

#### XIV. NOTES ON INDIAN MYGALOMORPH SPIDERS

By F. H. GRAVELY, M.Sc., Asst. Superintendent, Indian Museum.

(Plate XV).

The present is intended to be the first of a series of papers on Indian spiders, based on the collections in the Indian Museum.

The earliest descriptions of species in this collection were published by Stoliczka, in the *Journal of the Asiatic Society* for 1869. He pointed out in a most forcible manner the extraordinary neglect with which the study of so important and fascinating a group as the Indian Arachnida had met, a neglect which he set himself to remedy. The variety of other groups with which he was occupied can have left him little time for such work, and he only published two papers<sup>1</sup> in connection with it. But he collected specimens vigorously right up to the time of his early death in 1874. The whole of his private collection was bequeathed to the Indian Museum, where most of it still remains in good condition.

Since Stoliczka's death several Orders of Indian Arachnids have been investigated by Kraepelin, Pocock, Thorell, Roewer, Nuttall, Warburton and others; but our knowledge of Indian spiders is still woefully incomplete.

In the years 1887-9 the spiders preserved in the Indian Museum formed the subject of a series of short papers contributed by Simon to the *Journal of the Asiatic Society of Bengal*. And a short paper on our Mygalomorphae was published by Hirst in the *Records of the Indian Museum* for 1909.

In 1895 the British Museum published an account of the spiders of Burma by Thorell, who in 1896 and 1898 respectively contributed two lengthy papers on the spiders collected in Burma by Fea, to the *Annals of the Civic Natural History Museum of Genoa*.

In 1899 the Bombay Natural History Society published a paper by Pocock on Indian spiders with which they had supplied him. This was followed in 1900 by a paper in the same *Journal* containing descriptions which "were drawn up for publication in a volume upon the Arachnida of India, forming part of the Fauna of India Series" but which "together with the diagnoses of many

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<sup>1</sup> "A Contribution towards the Knowledge of Indian Arachnoidea" (*J.A.S.B.* xxxviii [II], pp. 201-251, pls. xviii-xx); and "Notes on the Indian species of *Thelyphonus*" (*J.A.S.B.* xlii [II], pp. 126-141, pl. xli).

previously established species'' were omitted on account of "exigencies of space." Why any volume of a series of books, whose chief value lies in their completeness, should have been thus curtailed, it is difficult to understand, especially as the volume in question is one of the shortest of the series and attempts to deal with four comparatively small Orders as well as with the immense Order Araneae. It is particularly unfortunate that spiders should have been treated in this way, for there is probably no other group in the whole of the animal kingdom which is so universally distributed in India, and at the same time so striking and varied both in structure and in habit. New and interesting facts about spiders force themselves upon one's attention wherever one goes; but a satisfactory record of them is commonly rendered almost impossible by the difficulty of indicating with sufficient precision the different kinds of spider to which the various facts refer.

The extension in 1912 of the space available for the research collections of the Indian Museum allowed of a much needed expansion of our collection of spiders. Previous to this extension the space allotted to spiders was so crowded by bottles of mixtures from different localities that no attempt at organization could be made. Since then I have devoted such time as I could periodically spare to sorting out the contents of these bottles, and getting both the named and the far larger unnamed collections systematically arranged.

The present paper, and those with which I hope to follow it, are the outcome of this work, which is now approaching its provisional conclusion. These papers will not aim at an extensive revision of the Indian spiders, but will discuss, in the light of the specimens in our collection, the classification adopted by Simon in his "*Histoire Naturelle des Araignées*" (Paris, 1892 and 1897), and record the localities from which the specimens dealt with have been obtained.

The extremely scattered literature relating to species of spiders already described, often all too briefly and usually without figures, together with the means which a large proportion of these species possess in early life of travelling long distances through the air, render it hopeless for anyone who cannot work on spiders during the greater part of his time to determine with certainty whether a species he has been unable to name is new to science or not. There are, however, many indications that a large proportion of such species are actually new. For instance, some common Himalayan spiders were described as new by no less an authority than Simon as recently as 1906. It is highly desirable, I think, that as many as possible of our more distinctive species should be described and named without delay, even at the risk of the creation of a few synonyms. The final revision of each family of spiders will have to be made by a specialist in a position to deal with members of that family from all parts of the world, and the richer the published material at his disposal, provided that the descriptions and

illustrations it contains are adequate and that reasonable care has been taken to avoid repetition, the more complete is his work likely to be. I propose therefore to describe a certain number of species as new, even though I may not be able to trace every possible description that may refer to them.

The very small number of extra-Oriental forms in our collection makes it impossible for me to criticize the relation which these bear to Oriental forms in Simon's system. Where, however, as in the case of the Aviculariinae dealt with in the present paper, the Oriental forms appear to exhibit definite structural zoogeographical relationships to one another, I have not hesitated to suggest the advisability of trying to alter his system in order to bring these into prominence. Such relationships have been found in all of the few groups in which I have looked for them. In the case of one of these groups—the Passalidae—in which such relationships recently led me to separate the Indo-Australian forms from those of the rest of the world, none of which I had seen, I have already obtained proof that the separation was justified; though some of the latter resemble certain Indo-Australian forms so closely that I, like previous authors, should probably have been misled by striking superficial characters, had not my earliest work on the family been confined to Indo-Australian species.

The characters on which the classification of spiders is at present based are to a great extent admittedly unsatisfactory; and it is quite possible that by dealing separately with the faunas of different zoogeographical areas—the extent of the areas that will have to be taken may be found to differ in different groups—local relationships may be brought to light which will lead to the discovery of new characters of deeper significance where we least expect them, especially among the more sedentary families.

References to Simon's "*Histoire Naturelle des Araignées*" and to Pocock's "*Fauna*" volume are so numerous that I have omitted the titles of these works throughout. Where not otherwise stated all references to these authors imply references to these works. Where no references to descriptions of species are given, these will be found in the "*Fauna*"

It has been convenient to put this paper into the form of a catalogue of the specimens in our named collection, a form which will probably be convenient for the rest of the series also. Our collection of spiders has recently been increased to a considerable extent by the generosity of collectors in different parts of India. This has made it more representative of India generally than would otherwise have been the case, and has greatly facilitated my work. Our thanks are due to all who help us in this way, and especially to H. E. the Governor of Bengal who, with the assistance of Mr. Möller, has been making large collections of the Invertebrata of the Darjeeling District; to Dr. Sutherland who has collected spiders extensively round Kalimpong in the same district; to Mr. M. Mackenzie who has sent numerous specimens from Siripur in Bihar; to Mr. G. Henry who has

submitted to me the specimens he has been able to collect in Ceylon during his tours on behalf of the Colombo Museum; to Mr. T. Bainbrigge Fletcher of Pusa; and to Mrs. Drake of Serampore.

Family LIPHISTIIDAE.

Genus **Liphistius**, Schiödte.

This interesting genus is represented in our collection by a single damaged specimen from Moulmein in Lower Burma.

Family AVICULARIIDAE.

Subfamily CTENIZINAE.

Group PACHYLOMEREAE.

Genus **Conothele**, Thorell.

Two female or immature specimens were collected by Theobald in the Nicobars. These differ from *C. birmanica*, Thorell, in having the posterior series of eyes procurved, and in having more teeth on the labium; but they may perhaps belong to some Malaysian species.

Group IDIOPEAE.

I am unable to follow Simon's final revision of this group (Vol. II, pp. 888-890) except as regards the union of *Acanthodon* with *Idiops*, a union the necessity of which is supported by the occurrence in our collection of the male of an Indian species with the eyes of the second group closely crowded and strongly unequal.

Simon separates the American genera of Idiopae from those of the Old World on the grounds that in the former the eyes of the posterior line, seen from above, are lightly procurved whereas in the latter they are lightly recurved, the area occupied by the four median eyes being moreover parallel-sided in the former and broader behind than before in the latter.

In all our specimens, however, and apparently also in those described in the "Fauna," the posterior line of eyes is distinctly procurved and never recurved, the posterior margins of the large laterals never being behind, and the anterior margins of these eyes always being in front, of the corresponding margins of the smaller posterior median eyes. And the area occupied by the four median eyes is not always even slightly wider behind than before.

Further, when these characters are disregarded, and an attempt is made to put our three specimens of the group into the Old World genera which would otherwise receive them, only one of the three (*Heligmomerus* sp.) is found to fit. The other two resemble *Gorgyrella* in the structure of the chelicerae, and *Pachyidiops* and *Titanidiops* in the shape of the labium, differing markedly from all of these and from one another in their com-

binations of the other characters used by Simon in his generic definitions.

I have therefore fallen back on Simon's earlier revision of the group (Vol. I, pp. 90-92), which, when *Acanthodon* has been merged in *Idiops*, takes in all these forms conveniently.

#### Genus *Heligmomerus*, Simon.

Represented by one female, caught in the Royal Botanical Gardens at Sibpur near Calcutta, where it may easily have been introduced among plants from some other place. Its burrow, a short silk-lined tube, closed externally by a trap-door, is also in our collection.

#### Genus *Idiops*, Perty.

Represented by a female from Bellary in South India, and by a male whose characters seem sufficiently well defined to permit of its description here as a new species.

#### *Idiops biharicus*, n. sp. ♂

(Pl. xv, figs. 1 *a-b*).

*Locality*.—Sahibgunge in Bihar.

*Dimensions*.—Carapace  $6.0 \times 5.2$  mm.; sternum  $3.0 \times 2.8$  mm.; legs in the order 1, 4, 2, 3. In the first legs the femur is fully, and the combined tarsus and metatarsus are scarcely, as long as the carapace. The patella and tibia combined are a little longer than either. The tibia and metatarsus of the second legs are about equal to the patella and tibia of the first in length, but are much slenderer. The tibia of the third leg on each side is nearly three times as long as wide; the femur and patella of these legs are together scarcely as long as the carapace, and are about equal to the femur alone of the fourth legs.

*Colour*.—Carapace plum-coloured; appendages dark reddish above, paler beneath especially basally; sternum and lower surface of abdomen also pale, almost ochraceous; upper surface of abdomen dull brown.

*Structure*.—The *carapace* is ovate, slightly narrower behind than in front, with the posterior margin short and faintly concave in the middle line. The anterior lateral eyes are situated close together on a prominent tubercle close to the anterior margin. The remaining eyes are situated in a compact group: of these the anterior medians are almost in contact, and are the largest; the posterior medians are separated by a distance about equal to a diameter of one of the anterior medians, and are the smallest; both are almost in contact with the posterior laterals, whose long diameter is about equal to that of an anterior median, and whose other diameter is about equal to that of a posterior median. The fovea is large and very deeply impressed in the form of a procurved semicircle.

In front of it the cephalic part of the carapace is strongly elevated, and bears a pair of broad longitudinal bands of sparse coarse tubercles, which become faint on either side of the posterior group of eyes and disappear before they reach the anterior margin of the carapace, this being quite smooth. The rest of the margin is granular except in the median concavity behind, and broadening bands of coarse tubercles radiate towards it from the fovea.

The *labium* is about as broad behind as it is long, and is slightly narrower in front. It is unarmed.

The *sternum* appears to have been spiny.

The *chelicerae* are provided each with a rastellum set on an apophysis overhanging the base of the fang. The *chelicerae* are armed each with 5 outer and 7 or 8 inner teeth.

There is no *stridulating organ*.

The tibia of the *palp* is excavate beneath in its distal third, the outer side of the hollow being armed with stout spines, of which those at the two ends are long and those in the middle short. The distal end of the tarsus bears a bluntly conical process on the outer side.

The bulb of the palpal organ (fig. 1b) is helicoid. The style consists of two parts, a basal lamina which is triangular in shape and somewhat narrower at the base than it is long, and a very slender, slightly curved, distal duct of about the same length.

The *legs* are spiny. The extremity of the tibia of the first legs (fig. 1a) is armed on the inner side with two stout conical apophyses, of which the proximal has a simple apex turned slightly downwards when viewed laterally, while the distal is strongly indented on the lower side below the somewhat upwardly directed apex. The metatarsus is somewhat bent outwards and swollen on the inner side below the middle; it lacks the submedian conical spur found in *I constructor* (Pocock), but bears numerous stout spines on the lower side, as does the tibia also.

The tibiae of the third legs are faintly excavate above, though not definitely so as in *Heligmomerus*.

This species seems to be most closely related to *I constructor* (Pocock), from the male of which it differs chiefly in the large size of the anterior median eyes—assuming that Pocock's description of the eyes of the female applies also to the male, except as regards their proximity where he notes a difference between the sexes. The unarmed labium appears to be another distinguishing character. In any case the present species differs from *I constructor* in the absence of the metatarsal spur of the first leg of the male.

#### Group CYRTAUCHENIEAE.

#### Genus *Atmetochilus*, Simon.

Represented by the type of *A. fossor*, Simon (*genotype*), and by an immature male from Upper Tenasserim.

## Group AMBLYOCARENEAE.

Genus *Damarchus*, Thorell.

Represented by the type specimen (male) of *Damarchus assamensis*, Hirst, and by three females associated with it which "do not differ in structure from the female of *D. oatesii* (1909, p. 384)." Also by a small specimen from Gmatia in the Birbhum District of Bengal.

## Group ARBANITEAE.

Genus *Scalidognathus*, Karsch.

Represented by specimens of *S. radialis* (Cambr.), from Kandy, Galagedara and Newara in Ceylon.

Genus *Nemesiellus*, Pocock.

Represented by specimens from Barkuda Island, Chilka Lake (north-eastern end of Madras Presidency), and from S. India. The lateral spacing of the eyes is distinctly less in both than it is in our specimens of the preceding genus, which makes the anterior line appear more procurved, and makes the anterior and posterior lateral eyes on each side appear relatively further apart.

## Subfamily BARYCHELINEAE.

## Group DIPLOTHELEAE.

Genus *Diplothele*, Cambr.

Represented by one specimen of *D. walshi*, Cambr from Waltair on the eastern side of the Madras Presidency.

Neither Simon nor Pocock appear to have been aware that Walsh described this species under the name *Adelonychia nigrostriata*, n. gen. and sp. (*J.A.S.B.*, LIX, [II], pp. 269-270) at about the same time that Cambridge described it from specimens which Walsh had sent him. Walsh's description was received on Oct. 27, read on Nov. 5, and published on Dec. 10, 1890. Cambridge's description was received on Oct. 23 and read on Nov. 18 of the same year; the date of publication is not recorded and cannot have been much if at all before Dec. 10. Cambridge's name has, however, been universally adopted, and it seems in any case undesirable to change it.

## Group BARYCHELEAE.

Genus *Sasonichus*, Pocock.

The description of this genus, and of the single species on which it is based, are very imperfect. So far as I can tell the new species which I am referring to the genus differs from the original species in one only of the characters to which generic value has

been attached. To avoid establishing a new monospecific genus this character, the presence or absence of apical apophyses on the tibia of the first leg of the male, may be given specific value.

***Sasonichus arthrapophysis*, n. sp. ♂**

(Pl. xv, figs. 2 a-b).

*Locality*.—Barkul in south-east Orissa.

*Dimensions*.—Carapace  $7.5 \times 6.0$  mm.; sternum  $2.7 \times 2.5$  mm.; legs in the order 4, 1, 2, 3.

The patella and tibia of the first legs are together equal to the length of the carapace; the tarsus and metatarsus are together slightly shorter, and the femur is shorter still, the femur and half the patella being about equal to the length of the carapace, as are also the femur of the second legs with the whole of the patella, the tibia and metatarsus together of the third legs, and the patella and tibia together and the metatarsus alone of the fourth legs.

*Colour*.—Dark brownish above, paler below, the ends of the tibiae of the legs silvery above—least so on the hind legs.

*Structure*.—The *carapace* is ovate, slightly broader behind than in front. The ocular area is very compact and is situated on a clearly defined tubercle approximately circular in outline. The anterior lateral eyes are oval, and are situated obliquely in front of the rest about a short diameter away from the anterior medians and fully a long diameter from one another. The anterior medians are round, their diameter fully as great as the long diameter of the anterior laterals; they are separated by a distance about equal to a diameter of the small posterior medians. The posterior medians and anterior laterals form a square; and the centres of the former are directly behind the outer margins of the anterior medians. The posterior laterals are quite as long as the anterior laterals, but much narrower. A line of low tubercles extends medially from the ocular tubercle to the fovea, which is linear as a whole, but distinctly recurved just at its extremities. Lines of tubercles radiate from the fovea. The whole carapace has probably been covered with long golden brown hair and scattered black spines, but most of these have disappeared. The spines are very long and thick posteriorly, where they project outwards and curve forwards.

The *labium* is very imperfectly separated from the sternum. It is armed behind the anterior margin with a line of four more or less distinct erect teeth, among long spiniform hairs.

The *sternum* is covered with erect spiniform hairs, and is bordered laterally and behind by a single row of long black slender spines. The *coxae*, *trochanters* and *femora* are similarly armed; but long white silky hair surrounds the mouth, both on the labium and on the coxae of the palps. On the latter it hides a group of denticles like those which form a line on the labium, but much more numerous.



The *chelicerae* are armed with about ten inner but no outer teeth, and are provided with a rastellum whose spines are somewhat long and slender.

There is no *stridulating organ*.

The tarsus of the *palp* is lobed on the inner side below. The style of the palpal organ (fig. 2*b*) is more or less lamelliform and parallel-sided throughout the greater part of its length, and is twisted on its own axis through about 90°; distally it is sharply pointed.

The *legs* are spiny, with a series of very stout spines on the tibia and metatarsus. The tibia of the first legs is armed on the inner side near the end with two stout apophyses, of which the distal is ventral to the other (fig. 2*a*). They curve towards one another as a whole, but the extreme apices are slightly turned in the opposite direction. The distal part of each, which is greater in the proximal than in the distal, appears to be jointed on to the basal part. From this it seems probable that the former is moveable in life. I do not remember to have heard of any other Arachnids with jointed apophyses; but the jointed setae of Nereidiform Polychaet worms and the jointed tooth found on the mandibles of most Passalid beetles, afford instances of similar jointing of chitinous structures in other groups.

This species differs from *S. sulivani* chiefly in the presence of apophyses on the tibiae of the first legs.

#### Group SASONEAE.

##### Genus *Sason*.

Represented by specimens of *S. cinctipes*, Pocock, from Peradeniya in Ceylon, and by one undetermined specimen from the Nicobars. *S. cinctipes* lives on moss-covered rocks or walls where it constructs a curious flat, more or less 8-shaped nest. The upper part of this nest consists of two rounded flaps hinged together along their contiguous borders, these borders forming the cross-piece of the eight. The double trap-door is attached to the basal part of the nest on either side of the cross-piece.

#### Subfamily AVICULARIINAE.

Five of the groups of this sub-family recognized in Simon's "Supplement" occur in the Indian Empire, and of these four are only known from the Oriental and Australian Regions. The fifth is the most primitive of them all, and has a much wider distribution; it may be looked upon as the ancestor of the other four.

This group, the Ischnocoleae, is almost confined in the Oriental Region to the Indian Peninsula and Ceylon. The genera which occur there are found nowhere else, except perhaps in the Eastern Himalayas and Burma. In Simon's arrangement they are scattered among genera from other parts of the world; but when taken by themselves they are found to fall into line, not only with

one another, but also with the Thrigmopoeae, each genus of the two groups (except perhaps *Annandaliella*, see below, p. 271) representing one stage in an evolutionary series culminating in the genus *Thrigmopoeus*.

Simon's final revision of the Ischnocoleae brings all the Oriental species of the group into three genera, *Phlogiodes*, *Heterophrictus* and *Plesiophrictus*, and to these Hirst has since added the genus *Annandaliella*. Of these the first appears to have been known to Simon only from Pocock's imperfect description of two forms which probably, as pointed out below (p. 269), are opposite sexes of a single species. Of the second he appears to have seen a female (the only sex known) of the single species as yet referred to it. Of the third the male was evidently known to him from Pocock's description only. It is, therefore, scarcely to be wondered at, that his definitions of these genera are somewhat unsatisfactory, and that several of the species described below differ from the genera in which I have placed them in one or more of the characters used in his keys; but as they differ at least equally widely from all extra Oriental genera and appear to be closely related to one another, I have thought it best to place them in these Oriental ones.

An account of the genera of Indian Ischnocoleae and of Thrigmopoeae will be found below (pp. 269-280). It is designed to bring out the evolutionary sequence which the genera appear to illustrate. This sequence seems to me to indicate that the two groups should ultimately be united; and that if any characters can be found to separate both of them from the extra-Oriental Ischnocoleae, a new group should be instituted for them. But as I have no extra-Oriental forms for comparison I am not able to attempt this at present.

None of the genera of Indian Ischnocoleae and Thrigmopoeae have attained so high a degree of specialization as have the genera *Poecilotheria* and *Chilobrachys*, which also live in the Indian Peninsula and Ceylon. The former lives in trees and in the thatch of houses, so can scarcely be regarded as entering into competition with ground-dwellers like the Indian Ischnocoleae<sup>1</sup>. I have elsewhere (1915, pp. 417-418) given reasons, largely zoogeographical, for supposing that it originated from a primitive stock—presumably of the Ischnocoleae or Thrigmopoeae—in the Indian Peninsula or Ceylon. It will be sufficient here to point out that it differs from the Selenocosmieae not only in important details of the stridulating organ, but also in the structure of the labium—for which reasons, among others, I prefer to follow Simon who established a special group, Poecilotherieae, for its reception, rather than Pocock who united it with the Selenocosmieae.

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<sup>1</sup> Nothing appears to be known of the habits of the Thrigmopoeae, which probably resemble those of the Ischnocoleae. The specimen I obtained in Cochin was not recognized when captured. If I caught it myself it must have been on the ground, like all the other Mygalomorphae I found. But it may have been brought to me by someone else.

The only remaining genus of Aviculariinae found in the Indian Peninsula or Ceylon is *Chilobrachys*, the most highly specialized genus of the group Selenocosmieae. The whole history of the evolution of this ground-dwelling genus can be read in the forms inhabiting the countries north and east of the Ganges to-day; and there seems no reason to doubt that its evolution took place there. The primitive forms left there are extremely rare, having no doubt suffered in the struggle for existence with their more highly specialized relatives. The most highly specialized genus of these has spread into the Indian Peninsula and Ceylon, a fact which probably accounts for the concentration southwards and westwards of the Indian Ischnocoleae and the Thrigmopoeae.

The evolution of the Selenocosmieae has already been dealt with from a primarily zoogeographical point of view (Gravely, 1915), with the results indicated in the above summary. The morphological point of view must now be more fully considered.

Reference has been made above to the existence in parts of the Oriental Region north and east of the Ganges of a few primitive species of Aviculariinae. These appear to be extremely rare, and those hitherto described are known to me from descriptions only. There is, however, in the Indian Museum collection, a single immature specimen from the Darjeeling District which must be associated with them. The species already described are two in number; both were collected by Fea in Burma, and referred by Thorell to the genus *Ischnocolus* (1896, pp 170-175). More recently Simon (Vol. II, p. 925) has shown that this genus *Ischnocolus* must be restricted to species from the Mediterranean and Ethiopian regions; but he makes no mention of the position to be assigned to the Burmese forms. In describing the labium of one of these, "*Ischnocolus*" *brevipes*, Thorell says, "apice fascia transversa sat lata granulorum densissimorum praeditum." With regard to the labium of the other, "*Ischnocolus*" *ornatus*, which he described from two immature specimens, he says, "quod apice minus dense granulatum est—an ita etiam in adultis?" Now the presence of a densely granular transverse band on the apex of the labium is characteristic of the Selenocosmieae. In all other Oriental groups of Aviculariinae the anterior part of the labium is more sparsely armed. The distinction, although quantitative, is very marked; and except perhaps in very young and imperfectly hardened specimens such as no one could think of naming, a glance at the labium is sufficient to show whether a specimen belongs to the Selenocosmieae or not.

The only Burmese species in which the labium is sparsely armed, other than those referred by Thorell to the genus *Ischnocolus*, are those comprising the group Ornithoctoneae, which are separated from all other Oriental species by the densely hairy outer surfaces of their chelicerae. That the occurrence of a sparsely armed labium in a Burmese species without externally hairy chelicerae struck Thorell as very remarkable, seems to be indicated by his suggestion that its presence was due to the imma-

turity of his specimens, a suggestion which is not supported by the immature specimens of Selenocosmieae in our collection. The dense armature of the labium of the Selenocosmieae has been recorded as a group character by Simon (Vol. II, p. 953), though he does not appear to have attached much importance to it. In view of the fact, however, that it supplies a clearly defined character which, unlike the stridulating organ, appears unchanged in all genera of the group, and thus enables us to recognize as a primitive ally of the group "*Ischnocolus*" *brevipes* in which no stridulating organ occurs at all, its importance as a group character should, in my opinion, be ranked even higher than that of the stridulating organ itself. "*Ischnocolus*" *brevipes* may therefore be transferred to the Selenocosmieae, the evolution of the higher forms of which is discussed below (pp. 282-287).

"*Ischnocolus*" *ornatus* must now be considered. It differs from the Selenocosmieae not only in the structure of the labium, but also in the greater number of spines on its legs. In the former character it resembles all, and in the latter the more primitive, of the Indian Ischnocoleae. For the present then it will be best to associate it with this group and especially with the primitive genus *Plesiophrictus*. But its genus cannot be definitely determined in the absence of mature specimens of either sex. This applies also to the immature specimen referred to above, which was collected in the Darjeeling District, and is preserved in our collection. These two forms are presumably remnants of a primitive Himalayo-Malaysian fauna from which both the Selenocosmieae and Ornithoctoneae have originated; and their rarity is probably accounted for by their inability to compete successfully with these more highly specialized groups.

The Ornithoctoneae are the only Oriental Aviculariinae that have not been dealt with above. They form so compact and isolated a group that little or no direct morphological evidence of their affinities with other groups is to be found (see Gravely, 1915, p. 417).

The five Oriental groups of Aviculariinae as described above may now be defined.

1. { Anterior part of labium armed with den-  
ticles somewhat sparsely distributed 2.
1. { Anterior part of labium covered with  
closely crowded granules .. *Selenocosmieae*, p. 282.
2. { Outer surface of chelicerae bare 3.
2. { Outer surface of chelicerae densely hairy *Ornithoctoneae*, p. 280.
3. { No bacilli present on anterior surface of  
coxae of palps, this surface bearing at  
most small spines 4.
3. { A cluster of more or less claviform bacilli,  
accompanied by one or more stout den-  
ticles, present on anterior surface of  
coxae of palps *Poecilotherieae*, p. 280.

4. { No stridulating organ present between  
       cheliceræ and coxæ of palps           *Ischnocoleae*, p. 269.  
       A stridulating organ present in this posi-  
       tion                                       *Thrigmopoeæe*, p. 278.

If any character can be found by means of which the Indian *Ischnocoleae* can be separated from the *Ischnocoleae* of other parts of the world it will be advantageous, as pointed out above (p. 266), to bring about this separation, at the same time uniting the former with the *Thrigmopoeæe*

#### Group ISCHNOCOLEAE.

Among Indian genera of this group there appears to be a marked sexual dimorphism. All known males are distinguished by the more or less extensive and conspicuous development of white hair on the feet, especially the anterior ones

In the two species of which males are known to me, the anterior tarsal scopulae, which, except in the genus *Phlogiodes*, are always more or less clearly divided in females,<sup>1</sup> are either undivided in the male or less clearly divided in the male than in the female; also the anterior median eyes tend to be enlarged in the male and the anterior laterals in the female.<sup>2</sup> As yet all species of this group appear to have been described from one sex only; but there can be little doubt, I think, that *Phlogiodes robustus*, Poc. (♀) = *P. validus*, Poc. (♂), since both are found at Matheran. In the former, according to Pocock (1899, pp. 748-9), the tarsal scopulae are broadly divided on legs 2-4, in the latter they are undivided except on the fourth leg where the division is narrow.

I have found it impossible to separate the genus *Heterophrictus* from *Plesiophrictus*. Pocock's distinction, based on slight differences in the shape of the fovea, is very unsatisfactory.

Simon separates them primarily on characters presented by the vestiture of the anterior surfaces of the coxæ of the first legs. But these vary even in mature examples of one sex of a single species, and they are clearly correlated with size, the *Plesiophrictus* characters being found in the young of large forms whose adults have well-marked *Heterophrictus* characters, as well as in adults of species of small size similar to that of the species grouped together by Pocock in the former genus.

The genus *Annandaliella* ought also, perhaps, to be merged in *Plesiophrictus*; but as the spines on the inner surfaces of the cheliceræ, by which it is characterized, are sharply distinctive I retain the genus provisionally. These spines are considered by Hirst to

<sup>1</sup> They are said to be undivided in *Annandaliella travancorica*, but fresh specimens show a median line of fine hairs such as accompany the spines by which the scopulae of the other feet are divided.

<sup>2</sup> In females of *Plesiophrictus sericeus*, *collinus* and *fabrei*, according to Pocock, the anterior laterals are not larger than the medians. Males do not appear to be known in any of these species.

be stridulatory structures; but so far as I know there is no direct evidence on this point. It is difficult to find any other explanation for them; in view, however, of the fact brought out by material recently added to our collection, that they do not occur in specimens less than half grown, or in mature males, their physiological homology with the stridulating organs of other Oriental Aviculariinae is open to question. But for the importance that has been attached to these spines the only species yet referred to the genus would find its natural place somewhere near the middle of the series of species composing the genus *Plesiophrictus*.

This series shows a gradual change from small forms with small marginal posterior sigilla and more distinctively *Plesiophricticid* anterior coxae, to larger forms with larger posterior sigilla more widely separated from the margin of the sternum and more distinctively *Heterophricticid* coxae, characters all of which are intensified in the genus *Phlogiodes*, which affords a transition to the *Thrigmopoeae*.

If the genus *Phlogiodes* were only distinguished by the size and position of its sigilla, and by the shape of its fovea—the characters used by Pocock in his key—its distinctness from *Plesiophrictus* could hardly be maintained. Probably the most important character separating the two genera is the absence in *Phlogiodes* of the tibial apophysis of the first leg of the male—a character which separates it alike from *Plesiophrictus* and *Annandaliella*.<sup>1</sup> But this character does not help in the case of species (unfortunately the majority) known from females only. It appears, however, that *Phlogiodes* approaches the *Thrigmopoeae* in the characters of its feet, as in so many other features. The feet of the *Thrigmopoeae* are very different from those of *Plesiophrictus*; and it is likely, I think, that the character will prove to be a valid one for the separation of *Phlogiodes* from *Plesiophrictus*, in spite of a certain amount of variation which it exhibits in the latter and perhaps in both genera.

The genera of the Indian Ischnocoleae may now be redefined thus:—

- |    |   |   |
|----|---|---|
| I. | { | A row of stout spines present on the inner surfaces of the chelicerae of mature females; feet of first legs slender, the division of their tarsal scopulae more or less obsolete especially in male; male with tibial apophysis of first leg . <i>Annandaliella</i> , p. 271. |
|    |   | No spines on the inner surfaces of the chelicerae   |
|    |   | 2.  |

<sup>1</sup> The possession of this apophysis, and of somewhat numerous spines on the legs generally, suggests a possible relationship between the more primitive Indian Ischnocoleae and the Indian Barychelinae. In the Indian Barychelinae, however, the spines thickly cover all joints of the legs, and no definite arrangement of them can be recognized. In the Indian Ischnocoleae such an arrangement is recognizable among the few spines that may be present on the anterior legs, and is repeated on the posterior legs in all species in which their spines have been reduced to a small enough number (see below, p. 274).

2. { Male with tibial apophysis of first leg ;  
       feet of first legs slender, their tarsal  
       scopulae (? always) clearly divided. *Plesiophrictus*, p. 273.  
 { Male without tibial apophysis of first leg ;  
       feet of first legs stout, their tarsal  
       scopulae (? always) undivided *Phlogiodes*, p. 278.

### Genus *Annandaliella*, Hirst.

It will be convenient to deal first with this genus, which appears to form a lateral offshoot from the main trend of evolution, leading up towards the *Thrigmopoeae*. It appears to have originated from some species near the middle of the evolutionary series of the genus *Plesiophrictus*, and to differ therefrom only in the presence of the characteristic spines on the inner surfaces of the chelicerae of the female, and perhaps in the absence of spines from among the fine hairs by which the anterior tarsal scopulae are divided in the female, hairs which are not sufficiently numerous in the male even to form a definite line. The absence of the characteristic spines from the mandibles of the male (and young) is very remarkable, if, as has hitherto been supposed, they constitute a stridulating organ comparable to that found between the chelicerae and palps of the more highly specialized Oriental genera of *Aviculariinae*.

The genus is represented in our collection by a number of specimens of *A. travancorica*, Hirst (1909). It is also represented by a specimen from Chalakudi in the cultivated low country of Cochin which may perhaps belong to the same species; by a specimen said to come from Hung in Persian Baluchistan—a locality which I have reason to think was at some time attributed to at least one bottle of mixed spiders from Southern India or Burma; by a mutilated specimen from Ootacamund; and by a young one from Coimbatore.

### *Annandaliella travancorica*, Hirst.

(Pl. xv, figs. 4a-b).

This species is represented in our collection by the type from Travancore; by a female from Kulattupuzha in the same State, at the base of the western slopes of the Western Ghats; and by numerous specimens, including three males, from under stones and logs of wood, in the rich evergreen jungle at the base of the same range near Trichur (Cochin) and near the rubber estate between the tenth and fourteenth miles of the Cochin State Forest Tramway. It is very sluggish, at least by day, crouching down when discovered, and remaining quiet with its legs drawn up against the body when seized.

This species has hitherto been known from the type only. Now that more extensive material is available it may be redescribed as follows:—

♂ *Dimensions*.—Carapace 7.2 × 6.0 mm.—9.2 × 8.3 mm. Sternum 3.4 × 3.0 mm.—4.4 × 3.9 mm. The fourth leg longer

than the first Tarsus and metatarsus together of first and third legs, and metatarsus alone of fourth legs, about equal to carapace in length; tarsus and metatarsus of second legs slightly shorter, of fourth legs longer by about half the length of the metatarsus, this joint being slightly longer than the femora of the first and fourth legs which are about equal to one another and to the femur together with half the patella of the second and third legs. The proportions all somewhat variable.

*Colour*.—Dark olivaceous brown, the tarsi and metatarsi of the two front pairs of legs, and the tarsi and distal halves of the metatarsi of the two hind pairs, white. The tarsi of the palps whitish.

*Structure*.—The *carapace* resembles in shape that of *Plesio-phrictus satarensis* described below, but the fovea is lightly procurved, and the anterior median eyes vary from slightly smaller than, to distinctly larger than, the anterior laterals, the diameter of the former being in the latter case about equal to the long diameter of the latter.

The posterior sigilla of the *sternum* vary in position from being almost close to the margin to being separated from it by somewhat more than the diameter of one of them.

The *labium* and its teeth are normal.

The inner surfaces of the *chelicerae* lack the row of spines characteristic of females of this genus.

The *palps* are slender, their tarsi bilobed, with the outer lobe itself obscurely divided into two parts, one anterior to the palpal organ and the other on its outer side. The palpal organ is shown on pl. xv, fig. 4*b*; the spiral curvature of its gracefully bowed, slender, tapering style is very slight.

The first *legs* are unarmed except for the usual apical spine on the metatarsus and apophysis (fig. 4*a*) and spine (the latter sometimes absent) on the tibia. The metatarsus of the second legs is armed with three apical spines and one (rarely absent) about in the middle of the ventral side. The tibia of the same leg has two apical spines and often one mid-ventral one. The tibiae and metatarsi of the third and fourth legs are each armed with a number of spines in the distal two-thirds of their length.

Of the tarsal scopulae only the fourth is divided. The metatarsal scopulae are all apical only; those of the third and fourth legs are sometimes obsolete.

♀ *Dimensions*.—Carapace up to 11.0 × 8.4 mm. Sternum up to 4.5 × 3.8 mm. Legs in the order 4, 1, 2, 3, but relatively much shorter than in the male. Carapace of about the same length as sum of tibia and patella or metatarsus of first leg, to sum of femur and patella of second leg, to patella and tibia with half metatarsus of third, to tibia with patella or half metatarsus of fourth; metatarsus of fourth about equal to tarsus and metatarsus combined of first and second legs, slightly shorter than those of third legs. As in the male these proportions are not altogether constant: the fourth metatarsus is, for instance, sometimes relatively longer as compared with the other joints.



*Colour*.—Brown, much paler than in the male and not olivaceous.

*Structure*.—The *carapace* differs from that of the male in having the fovea transversely linear, and the anterior median eyes smaller than the anterior laterals. *Sternum* and *labium* as in male; posterior sigilla often obscure.

The tibia of the *palp* is armed with two apical spines as in *Plesiophrictus satarensis*. The tibia of the first *leg* has one or two apical spines and no apophysis; otherwise the armature of the legs resembles that of the male, except that the metatarsus of the second leg usually has one instead of three spines. The metatarsal scopulae are denser and more extensive than in the male, those of the first legs extending practically to the base of the joint. The first tarsal scopula is often somewhat indistinctly divided by a row of long hairs, rather than by a definite band of spines; the second is divided by a line of spines, the third and fourth also by bands of spines.

### Genus *Plesiophrictus*, Poc.

Incl. *Heterophrictus*, Poc.

This genus appears to have given rise to both the other genera of Indian Ischnocoleae, and through one of them to the Thrigmopoeae also. It is much larger than any of the four derived genera; and the following description, based mainly on the species by which it is represented in our collection, may serve as a standard by comparison with which these genera can be more briefly described. In *Plesiophrictus satarensis*, of which alone the male is known to me, the characters mentioned are found in both sexes unless otherwise stated.

The ocular area is rectangular, nearly or quite three times as broad as long. The eyes of the anterior line, which is lightly procurved, are about equally spaced, somewhat variable in relative size but together larger than the eyes of the posterior line together. The median eyes of the posterior line, which is very lightly recurved, are smaller than the posterior laterals, with which they are practically contiguous being widely separated from one another. The anterior medians are circular, the rest are more or less oval.

The position of the posterior sigilla of the *sternum* varies. In small species they are (? always) marginal; in larger ones they tend to be separated from the margin by a distance not (? ever) exceeding their own width.

The *labium* is about as long as broad, with slightly concave anterior margin, immediately behind which it is armed with a transverse band of somewhat sparsely scattered denticles, rather coarse in the female but sometimes very fine in the male. Similar denticles occupy a roughly equilaterally triangular patch on the lower surface of the coxa of the palp, a patch of which one side is formed by the anterior half of the basal margin.

The *chelicerae* are armed with a row of denticles on the inner side only.

The trochanters of the *palps* are not scopulate; their vestiture resembles that of the trochanters of the legs. The tarsal scopulae of the palps (♀) resemble those of the first legs. The penultimate joints are not scopulate.

The first legs are almost always shorter than the fourth<sup>1</sup>, the second than the first, and the third than the second. The tarsal scopulae of the first legs are (? always) divided (? sometimes imperfectly especially in the male). The tarsal scopulae of the fourth legs are always divided in both sexes, and in the female at least the division is sometimes so broad that the scopula appears only as a pair of narrow lateral bands. The spiny armature of the legs does not reach its full development in all forms; and it is noteworthy that this is especially the case in relatively large forms whose posterior sigilla are situated away from the margin of the sternum. Such forms resemble *Phlogiodes* and the *Thrigmopoeae* in these respects.

The spines develop only after the specimen has attained a moderate size; they appear in a definite order, and those which are normally developed last are the first to be lost in the larger and more highly specialized species. The complete armature may now be described. The spines are confined to the lower surface and sides of the tibiae and metatarsi. On the third and fourth legs they are relatively numerous in well-grown specimens of all species. On the first and second legs, however, they are less numerous and occupy very definite positions. The metatarsi of these legs may bear the following spines—one midapical, a pair of lateral apicals, and one median, of which the midapical always appears first, the order of appearance of the others being less constant; but I do not know of any species in which any of these except the first is developed on the front leg. The complete armature of the tibiae consists of the following spines—inner apical, outer apical, and median, developed in that order. The tibia of the palp is similarly armed, except that so far as I know the median spine is never developed.

The species of *Plesiophrictus* in our collection are as follows:—

***Plesiophrictus satarensis*, n. sp.**

(Pl. xv, figs. 3a-b).

*Localities*.—Medha, 2200 ft., in the Yenna valley (♂♂); Umbri, 3500 ft., Taloshi, 2000 ft., Helvak, 2000 ft., and Kembsa, 2650 ft., in the Koyna valley (♀♀ and immature). All these localities are in the Satara district of the Bombay Presidency. The upper parts of the valleys of the Yenna and Koyna, rivers which flow into the Krishna, are only separated by one ridge of

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*P. tenuipes*, Poc., from Ceylon, is an exception.

hills, and I have no hesitation in regarding the males found in the one as belonging to the same species as the females found in the other. I have selected the largest male as type.

♂. *Dimensions*.—Carapace 5.0 × 3.4 mm.—7.2 × 4.9 mm. Sternum 3.0 × 2.4 mm.—2.1 × 1.6 mm. Fourth leg longer than first. Carapace about equal in length to patella and tibia of first and fourth legs, to tibia and metatarsus with patella or tarsus of second and third.<sup>1</sup> Legs relatively a little longer in small than in large specimens.

*Colour*.—Brown, sternum and coxae slightly brighter than the rest because less obscured by hair. The anterior metatarsi whitish.

*Structure*.—The *carapace* is ovate, broader behind than in front; it is smoothly rounded, free from tubercles, but clothed with hair. The anterior median eyes are as large as the anterior laterals. The fovea is transversely linear.

The posterior sigilla of the *sternum* are marginal.

The *labium* is armed with teeth so small as to be distinct only under a much higher magnification than is usually necessary.

The patella of the *palp* is swollen distally and the tibia proximally. The tarsus is bilobed. The palpal organ is shown in pl. xv, fig. 3*b*; its style is slender, tapering and spirally curved.

The first two pairs of *legs* are unarmed except for the usual apical spine on the metatarsi,<sup>2</sup> the apophysis and its accompanying stout spine on the tibia of the first leg (see pl. xv, fig. 3*a*) and one or two apical spines (not always found) on the tibia of the second leg. The metatarsus of the first leg is lobed on the outer side at the base (fig. 3*a*). The tibia and metatarsus of the third and fourth legs are armed ventrally with 2-3 transverse series of 2-4 spines each. The first tarsal scopula is undivided, the second very narrowly, the third and fourth more (but not very) widely divided.

The metatarsal scopula of the first legs is a little less dense than the tarsal, it is broad distally and narrow proximally, but extends over rather more than the distal half of the joint. On the second legs it is similar, but less obscured by long hair; on the third and fourth it is much smaller and confined to the sides of the distal part of the joint.

The male of this species appears to differ from *P. millardi*, Pocock (the only male hitherto described in the genus) in the denser metatarsal scopula of the first legs, and in the presence of a small apical metatarsal scopula on the fourth legs.

♀ *Dimensions*.—Carapace up to 6.0 × 4.5 mm., sternum up to 2.7 × 2.5 mm. The fourth leg longer than the first as in the male; the pieces which are about equal in length to the carapace in the male seem to be a little shorter in the female.

<sup>1</sup> These joints are a trifle longer in the second than in the third leg—slightly so in the type specimen, decidedly so in the other two, which are much smaller.

<sup>2</sup> Occasionally another near it in the second legs.

*Colour*.—Distinctly yellower than the male; no white hairs on any of the legs.

*Structure*.—The *carapace* resembles that of the male, but the anterior lateral eyes are somewhat larger than the anterior medians.

The *sternum* is somewhat broader in proportion to its length than in the male.

The teeth on the *labium* are stouter than in the male, normal.

The tibia of the *palp* is armed with two apical spines.

The first legs are armed only with the usual apical spine of the metatarsus, and sometimes with a small apical spine on the inner side of the tibia; the metatarsus is not lobed at the base. The tibia is similarly armed in the second legs, but the metatarsus of this pair has three apical spines. The metatarsi of the third and fourth legs are armed as in the male, but the tibiae of these legs appear to be unarmed in their basal halves. All the tarsal scopulae are divided, those of the anterior legs normally, those of the posterior legs very widely. The metatarsal scopulae resemble those of the male, but are perhaps a trifle less pronounced.

The female of this species differs from *P. tenuipes*, the only species previously described in which the anterior median eyes are smaller than the anterior laterals, in having the anterior legs distinctly shorter than the posterior.

### ***Plesiophrictus raja*, n. sp.**

This handsome species resembles *Annandaliella travancorica* in habits. Its name is given in recognition of the facilities for collecting kindly afforded me by H. H. the Raja (now the ex-Raja) of Cochin, and of the interest which he took in my work.

*Localities*.—Kavalai, 1300-3000 ft. on the Cochin State Forest Tramway, and near the rubber estate on the lowest slopes of the Ghats between the tenth and fourteenth miles of that tramway. Only one specimen, however, was obtained from the latter place. I have selected the largest of the Kavalai specimens as type.

♂ Unknown.

♀ *Dimensions*.—Carapace up to  $9.0 \times 6.5$  mm. Sternum up to  $3.2 \times 3.2$ . The fourth legs longer than the first. Carapace equal in length to femur and patella and to tibia metatarsus and tarsus of first legs, to patella tibia and metatarsus of second legs, to femur patella and tibia of third, and to femur and patella and to metatarsus and tarsus of fourth.

*Colour*.—Carapace and abdomen covered with hair, occasionally (in one faded-looking specimen from Kavalai) dull greenish brown throughout, usually deep blue above, giving the whole upper surface of the body a rich dark, steel-blue lustre. Legs and lower surface of body olivaceous, sternum and coxae more reddish; anterior tarsi and apical half of anterior metatarsi pale.

*Structure*.—The *carapace* is ovate, broader behind than in front. The fovea is lightly procurved. The anterior lateral eyes are at least as large as the anterior medians.

The *sternum* is no longer than it is broad. The posterior sigilla are fully a diameter distant from the margin.

The *labium* is normal.

On the tibia of the *palps* only the inner apical spine is developed.

The first *legs* are unarmed except for the usual apical spine on the metatarsus. The second legs have three apical and one median spines on the metatarsus; their other joints are unarmed. The third and fourth legs bear spines on the distal two-thirds of the length of each. All the tarsal scopulae are completely divided, but the spines between the two halves are stouter and more widely spaced on the two posterior pairs of legs than on the two anterior pairs. All protarsal scopulae are more or less obsolete.

This species differs from all that have hitherto been described in its deep steel-blue colour.

### *Plesiophrictus bhor*i, n. sp.

This species resembles *Annandaliella travancorica* and *Plesiophrictus raja* in its general habits. The jungle in which it lives is, however, largely of the deciduous type, instead of the ever-green type that predominates at the base of the hills and at Kavalai. A large proportion of the specimens were found under pieces of wood in open jungle consisting largely of bamboo, a type of jungle of which neither insects nor arachnids seem usually to be fond. The species is named after Mr. J. Bhore, the Dewan of Cochin, whose constant help enabled me to make interesting collections in places that I could not otherwise have reached during my short visit to the State.

*Locality*.—Parambikulam in the Western Ghats, Cochin State, at altitudes varying from 1700-3200 ft.

♂ Unknown.

♀ *Dimensions*.—Carapace up to 12.0 × 10.0 mm. Sternum up to 5.3 × 5.3. The fourth leg longer than the first. Carapace slightly shorter than femur and patella or tibia metatarsus and tarsus of first leg, about equal to (perhaps slightly longer than) patella and tibia of same leg, to femur and patella and to tibia metatarsus and tarsus of second legs, to trochanter femur and patella of third legs, and to tarsus and metatarsus of fourth, scarcely as long as femur and patella of fourth.

*Colour*.—Almost uniformly brown.

*Structure*.—The *carapace*, *sternum* and *labium* resemble those of the preceding species. The sternum is, however, somewhat more densely hairy. The tibia of the *palps* is armed with two apical spines only in the largest specimen seen (the type), in other large specimens only the inner one is present, the palps being as usual unarmed in the very young.

The first legs are armed as in the preceding species, except that in full grown specimens there is (? always) a small apical spine on the inner side of the tibia. The same applies to the second legs except that this inner apical spine of the tibia appears at an earlier stage, and is followed by a mid-ventral spine and an outer apical one. The third and fourth legs are armed as in that species. The tarsal scopulae resemble those of the preceding species. The metatarsal scopulae are dense on the first pair of legs, slightly thinner on the others; they occupy the distal half of the metatarsi of the first two pairs of legs, but are more restricted on the last two.

This species seems to be very closely allied to *P. milleti*. It agrees with Pocock's short description of that species in all structural characters, but differs in the colour of its pile which is distinctly brown, not red, being almost olivaceous on the abdomen; it also differs in the absence of white hairs from the extremities of the legs. The localities from which the two species come are very widely separated; and a fuller description of *H. milleti* will probably reveal structural differences between the two.

#### Genus **Phlogiodes**, Pocock.

This genus is not represented in our collection, unless it be by two immature specimens from the Bombay Presidency. I can add nothing to what I have already said about it above (pp. 269-270).

#### Group THRIGMOPOEEAE.

Pocock's key to the two genera recognized in this group seems quite satisfactory.

#### Genus **Haploclastus**, Simon.

The stridulating organ of the new species of this genus described below is of a very simple, almost rudimentary type. It has been figured elsewhere (Gravely, 1915, pl. xxxi, fig 1). The bacilli on the chelicerae are situated on the lower margin, into the general hairiness of which they merge, and the minute scattered bristles on the anterior surface of the coxa of the palp are scarcely if at all different from the more numerous bristles which cover this surface in the first legs. In other characters, the genus closely resembles the preceding<sup>1</sup> which has no stridulating organ, and the following in which the stridulating organ is of a somewhat more advanced type. It may therefore be regarded as transitional between the two.

#### **Haploclastus kayi**, n. sp.

*Locality*.—Parambikulam, 1700-3200 ft., Cochin State, where the wide knowledge of the country and its jungles possessed by

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<sup>1</sup> This refers to the female. No male Thrigmopoeae yet appear to be known.

Mr. P. B. Kay enabled me to find without delay the most promising collecting grounds of the neighbourhood. Only one specimen of the present species was obtained.

♂ Unknown.

♀ *Dimensions*.—Carapace 13.0 × 9.8 mm. Sternum 6.1 × 5.5 mm. First legs fully as long as fourth which are slenderer than any of the others; second shorter than first and fourth, longer than third. Carapace not quite as long as patella and tibia of first legs, much longer than femur and than tarsus and metatarsus of same, and than femur or patella and tibia or tarsus and metatarsus of second legs; fully as long as femur and patella of third legs, scarcely as long as tibia metatarsus and tarsus of same; about equal to femur and half patella, to patella and tibia, and to tarsus and metatarsus of fourth legs.

*Colour*.—Reddish brown, except the upper sides of the patella and tibia of the second legs which are paler, almost golden; and of the patella, tibia, and base of metatarsus of the first legs which are paler still and greyish.

*Structure*.—The shape of the *carapace* resembles that of the preceding species. The anterior median eyes are larger than the anterior laterals, the diameter of the former being about equal to the long diameter of the latter. The fovea is lightly procurved and very deeply impressed. The *labium* is normal; the *sternum* is very hairy, with large sigilla which are rounded in front and pointed behind. The *chelicerae* resemble those of *Plesiophrictus* apart from the presence of stridulatory spines upon them. There is the usual mid-apical spine on the metatarsi of the first pair of legs, but it is much hidden by the dense scopula. I have not been able to detect any spine on the second metatarsus, but here too the scopula is very dense. The metatarsi of the two hind legs each have three apical spines. The tibiae of the palps and of all the legs are unarmed. The tarsal and metatarsal scopulae are divided in the fourth leg only. The metatarsal scopulae of the first two legs are very dense, and extend to the base of the segment. Those of the third legs, though dense, only cover the distal half of the segment. Those of the fourth legs are weaker and apical.

This species differs from *H. nilgirinus* in that the fourth leg is longer than the second, and from *H. cervinus* in that the patella and tibia of the first are together longer than those of the fourth. From both it appears to differ in colour, but this difference may be less real than it seems as its most striking feature—the light grey of the upper surface of the patellae and tibiae of the anterior legs—is not apparent as long as the specimen remains superficially wet.

#### Genus *Thrigmopoeus*, Pocock.

A single immature specimen from South Arcot is the only representative of this genus which we possess. Its stridulating organ differs from that of *Haploclastus kayi* in the more definite arrangement and slightly greater size of the spines on the palps,

and also in the greater distinctness of the group of bacilli on the chelicerae from the hairs which clothe the lower sides of these appendages. The organ has been figured elsewhere (Gravely, 1915, pl. xxxi, fig. 2).

#### Group POECILOTHERIEAE.

This group, which contains only one genus, appears to have originated in the Indian Peninsula or Ceylon, from some form presumably allied to the foregoing genera of Aviculariinae, as a result of adaptation to a new mode of life (see Gravely, 1915, pp. 417-418).

#### Genus *Poecilotheria*, Simon.

#### *Poecilotheria miranda*, Pocock.

One female specimen from "Kharagpur Hills"<sup>1</sup>, and another from near Chaibassa in the Singbhum District of Chota Nagpur.

#### *Poecilotheria regalis*, Pocock.

One male from Bangalore, and one female from the Annamalai Hills. The latter record extends the known range of this species to the hills south of the Palghat Gap, an extensive low-lying plain which cuts right across the hills of South India. The specimen is one determined by Mr. Hirst of the British Museum, who presumably had the type available for comparison. The discovery of a male in the Annamalais is greatly to be desired, as it is possible that its palpal organ may prove to differ from that of the male found on the opposite side of the Gap.

#### *Poecilotheria striata*, Pocock.

One female from South India, and one somewhat smaller specimen from Pamben on Rameswaram Island.

#### Group ORNITHOCTONEAE.

Only one species of each of three genera of this group are recorded from the Indian Empire. Of these *Melopoeus minax* is much the commonest, and is represented in our collection by females from "Burma", "Upper Tenasserim", Myawadi on the Burmo-Siamese frontier (Thoungyin valley, Amherst District of Tenasserim), the hills between the Thoungyin and Me-Ping in Siam, and from Pitsanuloke in Siam. It spends the day in silk-lined burrows devoid of a trap-door, but comes out in the evening. The only specimen I saw outside seemed very sluggish.

The road between Thingannyinaung and the base of the Dawna Hills, on the extreme west of the Thoungyin Valley,

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<sup>1</sup> Kharagpur is situated in the Midnapur District of Bengal, in the western part of the flat country bordering on the Gangetic Delta. The hills referred to are probably those of Singbhum, a district of Chota Nagpur immediately to the west of Midnapur.



was lined with these burrows; but having little time to spare when I noticed them, and no proper digging implements, I only got one spider from them. This was a male which I had no hesitation in associating with the similar-looking female common in the district, *i.e.* with *Melopoeus minax*. Its characters were, however, those of a *Cyriopagus* rather than of a *Melopoeus*. This led me to consider whether *Cyriopagus* might not be simply the male of *Melopoeus*. The type of the former genus is recorded as a female; but it is in our collection, and there can, I think, be no doubt at all about its immaturity. It may therefore be a male. *Omothymus schioedtei*, Thorell, which Simon refers to the genus *Cyriopagus*, is described from a male only. The male of *Selenocosmia albostrata*, the species for which Pocock established the genus *Melopoeus*, is described by Simon (1886, p. 162) as "feminae subsimilis sed cephalothorace humiliore." The low cephalothorax is one of the two chief characters in which *Cyriopagus* differs from *Melopoeus*; and nothing is said as to the distance of the eyes from the margin of the carapace in either sex of the species in question. I conclude, therefore, that *Cyriopagus* and *Melopoeus* represent opposite sexes of one genus.

Of these two names the former has priority. This is unfortunate, inasmuch as the genus *Ornithoctonus*, which is known from the female sex only, differs from *Cyriopagus* in the same characters as does "*Melopoeus*", and may also very possibly have a male with *Cyriopagus* characters. The characters by which Pocock separates *Cyriopagus* (= *Melopoeus*) from *Ornithoctonus* are unsatisfactory even for females; and the two genera will very likely have to be united.

The material before me is not, however, sufficient to justify this course at present, so the probable relation of the genotype of the former, *Cyriopagus paganus*, to other members of these genera must be considered. The characters by which their females are separated are found in practice to be so unsatisfactory even in that sex, that it would be hopeless to try to apply them to the other. Pocock's figure of the stridulating organ of *Ornithoctonus* suggests, however, another means of separating that genus from *Cyriopagus*. For the stridulatory processes of the palp are shown as long spiniform structures, whereas in *Cyriopagus minax* they are short and denticuliform. And it may be mentioned that a specimen in our collection which seems to approach the genus *Ornithoctonus* rather than "*Melopoeus*" in the characters of its legs and fovea has spiniform, not denticuliform, stridulatory processes on the palp. Unfortunately the locality of the specimen is not known.

The stridulatory processes on the palp are denticuliform in the genotype of *Cyriopagus*; so it is *Melopoeus* rather than *Ornithoctonus* that must now be sunk as a synonym. Whether *Ornithoctonus* is to be sunk as well requires further investigation.

Apart from the immature type of *Cyriopagus paganus*, *C. minax* is the only named species of this group in our collection.

The male specimen is at present on loan in America so I cannot give the description of it which ought to appear here.

Group SELENOCOSMIEAE.

This group, as defined above (p. 268), contains all the Indo-Australian Aviculariinae in which the anterior part of the labium is covered with densely packed granules, no matter whether a stridulating organ is present between the chelicerae and palps or not.

The only known species which lacks the stridulating organ is "*Ischnocolus*" *brevipes*, Thorell, but in "*Ischnocolus*" *subarmatus*, Thorell, this organ is quite rudimentary. The latter species was removed by Simon (Vol. II, p. 925) to the genus *Phlogiellus*, Poc., a genus which has since been shown by Hirst (1909, p. 384) to be indistinguishable from *Selenocosmia* and *Chilobrachys*. For the species *subarmatus*, however, he instituted a new subgenus *Neochilobrachys*, on account of the rudimentary nature of the stridulating organ (*loc. cit.*, p. 389).

*Neochilobrachys subarmatus* differs from species belonging to the genus *Chilobrachys* in having a much smaller number of stridulating rods on the coxa of the palp, and *Chilobrachys* differs from *Selenocosmia* in the same way. It was presumably for this reason that Hirst decided to regard *Neochilobrachys* as a subgenus of the former rather than of the latter. The change from the *Selenocosmia* to the *Chilobrachys* type of stridulating organ—of which many stages can be illustrated from species found at the present day—has, however, been accompanied by a marked increase in the specialization of the stridulating rods. The whole organ is clearly of a more advanced type in *Chilobrachys* than in *Selenocosmia*, and the reduction in the number of the rods cannot be regarded as in any way indicating a tendency towards degeneration—the only process which could bring them to the rudimentary condition of the "rods" found in *Neochilobrachys subarmatus*. The "rods" of *N. subarmatus* are, indeed, mere spines, comparable to those composing the dorsal and lateral parts of the groups of "rods" found in *Selenocosmia*, in which genus only the middle and ventral elements of these groups are really bacilliform.

In my opinion, therefore, *Neochilobrachys subarmatus* should be regarded as a primitive form transitional between "*Ischnocolus*" *brevipes* with no stridulating organ, and the genus *Selenocosmia* which possesses a stridulating organ of some complexity. In this case *Neochilobrachys* cannot remain as a subgenus of *Chilobrachys*; and as it differs from *Selenocosmia* more widely than does that genus from certain species of *Chilobrachys*, it may be regarded as a distinct genus. For the present it will be best, I think, to define this genus somewhat loosely, so that "*Ischnocolus*" *brevipes* may be included in it. Otherwise yet another monospecific genus would be required.

The three genera *Neochilobrachys*, *Selenocosmia* and *Chilobrachys* represent three stages in the evolution of the type of stridulating organ found in the group. The *Selenocosmia* stage is found in the localized genera *Lyrognathus* (3 species), *Coremiocnemis* (2 species), *Selenostholus* (1 species) and *Selenotypus* (1 species) as well as in the large and widely distributed genus *Selenocosmia*. Of these the last two are Australian, and I am not in a position to say anything about them. Of the desirability of keeping the first two distinct from *Selenocosmia* I am very doubtful. The Indian species of *Selenocosmia* appear to be transitional between this genus and *Coremiocnemis*, a genus which should certainly, I think, be abandoned. And the value of the single character by which the genus *Lyrognathus* is distinguished is probably small. I have, however, provisionally retained *Lyrognathus* as a sub-genus. Similarly, I am inclined to doubt the advisability of keeping distinct from the larger and more widely distributed genus *Chilobrachys* the mono-specific genus *Orphnoecus* from the Philippines.

The genera of Selenocosmieae found in the Indian Empire may be distinguished as follows:—

- |    |   |   |                                  |
|----|---|---|----------------------------------|
| 1. | { | Stridulating organ between chelicerae and palps rudimentary or absent   | <i>Neochilobrachys</i> .         |
|    | { | Stridulating organ well developed   | 2.                               |
|    | { | Stridulating organ consisting of a dorsal crescent of fine spines, merging into and partially surrounding a ventral group of more or less claviform, but always somewhat slender, bacilli   | <i>Selenocosmia</i> , p. 284.    |
| 2. | { | A few of the bacilli in the ventral row very large and strongly claviform; the number of rows, both of bacilli and of spines, often greatly reduced; the ventral row of bacilli usually extending beyond the spines in one or other direction | .. <i>Chilobrachys</i> , p. 285. |

#### Genus *Neochilobrachys*, Hirst.

So far as I know, only two species have yet been described which can be placed in this genus. They are *N. brevipes* (Thorell, 1896, pp. 170-173) and *N. subarmatus* (Thorell, 1891, p. 13). In the former there is no stridulating organ between the chelicerae and palps. In the latter, which is represented in our collection by a number of specimens from the Nicobars, there is a row of 2-6 (see Hirst, 1909, p. 388) stout spinules on the palp, and a group of somewhat similar but scattered and smaller spinules on the sides of the chelicerae close to the hair on the proximal part of the lower margin. This stridulating organ has been figured elsewhere (Gravely, 1915, pl. xxxi, fig. 3). The part on the chelicerae has also been figured by Hirst (1909, pl. xxiv, fig. 2).

Genus *Selenocosmia*, Ausserer.

The palpal parts of the stridulating organs of this genus have already been described (p. 283). The parts situated on the sides of the chelicerae normally consist of a number of long and slender spines mixed with, and not always sharply differentiated from, scattered hairs which are continuous with the thicker covering of the lower margins. In *S. himalayana*, however, these spines are shorter, and not mixed with hair, resembling those found in *Chilobrachys assamensis* and *fumosus*, rather than those found in other members of its own genus. In this species, too, the group of claviform bacilli on the palp is elongated at the expense of the downwardly curved ends of the group of simpler bristles, the two groups being almost equal in extent. It approaches *Chilobrachys* in these characters of the palpal part of the stridulating organ, to a greater extent than does any other species of *Selenocosmia* known to me. I have elsewhere figured a typical stridulating organ of the genus *Selenocosmia* (1915, pl. xxxi, fig. 4).

Two Indian subgenera may be recognized, though their value is uncertain. They may be distinguished thus:—

Fourth legs much thicker than first,  
their metatarsal scopulae entire and  
extending to the base of the segment *Lyrognathus*.

Fourth legs not thicker than first, their  
metatarsal scopulae weaker and  
apical *Selenocosmia*.

*Lyrognathus* is represented in our collection by two specimens. One, from the Khasi Hills, has been determined by Hirst as *L. crotalis*; the other, from the Garo Hills, has been determined by myself as *L. pugnax*. I am very doubtful whether they are really distinct.

*Selenocosmia* is represented by one specimen from the Andamans doubtfully referred by Hirst to *S. javanus*; by two immature specimens from the same group of islands; by several specimens with slenderer legs from Sibsagar in Assam; and by several specimens (mostly males) of *S. himalayana*. The last named species was described by Pocock from a specimen from Dehra Dun, said to be a female, the length of whose carapace was 15 mm. Hirst (1907, pp. 523-4, text-fig. 2) has since described a male from Kasauli, 6,600 ft., with a carapace length of 20 mm., and a female from Dalhousie, 6000 ft., with a carapace length of 18 mm.; he therefore concludes that the type was immature. This was not necessarily the case, however, for we have adult males whose carapace lengths range from 8.5-12.0 mm. Two of these are from Dehra Dun, two from Almora, 5500 ft., and two from Naini Tal. We also have one female from Dehra Dun. The species is evidently very variable in size. In one of the males from Dehra Dun the characteristic projection on the outer side of the palpal organ, though present on that of the left side, is absent on that of the right.

Genus *Chilobrachys*, Karsch.

Simon's definition of this genus applies only to those species in which the stridulating organs approach or attain their highest degree of specialization. To the simpler forms it is inapplicable. This is especially so in the case of *C. assamensis* and *C. fumosus*, species which resemble *Selenocosmia himalayana* in the structure of the parts of the stridulating organs situated on the chelicerae, and approach it more closely than do any other species of *Chilobrachys* known to me, in the structure of the parts of these organs situated on the palps. The stridulating organ of *C. assamensis* has already been figured (Gravely, 1915, pl. xxxi, fig. 5).

*C. assamensis* and *C. fumosus* are closely allied to one another. *C. fumosus* appears invariably to attain a much greater size than *C. assamensis*; but in view of the great range in size shown by *S. himalayana* (see previous page) and by *C. hardwickii* (see following page) this, the only difference known to me in females, cannot be regarded as an altogether satisfactory character.

The palpal organs of males of the two species are remarkably alike in their general features, but the style is longer and more abruptly spatulate at the end in *C. fumosus* than in *C. assamensis*. The latter species is represented in our collection by cotypes of both sexes from Sibsagar in Assam. The former is represented by two males from Kurseong, on one of which (that collected by Dr. Annandale) Hirst's description of this sex (1909, pp. 386-7—the only one yet published) was based. Females and young, which must provisionally be referred to this species, are represented in our collection by specimens from Chitlong in Nepal; Singla, 1500 ft., Darjeeling, Sureil and Kalimpong in the Darjeeling District; the Assam-Bhutan Frontier of Mangaldai District; and Burroi at the base of the Daffa Hills. It remains to be seen, however, whether the males from all these localities belong to a single species. If not, as the type is a female labelled "North India", the name *C. fumosus* should be kept for the Kurseong (Darjeeling District) form. The arrangement of the spines on the chelicerae in parallel rows is more or less clearly marked in certain specimens of this and other species; it cannot be regarded as a good specific character.

In *Chilobrachys assamensis* and *fumosus* the largest bacilli on the palps are situated in the distal half of the ventral row, and the stridulating processes of the chelicerae are slender and spini-form as in *Selenocosmia*. In all other species which I have seen the largest bacilli are proximal, and the projections against which they work are short and denticuliform. In a species from the Malay Peninsula, however, the former are practically median, though the dorsal spines are concentrated a little on the distal side of them. It is possible that *Chilobrachys assamensis* and *fumosus* have originated independently of the rest of the genus, in which case the former might be made the type of a new genus containing the latter and perhaps also *Selenocosmia himalayana*. But the

evidence is not yet conclusive; and in any case these species furnish an interesting indication of the manner in which the more typical forms of the genus *Chilobrachys* must have arisen. I have already figured elsewhere the stridulating organ of the type specimen of *C. stridulans* (1915, pl. xxxi, fig. 6).

Of the three remaining Indian species of *Chilobrachys*, which I am able to identify in our collection, *C. fimbriatus* appears to be the most primitive, *i.e.* the least removed from *Selenocosmia*, in the structure of its stridulating organs; for the rows of small bacilli are more numerous than is usual in either of the others. In *Chilobrachys hardwickii* the extent of these small bacilli appears to be somewhat variable, but it is usually less than is the case in our single specimen of *C. fimbriatus*; the shape of the whole group of bacilli in *C. hardwickii* is, moreover, longer and narrower, and so more like that of *C. stridulans*, in which the rows of small bacilli left exposed by the dorsal fringe of hair are still fewer. Another variable feature of *C. hardwickii*, and one in no way correlated with the variations found in the stridulating organ, is its size. The mature males in our collection have carapaces varying in length from barely 10 to over 16 mm. in length. The smallest males are associated with specimens of similar dimensions which are presumably mature females. Pocock's suggestion that females of this species may always be distinguished from those of *C. nitellinus* by their larger size can no longer, therefore, be maintained.

*C. fimbriatus* is represented in our collection by a single male from Hoshali in the Shimoga District of Mysore. *C. hardwickii* is represented by specimens from Dharhara (Monghyr District) and Sahibgunge in Bihar; from Chakardharpur (Singbhum District) in Chota Nagpur; and from Gmatia (Birbhum District) and Murshidabad in Bengal. *C. stridulans* is represented by specimens from Punkabari at the foot of the Darjeeling Hills, and from Goalpara, Shamsbernager (Sylhet), Silcuri (Cachar), Aideo<sup>1</sup> and Sibsagar in Assam.

#### Subfamily *DIPLURINAE*.

##### Group *MACROTHELEAE*.

##### Genus *Macrothele*, Ausserer.

##### *Macrothele vidua*, Simon.

(Pl. xv, fig. 5).

I have little hesitation in referring to this species specimens sent me by Dr. Sutherland from Kalimpong. The species was described by Simon (1906, p. 306) from the "bas plateaux de l'Himalaya"; and the only way in which our specimens appear to differ from it is in the armature of the anterior tarsi, which is present on the outer as well as on the inner side.

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<sup>1</sup> I do not know in which district Aideo is situated.

The Kalimpong series includes one male, and we have a male of the same species from Kurseong. This sex differs from the female in having the anterior median eyes more distinctly larger than the anterior laterals, and the posterior medians much smaller than the posterior laterals. The lower surface is inclined to be somewhat reddish throughout—more so in our Kurseong specimen than in the other. The legs and spinnerettes are much slenderer in the male than in the female; and the abdomen is shorter in proportion to the length of the spinnerettes. The palpal organ is lightly constricted below the stout conical base of the remarkably long slender and almost straight style (see pl. xv, fig. 5).

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