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Plates I-XXIX and XIV *bis*.)

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ERRATA.—VOL. IV.

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Page 19, line 2—for *Willoughbeia* read *Willughbeia.*

Page 19, line 22—for *Sphœrothalamus* read *Sphærothalamus.*

Page 29, line 13—for *Malotus* read *Mallotus.*

Page 29, line 21—for *Adinandra* read *Adenandra.*

Page 29, line 29—for *Castania* read *Castanea.*

Page 33, line 28—for *Castania* read *Castanea.*

Page 45, line 6—*for* species *read* genus.

Page 55, lines 29, 32, and 35—for *Castania* read *Castanea.*

Page 56, lines 6, 7, and 15—for *Castania* read *Castanea.*

Page 58, line 22—for *Willoughbeia* read *Willughbeia.*

Page 86, line 2—for *Bœckia* read *Bœckea.*

Page 87, line 2—for *Soneratia* read *Sonneratia.*

Page 93, line 27—the final hyphen belongs to the line following.

Page 98, line 8—for *Rhodamnia trinervis* read *Rhodamnia trinervia.*

Page 107, line 24—for SPHÆROCARPA read SPHÆROCARPUM.

Page 107, line 25—for AZEDERACH read AZEDARACH.

Page 118, line 8—for *Fasciolaira* read *Fasciolaria.*

Page 204, line 17—*for* Genns PETERINEA *read* Genus PTERINEA.

Page 214.—In the explanation of fig. 7 of Pl. XVII. *for* "Side view of another example, showing relative convexity of the ventral valve," *read* Dorsal view of another example, showing fractured ventral umbo, and decorticated dorsal valve.

Page 367, last line—for *C. ewingii* read *H. ewingii.*

Page 415, line 7—for *pallida* read *pallidus.*

Page 422, line 5—for SUPERCILIOSUS read SUPERCILIOSA.

Page 451, line 30—for M. *striicollis* read *R. striicollis.*

Page 694, line 18—for *H. proxima* read *H. proximus.*

Page 724, line 14—for *R. flavipes* read *A. flavipes.*

Page 758, line 33—for *Goniomyia* read *Gonomyia.*

Page 818, line 10—for *P. tenuicornis* read *T. tenuicornis.*

Page 1029, line 6—for *Pöephila* read *Poëphila.*

NOTES ON AUSTRALIAN EARTHWORMS. PART VI.

By J. J. Fletcher, M.A., B.Sc.

In the following paper eight species chiefly from Eastern Australia are proposed as new, an attempt is made to deal with a number of small perichæte worms from various localities, which are treated as varieties of species previously described, and further particulars are given about four species as the result of the examination of additional and better supplies of material than were originally available. As in previous papers the question of the genera to which some of the species described should be referred is left an open one ; some of the most favourable localities even in this colony are yet unsearched for earthworms, and the question of instituting new genera is one therefore which may more profitably be considered later on.

The new forms include, firstly, five described as species of *Cryptodrilus*—one of the type of *C. unicus*, one with a remarkable arrangement of the outer couples of setæ the outer row of each of which is nearer to the mid-dorsal line than the inner row of each inner couple is to the mid-ventral line, one very robust form of the type of *C. mediterreus* and *C. canaliculatus*, and two others whose affinities at present are not very clear : secondly, a species of *Acanthodrilus* from N.W. Australia, the second species only of this genus so far recorded from Australia, in each case from the northern half of the continent: and thirdly two species of *Perichæta*, one of the type of *P. australina* ; the other a remarkable, probably intraclitellian form of the type of *P. canaliculata*, with a pair of conspicuous nephridiopores to a segment after the first, those of each side of the body forming a sinuous series.

I have to express my great obligations to Sir William Macleay, and to the Trustees of the South Australian Museum for the opportunity of describing several species, and to the following gentlemen for furnishing me, often at considerable trouble, with supplies of material, viz. Messrs. W. W. Smith, C. E. Rennie, Henry Tryon, T. G. Sloane, and the Revs. A. Swift, and T. F. Potts.

CRYPTODRILUS (?) FASCIATUS, n.sp.

Two (spirit) specimens 15-15·5 cm. long, 6-9 mm. broad; number of segments 90 and 130.

Colour: an anterior and a posterior portion of each segment of a light colour (dull yellowish in the specimens which have been some years in spirit and are in places somewhat stained or bleached), enclosing a wider middle dark purplish or purple band, reminding one of *Allolobophora fœtida*; sometimes the purple band is broader than at others, especially at first, but on the whole the body in both specimens presents a very noticeable and characteristic banded appearance, alternately light and dark, obscured by the girdle on the clitellar segments.

Prostomium divides the buccal ring very slightly (less than $\frac{1}{3}$). Body apparently not so depressed (at any rate in spirit specimens) as in *C. unicus*; one specimen is faintly but distinctly canaliculate throughout in the median dorsal line, the other only shows it here and there. Segments more or less distinctly bi-annulate (in one specimen a layer of the body-wall is caking off which is 4-annulate on the surface, whereas underneath the surface is bi-annulate).

Setæ in eight straight rows, the setæ of the outer couples further apart than those of the inner couples, and about as far apart as (usually a trifle further than) the two couples of each side.

Clitellum in one specimen comprising six segments, XIII-XVIII, complete all round; in the other less developed, but segments XIV-XVIII together with the posterior half of XIII are noticeably modified

Male pore, oviduct pores (in front and just ventrad of the innermost setæ), spermathecal pores, dorsal pores, and nephridiopores as in *C. unicus*.

Alimentary canal: the œsophagus longer, and the gizzard further back, than usual, the former extending through V, VI and into VII, the latter at first sight appearing to be contained in segments VII and VIII, the mesentery between these two surrounding it at about its middle, but investing it posteriorly; from X or XI to at least XIV (behind which in the specimen dissected the canal was damaged) the interseptal portions are dilated possibly functioning as calciferous glands, and in XIII and XIV there are incompletely pinched-off pouches.

Genitalia: two pairs of testes and ciliated rosettes in X and XI; vesiculæ seminales five pairs in IX-XIII, the first two pairs small, the last pair still smaller and rudimentary, the third and fourth pairs very large; a single vas deferens on each side joining the prostatic ducts a little way from the prostates. Spermathecæ a median series of five single stalked, rather long pouches, sacculated in appearance, in segments V-IX, each of them with two linear, long (but shorter than the pouches) almost cylindrical cæca, one on each side.

Last pair of hearts in XII.

Nephridia: a pair of tubules to a segment after the first, consisting as well as I can make out of at least three portions, viz., a distal convoluted portion whose free extremity lies in the segment in front of that to which the nephridium belongs, a shorter narrower middle portion, and a proximal still shorter vesicular or dilated portion with a lateral diverticulum.

Hab.—Richmond River District, N.S.W. *(Macleay Museum).*

This distinct species differs from both *C. unicus*, and *C. purpureus* in having the body more robust and transversely striped, and from the latter in addition in the rows of setæ being straight. These three species form a group of closely allied forms whose claims to

be regarded as worthy of generic separation will be considered hereafter. I have a single specimen in very bad condition of what is probably another species of this group from the same district, given me by Mr. H. R. Whittell.

Cryptodrilus (?) purpureus.

Cryptodrilus purpureus, Michaelsen, "Oligochæten des Hamburger naturhistorischen Museums," I.

Three spirit specimens from two different localities, 47 (juv.), 93, and 92 mm. long, 3-6·5 mm. broad; number of segments 116, 131, and 144.

Colour purplish above, paler below. Prostomium only partially divides the buccal ring (less than half). Segments for the most part bi-annulate, occasionally indistinctly tri-annulate. Setæ in eight at first straight longitudinal rows, those of the outer couples more than twice as far apart as those of the inner couples, and a little further than the two couples of each side; in about the posterior third of the body, or on about the last 40-50 segments the setæ of the two rows of the outer couple of each side are irregularly placed, sometimes alternating pretty regularly for a few segments, sometimes two or three times as far apart from each other, or from the inner couple, as at others.

Clitellum not developed, nor any indication of it in any of the specimens.

Male pore, oviduct pores, and spermathecal pores as in *C. unicus*. Dorsal pores commence after segment IV, but the first one appears to be rudimentary and not functional. Nephridiopores: the first three dorsad of, the others opposite, the fourth setæ on each side as long as these continue regular, afterwards continuing at the same level irrespective of the setæ.

Alimentary canal as in *C. unicus*.

Genitalia as in *C. fasciatus* and *C. unicus*.

Nephrida possibly as in *C. fasciatus*, but the details not made out.

Hab.—Miriam Vale, Queensland (two specimens presented by Dr. J. C. Cox to the Macleay Museum); Percy Island off the Queensland coast in lat. 21° S. (one specimen also in the Macleay Museum, collected by Mr. G. Masters during the 'Chevert' expedition in 1875).

The characters of the three specimens examined agree very well with Dr. Michaelsen's description based on the examination of specimens from Gayndah and Peak Downs, Queensland, but have the setæ slightly more irregular. Michaelsen says that the third and fourth rows are displaced on the last ten segments of the body, whereas in the specimens examined by me the irregularity affects more segments, about the last forty; also the first three pairs of nephridiopores are more dorsally situated than those which follow. The specimen from Percy Island is referred to in my second paper p. 971 under the head of "*incertæ sedis*;" owing to its immature and contracted condition its examination was not attended with very satisfactory results.

Cryptodrilus (?) unicus.

Cryptodrilus unicus, Fl., P.L.S. N.S.W., 1888, III., (2), p. 1540.

Three additional specimens from a new locality; 63 (juv.) to 100 mm. long, 3- 6 mm. broad; number of segments 126-144.

Clitellum in two of the specimens comprising segments XIV-XVII together with at least half of XIII and of XVIII. From the examination of these specimens, two of which are better developed than any seen before, and from a re-examination of the original specimens, my previous description may be amended as follows:—

The rows of setæ are straight and regular throughout.

The oviduct pores are in front and just ventrad (not dorsad) of the innermost setæ on XIV.

The gizzard is in segment VI.

There is a fifth pair of vesiculæ seminales on the posterior face of the mesentery between XII and XIII; the fifth pair, always the smallest, are so small in non-breeding worms as to be easily overlooked.

The spermathecæ are single median pouches, each with two cæca, as in *C. fasciatus*, and *C. purpureus* ; not pairs of pouches one of each of which is rudimentary.

Hab.—The banks of Lake Cudgellico, a few miles from the Lachlan River, N.S.W. (collected by Mr. T. G. Sloane).

Cryptodrilus Smithi, n.sp.

A good series of about eighty specimens killed in an extended condition from 21 (juv.) to 145 mm. long, 1-3 mm. broad ; number of segments from about 135-170.

Prostomium divides the buccal ring all but completely. Body slender, cylindrical, segments mostly tri-annulate ; colour pallid, the integument more or less pellucid.

Setæ in four ventral and four dorsal longitudinal rows forming on each side of the body a ventral and a dorsal couple separated by an ususually wide interval : the setæ of the ventral couples distant from each other about as far as (or a trifle less than) their inner rows are from the median ventral line ; those of the dorsal couples at varying distances apart, the third row on each side not being straight, rarely closer but usually more distant than those of the ventral couples ; except on the first three or four setigerous segments (II-IV or V) where they are a little further removed, the setæ of each fourth row quite close (unusually so) to the median dorsal line, closer than the first (ventral) row is to the median ventral line.

Clitellum of four segments, XIV-XVII, complete all round except for certain papillæ. On the ventral surface between each two segments from XV-XX, but encroaching more or less upon these, is a pair of contiguous nearly circular or elliptical eminences or papillæ, one on either side of the median line, their summits with a pore-like depression ; those of the third and fourth pairs (between XVII and XVIII, and XVIII and XIX) much depressed, and less conspicuous, and with an additional very conspicuous papilla immediately dorsad of each of them—the posterior pair of which probably carry

the male pores which are not readily determinable ; the papillæ of the fifth and of the sixth pairs not quite so close to the median line ; the ventral surface about the bases of the papillæ usually more or less tumid, sometimes forming distinct transverse ridges on which the papillæ are situated. The youngest specimens show no trace of these structures ; others show papillæ without any or with only slight modification of the surrounding surface ; others again show pore-like depressions or these with the margins only slightly tumid forming rudimentary papillæ, situated on distinct transverse more or less intersegmental ridges* formed by the ventral surface of the posterior one or two annuli of each segment becoming tumid for a space extending dorsad on each side to as far as or beyond the second setæ, and more or less completely confluent with a similarly modified portion of the anterior one or two annuli of the succeeding segment, or only one of the two sets may be modified ; the first and second ridges shortest (from side to side), the third and fourth longest (from side to side), most pronounced, and closer together ; in this region what appear to be the intersegmental, are only interannular furrows. In adults with girdles the papillæ are well-developed, and the ridges usually less distinct, the remnants of them appearing as swellings about the bases of the papillæ, except in case of the first two pairs which are entirely surrounded by the girdle tissue. In examining a number of specimens differences in detail are common ; rarely an additional pair, or only a single papilla, may be present between XIV and XV. Between VIII and IX, and IX and X a pair of similar papillæ with sometimes in addition a ventral portion of the preceding one or two annuli modified ; the anterior pair probably carry the fourth pair of spermathecal pores. Occasionally the ventral surface behind the papillæ is also slightly modified ; and in one case there is an additional papilla on one side between X and XI.

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*Possibly after all better regarded as primarily due to the coalescence and extension of the papillæ, as the ridges always show some indication of papillæ, whereas papillæ without ridges are not uncommon.

Male pores not readily determinable. Oviduct pores two, on XIV on little papillæ, in front and a little ventrad of the first setæ; spermathecal pores four pairs, intersegmental from V-IX, on little papillæ (the fourth pair of these modified as above) about opposite or slightly ventrad of the first setæ.

Dorsal pores commence after segment IV. Nephridiopores not visible (probably a pair on each segment except a few anterior ones).

Alimentary canal: gizzard in V (or VI); in some of segments IX-XVI there are dilatations some of which may be calciferous glands, but there are no pairs of pouches; large intestine commences about XVIII but is small and compressed between the prostates as far back as XXII.

Genitalia: two pairs of vesiculæ in IX and XII; two pairs of testes and ciliated rosettes in X and XI; a pair of prostates extending through about four segments, XVIII-XXI; genital ducts rather long and twisted; vasa deferentia not observed. Penial setæ absent. Ovaries and oviducts as usual; spermathecæ four pairs in VI-IX, stalked pouches with a single rudimentary club-shaped cæcum on the duct near its exit, the cæcum shorter than the duct.

Nephrida: a pair of convoluted tubules to a segment.

Last pair of hearts in XII.

Hab.—Eltham, Victoria (collected by Mr. W. W. Smith).

This distinct species is easily recognisable by the remarkably dorsal situation of the outer couple of setæ on each side, an exaggerated condition of the arrangement which is so frequently met with in species of this genus. Its affinities are not very clear.

CRYPTODRILUS TRYONI, n.sp.

One (very soft and not well preserved) specimen 325 mm. long, 10 mm. broad; number of segments about 209.

Buccal ring not divided by the prostomium. Colour (much bleached) more or less pallid, slightly tinged with brown superiorly. Body not canaliculate.

Setæ in eight straight rows, those of each outer couple remarkably far apart, not only further apart than those of each inner couple, but also (half as far again or even more) than the two couples of each side.

Clitellum of four segments, XIV-XVII, together with a small anterior portion of XVIII (but has not attained its maximum development), complete all round except posteriorly for a little space on the ventral surface of XVII.

Male pores not at all conspicuous (probably only owing to the condition of the specimen); the inner couples of setæ on XVIII are not visible, but about corresponding with the position of each inner setæ of these couples is a small pore, from one of which protrudes a portion of what is evidently a penial seta; possibly these are the male pores. Oviduct pores and spermathecal pores as in *C. mediterreus*.

Nephridiopores: a pair to a segment after the first, in two alternating series as in *C. mediterreus*; the first four pairs, and after these on alternate segments, opposite the fourth setæ; on segments VI, VIII and X opposite the third setæ, and on XII and after that on alternate segments opposite the second setæ. Dorsal pores commence after segment V. Accessory copulatory structures not present.

Alimentary canal: gizzard in V; five pairs of latero-inferiorly situated calciferous pouches in IX-XIII.

Genitalia: two pairs of vesiculæ seminales in IX and XII, &c. as in *C. canaliculatus*; there is a single vas deferens on each side joining the genital duct close to the prostates; penial setæ are present. Spermathecæ three pairs, each of them with two cæca.

Last pair of hearts in XIII.

Eight mesenteries from the anterior one of VII to the posterior one of XIII are thick.

The nephrida of the lower rows (opening opposite the second setæ) as well as those of the upper rows have a proximal vesicular

portion, a condition which possibly obtains also in the other species of this group.

In other respects so far as I know at present not differing from *C. mediterreus*.

Hab.—Milton, near Brisbane, Queensland (received from Mr. Henry Tryon).

This species is allied to *C. mediterreus* and *C. canaliculatus*: with the former it agrees in having the body not canaliculate; and with the latter in having two cæca to each spermatheca; while it differs from both in having the body more robust (being the largest specimen of a *Cryptodrilus* I have yet seen, with the exception of *C. saccarius*, var., to be mentioned subsequently), the setæ of the outer couples further apart, and an additional pair of calciferous pouches in IX. In the soft condition of the specimen examined the sacs containing the penial setæ are not visible, as was the case with the specimens of *C. canaliculatus* previously examined, in which species also, as I have since found, penial setæ are present.

CRYPTODRILUS SEMICINCTUS, n.sp.

Four moderately contracted spirit specimens 40-54 mm. long, 2·5-3 mm. broad; number of segments about 100.

Prostomium partially divides the buccal ring (about half). Body probably pallid or slightly tinged with brown or yellowish brown, slender, segments mostly tri-annulate.

Setæ of the outer couples a little further apart than those of the inner couples which are not so close as usual, and nearly as far apart as the two couples of each side; the outermost row on each side not so dorsally situated as usual.

Clitellum of segments XIV-XVII together with half or two-thirds of XIII, saddle-shaped, reaching only to about the third row of setæ or a little ventrad of it, not developed on the ventral surface.

Male pores two, on papillæ on the middle annulus of XVIII, about in line with the setæ of the second row; in front and also behind but a little dorsad of each papilla is a much smaller one,

usually intersegmental taking in one annulus of XVIII and one of the segment in front or behind, or confined only to the annuli of XVIII. Oviduct pores two, rather close together, in front and ventrad of the innermost setæ on XIV. Spermathecal pores two pairs between VII and VIII, and VIII and IX, in line with or just dorsad of the setæ of the second row.

Nephridiopores not visible in any of the specimens. Dorsal pores not determinable on the clitellum nor in front of it, the first visible one between XVIII and XIX.

Alimentary canal: gizzard in V; calciferous dilatations possibly in about segments IX-XIII, but no pairs of pouches; the large intestine begins in XVI.

Genitalia: one pair of testes and one pair of ciliated rosettes in XI; one pair of vesiculæ seminales in XII; a pair of long narrow linear folded prostates partly in XVIII and partly in XIX, anteriorly giving off the genital ducts which are fairly long and straight, a single vas deferens on each side joining the prostatic duct close to the gland; behind each genital duct is a pair of delicate sacs each containing a couple of curved tapering penial setæ. Ovaries and oviducts as usual; spermathecæ two pairs in VIII and IX, pouches with remarkably long ducts each with a pair of (in one case three) simple club-shaped cæca, one on either side of the duct near its exit.

Nephridia: delicate tubules, a pair to a segment.

Last pair of hearts in XII.

Hab.—Grafton, Clarence River, N.S.W. (received from the Rev. A. Swift).

A distinct species whose affinities are not very clear at present. I received a considerable number of worms from Mr. Swift, but with the exception of the above and half a dozen specimens of perichæte worms, the rest were simply the ubiquitous *Allolobophora turgida*, for which Grafton is the most northerly locality in N.S.W. from which I have yet seen specimens.

Cryptodrilus simulans, n.sp.

Three rather contracted spirit specimens from 82-108 mm. long, 4-5 mm. broad ; number of segments about 220.

Colour when fresh probably pallid with the integument more or less pellucid behind the girdle (spirit specimens usually tinged with brown). Prostomium only partially divides the buccal ring (less than half). Segments mostly tri-annulate after the first three or four.

Setæ of the inner couples closer together than usual, about half as far apart as those of the outer couples, the latter also about half as far apart as the two couples of each side ; hence the outer couples or at least the outer rows of these are more laterally situated than in many species.

Clitellum : no sign of it in two specimens, just commencing in the third ; when complete probably comprising XIV-XVII and part of XIII.

Male pores on two small papillæ, a little dorsad of the position of the first seta on each side, on the middle annulus of XVIII which presents a ridge-like swelling separated from somewhat similar but less pronounced ridges on XVII and on XIX by a depression in each case, the ends of the first and last ridges bending round and fusing with the middle one, their extremities reaching a little dorsad of the first couples of setæ ; on the anterior annulus of XVIII and of XIX appears to be in each case a pair of pores. Oviduct pores two, in front and ventrad of the innermost setæ ; spermathecal pores two pairs between VII and VIII, and VIII and IX, nearly opposite but a little dosad of the first setæ.

Nephridiopores not visible. Dorsal pores commence after about X but the first one appears to be rudimentary.

Alimentary canal : gizzard in V, the mesentery behind it very thin ; only two pairs of calciferous pouches seem to be present, in XIV and XV, but these in the specimen dissected immediately attracted notice, and in one specimen are discernible from the exterior ; large intestine commences in XVII.

Genitalia: two pairs of testes and of ciliated rosettes in x and xi; two pairs of racemose vesiculæ seminales in xi and xii; the prostates extend through about three segments; beside each straight genital duct is a pair of small sacs each containing several (3 or 4) curved and gradually tapering but not spinose penial setæ. Ovaries and oviducts as usual; spermathecæ two pairs in viii and ix, their ducts remarkably long, each with a lobate somewhat compressed and rosette-like cæcum.

Last pair of hearts in xii. Nephridial tufts numerous.

Hab.—Bulli, Illawarra, N.S.W. (received from Rev. T. F. Potts and Mr. T. G. Sloane).

Externally and in the absence of the clitellum this distinct species might pass for a species of *Digaster* or *Megascolides*; like the preceding species its affinities are not very clear.

Acanthodrilus Macleayi, n.sp.

About 110 small specimens, one of the largest of which is 27 mm. long, 2 mm. broad; number of segment about 90.

Colour rather light yellowish-brown. Prostomium only partially divides the buccal ring (less than half).

Setæ: four pairs to a segment after the first one, the setæ of the outer pairs close together like those of the inner ones; the inner pairs on xvii and on xix either not visible (probably then only obscured by the swellings on these segments) or situated a little dorsad of the usual position.

Clitellum present in a few specimens, comprising segments xii-xvi or xvii.

Male pores two pairs, a pair on xvii and a pair on xix, the pores of each pair rather close to, and one on either side of, the median line, distinctly closer to the median line than the innermost row of each inner pair of setæ would be if normally placed. The ventral surface of xvi and xvii, and to a less degree of the next two or three segments more or less modified and swollen as far

dorsad as the second pair of setæ, the modified surfaces more or less confluent, but intersegmentally for a short distance on either side of the median line less modified; hence the three or four intersegmental depressions (the first one between XVI and XVII) so commonly present in spirit specimens are probably *post-mortem* and due to shrinkage.

Oviduct pores, spermathecal pores, nephridiopores, and dorsal pores not determinable.

Alimentary canal: a single large gizzard present.

Genitalia: a large pair of vesiculæ seminales (probably in XII), a doubtful smaller pair situated two segments in front, with two pairs of ciliated rosettes (and probably testes) in the two intervening segments; prostates two pairs, with two pairs of straight fairly long genital ducts; four pairs of delicate sacs, a pair to each genital duct, containing penial setæ, long, curved, and tapering, and minutely notched distally, the free extremity not a sharp point, but flattened.

Nephridia: a pair of tubules to a segment.

Hab.—Napier Range, 100 miles S. of King's Sound, N.W. Australia (Macleay Museum, collected by Mr. W. Froggatt).

These were the only specimens of earthworms obtained by Mr. Froggatt during nearly a year's residence in the Kimberley District. Owing to their small size—the largest of them just exceeding an inch—it is difficult to make out the details or to localise the various organs. There is no doubt however about the presence of two pairs of prostates and two pairs of genital ducts. This species is distinct from *A. australis* from Cape York recently described by Dr. Michaelsen (*l.c.*, p. 9).

PERICHÆTA MACQUARIENSIS, n.sp.

Five well preserved somewhat contracted spirit specimens 130-180 mm. long, 5-7 mm. broad; number of segments about 150-200.

Colour purplish or reddish-brown, paler beneath. Prostomium partially divides the buccal ring (about half); sometimes from its posterior margin a median longitudinal groove extends backwards as far as the third segment.

Setæ fewer, larger and more conspicuous, the setiferous ridges also more conspicuous, in front of the clitellum ; segment II (the first setigerous one) with probably normally about 18 setæ [in the specimen in which the setæ are most complete there are 9 on one side and 8 on the other ; most of the specimens have 16 ; one shows only 6] ; segments III and IV with about 26 ; V-XV with about 28 (in one case segment VII has 15 on one side and 14 on the other), from XIX with 32-36, the posterior segments—except the last few—with about 40-44 ; very frequently owing to breakages or other causes only fewer than the numbers specified can be counted on a given segment. A median dorsal interval about 2-2½ times, and a median ventral interval about thrice the width of an ordinary interval between two setæ, devoid of setæ.

Clitellum (in two specimens) comprising four segments, XIV.-XVII.

Male pores on papillæ, about corresponding with the intervals between the first and second setæ ; adjacent to and dorsad of each pore is an additional slight swelling or papilla. The posterior ⅔ of the ventral surface of XVII and the anterior ⅔ of XIX modified, in each case with an indistinct pair of papillæ much as in *P. austrina :* in specimens with girdles the ventral surface of segments X and XI modified much as in *P. austrina* but the swellings are not pitted, and the posterior one is not subdivided ; in one specimen on X.-XII are three pairs of swellings extending anteroposteriorly across the segment, and from side to side from about the first to the third setæ, with a little pit in front and one behind the setigerous ridge. Oviduct pores two, in front and ventrad of the innermost setæ ; spermathecal pores three pairs, intersegmental after VI, nearly opposite or a little dorsad of the first setæ.

Dorsal pores commence after segment IV (sometimes apparently a rudimentary one after III). Nephridiopores not visible.

Alimentary canal : calciferous pouches in X-XIII (almost like a smaller pair in XIV).

Genitalia as in *P. austrina*, that is to say two pairs of testes and ciliated rosettes in X and XI, two pairs of vesiculæ seminales

in IX and XII &c.; but in the specimen dissected the cæca of the spermathecæ not so long (possibly only due to its non-breeding condition); and penial setæ only slightly curved but sharply bent almost at a right angle close to the free extremity are present. Last pair of hearts in XIII.

Hab.—Dubbo, N.S.W.; from the banks of the Macquarie River (collected by Mr. C. E. Rennie).

Allied to *P. austrina* and *P. hamiltoni*, but distinguished from them by the slightly more ventrally situated spermathecal pores, by details in the number of setæ, by the possession of penial setæ, and of a pair of hearts in XIII, and other details.

PERICHÆTA (?) TERRÆ-REGINÆ, n.sp.

One specimen rather contracted except in the middle region of the body which is soft and relaxed, 190 mm. long, 15-18 mm. broad; number of segments 144. Body stout, cylindrical; segments III-XIII biannulate, but with the anterior annulus in some of them faintly again subdivided; behind XIII there is little indication of annuli, nor are setiferous ridges anywhere prominent. Colour dark, probably purplish (the specimen both somewhat bleached and stained). Prostomium but slightly divides the buccal ring (about $\frac{1}{3}$).

Setæ: from their retraction, worn condition, or absence, it is difficult to determine the number of the setæ on the first few and the last few setigerous segments; elsewhere one may count from about 40-60 to a segment, with a median dorsal and ventral interval devoid of setæ of which the latter is fairly defined, its limiting rows of setæ straight, about five times the breadth of an ordinary interval between two setæ on the ventral and lateral surfaces where they are closer together, more regular, and not so frequently missing as on the dorsum; the latter much broader, ill-defined owing to the absence or irregularity of the setæ.

Clitellum not developed, but segments XIV-XXI, and XIII and XXII slightly, are of a noticeably different colour, a brighter

purplish ; from experience in other cases I regard this as indicative of a waxing or a waning clitellum. If so then this species like *P. canaliculata* is intraclitellian.

Male pores on two large papillæ, the outer (dorsal) margin of each extending to about the sixth setæ, their inner margins connected by an intermediate somewhat swollen portion ; these structures occupy the entire ventral surface of XVIII within the limits mentioned, obscuring the setæ if these are present, and they bulge a little antero-posteriorly ; the pores themselves are about in the line of the second row of setæ. Oviduct pores two, in front and a little ventrad of the innermost setæ on XIV ; spermathecal pores four pairs in the intervals between segments IV-VIII, about opposite or a little ventrad of the second setæ ; (the first pair a segment in advance of the usual arrangement).

Dorsal pores commence after segment V. Nephridiopores a pair to a segment after the first, just behind the anterior margins, forming a single irregularly sinuous series on each side, the pores varying in position from opposite the fourth or fifth setæ to dorsad of any visible setæ, and not very far from the median dorsal line.

Hab.—Mt. Bellenden-Ker, N.E. Queensland (received from Mr. Henry Tryon).

This distinct species belongs to the same group as *P. canaliculata*, Fl., from the same district. At present I refrain from dissecting the single specimen available.

From time to time I have received or collected a number of small perichæte worms from various localities in N.S.W., which while differing for the most part a good deal in size or general appearance from the typical forms of the species to which as varieties, at any rate provisionally, I now propose to refer them, yet present no sufficiently satisfactory or important points of difference entitling any of them to rank as independent species. From the small size and stunted growth, or not good state of preservation of some of them, together with the difficulty in determining

the number of setæ on the first few setigerous segments they are not a very satisfactory lot to deal with ; but for the sake of the interest attaching to the questions of variation and geographical distribution, the attempt is here made to deal with them.

The majority of them agree with *Perichæta Macleayi* described in my last paper in having (1) the preclitellar or a few more segments with 20 setæ per segment, increasing then to 24, and still further back to about 28-30 ; (2) the buccal ring nearly completely divided by the prostomium ; (3) two pairs of spermathecal pores opposite the second or third setæ, or the interval between them ; (4) both pre- and postclitellar accessary copulatory structures ; (5) calciferous dilatations in some of segments IX or X-XIII, but pouches are not pinched off ;* and (6) the same general characters of the genitalia, *e.g.*, two pairs of vesiculæ seminales in IX and XII, and two pairs of spermathecæ each of them with a single long club-shaped cæcum. Besides size they differ among themselves slightly in regard (1) to the number and character of the accessory copulatory structures ; the situation of (2) the first dorsal pore and (3) the spermathecal pores which in some are more nearly opposite the second, in others opposite the third setæ. They are accordingly treated as three varieties, noted separately from each locality. The remainder in which the number of setæ is slightly greater, probably normally 24 setæ on the anterior setigerous segments, are similarly treated as a variety of *P. fecunda* with two pairs of spermathecæ.

P. MACLEAYI, Fl., [*l.c.* (2) III, (1888), p. 1556], vars. nov.

Var a :—Thirteen specimens 60-87 mm. long, 3-4 mm. broad ; number of segments from about 110-125.

Setæ : the first thirteen setigerous segments (ii-XIV or thereabouts) with twenty setæ to a segment [frequently only fewer are visible, often 16 or still fewer ; nevertheless as 10 may often be counted on one side of a given segment, or a seg-

* " The two pairs of calciferous pouches in XI-XII " (*l.c.*, p. 1557) are so incompletely pinched off as to be little more than dilatations.

ment with 20 may precede one with 16, or when fewer than 20 the setæ are evidently at greater intervals, it would seem that 20 per segment is the normal number; hence differences are probably quite as much to be attributed to wear and tear as to possible variation]; this number then gives place to 24 (occasionally two or three more, though in this region one may find a segment preceded and followed by one with a greater number) which continues for a number of segments; finally posteriorly except on just the last few segments the number increases to about 30 or a few more. The body tapers steadily posteriorly and here the dorsal interval devoid of setæ may be said to vanish, the interval being not greater than that between two ordinary setæ.

Clitellum comprising segments XIV-XVII, together with XIII partially.

Accessory copulatory structures comprise (1) the ventral surface of X outwards on each side to beyond the second seta tumid, more or less completely longitudinally divided in the median line, and with four fossettes, an anterior and a posterior pair; and (2) pairs of papillæ on XVI and XVII, the ventral surface of XVIII dorsad of the male pores also swollen.

Dorsal pores after V as in the typical form.

Hab.—Mt. Wilson and Lawson, Blue Mts., N.S.W.

Var. b:—Seventeen specimens 57 (juv.) to 120 mm. long, 3-4 mm. broad; number of segments about 115-140.

Setæ: on the preclitellar segments usually 20 per segment, but the following variations were noted in different specimens:—on segment V, 14 on one side and only 8 on the other; on XIV, 14 + 14; on XV, 14 + 10: posteriorly the number may increase to about 40 setæ per segment.

Accessory copulatory structures: the ventral surface of XI swollen for a space extending outwards on each side to about the second seta, with a pair of fossettes, one on each side of the median line, in front and ventrad of the first setæ, rarely a little further apart; a similar but less completely developed area in

some specimens on x ; in one specimen none on x but a swelling and one fossette on xii. On xvii and on xx (on the latter sometimes more like the structures on xix but a little closer together) the ventral surface in the interval devoid of setæ tumid, with two fossettes, one on either side of median line, which may be confluent ; on xix a pair of papillæ each with a fossette in front of the interval between the first and second setæ. The above is the typical arrangement ; but specimens vary both in regard to the number of these structures and the extent to which they are developed ; and there may be an additional one on xxi.

Dorsal pores commence after segment iv.

Hab.—Burrawang, N.S.W.

Var. c. (i) :—Nine specimens 35-74 mm. long, 2-4 mm. broad; number of segments 82-95.

Spermathecals opposite the interval between the second and third setæ, or even opposite the third setæ.

Accessory structures : the whole ventral surface of x and xi as far dorsad on each side as about the third seta, raised and swollen ; opposite the interval between the first and second setæ a pair of fossettes. A pair of papillæ on xvii, and a pair on xix, closer than ♂ papillæ ; a slight papilla on xviii in median line in some specimens.

Hab.—Mt. Victoria, Blue Mts., N.S.W. (collected by Mr. A. G. Hamilton).

(ii) :—Nine specimens not in good condition 36-50 mm. long, 2-3 mm. broad ; number of segments 66-94.

Allowing for the poor condition of the specimens not distinguishable from the preceding ; the accessory swellings on x and xi are as in that form, but though xvii, or xvii and xix are modified, papillæ are not very evident.

Hab.—Raymond Terrace and Morpeth, N.S.W.

(iii) :—Fifteen specimens 26-60 mm. long, 2-4 mm. broad : number of segments 75-115.

Not distinguishable from the foregoing. There are exactly similar swellings on X and XI, and at least indications of pairs of papillæ on XVII and XIX in some of the specimens.

Hab.—Coonabarabran, Gunnedah from the banks of the Namoi, N.S.W. (collected by Mr. T. G. Sloane).

P. FECUNDA, Fl., [*l.c.* (2), II. (1887), p. 401], var. nov.

Twenty specimens 38-62 mm. long, 2-3 mm. broad; number of segments about 90-115.

Colour dark purplish iridescent superiorly and anteriorly as in the typical forms, lighter posteriorly, and quite pale on the ventral surface.

Setæ: On the preclitellar segments 24 (frequently only 20 or fewer with evident gaps in the half-circles, especially on the first setigerous segment (II), but as examples can be found in which there are 12 on one or both sides of this segment the difference is evidently accidental); on some of the clitellar segments or just behind them the number usually increases to 28, but here and there only fewer can be counted; still further back the setæ are finer, closer together and more numerous, from about 30-40 when the half circles are complete.

Accessory copulatory structures: the ventral surface of segments X and XI outwards on each side to about the third or fourth seta swollen, with a pair of fossettes in front of and about opposite the second seta or the interval between the second and third setæ on each side (in immature specimens the general surface is less swollen, but the rudimentary circular shallow depressions or fossettes are in most cases recognisable). On XVI a circular raised area nearly filling the ventral interval devoid of setæ on this segment; a larger but elliptical area similarly placed on XVII (these two less evident when the girdle is developed); the ventral surface of XIX as far outwards on each side as the third seta raised, like a pair of papillæ or pores in front and opposite the interval between the first and second setæ; XX somewhat similarly modified but not dorsad of the first seta, or the surface simply raised with a pair of fossettes, one on either side of median line.

Spermathecal pores two pairs, between VII and VIII, and VIII and IX, nearly opposite but a little dorsad of the second seta or as the margins of the apertures are tumid about opposite the interval between the first and second setæ.

Hab.—Burrawang, N.S.W.

Possibly distinct from *P. fecunda ;* but a satisfactory series of the latter is still a desideratum.

The following four species were each described from a few mostly small specimens at a time when there seemed to be no immediate prospect of obtaining further material ; during the period which has since elapsed I have had the opportunity of examining better series, from the examination of which I am now able to offer the following remarks partly supplementary to, partly in correction of, my original descriptions.

CRYPTODRILUS SACCARIUS, Fl., P.L.S.N.S.W. (2), I. (1886), p. 951.

The original description of this species was drawn up from the examination of half a dozen small specimens from Hornsby, in which for several reasons the slight irregularity of the rows of setæ did not attract particular notice. From further observations on a few additional specimens from the same locality, on a good series of specimens of what I regard as belonging to the same species from another locality, and on two other lots of specimens of what I consider as varieties, I now offer the following supplementary remarks.

Setæ : the eight rows of setæ never quite straight and regular throughout, the irregularity varying however within rather wide limits in different individuals; where regular the two rows of each outer couple not quite so far apart as the two couples of each side; all the rows at first regular and the two rows of each inner (ventral) couple continuing so throughout with the exception of a seta here and there out of place, or only slightly irregular, for some little distance in front of the posterior extremity (*i.e.*, in about

the posterior fourth or fifth of the body, except on about the last half dozen segments on which setæ are not visible) but with any tendency to irregularity more marked in the case of the second row of each of these couples; the rows of the two outer couples at first regular, in some specimens continuing so for a considerable distance (for the anterior half of the body, or even more) but sooner or later, or in others even on some of the preclitellar segments, the setæ of one or the other (most commonly the outer) and further back of both rows on each side of the body only here and there or continuously become displaced, at first slightly and then more and more markedly so that in about the hinder fourth or fifth of the body where always the two outer, and sometimes all four, rows of each side are out of place, the irregularity is sometimes very remarkable; the setæ of the same rows on different segments may be quite close or widely separated, the setæ of different rows sometimes alternating roughly for a few segments. In one specimen five setæ were present on one and four on the other side of the same segment. Even in worms without girdles and undeveloped male papillæ I have not noticed the inner couples of setæ on segment XVIII.

The ventral surface of segment XVIII in all but very young specimens is more or less modified, most marked in mature worms with well developed clitella in which (in spirit specimens) there is usually a rather broad but shallow transverse depression bounded by a tumid rim, most thickened just round and a little beyond the ends of the depression which reaches on each side to a little beyond the second row of setæ, the depression a little narrower (from before backwards) for a little way on each side of the median line of the body, then widening out towards the extremities thus bearing some resemblance in shape to a dumb-bell, the papillæ with the male pores in but not quite at the extremities of the enlarged ends corresponding in position with the interval between the setæ of the inner couples, and confluent with the posterior slope of the depression so that the depressed area passes in front and beyond them; sometimes a small papilla or only a little pit dorsad of each of the male papillæ. In less mature individuals the same arrange-

ments are indicated but are less developed, the depression not extending so far from side to side, its margins not so tumid, and its shape not so well-defined, and lying closer to the anterior than to the posterior margin of the segment. On the other hand as some specimens have the ventral surface convex but thickened for a space outwards on each side as far as about the second row of setæ, the thickening most marked towards the ends of the thickened area (which sometimes is dumb-bell-shaped from the extremities encroaching a little) it may be that the depression referred to is only or chiefly *post mortem* and due to the unequal contraction of a not uniformly thickened surface. Out of about 100 (spirit) specimens by far the majority of them show at least some indication of it. Individual variations in detail are common, and very frequently in the median line just behind the anterior margin of the segment there is one or a pair of dots or pits on a more or less distinctly thickened area resembling the accessory copulatory structure, or there may be one median, and two lateral dots or pits, in front of the ♂ papillæ. The supposed accessory copulatory structures vary in number, situation, and in pattern and size according to the extent to which they are developed. The first indication of each of them in immature worms is a pair (or there may be only one) of circular translucent dots or pore-like pits in the intersegmental groove (except in the case of those on the ventral surface of XVIII) one on either side of and not far from the median ventral line ; on each side of the intersegmental groove a portion of the ventral surface of each segment becomes modified forming a lanceolate or nearly elliptical transverse thickening extending from the innermost (ventral) row of setæ on one side across the median ventral line to the innermost row of the other side, and from before backwards extending over one or part of one annulus or more of each pair of segments between which it occurs, the surface still completely traversed by the intersegmental furrow, or a portion of the latter completely enclosed ; in more mature individuals the thickening increases, the pattern of the whole structure becoming more definite (lanceolate or nearly elliptical), the surface shallowly concave with an enclosing raised rim, or the

surface may be convex, in either case the dots or pits still visible on the surfaee. Sometimes the thickened areas are more elongate from side to side, and narrower from before backwards than at other times; sometimes the tissue only on one side of the inter-segmental groove thickens; frequently the thickened area is constricted in the median line giving it a slight dumb-bell shape; sometimes the little pits are surrounded by a tumid rim irrespective of the general thickening or even become a pair of papillæ; they are usually intersegmental structures but occasionally they appear to belong wholly to the posterior of the two segments involved, and to be only apparently intersegmental by encroachment. As regards number and situation, there may be two preclitellar ones between segments XI and XII, and XII and XIII; and four postclitellar, one between XVIII and XIX, and three between any two segments from XX-XXIV, besides another on the ventral surface of XVIII, but some or any of them may be wanting; in my original specimens only the two preclitellar ones were present; in the subsequently acquired specimens a very common arrangement is one preclitellar one between XII and XIII, and two postclitellar ones between XX and XXI, and XXI and XXII, together with indications of something like them on XVIII.

Dorsal pores: the first few are not at all conspicuous in the specimens examined; the first one appears to be between XI and XII, but there may be a rudimentary one between X and XI.

Alimentary canal: the gizzard in segment V; five pairs of calciferous pouches in IX-XIII, overlying the intestine.

Hab.—The eastern portion of the County of Cumberland north of Port Jackson, N.S.W.

C. saccarius var. *montanus*, var. nov.

Three moderately contracted spirit specimens 50-67 mm. long, 3-4 mm. broad; number of segments about 140-180.

Two without girdles have the ventral surface of XVIII convex and tumid, most marked on each side from a little ventrad to a little dorsad of the inner couples, the thickenings bulging a little

antero-posteriorly; the third has a narrow transverse depression with a raised vein very much as in some specimens of the typical form.

All three have the supposed accessory copulatory structures, two in front and one behind the clitellum, but the former and occasionally the latter instead of being intersegmental may occupy the posterior two-thirds of XII, XIII, and XXI, or becoming only accidentally intersegmental by encroachment.

Alimentary canal: six pairs of calciferous pouches in segments VIII-XIII.

In other respects, so far as I know at present, agreeing with the typical form.

Hab.—Springwood, Blue Mts.

The number of calciferous pouches appears to be constant in this variety. Externally there is little to distinguish it from the typical form.

C. saccarius var. *robustus*, var. nov.

Eight well preserved rather contracted (spirit) specimens 112-195 mm. long, 9-12 mm. broad; number of segments from about 250-290: another very young specimen 59 mm. long, 5-6 mm. broad; number of segments about 215.

Accessory copulatory structures: usually one between XII and XIII, and in one specimen a postclitellar one between XXI and XXII (they have probably not attained their maximum development in any of the specimens). The ventral surface of XVIII in some of the specimens without clitella shows a papilla-like thickening in the position of the second seta of each side (N.B., the inner couples as in the typical form not visible on XVIII); in more mature specimens the thickening has increased, and in the area corresponding with the interval between the inner couples the anterior and posterior annuli have become depressed, the middle portion remaining as a distinct papilla apparently with the very inconspicuous male pores which are about in line with or a little

dorsad of the second row (*i.e.* a little dorsad of the position they occupy in the typical forms); ventrad of the papillæ the depressions may become confluent, and in the most mature (but still immature) examples they extend inwards, while the ventral surface between the papillæ shows a tendency to become modified and the depressions to be bounded by a raised rim. Translucent dots or little pits are commonly present on XVIII, one or two on each side in front, and two or three on each side behind the papillæ, the latter nearer to the median line.

The spermathecal pores are in front and dorsad of the first setæ on the margins of VIII and IX, a little more dorsad than in the typical form.

Dorsal pores: the first one appears to be that between XII and XIII, though there sometimes appears to be a rudimentary one between XI and XII; the first not always readily made out in my specimens, and on the clitellum blocked up.

Alimentary canal: six pairs of calciferous pouches in VIII-XIII.

In other respects agreeing substantially as far as I know at present with the typical forms. From the condition of the clitellum, the accessory copulatory structures, and the ventral surface of XVIII, evidently none of the specimens are quite mature.

Hab.—Near Gosford, N.S.W.

With the exception perhaps of *C. Tryoni*, the larger examples referred to above are the finest and most robust earthworms I have yet seen belonging to the genus *Cryptodrilus*. Nevertheless except in regard to size, the body comprising a few more segments, and the very slightly more dorsally situated male and spermathecal pores I am unable to make out any satisfactory important points of external difference from the typical forms. Irrespective of the presence of an additional pair of calciferous pouches there are so many points of agreement that, with var. *montanus* as an intermediate link, at present it seems to me to be best considered as a local variety inhabiting the rich soil of the brushes, the typical form and the var. *montanus* occurring in areas of good but much poorer soil, in the Hawkesbury sandstone area.

PERICHÆTA TENAX, Fl., l.c. (2), I. (1886), p. 953.

Ten good average (spirit) specimens out of about thirty are from 101-157 mm. long, 5-6 mm. broad; number of segments from about 116-150.

Setæ: when all are in place 36 may be counted on the first setigerous segment (II), which number continues for some distance until just behind the clitellum where 40 may often be counted; in the posterior region except on the last few segments the number may increase to about 50 or 60; fewer than the numbers specified may be met with in individual cases.

Clitellum comprises segments XIV-XVII and part of XIII.

Accessory copulatory structures: the characteristic structures present on IX and X may extend outwards on each side as far as the third or fourth setæ (*i.e.*, further out than previously mentioned) and in one case there is an additional one on XI; they vary somewhat in regard to the extent to which they are developed, and occasionally extend only half-way (antero-posteriorly) across the segment. In addition to these there are certain other structures often only represented by vaguely defined swellings; on the ventral surface of XVII and of XIX is a pair of circular depressions, one on either side of and not far from the median line and immediately in front of a line joining the first (ventral) seta on each side, each surrounded by a more or less circular tumid rim, the two of each pair merely contiguous or more or less confluent; and often a single median one on XVIII. In sexually mature worms the papillæ carrying the male pores are situated (in spirit specimens) on the inner aspect (probably more evident owing to shrinkage in the middle) of two much bigger swellings extending antero-posteriorly across the segment, frequently pitted; in immature worms one may find an earlier stage showing five little pits with tumid surroundings forming an interrupted ridge, of which the middle one persists without much alteration, the first on each side of it being a male pore with its rudimentary papilla, and the second eventually becoming so much developed as to overshadow the papillæ of the ♂ pores.

Hab.—The County of Cumberland; Springwood, Blue Mts., N.S.W.

PERICHÆTA DORSALIS, Fl., *l.c.* (2) II, (1887), p. 618.

A good series of 35 specimens of various sizes, some very successfully killed in a fairly extended condition by Mr. Smith, comprising examples from 60 mm. long, 3 mm. broad (juv.) to 192 mm. long, 5-7 mm. broad; number of segments about 135.

Setæ: the full number (probably about 16) not present on the first setigerous segment (II) in any of the specimens, though a few have six setæ visible on at least one side of the body; the first and second (counting from the ventral ends of the half series) are rarely absent, and these may be the only ones visible; the next few segments usually have 16, increasing to 20 about segment VI; in one of the original specimens there are 12 on one side of segment XII, but this number is exceptional so far forward; still further back, except on about the last six or seven segments which are smooth, there may be about 30 or a few more. Fewer setæ than the numbers specified may be met with. The statement that the dorsal interval devoid of setæ is somewhat narrower than the ventral one applies only to the posterior region, or elsewhere only to particular individuals; as a rule anteriorly the dorsal interval is much broader than and not so well defined as the ventral one, its bounding rows of setæ not being straight since the setæ are not always at equal distances apart even on the same segment, or that some of them are absent, or posteriorly to the increasing number of setæ. The ventral interval is well-defined, its bounding rows straight and regular, the setæ in this region without the varying tendency to be absent so characteristic of those in the dorsal region. Even in young worms without clitella or papillæ however the first two or three setæ on each side of the ventral surface of XVIII are not visible, and are probably normally absent.

Genital pores: in worms in which the papillæ are not much developed the male pores are two conspicuous slit-like pores a little dorsad of what would be the position of the second seta on

each side, and corresponding with the interval between the second and third setæ; in mature worms the ventral surface of segment XVIII on each side from about the position of the first to the fourth seta all round the male pores is very tumid forming a conspicuous papilla bulging somewhat both forwards and backwards, more or less concentrically furrowed; and from the male pores there protrude what are probably functionally penial organs, though they appear to be only the proximal portions of the genital ducts everted. The oviduct pore is single (not as previously stated); the spermathecal pores are more dorsally situated than in any species I have yet seen; owing to the irregularity of the setæ they are not always "in line with about the eighth setæ," but may be as far dorsad as opposite the interval between the ninth and tenth setæ.

The supposed accessory copulatory structures on X and XI present in the largest of the original specimens are absent.

Genitalia: in addition to the three pairs of vesiculæ seminales in IX, XI, and XII there may be two additional rudimentary pairs in XIII, and XIV (unless the last of these, situated on the posterior face of the septum between XIII and XIV below and at the sides of the alimentary canal, should be appendages of the oviducts). The long cæca of the spermathecæ may be much longer than the pouches.

Hab.—Eltham, Victoria (collected by Mr. W. W. Smith).

In addition to the fine series of worms, Mr. Smith, who is a most enthusiastic observer of earthworms, very kindly sent me a number of the cocoons together with portions of the burrows, respecting which I give the following extracts from his letter:—"I send you fragments of the burrows of *P. dorsalis* with cocoons *in situ* to show their position with regard to the burrows. Several writers on the subject maintain that they are found in the burrows themselves, but I have never yet met with a single instance of such a thing, although I have examined hundreds of the burrows of New Zealand worms. You will see from the fragments sent that the cocoons are deposited by the worms on an average about

half an inch from the burrows in little cavities which are afterwards neatly packed with voided earth, forming moist chambers." The cocoons sent varied slightly in shape from nearly spherical to ovate, or almost elliptical, from 5 × 4·5 mm. to 6 × 4 mm. ; colour yellow or dull yellowish-brown ; usually with one end slightly drawn out ; one cocoon contained an embryo 15 mm. long ; the others had been more recently deposited, but owing to an unfortunate accident which befel them I am unable to give any further particulars respecting them. These are the only cocoons of Australian earthworms I have yet seen, as though I have collected extensively I have not so far had the good fortune to meet with them.

Perichæta Stirlingi, Fl., l.c. (2), II. (1887), p. 395.

An additional series of 14 good specimens very successfully killed in a fairly extended state by Mr. Zietz comprises examples from 105 mm. long, 3-4 mm. broad (juv.) to 220 mm. long, 9-10 mm. broad ; number of segments 120-190-200 segments.

Setæ : the full number (probably about 24) not present on the first setigerous segment (II) in any of the specimens, though a few have 10 on at least one side of the body, but even then one or two are probably missing, the tenth seta (counting from the ventral surface) not being so near the mid-dorsal line as the uppermost setæ on succeeding segments ; on the next two segments 12 or 13 may be met with at least on one side ; on the following segments for some distance the number may increase to 14 on one or both sides ; still further back 16-18 may occur on one or both sides, and quite posteriorly the total number may increase to 40 or a few more per segment. As in other species fewer setæ than the numbers specified for the different regions may frequently be met with ; and while the variation in number on some segments is evidently due to the mere accidental absence of setæ owing to breakage or wear and tear, in other cases it is owing to the frequent absence of one or two or more of the uppermost (dorsal) setæ of the half-series, and this in the absence of any definite information as to the dorsal

rows being more exposed to wear and tear than the ventral ones seems to be attributable to a tendency to a reduction in the number of setæ commencing with those in the dorsal region, as the ventral setæ and especially the first and second of each half series are remarkably constant in their presence even on segment II, on which sometimes the total number visible is only three or four.

The ventral interval devoid of setæ is very well marked throughout, but anteriorly where the setæ are fewer and further apart, and as elsewhere, not always at equal distances apart even on the same segment, its width may be much less than that of an ordinary interval between two setæ. The dorsal interval is narrower.

In mature worms in which the ventral surface of XVIII is more or less modified the first visible seta on each side is usually the third or fourth (counting from the ventral ends of the half-series); in an immature specimen on which the surface of this segment is unmodified and the ♂ pores quite distinct the first two on each side are wanting or invisible, and the pores are seen to be in what would be the interval between the second and third setæ but a little dorsad of the position of the first setæ; from the unequal distances between the setæ, or from the third or fourth setæ being hidden by the tumidity of the ventral surface, one is often obliged to judge of their position by that of the setæ on the preceding or succeeding segment, and then the pores sometimes seem to correspond with the interval between the third and fourth setæ. The oviduct pore is single and median (not two pores as previously stated); owing to the irregularity of the setæ the spermathecal pores are sometimes opposite the intervals between the fourth and fifth or more usually the fifth and sixth setæ.

Dorsal pores commence after segment IV.

In mature worms the tissue round the male pores becomes modified, or they are surrounded by a tumidity connecting the accessory copulatory papillæ of the second and third pairs on each side.

Genitalia: two pairs of testes and two pairs of ciliated rosettes in X and XI; three pairs of vesiculæ in XI-XIII (in XIV there may

be what look like a rudimentary fourth pair); the genital duct in the additional specimens dissected is rather long and several times bent on itself, and the two vasa deferentia of each side appear to remain separate and to join the prostatic duct about half the length of the latter from the gland. The spermathecal cæca may be as long or a little longer than the duct of the main pouch.

The numerous nephridial tubules lie just behind the insertions of the mesenteries.

Hab.—(As previously) near Adelaide, S.A. *(Coll. S.A. Museum, Adelaide).*