

XXXV.—On the Classification of the Diplopoda.

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OF the naturalists who since the time of Brandt have paid attention to the Diplopoda, no two have come to the same conclusions concerning the classification of the group, and every one seems to have failed to appreciate fully the true value of the characters which serve as signs of affinity, or the converse, between its various divisions.

In the case of the older authors this has, of course, been due to ignorance of the structures which by later writers are considered to be of the greatest systematic importance; for it is only comparatively of recent years that the copulatory feet have been studied, and the extent of the modifications presented by these organs fully realized.

Taking into consideration existing forms there are four genera of Diplopoda which may be selected as examples to illustrate the modifications of structure presented by the group. These four genera are the representatives of as many divisions; but since these divisions are by no means equal in value, it is desirable to decide the exact position that each ought to occupy with regard to the others. For this purpose it will be necessary shortly to treat of the structure of each of these genera in turn, and briefly to state the position that has been assigned to the division of which it has been taken as a type by naturalists who have written most extensively on the subject.

The four genera in question are—*Polyxenus*, *Glomeris*, *Iulus*, and *Polyzonium*.

By Brandt and Newport *Polyxenus* was associated with the Polydesmidæ to form the suborder Monozonina; by Wood it was placed with the Polydesmidæ, Iulidæ, and Lysiopetalidæ in his suborder Strongylia; but in 1872 M. de Saussure, in his work upon the Mexican Myriopoda, suggested that further observations into its structure would probably lead to the abandonment of the idea that any near relationship exists between *Polyxenus* and the other Diplopoda. Taking apparently this suggestion into consideration, and possessing besides greater knowledge of its anatomy, Dr. Meinert, in his paper on the Chilognatha of Denmark, divided the latter group into two sections—one to contain *Polyxenus*, the other the Glomeridæ, Iulidæ, and Polydesmidæ. But to these sections he gave no names. This deficiency was, however, in 1884, supplied by Dr. Latzel, who, using the name Diplopoda as synonymous with the Chilognatha of Meinert, restricted the

latter group to the families Glomeridæ, Iulidæ, Polydesmidæ, &c., gave to *Polyxenus* (Meinert's other section) the name Pselaphognatha, and made them both suborders of his order Diplopoda. This arrangement was adopted by Dr. Haase ('Schlesiens Diplopoden') in 1886, and in this position *Polyxenus* will probably remain.

The characters by which it may be separated from all the other Diplopoda are as follows:—The body is soft and clothed with tufts of scale-like hairs; there is a distinct labrum; the second pair of jaws do not form a plate resembling the gnathochilarium; there are no foramina repugnatoria; the anus is in the last segment but one.

Against the third and fourth of these distinctions it may be urged that no true gnathochilarium is present in *Siphonophora*, and that there are no foramina repugnatoria in the Chordeumidæ. To the former objection reference will be made later on; with regard to the latter it may be said that the whole organization of the Chordeumidæ points to close relationship with the Iulidæ, and that therefore it is fair to assume that the absence of foramina repugnatoria in the former family is due to atrophy. This of course may be, and very possibly is, the case with *Polyxenus*; but until allied forms possessing them be known, the assumption that these glands have never existed, as such, can certainly be defended.

As opposed to the above characters of *Polyxenus*, for which as a group-name the term Pselaphognatha (Latzel) may be retained, the characters of the rest of the Diplopoda, or, as Dr. Latzel has called them, the Chilognatha, may be briefly summarized as follows:—Body hard and chitinous, destitute of tufts of scale-like hairs; there is no distinct labrum; the second pair of jaws form a plate (the gnathochilarium); foramina repugnatoria are present; the anus is in the last segment.

Within the limits of the group Chilognatha thus defined fall the three remaining genera *Glomeris*, *Iulus*, and *Polyzonium*.

In 1865 Wood recognized that the peculiarities of the genus *Glomeris* are sufficient to warrant the formation for its reception of a group equivalent to the Monozonia and Trizonia of Brandt taken together. For this group he retained the old name Pentazonia, and, abolishing the Monozonia and Trizonia, gave to the Iulidæ, Polydesmidæ, and Lysiopetalidæ the name Strongylia. But although with the views of Wood concerning the affinities of *Glomeris*, those of M. de Saussure and of Mr. G. C. Bourne (Journ. Linn. Soc. xix.

p. 161) are more or less in accord, Drs. Meinert, Latzel, Berlese, and Haase, merely retaining in their works the family names Glomeridæ, Iulidæ, Polydesmidæ, &c., have put forward no classification expressive of the idea that in the Chilognatha the Glomeridæ are a family highly specialized and sharply defined; or, in other words, these authors seem to have altogether underrated the systematic value of the distinguishing characters of the genus. These characters are as follows:—The copulatory appendages are at the posterior end of the body; the pleuræ are distinct; the anal plates free; the body is composed of not more than fourteen somites; the foramina repugnatoria form a single series in the dorsal middle line; the alimentary canal is not straight, and the tracheæ are branched.

With this may be compared the structure of *Iulus* as typical of the rest of the Chilognatha. The copulatory appendages are in the seventh segment of the body; the pleuræ are not distinct; the anal plates are surrounded by the last body-ring; the number of body-somites is great and variable; the foramina repugnatoria form a single series on each side; the alimentary canal is straight, and the tracheæ are tufted.

In the case of all the genera allied to *Iulus* it of course cannot certainly be known whether the tracheæ be tufted and the alimentary canal straight or not; but taking into consideration the other points in common, it is perfectly fair to presume, until evidence to the contrary is forthcoming, that resemblance will be found to exist in these particulars also.

With regard to the Polyzonidæ, Brandt was apparently led to the formation of his group Siphonizantia, Sugentia, or Colobognatha from his inability, owing to the absence of intermediate forms, to recognize the possibility of the conversion of the masticatory jaws of an *Iulus* into the sucking-proboscis of a *Polyzonium*.

A genus, *Platydesmus*, with mouth-parts in many respects intermediate in character between the masticatory and suctorial types, was, in 1843, described by Lucas, who pointed out its resemblances to *Polyzonium* and *Polydesmus*. By Newport, who abolished the group Sugentia and assigned to *Polyzonium* and *Siphonophora* a position near the Iulidæ in his division Bizonia, this genus, which was probably known to him solely from the description and figure published by Lucas, was regarded as allied to *Polydesmus*.

Gervais in this respect followed Newport, both authors being apparently misled by the superficial resemblance between the two genera afforded by the presence of keeled segments in each.

It is difficult to reconcile the acquaintance that Wood must have had with *Platydesmus* (redescribed as *Brachycybe*) with his failure fully to appreciate the relationship existing between the families constituting his suborder Strongylia and the family Polyzonidæ, to which he rightly considered this genus to belong. This failure led him to raise the group of suctorial Myriopods to the rank of a suborder, equal in value to the Pentazonia or Strongylia; to this suborder he gave Brandt's name Sugentia.

By M. de Saussure the Polyzonidæ, containing *Platydesmus*, were regarded as allied most nearly to the Iulidæ, and were treated simply as a family of the Chilognatha.

Yet Dr. Latzel, in 1884, gave to the Polyzonidæ Brandt's name Colobognatha, and made this group co-ordinate with the Chilognatha, comprising the Glomeridæ, Iulidæ, &c., thus clearly showing that, in his opinion, the relationship between the Glomeridæ and Iulidæ is greater than the relationship between the Polyzonidæ and the Iulidæ.

That a naturalist so careful and observant as his elaborate work on the Austro-Hungarian Myriopoda has shown him to be, should hold these views it is hard to believe, for all the points given above as characteristic of *Iulus* are equally characteristic of *Polyzonium*, and the only important respect in which the latter genus differs from the former is the possession of a suctorial proboscis instead of manducatory jaws.

If no intermediate form had been known, and if Dr. Latzel had only been acquainted with *Siphonophora*, the most aberrant genus of the group, the views expressed in his classification would even then have been unintelligible; but being familiar, at all events from descriptions and figures, with *Platydesmus*, and seeing from the modifications of its mouth-parts the method by which the proboscis might have been formed, it is astonishing that he should have committed himself to the restoration of the group of Diplopoda with suctorial mouths as opposed to the group of Diplopoda with masticatory mouths.

The distinguishing features of *Polyzonium* are as follows:—The head is pointed in front; the mandibles are reduced in size; the gnathochilarium is represented by a plate pointed anteriorly and laterally soldered to the sides of the head, thus forming the proboscis.

In the allied genus *Platydesmus* the head is more or less pointed in front, the mandibles are reduced, but the gnathochilarium is distinct, and not laterally soldered to the head, so that there is only a partially formed proboscis.

If these characters be compared with those of *Glomeris*,

given above, they sink into insignificance, for it will be seen that the differences between *Polyzonium* and *Iulus* are merely differences of degree and are due to degeneration, while the characters which separate *Glomeris* from *Iulus* are, at all events some of them, radically different in kind.

Although one of the particulars given by Dr. Latzel to distinguish the Chilognatha from the Pselaphognatha is the presence of copulatory feet in the former group, the fact that the copulatory feet of the Glomeridæ are not homologous with the copulatory feet of the Iulidæ appears to be entirely overlooked. Since they are not homologous their presence is not a sign of relationship, but the contrary; and it is less right, because of their presence, to unite the Glomeridæ, in which they occur at the end of the body, with the Iulidæ, in which they occur in the seventh segment, as opposed to Polyxenidæ, in which they are entirely absent, than it would be to unite the Polyxenidæ with the Glomeridæ as opposed to the Iulidæ, because in the two former they are absent from the seventh segment, or the Polyxenidæ with the Iulidæ as opposed to the Glomeridæ, because in the two former they do not occur at the end of the body. For it seems certain that their independent existence in these two families, Glomeridæ and Iulidæ, points to differentiation along diverging lines, and consequent departure from some ancestral form. Further, it is more than probable than this ancestral form was without copulatory feet, for it does not seem likely that these organs, if originally existing in the seventh segment, should have entirely disappeared in the Glomeridæ, or, if once acquired at the end of the body, should have entirely disappeared in the Iulidæ; still less likely does it seem that they were present in some position other than the seventh segment or the posterior end of the body; for if so all trace of their former existence has entirely and independently disappeared in the Glomeridæ and the Iulidæ, and their place has been taken by organs functionally similar but morphologically different.

Assuming, then, on these grounds that the ancestral Chilognath was without copulatory feet, *Polyxenus* certainly, in this respect, more nearly resembles this ancestor than does either *Glomeris* or *Iulus*, and therefore since *Glomeris* and *Iulus* have been evolved along different lines from this *Polyxenus*-like ancestor, it follows that, so far as the copulatory feet are concerned, the difference between *Polyxenus* and *Iulus* or *Polyxenus* and *Glomeris* is less than the difference between *Iulus* and *Glomeris*, and that therefore it is, at all events, misleading for Dr. Latzel to advance as a character by which *Glomeris* and *Iulus* may be united together and

separated from *Polyxenus* the presence of these copulatory feet.

The occurrence of these organs in the Glomeridæ and Iulidæ is due to the existence of similar physiological requirements, but that the existence of similar physiological requirements in two groups is not a sign of affinity between them need now-a-days hardly be urged. It would be as justifiable to consider the branched tracheæ of *Glomeris* and *Scolopendra* to be a bond of union between the two genera as to think that the presence of the copulatory feet is a sign of affinity between *Glomeris* and *Iulus*.

The possession by the Glomeridæ of the branched tracheæ, referred to above, shows, as Mr. Bourne has pointed out, that great specialization has taken place; and great specialization signifies in this case great differentiation from the ancestral form, for it is very probable that the ancestor of the Chilognatha resembled *Peripatus* and the *Iulus*-like Myriopods in the possession of tufted tracheæ.

Another important particular in which the Glomeridæ and Iulidæ differ is the position of the foramina repugnatoria. Whether these glands be or be not homologous in the two groups it is difficult to say; but it seems that the suggestions made by Prof. Moseley (Encycl. Brit.) with regard to the stigmata of *Scutigera* are equally applicable to the apertures in question. However that may be, it is, by the way, an exceedingly remarkable thing that in the most highly specialized member of each of the two divisions of the Myriopoda (*Glomeris* in the one case and *Scutigera* in the other) a series of apertures, which in allied forms is found to be situated on each side of the body, exists as a single row in the dorsal middle line. Whether this single median dorsal series in *Glomeris* represents in reality the paired lateral series in *Iulus* must for the present be left an open question.

The straightness of the digestive tract in *Iulus* and the absence of distinct pleuræ in the body-rings, though characters of significance, are of less significance than the characters mentioned above, and the freedom of the anal valves in *Glomeris* is but a consequent of the incompleteness of the skeleton of the posterior somite.

Having now seen that the Diplopoda are divisible into two groups, the Pselaphognatha and the Chilognatha, and that the Chilognatha are in turn divisible into two groups, the first to contain the Glomeridæ, for which the name Oniscomorpha is proposed, and the second *Iulus* and allied genera and the closely-related but in some respects aberrant *Polyzonium*, it remains but to consider the structure of the

genera composing the second division, which may be called the Helminthomorpha, and to discuss the relationship that they bear one with another. As typical genera may be selected *Polydesmus*, *Lysiopetalum*, *Chordeuma*, *Iulus*, and *Polyzonium*, and the distinguishing characters of each of these are as follows:—

In *Polydesmus* the body is composed of not more than twenty segments; the mandibles have no basilar piece (cardo) and the gnathochilarium has no intergalea (promentum). The copulatory feet are formed from the anterior pair of the seventh segment, and they are external; the pedal laminæ (tracheal plates, Bourne) are mostly fixed.

In *Lysiopetalum* the number of segments is great and variable; the mandibles have the cardo and the gnathochilarium the promentum; the copulatory feet are formed from the anterior pair of the seventh segment, and they are more or less internal; the pedal laminæ are all free.

In *Iulus* the number of segments is great and variable, the mandibles have the cardo and the gnathochilarium the promentum; the copulatory feet are formed from both pairs of the seventh segment and are more or less internal; the pedal laminæ are mostly fixed (in a closely-allied genus, *Isobates*, they are free).

In *Chordeuma* the number of segments is thirty; the mandibles have the cardo and the gnathochilarium the promentum; the copulatory feet are formed from both pairs of the seventh segment and are more or less internal; the pedal laminæ are free; foramina repugnatoria absent.

In *Polyzonium* the number of segments is great and variable; the mouth-parts have undergone degeneration; the copulatory feet are formed from both pairs of the seventh segment and are more or less external; the pedal laminæ are free.

Setting aside *Polyzonium*, which in this respect it is not possible to compare, it will be seen from these short descriptions that *Polydesmus* differs from *Iulus*, *Lysiopetalum*, and *Chordeuma* in that the mandible is without the cardo and the gnathochilarium without the promentum, and further that in the possession of but one pair of external copulatory feet this same genus presents greater simplicity of organization. Greater simplicity of organization, except where degeneration has occurred, is usually an indication of greater affinity with the ancestral form, and therefore, assuming that the Helminthomorpha and the Oniscomorpha have sprung from a common ancestor, we should expect to find the resemblance between *Polydesmus* and *Glomeris* greater than the resemblance between, e. g., *Iulus* and *Glomeris*; and this seems to

be so, for in *Glomeris* the mandible is without the cardo and the gnathochilarium without the promentum, and the number of segments in *Glomeris* and *Polydesmus* is less than in any other Chilognath. From this latter fact it seems likely that the ancestral Chilognath was possessed of but few segments, an idea to which the existence of but few segments in larval forms lends great weight. And as bearing upon the same subject it is perhaps worthy of remark that *Polyxenus*, which in the palpiform character of its second pair of gnathites, and questionably in the absence of foramina repugnatoria, resembles, I believe, the ancestral Diplopod, also possesses a small number of segments.

Polydesmus then more nearly resembles the ancestor of the Chilognatha than does any other genus of the Helminthomorpha, and *Lysiopetalum* in the conversion of but one pair of appendages into copulatory organs resembles *Polydesmus*. But important as this one particular is as a sign of affinity, it is outweighed by the many points of resemblance between *Lysiopetalum* and *Iulus*. I have therefore associated the Lysiopetalidæ with the Iulidæ, Polyzonidæ, and Chordeumidæ in the suborder Iuloidea.

At the same time, however, it must be borne in mind that *Lysiopetalum* is intermediate between *Polydesmus* and *Iulus*, being more highly specialized than the former and less highly than the latter.

The conversion of both pairs of appendages of the seventh segment into copulatory organs shows close relationship between *Chordeuma*, *Polyzonium*, and *Iulus*—the Polyzonidæ, as M. de Saussure long ago suggested, appearing to be but degraded Iulidæ, and the Chordeumidæ only differing from the Iulidæ in the absence of the foramina repugnatoria, in the smaller size of the first segment, and in the possession of a smaller number of somites.

To sum up: *Polyxenus* in the possession of a small number of segments and in the pediform character of its second pair of gnathites shows comparatively but little specialization, and presumably therefore but little differentiation from the ancestor of the Diplopoda. The fusion of the second pair of gnathites into a plate, the gnathochilarium, characterized the ancestral Chilognath, which was further distinguished by the possession of tufted tracheæ (?), by the absence of the mandibular cardo and of the promentum in the gnathochilarium, and showed resemblance to the ancestral Diplopod by the presence of but few body-somites and by the absence of copulatory feet. From this Protochilognath sprang the Oniscomorpha and the Helminthomorpha. The former, undergoing

great specialization, acquired branched tracheæ and accessory feet to subserve copulation at the end of the body, the latter, retaining the tufted tracheæ, developed copulatory organs from the appendages of the seventh segment. The Polydesmidæ, in possessing comparatively few body-somites, no mandibular cardo, and no promentum in the gnathochilarium, show great approximation to the ancestor of the Chilognatha, and therefore to the ancestor of the Helminthomorpha, and are further shown to be the nearest living representatives of this latter by the conversion of the anterior pair of limbs alone of the seventh segment into copulatory organs and by the retention by these organs of their primitive external position. By possessing but one pair of copulatory organs the Lysiopetalidæ show relationship with the Polydesmidæ; but by the internal position of these organs and by the presence of a great and variable number of segments, of a mandibular cardo, and of a labial promentum, they show greater relationship with the Iulidæ. The conversion of the second pair of appendages of the seventh segment into a copulatory organ and the power to retract these within the segment distinguish the Iulidæ. From the Iulidæ the Polyzonidæ show degeneration by the reduction of the mandibles, and possibly the Chordeumidæ by the loss of the foramina repugnatoria.

To show in a condensed form the views here expressed as to the exact position to be assigned to the different families of the *Diplopoda* the following classification has been drawn up. But it must be borne in mind that, except in that greater value has been given to some groups and less to others, this classification, so far as concerns the relationship of the Polydesmidæ, Lysiopetalidæ, Iulidæ, and Chordeumidæ, is almost identical with that formulated by Dr. Berlese in 1886, and, so far as concerns the position of the Glomeridæ, Polyxenidæ, and Polyzonidæ, is little more than a modification of that suggested by M. de Saussure in 1872. That the ideas of this latter naturalist have received so little attention from subsequent writers is a matter to me of no little surprise.

It will be observed that no place has been assigned to the numerous extinct forms of *Diplopoda*. My excuse for the omission must be my ignorance of the structure of these fossils. Indeed, the knowledge possessed even by those who have especially studied this branch of the subject is, from the nature of things, but limited, and its extent may be perhaps to a certain degree estimated by the fact that Mr. Scudder has recently confessed, with an honesty which disarms comment, that certain portions of an organism described by him

as a new genus of Diplopods belonging to the Archipolypoda, a group of which he is himself the founder, are in reality fragments of a fossil fern !

Concerning the position that the Diplopoda should occupy with regard to the Chilopoda and Hexapoda, I believe the relationship between the two last-named to be greater than the relationship between the Chilopoda and Diplopoda. At all events the recent careful researches into the organization of *Scolopendrella* and of the Thysanura, carried on by Drs. Haase and Grassi, demonstrating as they do the affinity between the Hexapoda and the Chilopoda, are sufficient justification for the abolition of the name Myriopoda and for the elevation of the groups Chilopoda and Diplopoda to the rank of classes.

For the sake of comparison I have drawn up tabular lists of the classifications of the Diplopoda formulated by various naturalists.

Newport, 1844 (Trans. Linn. Soc. xix. p. 276).

Order CHILOGNATHA.

Tribe I. PENTAZONIA.

Fam. *Glomeridæ*.

Tribe II. MONOZONIA.

Fam. *Polyxenidæ*.
Polydesmidæ.

Tribe III. BIZONIA.

Fam. *Iulidæ*.
Polyzonidæ.
Siphonophoridæ.

Wood, 1865 (Am. Phil. Soc. xiii. p. 246).

Order CHILOGNATHA.

Suborder I. PENTAZONIA.

Fam. *Glomeridæ*.

Suborder II. STRONGYLIA.

Fam. *Polyxenidæ*.
Polydesmidæ.
Iulidæ.
Lysiopetalidæ.

Suborder III. SUGENTIA.

Fam. *Polyzonidæ*.
Siphonophoridæ.

Saussure, 1872 (Miss. Sci. Mex. vi. p. 9).

Order CHILOGNATHA.

Suborder I. = Fam. *Glomeridæ*.

Suborder II. = *Polyxenidæ*.

Suborder III. = { *Polydesmidæ*.
Iulidæ.
Polyzonidæ.

Latzel, 1884 (Myriop. österr.-ungar. Monarchie).

Order DIPLOPODA.

Suborder I. PSELAPHOGNATHA.

Fam. *Polyxenidæ*.

Suborder II. CHILOGNATHA.

Fam. *Glomeridæ*.

Polydesmidæ.

Chordeumidæ.

Lysiopetalidæ.

Iulidæ.

Suborder III. COLOBOGNATHA.

Fam. *Polyzonidæ*.

Berlese, 1886 (Bull. Soc. Ent. Ital. p. 42).

Suborder CHILOGNATHA.

Fam. *Glomeridæ*.

Polydesmidæ.

Iulidæ.

Subfam. *Lysiopetalidia*.

Iulidia.

Chordeumidia.

Mihi.

Class DIPLOPODA.

Subclass 1. PSELAPHOGNATHA.

Fam. *Polyxenidæ*.

Subclass 2. CHILOGNATHA.

Order 1. ONISCOMORPHA.

Fam. *Glomeridæ*.

Order 2. HELMINTHOMORPHA.

Suborder 1. POLYDESMOIDEA.

Fam. *Polydesmidæ*.

Suborder 2. IULOIDEA.

Fam. *Lysiopetalidæ*.

Iulidæ.

Polyzonidæ.

Chordeumidæ.

Class HEXAPODA.	{	Foraminibus genitalibus in segmento posteriore positis. Segmentis non ultra pari pedum uno instructis. Tribus pedum paribus in maxillas mutatis. Spiraculis in parte corporis laterali sitis.
Class CHILOPODA.		
Class DIPLOPODA.	{	Foraminibus genitalibus in parte corporis antica positis. Segmentis binis pedum paribus plerumque instructis. Duobus pedum paribus in maxillas mutatis. Spiraculis in parte corporis inferiore sitis.

Subclass 1. *PSELAPHOGNATHA*.

Ano in segmento penultimo posito. Maxillis secundi paris pedibus similibus. Foraminibus repugnatoriis nullis. Labro discreto. Corpore molli fasciculisque pilorum ornato *Polyxenidæ*.

Subclass 2. *CHILOGNATHA*.

Ano in segmento ultimo posito. Maxillis secundi paris laminam formantibus. Labro haud discreto. Foraminibus repugnatoriis manifestis. Corpore crustato fasciculisque pilorum haud ornato.

Order 1. *ONISCOMORPHA*.

Pedibus, qui instrumentum copulativum forment, segmento ultimo additis. Tracheis ramosis. Foraminibus repugnatoriis seriem unam in dorso medio formantibus. Pleuris distinctis: laminis ani haud segmento posteriore cinctis *Glomeridæ*.

Order 2. *HELMINTHOMORPHA*.

Pedibus segmenti septimi in instrumentum copulativum mutatis. Tracheis fasciculis similibus. Foraminibus repugnatoriis seriem unam quoque latere formantibus. Pleuris haud distinctis. Laminis ani segmento posteriore circumdati.

Suborder 1. *POLYDESMOIDEA*.

Instrumento copulativo ex anteriore pedum pari formato, externo: corpore segmentis non ultra viginti composito. Cardine mandibulæ nullo, promento gnathochilarii nullo. *Polydesmidæ*.

Suborder 2. *IULOIDEA*.

Segmentorum numero semper majore quam viginti, plerumque magno varioque. Mandibula cardine instructa, gnathochilario promento. Pedibus copulativis plerumque internis.

A. Instrumento copulativo ex anteriore pedum pari formato. Numero segmentorum magno varioque *Lysiopetalidæ*.

- B. Instrumento copulativo e duobus pedum paribus formato.
1. Numero segmentorum magno varioque. Foraminibus repugnatoriis manifestis.
 - (a) Mandibulis haud imminutis *Iulidæ*.
 - (b) Mandibulis imminutis *Polyzonidæ*.
 2. Numero segmentorum semper triginta. Foraminibus repugnatoriis evanidis *Chordeumidæ*.
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XXXVI.—*Descriptions of new or little-known South-American Frogs of the Genera Paludicola and Hyla.* By G. A. BOULENGER.

Paludicola nebulosa.

Liuperus nebulosus, Burmeister, Reise La Plata, ii. p. 532 (1861).

Tongue subcircular, indistinctly nicked behind. Vomerine teeth none. Snout extremely short, much shorter than the diameter of the eye, somewhat similar to that of *Notaden Bennetti*; nostrils directed forwards; eye large; interorbital space about two thirds the width of the upper eyelid; tympanum distinct, circular, measuring half the diameter of the eye. Fingers short, depressed, first much longer than second; toes short, much depressed, webbed at the base, the web extending as a fringe to their tips; subarticular tubercles small, of toes conical; two very strong, compressed, sharp-edged metatarsal tubercles, inner largest; no tarsal tubercle; no tarsal fold. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the axilla; tibia little longer than the skull. Skin smooth; no lumbar gland. Pale brownish above, with small scattered blackish spots; no cross bars on the limbs. From snout to vent 40 millim.

Mendoza.

Described from the type specimen (♀) in the Berlin Museum (no. 7374).

Paludicola albifrons (Spix).

Tongue small, elliptic, entire. Vomerine teeth none. Snout rounded, as long as the orbital diameter; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum hidden. Fingers moderate, first not extending quite as far as second; toes moderate, free, not fringed; subarticular tubercles moderate,



Pocock, R. I. 1887. "XXXV.—On the classification of the Diplopoda." *The Annals and magazine of natural history; zoology, botany, and geology* 20, 283–295.
<https://doi.org/10.1080/00222938709460057>.

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