A LIST OF THE DRAGONFLIES RECORDED FROM THE INDIAN EMPIRE WITH SPECIAL REFERENCE TO THE COLLECTION OF THE INDIAN MUSEUM.

Part V The Subfamily Gomphinae.

By F. F Laidlaw, *M.A.*, *M.R.C.S.*, *L.R.C.P.*

With an Appendix

By F. C. Fraser, *Major*, *I.M.S.*

Contents.

Introduction.

In 1907 Williamson published an account of the Gomphines of Burma and Lower Siam (see literature) in which he gave the first systematic review of the Gomphine fauna of the Oriental Region that has been attempted. Up to the present day no other account of this fauna as a whole has been published.

There are very considerable difficulties to be faced in making such a review, difficulties that may be defined as the results of two sets of circumstances. Firstly, the subfamily as a whole shows a remarkably small range of important venational differences and, as it is on venation that systematic writers have so largely depended, this has not unnaturally resulted in a lack of clearness in the definition of major series and even of genera in the subfamily. It has also resulted in the necessity of using for specific characters those other than venational— characters in many cases confined to or drawn from a single sex; hence it has come about that the identification of specimens is at times a laborious matter, indeed sometimes impossible without the examination of type-specimens. Secondly, these insects are usually rare, in collections at any rate, the sexes are not often taken together and specimens are frequently teneral or damaged; these factors depend probably rather on the habits of the insects than on any real scarcity. At any rate it is for this reason difficult to obtain adequate material in many cases.

Williamson's paper, one of the most important contributions to systematic and faunistic Odonatology that has yet appeared, has made it possible for me to deal with the material before me with greater confidence than would have been possible otherwise. The number of species available for this survey is so considerable that I consider myself exceptionally fortunate in having to deal with so rich a supply of material. The sequel will show only too plainly how much I have left undone, and how very much more remains for the collector to do.

From want of leisure I have omitted any study of the genital structures of the second abdominal segment of the male, and for the present I have not attempted any account of the larvae in the collection.

The Gomphinae are a very clearly defined group, not likely to be confused with any other of the subfamilies of the suborder Anisoptera, either in the larval or in the adult state.

The larvae are essentially burrowers, living in mud, silt or sand at the bottom of streams, either sluggish or rapid-flowing. Fraser has given an account of several of the Indian species[1] and he makes the interesting statement that in the larvae of *Macrogomphus annulatus* "the syphon-like end of the abdomen projects from the mud and thus permits the easy inspiration of clear water for purposes of respiration." Correlated with this burrowing habit no doubt are other characteristics of Gomphine larvae—small eyes, short limbs with two-jointed tarsi, short thick antennae and relatively long abdomen.

The larvae of *Ictinus*, however, have an almost circular abdomen, with a flattened, disc-like ventral surface, which suggests that they live under boulders and rocks in rapidly running water.

The adults though probably individually numerous, are not at all gregarious and probably disperse themselves widely over the country, resting high up in trees. Hence they are so usually captured soon after emergence.

With regards to literature bearing on the subject, the following is a list of the more important works consulted. It is not exhaustive.

E. de Selys Longchamps.

1854. Synopsis des Gomphines. *Bull. Acad. Roy. Belg.* (i) XXI.

1857. Monographie des Gomphines. *Mém. couron. Soc. Roy. Sci. Liège* XI.

1859. Addition au Synopsis des Gomphines. *Bull. Acad. Roy. Belg.* (ii) VII.

1869. Secondes Additions au Synopsis des Gomphines. *Bull. Acad. Roy. Belg.* (ii) XXVIII.

[1] *Rec. Ind. Mus.* XVI, pp. 461–463, pls. xxxiii, xxxiv (1919).

1873. Troisièmes Additions au Synopsis des Gomphines. Appendices. *Bull. Acad. Roy. Belg.* (ii) XXXV

1878. Quatrièmes Additions au Synopsis des Gomphines. *Bull. Acad. Roy. Belg.* (ii) XLVI.

1890. Odonates de Birmanie. *Ann. Mus. Civ. Genova* XXX.

1894. Causeries Odonatologiques, No. 7. *Ann. Soc. Ent. Belg.* 1894, pp. 163–181.

Calvert, P. P.

1898. Odonata (Dragonflies) from the Indian Ocean and from Kashmir, collected by Dr. W L. Abbott. *Proc. Acad. Nat. Sci. Philadelphia* 1898, pp. 141–154.

Kirby, W. L.

1890. A Synonymic Catalogue of Neuroptera Odonata or Dragonflies.

1894. Catalogue of the described Neuroptera Odonata of Ceylon with descriptions of new species.

Krüger, L.

1898. Die Odonaten von Sumatra: II Thiel, Familie Aeschniden, iv, Unterfamilie Gomphinae. *Stettin entomol. Zeit.* 1898, pp. 290–330.

Martin, R.

1904. Liste des Neuroptères de l'Indo-Chine. *Mission Pavie* (sep.), pp. 1–18.

Ris, F.

1912. Neue Libellen von Formosa, Sudchina, Tonkin und den Philippinen. *Supplementa Entomologica*, No. 1.

1916. H. Sauter's Formosa-Ausbeute: Odonata. *Supplementa Entomologica*, No. 5.

Williamson, E. B.

1908. The Dragonflies (Odonata) of Burma and Lower Siam: II Subfamilies Cordulegastrinae, Chlorogomphinae, and Gomphinae. *Proc. U. S. Nat. Mus.* XXXIII, pp. 267–317.

1920. A new Gomphine genus from British Guiana with a note on the classification of the subfamily. *Occas. Papers Mus. Zool. Univ. Michigan*, no. 50.

LIST OF THE SPECIES.

The fifty or so species of the subfamily I have to list are arranged according to Williamson's suggested grouping, which I have adopted as by far the most satisfactory classification so far published. I have even ventured to elaborate this classification to a

limited extent as regards his series *Gomphus*, which remains still in an unsatisfactory state for the systematist. The characters I have given in my generic definitions are such as I hope will render the reference of species to their appropriate genera not a very difficult task. I confess I have myself not found it easy in many cases.

As to terms employed, it is perhaps necessary to explain that as regards the colour pattern of the synthorax an *imaginary* typical species would have the dorsum (*mesepisternites*) black with a '*dorsal*' yellow stripe or band on either side of the median suture (or mid-dorsal carina) and external to this a *juxta-humeral* (or more shortly *humeral*) stripe just internal to the humeral suture. The sides of the synthorax of such a species would be yellow, with a fine black line marking the position of the two lateral sutures. The term meso-thoracic collar explains itself. De Selys uses also the term *antehumeral* in the same sense as I give here to the word *dorsal*, referring to the yellow bands placed near the mid-dorsal carina.

For terms used in discussing venation I would refer the reader to Tillyard's book "The Biology of Dragonflies" or to Needham's "Genealogic study of Dragonfly wing-venation"[1] or to Williamson's paper already quoted on 'The Dragonflies of Burma and Lower Siam.' For wing-photographs I am indebted, as on other occasions, to Mr. F. W Campion.

I fear that this paper is in danger of being too lengthy already. I will therefore not attempt to deal with the interesting questions of geographical distribution that suggest themselves. They may be postponed for future consideration, when our knowledge of the group is more complete.

I have not been able to deal with certain questions of synonymy satisfactorily, especially as concerns some of the species of *Ictinus*. I hope they will be tackled and solved by field-workers in India.

In the following list species marked with an asterisk have not been seen by me. Species of doubtful distinctness are put in brackets. I have throughout adopted the synonymy of Kirby's 'Catalogue.'

Series Hagenius.

Sieboldius japponicus Selys.

Series Diastatomma.

Ictinus rapax Ramb.
,, (*praecox*)* Selys.
,, (*mordax*)* Selys.
,, *angulosus* Selys.
,, (*atrox*)* Selys.
Gomphidia T-nigrum Selys.

[1] *Proc. U.S. Nat. Mus.* XXVI. pp. 703–764 (1903).

Series EPIGOMPHUS.

Macrogomphus annulatus Selys.
,, *robustus* Selys.
,, *montanus* Selys.
Perissogomphus stevensi, sp. nov.
*Leptogomphus gestroi** Selys.
,, *inclitus** Selys.
,, (?) *maculivertex** Selys.
Heliogomphus nietneri (Selys).
Microgomphus torquatus (Selys).

Series GOMPHUS.

Davidius (*zallorensis*)* Selys.
,, *aberrans* (Selys).
,, *davidi assamensis* Laidlaw.
Anormogomphus heteropterus Selys.
*Gomphus xanthenatus** Williamson.
,, *personatus* Selys.
,, (?) *promelas** Selys.
,, *nilgiricus* sp. nov.
,, (?) *ceylonicus** Selys.
Platygomphus dolabratus Selys.
,, *feae** Selys.
Burmagomphus pyramidalis sp. nov.
,, *vermiculatus** (Martin).
,, *sivalikensis* sp. nov.
Cyclogomphus hypsilon Selys.
,, *heterostylus* Selys.
,, *vesiculosus** Selys.
,, (?) *minusculus** Selys.
Temnogomphus bivittatus (Selys).
Anisogomphus occipitalis Selys.
,, *orites* sp. nov.
Onychogomphus grammicus (Ramb).
,, *lineatus* (Selys).
,, *cerastis** (Selys).
,, *bistrigatus** Selys.
,, *M-flavum* Selys.
,, *saundersi* Selys.
,, *aureus** sp. nov.
,, *biforceps* Selys.
,, *acinaces* sp. nov.
,, *modestus** Selys.
,, *frontalis** Selys.
,, *annularis** Selys.
,, *maclachlani** Selys.
,, (?) *circularis** Selys.
*Heterogomphus smithii** Selys.
,, *ceylonicus* sp. nov.
Ophiogomphus reductus Calvert.

Types of new species unless otherwise stated will be deposited with the Zoological Survey of India (Indian Museum, Calcutta).

SYSTEMATIC NOTES WITH DESCRIPTION OF NEW SPECIES.

Series HAGENIUS Williamson.

A small series characterized by the possession of a distinct trigonal supplement; that is to say, the boundary nerve between the two rows of cells which follow immediately the triangles of fore and hinder-wings is straightened out to form a single continuous nerve and does not consist, as in other Gomphines, of a number of separate nerves meeting one another in angular fashion. (Or in other words, the cells immediately following the triangles are rectangular.)

The distal margin of the triangle posterior to the attachment of this supplement, is distinctly concave. Triangles crossed by a single nerve. Some reduction of the cross-nerves between M_{1-3} and M_4 in hinder-wings. Legs very long, hinder femora as much as 17·5 mm. long in *Sieboldius*. Head relatively small, thorax robust, wings rather pointed.

Distribution : Holarctic and oriental.

Genus **Sieboldius** Selys.

Genotype : *Sieboldius japponicus* Selys.

Head very small relatively, abdomen black with yellow rings ; second segment of abdomen shorter than third.

Sieboldius japponicus Selys.

This fine species is chiefly Malayan in its distribution. It occurs in Lower Siam, and I have entered it on my list as there seems a possibility that it may turn up in Burma. In all probability it does not occur in Japan. Its only near allies are another species of the genus, *S. albardae* Selys from Pekin and the two species of the closely related genus *Hagenius*, one, *H. brevistylus* Selys, from N. America, the other *H. gigas* Martin, from Tonkin. Krüger's species, *S. grandis* from Sumatra, does not appear to be separable from the Selysian species.

Series DIASTATOMMA Williamson.

(= Legion *Lindenia* Selys.)

Venation dense. The series " is unique by the presence of a strongly developed sector (branch) of Rs and a usually less well developed sector of M_4." Triangles of fore and hinder-wings dissimilar. Outer side of triangle of hinder-wing slightly concave. Legs short.

This series includes a small number of rather large insects, it is represented in S. America by a single species of a peculiar genus; otherwise it is peculiar to the old world, mainly to the Oriental and Ethiopean regions.

Genus **Ictinus** Selys.

Genotype: *Ictinus rapax* (Ramb.).

Species examined: *I. rapax* (Ramb.), *I. angulosus* Selys.

Characters of the series. Leaf-like expansion on either side of the tergite of the eighth segment of the abdomen. Upper anal appendages of male longer than the tenth segment, parallel to one another and straight or nearly so. Lower appendage much reduced, with a pair of small processes.

A genus of large and handsome insects ranging from Africa to the warmer parts of Australia, but most abundantly represented in tropical Asia.

Ictinus rapax (Ramb.).

Ictinus rapax, Selys, *Mon. Gomph.*
,, *praecox*, Selys, *Mon. Gomph.*
,, *mordax*, Selys, *Mon. Gomph.*

2♂♂ 1♀ Calcutta, Labelled in de Selys' handwriting "*Ictinus rapax*, Ramb. Calcutta." (154/6, 387/6, 5441/20).
4♂♂ Calcutta, April, Sept. and Oct. (6235/20, 6331/20, 6333/20).
5♀♀ Calcutta (7220/8, 6283/14, 9282/14, 6332/20, 6334/20).
1♀ Calcutta, 17-ix-19 (1488/H 2).
1♀. Calcutta, Maidan, 27-vii-14 (8289/20).
1♂. Museum, Calcutta, 18-viii-16 (4246/H 1).
1♀ Calcutta, "sticking to railing in Museum Buildings," 28-ix-17 (7940/H. 1).
1♂, 1♀. Murshidabad (1815/10, 1817/10).
1♂ and exuviae. "Larva from hill-stream, Chakradharpur, Chota Nagpur, v-18. Adult emerged in Museum, 8-vi-18." F. H. Gravely (1428/H 2).
2♂♂. Chota Nagpur, 1000 ft., 1-ix-15. E. d'Abreu.
1♀. Barkuda I., Chilka Lake, 1–3-viii-14.
1♂. Chalakudi, Cochin State, 14-30-ix-14, F. H. Gravely (8236/20).
1♀. Trichur, Cochin State, 0–800 ft., 4-x-14. F. H. Gravely (8226/20).
1♂ and exuviae. "Larva from hill-stream, Chakradharpur, Chota Nagpur, v-18. Adult emerged in Museum, Calcutta, 8-vi-18." F. H. Gravely (1428/H 2).

Specimens from Calcutta have the juxta-humeral stripe complete or interrupted. In the specimens from Cochin this stripe is obsolescent, as is the yellow mark on the metepisternite; they are also slightly smaller than the more northern specimens. Possibly the S. Indian form may form a recognizable race. There seems a certain amount of individual variation, and in view of this I am strongly inclined to regard *praecox* Selys, and *mordax* Selys, as synonymous with the present species.

	Length of abdomen.	Length of hinder-wing.
♂, Calcutta.	48+3·25 mm.	40·5 mm.
♀, Calcutta.	50 mm.	41 mm.
♂, Cochin.	45+3 mm.	36 mm.
♀ Cochin.	43 mm.	35 mm.

This species seems to be one of the most widely spread, and perhaps one of the commonest of the Indian Gomphines. I have not seen specimens from Assam or Burma. A closely allied species or race, *I fallax* Selys, is known from Shanghai.

Ictinus angulosus Selys.

1 ♂ Dum-Dum, near Calcutta, 4-vi-11 (6371/20).

Face entirely yellow save for fine black lines below the anteclypeus and above the post-clypeus. A fine yellow line on the exterolateral surface of the middle pair of tibiae. The yellow markings, especially on the thorax and on segment 10, have a distinct red tone. Inter-alar spaces largely yellow, with a transverse black line between the wing-bases. Otherwise the specimen agrees with the description given of the type.

Length of abdomen 54 + 2·25 mm., of hinder-wing, 42 mm.

The species seems to me to be very near *atrox* Selys, of which only the female is known. Both are rare in collections, and I have not seen an example of *atrox*, nor the female of *angulosus*. I suspect the two are conspecific.

Genus **Gomphidia** Selys.

Genotype : *G. T-nigrum* Selys.
Species examined : *G. T-nigrum* Selys.

A genus of large and handsome insects, very similar in general to *Ictinus*, but readily distinguished by the *absence of any leaf-like lateral expansions on the eighth abdominal segment.* The members of the genus appear to be rarer insects of rather more restricted distribution than are the species of *Ictinus*. All are peculiar to the Oriental Region, and most of them are found in Malaya. *G. T-nigrum* is the only species recorded from within the limits of the Indian Empire. The larvae breed in tanks and still waters, thus differing from those of *Ictinus* which breed in running water (*Fraser*).

Gomphidia T-nigrum Selys.

2 ♂♂ 2 ♀♀ Poona, May, 1917. F. C. Fraser.

Recorded by de Selys as coming from the 'North of India.' The species, hitherto regarded as rare, is evidently fairly abundant near Poona, at any rate seasonally.

Length of hinder-wing of ♂ 38 mm., of abdomen 50 mm. + 4 mm.

Series **Epigomphus** (Williamson).

Characterized by free triangles, subtriangles and supra-triangles, and by the existence of more than two cross-nerves between M_{1-3} and M_4 in the hinder-wing. These cross-nerves are not widely spaced from one another as in the next series. Forking of M_{1-2} and M_3 usually unsymmetrical.

Five oriental genera can be distinguished. They may be very briefly separated as follows:—

A. Large insects (h.w.>36 mm.); ninth abdominal segment much longer than eighth ...	*Macrogomphus* Selys.
B. Size moderate or small (h.w. usually less than 36 mm); ninth abdominal segment smaller than eighth.	
I. Basal antenodal nervure of 2nd series present	*Leptogomphus* Selys.
II. Basal antenodal nervure of 2nd series absent	
a. Sectors of arculus approximated shortly after their origin.	
1. Size moderate (h.w. 25 mm. or more); outer side of triangles straight; upper anal appendages of male lyrate ...	*Heliogomphus*, gen. nov.
2. Size small (h.w. about 20 mm.); outer side of triangle broken; upper anal appendages of male chelate	*Microgomphus* Selys.
b. Sectors of arculus not approximated after their origin	*Perissogomphus*, gen. nov.

The unsymmetrical character of the forking of M_{1-2} and M_3 (which Williamson, doubtlessly the result of a *lapsus calami*, writes as M_{1-3} and M_4) is much more obvious in *Leptogomphus*, *Heliogomphus* and *Microgomphus*, than in *Macrogomphus* and in *Perissogomphus*. As to the specialization of cross-nerves between M_{1-3} and M_4, in all genera of the series *Gomphus*' that I have examined, or of which I have seen photographs, the forking of M_{1-2} and M_3 is preceded in the hinder-wing by a single cross-nerve only. In *Perrissogomphus*, least typical of oriental Epigomphines, this forking usually occurs at the level of the third cross-nerve, occasionally distal to it.

The genera of this series are confined so far as is known to the Oriental and Neotropical Regions.

Genus **Macrogomphus** Selys.

Genotype: *Macrogomphus robustus* Selys.

Species examined: *M. annulatus* Selys; *M robustus* Selys; *M montanus* Selys; *M decemlineatus* Selys; *M. quadratus* Selys.

Large insects (h.w. about 40 mm., abdomen still longer) easily recognized by the curious lengthening of the ninth segment of the abdomen in both sexes. Pterostigma unbraced. Forking of M_{1-2} and M_3 not markedly asymmetrical, more so in fore than in hinder-wing. Cubital space usually with two cross-nerves. Upper anal appendages of males chelate (much as in *Microgomphus*).

The lengthening of the ninth segment of the abdomen is diagnostic and at once distinguishes a *Macrogomphus* from any known oriental genus. The segment is roughly twice as long as the eighth.

Macrogomphus robustus Selys.

2 ♂ ♂ Assam.
1 ♀ "Sibs."=Sibsagar (6331, 1). Specimen identified by de Selys.

The males are undoubtedly conspecific with the female. The latter is very mature and in bad condition. The head is missing from one of the males, the occiput of the other differs from that of the type male described by de Selys in not possessing a conical tubercle, and to some extent in details of colouring. The different appearance of the occiput may be an individual peculiarity, the colouring probably owes its distinctions to age and state of preservation. At any rate I propose to list the males under the Selysian species for the present.

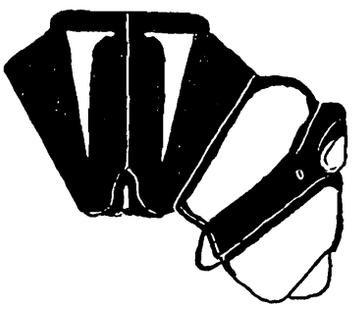

FIG. 1.—Colour-pattern of synthorax of *Macrogomphus robustus* Selys.

MALE. *Head.* Upper lip black save for a small yellow mark on either side at the base. Ante- and post-clypeus largely brownish-yellow margined with black, vertical parts of frons black, its horizontal part brownish-yellow on the *synthorax,* the juxta-humeral stripes are quite obsolete, and the whole of the metepisternite is black. The *abdomen* has segments 3-8 ringed with yellow, the yellow ring on the seventh segment covering the basal half of the segment, that on the other segments about the basal fifth of each. Segments 9 and 10 entirely black. Upper anal appendages yellowish-white darkening apically, the outer branch of each being the stouter, jointed at its apex, the inner branch is slender rather knobbed terminally and not quite so long.

Length of abdomen of ♂ 51 + 2 mm., of hinder-wing 40·5 mm.; length of abdomen of ♀ 47 mm., of hinder-wing 40 mm.

Macrogomphus annulatus Selys.

3♂♂ 3♀♀ Poona. F. C. Fraser.

Fairly similar to *M robustus.* It differs slightly in size. In colour its markings seem to be of a paler yellow than those of *M robustus* in which (in dried specimens) they are distinctly brown. *M annulatus* has the upper lip largely lemon-yellow, its base and a median longitudinal line black. The vertex has a small yellow spot immediately behind the ocelli.

The synthorax has a minute yellow spot, the last vestige of the humeral band, just in front of the alar sinuses to the outer side of the dorsal marks. This is present in all the specimens I have seen. The ninth segment of the abdomen has a small basal lateral spot of yellow. The metepisternite is entirely black. For an account of the larva of this species, and for an interesting note on its habits see Fraser.

Length of abdomen of ♂ 49+1·8 mm., of hinder-wing 38 mm., length of abdomen of ♀ 51 mm., of hinder-wing 39 mm.

Macrogomphus montanus Selys.

1 ♂ Calcutta (5255/20). 1 ♀. No locality (5921/13). Both in poor condition. The male identified and labelled by de Selys.

Readily distinguished from the preceding species by its generally lighter colouration, which appears to me in some respects also to be more primitive. On the synthorax the juxta-humeral stripes are conspicuous, though incomplete below. The metepisternite is yellow, outlined by black lines along the lateral sutures. The basal yellow rings on segments 2-8 of the abdomen occupy about the basal third of the segment. The abdomen of the male specimen is missing, that of the female lacks segments 7–10.

FIG. 2.—Colour-pattern of synthorax of *Macrogomphus montanus* Selys.

Length of hinder-wing in ♂ 38 mm., in 41 mm.

In addition to these Indian species of *Macrogomphus* three other species apparently closely related to one another occur in Malaya. These species are *M. parallelogramma* Burm., *M. albardae* Selys, and *M. decemlineatus* Selys.

Of these species *M. parallelogramma* has no trace of the juxta-humeral stripe on the synthorax. The metepisternite is black, but with a narrow vestige of yellow banding in its middle. It is recorded from Java and Sumatra. *M albardae* is very closely related (possibly only a local race) and differs from *M parallelogramma* in having the metepisternite entirely black. *M. decemlineatus* has the dorsal stripes of the synthorax very narrow, juxta-humeral stripes present, complete but very narrow, mesepisternite yellow, but with black bands on the lateral sutures as broad as the yellow. Metepimerite yellow with well-marked black posterior margin.

Lastly, three Malayan species form a distinct section of the genus. This is characterized by the large size of its members, the well-marked curving and complexity of the sectors of the wings, and the specialized colouring of the synthorax. The species forming this section are *M quadratus* Selys, from Borneo and the Malay Peninsula, *M. thoracicus* McLach., from Sumatra and also from the Malay Peninsula, and *M. abnormis* Selys, probably from Borneo. In them the dorsum of the synthorax is black with a large squarish yellow spot occupying about its anterior half. The way in which the species of the first section of the genus ring the changes' in the colour-pattern of the synthorax is very remarkable. It is parallelled in other genera of Gomphinae, but it seems to me that in other groups of Anisoptera at any rate the specific differences are of some other character. Here they

suggest almost some sort of "permutation and combination," and I believe similar conditions may be traced in regard to other features, hinting as it were at the working of some Mendelian sorting out of characters.

Genus **Leptogomphus** Selys (*restr.*).

Genotype: *L. semperi* Selys.

Basal antenodal nervure of 2nd series present. A maximum of two rows of cells between Cu_2 and the hinder-margin of the fore-wing, only one row of cells between M_1 and M_{1a} at level of distal end of pterostigma. Proximal angle of triangle of fore-wing as far distant from the arculus as length of proximal side of subtriangle. Sectors of arculus not approximated after their origin. Forking of M_{1-2} and M_3 unsymmetrical in both pairs of wings. One or two cross-nerves in submedian space (number apparently varying). Pterostigma unbraced. Upper anal appendages of male simple, rather *Gomphus*-like. Hamuli large, vesicle of penis small or moderate. Ninth segment of abdomen shorter than eighth. Size moderate.

Unfortunately the Museum collection contains no example of this genus. I believe that *L. gestroi* Selys, from Burma, is certainly to be referred to it and also *L. inclitus* of the same author. The latter, of which a description of the female only is available, is said by de Selys to be very similar to *L. semperi*. In addition, Ris has described two species of the genus, *L. sauteri* and *L. perforatus*, the former from Formosa, the latter from S. China.

The type-species, *L. semperi* Selys, has been recorded from the Philippine Islands, Borneo, and Tonkin.

Lastly, from Malaya several species are known, of these *L. lansbergi* Selys, is recorded from Sumatra and Java, the closely allied *L. assimilis* Krüger, is from Sumatra. *L. kelantanensis* (Laidlaw) is from the Malay State of that name and *L. williamsoni* Laidlaw, is from Borneo.

The position of one or two species referred to the genus is doubtful. *L.*? *maculivertex* Selys, from Burma, known from the female only, is possibly a *Heliogomphus*. *L. parvus* Krüger, from Sumatra would seem to belong rather to the *Gomphus* series; at any rate the number of cross-veins between M_{1-3} and M_4 is reduced as in that series.

Genus **Heliogomphus**, gen. nov.

Genotype: *L. nietneri* (Selys).
Species examined: *H. nietneri* (Selys).

No basal antenodal nerve of 2nd series. A maximum of two rows of cells between Cu_2 and the hinder margin of the fore-wing. Only one row of cells between M_1 and M_{1a} at level of distal end of the pterostigma. Proximal angle of triangle of fore-wing as far distant from the arculus as the length of the proximal side of the sub-

triangle. Sectors of arculus approximated about 1 mm. after their origin. Forking of M_{1-2} and M_3 unsymmetrical in both pairs of wings. One or two cross-nerves in the submedian space (number apparently varying according to species and sex). Triangle of hinder-wing occasionally crossed. Pterostigma unbraced. Upper pair of anal appendages of male carrying a remarkable apical process, so that the two processes are together somewhat lyre-shaped. Hamuli small, vesicle of penis large and prominent. Ninth segment of abdomen shorter than eighth. Size moderate, colouring rather sombre, with (usually) fine, longitudinal, dorsal line on segments 3–7 of the abdomen. Appearance of adult male, more particularly of the abdomen, very like that of *Anisogomphus*.

The following species appear to me to be clearly referable to this genus: *H. nietneri* Hagen, from Ceylon and Assam (from the latter locality possibly as a geographical race), *H. gracilis* Krüger, from Sumatra; *H. retroplexus* (Ris), from Tonkin; and *H. scorpio* (Ris), from Yunnan.

The generic separation of these species has been clearly foreshadowed by Ris, and hinted at by Williamson and Krüger Though I cannot claim to have had the opportunity of making as detailed a study of the species of this genus and of *Leptogomphus*, *s. restr.*, as any of these writers, it seems to me that a faunistic paper of the character of this on which I am now engaged affords a suitable opportunity for defining this new genus.

Heliogomphus nietneri (Selys).

1 ♂ 1 ♀ Tura, Garo Hills, Assam, 1500 ft. S. Kemp. (7977/H1).

These specimens are clearly examples of the same form as that described in the 'Odonates de Birmanie' by de Selys, which was regarded by him as being conspecific with Hagen's species from Ceylon. Not having any examples from the latter locality with which to compare the Assamese material I follow de Selys in leaving the specimens under this name, though I believe it not unlikely that they may prove to belong to a distinct race or even to a distinct species.

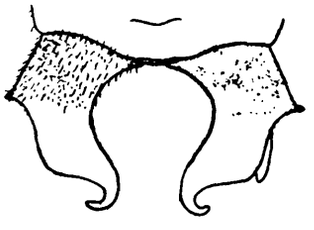

FIG. 3.—Anal appendages of *Heliogomphus nietneri* Selys, seen from above.

From Hagen's description they differ chiefly in having the two lateral black bands on the synthorax along the lines of the lateral sutures, the posterior band not being 'presque terminale.' The male has no lateral yellow markings on any of the segments beyond the fourth, whilst the pterostigma is brownish-black. In general appearance, and especially in the colouring and shape of the abdomen, the male of *H. nietneri* bears a curiously close resemblance to that of *Anisogomphus occipitalis* Selys.

The female of *H. nietneri* has not been described. In this sex the colouring of the *head* is, as in the male, largely black, with a pair of yellow spots at the base of the upper lip, the bases of the mandibles marked with yellow, and a yellow line across the frons from eye to eye. The frons, as in *Macrogomphus*, is flattened so that there is not the usual distinction between a vertical and a horizontal part. Behind the ocelli the vertex bears a pair of small conical tubercles. The occiput is depressed.

The *prothorax* has the yellow markings more extensive than in the male.

The *synthorax* has a small superior juxta-humeral spot not found in the mature male, in addition to the dorsal band, otherwise as in the male.

Abdomen. First segment entirely yellow, the remainder black, marked with yellow as follows :—Dorsum of 2–8 with longitudinal band, broader on the second segment than on the others, and from 2–7 occupying the whole length of the segment, on 8 only the basal third. A broad lateral band, including the well-developed auricles, along the second segment, a narrower and partly interrupted band on the third. Basal triangular spots on 4–7. Anal appendages whitish-yellow. Tenth segment extremely reduced (? shrivelled) not one-quarter the length of the ninth. Vulvar scale small, about one-third the length of the ninth segment, shaped like a truncated triangle, only slightly bifid.

Length of hinder-wing of ♂ 28 mm., of abdomen 29+1 mm., length of hinder-wing of ♀ 31 mm., of abdomen 32 mm.

Genus **Microgomphus** Selys.

Genotype : *M chelifer* Selys.
Species examined : *M. torquatus* (Selys).

No basal antenodal nervure of 2nd series. Only one row of cells between Cu_2 and the hinder margin of the fore-wing. Only one row of cells between M_1 and M_{1a} at level of distal end of pterostigma. Proximal angle of triangle of fore-wing as far distant from the arculus as the length of the proximal side of the subtriangle. Sectors of arculus approximated after their origin. Forking of M_{1-2} and M_3 unsymmetrical in fore and hinder-wings. Pterostigma unbraced or feebly braced. Upper anal appendages of male chelate. Vesicle of penis large, ninth segment of abdomen shorter than eighth. Size small, colouring brilliant.

In this definition there is little to separate *Microgomphus* from *Heliogomphus*, and I think the two genera are related. *Microgomphus* differs mainly in its smaller size, more reduced venation, chelate upper anal appendages of the male, and in its richer colouring.

Microgomphus torquatus (Selys).

Cyclogomphus torquatus, Selys, *Mon. Gomph.*
7 ♂♂ 4 ♀♀ Poona. F. C. Fraser.

MALE. *Head.*—Lower lip yellow. Upper lip yellow with black line at base produced as a triangular mark in the middle line. Genae and bases of mandibles yellow. Ante- and post-clypeus yellow, the latter with a pair of small black marks where it joins the frons. This has a black band running from one eye to the other just above the clypeus, but is otherwise yellow, its crest not inflated. Vertex and occiput black, the latter with a slightly concave margin, without hairs.

Prothorax black, its anterior margin lined with yellow, and with a small lateral spot on the posterior margin, and a median spot of the same colour.

Synthorax largely yellow, the dorsum black marked with yellow as follows: a mesothoracic collar, not interrupted, and in the middle line sending a short projection upwards along the mid-dorsal carina; a pair of oblique dorsal markings, pointed above and below, on either side of the mid-dorsal carina, not reaching to the mesothoracic 'collar' nor to the ante-alar sinus; above and to the outside of these markings a pair of small triangular spots, with the apices directed anteriorly, and lastly a minute yellow spot between the ante-alar sinuses. Laterally a black band less

FIG. 4*a*.—Colour-pattern of *Microgomphus torquatus* (Selys) ♂ semi-diagrammatic.

than half a millimetre across, runs obliquely downwards from below the front pair of wings to the base of the posterior coxa.

Legs black, the postero-lateral surfaces of the first, and the proximal half of the posterior surface of the third pair marked with yellow. The anterior surfaces of the femora are thickly studded with fine, irregularly arranged spines.

Abdomen black. Dorsum and sides of first segment with yellow marks. Second segment yellow on the sides, and with a yellow mark on the dorsum, not reaching the apex of the segment, pointed distally and widened at its middle rectangularly. The third segment has a yellow mark on either side at its base, extending for rather more than a third of its length distally, and a dorsal triangle of the same colour, its base resting on the basal margin of the segment. In the middle of the distal half of the segment is a narrow oblong-oval yellow spot dorsally, and on either side of this a somewhat similar lateral mark. Segments 4–8 have each a basal ring of yellow narrowest on 4–5, lengthening on 7–8, more produced laterally than dorsally, especially on the two latter segments. In addition 4 has a small, longitudinal oval spot, lying mid-dorsally, and occupying about the middle third of the seg-

ment. The ninth has a rounded lateral spot, and the tenth is entirely black. The auricle is yellow and the genital structures of the second segment are black. The abdomen is slender, the segments 7–9 rather wider and deeper than the rest.

The upper anal appendages, which are pale yellow with darkened apices are a little longer than the 9th segment of the abdomen. Each is chelate; the outer branch is much the stouter and diminishes gradually to its apex. The inner branch is slender, cylindrical, and is widest at about its middle. The two branches separate at about the middle of the total length of the appendage and run at an angle of about 60° to one another. The outer branch is quite straight, the inner is turned a little upwards at its apex. The lower appendage is about two-thirds of the length of the upper pair. It is brownish black in colour, has nearly parallel sides, and at its apex divides into two short branches which run a little outwards and upwards.

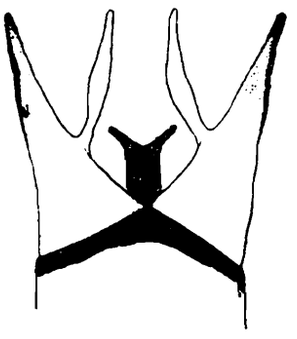

FIG. 4*b*.—Anal appendages of *Microgomphus torquatus* (Selys) ♂ seen from above.

The vesicle of the penis is large and conspicuous, almost as striking a feature of the male as in *Cyclogomphus*.

FEMALE. Colouring of the head, prothorax and synthorax as in the male. The abdominal colouring differs chiefly in that the two dorsal marks on the third segment are united, that on the fourth segment relatively longer, and in the fact that lateral spots lying at about the middle of the length of the segment occur on segments 4 and 5, that on 5 being very small. The anal appendages are minute, yellow in colour, and the abdomen is regularly cylindrical from the end of the third segment to the apex.

Length of abdomen of ♂ 23·5 mm., of hinder-wing 21 mm.; length of abdomen of ♀ 25·5 mm., of hinder-wing 22·75 mm.

It is curious that in this the smallest of the old-world Epigomphines the anal appendages of the males should bear a strong resemblance to those of *Macrogomphus*, a genus which includes the largest species of the series.

Microgomphus was founded by de Selys to include a species, *M chelifer* from Malaya, which until Major Fraser's discovery of the male of the present species remained the only known example of the genus. The finding of a second species in Peninsular India under climatic conditions which must be very different from those obtaining in the countries inhabited by *M chelifer* is interesting and a little surprising.

The larva of *M torquatus* has been figured and described by Major Fraser under the name of *Cyclogomphus minusculus* Selys.

The Malay species differs from *M torquatus* in having the dorsal band of the synthorax confluent at its upper extremity with

the juxta-humeral band, which is apparently not reduced as in *M torquatus* to a mere superior spot. The yellow rings on segments 4–7 of the abdomen are smaller, and the branches of each of the upper anal appendages of the male are nearly parallel to one another.

The venation differs but slightly from that of *M. chelifer*, the chief distinction being apparently that the present species has its venation a very little denser than in *M. chelifer*.

Nodal indicator $\frac{12-10}{10-8}\,\frac{10-12-13}{8-10}$.

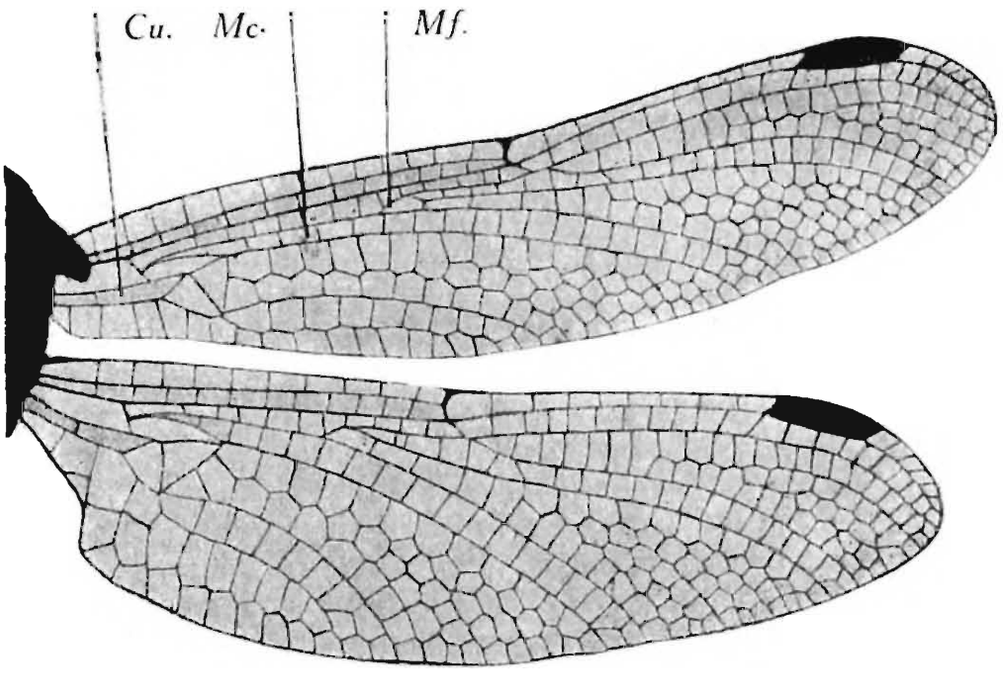

FIG. 5.—Venation of *Microgomphus torquatus* (Selys) ♂ (Photo by F. W. Campion.)
Cu., cubital space. *Mc.*, area between M_{1+3} and M_4. *Mf.*, Fork of M_{1+2} and M_3.

Perissogomphus,[1] gen. nov.

Genotype: *P. stevensi*, sp. nov.

An Epigomphine genus, without a basal antenodal nervure of 2nd series. A maximum of at least three rows of cells between Cu_2 and the hinder margin of the fore-wing. Only one row of cells between M_1 and M_{1a} at level of distal end of pterostigma. Proximal angle of triangle of fore-wing not so far distant from the arculus as length of proximal side of sub-triangle. Forking of M_{1-3} and M_4 unsymmetrical in both fore and hinder-wings. Two (sometimes three) cross-nerves in the submedian space of all four wings. Triangle of hinder-wing of female frequently crossed by a nerve running parallel to long axis of wing. Pterostigma braced. Anal

[1] περισσος=redundant, excessive.

appendages of male rather like those of *Gomphus, s. str.* Ninth segment of abdomen shorter than eighth. Legs short, hindermost femora when adpressed barely reaching the end of the first abdominal segment; armed with a number of very small tubercles on the ventral surface, not arranged in definite rows. Vulvar scale of female small, deeply cleft.

I have found it difficult to make up my mind as to the proper place of this genus. The character of the cross-nerves between M_{1-3} and M_4 shows a certain amount of variability even on the different wings of a single specimen. In some cases there is distinct evidence of a spacing out of the cross-nerves, suggesting an approach to the condition found in the *Gomphus* series; in other wings there is no evidence of anything of the sort. So that it would, it seems to me, be reasonable to regard this form as a primitive member of the *Gomphus* series, or as an Epigomphine showing a tendency to specialization in the same direction as the *Gomphus* series. The presence of two or even sometimes three cross-nerves in the submedian space, the frequent existence of a cross-nerve in the triangle of the hinder-wing of the female are characters that incline me to think the position of the genus should be rather with the Epigomphines. The colouring and so far as I know the other characters of *Perissogomphus*, do not lend any assistance in settling the question. On the whole I believe the genus is an annectant one and that it will ultimately prove to occupy a position not far from the base of both series.

Another oriental genus, *Merogomphus* Martin, known from a single species from Tonkin, seems to me to be, like *Perissogomphus*, intermediate between the series *Epigomphus* and the series *Gomphus*. It has fore-wings similar to those of the former series, hinder-wings with the differentiation of cross-veins characterizing the latter. The pterostigma is well braced. The anal appendages of the male closely resemble those of *Heliogomphus*. The position of the genus must be regarded as doubtful at present.

Perissogomphus stevensi, sp. nov.

1 ♂, 4 ♀♀ Gopaldhara, Darjiling District.
2 ♀♀ (fragmentary). Darjiling (cc/1060–cc/1061).

MALE. *Head.* Lower lip black, upper lip, ante- and post-clypeus brownish-black. Bases of mandibles yellow. Frons pale yellow. Occiput and vertex black, the former with a straight margin, edged with long hairs.

Prothorax black, with a fine yellow spot on its posterior margin, in the middle line.

Synthorax yellowish-brown, with a large M-shaped black mark anteriorly. The outer lines of the M run down along the humeral suture on either side from the ante-alar sinuses. The middle part is made up of a median black line running down from the sinuses on either side of the mid-dorsal carina, but not quite reaching the meso-thoracic ridge. The carina itself is yellowish-brown.

In addition, the second lateral suture is marked with a narrow black band.

Legs black, the first pair of femora yellowish on their ventral surfaces.

Abdomen black, marked with yellow. The first segment is yellow laterally, and has a dorsal band of the same colour, much contracted at its middle. The second is likewise yellow on the sides, with yellow oreillet, and it has a trilobed dorsal band of yellow extending the whole length of the segment. Segments 3–7 have a narrow longitudinal band of yellow dorsally, commencing at the base of each segment, but not reaching to the apex except in the case of the third segment. In each case this band is broadest at the base of the segment and narrows rapidly apically to a very fine line. It is broadest on 7. In addition 3 has a small basal lateral mark. The dorsum of segments 8 and 9 is entirely black, but these segments and also 7 have each a complete lateral yellow band. Segment 10 is yellow with black margins. The abdomen is slender, the distal part of 7, and the whole of 8 and 9 rather inflated.

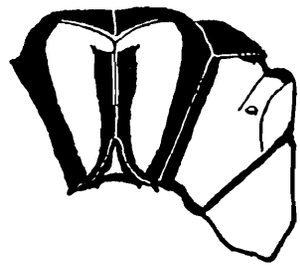

FIG. 6.—Colour-pattern of synthorax of *Perissogomphus stevensi*, sp. nov., ♀

The anal appendages are pale yellow, and in general like those of *Gomphus*, *s. str.* The upper pair are simple, almost regularly conical, somewhat acuminate, a little flattened below, and very slightly upturned at the apices. They are a little longer than segment 10 of the abdomen.

The lower appendage is about two-thirds of the length of the upper pair. Its terminal half is deeply cleft so as to form two branches, which are a little divaricate and upturned at their apices.

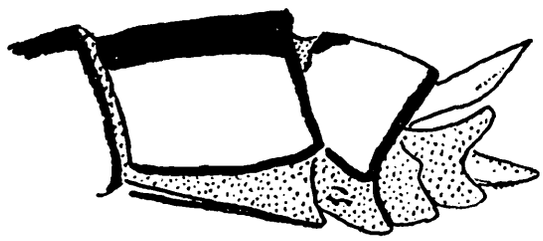

FIG. 7.—Anal appendages of *Perissogomphus stevensi*, sp. nov., ♂

FEMALE. The female differs from the male in colouring chiefly as follows:—On the *head* the upper lip is dark brown margined with black. The ante- and post-clypeus are dark-brown, the vertex and occiput are also very dark brown. Further, the hinder margin of the latter carries at either extremity a small spine.

The *prothorax* has the posterior margin entirely yellow. On the *synthorax* the only noticeable difference lies in the fact that the black line situate on either side of the mid-dorsal carina is truncate below, and not rounded as in the male.

The abdominal markings are very much like those of the

other sex. The lateral markings on the first three segments form a more definite band, reaching to the middle of the third segment. In general the colouring is not quite so bright as in the male, but the female specimens are all more mature and in worse preservation.

Length of abdomen of ♂ 35 + 1·5 mm. (approx.), of hinder-wing 33 mm., length of abdomen of ♀ 41 mm., of hinder-wing 37 mm.

Antenodal cross-nerves on fore-wing 17, post-nodals 13; antenodal cross nerves on hinder-wing 14, post-nodals 14.

Two of the six females examined have the triangles of the hinder-wing free. One female has three cross-nerves in the sub-

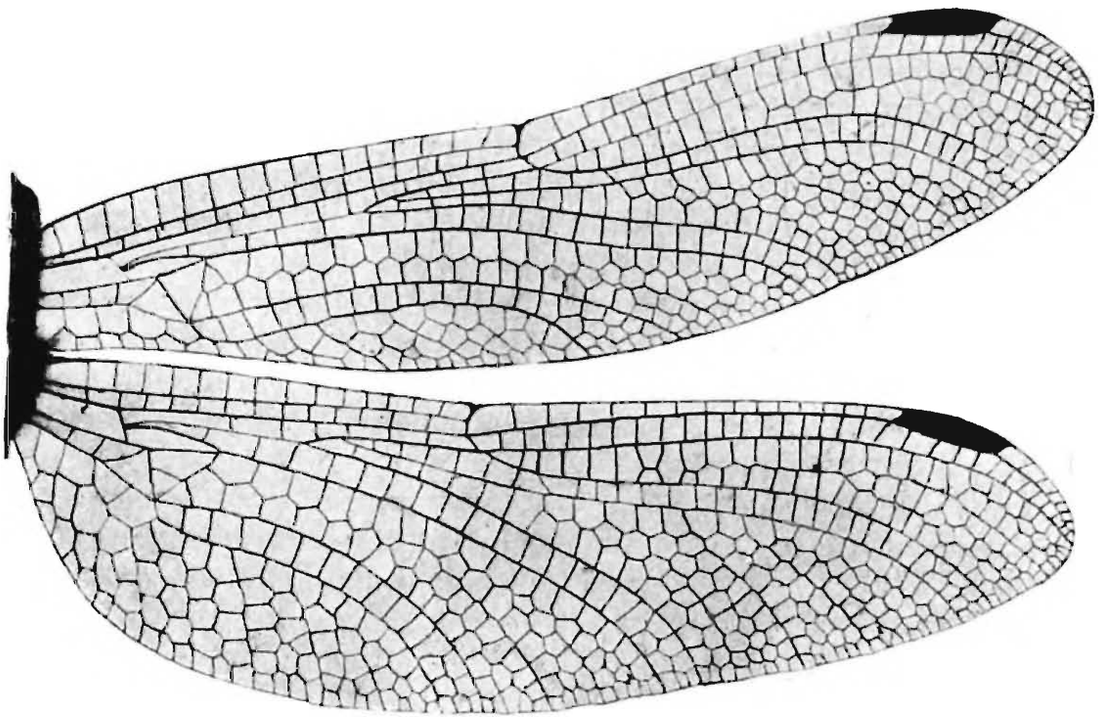

FIG. 8.—Venation of *Perissogomphus stevensi*, sp. nov. (Photo by F. W. Campion.)

median space of the fore-wing the other specimens have two apiece.

Series GOMPHUS (Williamson).

" Associated with uncrossed triangles, supra-triangles, and sub-triangles is a reduction and specialization in the cross-veins between M_{1-3} and M_4. This last character is unique in the Anisoptera." The forking of M_{1-2} and M_3 is approximately symmetrical.

The difficulty of defining genera in a satisfactory way, and of indicating their proper systematic position in grouping them with their allies, obvious enough in all the larger series of Gomphines, is especially so in the case of this large and dominant series which contains, as Williamson remarks, not less than thirty genera and two hundred and fifty species.

Clear-cut venational characters are not to be found, though this is possibly to some extent due to the fact that the very large genus *Gomphus* is something of a "dump" for a certain number of species whose exact position is at present doubtful. On the other hand, anyone who examines a considerable number of specimens belonging to several of the genera of the series can scarcely fail to notice that whereas the specialization of cross-veins between M_{1-3} and M_4, used by Williamson as the most important character for the definition of the series, is tolerably constant in the hinder-wing, in the case of the fore-wing a certain range of specific and even of individual variation may occur. Further, I believe that in certain genera, probably in those which are to be regarded as the most highly evolved of the series, this variability in the case of the fore-wing is by no means marked; it seems to me even to be absent in some cases, so that in such genera the specialization of the fore- and hinder-wings is about equal. Unfortunately, owing to the occurrence of tolerably numerous cases of individual variations of the fore-wing, the degree of specialization exhibited by it cannot as yet be used as a generic character.

Of characters available for grouping genera which appear to form natural assemblies in the series the most evident are those supplied by the anal appendages of the males. These characters, backed to some extent by colour peculiarities, and also here and there by features of the venation, give a grouping which I am persuaded is tolerably natural, and of some practical value. I would again insist that in presenting such an arrangement here I am drawing largely on suggestions and hints made by de Selys, by Williamson and by Ris, and that I am dealing entirely with Indian or Oriental forms. I believe the tribes or sections of the series defined below to have approximately equal value. *Davidius* would seem venationally to be the least specialized, and perhaps the most easily defined. *Onychogomphus* and *Heterogomphus* are the most advanced. In them it is rare or exceptional to find an individual in which the specialization of the cross-veins between M_{1-3} and M_4 of the fore-wing is not as fully developed as in the hinder-wing.

I propose then to group the bulk of the oriental members of the series in the following five "groups," leaving out of account one or two genera whose position is to my mind doubtful, or which are not sufficiently known to me. From what I have seen of the British Museum collection I should be inclined to say that there are still several genera awaiting recognition, especially amongst the material from Tonkin, a country apparently very rich in Gomphinae.

Groups:

DAVIDIUS,
CYCLOGOMPHUS,
GOMPHUS,
ONYCHOGOMPHUS,
HETEROGOMPHUS.

Group: DAVIDIUS.

Number of cross-nerves between M_{1-3} and M_4 not so constant, and not always showing the same amount of specialization in the fore-wings as in the hinder-wings. Sectors of arculus widely separated at their origin, constantly though slightly divergent, and scarcely curved Triangle of hinder-wing with costal margin about twice as long as the basal margin, its outer margin distinctly angled; often with a cross-nerve. Cu_1 and Cu_2 in hinder-wing distinctly divergent. Pterostigma braced. Basal antenodal nervure of 2nd series occasionally present. Hindermost femora when adpressed reaching almost to distal end of second abdominal segment (in *D. davidi*). Dorsum of segments 3–7 of abdomen entirely black, or marked with a fine longitudinal line of yellow.

Upper anal appendages of male each with large ventral process. Lower appendage cleft at the apex, its branches not divaricated.

Genus **Davidius** Selys.

Genotype: *D. zallorensis* Selys (?).[1]

Species studied: *D. aberrans* Selys, *D. davidi assamensis* Laidlaw.

Characters of the tribe.

Distribution: Himalaya, Assam, Tonkin, China, Japan, Manhuria.

Davidius aberrans Selys.

1 ♀ Binyar, Kumaon, 7700 ft., 24-v-1912. A. D. Imms, For. Zool. Coll.

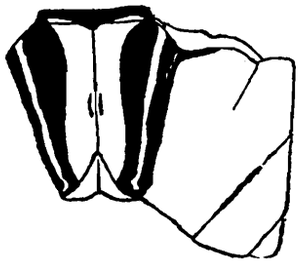

FIG. 9.—Colour-pattern of synthorax of *Davidius aberrans* Selys, ♀

This specimen has the triangles of both hinder-wings crossed by a single nerve, and in addition the triangle of the right forewing is traversed by a nerve lying parallel to the long axis of the wing. The triangles of the fore-wings in this specimen are relatively more elongated than appears to be the case in the species figured by Ris.

Length of abdomen 34 mm., of hinder-wing 28 mm.

Davidius davidi assamensis Laidlaw.

1 ♂ 2 ♀♀ Gopaldhara Darjiling District 9-v-14. H. Stevens.

Dorsum of synthorax entirely black save for the small mesothoracic collar and a small extension from this running up the mid-dorsal carina for about the first half of its length.

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[1] Should *D. zallorensis* and *D. aberrans* prove to be conspecific the latter name must take precedence, and the genotype would then be *D. aberrans* (Selys).

In the male the last five segments of the abdomen are entirely black. The seventh segment shows a peculiarity that I have not seen remarked on. A little beyond the middle of the segment the ventral border of the tergite is produced on either side to form a small tubercle-like process armed with stout hook-like spines directed backward. The ventral margins of the tergite of the eighth segment carry a series of spines, about the middle of the segment, rather larger than is usual in that position, and the sternite of that segment carries, close after its base, a small blunt projection. The significance of these structures is unknown to me.

The anal appendages of the male resemble rather closely those of *D. cuniculus* Ris, a Japanese species.

Of the species referred to the genus, *D. nanus* Selys would appear to have a doubtful right to the position. As Ris has pointed out the anal appendages of the male are quite unlike those of other species where known. This species is Japanese.

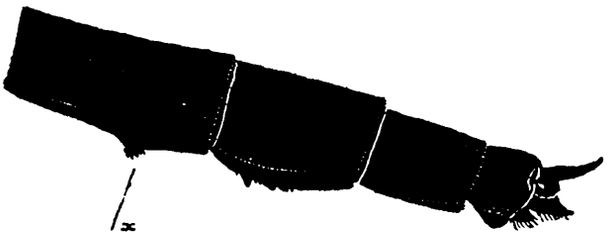

FIG. 10. Apex of abdomen of *Davidius davidi assamensis* Laidlaw, ♂ *x*, process of edge of tergite of the seventh segment.

D. fruhstorferi Martin, is in its venation clearly a member of the tribe *Davidius*. But the reduced anal area of the hinder-wing, and the characters of the male anal appendages suggest to me that it may require transference to a distinct (and new) genus, as already hinted by Ris.

For the rest *D. lunatus* (Bartenef), *D. aberrans* Selys, and *D. zallorensis*, have a yellow mark on the occiput; the first of these is Manchurian, the two others (probably conspecific) are from the Himalayas.

D. davidi Selys, from S. China and Assam, *D. ater* Selys, and *D. cuniculus* Ris, both from Japan, have a black occiput.

Lastly *D. bicornutus*, also from Japan, is larger than the other species, is known only from a female specimen and is of doubtful generic position.

Length of abdomen of ♂ 31 mm., of hinder-wing 26·5 mm.; length of abdomen of ♀ 28 mm., of hinder-wing 28·5 mm.

Group CYCLOGOMPHUS.

It is impossible to give a really satisfactory definition of this tribe, apart from sexual characters. None the less I am persuaded that it is a true phylogenetic entity.

The tribe is characterized by the anal appendage of the male. The upper pair are small, nearly parallel to one another, and often brightly coloured. They are often provided with a strong ventral projection. The lower appendage has its branches

widely divaricated, often these are longer than the upper appendages. In many cases the hinder femora are long, and have the spines of their apical half at least much longer than is usually the case with the other tribes of the series so far as I know. The occiput of the female is generally much reduced. A longitudinal dorsal stripe is often present on the last four segments of the abdomen. Lastly, the differentiation of the cross-nerves between M_{1-3} and M_4 does not seem so firmly fixed a character as in the three remaining tribes of series.

In *Anisogomphus* in fact, some individuals show scarcely more differentiation than does *Leptogomphus* in this respect, others in my short series show marked differentiation in the hinder-wing, less or none in the fore-wing. I have not enough material for a statistical study, but I believe that in *Cyclogomphus* about one individual in four shows lack of differentiation in the fore-wings.

An examination of the males of *Podogomphus practorius* and of *Notogomphus* sp. in the British Museum has convinced me that these two genera at least, in addition to the Oriental forms here enumerated, belong to this tribe.

Genus **Cyclogomphus** Selys.

Genotype : *C. hypsilon* Selys.
Species examined : *C. hypsilon* Selys, *C. heterostylus* Selys.

A genus of rather small Gomphines, characterized by the presence of a basal antenodal nervure of 2nd series on all four wings (absent from one hinder-wing of a single female specimen of *C. hypsilon* only). The costal side of the triangle of the hinder-wing is much longer than the basal side (almost twice as long in *C. hypsilon*), only one cross-nerve in the submedian space of both wings. Costal nerve with a fine yellow line. The pterostigma is relatively long, more than one-quarter the length of the distance between the nodus and the distal end of the pterostigma.

The hinder pair of femora when adpressed reach to the end of the proximal third of the second segment of the abdomen. They are armed with two rows of spines on the ventral surface, and there are in addition a few scattered tubercles of minute size near the base. The vulvar scale is small.

Of the five species which have from time to time been referred to the genus, *C. torquatus* Selys is undoubtedly a *Microgomphus*. The small species, *C. minusculus* Selys, known from a single specimen, a female taken at an elevation of between 4000 and 6000 ft. near Tenasserim, will in all probability prove to belong to a different genus.

C. vesiculosus Selys, described from an imperfect male, has been recorded from Poona by Major Fraser, but is unknown to me; it appears to differ, according to de Selys' account, but little from *C. hypsilon*, chiefly in its smaller size.

Cyclogomphus hypsilon Selys.

12 ♂♂ 9 ♀♀ Poona, Kartraj Lake, Aug., Sept., 1918.

The pterostigma is uniformly brown, enclosed between dark brown nerves, whilst in the next species (*C. heterostylus*, Selys) it is dark in the centre, and distinctly paler for its outer third. Furthermore, the light markings on the dorsum of the terminal segments of the present species are more extensive. Colouring varies much with age and state of preservation.

FIG. 11.—Abdomen of *Cyclogomphus hypsilon* Selys, ♂ seen from above.

Length of abdomen of ♂ 28 mm., of hinder-wing 25 mm. length of abdomen of ♀ 30 mm., of hinder-wings 26 mm.

Cyclogomphus heterostylus Selys.

2 ♂♂ 1 ♀. Poona, 19-ix-19. 1 ♀ Darjiling, 4-vii-18. 1 ♀ St. Thomas Mount Madras, 9-iii-18 (all from Major F. C. Fraser).

I cannot find any characters by which to distinguish the Darjiling specimen from the female from Poona. The males agree precisely with the figure given for this species in the monograph.

Length of abdomen of ♂ 28·5 mm., of hinder-wing 26 mm. length of abdomen of ♀ 30 mm., of hinder-wing 26·5 mm.

Genus Anisogomphus Selys.

Genotype : *A. occipitalis* (Selys).

Species examined : *A. occipitalis* (Selys), *A. orites*, sp. nov.

A genus of medium-sized Gomphines, distinguished from *Cyclogomphus* and *Temnogomphus* by the absence of a basal antenodal nervure of 2nd series. The costal nerve is black, and in general the colouring, especially in adult specimens, is rich but more sombre than in allied genera. Pterostigma relatively shorter than in *Cyclogomphus*. The inferior anal appendage of the male carries two stout rather widely divaricated branches, the superior appendages are coloured (in Indian species), each carries a stout black ventral process. The occiput of the female is much reduced. The vulvar scale has a length of about two-thirds of the ninth segment, its apical quarter is cleft.

Hindermost femora when adpressed reach to the middle of the second segment of the abdomen. Their armature consists of two rows of spines on the ventral surface, rather irregularly spaced, and varying a little in length, those placed more distally being on the whole the longer.

Of the species referred to the genus in Kirby's catalogue, the African *A. praetorius* Selys, has been since referred to an allied genus *Podogomphus* by its author.

I have ventured to remove *A. bivittatus* Selys, to a separate genus. The two species from N.-E. Asia, *A. maacki* Selys, and *A. M-flavum* Selys, are unknown to me save from the description. Both appear to belong to the genus.

Lastly *A. nietneri* Selys is referred by me to the new genus *Heliogomphus*.

Anisogomphus occipitalis (Selys).

2 ♂♂ 2 ♀♀ (in poor condition). Gopaldhara, Darjiling district. H. Stevens.

1 ♂ Darjiling, 1–3000 ft., May, 1912. Lord Carmichael's collection (cc/1167).

1 ♂ 1 ♀. Turzum Tea Estate, Darjiling, Mar. 1920. O. Lindgren.

1 ♂, Darjiling Dists. (1409/H2). 1 ♂ 1 ♀ Darjiling Dists. (3424/H1).

Closely allied to the following species, from which it is readily distinguished by the following characters:—

(i) All the specimens of *A. occipitalis* before me have two cross-nerves in the cubital space of the fore-wing.

(ii) The upper end of the dorsal stripe of the synthorax is not confluent with the upper end of the antehumeral stripe.

(iii) The black bands on the lateral sutures of the synthorax are much broader than in *A. orites*.

(iv) The anal appendages of male *A. occipitalis* also show marked differences. The ventral process of the upper pair is straight and dagger-like, and this process, owing to the fact that the appendages are more closely approximated than is the case in *orites*, is invisible from above. Further the branches of the lower appendage are straighter and rather more slender, with a more pointed apex.

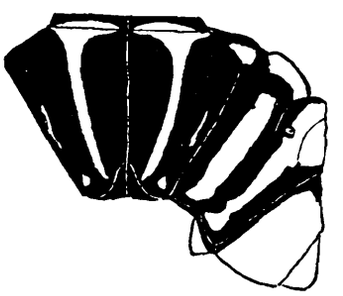

FIG. 12.—Colour pattern of synthorax of *Anisogomphus occipitalis* Selys, ♂, adult.

In young specimens of this species the antehumeral band of the synthorax is complete, in older specimens it is in part obliterated, and comes to consist of a dorsal spot, rather widely separated from a more anteriorly placed linear remnant.

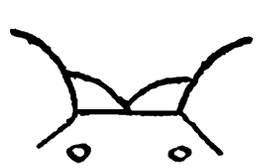

FIG. 12a.—Occiput, *Anisogomphus occipitalis* Selys, ♀ outline.

Length of abdomen of ♂ 32 mm., of hinder-wing 30 mm.; length of abdomen of ♀ 33 mm., of hinder-wing 32 mm.

Anisogomphus orites,[1] sp. nov.

1 ♂ 1 ♀ Shillong, Sept., 1919. T. B. Fletcher. (Type and allotype.)
" ♀ Flying along hedge away from water."

MALE. *Head* black save for a small spot on either side of the upper lip, the bases of the mandibles, and a broad band across the top of the frons from eye to eye. The markings are lemon yellow.

Prothorax black, marked with yellow on its hinder lobe.

Synthorax with black dorsum, yellow mesothoracic collar interrupted in the middle line. Dorsal bands meeting the collar anteriorly, running close up to the ante-alar sinuses, narrow, regular, of a pale greenish-yellow colour, confluent at their upper extremities with a small rounded spot on either side, the vestige of the upper end of the ante-humeral band, which is otherwise obsolete save for a fine line lying close against the humeral suture at about the middle of its length. The black of the dorsum passes on either side just beyond the humeral suture. The sides of the thorax are greenish-yellow in colour with a narrow black band on the first and second lateral sutures. The meso- and meta-notum are whitish-yellow.

FIG. 13.—Colour-pattern of synthorax, *Anisogomphus orites*, sp. nov., ♂

Legs black; the first pair of femora have a greenish-yellow band on the extero-lateral surface.

Abdomen black, of a particularly rich, almost velvety quality. The first segment has a transverse mark of yellowish-white dorsally. Segments 2–7 have each of them a dorsal, longitudinal

FIG. 14.—Last six segments of abdomen of *Anisogomphus orites*, sp. nov., ♂

band of the same colour, extending nearly the whole length of the segment but not quite reaching its apex. That on the second segment is trilobed; on segments 4–7 the bands are narrow and linear, that on the seventh being the most conspicuous. The sides of the first and second segments, including the oreillets, are greenish-yellow, also a small basal lateral spot on the third.

Upper *anal appendages* small, white in colour and aculeate. Each carries on its ventral side a large, black process. This process appears in side view almost triangular, attached above by its apex, widening ventrally. Each is somewhat incurved so as to be visible

[1] ὀρειτης = mountaineer.

between the upper part of the appendages when the abdomen is viewed directly from above. The lower distal angle of each of these processes ends in a small projecting point. Branches of lower appendage black, stout, curved a little upwards and outwards, with rounded apices.

FEMALE. Colouring in general very similar to that of the male. The third abdominal segment has a longitudinal lateral band of colour, and each of the segments 4–7 has a small lateral basal spot on either side. As in the male the upper anal appendages are white.

Length of abdomen of ♂ 31·5 mm., hinder-wing 30 mm.; length of abdomen of ♀ 34 mm., of hinder-wing 31·5 mm.

The *venation* of this species is in general very similar to that of its congener *A. occipitalis*. Neither of the two specimens before me, however, have the additional cross-nerve in the cubital space of the fore-wing. Though one cannot assert with any degree of certainty that the presence or absence of this additional vein can be used to distinguish the two species, what evidence exists points in this direction. I have accordingly omitted the presence of an additional nerve in this area from the generic characters.

Genus **Temnogomphus**,[1] nov.

Genotype: *T bivittatus* (Selys).

Species examined: *T bivittatus* (Selys) ♀.

A genus containing a single species of moderate size. It is characterized by the possession of a basal antenodal nervure of the 2nd series, and by the colour-line on the costal nerve which separate it from the closely allied *Anisogomphus*. From *Cyclogomphus* it differs in the relatively short pterostigma, and in having the triangle of the hinder-wing not elongated. It is also larger than in the species of *Cyclogomphus*.

FIG. 15.—Occiput of *Temnogomphus bivittatus* (Selys) ♀ outline.

The occiput in the female is reduced to a marginal line. The hindermost femora when adpressed reach to the end of the first segment of the abdomen. The armature consists of relatively long spines, much as in *Anisogomphus*.

Temnogomphus bivittatus (Selys).

2 ♀ Kumaon, v-1911. A. D. Imms, For. Zool. Coll.

The species is readily identified by the yellow face with two black bands running across it. The lower of these is the "anteclypeus" the upper a black band across the lower part of the irons. The occiput in the female is reduced to a narrow yellow margin between the eyes, fringed with long yellow hairs. The prothorax has its anterior and posterior margins yellow. On the syntho-

[1] τεμνω=cut *or* separate.

rax the mesothoracic collar is narrowly interrupted in the middle line, the dorsal stripes join it on either side, and the juxta-humeral stripes are complete and rather broad. The sides are yellow with very narrow black lines along the sutures.

The abdomen has a longitudinal median band of whitish-yellow on all the segments except the tenth, complete save for the narrow black sutural rings, bounded on either side by a brownish-black band; this encloses on either side a lateral band of yellow, broad and complete on the first and second segments, divided into two parts on segments 3–7 by the black mark on the transverse carina of each of those segments. On 8–9 the yellow lateral band is complete, and on the tenth segment it passes entirely to the ventral side, whilst the dorsum of the segment is black. Anal appendages black. The femora are yellow, with brownish-black spines and a dorsal brown band on each, the tibiae are black.

On the back of the occiput is a curious rounded tubercle of a bright yellow colour.

Length of hinder-wing 33 mm., of abdomen 36 mm.

The two males in the British Museum labelled as belonging to this species, one of them so labelled by de Selys himself, are evidently rather examples of *A. occipitalis*, as was recognized by de Selys in his latest account of the species (*Causeries Odonatologiques* No. 7, 1894). In this account he remarks further that *A. bivittatus* has a basal antenodal nervure of the 2nd series. This combined with certain other features emboldens me to remove *bivittatus* from the genus *Anisogomphus*, and to erect for it the new genus described above.

Group GOMPHUS.

Fore-wing and hinder-wing showing about equal specialization in regard to the arrangement of cross-nerves between M_{1-3} and M_4. Sectors of arculus well separated as a rule, approximately parallel and well curved. Cu_1 and Cu_2 parallel or only slightly divergent on hinder-wing. M_4 and Cu_1 slightly divergent (or parallel in *Burmagomphus*) at the level of the nodus, in the fore-wing. Pterostigma braced, basal antenodal nervure of the 2nd series usually absent. Legs variable, in *Gomphus, s. str.*, rather long. The male often has a conspicuous yellow mark on the dorsum of the ninth abdominal segment. Upper anal appendages of male shaped much like the same structures in the Libellulinae. Lower appendage with its branches divergent, usually a little shorter than the upper pair, and roughly parallel with them.

A. Hinder-wing of male with its anal border rounded. Small insects with reduced venation. Body sandy colour ... ... *Anormogomphus* Selys.

B. Anal border of hinder-wing of male sharply angled.

1. Four rows of cells at least between Cu_2 and hinder margin of hinder-wing ... ... *Gomphus* Leach.

2. Usually three rows of cells between Cu_2 and hinder margin of hinder-wing.

a. Apical segments of male abdomen much dilated ... . *Platygomphus* Selys.
b. Apical segments of male abdomen only slightly dilated. M_4 and Cu_1 parallel to beyond level of nodus of fore-wing ... *Burmagomphus* Williamson.

Genus **Anormogomphus** Selys.

Genotype: *Anormogomphus heteropterus* Selys
Species examined: *A. heteropterus* Selys.

This genus may ultimately come to be placed in a distinct tribe, but there seems no reason to doubt that it is derived from ancestors belonging definitely to the Gomphine series. It is of course unique amongst the Gomphinae by reason of the rounded hinder wings of the males.

Its geographical distribution is of great interest. With *Vanderia* (an ally of *Ictinus*) and with the Libelluline *Selysiothemis*, it is characteristic of the desert areas of S.-W Asia, but has apparently a more restricted distribution than either of the other genera.

Anormogomphus heteropterus Selys.

1 ♂ Lahore. H. T. Pease.

The small genus of which only two species are known, seems to be confined to the arid regions of W Asia.

The specimen before me agrees precisely with the account given of this species in the monograph. The other described species occurs in Mesopotamia and Turkestan, and is rather larger than *A heteropterus*. This species is *A. kiritshenkoi* Bart., of which I have seen a series in the British Museum.

Genus **Gomphus** Leach.

Genotype: *G. vulgatissimus* (Linn.).
Species examined: *G. personatus* Selys, *G. nilgiricus*, sp. nov.

My knowledge of this genus is very limited. A brief comparison of the genotype with the species inhabiting India (and some of their more immediate Eastern allies) gives one the impression that characters for a subdivision of the genus may be forthcoming in the future.

I confine myself to describing a species from the Nilgiri Hills that appears to be new, and to very short notes on the other Indian species.

Gomphus personatus Selys.

1 ♂ (fragmentary). Assam. Labelled by de Selys "*Gomphus promelas*? ♂." (5442/20).

Differs from the type in having only a superior spot, instead of a narrow vestige of the antehumeral stripe; in other respects what there is of the specimen agrees with the account given by de Selys, and I have no doubt but that the specimen is

correctly referred to the present species. The structure of the second pair of genital hamules is very similar to that found in *G. nilgiricus*, but the hamule is more curved forward at its apex and not so prominent as in that species.

Gomphus nilgiricus, sp. nov.

1 ♂ Nilgiris, 3000–4000 ft. F. C. Fraser.

Head. Lower lip yellow, upper lip brown, bases of mandibles and anteclypeus of the same colour, post-clypeus black. Vertical part of frons black, horizontal part lemon yellow. Vertex and occiput black, the latter with its hinder margin a little raised medially.

Prothorax black, the middle lobe with a large lateral spot of yellow on either side, and a small mid-dorsal, paired, yellow spot; the hinder margin likewise yellow.

Synthorax black dorsally, with a pair of rather broad yellow dorsal stripes, meeting the yellow mesothoracic collar, which is widely interrupted in the middle line. Sides yellow, with black

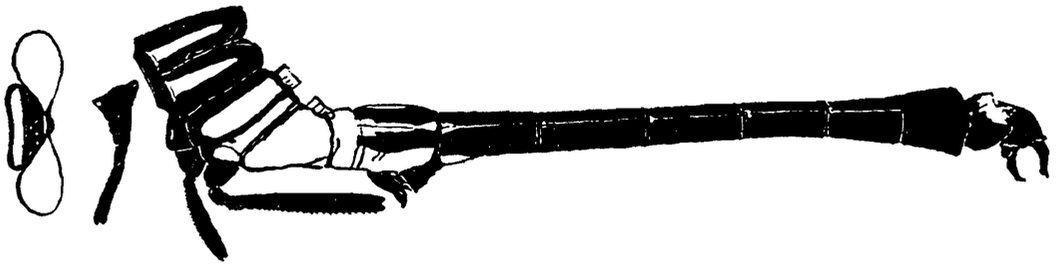

FIG. 16.—Colour-pattern of *Gomphus nilgiricus*, sp. nov., ♂ semi-diagrammatic.

bands along the lateral sutures, the metepisternite between these bands is darkened so that at first sight the bands appear to coalesce.

Legs black, rather long; hindermost femora 7·5 mm.

Abdomen slender, cylindrical, the eighth segment a little wider and deeper than the rest. Black, marked with yellow as follows:—Sides of first and second segments, including the oreillet, which are, however, heavily margined with black; lateral ventral mark on third segment; dorsum of first segment, the yellow mark widening apically; a longitudinal band on the dorsum of the second segment, extending the whole length of the segment, widest basally, a dorsal line on the third segment, wide at its base, narrowing rapidly, extending as a fine line almost to the apex of the segment. Segments 4–7 with fine paired spots lying basally on the dorsum of each. Distal half of 9 yellow.

Anal appendages black; upper pair about as long as the tenth segment, curved slightly ventralwards, ending in a fine upturned point. Branches of lower appendage about equal to them in length and equally divaricated.

Genital structures of second abdominal segment, black in

colour. Anterior pair of hamules, small simple and partly concealed between the second pair. These are large and very conspicuous, rather trigger-shaped, their apices lying ventrally to the triangular vesicle.

Length of hind-wing 35 mm., of abdomen 39 + 1·5 mm.

Venation that of a typical *Gomphus*, pterostigma braced, nodal indicator $\frac{12-13}{12-9}\Big|\frac{15-12}{10-13}$.

G. xanthenatus Williamson, Burma. Traces of the juxta-humeral band present, a broad black band on the two lateral sutures. Abdomen of ♂ 45 mm., hinder-wing 39 mm.

G. personatus Selys, Assam. Traces of juxta-humeral band present, narrow black bands on lateral sutures, the first incomplete above.

Abdomen of ♂ 42 mm., hinder-wing 37 mm.

G.? promelas Selys, Madras. Dorsal stripes of synthorax "presque confluentes" with mesothoracic collar, no juxta-humeral stripe. Pterostigma unbraced. Exact position doubtful. Female only known.

Abdomen of ♀ 42 mm., hinder-wing 38 mm.

G.? ceylonicus Selys, Ceylon. Narrow isolated dorsal stripes, juxta-humeral band represented by a superior spot. Pterostigma unbraced. Female only known. Abdomen of ♀ 41 mm., hinder-wing 39 mm.

Genus **Platygomphus** Selys.

Genotype: *P. dolabratus* Selys.

Species examined: *P. dolabratus* Selys.

Differs from oriental species of *Gomphus* in having the anal margin of the hinder-wing of the male only slightly excavated, so that the anal angle of the hinder-wing is not so bold as in that genus. In this respect it shows some approach to *Anormogomphus*. The number of rows of cells between Cu_2 and the margin of the hinder-wing is three only. The apex of the abdomen of the male is more dilated than in the oriental species of *Gomphus*, and the colouring is rather of the 'xerophilous' type; i.e. more brown and yellow than is usual in the allied forms where yellow and black prevails.

Platygomphus dolabratus Selys.

1 ♂

Upper lip entirely yellow. Vertex with a diamond-shaped yellow spot between the posterior ocelli, occiput yellow glabrous. Dorsum of synthorax black, with dorsal stripe reduced to a large triangular spot on either side of the mid-dorsal carina. Juxta-humeral band remarkably broad, complete, mesothoracic collar not interrupted in middle line. Sides yellow, short dorsal black

mark at upper end of first lateral suture, very narrow complete black line on second suture. Abdomen with segments 1–6 black with longitudinal brown bands dorsally; 7–10 mainly brown. Hindermost femora yellow.

Length of abdomen 38+1·25 mm., of hinder-wing 30 mm.

The species *P. feae* Selys, from Burma, is apparently closely allied. It differs in having no black on the clypeus, the yellow mark on the vertex is absent, and the short black band on the upper end of the first lateral suture of the synthorax is carried vertically downwards to join the black line of the second suture, forming with it a **Y**-shaped mark.

Genus **Burmagomphus** Williamson.

Genotype: *B. vermiculatus* Williamson? *nec* Martin.
Species examined: *B. pyramidalis*, sp. nov.; *B. sivalikensis*, sp. nov.; *B.* sp.

Rather small species (h.w. about 27 mm.). There is marked parallelism between M_4 and Cu_1 in the fore-wing to beyond the level of the nodus. As a rule only three rows of cells between Cu_2 and hinder margin of hind-wing. (Individually there are sometimes four rows). Generally only a single row of cells between M_1 and M_{1a} at distal end of pterostigma.

The genus probably contains a considerable number of small species which may shade off into *Gomphus* on the one hand and into *Platygomphus* on the other. Ris has pointed out that the parallelism of M_4 and Cu_1 is a feature common with *Onychogomphus* the Javanese species, *B. jacobseni* Ris, has the apex of the abdomen very like that of a *Platygomphus*, though the venation is definitely that of a *Burmagomphus*.

The genotype is the species described by Williamson under the name *Burmagomphus vermiculatus* (Martin). But his specimens are very probably not conspecific with Martin's, in which case the genotype would be without a name.

B. pyramidalis, sp. nov., is closely allied to both Martin's and Williamson's species; as in the latter the oblique yellow stripe of the dorsum of the synthorax is formed by the fusion of the upper part of the dorsal, with the lower part of the juxta-humeral stripe, a peculiarity which seems to occur in Martin's species as well. The three may well be geographical races of a single species. On the other hand the Bornean form which I described under the name *B. vermiculatus insularis* must rank as a distinct species, it appears to be related to a form from the Nilgiris represented in the collection before me by a single very immature example.

B. jacobseni Ris is quite distinct and as stated above in some respects approaches *Platygomphus*.

Lastly the new species, *B. sivalikensis*, from Dehra Dun is again quite distinct, and possesses a complete juxta-humeral stripe. In size and general proportions it resembles *B. pyramidalis*.

Burmagomphus pyramidalis, sp. nov.

8 ♂♂, 10 ♀♀. Poona, Aug., Sept., 1919. F. C. Fraser.
1 ♂ Nilgiri Hills, June, 1917. F. C. Fraser.
1 ♀. Gopaldhara, Darjiling district, 1913. H. Stevens.

MALE. *Head.* Lower lip yellow, black at its margins with lateral lobes greenish-yellow. Upper lip greenish-yellow, with narrow, black, anterior margin, and transverse black basal line prolonged forward in the middle line, but not meeting the black of the margin. Bases of mandibles yellow, genae black. Ante-clypeus black, post-clypeus black, with a median spot of greenish-yellow, and a pair of lateral spots of the same colour. Frons yellow, margined with black. Occiput and vertex black. The posterior margin of the occiput is slightly concave.

Prothorax black, with a greenish-yellow spot on either side.

Synthorax. There is a broad, complete mesothoracic collar of yellow. Above this is a pyramid of black, at the apex of which lies a small median yellow spot against the ante-alar sinuses. The pyramid is outlined on either side by an oblique yellow band which runs from just below the median yellow spot, without actually touching it, to the base of the second pair of legs. This

FIG. 17.—Colour pattern of *Burmagomphus pyramidalis*, sp. nov., ♂ semi-diagrammatic.

band is abruptly narrowed above from without inward, and ends dorsally in a fine point. To the outer side of its upper end and close below the lateral part of the ante-alar sinus is a small yellow triangle. The black colouring extends from the outer margin of the yellow band to just beyond the humeral suture. Laterally the synthorax is yellow, with a complete narrow band of black along the second lateral suture, and with a black mark along the lower part of the first lateral suture, extending upwards a very little beyond the level of the spiracle. A short black line descends vertically from the base of the first wing towards the black band of the second lateral suture, but does not meet it. Legs black, coxae of first and third pairs, and ventral surface of first pairs of femurs marked with yellowish-white.

Abdomen black. First segment with a basal dorsal mark of yellow, and a lateral mark of the same colour. Second segment with a basal ring of yellow, a mid-dorsal triangle of the same colour, and the sides of the segment, including the oreillet, likewise yellow: an apical ring of black. Segments 3–8 with a basal ring of yellow, extending for about one-sixth of the length of the segment on 3, about one-fifth on segment 7, very narrow on 8,

where, however, it is produced at the sides for about one-half the length of the segment, and followed by a yellow apical mark. The ninth segment has a large apical dorsal brownish-yellow mark. Segment 10 and the anal appendages are entirely black. The upper pair are about as long as the tenth segment, slightly divaricate, acuminate at their apices, the outer margin elbowed at its middle, with a minute ventral tooth at the level of the elbow. The lower appendage has two branches, slightly longer than the upper pair of appendages, more widely divaricated, and sharply upturned apically. The genital structures of the second abdominal segment are black in colour. The first hamules are small and inconspicuous, the apices pointed and hooked backwards. The second pair are large, rather oval, and each carries a prominent forwardly directed hook near its apex.

FEMALE. Colouring very similar to that of the male. It differs chiefly in having the basal yellow ring of the third segment of the abdomen broader, and in the presence of a lateral distal yellow mark on the same segment, whilst the lateral distal mark on the eighth segment is reduced and the dorsal yellow mark on the ninth is much smaller than in the male.

Length of abdomen of ♂ 29+0·75 mm., of hinder-wing 23·5 mm.; length of abdomen of ♀ 33 mm., of hinder-wing 27 mm.

Burmagomphus sivalikensis, sp. nov.

1 ♂ Dehra Dun, 4-ii-19. F. C. Fraser.

Head. Lower lip pale yellow. Upper lip yellow with black margins, and a median black line dividing the yellow into two large lateral spots. Bases of mandibles yellow. Anteclypeus brownish-black, post-clypeus the same, with a median and pair of lateral yellow spots. Frons yellow, with a black line extending from eye to eye across its vertical part. Vertex black, occiput yellow, margined with black, its posterior margin gently convex, carrying a fringe of long brownish-black hairs.

Prothorax black, its anterior margin, a pair of lateral spots on the hinder margin and a minute median spot on the same margin yellow.

Synthorax. Dorsum black marked with yellow as follows:—a broad mesothoracic collar, finely divided by a median black line; a pair of dorsal lines separated below from the mesothoracic collar and above from the ante-alar sinuses, and outside these on either side, a longer irregular juxta-humeral band, constricted a little below its apex, running down and continuing on to the mesinfraepisternite. This band is margined externally by a black line which runs on either side of the humeral suture. The sides of the synthorax are yellow; a narrow black band, of about the same width as that lying along the humeral suture, runs along the position of each of the lateral sutures on either side.

Legs black, the inner surface of the first pair of femurs yellowish-white.

Abdomen black, marked with yellow as follows :—Sides of first and second segments, including the oreillet; dorsum of first segment, and a longitudinal band on dorsum of second segment, the latter mark narrowing apically; a basal ring, occupying nearly the first third of segment three, but contracted dorsally in the middle line, in addition a distal lateral yellow mark; a similar basal ring on segments 4–7, but relatively smaller, and occupying only about one-quarter of each segment. Eighth segment entirely black, ninth with a dorsal triangle of orange-yellow, its base resting on the apical margin of the segment, its apex not quite touching the base of the segment. Terminal segment black.

Anal appendages black, very similar to those of *B. pyramidalis*. The upper pair about as long as segment 10, acuminate, very slightly upturned at the apex, elbowed on the outer margin. Lower appendage a shade longer, its branches rather more divaricated than are the upper appendages, upturned at the apices.

Genital structures of second segment of abdomen similar to those of *B. pyramidalis*, but the first pair of hamules are relatively larger and more prominent, the second pair not so oval but sloping obliquely backwards and ending in a forwardly directed hook.

Length of abdomen of ♂ 33+1 mm., of hinder-wing 25·5 mm.

Group ONYCHOGOMPHUS.

Fore-wing and hinder-wing showing equal specialization in regard to the cross-nerves between M_{1-3} and M_4. Sectors of arculus as in preceding tribe. Cu_1 and Cu_2 nearly parallel as far as wing margin. Pterostigma braced. M_4 and Cu_1 parallel to level of nodus in fore-wing. A_2 separated from A_1 by two rows of cells from immediately below the subtriangle, whereas in the preceding tribe there is usually a single cell between them at their origin, further A_2 lies nearer the wing base in this tribe than in *Gomphus*. Legs very short, hindermost femora scarcely reaching beyond the end of the synthorax when adpressed. Colour pattern not affording any definite characters for separation of the tribe. Upper anal appendages of male longer than tenth segment of abdomen, often equal in length to the ninth and tenth segments together; parallel or converging apically, arcuate.

Genus **Onychogomphus**.

Genotype : *O. forcipatus* (Linn.).

Species examined : [*O. forcipatus* (Linn.)], *O. lineatus* Selys; *O. grammicus*, Selys, *O. saundersi* Selys, *O. aureus*, sp. nov., *O. M-flavum* Selys; *O. biforceps* Selys, *O. acinaces*, sp. nov.

Characters of the tribe.

Distribution : Warmer parts of Europe, Africa, tropical Asia as far as the Celebes.

I group the species of this large and rather difficult genus in

several sections, which arrangement will, I hope, facilitate to some extent their identification. In this grouping I do not follow exactly de Selys' classification given in the monograph. Having to deal only with oriental forms I have adopted an order which bears more directly on them.

As usually is the case with collections of Gomphines the males are more abundant and more readily recognizable than the females. Hence in this list, as elsewhere in the paper, I am forced to rely largely on male characters, a practice not by any means theoretically ideal but, at the worst, useful in practice.

SECTION I, *grammicus*.

Frons and front of head entirely yellow. Dorsal stripes of synthorax not meeting mesothoracic collar, antehumeral stripes complete. Apex of abdomen of male not dilated. Upper anal appendages about twice as long as branches of lower appendage. A 'xerophilous' section.

Onychogomphus grammicus Selys.

1 ♂ Agra. S. Hankin.

Front of head including the whole of the frons, entirely yellow. Vertex and occiput largely yellow. Synthorax with dorsal yellow stripes not meeting the mesothoracic collar, antehumeral stripes complete. Femora and tibiae largely marked with yellow.

Abdomen almost cylindrical; the eighth segment shows a slight increase in depth compared with the others. The first segment is almost entirely yellow. The second has a trilobed longitudinal dorsal mark of yellow enclosed between lateral bands of brownish-black. Segments 3–6 are whitish-yellow as far as the transverse carina and beyond this black, but the black is marked with a prominent yellow spot dorsally, lying longitudinally.

Segments 7–10 entirely sandy yellow. Anal appendages of the same colour, upper pair nearly twice as long as branches of lower appendage; very like those of *O. lineatus*, but flattened and truncate apically.

Length of abdomen 32·5+3 mm., of hinder-wing 29 mm.

Closely allied to *O. flexuosus* Schneider, Asia Minor.

SECTION II, *lineatus*.

Front of head and frons entirely yellow save for a small transverse black line on the crest of the frons. Dorsal stripes of synthorax not meeting mesothoracic collar, antehumeral stripes complete. Apex of abdomen of male but little dilated from side to side, segments 8 and 9 carry leaf-like expansions. Upper anal appendages closely apposed, parallel and strongly decurved apically, lower appendage about one-quarter of the length of upper pair.

To this group belong the species *O. genei* Selys, and *O. pumilis* (Ramb.). Further the two species of *Mesogomphus* that I have seen

in the British Museum, *M coquatus* Selys, and *M hageni* Selys, both appear to be derived from it. Like the last this section contains 'xerophilous' forms.

Onychogomphus lineatus Selys.

2 ♂ ♂, 2 ♀ ♀ Poona, May–Aug., 1918. F. C. Fraser.
2 ♂ ♂, 2 ♀ ♀ Chota Nagpur, July, August, 1915. E. d'Abreu.
1 ♂ (with larval exuviae). Peradeniya, Ceylon, 1700 ft., 7-x-17. N. Annandale.

Probably a very common species. The presence or absence of a row of small denticles on the posterior margin of the occiput seems to be an individual character; two of the females are without the denticles, and one of the males (from Poona) has three or four denticles unsymmetrically arranged in this position, the other males lacking them altogether. It would be interesting to study this character in series from different localities, and also to determine how it is inherited.

Young males have the last four segments of the abdomen entirely yellow, with increasing age a black band develops on the dorsum of these segments, and at the same time the colouring of other parts of the body deepens, making the fully adult insect differ considerably in appearance from younger specimens.

O. lineatus seems to range over the Indian Peninsular but the limits of its distribution to the north and east are not known.

Possibly allied to this species are *O. reinwardtii* Selys, from Java and *O. capitatus* Martin, from Celebes.

O. lineatus is the only Gomphus I know of that shows a development of the second abdominal segment resembling the "genital lobes" of the Libellulidae.

SECTION III, *geometricus*.

Black markings on upper lip and head, frons largely black. Dorsal stripes of synthorax meeting mesothoracic collar to form a pair of inverted 7-shaped marks. Antehumeral stripes interrupted or represented by superior spot only. Segments 7 (distal half), 8 and 9 of abdomen dilated from side to side, the dilatation increasing regularly to the distal end of 8. These segments black above.

Upper pair of anal appendages orange or yellow in colour, well separated at origin, regularly tapering, cylindrical, a little downcurved. Lower appendage with its branches approximately equal in length to the upper pair; closely applied to one another for their whole length, moderately upturned.

Specially characteristic of this group is the combination of inverted 7-shaped marks with a vestigial antehumeral band on the dorsum of the synthorax. Only one other Indian species of *Onychogomphus*, *O. annularis* Selys, shows this feature in addition to the species referred to the section. And as that species was described from imperfect specimens, and remains very imperfectly known, it is quite possible that it too may ultimately find its place here.

O. capitatus Martin, from the Celebes shows the same combination in the colour-pattern of the synthorax. But according to its describer the sides of segments 8 and 9 of the abdomen carry leaf-like expansions, which at once distinguish the male from any of the *geometricus* group.

Onychogomphus saundersi Selys.

1 ♂ Burma. E. B. Williamson. 1 ♀. Toungo, Burma. E. B. Williamson. 1 ♀ "Type." Brit. Mus.

The specimens from Burma have not been identified by Mr. Williamson as this species but I think there can be no doubt of their identity.

I have not seen the specimen recorded by Williamson from Burma as belonging here. His figure of the anal appendages leave little room for doubt but that the specimen belongs to the *geometricus* section, but the colouring of the sides of the synthorax is not that of *saundersi*, which has distinct bands along the lateral sutures, with the metepisternite yellow, not black. Hence I think his specimen must belong to a species distinct from *O. saundersi* Selys.

Length of hinder-wing of ♂ 30 mm., of ♀ 32·5 mm.

Onychogomphus aureus, sp. nov.

3 ♂♂. Tura, Garo Hills, Assam, 1200–1500 ft. S. Kemp. (7978/H1).

Close allied to *O. geometricus* Selys.

Head. Upper lip black with a pair of large yellow spots. Ante-clypeus and post-clypeus black, with a pair of lateral spots on the latter. Frons black with a broad yellow band across the horizontal part just behind its crest. Vertex and occiput black, the former with a pair of tubercle-like projections immediately behind the ocelli.

Prothorax black with small paired median spot anteriorly and larger lateral spots; its hinder lobe yellow.

Synthorax with dorsum black, yellow mesothoracic collar interrupted in the middle by the black of the mid-dorsal carina. Dorsal stripes meeting it on either side. Antehumeral stripe interrupted, represented by a superior spot and a vestigial line separated from the spot, along the humeral suture. Laterally the synthorax is golden-yellow, with a black line along the second lateral suture.

Legs black, but posterior femora largely brown deepening to black apically.

Abdomen with segments 1 and 2 yellow, with the yellow of the dorsum enclosed between longitudinal black bands. On the first segment this dorsal yellow widens apically. On the second it is trilobed diminishing from before backwards. Oreillets yellow margined finely with black. Segments 3–6 golden brown with apical black rings, which are progressively larger, on the third segment occupying about the distal quarter of the segment, on the

sixth the distal third. In addition these segments have each an obscure darker longitudinal mark occupying about the middle of the segment. The basal two-thirds of the seventh segment are yellow, the apical third is black. Segments 8, 9 black, 10 golden brown margined apically with black, and with black marking on either side of the middle line dorsally.

Anal appendages yellow, very like those figured for *O. geometricus* in the monograph. Upper pair as long as segments 9 and 10 of abdomen, curved downwards, cylindrical and tapering to a point. Branches of lower pair closely approximated, rather abruptly curved upwards at the commencement of their apical third, truncate at their apices, rather shorter than the upper pair, and each carrying a dorsal tubercle at the end of the basal third of their length.

Length of abdomen of ♂ 35+3 mm., of hinder-wing 30·5 mm.

The species of this section of the genus may be distinguished as below.

A. Narrow complete black band on second lateral suture only, position of first lateral suture unmarked. Segments 3–6 with apical two-thirds yellow or brown, distal third black	*O. aureus*, sp. nov. Garo Hills, Assam.
B. Black bands marking the position of both lateral sutures of synthorax.	
1. Lower anal appendage of male black, upper pair tipped with black	*O. saundersi* Selys. Burma, Sumatra (Malay Peninsula ?).
2. Anal appendages of male entirely orange ...	*O. geometricus* Selys. Java.
C. Black bands marking the position of lateral sutures *confluent* over the metepisternite ...	*O. saundersi* Williamson (*nec* Selys ?). Burma.

There is a male specimen of a species of this group in the British Museum from Tonkin; I have not been able to identify it; but on casual inspection it would appear to be *O. geometricus*. I have also had the opportunity of examining a specimen from Sumatra identified by N. H. Campion, and of discussing it with him.

SECTION IV, *biforceps*.

Colouring largely black, dorsal bands of synthorax confluent or not with mesothoracic collar, antehumeral stripe present or absent. Dilatation of apical end of abdomen begins abruptly at base of eighth segment, the apical half of the seventh being scarcely enlarged. The dilatation attains its maximum at the middle of the eighth segment. Lower anal appendage of male longer than upper pair; its branches separated at their origin by a circular space. The branches project beyond the end of

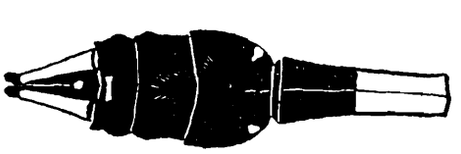

FIG. 18.—Apex of abdomen of *Onychogomphus biforceps*, Selys, ♂ seen from above.

the upper pair, or these latter may be sharply hooked downwards to lie along the dorsal surface of the lower appendage.

The insects contained in this section would appear from their colouring to be forest-haunting and shade-loving forms.

Onychogomphus biforceps Selys.

1 ♂ Pashok, Darjiling Distr., May, 1915. (3409/H1).

This splendid species remarkable for the specialization of the anal appendages of the male, is known only from examples of that sex. Owing no doubt to a misreading of de Selys' account, Williamson in his key to the species of *Onychogomphus* puts *biforceps* amongst the species in which the dorsal stripe joins the mesothoracic collar; this is not the case, the dorsal stripe being isolated.

FIG. 19.—Anal appendages of *Onychogomphus biforceps*, Selys, ♂ side view.

The still larger Tonkinese species, *O. camelus* Martin, represented in the British Museum collection, has the anal appendages in the male almost identical in shape with those of *O. biforceps* but entirely black.

The dimensions of the Indian Museum specimen are as follows, length of abdomen 35+4 mm., of hinder-wing 35 mm.

Onychogomphus acinaces,[1] sp. nov.

1 ♂ Castle Rock, N. Kanara Dist. S. Kemp. (4392/H1).

Very distinct from other described species.

Head. Lower lip black, yellow at its base. Upper lip black with a pair of transverse, greenish-yellow spots. Ante-clypeus yellow, post-clypeus black. Frons, vertical part black, horizontal part yellow, the yellow divided into two distinct parts by a median triangle of black. Vertex and occiput entirely black.

Prothorax entirely black.

Synthorax, dorsum black, mesothoracic collar of greenish-yellow, interrupted by black in the middle line. A dorsal band of greenish-yellow on either side, *not joining the collar*, narrowing to a point below, reaching the humeral suture above. *No trace of ante-humeral band.* Sides of synthorax largely yellow, but the metepisternite entirely black, the black extending to just behind the second lateral suture, so that laterally the synthorax has two yellow areas widely separated from one another by a broad belt of black.

[1] Acinaces = a scimitar.

Ventral surface black, meso and metanotum marked with lemon yellow. Legs entirely black.

Abdomen longer than wings, swollen at its base and again enlarged from segments 7–9. Black in colour. Segments 1–2 with mid-dorsal yellow bands. 3–6 with basal rings of yellow occupying about the basal sixth of each; these rings are contracted in the middle line dorsally. Basal half of seventh segment lemon yellow. First and second segments, including the oreillets, marked with yellow. Eighth segment with basal, lateral spots of the same colour.

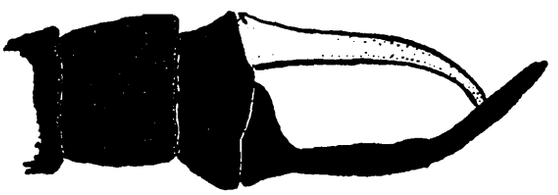

FIG. 20.—Anal appendages of *Onychogomphus acinaces*, sp. nov. ♂ side view.

Anal appendages, upper pair as long as ninth and tenth abdominal segments together, yellow, darker at apex, internally, and ventrally, tapering, parallel, curving downwards in their distal half. Lower appendage one-quarter as long again, its outer four-fifths bifid. The branches are parallel, closely approximated, and curve upwards for their distal half. Seen in profile the lower appendage is rather scimitar-shaped, and projects well beyond the end of the upper pair. They are entirely black.

The venation is that characteristic of the genus. The bases of both pairs of wings are distinctly tinged with dark brown, especially in the sub-costal space, where the colouring extends as far as the first cross-nerve. Antenodals $\frac{16}{11}\left|\frac{14}{11}\right.$; post nodals $\frac{10}{11}\left|\frac{12}{12}\right.$.

Length of abdomen 33 mm. +3·75 mm. (lower appendages) of hinder-wing 30 mm.

Apparently related to *O. biforceps* Selys, but with the anal appendages less strongly curved. It differs also in the distinct colouring of the wing-bases, rather unusual in Gomphines, and generally in the great extent of black colouring on the thorax.

The males of the species of this section may be distinguished as follows:—

A. Dorsal stripe confluent with mesothoracic collar; antehumeral stripe absent; anal appendages black, segment 8 of abdomen with a pair of dorsal prominences	*O. camelus* Martin. Tonkin.
B. Dorsal stripes of synthorax isolated.	
1. Antehumeral stripe complete	*O. biforceps* Selys. Tonkin; India.
2. Antehumeral stripes absent	*O. acinaces*, sp. nov. W. India.

The small species, *O. modestus* Selys, the hinder-wing of which has a length of 23 mm., would appear to have some right to be included in the present group on account of its generally dark colouration. The synthoracic colour-pattern is in fact very

similar to that of *O. acinaces*. De Selys regarded it as allied closley to *O. saundersi*. I have not seen a specimen but am inclined to refer it here, rather than to the *geometricus* group.

Onychogomphus, sp.

1 ♀ Garo Hills, Assam, 1200–1500 ft., June–July, 1917. S. Kemp, (7979/H1).

This specimen is apparently quite distinct from any yet described, its exact position is doubtful, but it seems to me possibly allied to *O. biforceps* hence I describe it briefly here.

Head: upper lip black, base of mandibles yellow, ante-clypeus yellow. Post-clypeus black, frons black with narrow yellow band across its crest, head otherwise black. Posterior margin of occiput slightly elevated in the middle line.

Prothorax black above, yellow below.

Synthorax with a black dorsum, marked with a yellow mesothoracic collar, which is continuous across the mid-dorsal carina, and a pair of narrow, isolated dorsal bands. No trace of antehumeral bands. Sides of synthorax yellow, with a broad black band on the first lateral suture, and a narrower band of grayish brown along the position of the second suture.

Legs black, anterior femora yellow internally, posterior pair yellow extero-laterally.

Abdomen black, sides of first and second segments yellow. Dorsum of first segment yellow, of second segment marked with a longitudinal trilobed band of the same colour. Segments 3–6 with basal ring of yellow, interrupted mid-dorsally, occupying about the first sixth of each segment. In addition segments 3–5 have a median longitudinal mark of yellow on the dorsum. The basal half of 7 is yellow; 8, 9 and 10 are black, but 8 has a small basal lateral mark of yellow on either side. Anal appendages small, brownish-white. Apical half of seventh segment dilated from side to side, the succeeding segments progressively narrower. The sternite of the eighth segment is produced apically in a downward direction, so that it is visible in profile. The vulvar scale, protected by this projection is small, bifid apically.

A similar development of the sternite of the eighth segment of the abdomen occurs in certain species belonging to the *Gomphus* series (e g. *Gomphus melampus* Selys), but I do not know of any other *Onychogomphus* which shows a similar development. Venationally and in colouration, however, I do not doubt but that this specimen is a true *Onychogomphus*.

Length of abdomen 37·5 mm., of hinder-wing 35 mm.

The following species, known only from female examples, resembles this specimen to some extent in the colouring of the synthorax.

O. frontalis Selys, Moolai, "between Burma and Tenasserim."

Dorsal stripes of synthorax isolated, vestige of a juxta-humeral band present. T-shaped mark on dorsum of frons. Occiput

yellow. Length of abdomen 29 mm., of hinder-wing 25 mm. From de Selys account I should imagine that the vulvar apparatus of the female did not show the remarkable arrangement found in the female described above from the Garo Hills.

Onychogomphus M-flavum Selys.

1 ♂ Darjiling Dist., 1–3000 ft., May, 1912. Lord Carmichael's collection. (cc/1319).
1 ♀ Gopaldhara, Darjiling district, 1914. H. Stevens.

The synonymy of this species is somewhat obscure. I have no doubt whatever but that the female specimen before me is properly referred to the Selysian species. The remarkable long vulvar scale, reaching to the apex of the abdomen is sufficient to make the determination certain, and the agreement in colouring is precise.

The male is I believe unquestionably conspecific with the female, it differs only in having the costal-vein lined with yellow as far as the nodus. It is immature and badly crushed. I believe the colouring of the costal vein may well be lost in more adult specimens and need not be regarded as a specific character.

A second, more serious difficulty lies in the fact that the male appears identical with that described by de Selys for *O. bistrigatus* (Selys) and figured by Hagen as such in the monograph. This is due to the fact, as I regard it, that the specimen figured in the monograph, and the male described in the second additions to synopsis are not conspecific with the type-specimens of *O. bistrigatus*, but are really examples of *O. M-flavum*, as is also the adult female (imperfect) noted in the monograph, in the Vienna Museum.

Hence in my opinion *O. bistrigatus* remains known only from the type female from 'India.' The figure of the occiput of the female given in the monograph would appear to have been drawn from the Vienna specimen of *M-flavum* as it shows none of the 'dentellures' described for *O. bistrigatus*.

MALE. Dorsal stripes of synthorax meeting mesothoracic collar, mid-dorsal carina marked with yellow for its anterior half. Juxta-humeral stripes complete. Sides of thorax yellow with narrow black bands on the lateral sutures.

Abdomen largely black, with basal rings of yellow, constricted mid-dorsally, on segments 3–6; and a mid-dorsal yellow mark on each of the same segments.

Basal two-thirds of the seventh segment yellow, distal third black. Segments 8, 9 yellow at the sides, dark dorsally, 10 yellow or light brown margined with black.

Anal appendages yellow, upper pair darker apically, the distal third rather sharply angled downwards, and lancet-shaped. Branches of lower appendage about two-thirds length of upper pair contiguous and parallel, curved upwards, with stout dorsal tooth at end of basal third, and smaller tooth at junction of middle and distal thirds (exactly as in pl. i, fig. 3, *Mon. Gomph.*). Segments 8, 9 of abdomen, and distal half of 7 slightly dilated.

Costal nerve lined with yellow as far as the nodus (? colour line disappearing in more mature specimens).

FEMALE. Colouring much as in the male; but the costal nerve is black (the specimen is much more mature than the male) and the dorsum of the tenth segment of the abdomen is black.

The occiput is without dentellations, but has a fringe of long black hairs. The length of the vulvar scale, reaching to the end of the tenth segment, is very remarkable.

Length of abdomen of ♂ ? +3.5 mm., of hinder-wing 32·5 mm.; length of abdomen of ♀ 38 mm., of hinder-wing 34·5 mm.

The two following species are known only from female specimens or from imperfect males, and I have not attempted to place them in any definite group.

O. annularis Selys, North Burma. Dorsum of synthorax with dorsal stripes confluent with the mesothoracic collar, vestiges of the juxta-humeral stripe present. Described from two males, both imperfect. This species may belong to the *geometricus* group. Length of abdomen 37 mm., of hinder-wing 32 mm.

O. maclachlani Selys, North Burma. De Selys suggests that this may be the female of the last species. It is larger, lacks any trace of the juxta-humeral stripe, but otherwise, except for details of colouring of the head, is very similar. Length of abdomen 43 mm., of hinder-wing 38 mm.

Another species, known only from the female, is *O. cerastes* Selys, from Nepal. This from its largely yellow colouring would seem to be rather a 'xerophilous' species, like *O. grammicus*. It is possibly allied to the female next described.

Onychogomphus sp.

1 ♀ Kumaon, W. Himalayas, 22-vii-14. (8343/20) (Lacking abdominal segments 4–10.)

Differs from other species of the genus (except *O. cerastes* Selys, and *O. grammicus* Selys) that I have seen in having many of the cross-nerves of the wing whitish-yellow in colour. This is particularly the case with the rows of cross-nerves in the areas between the subcostal nerve and M_4 proximal to the nodus, and with the cross-nerves of the cubital space.

Head. Upper lip yellow, with fine black line at base. Ante- and post-clypeus yellow, the latter separated from the frons by a transverse black line. Frons yellow, its extreme base black. Vertex black, with a small yellow spot between the posterior ocelli. Occiput yellow, its posterior margin slightly undulated.

Prothorax black, its anterior and posterior margins lined with yellow.

Synthorax. Dorsum black, mesothoracic collar entire, joined by the lower ends of the dorsal stripes. Juxta-humeral stripes complete. Sides of synthorax yellow, with narrow black line on each of the lateral sutures.

Legs yellow, with black spines and tarsi. Anterior surfaces of tibiae black. First pair of femora with black antero-lateral band, which is much reduced on the succeeding pairs.

Abdomen. First segment yellow, second with yellow sides and black dorsal marking enclosing a longitudinal median band of yellow, meeting a narrow apical ring of the same colour. Third segment yellowish-brown, its anterior margin finely marked with black, and with a *lateral* band of black not touching the anterior and of the segment. (The remainder missing.)

Length of hinder-wing 31 mm.

Lastly the N. Burmese species *circularis* Selys, unknown to me except from de Selys' account, is referred by its author to this genus with doubt.

Group HETEROGOMPHUS.

Large insects (h.w. 40 mm. or more). Cross-nerves between M_{1-3} and M_4 of fore-wing as specialized as those of hinder-wing, sectors of arculus approximated at origin, curved, and nearly parallel. Cu_1 and Cu_2 in hinder-wing parallel to wing-margin. M_4 and Cu_1 divergent in the fore-wing. Brace of pterostigma occasionally wanting. Wings long and pointed resembling rather those of *Ictinus*. Hindermost femora when adpressed barely reaching base of abdomen. Abdomen with basal rings on segments 3–7. Colour in some species tending towards a uniform brown. Segments 8 and 9 of abdomen slightly dilated from side to side. Upper anal appendages of male equal in length to the last two segments of abdomen; well separated, parallel and nearly straight. The two branches of the lower appendage also nearly straight, parallel, each carrying an internal tooth near its apex, each is nearly as long as an upper appendage.

Genus **Heterogomphus** Selys.

Genotype: *H. smithii* Selys.

Species studied: *H ceylonicus*, sp. nov.

Characters of the tribe.

Distribution: Himalayas, Ceylon, Indo-China, S. China, Great Sunda Islands.

Heterogomphus ceylonicus, sp. nov.

1 ♂ Ceylon. Col. Yerbury. Brit. Mus.

Head largely black. Upper lip yellow, margined with black, and with a black projection in the middle line from the base. Ante-clypeus yellow, post-clypeus black, with a lateral yellow spot on either side. Vertical part of the frons black, horizontal part yellow, with narrow black base. Vertex black, occiput black with median yellow spot.

Prothorax black with large lateral spot of yellow and a smaller median paired spot of the same colour.

Synthorax black, mesothoracic collar yellow, interrupted by the black of the mid-dorsal carina in the middle line. Dorsal stripe isolated, broad, elongate oval; antehumeral stripe represented by a small superior spot. Sides of synthorax black with a broad yellow band on the mesepimerite and a second on the metepimerite. These yellow bands are continuous on to the meso- and the metanotum.

Legs black, coxae and anterior surfaces of the femora marked with yellow.

Abdomen black. The first segment has a transverse yellow mark at its base dorsally. The second has a longitudinal dorsal band of yellow which is trilobed. Both these segments are marked with yellow laterally, including the oreillets. The third and fourth segments have a basal ring of yellow, and dorsally, from this a longitudinal basal extending for about half the length of the segment. Segments 5 and 6 have a narrow basal ring only; the basal half of 7 is brownish-yellow, and segments 8 and 9 have dark brown lateral basal marks. The tenth segment is entirely black.

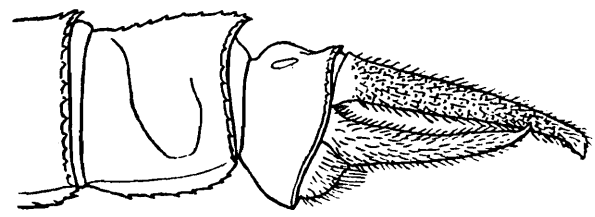

FIG. 21.—Anal appendages of *Heterogomphus ceylonicus*, sp. nov., ♂ from type in the British Museum: side view.

Anal appendages gray-black, upper pair slightly down-curved. Lower appendage with branches about five-sixths the length of upper pair each branch carrying a small internal tooth at about the commencement of its distal quarter.

Antenodals of fore-wing 17, 18, post-nodals 12–14.

Length of hinder-wing 41 mm., of abdomen 42+5·5 mm.

A handsome species rather resembling an *Ictinus* in its proportions. I fancy that the late Mr. Kirby must have overlooked the specimen for this reason when describing Col. Yerbury's collection.

H. ceylonicus is very distinct from other species of the genus in the markings of the synthorax, which are bolder and more sharply contrasted than is usual in the genus. It resembles in size the Malayan species of the genus. These are *H. sumatranus* Martin, from Sumatra and Borneo, and *H. icterops* Martin, from Java and Borneo. The British Museum has a specimen of both these species.

H. smithi Selys, is also represented in the Museum collection, it is very similar structurally to these species though considerably larger, and differs of course in details of colouring. It is found in the Himalayas. *H. cochinchinensis* Selys, is apparently an allied species from Cochin-China. *H. sommeri* Selys, from China is still larger and differs from the other species of the genus in having the upper anal appendages of the male a little incurved to one another apically. *H. unicolor* Martin, from Siam is allied to or identical

with *H. sumatranus*. Lastly *H. naninus* Foerster, from Tonkin, which I have not seen, is almost certainly not a *Heterogomphus* at all.

Genus not referred to any of the above defined 'groups.'

Genus **Ophiogomphus**

Species examined: *O. reductus* Calvert.

A genus belonging to the series Gomphus, holarctic in distribution, containing a number of robust species of moderately large size, mostly characteristic of mountainous country, whose larvae live in rapidly running rivers with sandy beds.

Venationally the genus differs from other members of the series noted in this paper by the possession of a small but quite definite 'anal loop.' The arrangement of cross-veins between M_{1+3} and M_4 is constant and specialized; the pterostigma is small and well braced, the triangles of fore and hinder-wings are subequal. The hindermost femora reach to the end of the first segment of the abdomen, and are armed with short black spines arranged irregularly for the basal half of the femur, on the distal half in two rows.

Upper anal appendages of the male as in the group Gomphus; lower appendage not so long as the upper pair, cleft narrowly for about its distal half.

Larvae with wing-sheaths divergent.

This genus may very likely stand as a distinct tribe, but as its distribution is Holarctic and its inclusion in this paper dependant rather on political than on zoogeographical boundaries I leave its exact position to be defined in some more appropriate place.

Ophiogomphus reductus Calvert.

1 ♂ (newly emerged, with exuviae). Kashmir, 1915. H. T. Pease. (890/H1).
1 ♀ Kashmir, 1915. H. T Pease. (582/1+1).
1 ♀ Jhelum Valley, Kashmir, 5200 ft., July, 1916. H. T Pease. (4819/1+1).

Length of hinder-wing of ♀ 36 mm., of abdomen 40 mm.