duct = 2.7; ratio length: length diverticulum (straightened) = 1.6 (H).

ETYMOLOGY. Named after the type-locality.

REMARKS. *Terrisswalkerius mcilwraithi* is closer morphologically to *T. blounti* than to other members of the genus and shares with it the otherwise unique restriction of the spermathecal pores to intersegment 7/8 (Table 1). In view of the close similarity of the two entities, and their relatively close geographical proximity, albeit separated by 3° of latitude, this location of the spermathecal pores is deduced to have developed in a common ancestor and is a synapomorphy of the two species. Of these, often subtle differences, the more significant, supporting specific separation of *mcilwraithi* from *blounti* appear to be the lack of closer coupling of the ventral setae

TABLE 1. Differences between *T. mcilwraithi* and *T. blounti*.

<i>Terrisswalkerius mcilwraithi</i> sp. nov.	<i>Terrisswalkerius blounti</i> (Jamieson, 1976)
Type Locality: 13°44'17"S	Type Locality: 16°34'S
Prostomium with middorsal groove only posteriorly	Prostomium bisected by middorsal groove
Setae: <i>ab</i> not narrower than other intervals of the same side	Setae: <i>ab</i> significantly narrower than other intervals of the same side
<i>aa</i> only slightly wider than the adjacent setal couple	<i>aa</i> ≈ 2-4 <i>ab</i> (widest caudally)
<i>zz</i> slightly less than twice the adjacent couple	<i>zz</i> smaller than adjacent couple
Nephropores in setal lines 10	Nephropores in setal lines 5
Male porophores 0.5mm apart	Male pores 1mm apart
Spermathecal pores, slightly lateral of <i>b</i> lines, very approximately 0.7mm apart	Spermathecal pores between setal lines 3 and 4, 1.7-2.0mm apart
Septa 12/13 and 13/14, slightly thickened, the remainder delicate	Thickest septa 8/9-12/13, moderately thickened
Nephridia with diverticulate bladders	Nephridia lacking bladders
Prostates tubuloracemose, confined to XVIII, the gland a flattened band coiled one on itself in a horizontal plane	Prostates long, flattened and irregularly tubular (tubuloracemose), meandering with adpressed coils in XVII, XVIII-XXIV, XXII
Spermathecae with stout, fusiform muscular duct	Spermathecae with long, slender and twisted duct
Ratio total length spermatheca: length duct = 2.7	Ratio total length spermatheca: length duct = 1.7
Ratio length: length diverticulum (straightened) = 1.6	Ratio length: length diverticulum = 2.3

*a* and *b*; location of nephropores in setal lines 10 (not 5, though lateral in both species); the closer approximation of the spermathecal and male pores; the presence of nephridial bladders; and the restriction of the prostates to XVIII and their coiled, not tortuous, form.

The type-locality of this species is almost 2° of latitude north of previous records for the genus. Its habitat is notophyll vine forest with fan and feather palms (*Licuala ramsayi*, *Ptychosperma elegans*, *Calamus australis*, and *Archontophoenix* spp.) along drainage lines with moist, humic soils, on Kintore Adamallite granite.

It is found sympatrically with *Diplotrema attenuata*, *D. scheltingai*, *Neodiplotrema mcdonaldi*, and species yet to be identified.

#### *Terrisswalkerius miseriae* sp. nov. (Figs 37-39)

TYPE LOCALITY. 15°52'S 145°13'E (1'x1' grid), Mt Misery, S.W. slope, Timber Reserve 165 Monkhouse, under logs, notophyll vine forest, alt. 600-750m. K.R. McDonald, C. Schneider, J. Sumner, 11 Nov 1994.

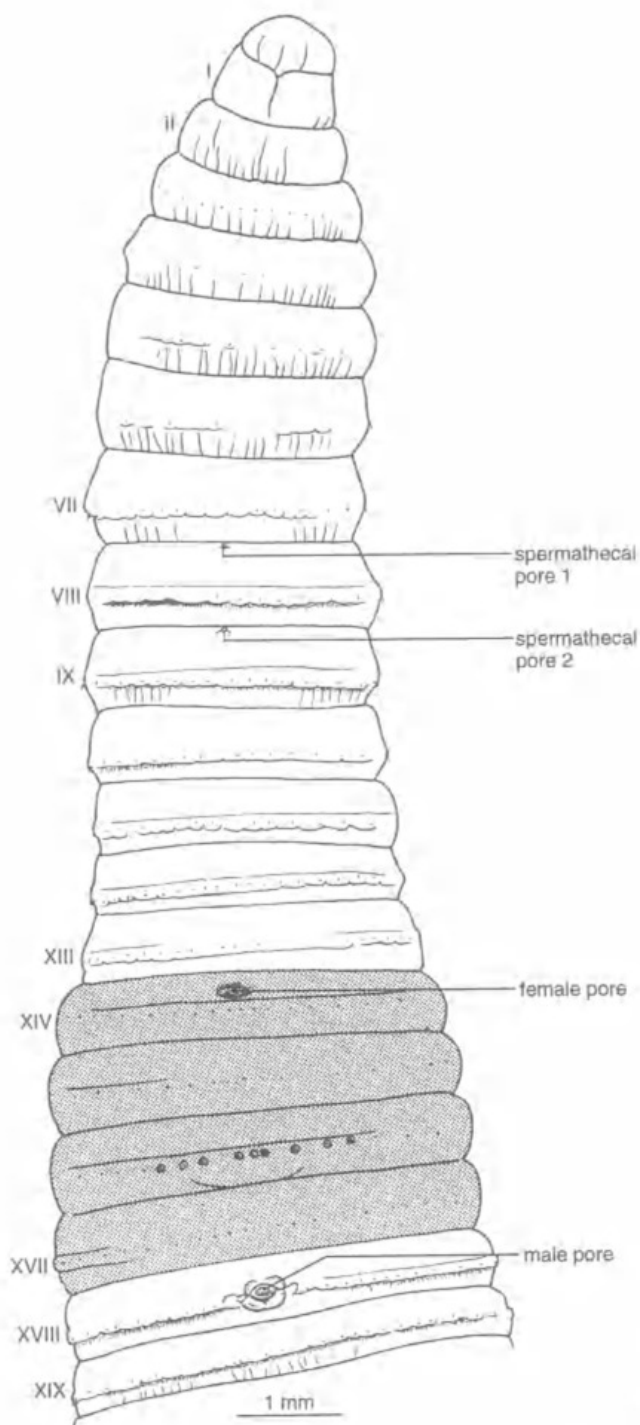


FIG. 37. *Terrisswalkerius miseriae* sp. nov. Holotype, QMG211964. Ventral view of forebody and clitellar region.

MATERIAL EXAMINED. HOLOTYPE. QMG211964. PARATYPES. P1 and 2, QMG211965-66. OTHER MATERIAL. 3 immature specimens not designated types.

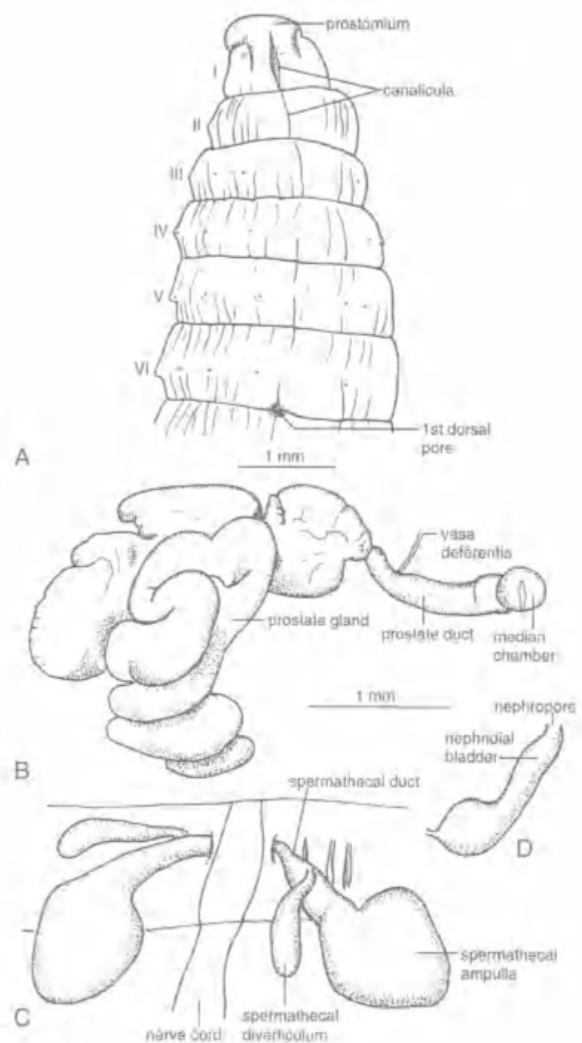


FIG. 38. *Terrisswalkerius miseriae* sp. nov. Holotype, QMG211964. A. dorsal view in region of prostomium. B. left prostate. C. spermathecae of IX, *in situ*. D. right nephridial bladder of VIII. B-D same scale.

DESCRIPTION. Length 48-70mm; H 54mm. Width (midclitellar) 3-(H)5mm (H). Segments 97-111; H 94. Colour in ethanol purplish brown, pale ventrally; clitellum buff. Prostomium epilobous 1/2, dorsal tongue open, sides parallel or slightly concave; a wide, deep, middorsal groove bisecting the peristomium and continuing posteriorly as a narrow groove (canalicula) which more distinct in the postclitellar region. Peristomium bifid ventrally. First dorsal pore 6/7. Setae 31 in XII; 40 caudally (12 segments from posterior end); all rows approximately straight. In XII, *aa*: *ab*: *bc*: *cd*: *yz*: *zz* = 1.0: 1.0: 1.5: 1.1: 3.0: 4.5; no ventral break; dorsal break ca. 1 to 3 times the adjacent interval. Nephropores conspicuous from V posteriorly, near the anterior borders of their

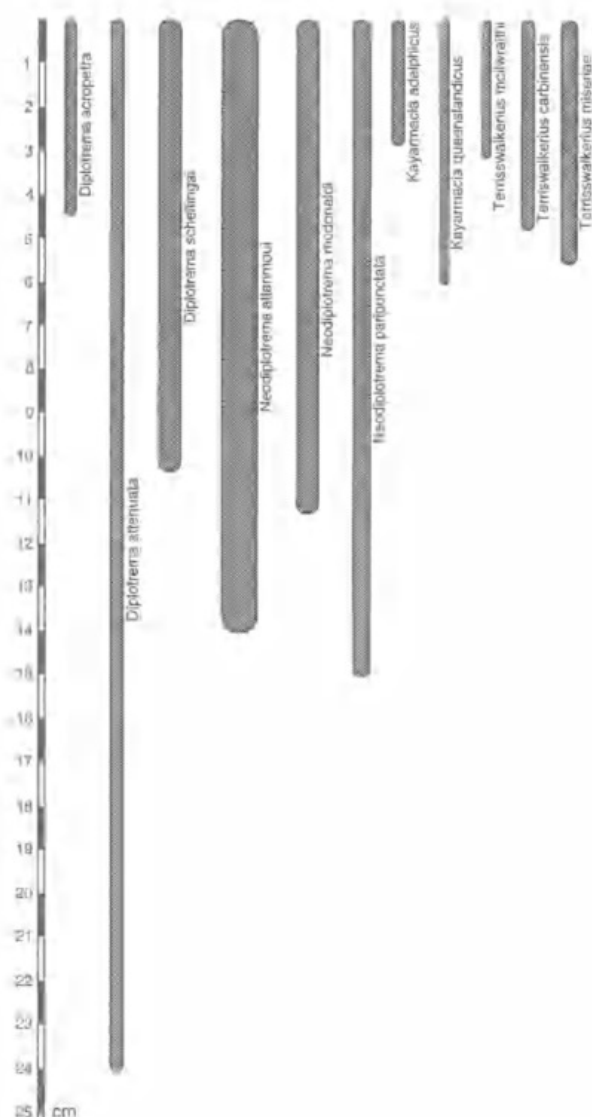


FIG. 39. Relative sizes of the oligochaete species described in this paper.

segments, in a slightly dorsolateral straight line on each side, with rare irregularity in single segments; much less conspicuous behind the clitellum; those on the clitellum in setal lines 10 from the ventrum. Clitellum annular, XIV-XVII; setae, nephropores, dorsal pores and intersegmental furrows retained. Male pore, in XVIII, in a midventral transverse slit on very small transversely elliptical whitish papilla centred shortly anterior to the setal arc and not extending posteriorly to this, surrounded by a narrow, rounded oblong, low pad which is subdivided into two anterior and two posterior quarters. Genital markings absent. Female pore single, midventral, midway between the setal arc and anterior margin of XIV.

Spermathecal pores unpaired, midventral, in 7/8 and 8/9, inconspicuous, concealed in the intersegmental furrow but succeeded by an indistinct whitish spot at the anterior border of the succeeding segment.

Septa 10/11-13/14 the thickest, but not strongly thickened. Dorsal blood vessel single, continuous onto the pharynx. Last hearts in XII. Gizzard very large, an elongate, glossy, muscular, anteriorly widening cylinder; in V but septum 5/6 very delicate and displaced, funnel-like, posteriorly, the posterior end of the gizzard being at the level of segment IX. Oesophagus in VII-XI segmentally swollen and whitish, increasing in width throughout these segments; broadly tubular in XII-XVII; calciferous glands absent. Intestine thin-walled, commencing with abrupt expansion in XVIII(?). Nephridia stomate, vesiculate, holonephridia, with large preseptal funnel and simple, elongate pyriform bladder. Fan-like testes and large iridescent sperm funnels two pairs, free in X and XI. Ovaries large, palmate, and funnels in XIII; ovisacs not seen. Prostates a pair, in XVIII-XXI, each unusually coiled; the ectal half almost racemose, the ental half thickly tubular; a flaccid, thin-walled duct, lacking muscular sheen, passing medianly to join the lateral aspect of a small midventral rounded chamber, not forming a noticeably muscular bursa, at the pore; conjoined vasa deferentia joining the duct at about its ectal fourth. Spermathecae 2 pairs, each with ovoid ampulla and slender duct of approximately the same length which is joined at approximately its ental third by a digitiform diverticulum about as long as the duct; the spermathecal duct entering the body wall anterior to setae *a* but presumably fusing with its fellow before opening at the common pore.

ETYMOLOGY. For the type locality.

REMARKS. *Terriswalkerius miseriae* completes the trend to midventral approximation of the spermathecal and male pores which is evident in several other species of *Terriswalkerius*. Total fusion of the pores, seen in this species, has hitherto been a diagnostic character of *Fletcherodrilus*. However, *Fletcherodrilus* remains distinct in having unpaired spermathecae, each with a pair of diverticula which are reasonably deduced to be retained from the single diverticulum of each member of an original pair of spermathecae. In *T. miseriae* the spermathecae, although opening at a single pore, are paired. There are three or five spermathecal pores in *Fletcherodrilus*, contrasting with two in *T. miseriae*.



Fletcher (1889), describing the type specimens of *Fletcherodrilus*, the type-species of its genus, claimed to have observed a stage in reduction of paired spermathecae, each of the pair with a single diverticulum, and with one of the ampullae rudimentary, to the unpaired condition seen in all species of the genus. Despite this evidence for origin of *Fletcherodrilus* from a form with paired spermathecae, an origin which would be presumed, as above, even in the absence of the exceptional individuals, the view is here maintained that *Terrisswalkerius miseriae* is not more closely related to *Fletcherodrilus* than it is to other species of *Terrisswalkerius* within what has been shown cladistically (Jamieson, 1994) to be a monophyletic *Fletcherodrilus*-*Terrisswalkerius* assemblage. A further difference of *T. miseriae* from *Fletcherodrilus* is absence of calciferous glands. It also lacks the pleated anterior genital markings which are a novelty of some species of *Fletcherodrilus* (*F. menurus* and *F. sigillatus*) though these markings possibly were not present in the stem form of *Fletcherodrilus*, being unknown in the type-species, *F. unicus*, or in *F. affinis* and *F. fasciatus*. Relationships of *T. miseriae* are the subject of a cladistic study of mitochondrial DNA which is in progress.

## DISCUSSION

In the above account, ten new species, in four genera, have been described from the Cape York Peninsula, Queensland: *Diploptrema attenuata* sp. nov.; *D. scheltingai* sp. nov.; *Neodiploptrema mcdonaldii* sp. nov.; and *Terrisswalkerius mcilwraithi* sp. nov., from the McIlwraith Range; *Diploptrema acropetra* sp. nov., *Neodiploptrema albanmouji* sp. nov., *N. paripunctata* sp. nov., and *Kayarmacia adelphicus* gen. et sp. nov., from Cape Melville National Park; *Terrisswalkerius carbinensis* sp. nov. from Mt Carbine Tableland, and *T. miseriae* sp. nov., from Mt Misery, near the headwaters of the Normanby River. *Kayarmacia queenslandicus* (Michaelsen, 1916) is redescribed from the Alice-Mitchell R. National Park, near the type-locality; it is clearly the sister-taxon of *K. adelphicus*.

These and other oligochaete species do not show congruence with the biogeographical affinities of various areas of Australia proposed by Crisp et al. (1995) in a cladistic analysis of the distribution of 11 angiosperm groups. Thus, of some 25 or more Australian oligochaete genera, *Begemius* Easton (1982) is the only indigenous genus which is also found in New Guinea, so far

as is known, whereas those authors recognize a close relationship between southern New Guinea and the Australian mainland. The genus *Diploptrema*, of which species are described in the present paper, has its closest relative, *Acanthodrilus*, in New Caledonia (Jamieson & Bennett, 1979) and these are in turn very closely related to eastern North American acanthodrilines, some of which may be referable to *Diploptrema* (see James, 1990). It appears that the Australian *Diploptrema* represent a Gondwanan and possibly Pangaeian acanthodrilite stock. The other Australian acanthodrilites described would previously have been attributed to the genus *Rhododrilus*, following Michaelsen (1916), but that they are congeneric with the predominantly New Zealand species, and the type-species, *R. minutus* Beddard (1889), is not here supported and the new genus *Kayarmacia* is erected to receive them. No acanthodrilites are known from New Guinea.

The genus *Neodiploptrema*, erected by Dyne (this volume) for species in the north-west of Cape York Peninsula and Thursday Island, is here shown to occur sympatrically with *Diploptrema* on the eastern side of the peninsula, at Cape Melville and in the McIlwraith Range. It is distinguished from *Diploptrema* by the meronephric condition and is reasonably considered by Dyne to have been derived by the supervention of this condition on the holonephry of *Diploptrema*. On this basis erection of *Neodiploptrema* would leave a paraphyletic *Diploptrema* unless, as seems improbable, the two genera are sister-taxa. There are, indeed, some indications that the *Neodiploptrema* condition was derived locally from that of *Diploptrema*, as is seen in the similarity of *N. mcdonaldii* to *D. ridei* Jamieson & Dyne (1976), from Cape York and Melville Island. However, there is no particular reason to believe that acquisition of meronephry in *Neodiploptrema* was a monophyletic event and the genus may well be polyphyletic from within *Diploptrema*. On strict cladistic principles *Diploptrema* and *Neodiploptrema* appear to form a monophylum and splitting of this into two genera thus is probably artificial, though convenient.

There remains, however, a possibility that origin of meronephry in *Neodiploptrema* was not temporally confined to Australia but that it may have been a more ancient event which occurred in a larger, Gondwanan or even Pangaeian area. The similarity of *Neodiploptrema* to the species of *Dichogaster*, itself a congener, in Africa, central America and Asia might, if this were the case, be

an indication of close relationship of *Neodiploptrema* and the acanthodrilids with those Dichogastrini which, like *Dichogaster* (though not the sexprostatic Fijian type-species, *D. damonis* Beddard), have the acanthodriline arrangement of male pores. The occurrence of true calciferous glands in *Neodiploptrema mcdonaldi* adds to the remarkable similarity of this species to *Dichogaster*, notwithstanding the diploptreman affinities mentioned above. Although at present there is no firm reason to doubt local derivation of *Neodiploptrema* from *Diploptrema* these alternative affinities must be considered in further studies. Molecular studies which may shed light on the phylogenetic relationships of these and other genera are in progress.

Three species are here added to *Terrisswalkerius*. This genus occurs in and near the Wet Tropics of north Queensland, though there are grounds for considering relationship to Indian species (see Jamieson, 1977) at present placed in the plesiomorphic congeries known as *Diporochaeta*. *Terrisswalkerius* shows no close affinity to Australian species of *Diporochaeta* or to the type-species of that genus, and its congeners, in the New Zealand (see Jamieson, 1994). There is no indication in the distribution of *Terrisswalkerius* in the Wet Tropics of Queensland to suggest that the Atherton Tableland has closer biogeographic affinities with more southerly areas of E Australia, postulated for angiosperms by Crisp et al. (1995), than with other areas of the wet tropics. Nevertheless, the genus *Fletcherodrilus* which forms a monophylum with *Terrisswalkerius* (see Jamieson, 1994) has a distribution which is both sympatric with *Terrisswalkerius* and includes eastern Australia as far south as N New South Wales.

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