

	Page
Note on the Embryogeny of the Tunicata of the group <i>Luciæ</i> , by M. A. Giard; On Hæckel's Theory (Allæogenesis) of the Genetic Connexion between the <i>Geryonida</i> and <i>Eginida</i> , by Alexander Agassiz; On the Embryogeny of the <i>Ephemera</i> , especially that of <i>Palingenia virgo</i> , Oliv., by M. N. Joly; Protection of Herbaria and Entomological Collections from Insects by means of Sulphide of Carbon, by M. J. B. Schnetzler; Silica of Grasses and other Plants carried up as Diatoms or other Siliceous Grains, and not in Solution or as Soluble Silicates, by Prof. P. B. Wilson; On Fish of the <i>Ceratodus</i> -group existing in the River Fitzroy, South Australia, by M. Paul Gervais	479—486
Index	487

PLATES IN VOL. XVII.

PLATE I.	} New Species of Terebratulina, Waldheimia, and Terebratella.
II.	
III.	New-Zealand Hydroids.
IV.	} New Species of Sessile-eyed Crustaceans.
V.	
VI.	} Palæozoic Corals.
VII.	
VIII.	} New British Fungi.
IX.	
X.	} Palæozoic Corals.
XI.	
XII.	Palæozoic Corals.
XIII.	New Species of Polytrema.
XIV.	} Palæozoic Corals.
XV.	
XVI.	} Amphipodous Crustaceans.
XVII.	
XVIII.	} Chrysochloris Trevelyani.—Mode of Propagation of Tree-Frogs.
XIX.	
XX.	} Palæozoic Corals.
XXI.	
XXII.	} Palæozoic Corals.
XXIII.	
XXIV.	} Palæozoic Corals.
XXV.	

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[FOURTH SERIES.]

"..... per litora spargite muscum,
 Naiades, et circum vitreos considite fontes:
 Pollice virgineo teneros hic carpite flores:
 Floribus et pictum, divæ, replete canistrum.
 At vos, o Nymphæ Craterides, ite sub undas;
 Ita, recurvato variata corallia trunco
 Vellite muscosis e rupibus, et mihi conchas
 Ferte, Dææ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasti Ecl. 1.

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I.—On the Classification of Scorpions.
By Prof. T. THORELL.

AFTER Peters, by his important work, "Ueber eine neue Eintheilung der Skorpione" &c.*, had carried out a thorough reform in the classification of Scorpions, it might have been expected that this interesting and neglected group of animals would become the subject of numerous and exhaustive researches, and that not only some among the many unknown species that lie preserved in public and private collections would be described, but also that their classification would be more fully developed on the principles laid down by Peters. Very little of this, however, has yet taken place; and under these circumstances the contribution to the knowledge of these animals which constitutes the substance of the following attempt at a systematical arrangement of the order of Scorpions, although based on the examination of a rather limited number (about 90) of species, may perhaps be considered not altogether superfluous, since it points out some

* Monatsbericht d. königl. Akad. d. Wissensch. zu Berlin, 1861, pp. 507-516.

features in their organization, the importance of which for the purpose of systematization seems not to have been sufficiently appreciated.

The principal material on which this essay is based consists of the collections in the National Museum at Stockholm and the Gottenburg Museum of Natural History; and I avail myself of this opportunity to express my thankfulness to the keepers of those institutions, Prof. C. Stål and Mr. A. W. Malm, whose obligingness enabled me to study the scorpions committed to their care.

De Geer was, as is well known, the first who divided the genus *Scorpio*, Linn., into smaller groups. He chose as the basis for his classification the differences in the number of the eyes. Most subsequent writers who have treated of the classification of scorpions (e.g. Leach, Hemprich and Ehrenberg, as also C. L. Koch) have either exclusively or principally adopted the same principle of division. C. L. Koch's arrangement is still employed by many naturalists, notwithstanding that Gervais and, subsequently, Peters have clearly shown the comparatively trifling importance and the often variable and unsatisfactory nature of the characteristics afforded by the eyes. The merit of having first disengaged himself from the ordinary view relative to the classification of scorpions belongs without doubt to Gervais*, although even he appears to attribute too much importance to the characteristics derived from the number of the eyes. The "groups," however, into which he collects the "subgenera" of his genus *Scorpio* are almost all perfectly natural, and agree in part with those proposed by Peters. His first group, containing the subgenera *Androctonus*, *Centrurus*, and *Isometrus* or *Atreus*, corresponds with Peters's *Androctonini* and *Centrurini* (which I unite in one under the denomination *Androctonoidæ*); his second group, *Télegones*, is identical with Peters's *Telegonini*. The four following subgenera (*Buthus*, *Chactas*, *Scorpius*, and *Ischnurus*) he does not, however, like Peters, unite in one similar group, but considers each of them as forming a separate group. (The genera *Vejovis* and *Dacurus* = *Centrurus*, C. L. Koch, which appear to have been unknown to him, were erroneously placed in his first group.)

But if Gervais's division is, on the whole, quite natural and far better than C. L. Koch's, it nevertheless leaves much to be desired as regards the sharp and sure limitation of the groups; and it is principally in this respect that the system

* Gervais, "Remarques sur la fam. d. Scorpions," in the Archives du Mus. d'Hist. Nat. iv. pp. 201-240; Walckenaer et Gervais, Hist. Nat. d. Ins. Apt. iii. pp. 32-74.

of Peters distinguishes itself before all previous attempts, in that he has called attention to characteristics, overlooked by all his predecessors, which have the advantage of being eminently constant and trustworthy. It is especially the form of the sternum and the different tooth armature of the mandibles that afford the distinctive characteristics of the four "groups" into which Peters arranges the scorpions. In his first group, *Telegonini*, the sternum is extremely short, transverse, almost forming a mere line, and both fingers of the mandibles are armed with a single row of teeth. In the second group, *Scorpionini*, the sternum is large, almost pentagonal, with parallel lateral margins, and the mandibles are similar to those of the preceding group. In the third group, *Centrurini*, the sternum is small, triangular, narrowing in front, and the movable finger of the mandible armed with two, the immovable with one row of teeth. Lastly, in the fourth group, *Androctonini*, the sternum has the same form as in the *Centrurini*, but both fingers of the mandibles are provided with two rows of teeth. These four groups are further divided into several (in great part new) genera, distinguished by differences in the form of the cephalothorax and the tail, the armature and sculpture of the latter, the number and position of the eyes, the form of the hands, &c. With regard to the lateral eyes, a distinction is made between the usually larger and in number and position almost uniformly constant "principal" lateral eyes and the more variable "accessory" eyes.

The modifications of Peters's system which I have thought proper to adopt are not of any especially great consequence. I have, however, found that similitude in the form of the sternum is not accompanied by similitude in the dental armature of the mandibles quite so often as Peters supposes; and I cannot, therefore, attribute to the characteristics derived from the mandibles the same importance that he does. One consequence of this is, that I find myself led to combine *Centrurini* and *Androctonini* in one and the same principal group. Moreover I think I have found in the form of the pectoral combs two separate types, which in a systematic point of view are probably quite as important as the different forms under which the sternum presents itself. The "combs" are, as is known, a sort of oblong laminæ, each made up of more or less numerous longitudinally arranged lamellæ, and bearing in its posterior margin a row of long, narrow, closely set parallel processes, the so-called teeth of the comb. The first (front) row of lamellæ is composed of three large plates, which may be called *lamellæ dorsuales*; the hindmost row consists of a number of very small rounded lamellæ, one behind the base of each tooth

(with the exception of the last), which I call *lamellæ fulciantes*, or *fulcra dentium*. Between these rows lies a variable number of rows of lamellæ, the *lamellæ intermedie*. In Peters's *Androctonini*, *Centrurini*, and *Scorpionini*, with the exception of *Vejovis*, these intermediate lamellæ are few in number, most, if not all, of them *angular* and *large* (larger than the fulcra), and always arranged in a single row. In his *Telegonini*, on the contrary, as also in *Vejovis*, the intermediate lamellæ are *numerous*, mostly *rounded* (at least towards the apex of the comb), and very *small* (little, if at all, larger than the fulcra), and arranged sometimes in one, sometimes in more rows. Such is at least the case with the few species of the two last-named groups that I have had the opportunity of examining. I have therefore detached *Vejovis* from Peters's *Scorpionini*, from the rest of which it differs also by several other peculiarities, and have formed of it a separate principal group. As the characteristics on which the four principal groups, *Androctonoideæ*, *Telegonoideæ*, *Vejovoideæ*, and *Pandinoidæ**, recognized by me were founded, are at least as important as those whereby the *families* included in the order of Spiders, for example, are distinguished from each other, I call these groups also *families*.

For determining the limits of the smaller subdivisions, the subfamilies and genera, I have partly made use of the cha-

* The name is formed from the new generic name *Pandinus*. As *Scorpiones* (or *Scorpii*) is the name of the whole order, the name *Scorpio* or *Scorpius* can no more be retained as a "nomen genericum" than *Aranæus* or *Aranæa* when we call the order of Spiders *Aranææ*. Together with the generic names *Scorpio* and *Scorpius* the denomination *Scorpionini* must of course be discarded.

As long as it was customary to unite the *Pseudoscorpiones* in the same "family" as the Scorpions, it was right to call that family *Scorpionides* (-*idea* &c.); but since the Scorpions have been formed into a separate order, or at least suborder, this group ought as assuredly to be called *Scorpiones*, as the class of fishes *Pisces*, and that of birds *Aves*. When we have the good fortune to possess a universally known "nomen appellativum" which accurately suits a class, order, or suborder, nothing can surely be gained by rejecting it for a newly manufactured denomination, or by appending to the end of it *-ides* or *-idea*, a termination which implies an *extension* of the notion to which it is applied, and therefore, in the present instance, *falsifies* it, and is, moreover, in zoology generally applied as an ending to *family* names, rarely to those of higher groups. Neither is this our view invalidated by an appeal to the "law of priority;" for that law holds only for the names of genera and species, not for groups of higher rank, and is moreover not so absolute as not to admit of exception—for instance, for the sake of avoiding a *false* denomination. Thus the name *Scorpio europæus* certainly could not be retained for a species never found in Europe, but only in America; and the older name *Tarentula*, Fabr., has been universally abandoned for *Phrynus*, Oliv., because it would be quite as wrong to call those animals *Tarentula* as *Scorpio* or *Musca*.

acteristics employed by Peters and others, partly of certain new ones, among which I desire to call special attention to the tooth armature of the *palp-fingers* (which often seems to me to offer particularly good and trustworthy marks of distinction), as also to the position, with regard to the upper and underside of the hand, of what I call the *hand-back* (*manus aversa*). By hand-back I mean that surface of the hand which (in the family *Pandinoidæ*) is turned outwards, and which is bounded by the two strongest costæ of the hand. I have retained Peters's division of the lateral eyes into principal and accessory lateral eyes, although it may sometimes be difficult to say under which of these categories an eye comes. I have also, after him, allowed the presence or absence of "keels" on the tail to serve as a distinctive mark of genera, although I am by no means sure that this characteristic is always entitled to so much credit. Those also of Peters's genera which are to me unknown, I have endeavoured, as far as possible, to accommodate with places in my scheme (they are here marked with an asterisk), but, I have no doubt, in some instances failed to assign them their proper place.

Many may probably entertain the opinion that I have broken up the families into too many genera, whereas I am convinced that the number of these groups will hereafter be considerably increased. If there is ever to be an end of the confusion in which our knowledge of the *species* of scorpions is involved (a confusion which has probably contributed more than any thing else to deter zoologists from the study of this group of animals), the first necessary step will assuredly be its division into numerous and well-distinguished *genera*.

That I have corrected the faultily written names *Brotheas* and *Vejovis* to *Broteas* and *Vejovis* (as on a former occasion I corrected, for instance, *Marpissa* to *Marpessa*), will probably be disapproved by no others than those who look upon every letter of a once published name as holy and intangible. I ought to mention that I do not allow myself to make such a correction without its having been first approved by a philologist *ex professo*. As regards my views on the subject of zoological nomenclature in general, I beg to refer to my work 'On European Spiders,' pp. 3-14.

Scorpions form so compact and uniform a group that it is extremely difficult, perhaps impossible, to say with certainty which of them are the highest and which the lowest. Those who consider Spiders as ranking above Scorpions will no doubt assign the highest place to those forms (*Ischnurus* for instance) in which the tail is least developed, and which thus

appear to form a transition, though a very indistinct one, to *Thelyphonus* and *Phrynus*. For my part I am more inclined, with Gervais, to consider the *Androctonini* the most highly developed scorpions, in virtue of their more numerous eyes, more developed pectoral combs, and richer tooth armature of the fingers both of the mandibles and the palpi, their powerful tail, &c. At least the *Androctonini* are the most typical of scorpions; and with them therefore I begin my arrangement. The *Pandinini*, which differ most from the *Androctonini*, have on that account received the lowest place*.

Ordo SCORPIONES (sive SCORPII).

Fam. I. Androctonoidæ.

Sternum narrowing forwards, subtriangular. Intermediate lamellæ of the pectoral combs rather few in number, most of them angular and larger than the fulcra, and forming only one series. The movable finger of the mandibles (which always forms a perfect furca) has two rows of teeth; their immovable finger has two teeth in the superior margin, 2-0 in the inferior. The fingers of the palpi are, along the middle of their edge, provided with a number of oblique rows of fine teeth, and on either side of these with other, generally coarser teeth, arranged in one or more rows. Three principal lateral eyes and 2-0 accessory eyes on each side of the cephalothorax.

Subfam. 1. ANDROCTONINI.

Not only the upper but also the under margin of the immovable mandibular finger armed with two strong teeth. Lateral teeth of the palp-fingers, which are coarser than the median teeth, form along the inner side a single simple row;

* The place that I consider the order of Scorpions to occupy in the class of Arachnoidea will appear by the following scheme:—

Class ARACHNOIDEA.

Subcl. 1. THORACOPODA, nob.

Ordo 1. Scorpiones.

2. Pedipalpi.

6. Pseudoscorpiones.

7. Acari.

8. Linguatulina (=fam. *Pentastomoidæ*).

Ordo 3. Araneæ.

4. Opiliones.

Ordo 5. Solifugæ.

Subcl. 2. (Ordo 9) CORMOPODA, nob. (=fam. *Arctiscoidea*).

[The usual name of the last order, "Tardigrada," belongs to a group of Mammals. The order Pantopoda (fam. *Pycnogonoidæ*) appears to be more nearly allied to the Crustacea than to the Arachnoidea.]

but along the outer side they are arranged in a series of teeth placed two and two obliquely and transversely near to each other. No tooth or spine under the base of the sting. Generally two accessory eyes, besides the three principal eyes, on each side of the cephalothorax.

1. The fifth joint of the tail broadly excavated above, its superior margins forming an elevated denticulate or granulate keel. Tail generally increasing in breadth from the base to the fifth joint.
ANDROCTONUS, (Hempr. et Ehr.), 1829.
Type *A. australis*, (Linn.), 1758¹.
2. The upper margins of the fifth caudal segment rounded, not compressed into an elevated keel BUTHUS, (Leach), 1815.
Type *B. europæus*, (Linn.), 1754².

Subfam. 2. CENTRURINI.

The immovable finger of the mandibles has no tooth, or only one, in the inferior margin. Lateral teeth of the palp-fingers arranged in a single series, or forming several short transverse rows. The sixth caudal joint generally provided with a spine or tooth under the sting. Accessory lateral eyes often wanting, sometimes one or two on each side.

A. "Joints of the tail destitute of keels" (Pet.)
*UROPLECTES, Pet., 1861³.
Type *U. ornatus*, Pet., 1861.

B. At least a few of the joints of the tail evidently keeled.
a. Inferior margin of the immovable mandibular finger toothless.
1. Lateral teeth of the palp-fingers form on the inner side a single simple row; on the outer side they are arranged in a row which partly consists of teeth placed two and two transversely near to each other. (A tooth under the sting is often wanting.)
LEPREUS, n.⁴
Type *L. pilosus*, n.⁵

¹ = *A. funestus*, Hempr. et Ehr. The *Scorpio australis* of Linnæus, which was quite erroneously by DeGeer referred to an American species, by Herbst to a scorpion which is perhaps identical with a species called by me *Buthus craterus*, by Savigny and Audouin to *Andr. crassicauda*, (Oliv.), or *A. bicolor*, Hempr. et Ehr., is probably the same species as *A. funestus*, *id.*, which is, I believe, the *Androctonus* most generally met with in European collections, and of which a very old specimen in the National Museum of Stockholm is labelled "*Scorpio australis*, Linn."

² = *Scorpio occitanus*, Amour. 1789, or *S. tunetanus*, Herbst, 1800. (Not = *S. europæus*, Linn. 1758!)

³ Of his *U. flavoviridis*, however, Peters says (*l. c.* p. 516), "Obere Schwanzkämme deutlich." *Uroplectes* is perhaps not different from *Tityus* (C. L. Koch) nob.

⁴ Nom. propr. mythol.

Lepreus pilosus, n.

⁵ *Densius pilosus*, pallide vel subcinereo-testaceus, oculis nigris, cauda apice

2. Lateral teeth of the palp-fingers form, both on the inner and outer side, a row of teeth placed two and two transversely near to each other. (The tooth under the sting is sometimes wanting.)
TITYUS, (C. L. Koch), 1836.
Type *T. lineatus*, C. L. Koch, 1845.
- b. Inferior margin of the immovable mandibular finger armed with one (very small) tooth. (A tooth or spine under the sting is rarely wanting.)
- * Both the inner and the outer lateral teeth of the palp-fingers arranged in a single row.
1. The fifth caudal joint broadly excavated above, its upper margins forming an elevated keel. (The tail gradually somewhat incrossed from the vicinity of the base to the fifth joint.)
PHASSUS, n.¹
Type *P. columbianus*, n.²
2. Upper margins of the fifth caudal joint rounded, not forming an elevated keel ISOMETRUS, (Hempr. et Ehr.), 1829.
Type *I. maculatus*, (DeGeer), 1778³.

plus minus infuscata; segmentis abdominalibus costis trinis versus medium, postice, munitis; cauda gracili, segmentis 1^o-4^o subcylindricis et carinis inferioribus mediis carentibus, carinis reliquis debilissimis, subtiliter denticulatis; segmento 5^o carinis superioribus carente, saltem duplo et dimidio longiore quam latiore; vesica sub aculeo mutica; digito manus mobili manu postica non vel vix longiore, ordinibus dentium secundum mediam aciem ejus 9; dentibus pectinum 29-31. Long. circa 47 millim. Africa, Caffraria.

¹ Nom. propr. mythol.

² *Phassus columbianus*, n.

Cephalothorace sat crasse granuloso, nigro et fusco-testaceo variato, abdomine nigricante, ordinibus 5 longitudinalibus macularum fusco-testacearum; cauda basi fusco-testacea, apice late nigricante, ibique sat fortiter angustata, vesica parva, oblonga, crasse granulosa, sub aculeo dente forti compresso supra bidenticulato armata; manibus brachia latitudine fere sequantibus, evidentissime granuloso-costatis; digito manus mobili manu postica duplo longiore, ordinibus denticulorum secundum mediam aciem ejus circa 8; dentibus pectinum fere 12. Long. circa 32 millim. America merid., Columbia.

³ = *Scorpio americanus*, Linn., 1758. I suppose we cannot well retain the Linnæan name of this scorpion, as Linnæus had already in 1754 (in his 'Museum Adolphi Friderici,' where the binominal nomenclature is consistently and constantly employed) given the name *S. americanus* to another species of *Isometrus*. In his 'Syst. Nat.' ed. 10 (1758) and in 'Mus. Ludov. Ulricæ' (1764), Linnæus changed the name of that scorpion, erroneously considering it identical with a European species, into *S. europæus*, although the specimen which he had described was from America. This *S. americanus*, Linn. 1754, or *S. europæus*, ejusd. 1758, in which, according to Linnæus (Mus. Ludov. Ulricæ, p. 429), the hands are "supra angulatæ, admodum angustæ," is no doubt identical with *S. europæus*, DeGeer (of which I have seen the type specimen), or *S. obscurus*, Gerv., which species I therefore call *Isometrus americanus*, (Linn.).

- ** Both the inner and outer lateral teeth of the palp-fingers arranged in a number of short oblique rows, with at least three teeth in each row.
1. The fifth caudal joint broadly excavated above, its upper margins forming an elevated keel. (The tail gradually broader from its base towards the fifth joint.) RHOPALURUS, n.¹
Type *R. laticauda*, n.²
2. The upper margins of the fifth caudal joint rounded, not forming an elevated keel. CENTRURUS, (Hempr. et Ehr.), 1829³.
Type *C. biaculeatus*, (Lucas), 1839.

Fam. II. Telegonoidæ.

Sternum very short, forming a transverse falciform band or line curved backwards between the coxæ of the second pair and the genital plates. The intermediate lamellæ of the combs generally (always?) numerous, most of them rounded and small (little or not larger than the fulcra), and arranged in 1-3 longitudinal rows. Both fingers of the mandibles provided with a single row of teeth. Lateral eyes three or two (?) on each side, small. No tooth or spine under the sting.

4. Tail without keels on the underside.

1. The fifth caudal joint provided on the underside, near the apex, with a large, depressed, almost semielliptical area, rounded in front, and limited by a row of small teeth or granules.

BOTHRIURUS, (Pet.), 1861⁴.

Type *B. vittatus*, (Guér.), 1830.

¹ ῥόπαλον, club; οὐρά, tail.

² *Rhopalurus laticauda*, n.

Substernum, cauda a basi ad segmentum quintum dilatata, tum fortiter angustata, apice late infuscata, manibus subtiliter granulosis, plus minus evidenter costatis, brachio circiter dimidio latioribus, digito manuum mobili manu postica paullo plus dimidio longiore, ordinibus denticulorum secundum mediam aciem circa 8; dentibus pectinum fere 19-23. Long. circa 44-50 millim. America merid., Columbia.

³ Hemprich and Ehrenberg formed the genus *Centrurus* for those scorpions which had "10 eyes," without giving any species as its type. Peters says (l. c. p. 508) that it is founded on a Brazilian species, and that there can be no doubt of that species belonging to the genus *Tityus* of C. L. Koch. I have therefore as type of the genus taken a species, *C. biaculeatus*, (Luc.), which Peters expressly names as belonging to *Centrurus*, Hempr. et Ehr. In this genus the eyes do not appear to me to be in general more than 8 but there certainly are species with 10 (for instance, *C. testaceus*, (DeGeer), which has an accessory eye either on both sides or only on one of the sides), and even with 12 eyes. It is therefore impossible to take the number of eyes into account in characterizing this genus.

⁴ I have altered the characteristics of Peters's genus *Bothriurus* so as to make it also comprehend *Brotheas erythroductylus*, C. L. Koch, which probably is the female of *B. bonariensis*, ejusd.; *Scorpio vittatus*, Guér., is, I believe, the same species.

2. The fifth caudal segment smooth below, without a depressed semi-elliptical area TELRAGONUS, (C. L. Koch), 1836.
Type *T. versicolor*, C. L. Koch, 1836.
- B. Tail keeled at least on the underside of the fifth joint.
CERCOPHONIUS, (Pet.), 1861.
Type *C. squama*, (Gerv.), 1844¹.

Fam. III. *Vejovoidæ*.

Sternum with parallel sides, subpentagonal, rather small, about double as broad as long. Intermediate lamellæ of the combs generally (always?) numerous, most of them rounded and small (little or not larger than the fulcra), and arranged in 1-3 longitudinal rows. The movable mandibular finger armed with one or two rows, the immovable with a single row of teeth. The hands subfusiform or ovate, their height or thickness in general greater than their least breadth. Three (or four) lateral eyes on each side, forming a row curved inwards². No spine or tooth under the sting.

1. The movable mandibular finger provided with a single row of teeth in the upper margin. Dorsal eyes placed rather far in front of cephalothorax. The tail keeled VEJOVIS, C. L. Koch, 1836³.
Type *V. intrepidus*, n.⁴

¹ The genus **Acanthochirus*, Pet., which appears to differ from *Cercophonius* almost only by the hands being armed with a spine on the inner side, is probably, as has already been suggested by Gerstäcker ("Bericht über die wissensch. Leist. im Gebiete d. Entom. 1861"), founded on the male of *Cercoph. squama*. I have myself seen a species of *Tityus* in which the male is provided with a similar spine, whereas in the female this spine is represented only by a low tubercle.

² According to Peters, these scorpions have two principal lateral eyes and one or two accessory eyes.

³ Not being acquainted with any of C. L. Koch's *Vejovis*-species, I have been obliged to give an apparently new species as the type of the genus.

Vejovis intrepidus, n.

Ferrugineo-fuscus, vesica ferrugineo-testacea, manibus pallidius ferrugineis, costis obscurioribus; cephalothorace crasse granuloso, segmenta caudæ 1^m et 2^m longitudine æquante, segmentis abdominalibus anticæ lævibus, nitidis; cauda cephalothorace circiter quadruplo et dimidio longiore, latiore quam altiore, carinis superioribus in segmentis 1^o-4^m denticulatis, dente apicali fortiore, carinis inferioribus granulosis, mediis segmentorum anticorum lævibus tamen, segmento 5^o in marginibus superioribus tenuius granuloso, carinis inferioribus subtiliter dentatis; palporum humero supra plano, granulis tantum minutissimis sparso; manibus crassis, tumidis, costis 8 longitudinalibus granulosis, digito mobili manu postica circiter dimidio longiore; pectinum dentibus circa 22. Long. circa 84 millim. America, Mexico.

2. The movable mandibular finger not only provided with a row of teeth in the upper margin, but also with a tooth in the under margin. Dorsal eyes not far removed from the centre of cephalothorax. Tail keeled HADRURUS, n.¹
Type *H. hirsutus*, (Wood), 1863.

Fam. IV. *Pandinoidæ*.

Sternum with parallel sides, subpentagonal, generally large. Intermediate lamellæ of the combs rather few in number, angular, and (at least most of them) larger than the fulcra, and arranged in a single row. The movable mandibular finger provided with one or two rows, the immovable with a single row of teeth. Hands broader than high, in general large and depressed. The principal lateral eyes three or two, the accessory eyes in general wanting, rarely one on each side. The sixth caudal segment nearly always destitute of a tooth or spine under the sting.

Subfam. 1. *IURINI*.

The movable mandibular finger not only provided with a row of teeth in the upper, but also with one or more teeth in the under margin. (Cephalothorax emarginate in front; dorsal eyes situated far in front of the centre of cephalothorax; lateral eyes three, removed from the lateral margin of cephalothorax. Sternum as broad as the labial lobes of the second pair together. Hands rather large, thick; the hand-back forming an obtuse angle with the upper surface of the hand. Tail evidently keeled, its sixth joint long, not grooved on the underside.)

1. The inferior margin of the movable mandibular finger armed with one strong tooth. The fine teeth along the middle of the edge of the palp-fingers forming many short oblique rows IURUS, n.²
Type *I. granulatus*, (C. L. Koch), 1838.
2. The inferior margin of the movable mandibular finger provided with a row of (5) teeth. The teeth along the middle of the edge of the palp-fingers forming a single continuous row UROCTONUS, n.³
Type *U. mordax*, n.⁴

¹ ἀδρός, strong; οὐρά, tail.

² ἰός, poison; οὐρά, tail.

³ οὐρά, tail; κτείνω, kill.

⁴ *Uroctonus mordax*, n.

Saturate fuscus, costis palporum nigris, abdomine supra plerumque dilutiore, pedibus pallidioribus, vesica testaceo-fusca; cephalothorace subtiliter granuloso, segmentis duobus primis caudæ conjunctim paullo longiore; digito manus mobili manum posticam longitudine æquante; dentibus pectinum 8-10. Long. circa 50 millim. America septentr., California.

Subfam. 2. *PANDINI*.

The movable mandibular finger provided with a single row of teeth, situated in its upper margin.

A. Three principal lateral eyes on each side.

- A. "Joints of the tail rounded, without keels. Dorsal eyes behind the centre of cephalothorax"¹ **DACURUS*, Pet., 1861.
Type *D. galbineus*, (C. L. Koch), 1838.

B. Tail evidently keeled.

- a. "A spine under the base of the sting. Dorsal eyes situated just behind the first third of cephalothorax. Body, palpi, and tail as in *Heterometrus*, Hempr. et Ehr." (*Pet.*).
**DIPLOCENTRUS*, Pet., 1861.
Type *D. mexicanus*, Pet., 1861.

b. No tooth or spine under the sting.

- a. Lateral eyes removed from the lateral margin of cephalothorax. Hand-back forming an acute angle with the upperside of the hand.

† Dorsal eyes not very far removed from the centre of cephalothorax. Underside of tail provided with three longitudinal grooves, and with granules arranged in at least four longitudinal rows. Labial lobes of the second pair together from half as broad again to double as broad as sternum.

§ Cubitus rounded off anteriorly; its anterior side not separated by a strong margin or ridge from the upper and under surfaces. (Dorsal eyes situated nearly in the centre of cephalothorax. The infero-lateral keels of the fifth caudal joint are, towards the apex, diverging and curved rather strongly upwards. Hands not much compressed on the inner side. Anterior margin of cephalothorax rather broadly emarginate.)

HETEROMETRUS, (Hempr. et Ehr.), 1829.
Type *H. maurus* (Linn.), 1758².

§§ Cubitus subprismatic, with the anterior and superior sides plain; anterior side subrectangular, limited both above and below by a very distinct dentate or granulate margin.

* Anterior margin of cephalothorax rather broadly and deeply emarginate, its frontal lobes rounded.

1. Inner margin of the hands strongly compressed, thin. (Dorsal eyes situated a little behind the centre of cephalothorax³.) *PANDINUS*, n.⁴
Type *P. africanus*, (Linn.), 1754.

¹ According to Peters; C. L. Koch, however, says of his *Centrurus galbineus* (Die Arachn. iv. p. 111):—"Die Seitenkiele und die unteren Kiele zwar vorhanden, aber in nicht sehr starkem Ausdrucks." The hands are said to be "schmal, an der Aussenseite uneben, ohne deutliche Kiele." Koch gives this species ten eyes (?).

² = *H. palmatus*, Hempr. et Ehr.

³ The measures are taken from the eyes to a straight line tangent to the anterior margins of the frontal lobes, and to the middle of the posterior margin of the cephalothorax.

⁴ πάνδεινος, quite terrible.

2. Inner margin of the hands very thick, not compressed. (Dorsal eyes situated a little in front of the centre of cephalothorax.) *PALAMNÆUS*, n.¹
Type *P. Petersii*, n.²

** Anterior margin of cephalothorax rather slightly emarginate in the middle; frontal lobes broadly truncate; dorsal eyes situated behind the centre of cephalothorax.
MICEPHONUS, n.³
Type *M. Wahlbergii*, n.⁴

†† Dorsal eyes situated about double as far from the anterior margin of cephalothorax (which is but little or not emarginate) as from its posterior margin. Labial lobes of second pair of legs together a little broader than (not more than half as broad again as) sternum. The sixth caudal joint destitute of rows of granules and of distinct grooves on the underside.

OPISTHOPHTHALMUS, C. L. Koch, 1837.
Type *O. capensis*, (Herbst), 1800.

β. Lateral eyes, at least the anterior one, situated very near to or on the lateral margin of cephalothorax. Hand-back forming an obtuse or nearly right angle with the upper surface of the hand. (Cephalothorax emarginate in front. Dorsal eyes not far removed from its centre. Sternum not, or only a little, narrower than the labial lobes of the second pair together. Tail rather slender, its sixth joint long and narrow, destitute of grooves and rows of granules on the underside. Body and hands in general flattened.)

† Tail not much compressed; its superior margins rounded, not keeled.

1. The elevated lateral margin of cephalothorax visible under the lateral eyes; these eyes, therefore, separated from the margin by a slight interval. Hands not much flattened *OPISTHACANTHUS*, (Pet.), 1861⁵.
Type *O. elatus*, (Gerv.), 1844.

¹ παλαμναῖος, murderer. ² = *Heterometrus megacephalus*, Sim.

³ μαιφόνος, stained with blood, murderer.

⁴ *Micophonus Wahlbergii*, n.

Supra fusco-testaceus, segmentis abdominalibus basi late nigricantibus, cauda versus apicem plus minus late infuscata; subter cum pedibus testaceis; cephalothorace segmenta caudæ primum et secundum cum dimidio tertii longitudine superante; cauda leviter carinata; manibus latis, intus fortiter rotundatis, supra pæne lævibus; dentibus pectinum circa 18. Long. circa 78 millim. Africa, Caffraria.

⁵ In this genus the hind lateral eye is sometimes (as in *O. elatus*) placed a little nearer to the middle eye than this to the anterior, as also a little more inwards than the other lateral eyes. Peters has based the genus on this character, which, however, appears to me to be of less importance than that here given.

2. Lateral eyes situated on the very margin of cephalothorax.
Hands very flat HORMURUS, n.¹
Type *H. caudicula*, (L. Koch), 1867.

†† Tail rather strongly compressed, with keels both on the upper and underside .. ISCHNURUS, (C. L. Koch), 1837.
Type *I. trichiurus*, (Gerv.), 1844.

B. Two principal lateral eyes on each side.

- a.** "Tail with only three keels on the underside, thick, its keels strong. Frontal margin arcuato-emarginate. Sternum broader than long, as broad as the labial lobes of the second pair. Hands broader than high, strongly keeled. Two large principal eyes on each side." (Pet.) *URODACUS, Pet., 1861.
Type *U. novae hollandiae*, Pet., 1861.

- b.** The first four caudal joints with four keels on the underside.
a. Sternum narrower than the labial lobes of the second pair together. Dorsal eyes situated far in front of the centre of cephalothorax; the tubercle on which they are placed not grooved longitudinally. Hands thick, convex, the hand-back turned rather more downwards than upwards. Tail keeled on all sides. Besides the two principal eyes, there is sometimes an accessory eye on one or both sides of cephalothorax.
BROTEAS, (C. L. Koch), 1837.
Type *Broteas Herbstii*, n.³

- β.** Sternum as broad as the labial lobes of the second pair together.
† "Sternum longer than broad. Hind margin of cephalothorax angulato-emarginate. Hands flat, angular. The hind lateral eye sometimes divided into two." (Pet.)
*SCORPIOPS, Pet. 1861.

Type *Scorpiops Hardwickii*, (Gerv.), 1844.

†† Sternum broader than long. Hand-back forming, with the upperside of the hand, a right or obtuse angle. Only two lateral eyes on each side.

- 1.** Dorsal eyes situated nearly in the middle of cephalothorax, which is emarginate in front; dorsal eye-tubercle divided by a longitudinal middle groove. Hands rather thick. Tail somewhat strong, with strongly marked keels on all sides.

IOCTONUS, n.⁴
Type *I. manicatus*, n.⁵

¹ ὄρμος, necklace; οὐρά, tail.

² The place of **Hemiscorpius*, Pet., is probably in the vicinity of this genus. It is characterized by Peters in the following words:—"Sternum as broad as the labial lobes of the second pair. Frontal margin scarcely emarginate. Body and extremities flattened. Tail slender, long, higher than broad, keeled, its sixth joint with two lateral tubercles (in the males) behind the base of the short sting. The hind lateral eye somewhat smaller, placed more inwards."

If the tubercles mentioned by Peters also exist in the females, *Hemiscorpius* is without doubt a good genus.

³ = *Scorpio* (*Broteas*, *Chactas*) *maurus*, De Geer, script. recent. (non Linn.).

⁴ ἴδς, poison; κτείρω, kill.

⁵ *Ioctonus manicatus*, n.

Fuscus, palporum costis nigris, vesica fusco-testaceo lineata, pedibus apice

2. Dorsal eyes far in front of the centre of cephalothorax; frontal margin not, or but little, emarginate; dorsal eye-tubercle destitute of a longitudinal middle groove. Hands flattened. Tail slender EUSCORPIUS, n.*
Type *E. carpathicus*, (Linn.), 1767.

II.—On some Species of Terebratulina, Waldheimia, and Terebratella from the Upper Tertiary Deposits of Mount Gambier and the Murray-River Cliffs, South Australia.
By R. ETHERIDGE, jun., F.G.S.

[Plates I. & II.]

I AM indebted to the kindness of the President and Council of the Geological Society of London, through the Assistant Secretary, Mr. W. S. Dallas, F.L.S., and to Mr. T. Davidson, F.R.S., for the opportunity of describing four of the following species from the Tertiary beds of Mount Gambier. The remaining specimen I have been permitted to borrow from the small foreign collection of the Museum of Practical Geology; it is from similar beds at the Murray-River Cliffs, near the Great Bend, South Australia. Had it not been for Mr. Davidson's considerate help, both in information and the loan of specimens, I should have been unable to complete these notes; I therefore take this opportunity of thanking him for his kind assistance.

Bibliography.—So far as known to me, the following is a brief digest of previous writings in connexion with Australian Tertiary Brachiopoda.

Capt. Sturt, during his memorable exploration of the river Murray, collected a few fossils from the Murray Cliffs, which are figured in the account of his exploration †. The only Brachiopod there represented ‡ was afterwards described and figured from another locality by Mr. G. B. Sowerby, in Count

late flavo-testaceis; cephalothorace subtilissime granuloso, segmenta duo prima caudæ conjunctim longitudine paulo superante; cauda cephalothorace quadruplo longiore, segmentis anterioribus desuperne visis in lateribus leviter rotundatis; dentibus pectinum circa 13. Long. circa 54 millim. Nova Hollandia.

* εὖ-, well, true; σκορπίος, scorpion. I have preferred the termination *us* to *o* or *on* in names composed of σκορπίος (-ίων) and another Greek word, a scorpion being in Greek called σκορπίος; σκορπίων signifies the shooting-engine called by the Romans *scorpio* or *scorpius*.

† Two Expeditions into the Interior of S. Australia, 1832. 2 vols. 8vo.
‡ T. 3. f. 15.