

A TAXONOMIC REVISION OF THE  
OLIGOCHAETE GENUS *EUKERRIA* MICHAELSEN  
1935 (OCNERODRILINAE, MEGASCOLECIDAE)



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*Pp. 131-172 ; 10 Text-figures*

BULLETIN OF  
THE BRITISH MUSEUM (NATURAL HISTORY)  
ZOOLOGY Vol. 20 No. 5  
LONDON : 1970



THE BULLETIN OF THE BRITISH MUSEUM (NATURAL HISTORY), instituted in 1949, is issued in five series corresponding to the Departments of the Museum, and an Historical series.

*Parts will appear at irregular intervals as they become ready. Volumes will contain about three or four hundred pages, and will not necessarily be completed within one calendar year.*

*In 1965 a separate supplementary series of longer papers was instituted, numbered serially for each Department.*

*This paper is Vol. 20 No. 5 of the Zoological series. The abbreviated titles of periodicals cited follow those of the World List of Scientific Periodicals*

World List abbreviation:  
*Bull. Br. Mus. nat. Hist. (Zool.).*

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THE BRITISH MUSEUM (NATURAL HISTORY)

*Issued 31 December, 1970*

*Price £1.30*



# A TAXONOMIC REVISION OF THE OLIGOCHAETE GENUS *EUKERRIA* MICHAELSEN, 1935 (OCNERODRILINAE, MEGASCOLECIDAE)

By B. G. M. JAMIESON

## SYNOPSIS

Material of 15 of the 27 described species of *Eukerria* has been examined and of the 21 species recognized at commencement of the study, 17 are considered valid. *E. hortensis* Stephenson, 1931; *E. peguana* Gates, 1942, *E. asilis* Righi, 1968 and *E. zonalis* (Eisen, 1893) pass into synonymy. Three infrageneric groups are recognizable from the internal structure of the calciferous glands of which two appear to be polyphyletic. The most clearly definable subgroup, a *stagnalis*-group, consisting of *E. stagnalis*, *E. papillifera* and *E. weyenberghi*, may require separate generic status when further knowledge of the morphology of these species and of the genus as a whole is acquired.

## INTRODUCTION

*Eukerria* is a neotropical genus of the Ethiopian, Neotropical and Oriental subfamily Ocnerodrilinae (Ocnerodrilidae *sensu* Gates 1939, 1959). A revision of the genus has been undertaken as a contribution to a review of the Ocnerodrilinae which is in preparation. The name *Eukerria* was proposed by Michaelsen (1935) who showed *Kerria* to be preoccupied by a protozoon. *Kerria* was erected by Beddard (1892) for *K. halophila*, a brackish water species from the upper reaches of the Pilcomayo River (Bolivia?). His description is inadequate and contains contradictions and, as no species identifiable with *halophila* has since been found, seriously hampers revision of the genus.

Prior to the present account, relatively few species of *Eukerria* had been revised since the dates of their first description. The courtesy of the authorities of the British Museum (Natural History), the Torino Museum and of the Zoologisches Museum, Hamburg, has made it possible for the author to examine material of eleven of the seventeen species of the genus recognized in the present work or fifteen of the twenty seven species which have been recognized prior to demonstration of extensive synonymy in this and other accounts. Much work remains to be done on the taxonomy and morphology of the genus, however, as examination has been limited by the poor condition of much of the long-preserved material, the short series available, and the necessity to minimize dissection of type-material.

## SYSTEMATICS

Genus ***EUKERRIA*** Michaelsen, 1935

Prostomium variable. Setae 8 per segment in 2 closely paired couples; the interval between those of the ventral pair (*ab*) equal to that between those of the dorsal



pair (*cd*) ; dorsal median intersetal distance (*dd*) = 0.4–0.5 of the circumference (*u*). Nephropores presetal, from mid *bc* to *c* lines ; in a single series which is straight or nearly so on each side. Clitellum annular or saddle-shaped, in the region of XIII–XX. Prostatic pores 2 pairs, on XVII and XIX, each pore receiving the duct of a single prostate gland or very exceptionally (abnormally?) of 2 such glands. Male pores in XVIII. A seminal groove usually present on each side, connecting the male pore with the prostatic pores of the same side. Female pores paired on XIV in front of or slightly anterolateral to the ventral setal couples, (rarely in a median fissure?). Spermathecal pores 2 pairs, in 7/8 and 8/9. Dorsal pores absent.

Gizzard well developed or rudimentary in VII or absent. 1 pair of calciferous glands, in IX, with wide lumen into which project weakly or well developed septa which may fuse centrally ; or lacking septa and with thicker walls ; or (e.g. *saltensis*) intermediate in structure, having thick walls with few irregular low projections but no definite septa. Intestine commencing in XII or XIII ; typhlosole (always?) absent. Hearts in IX (always?), X and XI ; precardiac commissurals absent or forming an extensive series. Nephridia beginning in IV–XI ; avesiculate or with small bladderlike ectal dilatations. Proandric ; testes and funnels in X ; free or (*stagnalis*, and *kukenthali*) in a circumcardiac testis-sac. Seminal vesicles in IX (or X?) and XI, or IX only or XI only. Prostate glands with or without muscular terminal bursae ; vasa deferentia rarely thickened ectally. Ovaries in XIII ; ovisacs absent or rarely (intraspecific variation?) present. Spermathecae with more or less distinct ducts ; adiverticulate (or, in *mcdonaldii*, with pseudo-diverticula which do not store sperm).

DISTRIBUTION. South America : Brazil ; Paraguay ; Bolivia (?) ; Argentina ; Chile. Baja California. Two species have ranges outside America : *E. kukenthali* in the West Indies, Malaya, Christmas Island (near Java) and Burma ; *E. saltensis* in South Africa, Burma, New Caledonia and Australia. The genus is usually regarded as limnic (Stephenson, 1930) but few species are known certainly to occur in aquatic habitats.

TYPE-SPECIES. *Kerria halophila* Beddard, 1892.

#### KEY TO SPECIES OF THE GENUS *EUKERRIA*

- |   |  |                                     |
|---|--|-------------------------------------|
| 1 | Prostatic porophores, (raised approximately circular areas around the prostate pores) extending into or meeting in XVIII . . . . . | 2                                   |
| – | Prostatic porophores not extending into XVIII . . . . .  | 6                                   |
| 2 | Spermathecal pores in <i>b</i> lines . . . . .   | <i>E. tucumana</i> , p. 162         |
| – | Spermathecal pores a little below <i>c</i> lines to above <i>d</i> lines . . . . .   | 3                                   |
| 3 | Spermathecal pores above <i>d</i> lines . . . . .  | <i>E. eiseniana</i> s. lat., p. 136 |
| – | Spermathecal pores in or slightly below <i>c</i> lines . . . . .   | 4                                   |
| 4 | Prostatic porophores in contact in segment XVIII . . . . .   | <i>E. garmani</i> , p. 140          |
| – | Prostatic porophores (or papillae) separated in XVIII by a region equal in width to a porophore . . . . .                          | <i>E. pascuorum</i> , p. 149        |
| 5 | Spermathecal ducts significantly shorter than the ampulla. . . . .   | 6                                   |
| – | Spermathecal ducts hardly appreciably shorter to longer than the ampullae . . . . .  | 12                                  |
| 6 | Spermathecal pores above <i>b</i> lines . . . . .  | 7                                   |
| – | Spermathecal pores in or below <i>b</i> lines . . . . .  | 10                                  |



- 7 Gizzard small or well developed . . . . . 8  
 – Gizzard totally absent . . . . . *E. stagnalis*, p. 153
- 8 Spermathecal duct ectally very strongly muscular and thicker than the remainder of the spermatheca. (Calciferous glands with slit-like lumen and thick, honeycombed walls) . . . . . *E. limosa*, p. 146  
 – Spermathecal duct not more strongly muscular ectally than elsewhere. (Calciferous glands with fairly wide lumen, into which folds of the walls project) . . . . . 9
- 9 Seminal grooves in the same longitudinal line as the prostatic pores though slightly convex medianly . . . . . *E. rosae*, p. 149  
 – Seminal grooves distinctly median to the prostatic pores, strongly convex medianly . . . . . *E. subandina*, p. 158
- 10 Gizzard well developed. Median papillae absent . . . . . 11  
 – Gizzard absent. Median papillae present, in XIV–XVI . . . . . *E. papillifera*, p. 148
- 11 Seminal grooves present. Clitellum in XIII–XX . . . . . *E. asuncionis*, p. 135  
 – Seminal grooves absent. Clitellum in XIV–XIX . . . . . *E. halophila*, p. 144
- 12 Seminal grooves absent . . . . . 13  
 – Seminal grooves present . . . . . 14
- 13 Spermathecal pores in *b* lines . . . . . *E. weyenberghi*, p. 163  
 – Spermathecal pores near *c* lines . . . . . *E. rubra*, p. 151
- 14 Seminal grooves further lateral at the male pores (in XVIII) than at the prostatic pores . . . . . *E. urna*, p. 162  
 – Seminal grooves straight or further median at the male pores than at the prostatic pores . . . . . 15
- 15 Spermathecal pores in *ab* lines. (A median genital marking usually present in XXI) . . . . . *E. kukenthali*, p. 144  
 – Spermathecal pores well dorsal of *b* lines . . . . . 16
- 16 Spermathecal pores in *bc* . . . . . *E. saltensis*, p. 152  
 – Spermathecal pores in *cd* . . . . . *E. mcdonaldii*, p. 147

### *Eukerria asuncionis* (Rosa, 1895)

*Kerria asuncionis* Rosa, 1895a : 2 ; Rosa, 1895b : 145 ; Michaelsen, 1900 : 370.

l = 25–45 mm, w = 2 mm, s = ca. 100. Epilobous.  $aa = bc : dd : u = 0.5$ . Clitellum annular, XIII–XX, weaker ventrally. Prostatic pores eye-shaped at the protuberant rounded angles of a quadratic male field which is laterally delimited by straight seminal grooves connecting the prostatic pores of each side. Female pores possibly represented by a median transverse fissure with slightly tumid lips. Spermathecal pores in front of the ventral setae.

Last septal glands in VIII. Gizzard well developed. Oesophageal diverticula large. Testes? Prostates minute, about 1 mm long, almost straight. Spermathecae pyriform, passing gradually into a short duct.

DISTRIBUTION. Paraguay.

MATERIAL EXAMINED. 4 postclitellar portions ; Torino Museum ol. 105, ex. 296, L. Borelli, 1893.

The above description is taken from Rosa (1895b).

The re-examined specimens are presumably types but, as they lack the clitellar ends,



are not certainly identifiable and yield no information. The species is inadequately defined from *E. halophila*.

***Eukerria eiseniana* (Rosa, 1895)**

Fig. 1, 2A–F, 10A

*Kerria eiseniana* Rosa, 1895a : 2 ; Rosa, 1895b : 141, Pl. fig. 16 ; Michaelsen, 1900 : 372.

*Kerria hortensis* Stephenson, 1931 : 314, Fig. 2, Pl. 17, fig. 8, Pl. 18, fig. 9.

l = 35–50 mm, w = 1.4–1.8 mm, s = 86–123 (25–55 mm, 2 mm, 90–125 (Rosa) ). Epilobous  $\frac{1}{2}$ , margins slightly or strongly convergent, open or (1 specimen) with an indistinct posterior margin. Setae : in segment XII  $aa : ab : bc : cd : dd = 4 : 1 : 5.3 : 1.4 : 11.3$  ;  $dd : u = 0.37$  (1 specimen) but  $cd$  not always significantly larger than  $ab$  ; setae  $a$  present and  $b$  absent in XVII to XIX. Clitellum annular, weaker in  $aa$  to the extent, in one specimen, of appearing saddle-shaped ; XIII,  $\frac{1}{2}$  XIII –  $\frac{1}{2}$  XX, XX (=  $7\frac{1}{2}$ –8 segments) ; intersegmental furrows weak or in XVII–XIX, totally obscured ; setae visible. Prostate pores at mid  $bc$  (relative to adjacent segments) on small round papillae each of which lies on a transversely oval tumescence (porophore) which fills XVII or XIX longitudinally and  $b$  to  $c$  transversely ; a straight or medianly very slightly convex seminal groove connecting the papillae of a side ; the prostatic porophores joined longitudinally by a low tumid area of approximately equal width, a male pore lying in each seminal groove where the latter intersects a transverse cleft which bisects the male field in XVIII. A pair of more or less distinctly visible presetal tumid pads (accessory genital markings) in  $ab$  of XX with lateral extensions to  $c$  lines.

Female pores inconspicuous, near the anterior margin of XIV in  $b$  lines. Spermathecal pores minute sometimes considerable orifices without or, in one specimen, with slightly raised rims, in  $7/8$  and  $8/9$  in or slightly above  $d$  lines.

Last septal glands anterior in VII. Gizzard glossy and globular approximately  $1\frac{1}{2}$  times the width of the preceding oesophagus ; easily compressible, its wall little thicker than that of the oesophagus. Calciferous glands, each with a long somewhat twisted duct which is about as long as the large subspherical sac ; the walls thin and with numerous (approximately 30) thin radial septa of varying lengths, some reaching the centre of the lumen but none uniting across it or with adjacent septa ; lumen ciliated. Intestine beginning in XII. Hearts in X and XI ; thin commissurals in IX. Nephridia not seen anterior to IX ; ducts entering the parietes in  $bc$  nearer  $c$  than  $b$ . Fairly small tonguelike testes and very large iridescent much-convoluted sperm funnels free in X. Seminal vesicles very large, slightly incised, almost smooth-surfaced in IX and XI, the posterior pair the larger.

Prostates with long very muscular, ectally widening ducts which are maximally  $114\ \mu$  wide ; the glandular portions tortuous but not much intertwined extending to XXXII, maximally  $160\ \mu$  wide. Ovaries small with few, large oocytes and small funnels, in XIII. Spermathecae discharging anteriorly in VIII and IX each with a saclike ampulla and spiral or somewhat twisted duct which when extended is as long as or longer than the ampulla ; the terminal region of the duct forming a slight muscular bulbus ; length of right spermathecae, moderately extended 0.82–0.88 mm.



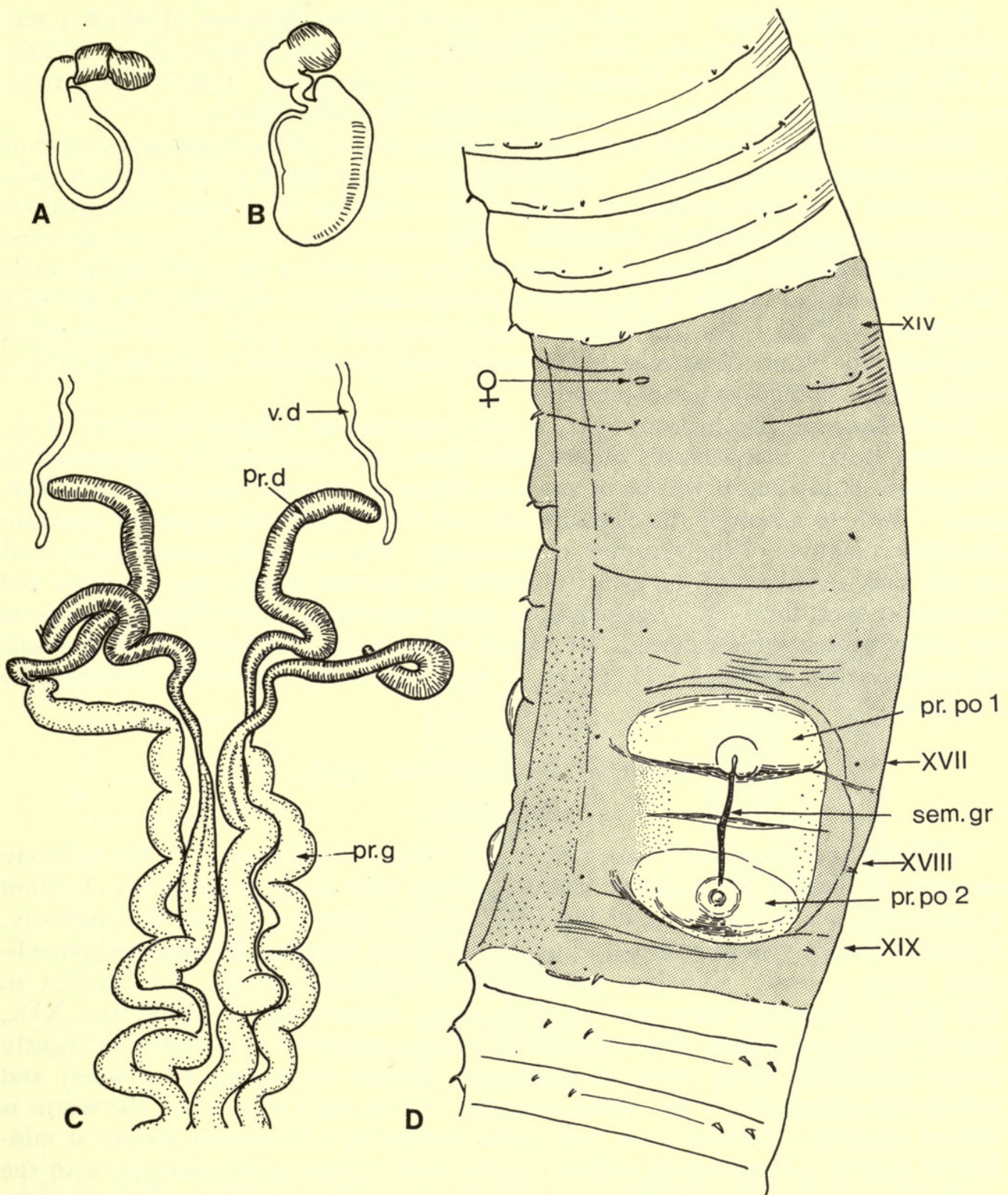


FIG. 1. *Eukerria eiseniana*. Syntype, Torino Museum, ol. 110, ex. 295. A and B, right and left spermathecae respectively of VIII; C, prostates; D, clitellar region.



DISTRIBUTION. Paraguay : Asuncion and Rio Apa (Type localities) and (*hortensis*) Makthlawaiya.

MATERIAL EXAMINED. 5 clitellate syntypes of *Kerria eiseniana*, of which 1 was dissected, Rio Apa, Paraguay, collector Borelli, 1893 ; Torino Museum ol. 110 ex. 295. A clitellate "cotype" of *Kerria hortensis*, Makthlawaiya. B.M. (N.H.) 1930. 7.30 56/66 (the latter specimen is described in the Remarks below).

REMARKS. Rosa observed in *eiseniana* ornamentation of the setae in the form of minute depressions on the tip. The clitellum was considered to be saddle-shaped. The present investigation does not confirm the contiguity of anterior and posterior prostatic porophores which he described. The contorted portion of the spermathecal ampulla described in the type description is here regarded as the ental region of the duct, the terminal bulbus of the present account being the equivalent of the duct described by Rosa. The calciferous glands were said by Rosa to be permeated longitudinally by many parallel blood vessels and the internal lumen to be large ; folding of the lining was not observed.

*Kerria hortensis* Stephenson, 1931, is here regarded as a junior synonym of *K. eiseniana* Rosa. Stephenson's observations have been considerably augmented in the present study and it will be of value to present a separate description of "*hortensis*" both to assemble the characteristics of this entity and to permit separate description (above) of the syntypes of *eiseniana*. The two taxa are sympatric and are the only members of the genus in which the spermathecal pores lie above the dorsalmost setal lines (*d*). Agreement in other respects is correspondingly close as the following description shows. It should be noted that Stephenson's illustrations for *hortensis* (Pl. 17, fig. 8 ; Pl. 18, fig. 9) were incorrectly labelled as pertaining to *E. limosa*.

### *E. hortensis* (Stephenson, 1931)

Fig. 2A-F

l = 35-48 mm, w = 1-1.5 mm, s = 86-91. Slightly epilobous. In the midbody *aa* ca. = *bc*, behind the midbody slightly greater than *bc*, in front of the clitellum 1.3 *bc* ; *dd* : *u* = 0.5 in front of the clitellum, less than 0.5 behind the midbody. Nephropores not visible externally ; nephridial ducts entering the parietes immediately below *c* lines. Clitellum saddle-shaped, XIII-XX (= 8), but thickest in XII-XVI. Prostatic pores post- and pre-setal, respectively, in XVII and XIX, nearer *c* lines than *b* lines, those of a side on a large prominent oblong-oval or slightly dumb-bell-shaped area, which is sufficiently lateral (extending to *d* lines) and sufficiently prominent to be visible, standing out on each side, when the worm is viewed dorsally. Each of these male areas crossed by a transverse groove at mid-XVIII and by a longitudinal seminal groove which connects the anterior with the posterior prostatic pore. Male pores apparently at the junction of the two grooves. Female pores in *b* lines approximately midway between the setal arc and the anterior margin of XIV, round orifices without appreciable lips. Spermathecal pores in 7/8 and 8/9 approximately midway between setae *d* and the dorsal midline, each bounded anteriorly and posteriorly by a strongly protuberant lip.



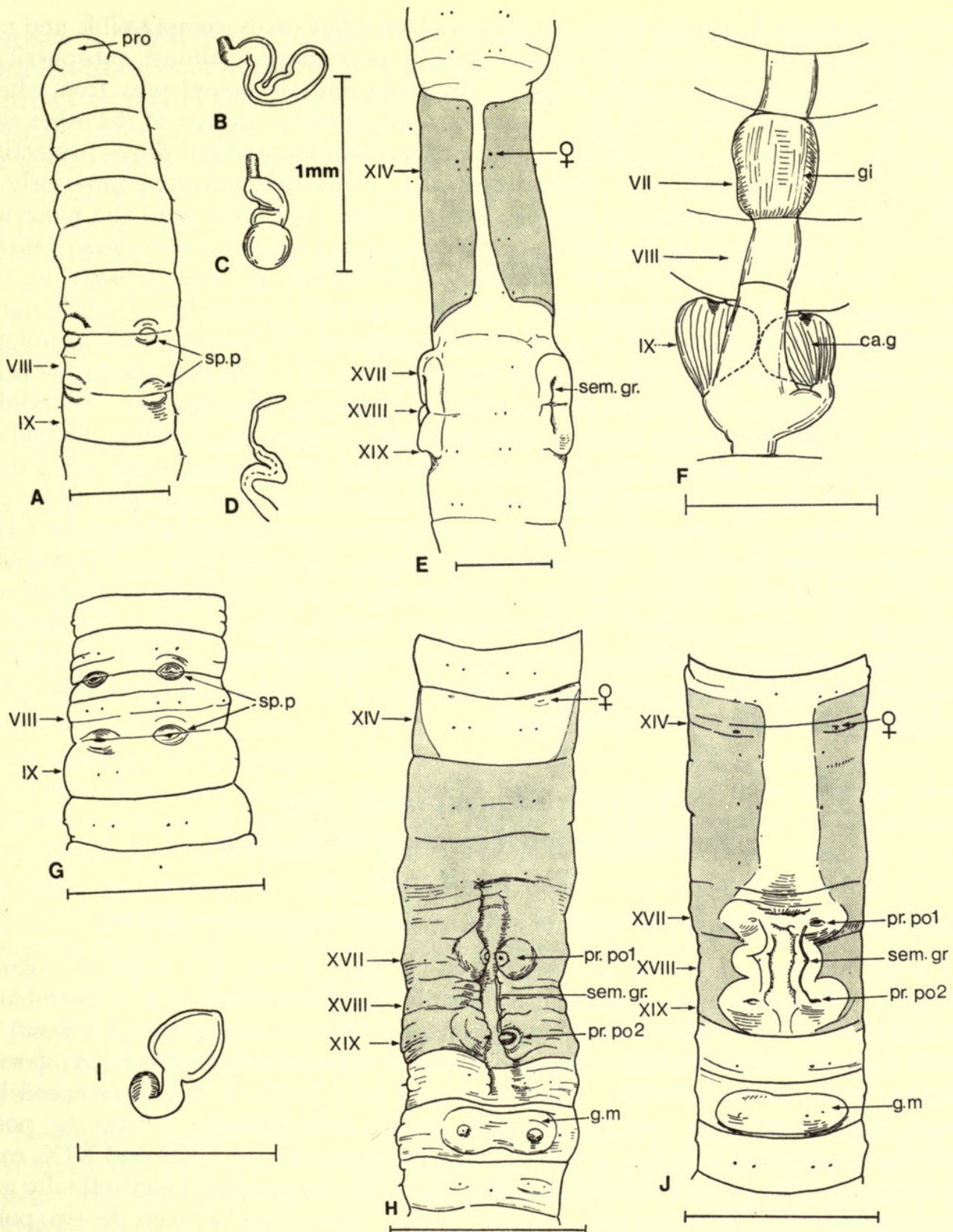


FIG. 2. A-F. *Eukerria eiseniana*. ("cotype" of *E. hortensis*, B.M. (N.H.) 1930.7.30. 56) : A, dorsal aspect showing spermathecal pores ; B and C spermathecae ; D, anterior end of a prostate gland ; E, clitellar region ; F, calciferous glands and gizzard. G-J, *E. kukenthali*, G, Christmas Island specimen, B.M. (N.H.) 1934.3.12.40, dorsal aspect showing spermathecal pores ; H, clitellar region of same ; I, left spermatheca of IX of type-specimen, Hamburg Museum, V. 7188 ; J, clitellar region of cotype of *E. selangorensis*, B.M. (N.H.), 1933.2.14.62.



Gizzard almost twice the width of the oesophagus but easily compressible and not strongly muscular. Calciferous glands stoutly pear-shaped, almost subspherical, with the wide end anterior ; each considerably wider than the oesophagus, from which it arises by a short thick stalk dorsolaterally, and adpressed to that of the other side below the oesophagus; thin walled, with 20–25 narrow longitudinal ridges projecting well into the lumen but not in contact centrally. Intestine beginning anteriorly in XII, with distinct oesophageal valve. Dorsal vessel continued onto the pharynx. Hearts in X and XI large and latero-oesophageal ; in IX smaller and dorso-ventral only. Nephridia with preseptal funnels ; commencing in VI ; present in the spermathecal and gonadial segments. Testes large and tongue-like, funnels much convoluted, free in X. Each vas deferens throughout the length of XI forming a wide, gently curved seminal reservoir tapering from the funnel ; seminal vesicles small, in XI only (in IX also in a sectioned specimen, Stephenson). Glandular portions of the prostates much intertwined and irregularly winding, extending posteriorly through several segments ; ducts abruptly demarcated, about one-fourth the width of the glandular portions and about the length of a segment, lacking a muscular sheen. Ovaries well developed, with several united egg strings, in XIII. Ovisacs apparently absent. Spermathecae tubular, the ental portion being somewhat but not much wider than the rest, there being no sharp distinction between one part and the other. A short terminal portion, which may be called the duct, is however, narrow and muscular. Length of two spermathecae, *in situ*, 0.6 mm of which about one fifth comprises the muscular duct. The spermatheca is strongly bent on itself at about the middle of its length.

*Eukerria garmani* (Rosa, 1895)

*Eukerria garmani garmani* (Rosa, 1895)

Fig. 3 A–E, 10B

*Kerria garmani* Rosa, 1895a : 2 ; 1895b : 139, Pl. fig. 14, 15 ; Michaelsen, 1900 : 371.

$l = 56$  mm,  $w = 1.3$  mm,  $s = 124$ . (50–55 mm, 1 mm, 150 segments (Rosa, 1895b) ). Proepilobous (1 specimen) to broadly epilobous, closed  $1/3$  (2 specimens). In XII,  $aa : ab : bc : cd : dd = 5 : 1 : 5 : 1 : 13$  ;  $dd : u = 0.41$  ( $aa < bc$ ) (Rosa) ) ; Setae  $b$  absent in XVII–XIX ; setae  $a$  present or sporadically absent Nephropores? Clitellar limits indeterminable. (Saddle-shaped on  $\frac{1}{2}$  XIII– $\frac{1}{2}$  XX interrupted between the ventral setae and by the male genital field (Rosa) ). Prostatic pores minute, at approximately  $\frac{1}{4} bc$  above  $b$  lines, and equatorial, in XVII and XIX, each on a large porophore, widest longitudinally which fills its segment longitudinally and impinges onto XVIII so that only a small “waist” intervenes between the two porophores of a side ; each porophore inflated or depressed and auricular ; the lateral borders of the porophores, reaching approximately to  $\frac{1}{2} bc$ , well defined, the median borders, in  $b$  lines, indistinct. Male pores minute, at the sites of the absent setae  $b$  of XVIII, the narrow distinct seminal grooves running almost straight and medianwards to them from the prostatic pores of the corresponding side ; each groove bounded laterally, between the porophores, by a wide low, tumid border. The entire ventral



surface in XVII–XIX, between the prostatic porophores may be elevated as a cushion-like area of which the porophores form the rounded corners. Intersegmental furrows 17/18 and 18/19 obscured ; those on the remainder of the clitellum visible. Female pores inconspicuous, near the anterior border of XIV, immediately lateral of (or in (Rosa) ) *b* lines. Spermathecal pores elliptical white areas, approximately the width of a setal couple, with their median limits at mid *bc* (centres a little median of the dorsal setae (Rosa) ). Accessory genital markings : an indistinct midventral tumescence in XIII, filling the presetal region longitudinally and laterally extending to *a* lines (3 specimens).

Last septal glands in VII. Gizzard almost unrecognizable, the oesophagus elongated in VII but its walls transparent and only a little thicker than those of the oesophagus in VIII (the musculature comprising  $\frac{3}{4}$  of the total thickness of the walls (Rosa) ). Calciferous glands arising ventrolaterally from the oesophagus. (In the single specimen examined that on the right is a rudimentary, broadly digitiform diverticulum lying parallel to and lateral to the oesophagus and reaching anteriorly only to  $\frac{1}{2}$  IX from septum 9/10 whereas that on the left fills the segment longitudinally lying beneath and projecting laterally beyond the oesophagus). Intestine originating anteriorly, and with abrupt expansion, in XII ; typhlosole absent. Hearts in X and XI ; slender commissurals in IX ; supra-oesophageal vessel seen in XI. Testes narrow, tongue-like ; sperm funnels iridescent ; free. Seminal vesicles in IX and XI very large, each deeply dissected into several distinct lobes which are themselves lobulated ; approximately equisized in the two segments. Prostates ending in XXXVII (passing at least to XXVIII (Rosa) ), coiling in the first few segments and then running almost straight ; their ducts ca. 1 mm long reaching a maximum width, near their ectal ends, of 115  $\mu$ , demarcated from the glands by their muscular sheen, the ducts and glands narrower at their junction. Ovaries broadly paddle-shaped ; funnels small ; ovisacs absent. Spermathecae each more or less contorted, with an irregular saclike ampulla constricted off from a shorter duct which consists of an ectal muscular portion and an ental inflated portion which might be considered part of the ampulla ; total length (a right spermatheca of VIII) 0.97 mm.

DISTRIBUTION. Central Paraguay.

MATERIAL EXAMINED. Several syntypes of which three have the male fields developed, all badly softened, Central Paraguay, collector Borelli, 1893 ; Torino Museum, ol. III, Ex. 293.

REMARKS. Rosa (1895b) observed ornamentation of the setae in the form of semilunar depressions near the tip, larger but less numerous than those in *E. papillifera*. His description of the male genital field applies well to the specimen here illustrated in fig. 3A though anterior and posterior porophores are not contiguous in the latter, but does not cover all variations. The statement that the intestine commences in XIII is not confirmed. His interpretation of the form of the spermathecae agrees in essentials with the author's though he did not recognize the existence of a distinct duct. It was as follows: the spermatheca is large, sessile, without diverticula and each forms a large tube contorted into a spiral, a slight constriction permits recognition of two chambers of which the first, which is the shorter, has a columnar



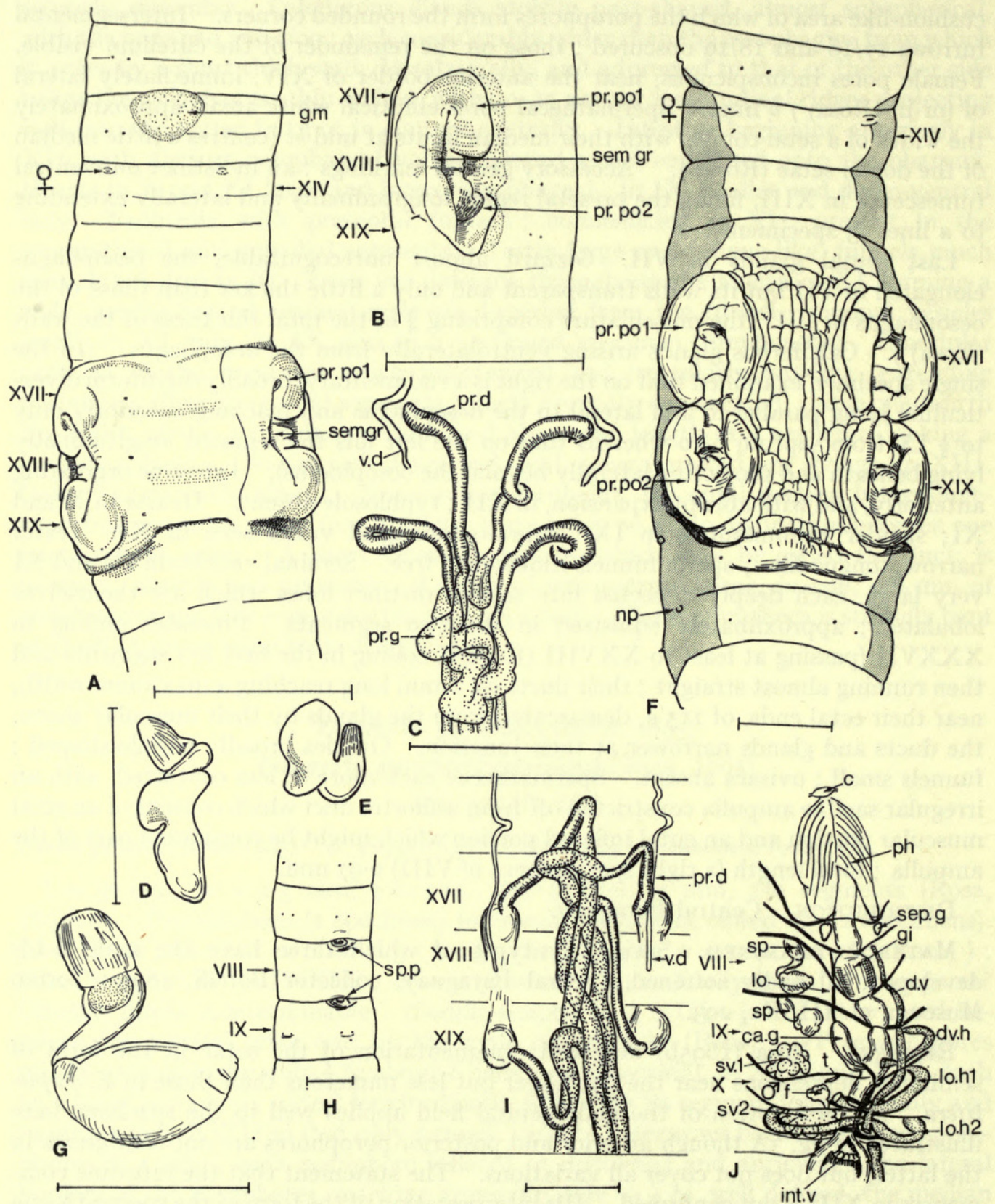


FIG. 3. *Eukerria garmani*. A-E, syntypes, Torino Museum, ol. III, ex. 293: A and B, genital regions of two syntypes; C, prostates; D and E, right spermathecae of VIII and IX respectively, of latter specimen. F-J, *E. garmani argentiniae* subsp. nov., holotype, B.M. (N.H.) 1949.3.1.1165: F, clitellar region; G, spermatheca; H, spermathecal pores; I, prostates; J, anterior dissection.



epithelium higher and more regular than that of the second chamber of which the walls are more glandular. The first chamber tapers gradually without differentiation of a duct, to the external aperture; the part nearest the body wall being invested in a strong muscular sheath.

Poor preservation has prevented description of the nephridia.

***Eukerria garmani argentinae* subsp. nov.**

Fig. 3 F-J

l = 62-136 mm (14 clitellate specimens). Indistinctly epilobous, open,  $\frac{1}{2}$ . In XII,  $aa : ab : bc : cd : dd = 3 : 1 : 3.5 : 1 : 9.25$ ,  $dd : u = 0.40$  (1 specimen); ventral setal couples obscured (absent?) in XVII-XIX. Nephropores not generally visible but evident on the clitellum as white circular prominences, anterior in their segments and a little above mid  $bc$ . Clitellum saddle-shaped,  $\frac{1}{2}$  XII-XXI, best-developed in XIV-XX, ventral margins shortly above  $b$  lines. Prostatic pores shortly lateral of  $b$  lines at the depressed puckered centres of very large inflated, longitudinally oval porophores, those of XVII contiguous with those of XIX, the rims of the porophores interrupted or lower at the region of contact. No definite seminal grooves present but the internal, median margin of the rims probably functioning as such. Male pores (from internal examination) in XVIII, intermediate between and in the same line as the prostatic pores. The area between the porophores tumid, pleated and reticulated from shortly behind the setal zone of XVI to shortly in front of the setal zone of XX; intersegmental furrows 16/17-19/20 obscured; those on the remainder of the clitellum visible. Female pores inconspicuous transverse slits with slight, parallel lips, near the anterior border of XIV, immediately lateral of  $b$  lines. Spermathecal pores fairly conspicuous elliptical clefts in  $c$  lines. Accessory genital markings (14 specimens) absent.

Last septal glands in VI. Gizzard in VII, about twice the width of the preceding oesophagus. Calciferous glands fusiform. Intestine commencing anteriorly in XII. Dorsal vessel traceable to anterior VII only; hearts of IX dorsoventral, of X and XI latero-oesophageal; no preceding commissurals recognizable; supra-oesophageal vessel arising by a vessel from each calciferous gland and ending by bifurcation to the hearts of XI; latero-oesophageal (extra-oesophageal) vessels a pair running median to the hearts, traced from anterior VII to the anterior poles of the calciferous glands; subneural vessel absent. First detectable nephridia rudimentary in XI; well developed in XII posteriorly, with large preseptal funnels; ducts slender, avesculate. Testes, funnels and sperm masses free in X, the vas deferens swollen in XI behind each funnel; seminal vesicles racemose in IX and XI. Prostates similar to those of the nominate subspecies but small indistinct bursae visible internally corresponding with the prostatic porophores. Ovaries very large and much branched, in XIII; ovisacs absent. Spermathecae with ovoid to subspherical ampulla and narrow duct of approximately the same length, a short terminal portion of which is widened and has a muscular sheen; the duct twisted axially through half to a whole turn.

DISTRIBUTION. Argentina.



MATERIAL EXAMINED. Syntypes : 14 clitellate specimens of which 2 were dissected, Loreto, Argentina, collector L. Černosvitov, 27.x. 1931, B.M. (N.H.), 1949.3.1. 1165-1194, labelled by Černosvitov "*Kerria (eiseniana* var.?)".

REMARKS. The constant absence of the median accessory genital marking in Argentinian specimens is here tentatively considered to merit subspecific distinction from Paraguayan specimens. Černosvitov's queried identification of the Argentinian specimens as *eiseniana* is contraindicated by the location of the spermathecal pores which are dorsal to *d* lines in *eiseniana*. It, nevertheless, reflects the similarity between the latter species and *garmani*.

***Eukerria halophila* (Beddard, 1892)**

Fig. 9A

*Kerria halophila* Beddard, 1892 : 355, Fig. 1, 2 ; Beddard, 1895 : 556 ; Michaelsen, 1900 : 370.

$l = 25-38$  mm,  $w = 1$  mm,  $s$  ? Setae closely paired and unmodified throughout ; persistent on the genital segments. Clitellum annular, XIV-XIX. Prostatic pores on the summit of elevations ; the anterior pores a little anterolateral to setae *b* of XVII ; the posterior pores slightly behind the ventral setae of XIX ; male pores in the setal zone and lateral to *b* of XVIII. (This textual distribution differs from Beddard's illustration in which anterior prostatic pores are postsetal and very slightly lateral to *b* lines of XVII and posterior prostatic pores are presetal in *a* lines of XIX ; and the male pores are lateral to setae *b* of XVIII). Female pores on XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, in *ab* lines.

Gizzard well developed, in VII. Oesophageal diverticula with much folded internal walls, in IX. Intestine commencing in XIII. Nephridia present in the genital segments. Prostates fairly wide ; extending through several segments bent or recurved once ; with narrow muscular duct about one fourth the length of the glandular part ; the latter with a single layer of cells. Testes and very large sperm funnels free in X. Sperm sacs in X and XI, "partially involve" the testes and sperm funnels. Oviducal funnels and large ovaries in XIII ; ovisacs absent. Spermathecal ducts about  $\frac{1}{4}$  the length of the large ampulla in VIII and IX ; adiverticulate.

DISTRIBUTION. South America : upper reaches of the Pilcomayo River in exceedingly salt, bitter water.

REMARKS. No specimens of this species are traceable.

***Eukerria kukenthali* (Michaelsen, 1908)**

Fig. 2G-J, 9B-D

*Kerria kukenthali* Michaelsen, 1908 : 24 ; Michaelsen, 1935 : 102.

*Kerria selangorensis* Stephenson, 1931 : 279, Fig. 8.

*Eukerria peguana* Gates, 1942 : 67.

*Eukerria asilis* Righi, 1968 : 180, Fig. 1-5.

$l = 20-70$  mm,  $w = 0.7-1.2$  mm,  $s = 105-142$ . Prolobous, proepilobous, or indistinctly epilobous. In the forebody  $aa = 0.75-1$  *bc* and more or less than 3 *ab* ;



$ab = cd$  ;  $aa : ab : bc : cd : dd = 4.5 : 1 : 5.8 : 1 : 16$ , in the midbody,  $= 3.4 : 1 : 3.8 : 1 : 12.2$ , in the hindbody ;  $dd : u = 0.42-0.44$  ( $-0.5?$ ). Nephropores externally unrecognizable. Clitellum saddle-shaped (?), XIII,  $\frac{1}{2}$  XIII,  $1/n$  XIII, XIV-XIX,  $1/n$  XX, interrupted (or merely weaker?) in  $aa$  ; ventral setal couples are present throughout but may be obscured in XVII and XIX. Prostatic pores slightly lateral of setae  $b$ , though often appearing median of  $b$  lines of segments beyond the limits of the male field owing to contraction of the field with formation of a more or less deep midventral trench which may extend into XVI and XX. Each prostatic pore on a porophore, the median margin of which is in  $a$  lines and which does not completely fill its segment longitudinally. Male pores slightly lateral of setae  $b$  in seminal grooves, with tumid margins, which connect the anterior and posterior prostatic pores and may be straight or variously bent according to the state of contraction. A sucker like or raised glandular (?) area present midventrally in XXI, almost filling the segment longitudinally and extending laterally of the ventral setal couples the sites of which may be occupied by a papilla on each side and which may be obscured. This genital marking occasionally developed on one side only or absent. Female pores paired, near the anterior margin of XIV, slightly lateral of  $b$  lines. Spermathecal pores paired in  $7/8$  and  $8/9$ , in  $ab$  lines, each surrounded by a transversely elliptical field which may be somewhat raised, and may fuse with that of the other side.

Septal glands mostly in V ; some in VI or even in VII. Gizzard, in VII, not or only a little wider than the oesophagus, soft, but with muscular layer as much as twice as thick as that of the oesophagus. Calciferous glands pear-shaped, arising ventrolaterally (or laterally?) by short, slender stalks ; central cavity small and irregular, with an epithelial lining of its own, about  $1/3-1/4$  of the width of the sac ; blood channels running longitudinally in the thick walls, with, between them rows of cells penetrated by numerous intracellular canaliculi. Intestine commencing in XII (or XIII?). Preseptal nephridial funnels vestigial? Latero-oesophageal hearts in X and XI ; commissures in IX heartlike but only dorso-ventral. Testes and funnels free, in X. Seminal vesicles racemose, in IX and XI. Prostates attaining a length of at least 6 mm, closely and irregularly wound, extending through several (as many as 10) segments posteriorly ; glandular part  $65 \mu$  wide ; duct lacking muscular sheen,  $\frac{1}{2}-1$  mm long,  $35 \mu$  wide widening to  $55 \mu$  and becoming more muscular before penetrating the parietes. Genital marking glands stalked, coelomic and tubular ; the duct as long as but slenderer than that of the prostate, translucent and sinuous ; the gland  $0.5-1.5$  mm long and much slenderer than the prostate. Ovaries and funnels in XIII. Spermathecae two pairs, entally swollen to form an ampulla equal to or one third of the length of the more or less distinctly demarcated narrower duct. The ampulla sometimes subdivided by folding and in some cases forming a diverticulum-like outpouching. The entire spermathecae bent and twisted ; its length (not extended) ca.  $0.3$  mm.

DISTRIBUTION. Peregrine on banks of or in streams. West Indies : St. Thomas. Malaya : Selangor (banks of Batu Caves River). Christmas Island (near Java). Burma : Rangoon ; Kungyangon, Thongwa ; Moulmeia ; Wanetchaung ; Myaungmya ; Ptinmana. Brazil : Marajo Island.



**MATERIAL EXAMINED.** 1 dissected, clitellate type-specimen, St. Thomas, collector Hartmeyer ; Hamburg Museum, V. 7188. 3 clitellate specimens, Christmas Island, Indian Ocean, from banks of a small stream on terraces, collector J. Harrison, 21. i. 1933 ; B.M. (N.H.), 1934. 3. 12. 40/42. Several clitellate "cotypes" of *Kerria selangorensis*, Batu Caves River, Selangor, B.M. (N.H.), 1933. 2. 14. 62/67.

**REMARKS.** Re-examination of the Christmas Island specimens has revealed the presence of an accessory genital marking in segment XXI which was overlooked by Michaelsen. A marking is not visible in the type-specimen of *kukenthali* but comparison with the Christmas Island specimens gives no reason to doubt Michaelsen's identification of the latter with *kukenthali*. Such a marking is characteristic of *E. asilis* Righi, 1968, the anatomy of which corresponds sufficiently closely with that of *kukenthali* to leave no doubt of its synonymy with the latter. The same genital marking has been observed in a re-examination of the types of *E. selangorensis*, confirming union of this species with *kukenthali* by Michaelsen (1935).

The discovery of genital markings in XXI in *E. kukenthali* also removes the grounds for recognizing *E. peguana* Gates, 1942, which agrees in all respects with *E. kukenthali*. Rounded protuberances from the prostatic porophores observed on re-examination of the Christmas Island material of *kukenthali* are presumably the "clear glands" described by Gates.

### ***Eukerria limosa* (Stephenson, 1931)**

*Kerria limosa* Stephenson, 1931 : 312, Pl. 17, fig. 7.

l = 20–28 mm, w = 0.7 mm, s = 95–127. Almost tanylobous. In the anterior segments  $aa = 2\ bc$  elsewhere smaller but always  $> bc$  ;  $cd$  lateral,  $dd : u$  nearly 0.5. Clitellum XIII or  $\frac{1}{2}$  XIII–XX. Prostatic pores immediately lateral to setae  $b$ , on XVII and XIX, on round papillae, which are separated, longitudinally, by a space of equal width. Seta  $a$  or  $b$  sporadically absent in XVII and XIX ;  $b$  may be absent in XVIII. Male pores, not externally visible, on XVIII midway between the prostatic pores slightly lateral of  $b$ . Seminal grooves not recognizable. Spermathecal pores in 7/8 and 8/9 approximately midway between  $b$  and  $c$  lines.

Pharyngeal glands ending in VII. Gizzard small, in VII, oesophageal musculature there considerably increased but diameter not greatly. Calciferous glands originating posteriorly in IX ; lumen slitlike ; the very thick wall honeycombed by numerous blood spaces separated by stout trabeculae and confluent posteriorly to become fewer and larger. Last hearts in XI. Testes and funnels free in X. Seminal vesicles in IX and XI. Vasa deferentia not terminally thickened. Prostates passing gradually into muscular ducts about 200  $\mu$  long which discharge through cushion like thickenings ; terminal bursae absent. Spermathecae with ental portion tubular and twisted, with narrow lumen 6–8  $\mu$  or less in diameter ; further ectally a sharply demarcated portion with irregular cavity 20–28  $\mu$  in diameter and, finally, a short duct which has an extraordinarily thick muscular sheath ; diameter of spermatheca 34  $\mu$  in the ental tubular portion ; 70  $\mu$  in the ectal, swollen region.

**DISTRIBUTION.** Paraguay : Makthlawaiya (mud of shallow pools after rain).



REMARKS. The "cotypes" of this species in the British Museum (1930. 7. 30. 7/13) are all that the author has been able to trace. All are immature or lack the anterior and genital regions.

***Eukerria mcdonaldi* (Eisen, 1893)**

Fig. 9E-F

*Kerria mcdonaldi* Eisen, 1893 : 294, Pl. XI, fig. 1-6, 8-10, Pl. XII, fig. 13-27 ; Eisen, 1900 : 135 ; Michaelsen, 1900 : 372.

?*Kerria zonalis* Eisen, 1893 : 311, Pl. XI, fig. 7, 11, 12, Pl. XII, fig. 28-30. Michaelsen, 1900 : 372.

l = 25 mm, w = "1 line". All setae present in XVII-XIX, but setae *ab* here 1/3 smaller and slightly wider than other setae. Most setae with minute cicatricing at the free ends. Clitellum saddle-shaped, XIII-XX. Male genital field a raised area on each side of the ventral midline, separated by a cylindrical cavity crossing XVII-XIX ; this cavity bridged internally by arciform muscles. Prostatic pores paired in the setal zones of XVII and XIX shortly lateral of setae *b* ; male pores paired in XVIII, each on a small papilla, immediately lateral of setae *b* and therefore slightly median of the prostatic pores. Seminal groove on each side connecting the prostatic pores and curving slightly medially but deflecting a little laterally to skirt the male pore which it does not include. The prostatic pores lying on transversely oblong papillae which are thicker laterally. These papillae and the body wall medial of the seminal groove forming an approximately crescent shaped genital zone on each side. Female pores in front of setae *ab* of XIV. Spermathecal pores paired, in 7/8 and 8/9, or in 8/9 only, in *cd* lines.

Last septal glands in VII ; oesophagus in ½ IV to anterior XII, gizzard very rudimentary in VII. Calciferous glands arising from the oesophagus anteriorly in IX ; hidden by the oesophagus in dorsal view ; each rounded and blunt, with a single internal cavity with large projecting ridges and traversed by longitudinal blood vessels. Intestine commencing abruptly, anteriorly in XII. Gut highly vascularized in XI-XX. Hearts in X and XI. Nephridia commencing in IV ; with peritoneal cells in IX posteriorly ; ducts avesculate. Testes and large sperm funnels in X ; unpaired (?) "sperm sacs" or "sperm masses" in X and XI ; seminal vesicles absent from IX. Vasa deferentia superficial on the parietes and very tortuous, ending at the male pores, in XVIII, without terminal dilatation. Exceptionally with a second pair of sperm funnels in XI, and additional seminal vesicles in XII ; the anterior pair of sperm ducts opening adjoining the anterior prostatic pores in XVII, the posterior pair at the male pores in XVIII. Prostates 2 pairs (abnormally double on each side) much bent, when extended about as long as the width of a segment ; glandular part of the anterior and posterior prostates about three times and five times as long respectively as the muscular duct ; ducts of the anterior much narrower than those of the posterior pair ; neither with terminal expansion. Ovaries (palmate) and funnels in XIII ; ovisacs absent. Spermathecae with large, saclike ampulla and narrow tubelike duct, and usually, at their junction, with a diverticulum which is 3-lobed ; spermatozoa stored in the ampulla, not in the diverticula ; the



ampulla usually bent on the duct. The anterior spermathecae usually smaller, never larger, than the posterior pair. Spermatophores [?] paddle-shaped.

DISTRIBUTION. Baja California : Miraflores near San Jose del Cabo (In mud) ; Cape Region (a pond near Santa Ana).

REMARKS. *E. zonalis* agreed with *E. mcdonaldi*, with which the single specimen was collected, in lacking a gizzard, in the location of spermathecal, male and prostatic pores and in the possession of spermathecal diverticula and according to Eisen "much resembles" *E. mcdonaldi*. Differences from *mcdonaldi* were persistence of setae *b* in XVII and XIX, absence of spermathecae from VIII and duplication of the prostate glands on each side. On the whole resemblance to *mcdonaldi* is so close, even to the most unusual possession of spermathecal diverticula, and the chief difference, duplication of the prostate, is so clearly an abnormality that *zonalis* is here regarded as a junior synonym.

Elsewhere in the Ocnerodrilinae spermathecal diverticula are seen only in *Pygmaeodrilus*. There, however, they store sperm as is usual in the megascolecoids.

The presence in *E. mcdonaldi* of "sperm sacs" in X and XI (Eisen, 1893) was subsequently denied (Eisen, 1900). In the latter account there were said to be only "sperm masses", in X and XI. It seems likely that there were free sperm masses in X and seminal vesicles in XI.

### *Eukerria papillifera* (Rosa, 1895)

Fig. 9G

*Kerria papillifera* Rosa, 1895a : 3 ; Rosa, 1895b : 145, Pl. fig. 19-21 ; Michaelsen, 1900 : 370.

l = 55-60 mm, w = 2 mm, s = 140. Epilobous. *aa* somewhat smaller than *bc*. Setae ornamented distally by 4-5 longitudinal rows of arcuate depressions. Clitellum saddle-shaped, XIII-XIX, interrupted in *aa* and by the male field. Prostatic pores in *ab* lines on minute papillae in sucker-like depressions on large dome-shaped papillae. Seminal grooves absent. Male pores in XVIII in line with the prostatic pores. Ventral setae present on XVIII, absent from XVII and XIX. 3 unpaired midventral genital papillae in the posterior halves of XIV, XV and XVI. Spermathecal pores large, in setal lines *b*, with tumid lips.

Gizzard absent. Calciferous glands round-based cones. Testes? Prostates tortuous or straight, extending through as many as 20 segments; ducts about 3 segments long each opening through a muscular copulatory sac. Posterior pair of spermathecae larger than the anterior ; ampulla oval, wider anteriorly, with short, wide, sharply demarcated duct, without diverticula.

DISTRIBUTION. Central Paraguay.

REMARKS. Two specimens in Torino Museum (ol. 113, ex. 289) collected by L. Borelli in Central Paraguay, are presumably syntypes but neither possesses the clitellar end.



*Eukerria pascuorum* (Stephenson, 1931)

*Kerria pascuorum* Stephenson, 1931 : 316. Pl. fig. 10.

$l = 33-60$  mm,  $w = 0.8$  mm,  $s = (110?) - 144$ . Prolobous. Setae :  $aa = 3$   $ab = bc$  ;  $ab = cd$  ;  $dd : u = 0.5$ . Clitellum saddle-shaped, XIV-XX and (sections) the greater part of XII. Prostatic pores on XVII and XIX in  $bc$ , nearer  $b$  than  $c$  lines, on small porophores which are carried on moderately large, conspicuous papillae twice as long as wide, occupying the length of their segments and a little of XVIII ; a small part of XVIII equal to the diameter of a papilla intervening between the papillae of a side ; seminal grooves straight. Male pores (in sections) intermediate between and in line with the prostatic pores. Ventral surface of XVIII sometimes tumid. Spermathecal pores (from sections) in  $7/8$  and  $8/9$  in  $c$  lines.

Last septal glands in VII. A moderate gizzard, with thick walls, but not much wider than the oesophagus, in VII. Calciferous glands arising posteriorly in IX ; pear-shaped with broad end anterior ; lumen slit-like or star-shaped, walls honey-combed as in *limosa*. Last hearts in XI. Testes and funnels free in X ; seminal vesicles in IX and XI lobulated or racemose. Prostates extending posteriorly through several segments ; duct equal in diameter to glandular part but muscular. Walls of glandular part one cell thick. Duct equal to or a little more than a segment in length, widening close to its termination at the surface of its porophore but lacking a terminal bursa or special muscular investment. Spermathecal ampulla elongated-ovoid or cylindrical ; sometimes bent on itself and sometimes constricted at the bend ; duct short but so muscular as to equal ampulla in width.

DISTRIBUTION. Paraguay : Makthlawaiya (Mud of ponds in pasture).

MATERIAL EXAMINED. 3 syntypes, immature or lacking the anterior and genital region, excluded from the above description ; B.M. (N.H.), 1930. 7. 30. 51/53.

REMARKS. Distinctions from the sympatric *E. limosa* are few and of doubtful importance. The small lumen of each calciferous gland and the more ventral location of the spermathecal pores appear to separate both species from the otherwise rather similar *E. eiseniana*.

*Eukerria rosae* (Beddard, 1895)

Fig. 4A-F

*Kerria rosae* Beddard, 1895 : 224 ; Beddard, 1896 : 41 ; Michaelsen, 1900 : 372 ; Pickford, 1928 : 381, Fig. 5.

$l = 25-35$  mm,  $w = 1-1.2$  mm,  $s ?$ . Setae closely paired ; in segment XII  $aa : ab : bc : cd : dd = 2.8 : 1 : 3.4 : 0.81 : 10.6$  ;  $dd : u = 0.45$  (1 type-specimen, B. M. (N.H.)) ; setae  $a$  present on the male field,  $b$  present or absent. Nephropores conspicuous small papillae anteriorly in their segments about  $1/3$   $bc$  below  $c$  lines or (Hamburg material) not visible. Clitellum imperfectly developed. Prostate pores on small papillae nearer  $b$  than  $c$ , on XVII and XIX, each surrounded by a low, laterally elevated auricular lobe limited to its segment ; the 2 pores of a side connected by a seminal groove which is only slightly bent medianwards, and is bordered by slightly



tumid ridges. Male pores not externally apparent, from internal examination, in the seminal grooves at mid XVIII. Female pores on small circular papillae anterior in XIV, slightly lateral of *b* lines. Spermathecal pores inconspicuous, bordered anteriorly and posteriorly by slight ridges or on small papillae, about one-third *bc* below setal lines *c*.

Last septal glands in VII. Gizzard barely twice the width of the oesophagus but

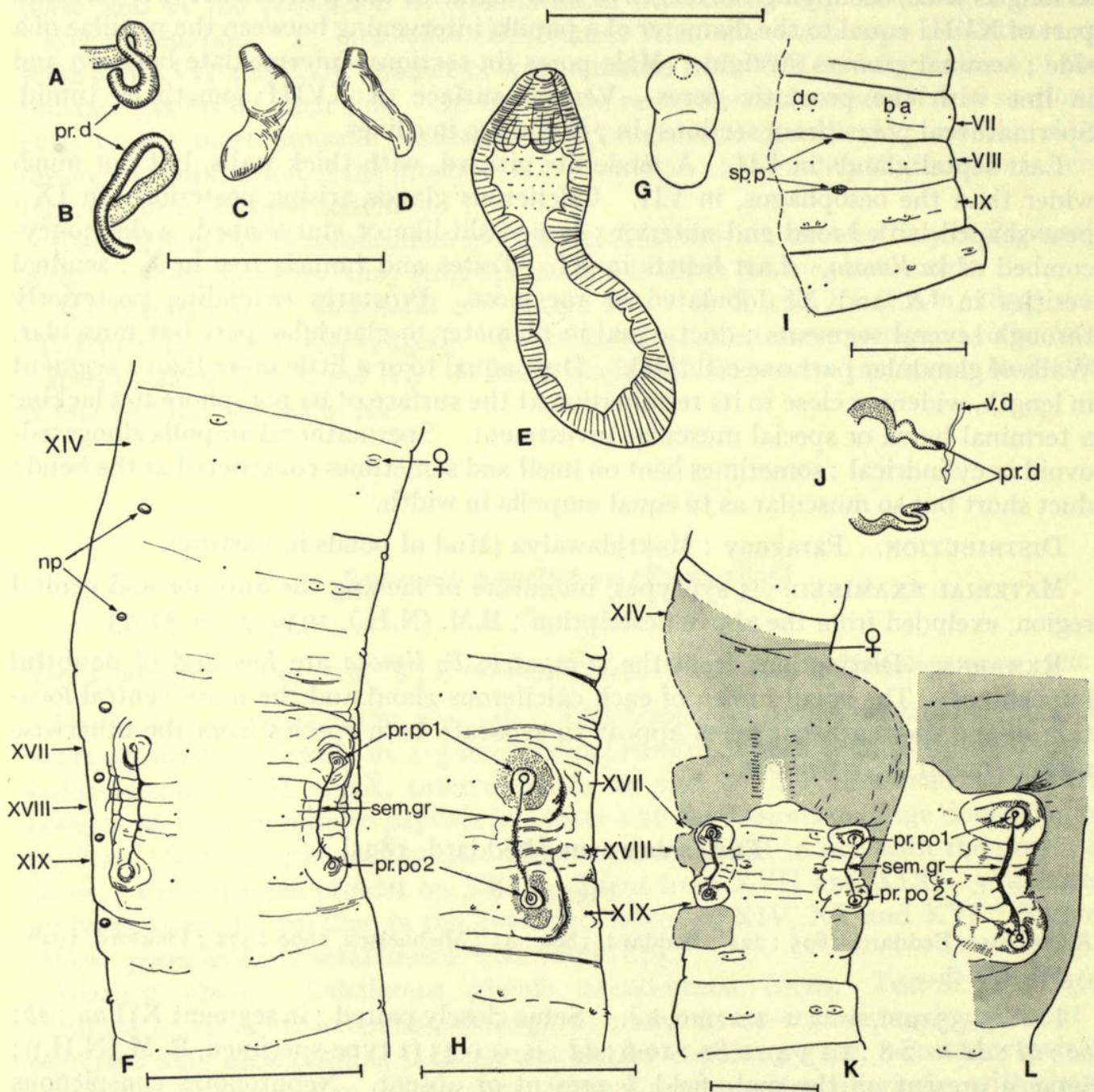


FIG. 4. A-F. *Eukerria rosae*, syntype, B.M. (N.H.), 1904.10.5. 929 : A and B, right anterior and posterior prostates ; C and D, left posterior and right anterior spermathecae respectively ; E, former spermatheca cleared (freehand) ; F, male genital field. G-H, syntype, Hamburg Museum, V. 4103 : G, left spermatheca of VIII ; H, male genital field of left side of same. I-L, *E. saltensis*, syntype, B.M. (N.H.), 1904.10.5 928 : I, spermathecal pores ; J, prostates ; K, clitellar region ; L, left side of same.



firm and thickly muscular. Calciferous glands almost sessile stoutly pear-shaped, broad end anterior, adpressed medianly below the oesophagus beyond which they project laterally. The walls of each pouch fairly thick, permeated by blood vessels, and projecting in places as folds into the lumen. Intestinal origin in XII; oesophageal valve well developed at approximately  $\frac{1}{2}$  XII. Typhlosole absent. Last hearts, in XI, exceedingly large, those in X less so. Nephridia avesiculate, the first in VII. Proandric; sperm funnels multilocular, in X; seminal vesicles in IX and XI; sperm ducts slightly widened in XI. Prostates extending posteriorly into XXIII. Glandular parts exceedingly long; except ectally, thread-like and much coiled and mutually entangled; maximally  $90\ \mu$  wide. Ducts muscular and glossy, gently curved or strongly sigmoid,  $40\text{--}90\ \mu$  wide and approximately  $0.7\text{ mm}$  long; lacking terminal expansions. Spermathecae  $0.6\text{--}0.7\text{ mm}$  long; the duct muscular, approximately one sixth of the length of the ampulla. Ampulla digitiform, wider ectally.

DISTRIBUTION. Argentina: Buenos Aires (Barracas do Sul, under stones, on the banks of a river).

MATERIAL EXAMINED. 5 semimature syntypes, Buenos Ayres, Beddard collection, B.M. (N.H.) 1904. 10.5. 929/33. Many semimature syntypes, Buenos Ayres, "Barracas d. Sul, Fluss Ufer" collector Michaelsen, 26. VII. 1893, Hamburg Museum, V. 4103.

REMARKS. Re-examination of the specimens in the British Museum permits the above very considerable extension of previous accounts. *E. rosae* is morphologically and probably cladistically very close to *E. saltensis* but is clearly distinguished by the very short spermathecal ducts and ectal widening of the ampullae. Conspicuous nephropores distinguish the British Museum material from *E. saltensis*, in which none of the many specimens which have been described possessed visible pores, but nephropores are not recognizable in the many Hamburg Museum specimens. As the specimens in both museums are labelled as types it seems possible that differences in the method and condition of preservation have resulted in the difference in visibility of the pores.

Only a brief examination of the Hamburg specimens has been possible, little being observed beyond the form of the spermathecae, wider ectally than entally with an extremely short duct, and the form of the male genital field.

### *Eukerria rubra* (Friend, 1916)

*Kerria rubra* Friend, 1916: 147, Fig. 1-6.

l =  $38\text{ mm}$ , w =  $2\text{ mm}$ , s = 90. Setae: *dd* less than  $0.5\ u$ . Clitellum saddle-shaped, XIII-XX. Prostatic papillae inconspicuous, on XVII and XIX. Male pores on XVIII, not in line with the prostate pores. Spermathecal pores 2 pairs, in  $7/8$  and  $8/9$ , in *cd* lines (also said to be immediately below *c*).

Septal glands extending between IV and VIII. Gizzard absent. Calciferous glands pear-shaped, arising laterally and disposed ventrolaterally; apparently with



a rather narrow lumen and thick walls. Intestinal origin in XII. Nephridia commencing in VII ; absent from segments XI and XIV. Testes and funnels (free?) in X ; seminal vesicles in IX and XI. Vasa deferentia apparently lacking terminal dilatation. Prostates with glandular part lined by a single layer of cells, extending at least to XXI ; ducts short, approximately equal in length to a segment ; lacking terminal bursa. Ovaries and funnels in XIII ; ovisacs in XIV. Spermathecae "pear or bottle-shaped" with slightly swollen ampullae ; and slightly longer, fairly sharply demarcated, tubular ducts about half as wide.

DISTRIBUTION. Focus of endemicity unknown. Type-locality the Lily House, Oxford Botanical Garden, England, "in oozy mud which surrounded the plants on one side of the tank".

REMARKS. The description of this species, specimens of which are no longer traceable, is inadequate and it probably should be regarded as a *species dubium*.

### *Eukerria saltensis* (Beddard, 1895)

Fig. 4I-L, 9J, K, 10D

*Kerria saltensis* Beddard, 1895 : 225 ; Beddard, 1896 : 42 ; Michaelsen, 1898 : 479 ; 1900 : 371 ; 1904 : 286 ; 1907 : 23 ; 1935a : 103 ; 1935b : 40 ; Pickford, 1928 : 378, Fig. 1-4 ; Gates, 1942 : 73 ; Gavrilov, 1952 : 692 ; Jamieson, 1967 : 61, Fig. 1.

*Acanthodrilus sydneyensis* Sweet, 1900 : 124, Pl. 14, fig. 7, Pl. 15, fig. 18.

*Kerria gunningi* Michaelsen, 1913b : 1, Fig. 1 ; Michaelsen, 1913c : 419 ; 1913e : 276.

?*Kerria nichollsi* Jackson, 1931 : 121, Pl. XVI, fig. 5, 8, 9, 11.

l = 25-100 mm, w = 1-2 mm, s = 118-135. Epilobous. In segment XII,  $aa$  ca. =  $bc$ ,  $ab = cd$ ,  $dd : u = 0.35-0.39$  (-0.5?) ; in the type (postclitellar)  $aa : ab : bc : cd : dd = 4 : 1.0 : 4.4 : 1.0 : 10.9$  ;  $dd : u = 0.39$ . Setae  $a$  present throughout the clitellum ; setae  $b$  present or absent in XVII-XIX ; lateral (and ventral?) setae in the forebody bearing minute teeth. Clitellum annular but less tumescent ventrally,  $\frac{1}{2}$  XIII, (XIV)-(XIX), ( $\frac{1}{2}$  XX, XX),  $\frac{3}{4}$  XX (= 7-8 segments). Prostatic pores on minute papillae, on XVII and XIX, considerably lateral of setal lines  $b$  of adjacent segments ; those of a side connected by a seminal groove with tumid margins which bends medially in XVIII in which it contains the male pore (i.e. male pores considerably mediad to the prostatic pores but still lateral of  $b$  lines). Each prostatic papilla encircled by the groove and situated on the summit of a transversely oval prominence which is not clearly defined medially and is in turn borne on a low, earlike prominence which is only laterally elevated. Nephropores not visible externally. Female pores conspicuous or not, anterior in XIV, in  $b$  lines, or much less commonly in  $ab$  lines or lateral of  $b$  lines ; on minute cones or with narrow lips. Spermathecal pores in  $\frac{7}{8}$  and  $\frac{8}{9}$ , mostly at  $\frac{2}{3} bc$ , occasionally at mid  $bc$  ; usually readily observed on close examination but never conspicuous.

Last septal glands in VI. Gizzard weakly to well developed in VII. Calciferous glands slenderly pear-shaped rather thick walled, permeated by blood vessels (and intracellular spaces?) but without internal folds. Intestine commencing in XII. Hearts 3 pairs ; latero-oesophageal in X and XI ; dorsoventral in IX. Nephridia



commencing in VI (?), entering the parietes at mid *bc* (with small terminal dilatation of the duct?). Testes and funnels large, free, in X. Seminal vesicles in IX and XI or XI only. Prostates very slender (0.06–0.1 mm wide), winding posteriorly into XXVI or further; ducts slightly or much more slender, demarcated by their muscular sheen. Neither prostatic nor sperm ducts notably thickened ectally. Ovaries (palmate) and funnels in XIII; ovisacs absent. Spermathecal ampulla large and oblong-ovoid with thin walls; duct (always?) with a capacious thin walled ental chamber approximately one third the length of the ampulla, and a muscular terminal portion which is as long as, or shorter than the remainder. Total length of spermatheca 0.5–0.8 mm.

**DISTRIBUTION.** South America : Chile ; Juan Fernandez Is ; Argentina. South Africa : Cape Province ; Natal ; Transvaal-Orange Free State border. Burma. New Caledonia. Australia : New South Wales ; S. West Australia (?) ; Queensland.

**MATERIAL EXAMINED.** A single fragmentary previously dissected clitellate type-specimen of *K. saltensis*, Beddard collection, B.M. (N.H.), 1904, 10.5. 928. A clitellate type-specimen of *Kerria gunningi*, Hamburg Museum, v. 7490.

**REMARKS.** This is the most widely peregrine species of *Eukerria*.

The type-specimen in the British Museum now yields little information beyond what is indicated in the accompanying illustrations. The prostomium is epilobous  $\frac{1}{2}$ , closed acute; setal ratios are as recorded above; nephridia enter the parietes slightly above mid *bc* and have each a very small ectal dilatation of the duct; the gizzard is about twice the width of the oesophagus but strongly muscular; the spermathecae have been severed shortly ental to the duct which is muscular and spindle-shaped; and the prostates are much coiled and extend to XX.

I follow Pickford (1928) in including the South African *K. gunningi* as a junior synonym of *E. saltensis*. A Hamburg Museum specimen differs from the type of the latter taxon in having a long U-shaped muscular spermathecal duct (the knoblike ampulla being one fourth of its length) but that illustrated by Pickford showed the usual *saltensis*-form and there is no evidence to suggest that the variation observed is not intraspecific. A large number of specimens from South Africa described by Jamieson (1967) accord closely with the type and with Beddard's descriptions of it.

### *Eukerria stagnalis* (Kinberg, 1867)

Fig. 5, 6, 10C

*Mandane stagnalis* Kinberg, 1867 : 100.

*Acanthodrilus stagnalis* ; Vaillant, 1899 : 177.

*Kerria stagnalis* ; Michaelsen, 1899 : 426 ; 1900 : 370.

*Eukerria stagnalis* ; Cordero, 1942 : 278, Fig. 8.

*Acanthodrilus spegazzinii* Rosa, 1890 : 516, 1 Fig.

*Kerria spegazzinii* ; Rosa, 1895b : 146 ; Beddard, 1896 : 40.

l = 31–86 mm, w = 0.8–3 mm, s = 80–168. Prostomium epilobous  $\frac{1}{2}$ , sometimes  $\frac{1}{3}$ , usually open. Pigmentless in alcohol. Setae closely paired. In segment XII :



			<i>aa</i>	<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>dd</i>	<i>dd : u</i>
Buneos Aires	{ large morph	{	4.0	1.0	5.6	0.8	18.6	0.50
			3.2	1.0	4.0	0.9	15.5	0.51
	{ small morph		3.2	1.0	4.6	1.0	15.6	0.49
Paraguay	{	{	5.6	1.0	6.8	1.2	16.2	0.41
			4.6	1.0	6.4	1.2	20.4	0.49
mean of 5			4.1	1.0	5.5	1.0	17.3	0.48

Setae *a* present, *b* present or absent in XVIII, totally absent in XVII and XIX ; penial setae absent. Nephropores rarely visible as white dots shortly median of setae *c*. Clitellum annular though interrupted by the male genital field, occupying XIII  $\frac{1}{2}$  XIII–XIX,  $\frac{1}{2}$ ,  $\frac{2}{3}$  XX (=  $6\frac{1}{2}$ – $7\frac{2}{3}$  segments) ; ventrally less strongly developed and sometimes embayed almost to  $\frac{1}{2}$  XIV ; intersegmental furrows present only ventrally, setae retained. Male genital field : prostatic pores two pairs of conspicuous transverse gaping slits, in XVII and XIX, wider than a setal couple, their centres in line with the ventral setal couples of neighbouring segments ; a single or double conical penis-like structure may be visible projecting through a pore. Each pore almost spanning a low oval papilla which is surrounded by a broad low tumid area which extends laterally to almost mid *bc*, fills the segment longitudinally and is united with those of the other side. Male pores a pair of small, rarely visible slits, on XVIII, shortly lateral of, less commonly at the sites of, setae *b* ; the ventral couples often translocated medially ; bordered by tumid longitudinal bands, confluent or contiguous medially, which are continuous with the tumid prostatic fields. Seminal grooves indistinct tracts connecting the prostatic and male pores of each side or not distinguishable their courses varying according as the male pores are median to, in line with, or lateral to the prostatic pores. Glandular mounds, approximately as large as the prostatic porophores, present in line with or median to the latter postsetally in XVI and presetally in XX, or vestigial or absent, surrounded by tumid areas confluent with the male genital field.

Female pores inconspicuous, shortly lateral of *b* lines anteriorly in XIV. Spermathecal pores 2 pairs of transverse slits with slightly raised margins, in  $\frac{7}{8}$  and  $\frac{8}{9}$ , their centres in or slightly lateral of *b* lines. Dorsal pores absent.

Pharynx in III, invested by lobulated pharyngeal glands which extend to the anterior region of VI. Gizzard totally absent. Calciferous glands ; broadly pyriform, narrowing posteriorly to a short duct which joins the lateral aspect of the oesophagus ; the two glands contiguous or nearly so below the oesophagus. The walls thin, with approximately twelve thick vascularized radial septa projecting into the lumen for varying distances, some uniting with neighbouring septa or with those of the other side or all free ; walls and septa ciliated. Intestine beginning, with abrupt expansion, in XII ; typhlosole absent. Dorsal blood vessel slender in the region between the pharynx and the posterior hearts, not certainly traced onto the pharynx. Dorsoventral commissural vessels in (V?), VI–XI ; those in X–XI forming latero-oesophageal hearts, receiving connectives from the dorsal and supraoesophageal vessels. Supra-oesophageal vessel as wide as or much narrower than the dorsal



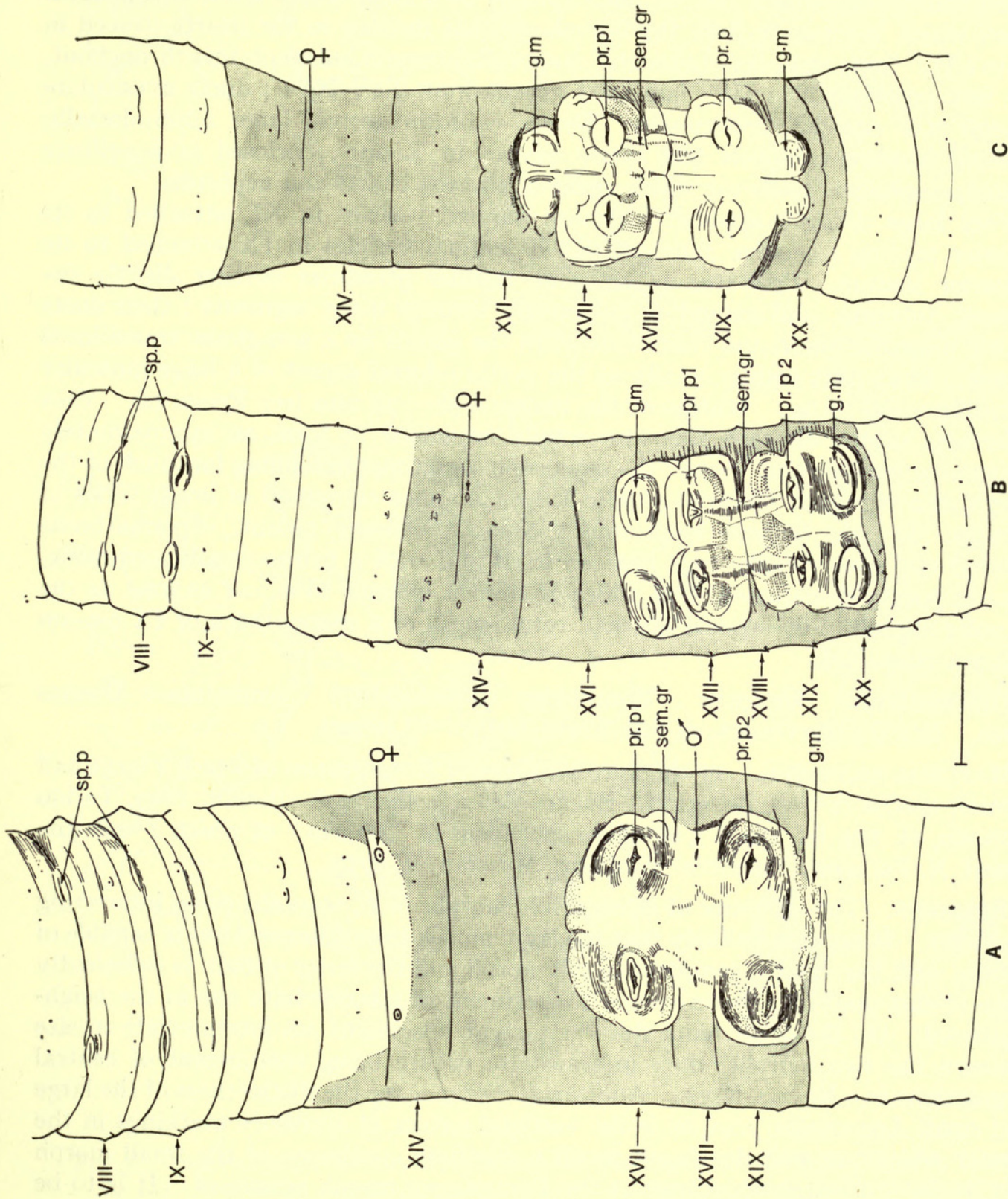


FIG. 5. *Eukerria stagnalis*, genital fields. A, syntypes of *Kerria spegazzini*, Torino Museum, ol. 114, ex. 291 : A, large morph ; B, small morph ; C, "*Kerria*", Hamburg Museum, V. 6713.



vessel, arising anteriorly as a vessel (calciferous vessel) from each calciferous gland, and ending by bifurcation to form the connectives to the hearts of XI ; the calciferous vessels apparently in one specimen giving connectives to the hearts of IX. Calciferous gland on each side supplied apically by a longitudinal latero-oesophageal vessel which is separate from the oesophagus but median to the hearts (traced in VI to IX). Subneural vessel absent. Nephridia stomate holonephridia throughout, the first postseptale in III ; (always?) absent from XIV–XVI ; ducts avesiculate though not especially narrowing. Dense villiform testes, large anterodorsally directed iridescent funnels and sperm masses in X only, enclosed in a delicate circumoesophageal testis-sac which encloses also the hearts and nephridia.

Very large dorsally apposed racemose seminal vesicles in XI, attached to its anterior septum ; smaller, much-dissected seminal vesicles in IX attached to its posterior septum. Prostates 2 pairs, the tubular glandular portion slightly depressed, tortuous, and extending posteriorly through many segments ; their ducts with a muscular sheen and continuous with the glands by a non-glossy transitional region. Each duct ending ectally at the postero-dorsal aspect of a large muscular hemispheroidal bursa. Widths of the bursae 0.38–0.78 mm (see Remarks). Vasa deferentia united on each side and ectally expanded to form an approximately fusiform or subspherical bursa ; the expansion sometimes extending for much of the length of a segment. Ovaries paddle-shaped laminae composed of linear series of oocytes. Female funnels large and compact ; ovisacs absent. Spermathecae inflated sacs each usually once bent on itself and with a firmer ectally narrowing, usually poorly demarcated duct which is from a quarter to a half as long as the saccular ampulla ; diverticula absent ; total length of a spermatheca of IX 0.9–2.0 mm (see Remarks).

DISTRIBUTION. Uruguay : Montevideo (type-locality). Argentina : Buenos Aires. Brazil : Rio Grande do Sul, Porto Alegre. (Limnic).

MATERIAL EXAMINED. 11 clitellate syntypes of *K. spegazzini* of which 1 large and 1 small specimen were dissected ; Buenos Aires, collector L. Borelli, 1893, Torino Museum, ol. 114, ex. 291. 3 clitellate specimens of "*Kerria*" of which 1 was dissected, N. Paraguay, collector? Hamburg Museum, V. 6713.

REMARKS. The existence of infraspecific morphs in *E. stagnalis* poses interesting problems. It appears unlikely that the large morph from Buenos Aires is capable of pairing with the exactly sympatric small morph and the series of both is sufficiently large to cast doubt on the existence of specimens of intermediate size in the neighbourhood. On the other hand the Paraguayan specimens are intermediate in size between the two morphs, their intermediate nature being reminiscent of central populations in a Rassen-Kreis. Additional evidence for the distinctness of the large and small Argentinian morphs is the vestigial nature of accessory markings in the former which are well developed in all 6 clitellate specimens of the small morph and in the 3 clitellate specimens of the Paraguayan morph examined. It is to be hoped that comparisons of ploidy in the three morphs will be undertaken.

Comparative data on the three morphs from the small series available are recorded below. Data are limited as several specimens are posterior amputees or



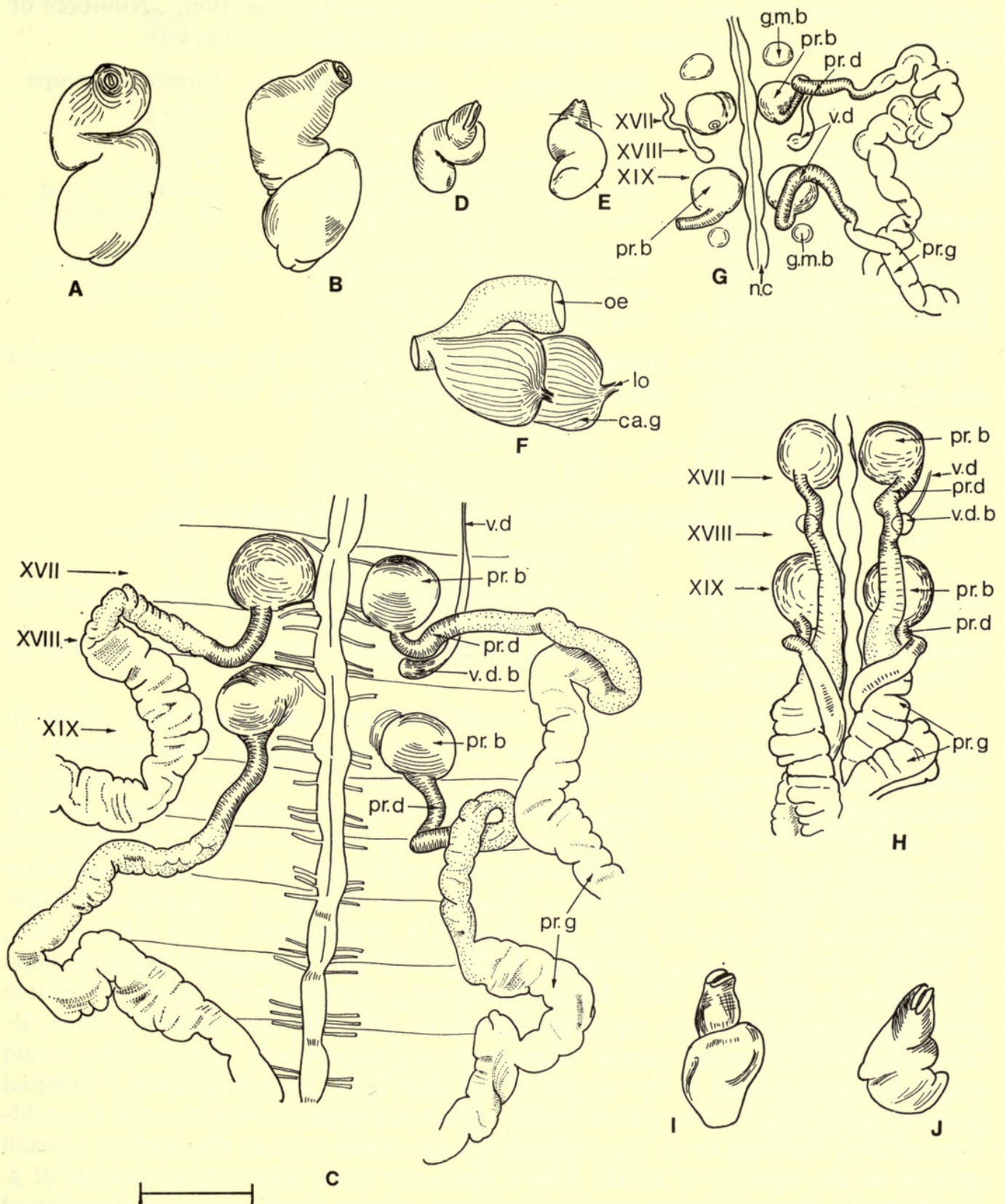


FIG. 6. *Eukerria stagnalis*. A-G, syntypes of *Kerria spegazzini*, Torino Museum, ol 114, ex. 291 : A-C, large morph, A and B, ventral and lateral aspects of right spermatheca of IX ; C, prostates of same specimen. D-G, small morph, D and E, median and dorsal aspects of left spermatheca of IX ; F, lateral view of calciferous glands ; G, prostates of same specimen ; H-J, "*Kerria*", Hamburg Museum, V. 6713, H, prostates ; I and J, ventral and lateral aspects of right spermathecae of VIII and IX. (All to same scale).



regenerates and because of the desirability of minimizing dissection. Numbers of specimens examined are shown in parentheses. Measurements are in mm.

	Small morph	Large morph	Paraguayan morph
Length	31-52 (6)	82-86 (2)	62-82 (3)
Greatest width	0.8-1.1 (6)	1.5-1.9 (3)	2.5-3 (3)
Mid-clitellar width	1.8-2.4 (mean of 4 = 2.1)	3.1-4.4 (mean of 4 = 3.5)	2.1-2.4 (mean of 3 = 2.3)
Segments	80-123 (6)	168-170 (2)	88 (regenerating?)— 154 (3)
Accessory genital markings	Well developed (6)	Vestigial (3)	Well developed (3)
Width prostatic bursae	0.38-0.47 (1)	0.69-0.78 (1)	0.59-0.69 (1)
Length of a spermatheca in IX	0.9 (1)	2.0 (1)	1.2 (1)

The greater width of the Paraguayan specimens appears to be due to contraction of the forebody, the clitellar width being intermediate between that of the other two morphs.

***Eukerria subandina*** (Rosa, 1895) emend. Gavrilov, 1967

Fig. 7, 8, 9H, I, L, 10E

*Kerria subandina* Rosa, 1895a : 2 ; Rosa, 1895b : 143, Pl. fig. 17, 18 ; Michaelsen, 1900 : 371 (Including *K. borellii*) ; Cognetti, 1902 : 3 ; Pickford, 1928 : 381, Fig. 7.

*Kerria borellii* Cognetti, 1900 : 6, Pl. fig. 6 ; Cognetti, 1902 : 3 ; Pickford, 1928 : 381, Fig. 8 ; Gavrilov, 1967 : 144, Fig. 1-7.

l = 30-81 mm, w = 1.4-2.4 mm, s = (76?) 100-136, rarely 148-169. Rosy in life. Proepilobous to epilobous. Setae narrowly ornamented from segment II. Setae *ab* absent or only partly represented in XVII-XIX ; *ab* = *cd* (or larger or smaller) ; *dd* : *u* = 0.5 or rarely somewhat smaller. In a type of *borelli*, in XII, *aa* : *ab* : *bc* : *cd* : *dd* = 3.5 : 1.0 : 4.4 : 0.63 : 14.3 ; *dd* : *u* = 0.47. Nephropores (always?) in *bc* near *c* ; in the preclitellar segments in front of *c* ; in the postclitellar segments further presetally. Clitellum annular, less developed ventrally and interrupted by the male genital field ; in XII,  $\frac{1}{2}$  XII,  $\frac{1}{n}$  XII, -XII, XIII-XIX,  $\frac{1}{2}$  XX,  $\frac{2}{3}$  XX,  $\frac{3}{4}$  XX, XX (=7-9 segments). Male genital field I-shaped, ventral median between the equators of XVII & XIX ; its angles reaching transversely a variable distance into *bc* ; its median region less extensive, generally not extending above *ab*. The four prostatic pores central or eccentric on transversely elongated or round papillae, which extend in the angles of the male field, from *b* laterally. Seminal grooves, with more or less elevated and whitish margins, convex towards the mid-ventral line, reaching to or approximately to *a* ; male pore at the bottom of each groove, at the equator of XVIII with a tendency to be very slightly lateral of *a*. Prostatic papillae and the areas delimiting them, joining the elevations of the seminal grooves, constituting little-developed porophores which laterally delimit the male genital field ; the area median to these, with anterior and posterior margins of variable configuration, may be prominent, level with the remainder of the integument, or depressed. In several re-examined syntypes of *borelli* there is a pair of pad-like accessory genital markings at 19/20, sometimes represented on one side only or



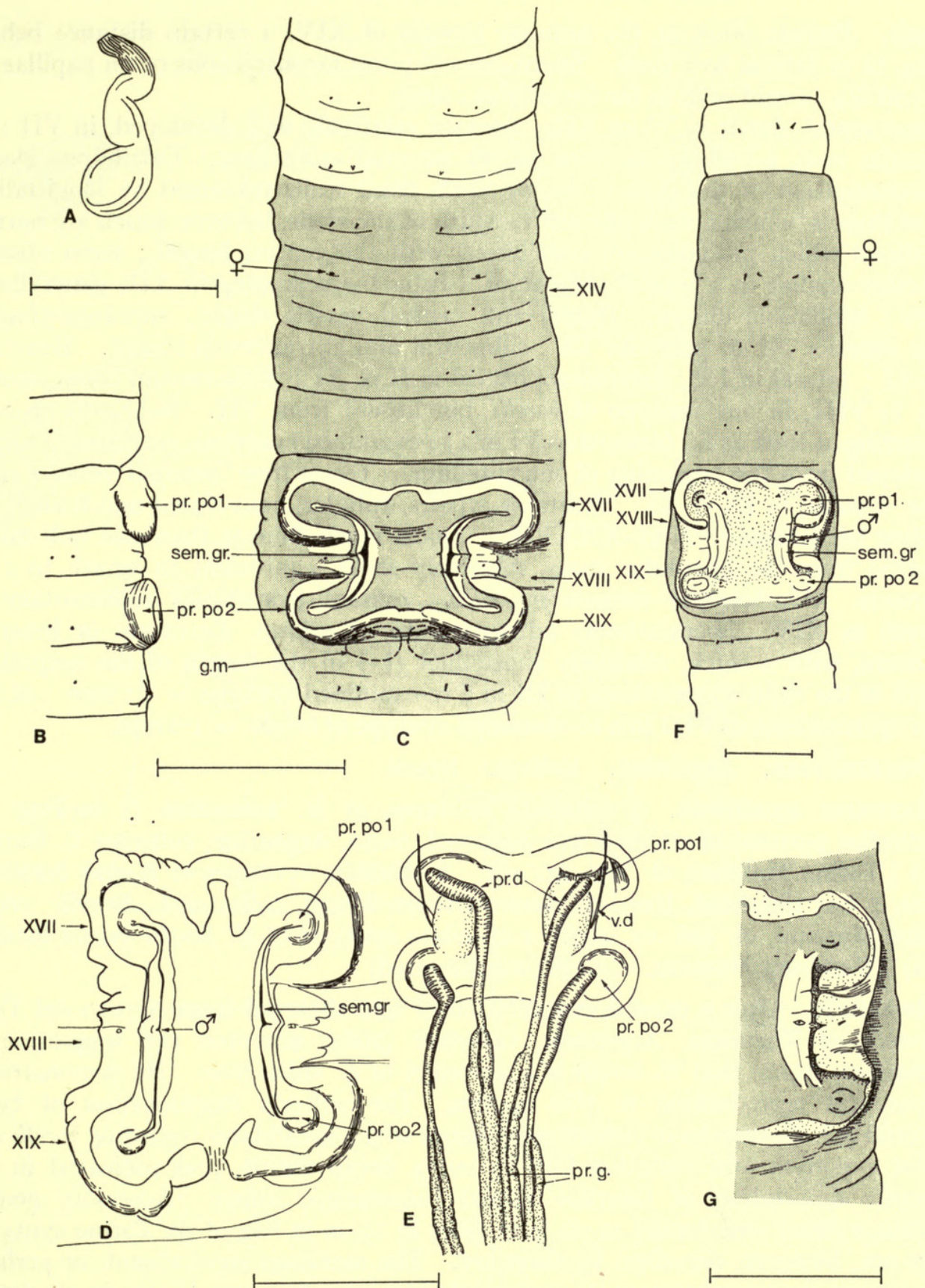


FIG. 7. *Eukerria subandina*. A-E, syntypes of *Kerria borelli*, Torino Museum, ol. 115, ex. 467 : A, right spermatheca of VIII ; B, lateral and C, ventral views of the male genital field of the same specimen ; D, previously excised male genital field of another specimen ; E, prostates of first specimen. F and G, syntype of *K. borelli*, Hamburg Museum, V. 5896 : male genital field.



absent. Female pores at the anterior margin of XIV, a certain distance behind 13/14, in or lateral to *b* lines. Spermathecal pores inconspicuous or on papillae, in 7/8 and 8/9, at mid *bc* or as far dorsally as *c* lines.

Last septal glands in VI or VII. Gizzard relatively well developed, in VII ; its muscular coat 3–5 times as thick as the internal epithelium. Calciferous glands (re-examination of the type of *borelli*) with thick walls traversed by longitudinal blood sinuses, which occupy the entire width of the walls, between which are narrow canaliculi which probably are continuous with the central lumen ; septa absent ; structure similar in a type of *subandina*. Intestine beginning in XII, generally at 11/12 ; typhlosole absent. Dorsal and ventral vessels single ; supraoesophageal from anterior XI to posterior IX ; subneural and extraneurals absent. Hearts in IX–XI ; lateral in IX ; laterooesophageal in X & XI ; dorsoventral commissurals seen in VIII, in one syntype of *borelli*, but absent from VII. Nephridia from V (occurring at least as far forward as VI in a re-examined syntype), peritoneum highly developed from the beginning of the clitellum. Testes free ; seminal vesicles racemose, 2 pairs, in IX & XI. Prostates 2 pairs, tubular, convoluted and folded, extending backwards to XXI–XXXVII. Ducts much thinner than and well differentiated from the glandular parts, relatively short, equivalent in length to 1½–2 segments. Ovaries and funnels in XIII ; ovisacs (sometimes rudimentary or absent) in XIV. Spermathecae adiverticulate, claviform, digitiform or inverted pyriform, with a thick, relatively short duct (½–¾ of the length of the ampulla) ; length of the right spermatheca of IX in a re-examined syntype = 1.1 mm ; of the right spermatheca of VIII in a re-examined syntype of *borelli* = 1.0 mm.

DISTRIBUTION. Argentina. Bolivia. Brazil.

MATERIAL EXAMINED. 5 clitellate syntypes of *K. subandina* (1 lacking the preclitellar portion) of which 1 was dissected, Salta, Argentina, collector L. Borelli, 1893 ; Torino Museum, ol. 115, ex. 467. 8 clitellate syntypes of *Kerria borelli* of which 1 was dissected, Urucum, Matto Grosso, Brazil, collector L. Borelli, 1899 ; Torino Museum, ol. 106, ex. 497. 1 clitellate syntype of *K. borelli* (same locality data) ; Hamburg Museum, v. 5896 (not dissected).

REMARKS. After a careful examination of new material from Arroyo del Toro, Province of Tucuman, Argentina, Gavrilov (1967) accepted the suggestion of Michaelsen (1900) that *E. borelli* is a synonym of *E. subandina*. He demonstrated uniparental reproduction in this species. The writer's examinations of type-material of both taxa have yielded no evidence which invalidates regarding *borelli* as a junior synonym and variation falls in every detail within that indicated in the synoptic description of Gavrilov (1967) summarized above. Accessory genital markings noted unilaterally or on both sides in 19/20 in five of six Torino syntypes were not, however, described by Gavrilov. The markings were absent, or perhaps represented by a medianly continuous slight rim or pad, in one of the six specimens and in the Hamburg Museum specimen. The albeit inconsistent occurrence of these markings and the conspicuous appearance of the spermathecal pores confirmed in the re-examination both contrast with the condition in Argentinian specimens and the possibility of subspecific distinction of Brazilian populations deserves investigation.



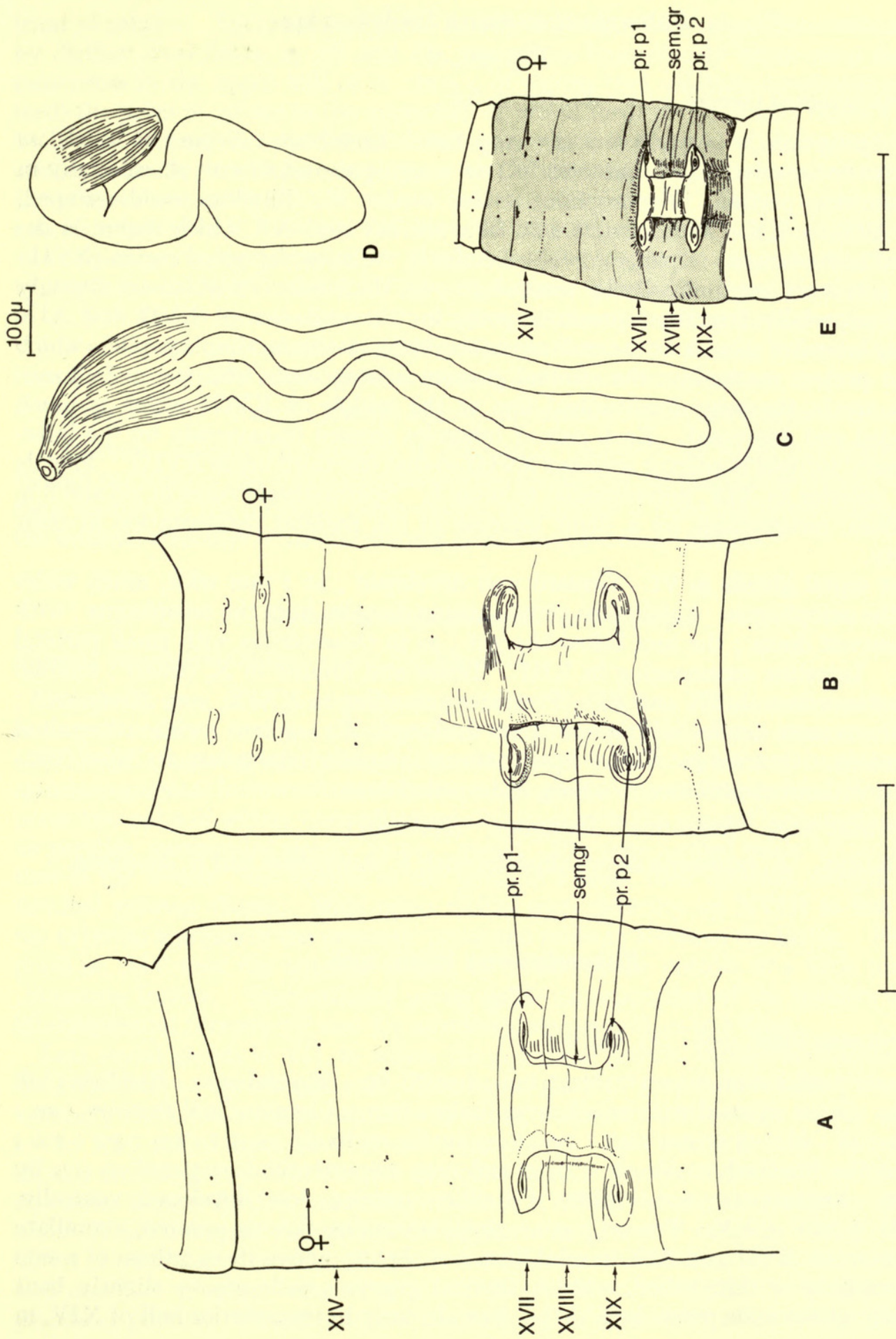


FIG. 8. *Eukerria subandina*, syntypes, A-D, Torino Museum, or. 115, ex. 467 : A and B, male genital fields of two specimens ; C and D right spermathecae of IX and VIII respectively ; E, Hamburg Museum, V. 5894, male genital field.



*Eukerria tucumana* Cordero, 1942

Fig. 9M, N

*Eukerria tucumana* Cordero, 1942 : 281, Fig. 12-15.

$l = 63-65$  mm,  $w = 1.5-2$  mm,  $s = 105-120$ . Epilobous. Setae :  $ab = cd$  ;  $aa$  less than  $bc$  anteriorly,  $= bc$  posteriorly ;  $aa = 4.5-5 ab$  and  $dd > 0.5 u$ , especially in the anterior portion. Nephropores in  $bc$ , nearer  $c$ . Clitellum saddle-shaped, XIII-XIX,  $\frac{1}{2}$  XX. Male genital field between XV and XX which region is depressed and concave. 2 pairs of oval tubercles in the most depressed region (XVII-XX), traversed longitudinally by seminal grooves the borders of which are strongly tumid, especially laterally ; prostatic pores in the setal arcs of XVII and XIX slightly lateral of setae  $b$ , at the ends of the seminal grooves, on simple papillae which do not project markedly ; the seminal grooves linking these with the male pores, which are in the same longitudinal line at the middle of XVIII which is much extended and depressed. Each pair of tubercles crossed transversely by the inter-segmental furrows bordering segment XVIII so that one third lies in XVIII. Female pores anterior in XIV, anteromedial to setae  $b$ . Spermathecal pores in  $7/8$  and  $8/9$ , in  $b$  lines, recognizable by a slight increase in the parietal pigmentation in their vicinity.

Last septal glands in VI. Gizzard well developed ; at 1 mm wide, much wider than the oesophagus. Calciferous glands arising dorsally from the oesophagus ; with long curved ducts ; the sacs below the gut ; as in *Ocnerodrilus* with small parietal septa. Intestine commencing in XIII. Testes and funnels in X, (free?) ; seminal vesicles racemose, in IX and XI. Prostates extending to XXIX, very attenuated ; their ducts more slender, a little more than the length of a segment ; without terminal expansions. Ovaries in XIII. Spermathecal ampulla triangular, its apex continuing without constriction as a long, wide, coiled duct.

DISTRIBUTION. Argentina : Tucuman. (Habitat?).

REMARKS. *E. tucumana* shows affinities with *E. pascuorum* and *E. eiseniana*.

*Eukerria urna* Righi, 1968

Fig. 90

*Eukerria urna* Righi, 1968 : 183, Fig. 6-8.

$l = 22.7-28.4$  mm,  $w = 1.23-1.41$  mm,  $s = 76-89$ . Zygalobous. Reddish pink in life. Setae sigmoid with small, irregularly arranged longitudinal furrows ;  $aa : ab : bc : cd : dd = 5.3 : 1.0 : 6.7 : 1.0 : 14.3$ , in the midbody,  $= 3.1 : 1.0 : 4.2 : 1.1 : 8.6$ , in the hindbody ;  $dd : u = 0.39$  and  $0.35$  respectively (computed as  $0.5$  by Righi). Nephropores not visible. Clitellum annular, less developed ventrally,  $\frac{1}{2}$  XIII,  $\frac{1}{2}$  XIV- $\frac{1}{2}$  XX. Prostatic pores small transverse slits on pointed, mamillate elevations on XVII and XIX in setal lines  $b$  or slightly above these ; those of a side connected by a thin-walled, whitish seminal groove ; each groove slightly bent laterally at the male pores, in XVIII. Female pores in the anterior half of XIV, in



front of setae *b*. Spermathecal pores mostly unrecognizable, sometimes surrounded by distinct oval fields, in 7/8 and 8/9, sometimes immediately below setal lines *b*, sometimes in the upper half of *bc*; in 5% of worms (136 clitellate specimens examined) the pores in 7/8 are in the upper half of *bc* and those of 8/9 shortly below *c* lines.

Gizzard strong, clearly distinguished from the oesophagus. Calciferous glands arising laterally from the oesophagus, in IX, rounded, of the ocnerodriloid type. Intestine commencing in XII. Last hearts in XI, lateral. Testes, sperm masses and funnels free in X; seminal vesicles in IX and XI, the latter pair displacing 11/12 and sometimes 12/13 posteriorly. Prostates with an irregular course below the gut, ending between XXIII and XXVIII; duct much thinner than the glandular part, of variable length, penetrating only a single septum or extending through 3 segments. 1 pair of ovaries and funnels, in XIII. Spermathecal duct mostly thinner than the broadly oval ampulla and somewhat longer, bent in various ways.

DISTRIBUTION. Brazil: Marajo Island, at Cachoeira do Arari (banks of a river).

REMARKS. Clearly this species is close to *E. saltensis*, as Righi has stated, although the form of the spermathecae and the location of the male pores lateral, rather than median of, the prostatic pores clearly distinguish it from the latter species and the internal structure of the calciferous glands is apparently distinct.

### *Eukerria weyenberghi* Cordero, 1942

*Eukerria weyenberghi* Cordero, 1942: 279, Fig. 9-11.

l = 37-68 mm, w = 3-4 mm, s = 59-109. Epilobous. Setae: *ab* = *cd*, *aa* = *bc* = 3 *ab*; *dd*:*u* = 0.5. Nephropores in *c* lines. Clitellum annular, XIII,  $\frac{1}{2}$  XIII-XX; some or nearly all of the ventral and dorsal couples may be obscured; all intersegmental furrows obscured except 13/14 which is partially visible. Prostatic pores two pairs of widely open elliptical slits level with the general body surface, not on papillae, surrounded simply by an "eyelid" like zone formed solely by modification of the cuticle; the centres of the pores in *b* lines, their internal margins in *a*. Seminal grooves absent. Male pores visible with difficulty on XVIII in line with the external margins of the prostatic pores and midway between the latter. Female pores on XIV near the anterior border, in *b* lines at the bottom of a little marked transverse furrow. Spermathecal pores visible on separation of the borders of the intersegmental furrows 7/8 and 8/9 as minute simple orifices in *b* lines.

Last septal glands in VII, in which the gizzard is present though no thicker than the remainder of the oesophagus. Calciferous glands "grape-seed shaped", arising ventrally from the oesophagus and extending anteriorly; internally with a central cavity with radial septa inserted on its periphery. Last hearts in XI. Testes and funnels free in X; seminal vesicles one pair, in IX. Prostates longer than those of any other known species, extending *in situ* to XXXII, the sinuous glandular region, which is quadrangular in section, occupying a length of 8 mm (its actual length about 3 times this); duct somewhat narrower, circular in section, smooth and muscular and coiled in a spiral, extending into XXII; about one eighth the length of the glandular portion. Prostatic ducts discharging on muscular hemispherical papillae



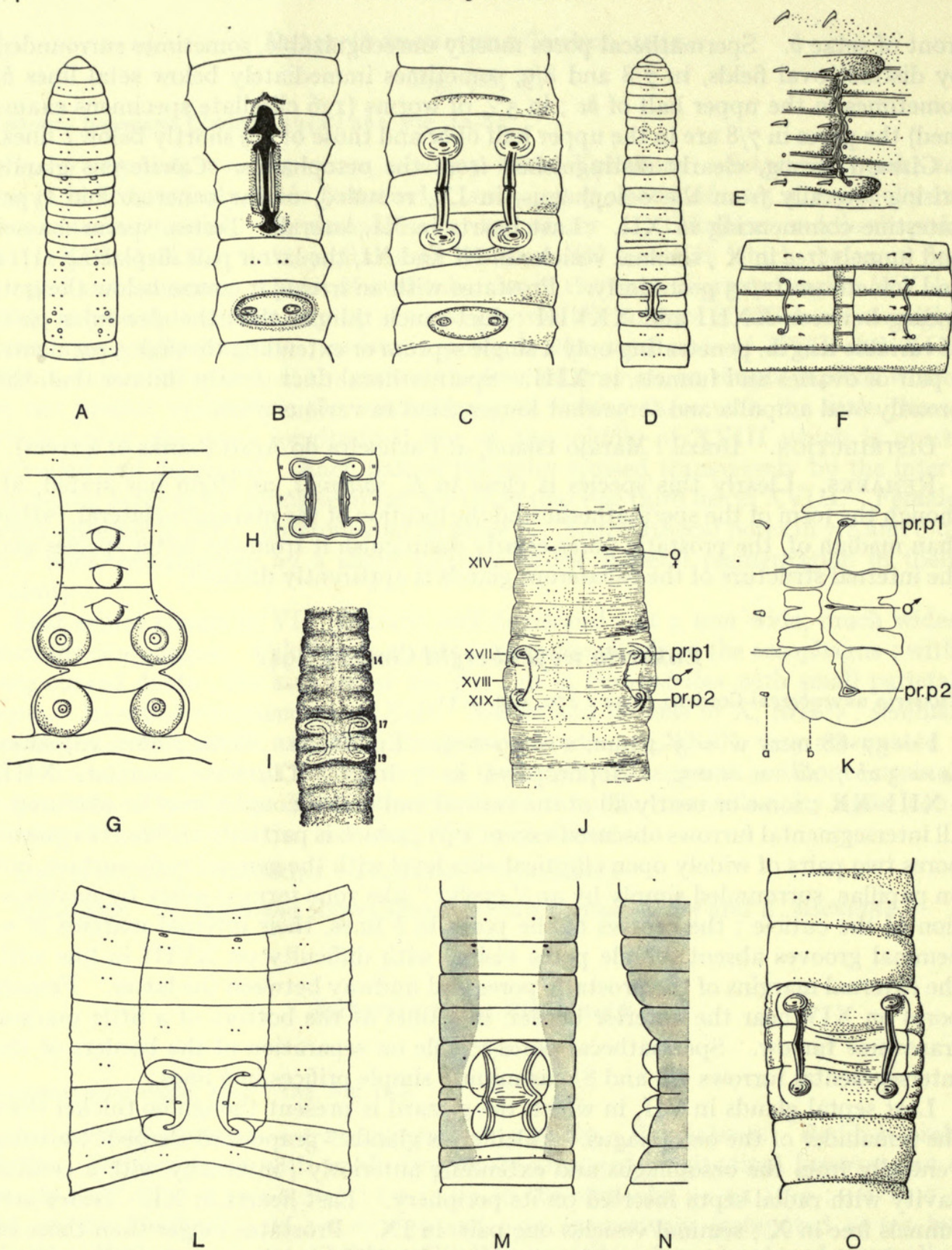


FIG. 9. *Eukerria*, reviewed illustrations of male genital fields. A, *E. halophila* (after Beddard, 1892) ; B-D, *E. kukenthali* : B and C, *E. asilis* (after Righi, 1968) ; D, syntype (after Michaelsen, 1908) ; E and F, *E. mcdonaldii* (after Eisen, 1893) ; G, *E. papillifera* (after Rosa, 1895b) ; H, *E. subandina* (= *Kerria borelli*) (after Cognetti, 1900) ; I, *E. subandina* (after Gavrilov, 1967) ; J, K, *E. saltensis* (after Jamieson, 1967) ; L, *E. subandina* (after Rosa, 1895b) ; M and N, *E. tucumana* (after Cordero, 1942) ; *E. urna* (after Righi, 1968).



corresponding with the external pores and containing a large "atrial" chamber. Prostatic duct joining the postero-medial aspect of the internal papilla. Spermathecae 3 mm long by 1 mm wide; the ampulla large and pyriform; each flexing around the oesophagus which is in contact with the duct. The duct wide and ampulliform, distinguishable by its texture and greater opacity; equalling the ampulla in length.

DISTRIBUTION. Argentina: Buenos Aires Province, Islas del Tigre (Habitat?).

REMARKS. It seems probable that the internal papillae (bursae?) at the ends of the prostatic ducts are capable of eversion or protrusion to give external papillae of the type seen in other species of *Eukerria*.

#### DISCUSSION

Within the tribe Ocnerodrilini (= Ocnerodrilinae s. Gates, 1966), only *Eukerria*, *Kerriona* Michaelsen, 1924, and *Maheina* Michaelsen, 1899b, display the acanthodrilin condition of the male pores, with the prostatic pores on XVII and XIX and the openings of the vasa deferentia intermediate on XVIII. An especially close relationship between *Maheina* and *Eukerria* can be rejected as the single species of *Maheina* differs from *Eukerria* in its setal ratios (the setae of the fore- and mid-body being widely separated), in location of the gizzard in VI, in possessing two pairs of calciferous glands; in having testes in X and XI, and geographically, being the only Ocnerodriline known from the Seychelles.

A close relationship between *Eukerria* and the two known species of the Brazilian genus *Kerriona* was proposed by Stephenson (1930) as *Kerriona* besides having acanthodrilin male terminalia has the testes confined to segment X as in *Eukerria*, such proandry being known elsewhere in the Ocnerodrilinae (s. lat) only in *Haplo-drilus* Eisen, 1900 and, now, in *Gatesia* Jamieson, 1962. Contrary to the views of Michaelsen (1924) and Stephenson (1930), the terrestrial mode of life of *Kerriona* cannot be considered a valid distinction from *Eukerria* as some species of the latter genus are known only from terrestrial habitats. Nevertheless, *Kerriona* shows morphological distinctions which set it apart from *Eukerria* and which suggest that the mutual possession of proandry and acanthodrilin male terminalia in the two genera does not indicate a closer relationship between the two genera than either has with other genera of the Ocnerodrilini. Of the few known characteristics of *Kerriona*, those which indicate that it is phyletically and phenetically distinct from *Eukerria* are wide pairing of setae in at least the mid and hindbody; the panicked-tubular or tubular calciferous glands, and the presence of an intestinal typhlosole.

In the subfamily Octochaetinae variation from the acanthodrilin condition to the microscolecin condition (a single pair of male and prostatic pores, on XVII) of many ocnerodriles occurs within a single genus, *Lennogaster*, and therefore the possibility of close relationship of *Eukerria* and non-acanthodrilin ocnerodriles deserves attention. At present there is, however, no convincing evidence for such a relationship though Gates (1957), in a key to the genera of the Ocnerodrilinae, placed those species of *Eukerria* which lack gizzards in an *Ocnerodrilus*-group of species. He stated that *Eukerria* must be restricted to those species with a gizzard in segment VII



and went so far as to specify that “*Kerriona* may be closer to *Ocnerodrilus* than to its supposed ancestor *Kerria*”.

With regard to relationships within *Eukerria* there can be no *a priori* justification for segregation of species which lack a gizzard from the remainder of a genus in which development of the gizzard varies from weak to strong, as Jamieson (1963) showed for the genus *Nannodrilus*, but perusal of the accounts given above in the systematics section does reveal that absence of gizzards correlates with other distinctions in one group of species. Some grounds therefore exist for recognizing subgroups within *Eukerria* though elevation of these to generic rank seems inadvisable in view of the many gaps in our knowledge of the genus.

This agiceriate species-group is the only clearly defined subgroup which the author is able to recognize from the present limited evidence. It may be termed the *stagnalis*-group and contains only *E. stagnalis*, *E. papillifera* and *E. weyenberghi*. These species share a number of characters which are individually or at least in combination very distinctive. They are :

- (i) absence of a gizzard, at least as a recognizable swelling of the oesophagus (only in *E. rubra*, elsewhere in the genus, is a gizzard said to be absent) ;
- (ii) location of the prostatic pores in line with the ventral setal couples (a condition occurring elsewhere in *E. halophila*, *E. kukenthali*, *E. tucumana* and *E. urna*) ;
- (iii) presence on the prostatic ducts of ectal bursae, which do not occur elsewhere in the genus ;
- (iv) the absence (*E. papillifera* and *E. weyenberghi*) or slight development (*E. stagnalis*) of seminal grooves (doubtfully absent in *E. halophila* and *E. rubra*) ;
- (v) extension of the prostatic glands through many segments, a feature seen also in *E. kukenthali*.

The structure of the calciferous glands is not known for *papillifera* but in *weyenberghi* small parietal septa were seen by Cordero (1942), a condition which does not conflict with that in *E. stagnalis* (p. 154) in which, however, some septa are known to fuse centrally. Cordero's statement that in *weyenberghi* a gizzard is present in VII, though no wider than the oesophagus, would, if correct, suggest real affinity of the *stagnalis* group with other species of *Eukerria*. The extensive series of precardiac commissural vessels in *E. stagnalis* appears to be a primitive feature but, from the evidence of *weyenberghi*, it appears more likely that absence of the gizzard in *stagnalis* and *papillifera* is secondary. Subgeneric or even separate generic status for the *stagnalis* group is not without justification but the apparently close relationship with *Eukerria* and the paucity of our knowledge of the latter do not warrant making such distinctions at present.

In the absence of taxonomically important information with regard to several systems in many species of *Eukerria*, the character which appears most likely to permit subdivision of the remaining *Eukerrias* into morphologically and, presumably, phylogenetically distinct groups is the internal structure of the calciferous glands. Three categories may be distinguished on the basis of this character as shown below.



STRUCTURE OF THE CALCIFEROUS GLANDS IN *EUKERRIA*

\* personal examination

(I) Walls very thick and not projecting as septa or as folds into the lumen (Fig. 10E)

*E. limosa**E. pascuorum**E. subandina*\* and its junior synonym *E. borelli*\**E. rubra*?

(II) Transitional. Walls very thick but with a few longitudinal folds though with no defined complete or incomplete septa (Fig. 10D)

*E. rosae**E. saltensis*\*

(III) Walls relatively thin. Parietal septa well defined and numerous (Fig. 10A-C)

*E. eiseniana*\* and its junior synonym *E. hortensis**E. garmani*\**E. halophila*?*E. kukenthali**E. tucumana**E. urna**E. mcdonaldi*? (or II)and the *stagnalis*-group species, *E. stagnalis*\*, *E. weyenberghi*.

Internal structure unknown.

*E. asuncionis* and *E. papillifera*.

Information on several of the species listed is inadequate and the extent of individual variation needs to be investigated but this albeit crude classification serves to suggest a starting point for further subdivision of the genus.

After removal of the *stagnalis*-group it is not possible to place all the remaining species in subgroups though some groupings are observable. In group I, *E. limosa* and *E. pascuorum* are morphologically similar or perhaps synonymous. The two species of group II, *E. saltensis* and *E. rosae* appear to be closely related though distinct species. Of the group III species, few affinities are discernible, again largely because of lack of data. *E. eiseniana* and *E. garmani* are mutually close but the glands of *eiseniana* are larger and have more delicate and more numerous septa than those of *garmani*. *E. mcdonaldi* isolated in Baja California, stands apart in possessing a type of spermathecal diverticulum. Affinities of the other species, *E. tucumana*, *E. urna* and the type-species, *E. halophila* with other species are uncertain though they must at least for the time being be regarded as congeneric. *E. urna* resembles *E. saltensis* more than it does other species but its ocnodriloid calciferous glands are a noteworthy difference. *E. tucumana* appears to have its closest affinities with *E. garmani*.

It is hoped that drawing together our limited knowledge of *Eukerria* in this account will stimulate further investigation of the genus, ideally by workers in South America, and that sufficient data will be forthcoming to permit a taxonomic investigation of the affinities of its species.

The species of *Eukerria* recognized as valid in the present work, their junior



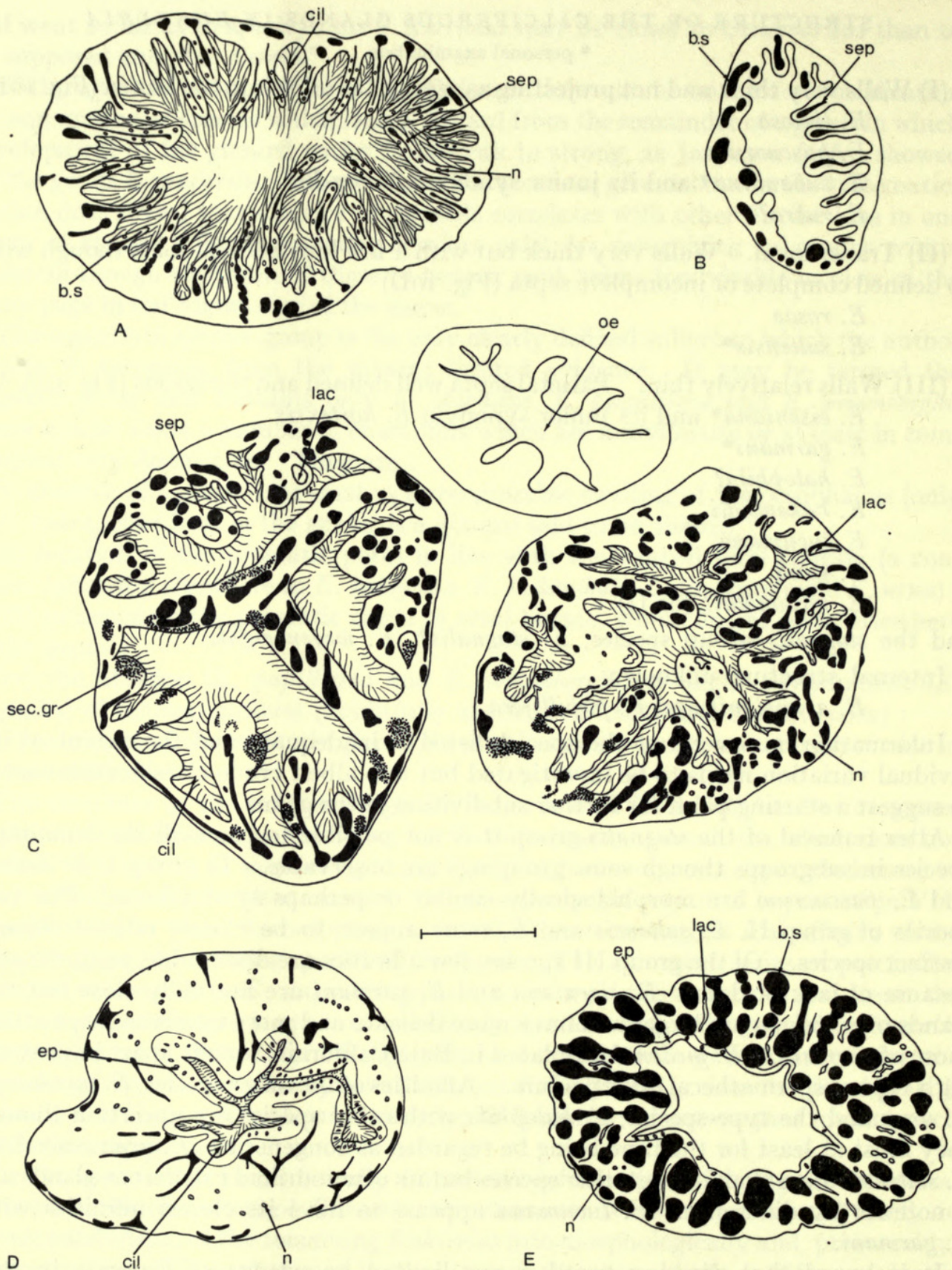


FIG. 10. Calciferous glands in transverse section. A, *Eukerria eiseniana*, syntype, Torino Museum, ol. 110, ex. 295; B, *E. garmani* (*garmani*), syntype, Torino Museum, ol. 111; C, *E. stagnalis*, syntype (small morph) of *E. spegazzini*, Torino Museum, ol. 114, ex. 191, showing two glands and the oesophagus; D, *E. saltensis*, specimen from the Great Berg River, South Africa, author's collections; E, *E. subandina*, syntype of *E. borelli*, Torino Museum, ol. 106, ex. 497. (All to the same scale).



synonyms, their distribution, and the sources of material examined are set out in the taxonomic summary below.

## TAXONOMIC SUMMARY

Species here recognized	Junior Synonyms + = new synonymy	Museum material examined B.M. = British Museum T. = Torino Museum H. = Hamburg Museum * = Type material	Distribution
1. <i>E. asuncionis</i> (Rosa, 1895)		T*	Paraguay
2. <i>E. eiseniana</i> (Rosa, 1895)		T*	Paraguay
	<i>K. hortensis</i> Stephenson, 1931 <sup>+</sup>	B.M.*	Paraguay
3. <i>E. garmani</i> (Rosa, 1895)		B.M. T*	Paraguay; Argentina
4. <i>E. halophila</i> (Beddard, 1892)		—	Bolivia (?) : upper reaches of the Pilcomayo
5. <i>E. kukenthali</i> (Michaelsen, 1908)		B.M. H*	St. Thomas, West Indies; Christmas Island, Indian Ocean
	<i>K. selangorensis</i> Stephenson, 1931	B.M.*	Selangor, Malaya
	<i>E. peguana</i> Gates, 1942 <sup>+</sup>	—	Burma
	<i>E. asilis</i> Righi, 1968 <sup>+</sup>		Brazil : Marajo Island
6. <i>E. limosa</i> (Stephenson, 1931)		B.M.*	Paraguay
7. <i>E. mcdonaldii</i> (Eisen, 1893)		—	Baja California
	<i>K. zonalis</i> Eisen, 1893 <sup>+</sup>	—	Baja California
8. <i>E. papillifera</i> (Rosa, 1895)		T*	Paraguay
9. <i>E. pascuorum</i> (Stephenson, 1931)		B.M.*	Paraguay
10. <i>E. rosae</i> (Beddard, 1895)		B.M.* T* H*	Argentina
11. <i>E. rubra</i> (Friend, 1916)		—	Oxford botanical gardens
12. <i>E. saltensis</i> (Beddard, 1895)		B.M.*	Chile-mainland and Juan Fernandez Is ; Argen- tina ; Burma ; S. Africa ; Queensland
	<i>Acanthodrilus sydneyensis</i> Sweet, 1900	—	New South Wales ; Vic?
	<i>K. gunningi</i> Michaelsen, 1913	H*	South Africa ; New Cale- donia
	<i>K. nichollsi</i> Jackson, 1931	—	South West Australia



TAXONOMIC SUMMARY (*continued*)

13. <i>E. stagnalis</i> (Kinberg, 1867)	—	Uruguay
<i>Acanthodrilus spegazzini</i> Rosa, 1890	T* H.	Argentina ; Brazil
14. <i>E. subandina</i> (Rosa, 1895)	T*	Argentina
<i>K. borelli</i> Cognetti, 1900	T* H*	Brazil
15. <i>E. tucumana</i> Cordero, 1942	—	Argentina
16. <i>E. urna</i> Righi, 1968	—	Brazil : Marajo Island
17. <i>E. weyenberghi</i> Cordero, 1942	—	Argentina

## ACKNOWLEDGEMENTS

This study was made possible through the kind cooperation of Mr. R. W. Sims, British Museum (Natural History), Dr. M. Dzwillo, Zoologisches Museum, Hamburg, and Dr. L. Parenti of the Museo ed Istituto di Zoologia Systematica, University of Torino to whom the author gratefully extends his thanks. Serial sections were prepared by Mr. J. Casey. The work was financed by the Canadian National Research Council and University of Queensland Research Grants. Special thanks are due to Professor R. O. Brinkhurst for facilities provided.

## ILLUSTRATIONS

With the exception of Fig. 9, the illustrations have been drawn by the author by camera lucida. The scale indicated is 1 mm unless otherwise labelled. Shaded areas represent the clitellum.

Abbreviations used in the illustrations :

b.s, blood sinus ; c, cerebral ganglia ; ca. g, calciferous gland ; cil, cilia ; d.v. dorsal blood vessel ; dv. h, dorsoventral (lateral) heart ; ep, epithelium ; ♀, female pore ; gi. gizzard ; g.m, accessory genital marking ; g.m.b, bursa corresponding with external genital marking ; int. v, intestinal (oesophageal) valve ; lac, cavity or lacuna ; lo, latero-oesophageal vessel lo.h, latero-oesophageal hearts ; ♂ male pore ; ♂ f, seminal funnel ; n, nucleus ; n.c, ventral nerve cord ; np, nephropore ; oe, oesophagus ; ph, pharynx ; pr. d, prostate duct ; pr. g, glandular part of prostate ; pr. b, prostatic bursa ; pr. p, prostate pore ; pr. po, prostate porophore ; pro, prostomium ; sec. gr, secretory granules ; sem. gr, seminal groove ; sep, septum ; sep. g. septal gland ; sp, spermatheca ; sp. p, spermathecal pore ; s.v, seminal vesicle ; t, testis ; v.d, vas deferens ; v.d.b, ectal thickening (bursa) of vas deferens.

## REFERENCES

- BEDDARD, F. E. 1892. On some aquatic oligochaetous worms. *Proc. zool. Soc. Lond.*, 1892 : 349-361.  
 — 1895a. Preliminary account of new species of earthworms belonging to the Hamburg Museum. *Proc. zool. Soc. Lond.*, 1895 : 210-239.  
 — 1895b. *A monograph of the Order Oligochaeta*. Oxford Clarendon Press.



- BEDDARD, F. E. 1896. Naiden, Tubificiden und Terricolen. Hamburg-Naturhistorisches Museum. *Ergeb. Hamb. Magal. Samm.*, **1** : 1-63.
- COGNETTI, L. 1900. Contributo alla conoscenza degli Oligochaeti neotropici. *Boll. Musei Zool. Anat. comp. R. Univ. Torino*, **15**, 369 : 1-15.
- 1902. Terricoli boliviani ed argentini. *Boll. Musei Zool. Anat. comp. R. Univ. Torino*, **17**, 420 : 9-11.
- CORDERO, E. 1942. Oligoquetos terrícolas del Museo Argentino de Ciencias Naturales. *An. Mus. Argent. Cienc. nat.*, **40** : 269-297.
- EISEN, G. 1893. On the anatomical structures of two species of *Kerria*. *Proc. Calif. Acad. Sci.*, (2) **3**, 2 : 291-318.
- 1900. Researches in American Oligochaeta, with especial reference to those of the Pacific coast and adjacent islands. *Proc. Calif. Acad. Sci.* (3) **2** : 85-276.
- FRIEND, H. 1916. Alien oligochaetes in England. *J. R. microsc. Soc.*, 1916 : 147-157.
- GATES, G. E. 1939. Thai Earthworms. *J. Thailand Res. Soc.* **12** : 65-114.
- 1942. Notes on various peregrine earthworms. *Bull. Mus. comp. Zool. Harv.*, **89**, 3 : 61-144.
- 1959. On a taxonomic puzzle and the classification of the earthworms. *Bull. Mus. comp. Zool. Harv.*, **121** : 229-261.
- 1966. Contributions to a revision of the earthworm family Ocnerodrilidae. VII-VIII. *Ann. Mag. nat. Hist.*, (13), **9** : 45-53.
- GAVERILOV, K. 1952. Sobre *Eukerria saltensis* (Beddard) y su reproduction. *Acta zool. lilloana*. **10** : 673-716.
- 1967. Acerca de un representante del genero *Eukerria*. *Acta zool. lilloana*. **23** : 139-146.
- JACKSON, A. 1931. The Oligochaeta of south-western Australia. *J. Proc. R. Soc. West. Aust.*, **17** : 71-136.
- JAMIESON, B. G. M. 1962. Some new species of Ocnerodrilinae (Oligochaeta). *Proc. zool. Soc. Lond.*, **139** : 607-626.
- KINBERG, J. G. H. 1866. Annulata nova. *Öfvers. K. Vetensk. Acad. Förh.*, **23**, 4 : 97-103.
- MICHAELSEN, W. 1898. Die Oligochaeten der Sammlung Plate. *Zool. Jb. Suppl.*, **4** : 471-480.
- 1899a. Revision der Kenberg'schen Oligochaetentypen. *Öfvers. K. Vetensk. Acad. Förh.*, **56** : 413-448.
- 1899b. Oligochäten von den Inseln des Pacific, nebst Erörterungen zur Systematik der Megascoleciden. *Zool. Jb. Syst.*, **12** : 211-246.
- 1900. *Das Tierreich*, 10, Vermes, Oligochaeta.
- 1904. Catalogo de los Oligoquetos del territorio chileno-magallánico i descripción de especies nuevas. *Revta chil. Hist. nat.*, **8** : 262-322.
- 1907. Oligochaeten von Australien. *Abh. Geb. Naturw., Hamburg*, **19**, 1 : 1-25.
- 1908. Die Oligochäten Westindiens. *Zool. Jb. Suppl.*, **11** : 13-32.
- 1913a. The Oligochaeta of Natal and Zululand. *Ann. Natal Mus.*, **2**, 4 : 397-458.
- 1913b. Oligochäten von tropischen und südlich-subtropischen Afrika. *Zoologica, Stuttg.*, **27**, 68 : 1-63.
- 1913c. Die Oligochäten von Neu-Caledonien und den benachbarten Inselgruppen. Sarasin, Fritz and Jean Roux, *Nova Caledonia*. A. Zoologie, **1**, 3, 5 : 171-280.
- 1924. Oligochäten von den wärmeren Gebieten Amerikas und des Atlantischen Ozeans sowie ihre faunistischen Beziehungen. *Mitt. naturh. Mus. Hamburg*, **41** : 71-83.
- 1935a. Oligochaeta from Christmas Island, south of Java. *Ann. Mag. nat. Hist.* (10), **15**, 85 : 100-108.
- 1935b. Earthworms from South Western Australia. *J. Proc. R. Soc. West. Aust.*, **21** : 39-43.
- PICKFORD, G. E. 1928. Synonymy in the genus *Kerria* (Oligochaeta, Ocnerodrilinae). *Ann. Mag. nat. Hist.* (10), **2** : 378-382.
- RIGHI, G. 1968. Über die Oligochätengattung *Eukerria*. *Beitr. neotrop. Fauna*, **5** : 178-185.



- ROSA, D. 1890. Terricoli Argentini raccolti dal Dott. Carlo Spegazzini. *Annali Mus. civ. Stor. nat. Giacomo Doria*, **29** : 509-521.
- 1895a. Oligocheti terricoli. *Boll. Musei Zool. Anat. comp. R. Univ. Torino*, **10**, 204 : 1-3.
- 1895b. Contributo allo studio dei terricoli neotropicali. *Memorie Accad. Sci. Torino* (2), **45** : 89-152.
- STEPHENSON, J. 1930. *The Oligochaeta*. Oxford.
- 1931. The Oligochaeta from Brazil and Paraguay. *J. Linn. Soc., Zool.*, **37**, 252 : 291-326.
- SWEET, G. 1900. On the structure of the spermiducal glands and associated parts in Australian earthworms. *J. Linn. Soc., Zool.*, **28**, 180 : 109-139.
- VAILLANT, M. L. 1889. Lombriciniens, Hirudiniens, Bdellomorphes, Térétulariens et Planariens. Quatrefages de Bréau, J.L.A. de. *Histoire naturelle des Annelés marins et d'eau douce*, **3**, 1 : I-XII : 1-340.

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