

SIX SPECIES OF MEGASCOLECINAE (MEGASCOLECIDAE: OLIGOCHAETA) FROM NEW SOUTH WALES AND THE AUSTRALIAN CAPITAL TERRITORY

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A small collection of earthworms from New South Wales and the Australian Capital Territory which are the subject of agricultural studies is shown to consist of five species: *Notoscolex bakeri* sp. nov.; *Spenceriella bywongensis* sp. nov.; *S. hamiltoni* (Fletcher, 1887), *S. macleayi* (Fletcher, 1889) and *S. nevellensis* sp. nov. *Notoscolex sensu stricto* is known from New South Wales and Victoria, with one species, doubtfully included, from south-western Australia. *N. bakeri* appears to be the closest known relative of *N. montiskosciuskoi* Jamieson, 1973, but differs from the latter in lacking calciferous glands. *Spenceriella* occurs in the Kosciuskan Division and Darling Basin province of Australia, Lord Howe Island, and Norfolk Island. *S. macleayi* (Fletcher), *S. bywongensis* and *S. nevellensis* spp. nov., all with two pairs of spermathecae, appear closely related but differ, among other respects, in having respectively two, three and four pairs of calciferous glands. *S. hamiltoni*, with three pairs of spermathecae and of calciferous glands, is considered to be the senior synonym of *Anisochaeta chani* Blakemore, 2000. Material from the Upper Manning River, New South Wales, previously referred to *S. raymondiana* (Fletcher 1887) is distinguished as *Spenceriella manningi* sp. nov. □ *Notoscolex*, *Spenceriella*, new species, *Megascolecinae*.

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A collection of earthworms from New South Wales and the Australian Capital Territory which are the subject of agricultural studies by Geoffrey Baker, C.S.I.R.O. Entomology, is shown in the present paper to consist of: *Notoscolex bakeri* sp. nov.; *Spenceriella bywongensis* sp. nov.; *S. hamiltoni* (Fletcher, 1887), *S. macleayi* (Fletcher, 1889) and *S. nevellensis* sp. nov. In addition, material from the Upper Manning River, New South Wales, previously referred (Jamieson, 2000) to *S. raymondiana* Fletcher (1887) is distinguished as *Spenceriella manningi* sp. nov.

***Notoscolex* Fletcher, 1886
emend Jamieson, 2000**

Notoscolex Fletcher, 1886a: 546.
Notoscolex(emend.); Jamieson, 2000: 858-860.

DIAGNOSIS. Setae 8 per segment. Combined ♂ and prostatic porophores a pair on XVIII. A single gizzard, in V and/or VI. Meronephric, with exonephric stomate nephridium median to exonephric astomate micromeronephridia caudally (the notoscolecine condition). Prostates racemose, exceptionally tubuloracemose.

REMARKS. *Notoscolex* occurs in NSW and Victoria; one species, doubtfully included, from SW Western Australia. The genus contains some species which form what is undoubtedly a

monophyletic core and other species which can, with varying confidence, be associated with or placed in this monophylum. Members of the core (*Notoscolex* s. s., including the type-species *N. camdenensis* Fletcher, 1886a) are associated, *inter alia*, by 3 pairs of extramural calciferous glands, in XIV-XVI, a clear synapomorphy (Jamieson, 2000). Calciferous glands are absent in *N. bakeri* but it nevertheless shows close similarities to *N. montiskosciuskoi* which has 3 pairs of calciferous glands, albeit in X-XII.

***Notoscolex bakeri* sp. nov.
(Figs 1, 2)**

MATERIAL EXAMINED. HOLOTYPE QMG218232. PARATYPES QMG218233-218234. All from N.S.W., 36°10'S.149°20'E., in a black basaltic soil on a flat near Rock Flat Creek, 'Rosebrook' approx. 14 km NE of Cooma, L. Robinson; 3 macerated clitellate specimens.

DESCRIPTION. Length 225 (P2), 250 (P1), >255mm (H). Width (midclitellar) 8mm (H, P1,2). Segments ca 185 (H) (posterior amputee), ca 200 (P1). Form moderately stout, anterior end club-shaped though apically tapering, clitellar region wider; segments III-XIII strongly biannulate, clitellar and more posterior segments weakly biannulate. Pigmented reddish brown; pale ventrally. Prostomium pro-epilobous but

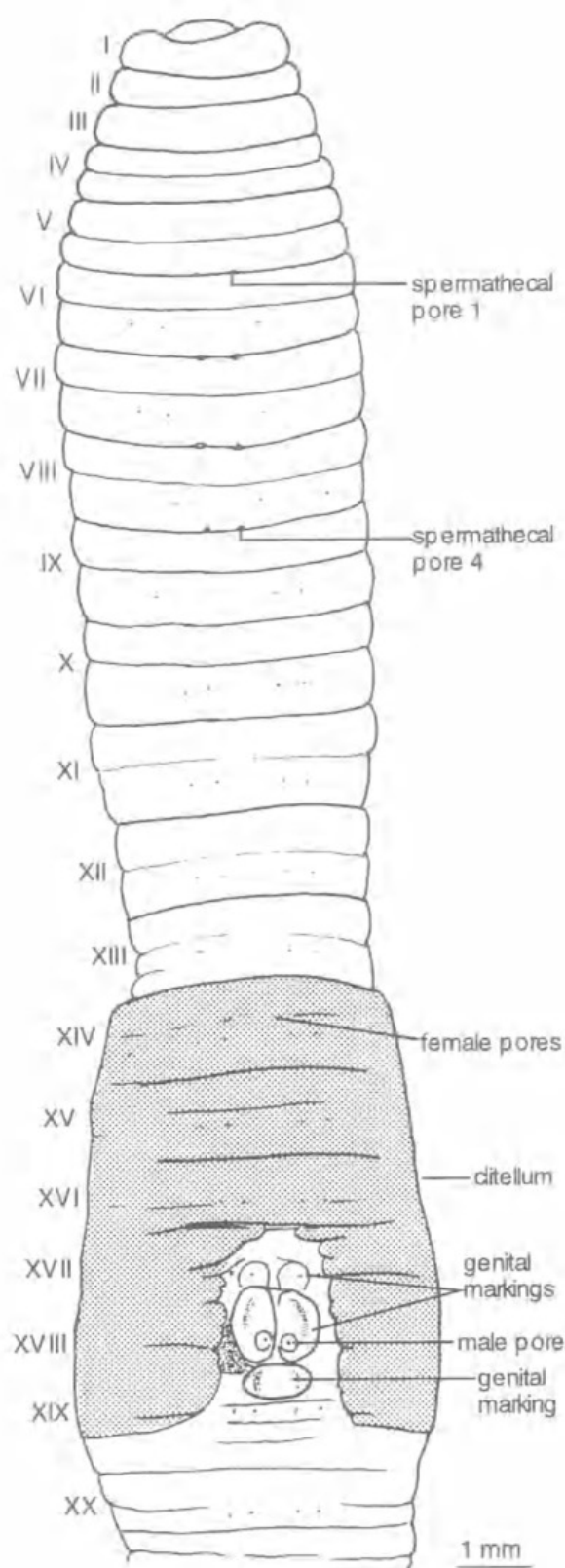


FIG. 1. *Notoscolex bakeri* sp. nov., holotype. Ventral view of fore- and mid-body.

broken up by longitudinal and transverse fissures extending the length of peristomium. First dorsal pore 4/5. Setae small, discernible with difficulty, clearest ventrally on clitellum; in 8 longitudinal rows, commencing on II, *c* and *d* caudally with pale epidermal areolae; *a* and *b* absent in XVIII; in XI (XII not clear), *aa*: *ab*: *bc*: *cd*: *dd* = 8.5: 5: 19: 6: 50%; caudally setal lines *c* and *d* and occasionally *b* irregular; *d* lines becoming irregular shortly behind clitellum. Nephropores not externally visible. Clitellum annular, well developed, thick and rigid, embracing XIV-XIX; interrupted ventrally in XVII-XIX; intersegmental furrows and dorsal pores visible though weak; setae retained. Male pores on inconspicuous small circular papillae median to *a* lines in XVIII; each papilla lying near inner posterior border of a flat, ear-shaped genital marking with slightly raised margin, the two markings conjoined across midline anteriorly and filling XVIII longitudinally. A further genital marking, also flattened with raised margin, but forming a single midventral transverse ellipse, pre-setally in XIX; both sets of markings extending laterally into *ab*. Female pores paired anteromedian to setae *a* of XIV. Spermathecal pores 4 pairs in 5/6-8/9, minute points median to *a* lines (Holotype).

Some anterior septa strongly thickened; 9/10-11/12 very thick. Dorsal blood vessel paired segmentally, unpaired at septa, in VII-XVI and possibly further posteriorly, the two slender halves widely divergent so as to form a diamond pattern in each segment; last hearts in XII, those in X-XII (all very slender) with their major connection to supra-oesophageal vessel which is at least partly double. Gizzard very large but flaccid in V, enclosed in septa 5/6 and 6/7; preceded by an equally wide pharyngeal mass. Oesophagus lacking calciferous glands. Intestine commencing in XVII (fragmentary). Meronephric; forebody segments with forests of minute (astomate?) parietal micromeronephridia. Caudally with transverse rows of few astomate, integumentary micromeronephridia with, on each side of nerve cord, a median stomate exonephric megameronephridium, funnel with long preseptal neck. Large iridescent sperm funnels and copious sperm masses free in X and XI; small, compact slightly lobulated seminal vesicles in IX and XII, on their posterior and anterior septa, respectively, but also a pair on posterior septum of VIII. Small ovaries in XIII. Prostates elongate, flattened racemose (tubuloracemose?), extending laterally,

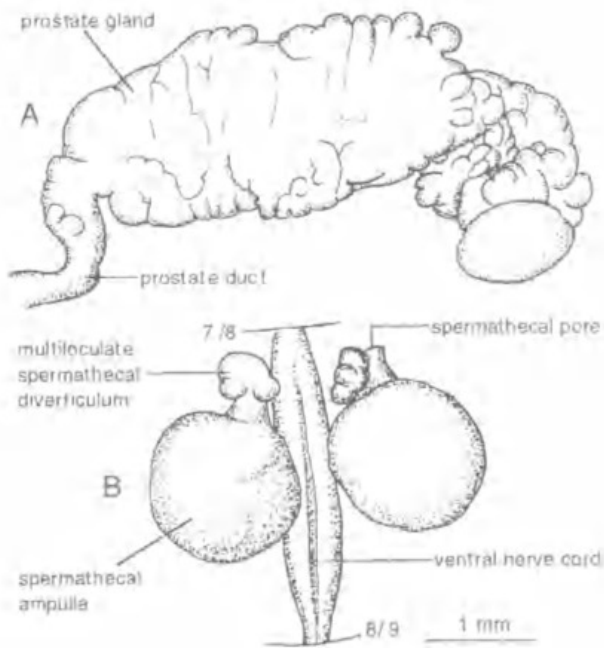


FIG. 2. *Notoscolex bakeri* sp. nov., paratype 1. A, dorsal view of right prostate. B, dorsal view of spermathecae of VIII, *in situ*.

restricted to XVIII; tongue-like with lobulated surface, each gland with single ental bend; duct short, narrow and flaccid, lacking a muscular sheen. Penial setae absent. Spermathecae 4 pairs opening anteriorly in their segments, each with subspheroidal ampulla, a wide, somewhat shorter ectally tapering duct; and a large, sessile, multiloculate iridescent diverticulum, usually with three lobes, which joins ectal end of duct; size uniform (Paratype 1).

ETYMOLOGY. For Dr Geoffrey Baker, who provided this collection, in recognition of his contributions to earthworm ecology in Australia.

REMARKS. *N. montiskosciuskoi* Jamieson, 1973, is the only other species of *Notoscolex* with four pairs of spermathecal pores and, like *N. bakeri*, has a double dorsal vessel (double also in *N. cameroni*). It differs from *N. bakeri* in the configuration of genital markings which form ill-defined transverse slightly tumid strips one in front of, the other behind the equators of segments XVIII–XXII; those in XVIII between the male papillae. *N. bakeri* further differs in the absence of extramural calciferous glands; in lacking penial setae, in the auxiliary seminal vesicles, in VIII; and in the multiloculate, not simple clavate form of the spermathecal diverticula.

Despite the absence of calciferous glands in *N. bakeri*, similarities with *N. montiskosciuskoi* and the geographical proximity suggest that they are sister-species.

***Spenceriella* Michaelsen, 1907.
emend. Jamieson, 2000**

Spenceriella Michaelsen, 1907: 161.

Spenceriella (emend.); Jamieson, 2000: 1123.

DIAGNOSIS. Perichaetia; setae 16 or more per segment. A pair of combined ♂ and prostatic pores in segment XVIII. Spermathecal pores intersegmental. Gizzard in V well-developed or rudimentary. Calciferous glands 3 or 4 pairs in X–XII, XIII, or absent. Intestine acaecate. Meronephric; bucco-pharyngeal tufts present or absent; oesophageal nephridia astomate or stomate; caudal nephridia stomate (and astomate?); nephridia in regions in which they are stomate (always?) with a median preseptal funnel and multiple intrasegmental funnels. Caudal enteronephry present or, more commonly, absent. Rarely with nephridial bladders. No setae median to the male pores. Prostatae racemose or tubuloracemose. Spermathecae diverticulate.

REMARKS. *Spenceriella* occurs in the Eastern Subregion, Kosciuskan Division of Australia (*sensu* Kikkawa & Pearse, 1969); Lord Howe Island and Norfolk Island and the Western Subregion Darling Basin province (Jamieson, 2000). *Spenceriella* as redefined by Jamieson (2000), differs from *Anisochaeta* Beddard, 1890, in having multiple intrasegmental (not preseptal) nephrostomes, a less extensive series of calciferous glands (if present), and more numerous setae which are not in the anisochaetia arrangement. It differs from *Gemascolex* in having segmental not intersegmental genital markings and multiple intrasegmental (not preseptal) nephrostomes.

The four species of *Spenceriella* described here are referable to the *S. notabilis*-group (*Spenceriella* s. s.) of Jamieson (2000).

***Spenceriella bywongensis* sp. nov.
(Figs 3–8)**

MATERIAL. HOLOTYPE (clitellate) QM G 218235. PARATYPES 1–5 (weakly clitellate) QMG218236–218240. All from A.C.T., 35°10'S, 149°20'E., 'Bywong', Sutton, ca 20 km NE of Canberra, improved pasture, July 2000. CSIRO sample 'B'. PARATYPES 6–8 QMG218241–218243. 'Gold Creek', NE of Gungahlin, Canberra, J. Scown, July 2000. CSIRO sample 'D'; faintly clitellate.

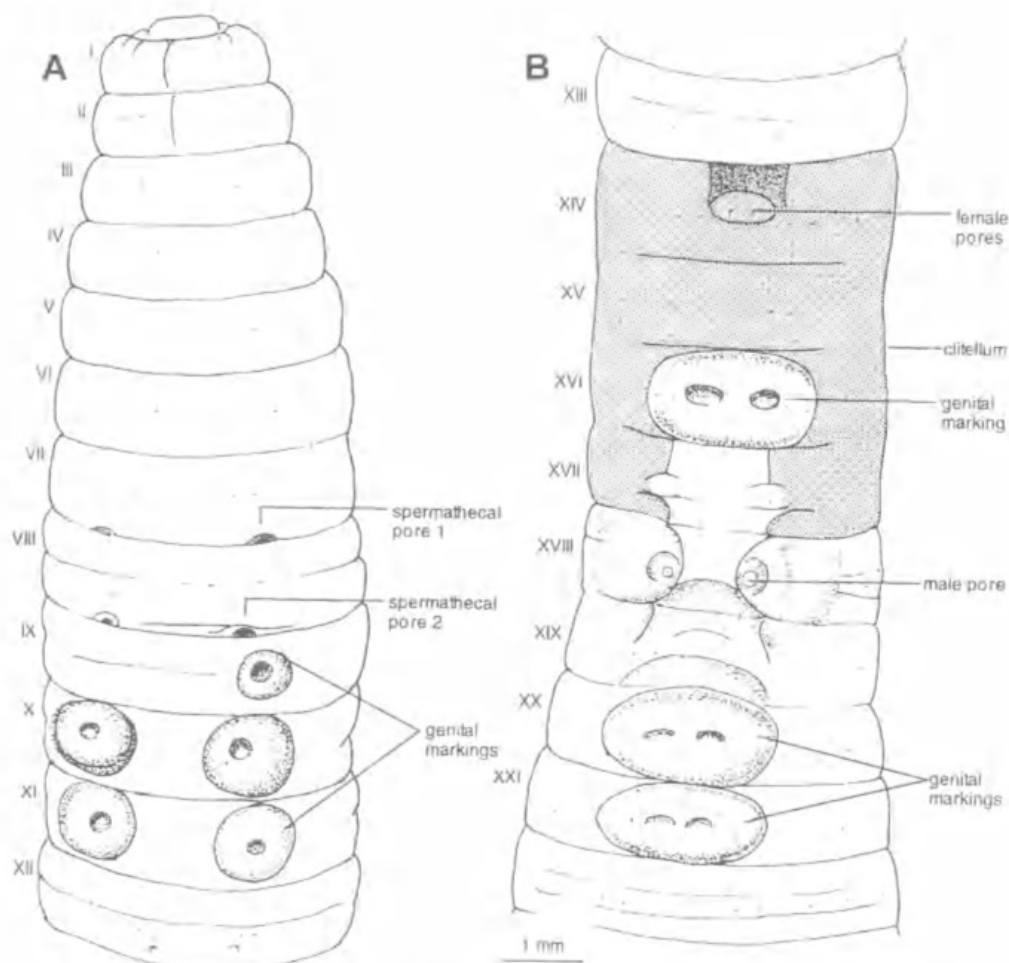


FIG. 3. *Spenceriella bywongensis* sp. nov., holotype. Ventral view. A, forebody; B, midbody.

DESCRIPTION. Length (clitellate specimens) 65-86mm, mean 75mm (H, P1-5). Width 3mm. Segments 97 (P3 is shortest)-106 (Holotype is longest). Form (as preserved) slender and elongate, cylindrical, tapering at each end, with no clubbing; slightly wider at clitellum than elsewhere. Postclitellar segments weakly triannulate. Pigmentless buff in ethanol. Prostomium epilobous 2/3 or tanylobous. Peristomium bisected ventrally. First dorsal pore 5/6. Setae per segment 20 in XII and caudally; in forebody *aa* about 4 *ab* but *ab* smaller than *bc*; *zz* less than twice adjacent intervals. All rows regular. Clitellum XIV-XVII (=4 segments); annular but interrupted ventrally, in *aa*, in XVII; intersegmental furrows obscured dorsally, dorsal pores and setae clearly visible. Male pores minute but distinct, in *a* lines of XVIII, each near median aspect of a large circular porophore which fills XVIII longitudinally and extends slightly median of *a* and well laterally, beyond *c*; porophore more

sharply defined medianly than laterally, on transversely oval porophores; each male pore on small circular papilla on porophore. Genital markings: prominent circular eminences, in IX-XI; unilateral left in IX in H; right in P2, P5; absent from IX in others; paired in X and XI (constant); each with conspicuous immediately presetal pore-like centre but prominence extending both pre- and post-setally. Posterior markings: midventral oval pads filling their segments longitudinally and extending laterally of *b* lines, in XVI, XX and XXI (constant in the 3 segments), or XXII also (P1, P2, 'pore' unilateral left; P5, 'pore' paired) each with 2 transversely elongated 'pores' immediately anterior to and including setal arc, excepting P1 in which in XVI and XXII pore-like marking is unpaired midventral and is hardly bifid in XX and XXI; a slightly posterior crescentic swelling in XIX (H) and a midventral pad in XVII (P3, P5); in only P2 a pair of widely separated porelike markings in

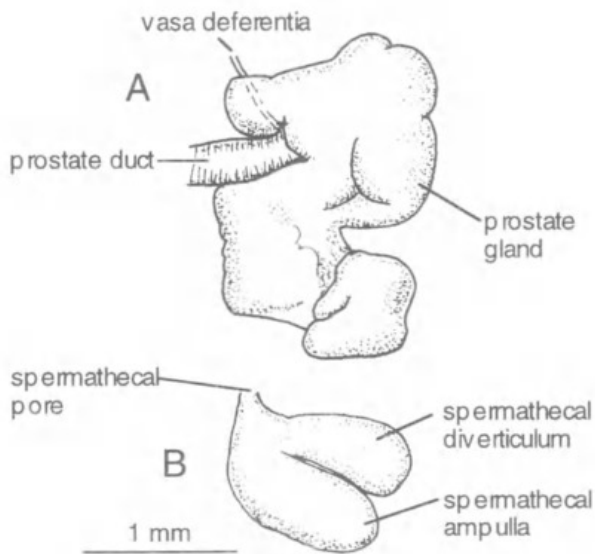


FIG. 4. *Spenceriella bywongensis* sp. nov., Bywong material, holotype. A, dorsal view of right prostate; B, dorsal view of right spermatheca of VIII.

XIX. Female pores paired on XIV, just anterior to setal arc, about one-third *aa* apart, in common glandular field. Spermathecal pores 2 pairs of large eye-like papillae, in 7/8 and 8/9, centred approximately in *b* lines.

Several anterior septa moderately thickened; 8/9 strongest. Dorsal blood vessel continuous onto pharynx; hearts in X-XII latero-oesophageal with chief origin from calciferous vessel, near origin of latter from supra-oesophageal vessel; commissurals of IX anterior dorsoventral only. Gizzard large, barrel-shaped in V, with muscular sheen but readily depressed; extending to level of intersegment 8/9 posteriorly, septa 5/6 and 6/7 funnel-shaped around it. Oesophagus with 3 pairs of very large almost spherical calciferous glands, in X, XI and XII, each with its ventromedian aspect narrowly attached to oesophagus. Intestinal origin XVI, superficially appearing to commence in XV but septum 15/16 adherent to its anterior limit; acaecate; a well-developed dorsal typhlosole commencing though there rudimentary in XVIII. Meronephric with pairs of small tufted nephridia ventrally in III, IV and V; first 2 pairs small, those in V very large; all apparently exonephric; reducing to parietal but not numerous micromeronephridia by clitellar region. A large median preseptal funnel and post-septal (intrasegmental) funnels demonstrated for caudal nephridia, confirming placement in *Spenceriella*; all exonephric. Ovaries in XIII, an exceptionally large palmate

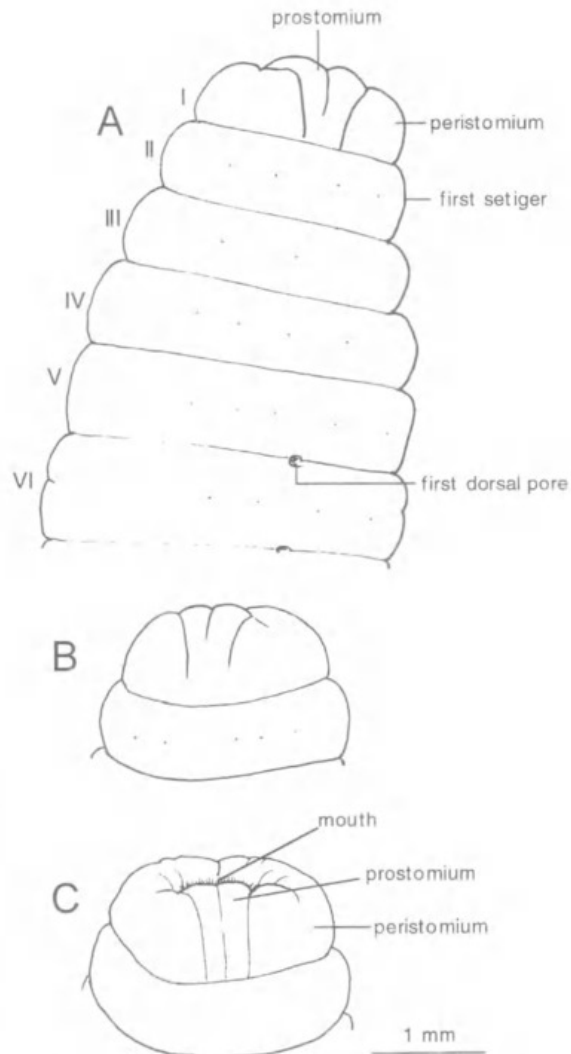


FIG. 5. *Spenceriella bywongensis* sp. nov. Bywong material. Dorsal view of prostomial region. A, holotype; B, paratype 1; C, paratype 3.

pair with numerous strings of large oocytes, and paired thick funnels; conspicuous ovisacs on anterior wall of XIV, only slightly smaller than ovaries and with several oocytes projecting. Holandric, a pair of large testes and funnels in each of X and XI (only those in X notably iridescent), embedded in large free sperm masses; large racemose seminal vesicles in IX and XII, posterior pair larger. Prostates a pair of large, racemose glands, in XVIII-XX, but resolvable into a flattened S-shape the anterior half of which is enlarged and forms a square outline; vasa deferentia joining ental end of duct [as in *S. macleayi*]; duct thick and with muscular sheen, shorter than width of square portion of gland, extending directly median. Penial setae absent. Spermathecae 2 pairs, in VIII and IX with

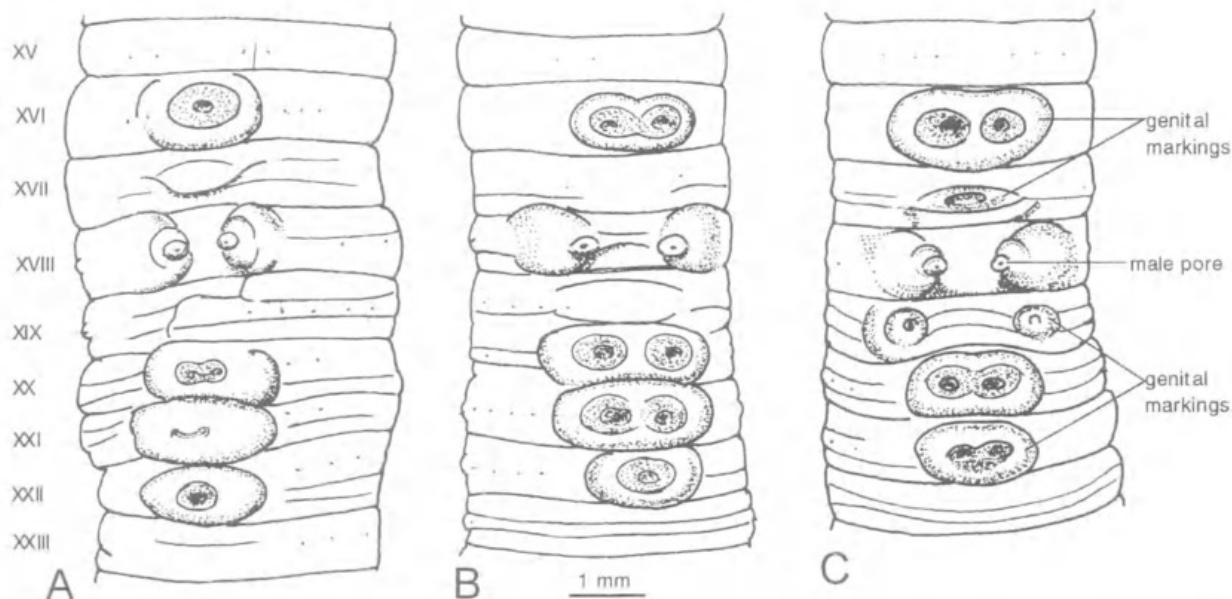


FIG. 6. *Spenceriella bywongensis* sp. nov. Bywong material. Variation in configuration of posterior genital markings. A, paratype 1; B, paratype 2; C, paratype 3.

large ovoid or polex-shaped ampullae tapering to ducts each bearing near its ectal end a thickly digitiform diverticulum which is a little shorter than, and (on right VIII) may be almost as wide, as ampulla; common duct of ampulla and diverticulum scarcely developed.

The 3 Gold Creek specimens (P6-8) are closely similar to those from Bywong but differ in having paired pore-like markings in XVII (P6, P8) and large markings of this type in XIX (constant); furthermore, one specimen has a marking (unpaired, midventral) on XXII. In detail, there are paired (sometimes unilateral) pore-like markings in IX (P6 only, unilateral left); X and XI (constant but unilateral left in P7); XVI (constant); XVII (P6, P8, absent P7); XIX-XXI (constant); and midventral marking in XXII in P7. Paired markings in XIX-XXI are progressively closer, posteriad, to the midventral line, those in XXI being on common pad.

ETYMOLOGY. From the type locality, Bywong.

REMARKS. Other species of *Spenceriella* with 2 pairs of spermathecal pores and 3 pairs of calciferous glands, in X-XII, are *S. australis* (Fletcher, 1886) from Burrawang and Mt Wilson, NSW, *S. indissimilis* (Fletcher, 1889), from Lake Alexandrina, S. Australia, and *S. montanus* (Spencer, 1900), from Mt Baw Baw, Victoria. *S. australis* differs from *S. bywongensis* in the wide separation of the spermathecal pores and a very different configuration of the genital markings.

The little known *S. montanus* appears to differ in having unpaired, not paired genital markings in X and XI, together with those in XIX and XX. The geographically distant *S. indissimilis* is the most similar to *S. bywongensis* but differs, among other respects, in restriction of its anterior genital markings (in some or all of VII-X) to the presetal parts of their segments; in absence of any indication of pairing in the posterior genital markings; the closer pairing of the spermathecal and male pores; the smaller gizzard; and the bipartite condition of each prostate. The wide geographic separation of *S. bywongensis*, *S. montanus*, and *S. indissimilis* further supports specific distinction.

Spenceriella hamiltoni (Fletcher, 1887) (Figs 9, 10)

Perichaeta hamiltoni Fletcher, 1887: 399-400

Megascolex hamiltoni; Beddard, 1895: 373.

Anisochaeta hamiltoni; Blakemore, 2000: 4.

Spenceriella hamiltoni; Jamieson, 2000: 1225-1227, Fig. 41.28.

Anisochaeta chani Blakemore, 2000: 18-19. New Synonymy.

Spenceriella chani; Jamieson, 2000: 1193-1195.

NEW RECORD. N.S.W., ca 5km S of Neville (33°43'S.149°13'E.), near Blayney and Bathurst, from improved pasture (CSIRO sample 'E - dark head'); 2 weakly clitellate, QMG218244-218245, and 2 (unregistered) acitellate, macerated specimens.

DESCRIPTION. Length 134-150mm (specimens 1 and 2 respectively). Width ca 6.4mm. Segments 128-145mm. Form (as preserved)

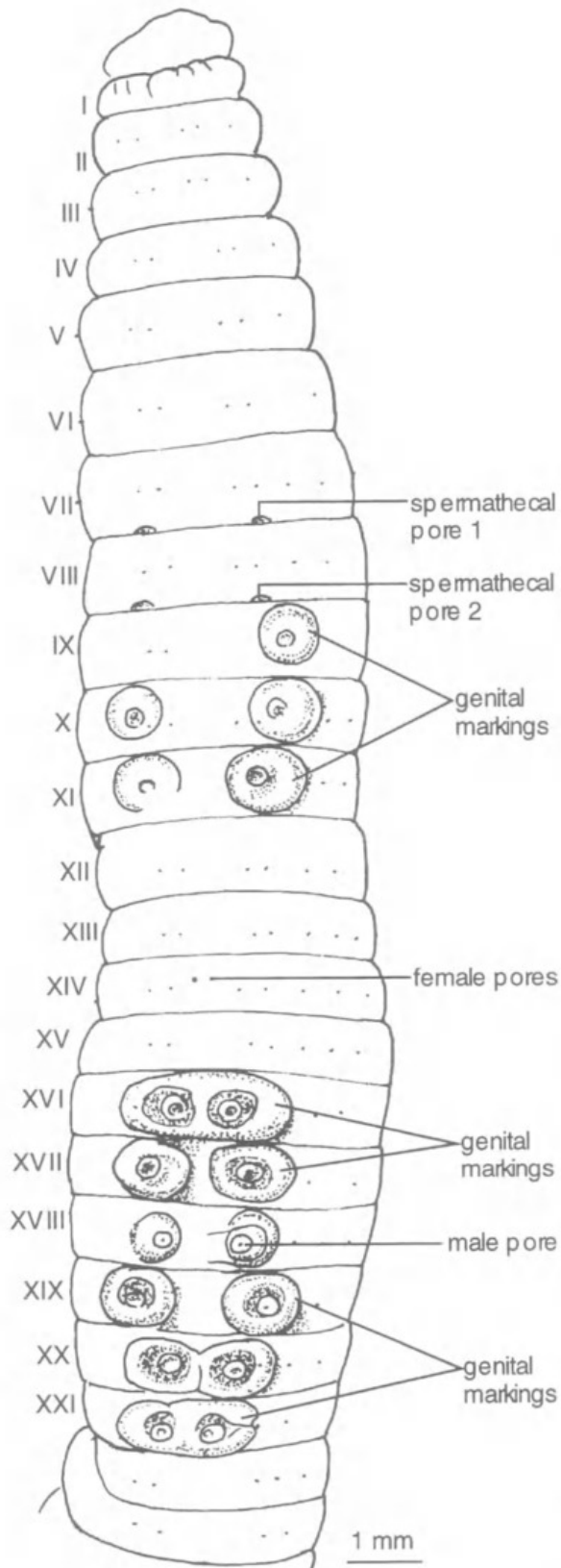


FIG. 7. *Spenceriella bywongensis* sp. nov. Gold Creek material. Paratype 6. Ventral view of fore- and mid-body.

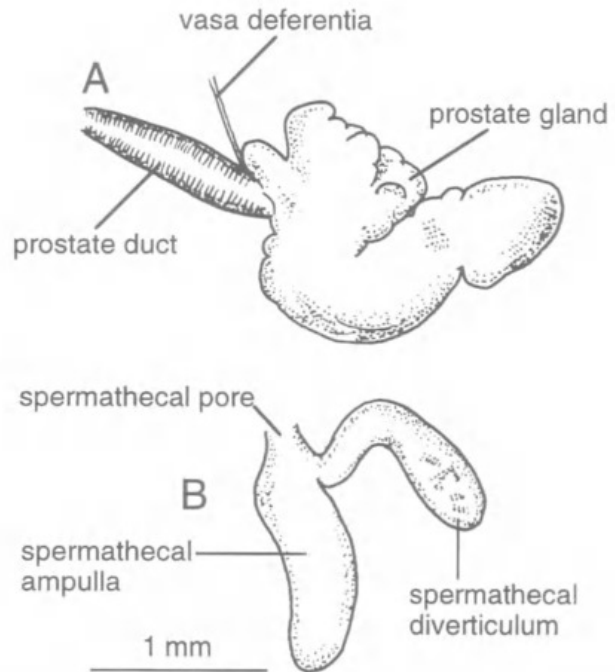


FIG. 8. *Spenceriella bywongensis* sp. nov. Gold Creek material. Paratype 6. A, dorsal view of right prostate; B, dorsal view of right spermatheca of VIII.

slender, elongate, cylindrical, tapering at each end, slightly club-shaped anteriorly; clitellum about as wide as club-shaped region. Segments simple, lacking secondary annulation. Darkly pigmented, pale ventrally, in ethanol. Prostomium narrow epilobous 2/3, open. Peristomium weakly bisected ventrally. First dorsal pore 5/6. Setae per segment: 18 in XII, 20 in XX; about 28 caudally; in forebody *aa* ca 3.5 *ab* but *ab* smaller than *cd* (*cd*: *ab* = 1.5); dorsal break large, *zz* = about 4 *zy*. All rows regular, with occasional slight divergence. Clitellum weakly developed, from redder coloration, XIV-XVII (= 4 segments); annular?, intersegmental furrows and setae clearly visible; dorsal pores obscured (but minute elsewhere). Male pores in XVIII, each projecting mediad from a large mound; minute but distinct, very slightly median of *a* lines of XVIII, each on small but distinct circular porophore which fills about two-thirds of length of XVIII, is continuous laterally with longitudinal prominence which occupies whole length of segment and extends laterally, beyond *c*; prominence more sharply defined medianly than laterally. Genital markings: pre- and post-setal paired pore-like markings faintly indicated on common transverse pad, on X. Paired pore-like markings close to midventrum immediately postsetal in XVI and XVII and

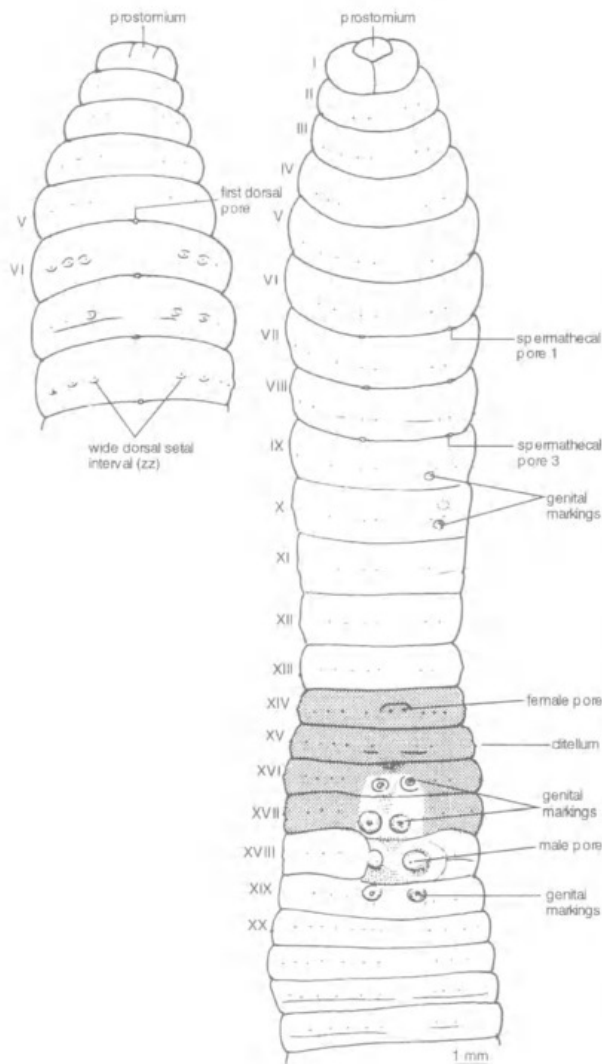


FIG. 9. *Spenceriella hamiltoni* (Fletcher, 1887). A, dorsal view of prostomial region; B, ventral view of fore- and mid-body of specimen 2.

presetally and slightly more laterally, though anteromedial to setae *a* in XIX. Female pores paired on XIV, just anterior to setal arc, close together in a common glandular field. Spermathecal pores 3 pairs of small but sharply defined open slits, in 6/7, 7/8 and 8/9, in setal lines *b*.

Several anterior septa thickened; 8/9-11/12 strongly. Dorsal blood vessel single, continuous onto pharynx; hearts in X-XII latero-oesophageal with chief origin from calciferous vessel, near origin of latter from supra-oesophageal vessel; commissurals of IX anterior originating from dorsal vessel only. Gizzard large, barrel-shaped in V, firmly muscular; extending to level of



FIG. 10. *Spenceriella hamiltoni* (Fletcher, 1887). Dorsal view of (immature) right prostate of specimen 2.

intersegment 8/9 posteriorly, septa 5/6 and 6/7 funnel-shaped around it. Oesophagus with 3 pairs of large almost spherical calciferous glands, in X, XI and XII, each broadly attached to oesophagus but separated by a deep trench middorsally. Intestinal origin XVI; acaecate; a low ridge but no true dorsal typhlosole present. Intestinal contents unusual in containing very little fine grit, but with sparse (siliceous?) grains and filled with dense masses of what appear to be strips of grass blades. Meronephric, nephridia commencing in II; forming large masses in III-VI but not united as tufts; all apparently exonephric; reducing to parietal but not numerous micromeronephridia by XII or XIII. A single median preseptal funnel (not multiple funnels) demonstrated on each side of nerve cord for caudal nephridia, confirming placement in *Spenceriella*; all exonephric. Sparse ovaries with visible oocytes and small funnels, in XIII; ovisacs not found. Holandric, seminal funnels in each of X and XI, lacking spermatozoal iridescence; racemose seminal vesicles in IX and XII, posterior pair tortuous, vermiform (incompletely mature). Prostates a pair of racemose glands, in XVIII, incompletely mature; divided from ental end of duct into three major, elongate lobes; vasa deferentia joining anterior lobe near its base; duct wide and fusiform. Penial setae absent. Spermathecae 3 pairs, small and immature, in VII, VIII and IX with ovoid ampullae tapering to ducts each bearing near its ectal end a small polex-shaped diverticulum; common duct of ampulla and diverticulum scarcely developed.

REMARKS. The clearly phytophagous nature of this species, demonstrated in the new material, correlates with the dark pigmentation of the body

as it presumably emerges above ground to remove portions of grass blades.

This material conforms very closely to the description of *Spenceriella* (= *Anisochaeta*) *chani* (Blakemore, 2000), reported from Neville and Cowra, even to the multilobed prostates. However, there seems no valid reason to separate it, or *chani*, from the prior *S. hamiltoni* (Fletcher, 1887) which was collected from Cowra and Oberon by Easton, as reported in Jamieson (2000). These localities are respectively 51 km W and 59 km E of Neville. The type locality of *S. hamiltoni*, Guntawang, is about 150 km N of Neville. The ♂ pore on the right side in the putative syntype of *S. hamiltoni* (Jamieson, 2000) is near *a* line, the disposition of genital markings, albeit absent in XVI, resembles that in *S. chani* and the prostates are again multilobed. Location of each of the small ♂ poropores, in the new material, median to a longitudinal prominence is not here considered a significant difference from *hamiltoni* and *chani* as in both of these there is a tendency to lateral enlargement of the prostate poropores. The possibility that *S. hamiltoni* is a junior synonym of *S. austrina* (Fletcher, 1886) remains to be investigated.

***Spenceriella macleayi* (Fletcher, 1889)**
(Figs 11)

Perichaeta macleayi Fletcher, 1889: 1556-1558.

Perichaeta macleayi var. *a*, *b* and *c*; Fletcher, 1890: 1004-1007.

Megascolex macleayi (Fletcher); Beddard, 1895: 376.

Spenceriella macleayi (Fletcher); Blakemore & Elton, 1994: 251-254, fig. 1; Jamieson, 2000: 1254-1258, fig. 41.43-41.47.

Anisochaeta macleayi (Fletcher); Blakemore, 2000: 4.

? *Anisochaeta filix* Blakemore, 2000: 21-22, Fig. 11.

NEW RECORDS: A.C.T., 35°10'S.149°20'E., 'Bywong', Sutton, ca 20 km NE of Canberra, in improved pasture, July 2000. 8 clitellate specimens. CSIRO sample 'A, Dark head'. QMG218246-218253. 'Gold Creek', native pasture just NE of Gungahlin, Canberra, J. Scown, 2 July 2000. CSIRO sample 'C. Native 1'; 3 clitellate; 3 (unregistered) acitellate specimens. QMG218254-218256.

DESCRIPTION. Length of clitellate specimens from both localities 55-95 (mean 70) mm. Width (midclitellar) 3.8mm; segments 87 (A, illustrated specimen). Colour in ethanol dark purplish grey-brown dorsally and laterally, especially anterior to clitellum, setal areolae and ventrum pale. Prostomium epilobous 3/4, closed, wedge-shaped. Peristomium bisected ventrally. First dorsal pore 5/6. Setae per segment 22 in XII. Clitellum annular, XIII-XVII. Genital markings (constant in 8 A and 3 C clitellate specimens): a

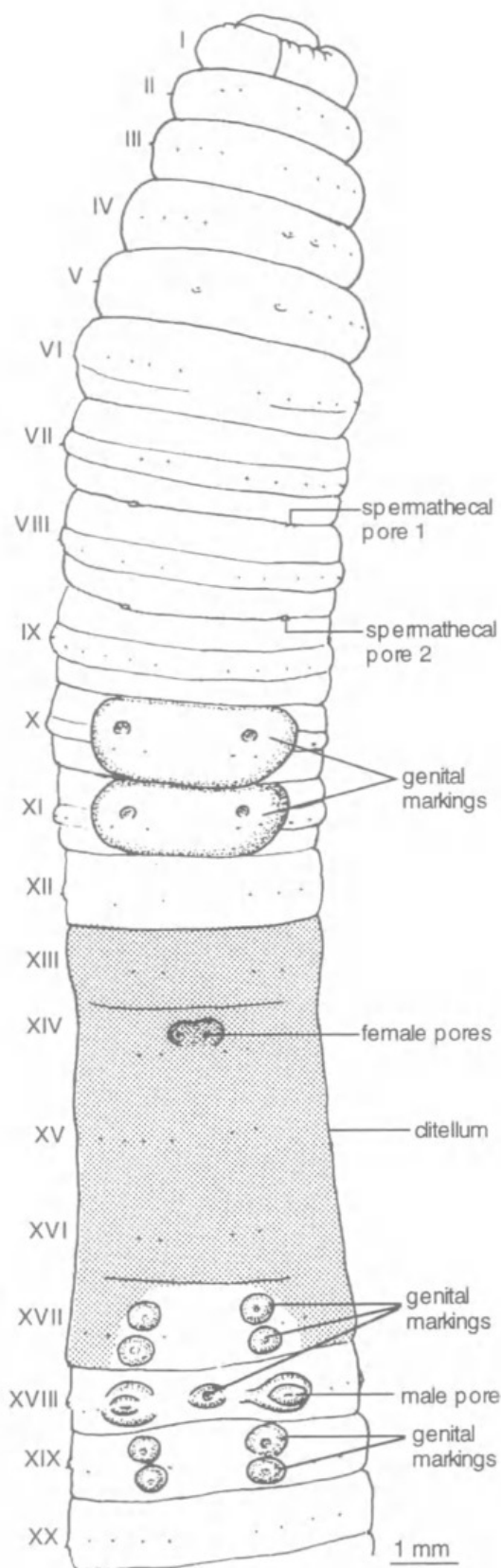


FIG. 11. *Spenceriella macleayi* (Fletcher, 1889). Ventral view of fore- and mid-body

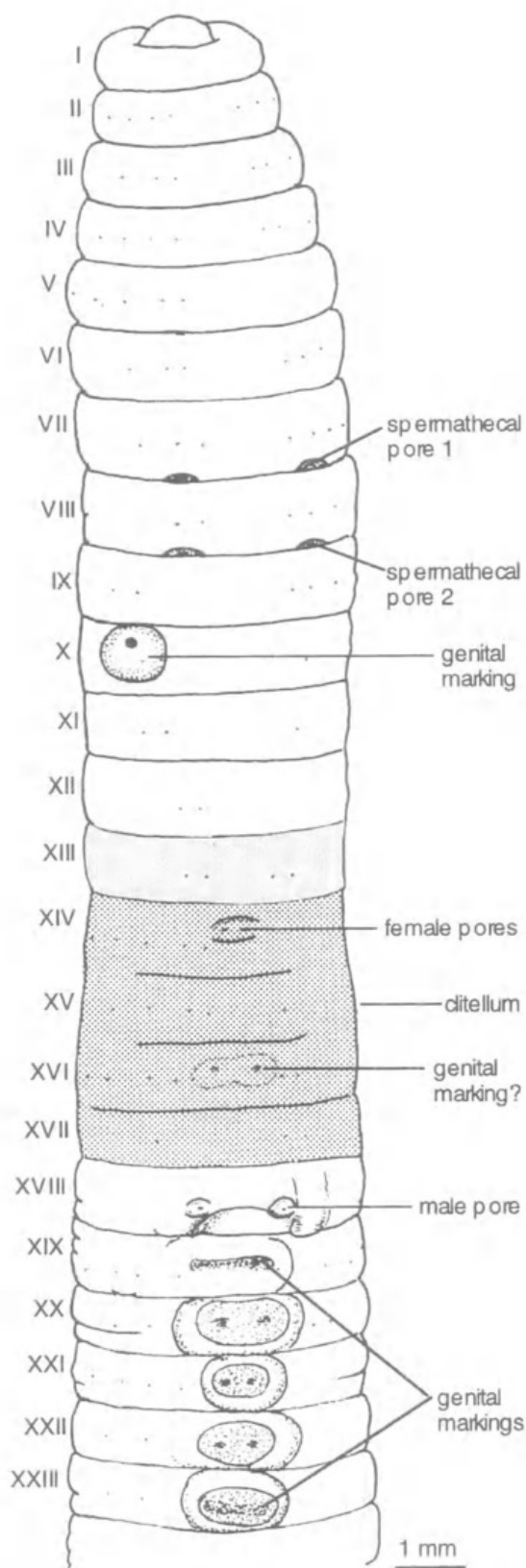


FIG. 12. *Spenceriella nevillei* sp. nov. Holotype. Ventral view of fore- and mid-body of holotype.

transverse pad on each of X and XI, extending laterally to about *c* lines and filling segment longitudinally, each with pair of pore like presetal circular markings in *ab*; a pair of presetal and postsetal circular papillae with pore-like centre in each of segments XVII and XIX, most anterior and posterior pair of four, slightly more median than other two and all slightly median of line of male pores; an additional, midventral, eye-like marking equatorial in XVIII between male porophores. Male pores in *bc* lines on small elliptical papillae which are situated on larger porophores which do not, however, reach anterior and posterior borders of XVIII. Female pores paired on XIV, presetally and about $1/3$ *aa* apart, in a common glandular field. Spermathecal pores 2 minute pairs, in $7/8$ and $8/9$, in or slightly ventral of *c* lines.

Dorsal blood vessel single, continuous onto pharynx. Last hearts in XII. Gizzard large, a posteriorly slightly tapering cylinder in V, moderately muscular. Prostates large, racemose bipartite glands (C) or tortuous racemose, in XVIII to as far as XXI (A). Spermathecae 2 pairs, in VIII and IX with large subspherical or elongate ampullae tapering to ducts each bearing near ectal end a large, clavate diverticulum (A, C).

REMARKS. The combination of calciferous glands limited to XI and XII with the particular arrangement of genital markings is diagnostic of *S. macleayi*. Fletcher (1889) noted as a variant a midventral marking in XVIII, also seen here. Specimens from Manning River, NSW, identified as *S. raymondiana* Fletcher (1887) by Easton (unpubl.) with similar restriction of calciferous glands to XI and XII are referred below to a new species which differs, among other respects, from *S. macleayi* in having 3 pairs of spermathecae. They were tentatively described as *S. raymondiana* by Jamieson (2000). The only other species of *Spenceriella* with 2 pairs of calciferous glands is *S. filix* (Blakemore, 2000), collected by Easton from Tree Fern Valley, NSW. It appears probable, from its description, that it is conspecific with *S. macleayi*.

S. macleayi is widespread in NSW, being known from Elizabeth Bay, Sydney (the type locality); Mt Wilson; Mt Lawson; Burrawang; Mt Victoria; Raymond Terrace; Morpeth; Richmond; Queenscliff; Mt Tomah; Bunadon; Moss Vale District; Upper Manning River; and Old Newington (details in Jamieson, 2000).

***Spenceriella nevilleensis* sp. nov.**
(Figs 12, 13)

MATERIAL EXAMINED. HOLOTYPE QMG218257. PARATYPES 1 & 2, QMG218258–218259. All from ca 5 km S of Neville (33°43'S, 149°13'E.), near Blayney and Bathurst, NSW, from improved pasture (CSIRO sample 'F'). Two weakly clitellate; one (excluded from type series) acitellate.

DESCRIPTION. Length (clitellate specimens) 80–115 mm (H, P₁). Width (forebody) 4 mm. Segments 91–129. Form (as preserved) slender and elongate, cylindrical, tapering at each end, slightly club-shaped in forebody; clitellum forming a narrower cylinder. Segments weakly triannulate. Pigmentless buff in ethanol. Prostomium tanylobous, its lateral borders gradually converging posteriad but posteriorly so weakly defined that it appears epilobous. Peristomium bisected ventrally. First dorsal pore 5/6. Setae often difficult to discern, about 18–20 in XII and caudally; in forebody *aa* about 2.6 *ab* but *ab* smaller than *bc*; *zz* in forebody less than twice adjacent intervals, not an appreciable break in setal circlet behind clitellum; setal rows mostly regular. Clitellum XIII–XVII (=5 segments); less developed in XIII; annular but interrupted ventrally, to approximately *c* lines, in XVI and XVII; intersegmental furrows and dorsal pores, except 13/14, obscured dorsally, setae clearly visible. Male pores minute but distinct, in *a* lines of XVIII, each on a very small transversely elliptical papilla which is bordered laterally by a longitudinal prominence which extends length of segment. Genital markings a weakly visible circular disc on right side only (H) or paired (P₁) almost filling segment longitudinally and bearing a pore-like presetal marking in ca *c* line. Posterior genital markings consisting of faintly visible midventral pads with raised rims in each of XX–XXIII, first 3 of them with suggestions of paired pore-like markings. A suggestion of ventral glandularity in XVI is probably not a true genital marking; a marking in XIX is also doubtful (H). Posterior genital markings in the paratypes are too poorly defined for certain determination of their distribution. Female pores paired on XIV, just anterior to setal arc, about one third *aa* apart, in a common glandular field. Spermathecal pores 2 pairs of large eye-like papillae, in 7/8 and 8/9, centred approximately in *b* lines.

Several anterior septa moderately thickened; 8/9–10/11 strongest. Dorsal blood vessel continuous onto pharynx; dorsoventral commissurals in X–XII forming large hearts. Gizzard

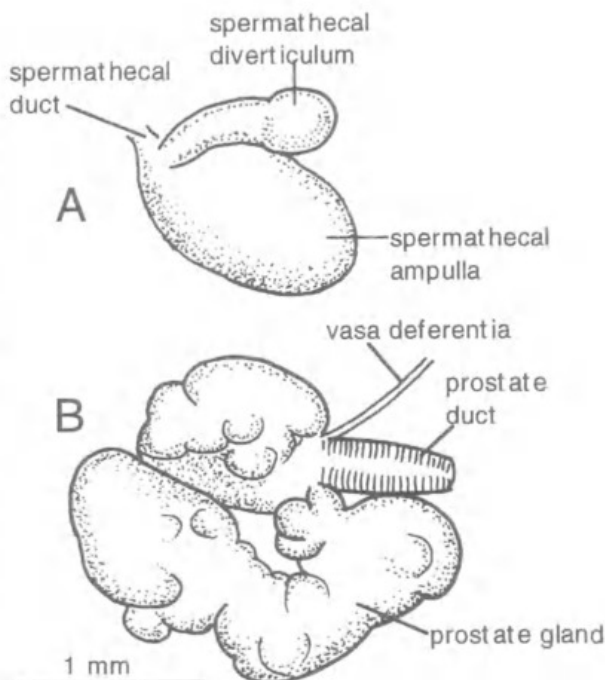


FIG. 13. *Spenceriella nevilleensis* sp. nov. Holotype. A, dorsal view of right spermatheca of IX; B, dorsal view of left prostate.

in V, large, wider anteriorly than posteriorly, with muscular sheen but readily depressed; extending to level of intersegment 8/9 posteriorly, septa 5/6 and 6/7 funnel-shaped around it. Oesophagus with 4 pairs of large reniform calciferous glands, in X–XIII (holotype and paratype), a short duct from hilus connecting to dorsolateral aspect of oesophagus; each pair of glands supplied by bifurcation of supra-oesophageal vessel present anteriorly in segment but does not continue posteriorly of pair of glands and originates anteriorly from dorsal vessel. Intestinal origin XVI; acaecate; a well-developed dorsal typhlosole commencing in XVIII–XIX though there rudimentary. Meronephric with at least 3 pairs of tufted nephridia in buccopharyngeal region with thick anteriorly running (enteronephric?) ducts; parietal micromeronephridia, about as numerous as setae in clitellar region. Ovaries not visible (H) or small, bushy (P₁). Holandric, a pair of free sperm masses and funnels (with negligible spermatozoal iridescence) seen in each of X and XI; large laterally extensive racemose seminal vesicles in IX and XII, posterior pair larger. Prostates S-shaped tubuloracemose; a stout muscular duct of moderate length arising from anterior limit where it is joined basally by combined vasa deferentia. Penial setae absent.

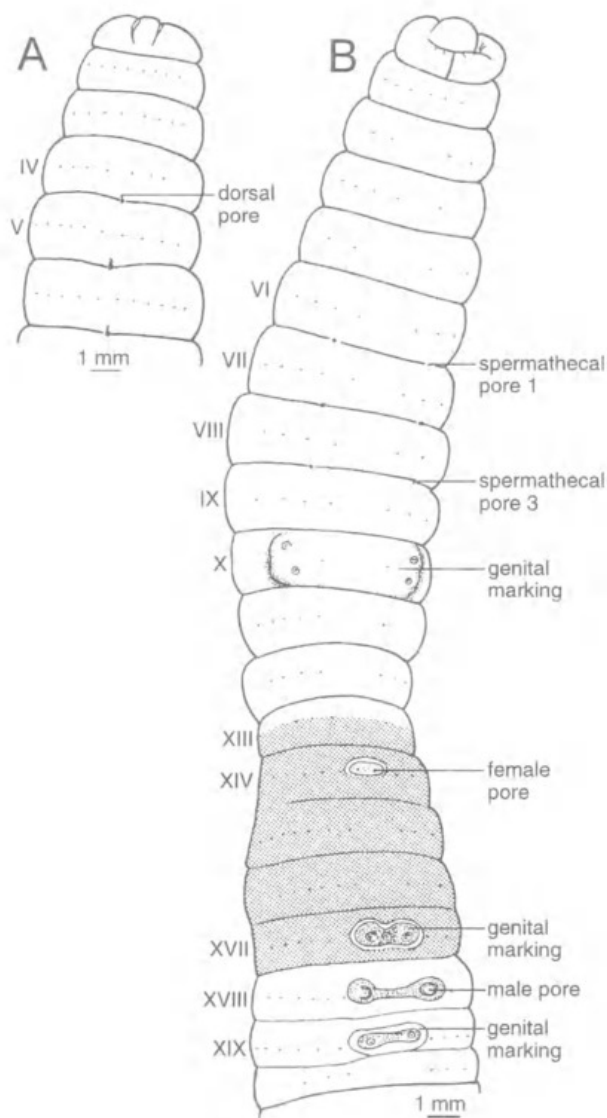


FIG. 14. *Spenceriella manningi* sp. nov. Holotype. A, prostomium; B, ventral view of fore- and mid-body.

Spermathecae 2 pairs, in VIII and IX with large ovoid ampullae tapering to ducts each bearing near its ectal end a clavate diverticulum which is a little shorter than ampulla; common duct of ampulla and diverticulum scarcely developed.

ETYMOLOGY. From near Neville.

REMARKS. Two pairs of spermathecae and 4 pairs of calciferous glands, as in *S. nevillensis*, are also seen in *S. monticola* (Fletcher, 1887) and *S. calpetana* (Blakemore, 2000). *S. monticola* differs from *S. nevillensis* in being larger, pigmented reddish brown, with more setae (16–50); and a different configuration of genital markings.

S. calpetana differs, among other respects, in having about 60 setae per segment, a markedly different configuration of genital markings, seminal vesicles in XI and XII; and no typhlosole.

***Spenceriella manningi* sp. nov.**

(Fig. 14,15)

Spenceriella raymondiana (part.) Jamieson, 2000: 1293–1297, fig. 41.70, 41.71.

MATERIAL. HOLOTYPE AM W197644 from 31°49'S, 151°56'E., Upper Manning River, NSW, coll. and ident. as *S. raymondiana* by E. Easton, 1983.

DESCRIPTION. Length 165mm. Width (mid-clitellar) 71mm. Segments 117. Prostomium epilobous, almost tanylobous, with wide, deep lateral grooves, slightly convergent posteriad. Prostomium bisected ventrally. First dorsal pore 4/5. Setae per segment: in XII 26; caudally 32. In XII *aa*: *ab*: *zz* = 14: 4.5: 6.0; dorsal and ventral breaks clearly visible preclitellar; not apparent behind clitellum but *aa* becoming wide caudally; no evident irregularity. Clitellum annular, limits indistinct but dorsally from setal zone of XIII to posterior XVII; dorsal pores of 14/15–16/17 occluded. Male pores in *a* lines on small rounded papillae surrounded by dark glandular border with narrow connection across ventral midline with that of other side. Genital markings a pair of small pore-like markings presetally in *bc* and post-setally in *b* lines of X; 2 'pores' of a side lying on a common raised glandular pad which is well defined laterally but not medianly. A pair of pore-like markings immediately presetal and median to *a* lines of XVII, each surrounded by a dark glandular border which is broadly confluent with that of other side. Similar markings in XIX with a narrower connecting zone. Female pores shortly presetal, well median of *a* lines, in a common dark oval field with a narrow, tumid, pale margin. Spermathecal pores 3 pairs of minute orifices apparent only on opening up inter-segmental grooves, in 6/7, 7/8 and 8/9, shortly below *b* lines.

Septa 7/8–13/14, strong. Dorsal blood vessel single, continuous onto pharynx; last hearts in XII; those in XI and XII, only, latero-oesophageal. Supra-oesophageal recognizable in XI and XII. Gizzard in V, broad, cylindrical and strongly muscular, preceded by a short, almost equally broad proventriculus. Oesophagus with a pair of large, extramural calciferous glands, each with a narrow posterior connection to gut, in each of segments XI and XII; glands with numerous

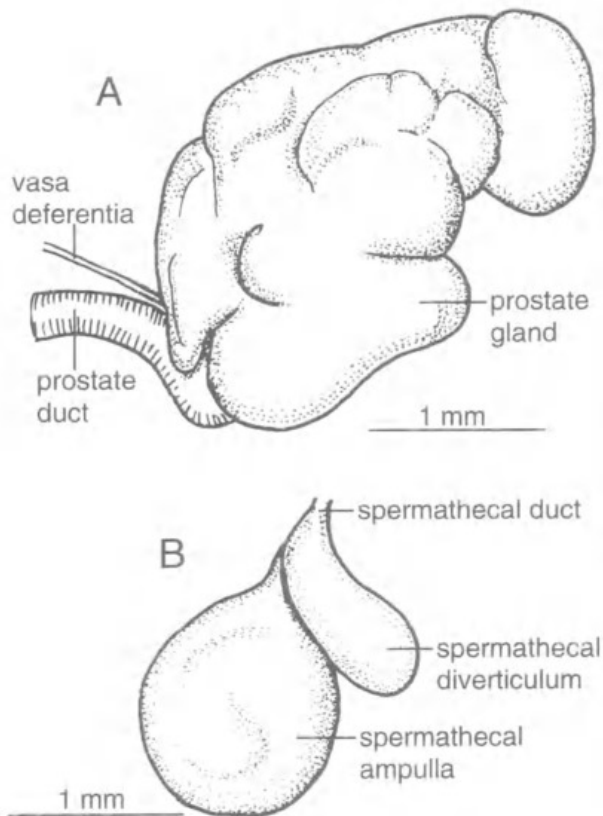


FIG. 15. *Spenceriella manningi* sp. nov. Holotype. A, right prostate; B, right spermatheca of IX.

narrow internal longitudinal septa. Intestine commencing XVI but pushing septum 15/16 close to 14/15; no definite typhlosome seen. Nephridia tufted in III and IV and, less compact, in V. Transverse bands of apparently astomate meronephridia posterior in succeeding segments of forebody. Caudally with dense bands of meronephridia filling segments; no preseptal funnels seen; some intrasegmental funnels tentatively identified. Large sperm masses in X and XI invest iridescent sperm funnels which lie posteriorly in each segment; the masses possibly enclosed in thin, membranous testis-sacs. Seminal vesicles large, racemose, in IX and XII. Ovaries webs of numerous large oocytes in XIII. Large morula-like ovisacs on anterior walls of XIV. Prostates appearing to be compactly tubuloracemose but not resolvable into distinct tubes, therefore racemose; restricted to XVIII, each with a short, muscular duct which is joined, near its junction with gland, by a thick vas deferens. Spermathecae 3 pairs, each with somewhat flattened subspheroidal ampulla, narrowing with no distinct duct to body wall and joined ectally by clavate uniloculate

diverticulum of about equal length (1.4mm), with spermatozoal iridescence.

ETYMOLOGY. From the type locality.

REMARKS. Jamieson (2000) stated that in the absence of type material, it was uncertain that the material identified by Easton as *S. raymondiana*, including that from the Upper Manning River (W197644 ex 1515), was referable to this species, in which it was provisionally placed. The Manning River material is here distinguished as *S. manningi*. The remaining Easton material is not available for examination.

Only *S. macleayi* Fletcher, 1889, and the probable junior synonym of the latter, *A. filix* Blakemore, 2000, resemble *S. manningi* in having calciferous glands restricted to 2 pairs, in all 3 taxa being in segments XI and XII. *S. manningi* differs in having 3 pairs of spermathecal pores, the other 2 taxa having 2 pairs. The genital field of *S. manningi* differs in important respects from that of *S. macleayi*.

The posterior genital field in the Manning River material is also similar to that of *S. jenolanensis*, and may indicate close relationship though that species differs in its 4 pairs of spermathecae and 4 pairs of calciferous glands, in X-XIII.

Molecular studies are required to aid elucidation of the phylogenetic relationships of these and other *Spenceriellas*.

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