A SURVEY OF THE ODONATE (DRAGONFLY) FAUNA OF WESTERN INDIA WITH SPECIAL REMARKS ON THE GENERA *MACROMIA* AND *IDIONYX* AND DESCRIPTIONS OF THIRTY NEW SPECIES.

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(Plates XXV—XXVII.)

Introduction.

Although some of the earliest types of dragonflies came from Western India, no area of the Continent has been so little worked in respect to this order of insects.

Up to less than a decade ago, no dragonflies had been reported from the area since 1842, when Rambur described several species which must clearly have been collected in Bombay, Poona and the Nilgiris. Such are,—*Ictinus rapax*, *Vestalis gracilis*, *Pseudagrion microcephalum* and *P. decorum* from Bombay, *Micromerus lineatus*, *Copera marginipes* ? and *Chloroneura quadrimaculata* from Poona, *Pseudophœa dispar* and *Indoneura gomphoides* from the Nilgiris. Selys described *Rhinocypha bisignata* and *Phylloneura westermanni* from the Nilgiris in 1853 and 1860, respectively.

Some idea of how little the area has been worked may be gained by taking Coorg as an example of the whole. Only a single dragonfly has been reported from this district although during the past year I have been able to list over 120 species. From the whole of Malabar hardly a single species has been reported and the same is almost equally true of the whole of Kanara, Cochin and Travancore.

The area surveyed.

In this survey, no attempt has been made to deal with the West Coast lying to the north of Bombay, the latter place may therefore be taken as the most northerly point of the area. From thence a line drawn inland to Poona and continued southward through Belgaum, Mysore City and Madura to Cape Comorin will include between it and the Arabian Sea the whole of the localities in which collecting has been done.

It will be seen that this area embraces the whole of the Western Ghats, which rise abruptly from the low lying plains at an average distance of forty miles from the sea. These Ghats spread southward from Khandala, opposite Bombay, in a continuous uneven rampart as far as the Palghat Gap in Malabar, south of which they are again continued as far as Cape Comorin.

At the level of Bombay, the watershed rises abruptly up to Khandala, 2,500 ft, about 50 miles from the sea, and from thence slopes gradually to and blends with the Deccan. From Kanara, the hills after rising up to heights of over 6,000 ft., descend eastwards in a succession of ridges

and valleys to the uplands of Coorg and Mysore, 3,000 to 4,000 ft. The Bababudin Hills and Martiparvati Ridge in Mysore form an isolated group rising to an altitude of 6,300 ft.

From North Malabar, the Ghats rise steeply to altitudes varying from 2,500 ft. to 7,000 ft. and then descend leisurely eastwards to the so-called Malabar Wynaad, a large stretch of forest-clad country hardly touched by the entomologist. From South Malabar the Ghats throw out a vast easterly projecting triangular plateau which constitutes the Nilgiri Hills, comparatively isolated and rising to an altitude of over 8,000 ft.

The Malabar Wynaad here throws out a narrow extension between the Nilgiris and Mysore which, although geographically forming part of the Wynaad, has been politically included in the Nilgiri District and termed the Nilgiri Wynaad.

The Palghat Gap forms a narrow interruption in the continuity of the Ghats and serves to connect the Carnatic plains with the narrow strip of low lying country between the sea and the Ghats and probably forms a very important highway for the spread of species from one district to the other.

South of the Gap, the Ghats widen and extend in an uneven plateau of enormous extent as far as Madura, with an average altitude of 7,000 ft. They are here made up of three ranges, the Annaimallais, the High Range of Travancore and the Palni Hills of the Madura District. South of this the hills contract in breadth and height, forming the Cardamom Hills of Travancore and a narrow range separating the latter district from Tinnevelly.

VARIATIONS OF CLIMATE.

As one would expect in a tract of country varying in altitude from sea level to over 8,000 ft., wide variations of climate are met with; moreover the Ghats standing as they do, form a natural rampart on which the full force of the South West monsoon vents itself, thus producing wet and moderately dry zones according to which side of the protecting watershed they lie on. This is very strikingly shown in the Nilgiri District where passing through the Wynaad towards Mysore territory, a difference of ten inches per mile is experienced in the annual rainfall.

The coastal strip is hot and swelteringly humid throughout the greater part of the year. The hills vary from a dry heat at 2,000 ft. (except during the monsoon when rain falls continuously) to a perpetual English summer at elevations of 4,000 ft. and upwards. At 6,000 ft. and upwards, hard ground frosts are experienced during the months of December and January, at which time the greater part of insect life disappears. From the middle of June to well into September the whole of the western aspect of the area is hidden in a smother of driving mist and rain especially at altitudes of 4,000 ft. and above.

The rainfall varies from 30 inches on the eastern side, where the mountain ranges merge into the dry plains of the Deccan and Carnatic, to over 200 inches on the sea face of the watershed. The whole district is served with a net-work of rivers ranging from thousands of tiny moun-

tain rills, to the majestic flowing expanse of the Godavari, Kistna and Cauvery rivers. Thus the country is ideally suitable for the propagation of insects which spend the greater part of their lives in a watery element.

THE EXTENT OF THE SURVEY.

Of this vast area covering roughly 18,500 square miles, only a small fraction has been thoroughly surveyed, but as the localities collected in are well distributed and the number of species collected equal to a third of the total number listed from the whole of India, Burma and Ceylon, a number rather larger than we should expect, the survey may be considered to be fairly exhaustive.

The Nilgiris, Coorg, Bombay, Khandala, Poona and the country between the last three places have been very thoroughly collected over by myself. Mr. T. Bainbrigge Fletcher and Major Frere have made exhaustive collections in the Palni Hills but only at the highest elevations, the low country here being quite unexplored save for small collections made by the Jesuit fathers at Shembaganur. The late Dr. N. Annandale also sent me a collection made at Kodai-Kanal in the same district.

North Malabar has been touched upon by myself and collections have been made in South Malabar by Mr. T. N. Hearsey and E. Barnes.

A single species is known from the High Range, Travancore and another from Trichur, but not a single species has been collected in the enormous forest-clad area of the Annaimallais. Lastly a few odd specimens have been collected by Messrs. S. Kemp and F. Gravely at Cochin and Castle Rock, North Kanara, and by myself in South Kanara. A small collection was made in Mahableshwar by myself in 1920 but as the time of the year was unseasonable, the results were poor.

I am much indebted to all those mentioned above, both for specimens and valuable notes sent to me from time to time. The wing photographs have been made by the kind offices of Dr. Gahan of the British Museum, the sketches of anal appendages of *Lestes* by one of the Pusa artists, whilst the remaining sketches are original.

LIST OF SPECIES.

In the following list, species marked with an asterisk are considered as entogenic on account of their being solely restricted to the area under survey or to their presence as a very definite zoo-centre in the area, thus *Zygonyx iris* has very definite zoo-centres in the Nilgiris and Coorg, *Rhyothemis triangularis* and *Hydrobasileus croceus* in Coorg only, whilst *Dysphaea ethela*, *Chloroneura apicalis*, etc., are known only from Western India (Coorg only).

Sub-order Anisoptera.

Sub-family Libellulinae.

Tetrathemis platyptera Selys.*

Hylaeothemis fruhstorferi fruhstorferi (Karsch)*

Hylaeothemis fruhstorferi apicalis, subsp. nov.*

Amphithemis mariae Laid.*

Sub-order Anisoptera—*contd.*

Sub-family Libellulinae—*contd.*

Lathrecista asiatica asiatica (Fabr.)
Cratilla calverti Först
Potamarcha obscura (Karsch)
Orthetrum taeniolatum (Schneid.)
Orthetrum chrysostigma luzonicum (Brauer)
Orthetrum sabina (Drury)
Orthetrum glaucum (Brauer)
Orthetrum pruinosum neglectum (Ramb.)
Orthetrum triangulare triangulare (Selys)
Palpopleura sexmaculata (Fabr.)
Brachydiplax sobrina (Ramb.)
Acisoma panorpoides panorpoides Ramb.
Diplacodes nebulosa (Fabr.)
Diplacodes trivialis (Ramb.)
Diplacodes lefebvrei (Ramb.)
Indothemis coesia (Ramb.)
Indothemis limbata Selys*
Crocothemis servilia (Drury.)
Bradinopyga geminata (Ramb.)
Neurothemis tullia tullia (Drury)
Neurothemis intermedia intermedia (Ramb.)
Neurothemis fulvia (Drury.)
Brachythemis contaminata (Fabr.)
Rhodothemis rufa (Ramb.)
Sympetrum fonscolombei (Fons.)
Trithemis aurora (Burm.)
Trithemis kirbyi kirbyi (Kirb.)*
Trithemis festiva (Fabr.)
Trithemis pallidinervis. (Kirb.)
Zygonyx iris Selys*
Zygonyx isis, sp. nov.*
Onychothemis testacea ceylanica Ris.*
Zyxomma petiolatum (Ramb.)
Tholymis tillarga (Fabr.)
Pantala flavescens (Fabr.)
Rhyothemis variegata variegata (Linn. et Joh.)
Rhyothemis phyllis phyllis (Sulz.)
Rhyothemis triangularis Kirby*
Hydrobasileus croceus (Brauer)*
Tramea basilaris burmeisteri (Burm.)
Tramea limbata (Desj.)
Urothemis signata signata (Burm.)
Aethriamanta brevipennis brevipennis (Ramb.)

Sub-family Corduliinae.

Hemicordulia asiatica Selys*
Azuma cyanocephala (Selys)
Macromia cingulata Ramb.*
Macromia flavicincta Selys*

Sub-order Anisoptera—*contd.*

Sub-family Corduliinae—*contd.*

Macromia indica, sp. nov.*
Macromia irata, sp. nov.*
Macromia binocellata, sp. nov.*
Macromia ida, sp. nov.*
Macromia ellisoni, sp. nov.*
Macromia bellicosa, sp. nov. *
Macromia miniata, sp. nov.*
Macromia sp.*
Idionyx corona corona Fras.*
Idionyx corona burliyarensis Fras.*
Idionyx nilgiriensis (Fras.)*
Idionyx saffronata, sp. nov.*
Idionyx nadganiensis, sp. nov.*

Subfamily Aeschninae.

Hemianax ephippiger (Burm.)
Anax immaculifrons Ramb.*
Anax guttatus (Burm.)
Anax parthenope parthenope Selys
Anaciaeschna jaspidea (Burm.)
Anaciaeschna martini (Selys)*
Gynacantha hyalina Selys
Gynacantha millardi Fras.*

Subfamily Cordulegasterinae.

Orogomphus xanthoptera Fras.*
Orogomphus campioni, sp. nov.*

Subfamily Gomphinae.

Ictinus rapax rapax (Ramb.)
Ictinus rapax mordax Selys
Ictinus rapax praecox Hagen et Selys
Gomphidia t-nigrum Selys
Gomphidia fletcheri Fras.*
Gomphidia kodaguensis Fras.*
Macrogomphus annulatus (Selys)*
Macrogomphus wynaadicus, sp. nov.*
Davidioides martini, gen. et sp. nov.*
Heliogomphus pruinans Fras.*
Microgomphus torquatus torquatus (Selys)*
Microgomphus torquatus souteri, subsp. nov.*
Cyclogomphus heterostylus Selys
Cyclogomphus ypsilon Selys
Burmagomphus pyramidalis Laid.*
Burmagomphus laidlawi, sp. nov.*
Gomphus nilgiricus Laid.*
Lamellogomphus nilgiriensis (Fras.)*
Lamellogomphus acinaces (Laid.)*
Lamellogomphus malabaricus Fras.*
Mesogomphus lineatus (Selys)

Sub-order Anisoptera—*concld.*

Sub-family Gomphinae—*contd.*

Onychogomphus stria us Fras.*
Indogomphus longistigma Fras.*
Megalogomphus hannyngtoni Fras.*

Sub-order Zygoptera.

Family Agrionidae.

Neurobasis chinensis (Linn.)
Vestalis gracilis (Ramb.)
Vestalis aplicalis Selys
Pseudophaea dispar (Ramb.)*
Pseudophaea fraseri Laid.*
Dysphaea ethela, sp. nov.*
Rhinocypha bisignata Selys *
Rhinocypha laidlawi, sp. nov.*
Micromerus lineatus (Burm.)

Family Lestidae.

Lestes elata Selys
Lestes viridula Ramb.*
Lestes praemorsa Selys*
Lestes dorothea, sp. nov.*
Lestes patricia, sp. nov.*
Ceylanicolestes gracilis birmanus (Selys)*
Ceylanicolestes pulcherrima, gen. et sp. nov.*

Family Coenagrionidae.

Onychargia atrocyana Selys.
Ischnura aurora (Brauer)
Ischnura senegalensis (Ramb.)
Mortonagrion varralli Fras.*
Agriocnemis pygmaea (Ramb.)
Agriocnemis pieris Laid.
Agriocnemis splendidissima Laid.
Enallagma parvum Selys
Aciagrion pallidum (Selys)
Aciagrion occidentalis Laid.*
Ceriagrion coromandelianum (Fabr.)
Ceriagrion rubiae Laid.
Ceriagrion olivaceum Laid.
Ceriagrion aurantiacum, sp. nov.*
Ceriagrion cerinorubellum Selys
Pseudagrion decorum (Ramb.)
Pseudagrion microcephalum (Ramb.)*
Pseudagrion rubriceps Selys
Pseudagrion hypermelas Selys
Pseudagrion indicum, sp. nov.*
Pseudagrion malabaricum, sp. nov.*
Pseudagrion praeclarum, sp. nov.*
Coenagrion dyeri Fras.
Copera marginipes (Ramb.)*

Sub-order Zygoptera—*contd.*

Family Coenagrionidae—*contd.*

Copera vittata deccanensis Laid.*
Protosticta gravelyi Laid.*
Protosticta stevensi Fras.*
Protosticta sanguinostigma Fras.*
Protosticta cerinostigma, sp. nov.*
Protosticta hearseyi Fras.*
Protosticta mortoni, sp. nov.*
Platysticta deccanensis Laid.*
Chloroneura quadrimaculata (Ramb.)*
Chloroneura apicalis, sp. nov.*
Disparoneura tetrica Laid.*
Disparoneura nigerrima Laid.
Caconeura verticalis annandalei Fras.*
Caconeura canningi Fras.*
Phylloneura westermanni (Selys)*
Indoneura gomphoides (Ramb.)
Indoneura ramburi Fras.*
Melanoneura bilineata Fras.*
Esme cyaneovittata Fras.*

From a perusal of the above list, it will be seen that Western India has a remarkably large number of species either peculiar to itself or which are separated from other zoo-centres by enormous gaps. In many cases it is difficult or impossible to say from whence they are derived. The total evidence goes to show that most species arrived direct from Indo-China, thus *Caconeura verticalis annandalei* occurs on the low hills south of Madras on the east coast. It is related to *C. verticalis verticalis* from Lower Burma, Indo-China, and Borneo through the medium of the link subspecies *C. verticalis andamanensis* from the Andamans, these islands lying in the direct line of emigration. *Lyriothemis acigastra ethela* has no nearer relative than the Malay Straits, *Rhyothemis variegata variegularis* and *Onychargia atrocyana* are both found in Ceylon and Assam but the parent stocks are from Indo-China. These instances may be multiplied and go to show a close relationship between the fauna of the two regions. The *Protostictas* of Western India, *Platystictas* from the same area and Ceylon and the *Drepanostictas* of North East India are all probably derived from Indo-China by a radiating ring of emigration. The *Indoneura* group (*Phylloneura, Indoneura, Melanoneura* and *Esme*) are quite unknown outside the region and their origin is veiled in obscurity.

BIOLOGICAL NOTES AND DESCRIPTIONS OF NEW SPECIES.

Sub-order ANISOPTERA.

Sub-family LIBELLULINAE.

1. Tetrathemis platyptera Selys.

Moderately common in the Nilgiris, Coorg and South Kanara. Localities in the former place are Sigur River, January, breeding in pools

left by the falling river, Kalapani, Kotagiri Ghat, breeding in a very dirty pond which is not much else than the village latrine. Numbers were found emerging here in June and many adults were to be seen perched on twigs of a tree which had fallen into the pond. Found also breeding in pools in the bed of the river at Burliyar, Mettupalayam Ghat. At Gudalur, Nilgiri Wynaad, it breeds in swamps and adults may be seen perched on all the upper twigs of osiers growing there. Mr. T. N. Hearsey informs me that at Palghat, in Malabar, it breeds down wells, and I have seen them down a well myself in the Nilgiris.

In Coorg they breed in most of the pulping tanks on coffee estates and at Sidapur I was fortunate enough to see two females ovipositing. This act was performed well above water, eggs being inserted into mosses and lichen growing on a stump which was sticking up from the surface of the water. The females with their abdomen curled well under the body, hovered in front of the stump, darting in and out, stabbing their eggs into the moss at about two feet above water level. Owing to their smallness, the yellow colour of the body and saffronation of their wings, I at first mistook them for wasps hovering round the stump.

2. **Hylaeothemis fruhstorferi fruhstorferi** Karsch.

The type comes from Ceylon, it was first reported from within Indian limits in 1917 when I found it common on the Burliyar river, Nilgiris, during the months of June and July. In 1921-22, I found it in several localities in the Nilgiri Wynaad. Major Frere sent me a few specimens taken in the Palni Hills in August 1923. It breeds in marshy spots and bogs along the borders of mountain streams, the female ovipositing unaccompanied by the male.

3. **Hyaleothemis fruhstorferi apicalis,** subsp. nov.

The Coorg form differs from type by having the tips of the wings, especially those of the female, broadly tipped with black. This marking in the male may be quite absent and at the most is a dark brownish tip not extending quite to the distal end of pterostigma, in the female it is always present and reaches to the inner end of stigma.

Found in similar situations as the other but appearing much earlier. I took two tenerals at Bhagmandala (29. iv. 23) and saw it rather common down the Sampaji Ghat, 13. v. 23. Towards the end of June it was very common along the banks of the stream flowing through Hallery Estate, near Mercara. I rescued a teneral here from the jaws of a *Pseudophaea fraseri*, which I had not credited with such cannabalistic tendencies.

4. **Amphithemis mariae** Laid.

Described from four pairs taken by F. H. Gravely at Parambikulam, Cochin. I found it swarming on bamboos along the borders of a stream at the top of the Cannanore Ghat, Coorg, 27. ix. 23, *ca.* 2,000 ft. The red base of the male abdomen is very conspicuous as it rests on the green bamboo fronds. Pairing was taking place freely but I saw none ovipositing, nor was I able to find any exuviae after a prolonged search.

The weather was very showery and these objects are soon washed away, especially as the rivers are continually rising and falling. Following up this stream, I found that the insect occurred in colonies about every 1,000 yards.

The wings show a good deal of individual variation, in most specimens the trigones of all wings show a broken costal border, there is usually a single cubital nervure in the forewing, 2 in the hind, the hypertrigones of the forewing are not uncommonly traversed once, although most usually entire, the same may be said of the trigone in the hindwing, supplementary nervures to the bridge are nearly always absent but I noticed nervures present in at least six specimens. In a few specimens all semblance of order is lost beyond the trigone, the discoidal field being indistinguishable from the cells on either side. The loop may or may not be present.

The black ring at the apical border of segment 3 is very variable, broad or very narrow, or prolonged along the dorsal carina.

5. **Lathrecista asiatica asiatica** Fabr.

Quite unknown in the Palni and Nilgiri Hills but moderately common in South Coorg and becoming progressively more so as traced up the coast. At Khandala and inland towards Poona it becomes a very common insect and the Empress Horticultural Gardens in Poona swarm with it during the months of June and July.

An arboreal species, rarely found far from the shelters of deep jungle. A sunny glade in the middle of dense jungle is a favourite spot to find the insect, and here practically every twig will hold its occupant. In Coorg it is not uncommonly found along the banks of the Cauvery, where jungle clothes the banks, but I have never found it ovipositing in the river nor have I ever solved the problem of where it breeds. Recently I took a female in which the abdomen was bright crimson as in the male.

6. **Cratilla calverti** Först.

In Coorg, this is perhaps the commonest dragonfly, having a long season extending from May until the end of August. Even the heavy monsoon (68 inches during August 1923) fails to stamp it out, although all other species quickly perish. I saw numerous females ovipositing in pools at Makut towards the end of June but as these dry up rapidly at the end of the monsoon, either the larvae must have a very short life cycle or all perish when planted in such exiguous spots. I noticed females ovipositing in roadside channels at Mercara. From such, it is possible that the eggs are washed down to rivers or tanks, but if not all the larvae must perish as these channels are of a very temporary nature. Like the last species, it is a forest loving insect, and numbers may be seen along any forest path in Coorg resting with their body parallel to twigs, the wings sloping strongly downward. In such spots they are remarkably inconspicuous and so sure of their retreat, that they can be swept up with the net with the greatest of ease. A few species are occasionally seen in the Nilgiris but it is totally unknown

from the rest of the area. I have occasionally seen rows of them resting along telegraph wires.

7 **Potamarcha obscura** Ramb.

A common insect in the northern part of the area under discussion, but becoming increasingly rare as traced southwards. It is a rare insect in the Nilgiris and has not, so far, been reported from the Palnis. Great numbers are seen at Poona and Khandala, usually in woody retreats, resting on the ends of twigs along jungle ridings but not lying as closely as the last species. In June 1923 I saw a swarm of these insects at Pollibetta, Coorg, where casurina trees, opposite the club, had an occupant on practically every twig.

Usually, however, it is a comparatively rare insect in Coorg. Breeds in almost any waters but prefers small tanks and pools. In Poona, larvae may be found in every small garden reservoir, and here the male may often be found settled on the stone coping awaiting the advent of females.

8. **Orthetrum sabina** Drury.

Found commonly throughout the whole of Western India. Shows a remarkable adaptability to changes in climate and altitude. It is quite common at sea-level and numbers may be seen hawking round the Parel Tank, Bombay. On the other hand it breeds freely in the Ooty Lake, at an altitude of 7,250 ft., where during December and January, I have seen thin ice forming round the edge of the lake. The males frequent rank herbage round the borders of ponds and lakes where they make a heavy toll of small Zygoptera. On the Ooty lake, they appear to feed exclusively on *Ischnura senegalensis* which positively swarm there. It is a veritable shark amongst these small defenceless insects. Females hide up in dense jungle far from water. I have seen them in such places, in Coorg, at 4,000 ft., the nearest breeding ground being at least three miles away.

9. **Orthetrum pruinosum neglectum** Ramb.

What has been said about the distribution and adaptability of the last species applies equally well to this, but their habits are very different. Where *sabina*, relying on its cryptic colouring, darts stealthily about among rank growing herbage, *pruinosum*, glorying in its showy colours takes up its stand on a prominent twig overhanging the banks of some pond or stream and disputes its possession with all comers, dashing out and boldly attacking any passing dragonfly. Nor does it appear to be particularly cannabalistic but takes all that comes its way. It seems to stand even greater variations of temperature than does *sabina* and I have seen them commonly disporting round the Lovedale lake, Nilgiris, shortly after dawn following a cold frosty night.

Breeds in tanks, lakes or sluggish streams, the larvae lying up in shallows beneath curtains of Spirogyra.

10. **Orthetrum taeniolatum** Schneid.

A plain species not found above 2,500 ft. I have seen a few specimens in the bed of the Kallar river, Nilgiris, but it is not common there. At Poona and Khandala it is probably the commonest *Orthetrum* and may be found resting on stones in the bed of any rocky sluggish stream. Has not been found in the Palnis, Coorg, Kanara or Malabar. Breeds solely in streams.

11. **Orthetrum glaucum** Brauer.

Although a common insect in Coorg and the Nilgiris, it is either rare or entirely absent throughout the rest of the area. I have seen a few specimens at Khandala and Poona but it has been unrepresented in collections received from the Palnis. It is a submontane species, breeding in mountain streams and not found above 5,000 ft.

It has a habit of resting on rocks in midstream or on herbage beside its breeding places. Very occasionally specimens are seen hawking up and down roadside brooks, especially in the Nilgiris.

In Coorg it seems to prefer marshes and I have seen it in great numbers in such places during May and June.

12. **Orthetrum triangulare triangulare** Selys.

A montane species with palaearctic tendencies, is found at altitudes above 5,000 ft. Its lower line of distribution meets, but rarely merges with that of the last species, although their habits and breeding places are identical. They appear to be inimical to one another and I do not ever remember seeing the two species in the same locality. Thus at Coonoor, Nilgiris, 5,500 ft., *O. triangulare* is found commonly over small brooks along by Lady Canning's Seat. At the Dhobi stream, 5,000 ft., *glaucum* appears, and still lower down an occasional *triangulare* will be seen but no *glaucum* keeping it company. On the Burliyar river, 2,500 ft., on the same ghat, *glaucum* is found in plenty. *O. triangulare* breeds in all brooks and streams on the kundahs of Ooty, Nilgiris, at altitudes of 7,000 to 8,000 ft., and is most commonly met with over boggy or marshy ground at the mouths of ravines or borders of sholars (small woods filling ravines in the Nilgiris). Moderately common in the Palnis above 6,000 ft., and Coorg at 4,000 ft.

13. **Orthetrum chrysostigma luzonicum** Brauer.

A very common insect at high altitudes in the Nilgiris, Palnis and Mahableshwar, less common in Coorg. Found at lower elevations further to the north. I have seen it swarming from April to June on the kundah streams, Ootacamund. Breeds in marshes, a stream flowing through a marsh being a favourite spot. The imago usually found settled on scrub or grass bordering streams.

14. **Palpopleura sexmaculata** Fabr.

Mr. T. Bainbrigge Fletcher has taken this species at Kodai Kanal, in the Palni Hills at an elevation of over 6,800 ft. In the Nilgiris it is

localised to small areas in the Wynaad and I have never seen it above 3,000 ft. In Coorg it swarms in every marsh at altitudes of 2,000 to 3,000 ft. but is less common at Mercara, at 4,000 ft. It has a long season in Coorg, at Fraserpet I have seen it swarming in marshes as late as December.

The imago has a low circling flight, often coming to rest on heads of grasses and by reason of its yellow colour, looks exactly like a hymenopterous insect. Its flight is best likened to that of a Burnet moth (*Zygaenae filipendulae*). After the male has developed blue pruinescence this resemblance is lost, as the blue is very conspicuous during flight. Breeds in marshes and shallow ponds.

15. **Brachydiplax sobrina** Ramb.

Coorg is the only part of the area from which this insect has been reported, but here, at Fraserpet and on most tanks bordering the Mysore frontier, it occurs in abundance. In an old lotus tank at Fraserpet, during June, it was so abundant as to crowd out temporarily all other species. Visiting this same tank at the beginning of July I found a strong S. W wind had driven the whole of the insects to the shelter of jungle lying to the N. E., where hardly a twig could be seen that had not its occupant. A couple of weeks later, the whole of this area was inundated to a depth of many feet and not a single specimen was to be found.

The male, which is a very wary insect, is found keeping well out on vegetation growing on small weedy ponds ; the female keeps to the seclusion of neighbouring jungle. Breeds in ponds.

16. **Acisoma panorpoides panorpoides** Ramb.

Common along the whole length of the coast at sea-level and lower elevations. Not uncommon on ponds in Coorg bordering the Mysore frontier. Major Frere took a few specimens at the surprising altitude of 7,000 ft., Palni Hills, but it is unknown at this elevation in the Nilgiris, where it is a comparatively rare insect. Well distributed about Bombay, Khandala and Poona. Rests among low herbage bordering small tanks and lakes.

17 **Diplacodes trivialis** Ramb.

Distributed everywhere and at all elevations throughout the year. Breeds in ponds or pools in sluggish streams. Not often found near water except when ovipositing. A common insect in gardens or by roadsides where it rests on bare patches of ground or on bared foot-tracks through low grass.

18. **Diplacodes nebulosa** Fabr.

Occurs in small colonies at sea-level, breeding in marshes or weedy ponds. I took a single specimen at Hoskoti, Coorg, 2,000 ft., and found it moderately common at Hunsi, North Coorg, 3,000 ft., but it is quite unusual to find it at such altitudes. I have no records of its

occurrence on the West coast north of Coorg. Unlike *trivalis* this insect never leaves the marshes in which it has been bred.

19. **Diplacodes lefevrei** Ramb.

Found throughout the area in dry zones only, or during the hot dry months of the year. A very common insect throughout Coorg, along the Mysore frontier, in Mysore itself, and extending inland as far as Bangalore, where I saw it in fair numbers on tanks in the Lal Bagh. Its habits appear to be a combination of those of the two former species. Breeds in small weedy ponds and is most common around their borders, but quite commonly spreads widely inland to the surrounding country, where it adopts similar habits to *trivialis*. The distribution of this species is quite unusual and paralleled only by *O. sabina*. Making its appearance in the dry zone of Coorg, it spreads inland and northwards keeping to eastward of the watershed as far as the level of Bombay. Here it is unknown at Poona or Khandala, but appears to west of the watershed in the low lying plains and extends from thence along the coast as far as the deserts of Sind. It is a common insect at Jask and Bushire and one of the commonest dragonflies of Lower Mesopotamia. The dry zone of Coorg is only comparatively dry, its annual rainfall being at least seven times that of Sind.

Rambur's type was probably taken at or near Bombay.

20. **Indothemis limbata** Selys.

The species has not hitherto been reported from India, an incomplete male, the type, is from Teinzo, Burma. The only other known specimens are from Perak (Mus. Hamburg), and Singapore (British Museum). The female, hitherto unknown, has not been described.

Of this rare insect I took two males on a small tank about three miles out of Mercara, Coorg, 6. v. 23. On the 25th of the same month, I saw two females ovipositing on the same pond. A few males were about but so shy that I could not get near them and finally I brought down a couple with dust shot. I unfortunately failed to secure the females, which kept too far out over the pond. Two more males were secured on a small pond about four miles beyond Virajpet, 31. v. 23, and the last specimen, another male, taken before the monsoon broke, on the Mercara tank mentioned above, 14. vi. 23. A second brood appeared towards the middle of October, I saw quite a number on a tank near Sidapur and secured six males. A single female was finally taken at Gonikopal, 22. x. 23, settled on a thorny bush alongside a tank, but unfortunately one of its forewings was lost by the net getting caught up in the thorns.

I. limbata is indistinguishable from *T festiva* on the wing, and as the two occur together, one is liable to be taken in mistake for the other. Usually they resort to weedy tanks and jhils, resting on reeds or rushes just out of reach, this in addition to their wariness rendering them difficult to take. From their resting place they make frequent excursions out to the centre of the pond attacking all other species, *Rhyothemis triangularis* being an especial object of their attentions

Female. Abdomen 21 mm. Hindwing 26 mm.

Head. Eyes reddish brown above, olivaceous beneath, lips, face and front olivaceous yellow, frons above deep shiny black, vesicle notched, it and occiput reddish brown. Eyes bright yellow behind.

Prothorax yellowish brown.

Thorax golden brown on dorsum, bright yellow with a greenish tinge on the sides, an antehumeral and humeral warm brown stripes meeting obliquely below, two similarly dark coloured stripes on the sides, one traversing the spiracle, the other over the postero-lateral suture, confluent at two points and obscuring largely the yellow ground colour between them.

Legs blackish brown, anterior femora yellowish, hind femora with a row of moderately closely-set gradually lengthening spines and a single longer distal one.

Wings hyaline, bases saffronated, in forewing, rays only in subcostal and median spaces extending as far out as 1st antenodal nervure, in hind, rays in same spaces as far as 2nd antenodal, halfway to trigone and broadly in anal triangle to nearly as far as tornus of wing ; nodal index $\frac{\quad}{8-8}\left|\frac{10\frac{1}{2}-7}{8-7}\right.$ (one forewing missing), pterostigma dark brown, over *ca.* 2 cells, all hypertrigones and trigones entire, discoidal field begins with 2 rows and is continued as such for a distance of 6 cells.

Abdomen bright yellow marked with black, yellow preponderates basad, black apicalward, all sutures and transverse sutures finely black, dorsal carina finely black from base of segment 2, gradually broadening and obscuring ground colour as far as segments 9 and 10 which are entirely black, a medio-lateral stripe which broadens and fuses with dorsal black towards apex of each segment, cutting off a yellow spot on each segment, these spots lessening in size as far as segment 8. A similar finer ventro-lateral stripe which cuts off a second series of yellow spots as far as segment 7

Anal appendages very small, conical, black.

Vulvar scale aborted, very tiny, a mere overhanging of the apical border of segment 8.

The males differ only from type by the fewer antenodal and postnodal nervures. The size is exactly similar to the measurements given in Ris, *Cat. Coll. Selys.* Nodal index $\frac{7-9-10\frac{1}{2}-11\frac{1}{2}}{7-9-8}\Big|$ compared to $\frac{11-12\frac{1}{2}}{10-9}\Big|$ in the type.

21. **Indothemis coesia** Ramb.

Within the area under survey, reported from Bombay, Nilgiris, Palni Hills and Coorg. The species is probably distributed sparsely throughout the whole of Western India. Only on the Masnagudi tank, at the extreme South East corner of the Nilgiri Wynaad, have I seen it at all common. A small colony has established itself on a tank about halfway down the Kotagiri Ghat, Nilgiris.

Breeds in small ponds, the imago hiding up in long grass in their neighbourhood. In such places they often betray their presence by a loud rustling of wings as they thread their way through the grass. The males are often seen hovering about two feet above the ground or settled

in small holes where turf has been removed. After discovering this latter habit I took quite a number in the space of half an hour near the Masnagudi tank.

22. **Crocothemis servilia** Drury.

Found throughout the whole of Western India in submontane and plain areas. Very common in the northern parts of the district, especially at Khandala, Bombay and Poona. Breeds alike in running and still waters. The imago is usually taken along the banks of ponds and sluggish streams.

23. **Bradinopyga geminata** Ramb.

A common insect at sea level, less common in the hills. I have seen a few specimens in the bed of the Burliyar river, Nilgiris, 2,500 ft. and near Mahableshwar at 3,000 ft. Moderately common at Poona and Khandala and very common on Elephanta Island, Bombay.

The species breeds in small stagnant ponds or down wells.

Taking advantage of its cryptic colouring, the imago always rests flat on slab rock or cement-plastered walls, where its peculiar fine mottling of brown, black and white render it almost invisible. Quite unknown from the Palnis and Coorg.

24. **Neurothemis tullia tullia** Drury.

This species restricts itself to small patches of marsh land or weedy tanks where it forms thickly populated colonies. In one such at Fraserpet, Coorg, the numbers are so great as to blacken the grassy borders of the tank. Their colouring is apparently protective in nature as they enjoy a total immunity from the aggression of birds. Their flight is short, weak and buzzing and may be intended to imitate the common black bamboo bee. In the Nilgiris it is restricted to small marshy localities in the Wynaad, and to Kallar on the Coimbatore side, where it frequents areca palm topes under irrigation.

25. **Neurothemis intermedia intermedia** Ramb.

A common insect in the northern part of the area, especially about Bombay, Khandala and Poona. In the Empress gardens, at the latter place, the grass is often alive with the vast numbers resting in it. Common at sea level all along the coast but becoming rare as traced into the hills and altogether absent at an altitude above 3,000 ft. Only a single specimen has reached me from the Palni Hills, where it is presumably rare, and it is a scarce insect throughout Coorg.

Specimens from around Bombay, Khandala and Poona have the basal golden marking of wings of the palest amber, so pale as to be almost imperceptible at times. These I think must clearly conform to Rambur's type from Bombay. In the Nilgiris isolated colonies crop up in the Wynaad, in which all males have the basal marking a rich dark amber. Mr. T. N. Hearsey has sent me similar specimens from Palghat, Malabar. I regard these as quite distinct from the Bombay type, although Dr. Ris

describes them as a Ceylon form of *intermedia.* Recently Dr. Laidlaw has sent me some specimens which were taken in Burma and are labelled *N. intermedia atalanta.* The name is new to me but the specimens themselves are indistinguishable from the darkly marked forms mentioned above.

The species has a very weak flight and is often taken in company with and found in similar situations as *Palpopleura.*

26. **Neurothemis fulvia** Drury.

A very common insect throughout the whole of Western India. In Coorg, specimens were first taken in the last week of April and numbers were seen from then onward until the second week in July.

It has a habit of forming colonies or what might be better described as "rookeries," a hundred or more perching on the twigs of one or two adjacent trees. In one such colony noticed in the Nilgiri Wynaad, there were more specimens than I have seen during all the years I have been collecting. In Coorg at the onset of the monsoon, numbers may be seen skimming over the wet steaming roads but this is foreign to their usual habit of lying up in more or less dense jungle. The species is a submontane one and breeds in shady jungle streams.

27. **Brachythemis contaminata** (Fabr.)

A common insect in the plains and on all foot-hills to west of the ghats, but occasionally found at considerable altitudes. Thus Major Frere has taken it at over 3,000 ft. in the Palnis, and I have taken it in Coorg at nearly 4,000 ft. Very common at Poona, on the pond at Khandala and on all tanks around Bombay. At Parel, in the latter place, it appears at sundown and is to be seen flying round the borders of the tank until darkness obscures it from one's vision. Breeds in weedy tanks and is never seen away from their vicinity.

28. **Rhodothemis rufa** (Ramb.)

Moderately common throughout the plains to west of the ghats, found sparingly at 2,000 to 3,000 ft. in parts of Coorg, a rare insect in the Nilgiris and unknown from the Palnis. Mr. T. N. Hearsey sent me many specimens from Palghat, Malabar, where it is apparently a common insect. I have seen it in considerable numbers round the borders of the Parel tank, Bombay, females lying up in the surrounding jungle. Breeds in weedy tanks.

29. **Sympetrum fonscolombei** (Fons.)

A Palaearctic species found on all the hills above 6,000 ft. Breeds freely in the Kundah streams and lakes about Ootacamund, Nilgiris and in the lake at Kodai Kanal, Palni Hills. During the cold months of the year, many females may be found lurking in pine and eucalyptus woods, on the highest summits (Dodabetta Peak, 8,350 ft.)of the Nilgiris. It has apparently arrived in the Nilgiris from Kashmir, a distance of 1,600 miles as the crow flies. Emigration probably takes place in the

autumn and winter months when a Palaearctic species could easily stand the temperate climate through which it would then have to travel.

30. **Trithemis aurora** (Burm.)

A common species in submontane areas and at sea-level, especially common on streams about Poona, Khandala and Satara. Occurs in moderate numbers along the lower reaches of the Cauvery, Coorg at 2,000 ft., less common in the Nilgiris, Kallar being the only locality in which I have seen it. A few specimens received from Major Frere were taken at about 4,000 ft., Palni Hills, and I found it at the same altitude below Mahableshwar.

Breeds in streams, canals and less commonly in ponds. Adult males may be seen resting on herbage along the banks of such waters, indulging in short beats up and down stream, always however returning to the original resting place. Females and teneral males often wander far from water but are usually common in jungle adjacent to their breeding places.

31. **Trithemis festiva** (Fabr.)

T festiva is the most dominant species of the genus and is found throughout the whole area, not only in the plains but at all altitudes up to 7,000 ft. It breeds freely both in still and running waters but prefers the latter. Males are never found away from the neighbourhood of water, where they take up positions on rocks in midstream or on twigs overhanging water and dispute for the possession of such with all comers.

Major Frere has sent me specimens from the Palnis taken at an altitude of 4,000 ft. and I have taken it in the Nilgiris at the outlet of the Lovedale lake, at 7,000 ft.

32. **Trithemis kirbyi kirbyi** (Kirb.)

A very local species found only in the northern part of the area under survey. I cannot remember ever having received a specimen of this insect from any collector, so that it would appear to be generally unknown. I have taken it at Poona, where it is not uncommon in the Byrobah nullah and along the banks of the Mullah river. I have seen it also in scattered localities throughout the Satara district, at Khandala and Lingmala below Mahableshwar. It is invariably found in the same situations, resting on bare slab rock in hot barren wastes where it is usually the one bright spot of colour to be seen. Owing to its wariness and to the open and flat situations it affects, the collector is often led a long and weary chase before he effects a capture. Females are rare and only seen when they come down to water to oviposit. I have taken some half dozen or more in the act of ovipositing in the small Byrobah stream. Great variation is met with in the basal marking of the hindwings, not only in extent but in colour. Usually the latter is an intense vermilion but in some it has a dull brownish hue or is coarsely stippled on account of the pigment being distributed around the periphery of individual

cells. Females may have the marking almost absent, or more rarely as extensive as in the male.

33. **Trithemis pallidinervis** (Kirb.)

A comparatively local species breeding in large tanks or sluggish streams. A large colony has established itself on the Katraj lake, Poona, where during some months of the year, the head of every reed and bullrush will be seen to be occupied by one of these insects, whilst numbers are hovering or circling slowly in the air above. (Mr. Bainbrigge Fletcher tells me that he has seen the air thick with them at Pusa, Bihar.) This gregarious habit is quite peculiar to *pallidinervis* and is shared by no other species within the genus. When on the wing, it bears a close resemblance to *Rhyothemis variegata*, whose flight it simulates closely.

It is a rare insect throughout the greater part of the area. I have seen only a single specimen in the Nilgiri district, a female, on the borders of the Ooty lake, 7,250 ft. Mr. Bainbrigge Fletcher and Major Frere have both taken it sparingly in the Palnis, at Kodaikanal. I have only once come across it in Coorg, on the Cauvery, at Napoklu, where a few specimens were seen perched on the tops of scrub growing on sand banks in midstream. It occurs sparingly at Khandala, in various places throughout the Satara district and at Mahableshwar (a few isolated females on hill-sides). Isolated specimens are invariably found to be females, males never wandering far from water. I regard the species as belonging doubtfully to the genus. It not only differs markedly from all others in its habits but also by its long spidery legs, comparatively long narrow wings and bicolorous pterostigma.

34. **Zygonyx isis,** sp. nov.

Male.—Abdomen 38 mm. Hindwing 46 mm.

Head. Eyes dark violet brown, lilaceous beneath, black behind, with a fine yellow line at the margins, lips and anteclypeus dark brown, postclypeus dark yellow obscured by a brownish suffusion, frons and vesicle dark metallic violet, occiput dark reddish brown.

Prothorax black.

Thorax dark metallic green marked obscurely with brownish yellow; an obscure humeral and two lateral interrupted stripes, a paler brighter yellow spot on hinder half of metepimeron.

Legs black, hind femora with a row of short robust evenly-spaced, moderately closely-set spines.

Wings hyaline faintly tinted with yellow, pterostigma black, that of forewing distinctly longer than hind, over 1 to 2 cells, long and narrow, *trigone of forewing with costal side less than half the length of proximal and outer sides*; traversed once, *only 1 cubital nervure to all wings*, membrane pure white, nodal index, $\frac{8-11\frac{1}{2}}{8-8}\Big|\frac{10\frac{1}{2}-8}{8-8}$.

Abdomen black marked with bright yellow as follows :—segment 1 with an obscure spot on sides, 2 with a large transversely oval lateral spot apicad to the transverse suture, 3 with a large lateral spot basad and a much larger apicad to the jugal suture, two small linear almost

obsolete stripes on either side of the middorsal carina, 4 to 8 with large medio-lateral spots and paired dorsal stripes, which on 5 to 7 are confluent across segment and on 8 very small and isolated, 9 and 10 unmarked.

Anal appendages black, equal, rather long, superior thin and cylindrical at base, clubbed apicalward and then tapering to a fine point; inferior triangular, curling up at apex.

Genitalia. Lamina broad, long, sloping, eave-like over hamules, inner hamules short sharply and backwardly curved hooks, outer tumid shorter than inner, not overlapping lobe, latter long, narrow, projecting, rather sharply recurved.

Distribution. Six males of this fine species were taken by Mr. Souter and myself over the Cauvery River, Fraserpet, Coorg, 14-25. ix. 23.

Its habits are rather different to those of *iris*, it hovers over rapids in midstream and is therefore difficult to get at. Although *Z. iris* is a common insect in Coorg, I have only once seen a single specimen at so low an elevation as this (2,000 ft.), on this side of Coorg. Two or three other males of *isis* were seen at the same place and a single female. I managed to get within striking distance of this latter, as it rested on a willow on a small island in mid-stream, and so was able to see its markings, which are rather broader and better defined than in the male.

Differs from *ida* and *iris* by having only a single cubital nervure in all wings, from *ilia* by its very narrow triangle (which resembles that of the two first mentioned species). Differs from all by its abdominal markings.

Type in the B. M., paratypes in Fraser and Souter collections.

35. **Zygonyx iris** Selys.

Only reported from Malabar, the Nilgiris and Coorg, but probably distributed throughout the whole of the Western Ghats south of Bombay.

In the Nilgiris the species is almost confined to the Coimbatore side, the Burilyar and Kallar rivers being the only two spots in which it occurs. Occasional specimens are seen on the Moyar river, on the Mysore side, and on the Pandy river in the Ochterlony valley. It is, at some times of the year, one of the commonest dragonflies in Coorg. At Hallery just below Mercara I have seen the sky full of them, sometimes a hundred or more massing together high in the air. I saw similar swarms down the Mangalore Ghat. I quote from my diary,—"Halting at the black bridge halfway up the Sampaji Ghat, I searched the skyline with my field glasses and was astonished to see, some 500 ft. above, a perfect host of dragonflies. I could not tell what they were. The lowest were certainly largely *Zygonyx iris* with a few *Macromia* scattered among them. The highest were probably large species of *Anax*—so large that as they passed through the field of my glasses, they looked like swallows flitting across." The earliest record is 16-iv, in Coorg, and 23-iv, in the Nilgiris. The last specimens seen were 25-vi, Kallar, Nilgiris, and 26-vi, Mercara, Coorg. Three pairs were seen ovipositing at Makut, on the Malabar frontier, Coorg, as late as 13-vii. A few

specimens appear to survive the monsoon, for I saw several very old and rather ragged specimens on the Sampaji river, Coorg, at the beginning of November.

The females only come down to water to oviposit and the males rendezvous there to meet them, hawking slowly up and down stream on a very limited beat, settling at times on low bushes or twigs overhanging the stream, where they take long rests. They sleep during the heat of the day, and at night high up in trees. The larvae are found in mountain streams, the exuviae being commonly seen clinging to rocks.

I have seen numbers on the rocks below the waterfall at Hallery, Mercara, and have wondered how the larvae withstood the weight of water which roars over this pool in the height of the monsoon.

36. **Onychothemis testacea ceylanica** Ris.

The type comes from Ceylon, it was first recorded from within Indian limits in 1917 when I took a single male at Kallar, Nilgiris. Three other males were taken at the same place in June, 1922 and I finally came across it somewhat commonly in Coorg, 1923. It has established itself on most of the tributaries entering the upper reaches of the Cauvery and I have also seen it sparingly on rivers draining the opposite side of the watershed in South Kanara. (Mr. H. V O'Donel has taken the same subspecies in the Duars, Bengal, so that it would appear that emigration from the Malay Straits has radiated in direct lines to Ceylon, South India and Bengal, and not in a continuous line *via* Burma, from where it has not been recorded. The specimens from the Duars differ in no respect from Coorg or Nilgiri examples.) Breeds in streams running through heavy jungle.

37. **Zyxomma petiolatum** (Ramb.)

A crepuscular species breeding in jungly tanks or down wells in cultivated areas. I have seen a female ovipositing down a well in Bombay, where it was not uncommon on the Parel tank. It has established itself in a large deep well in the Empress gardens, Poona, where it may often be seen flying, even during the day-time, the gloom of the well making an artificial twilight. With the exception of a single jungle tank in South Coorg, the two localities mentioned above are the only known records of the insect from Western India. It appears on the wing just as dusk falls, pursuing a rapid irregular restless flight round the borders of tanks, which coupled with the darkness renders it a most difficult insect to take. Its nocturnal habits probably account largely for its comparative rarity. I have occasionally put it up by beating for it in dark jungly shelters. Mr. C. A. Souter found this species very common in the Laccadive Islands during January 1923. (These islands are included politically in Western India.)

38. **Tholymis tillarga** (Fabr.)

A crepuscular insect like the last, distributed throughout the whole area up to altitudes of 4,000 ft. In Coorg, at "Greenfields" coffee

estate, I have been able to time its evening flight. The insect appears on the wing at a quarter to six (December-January), one or two at a time, but quickly augmented until the air is swarming with them. Their flight and actions are apparently governed directly by that of the small insects on which they feed, for at one moment the swarm flights high and at another descends to skim the surface of the ground. At a quarter past six the whole swarm disppears with dramatic suddenness.

During the day they hide up under the shelter of bushes from which places they may often be beaten up. This species was also taken by Mr. C. A. Souter, in the Laccadives.

39. **Pantala flavescens** (Fabr.)

A universal dragonfly found throughout the year. In the Nilgiris, I witnessed, two years running, a flight of these insects from North East to South West which lasted for several weeks during the months of September to November. This flight is probably an annual migration and is spoken of by the natives as " the pilgrimage."

40. **Rhyothemis variegata variegata** (Linn. et Joh.)

A common insect along the eastern side of the area under discussion, forming large colonies in old weedy tanks or marshes. A rare insect in the Nilgiris and so far not reported from Kanara, Malabar or the Palni Hills. Countless thousands may be seen hovering in the air around the borders of all shallow lakes on the Coorg-Mysore frontier, during the months of September to November. Both types of female are equally common.

41. **Rhyothemis phyllis phyllis** (Sulz.)

Found in similar situations to the last and usually in company with *variegata*. Their markings grade imperceptibly into those of the latter species and I am doubtful as to whether they are specifically distinct, especially as none have the outer parts of the wings so free from markings as in true *phyllis phyllis* (that I have examined from Burma and Siam).

42. **Rhyothemis triangularis** Kirby.

Fig. 1.

One of the commonest dragonflies of Coorg but unknown from the rest of the area. It is more or less limited to South Coorg and, around Virajpet in particular, literally swarms on some of the tanks, especially during September and October. I noticed it first at Fraserpet, east Coorg, at the end of March. I observed, what I took to be, a swarm of large bamboo bees (*Xylocopa aestuans* Linn.) flying round the top of a banyan tree. My curiosity was aroused as these bees are solitary and not given to swarming. A hunt round a lotus tank opposite eventually revealed the presence of a few *R. triangularis* which I then recognised as mimicking the black bamboo bee. It is only comparatively rarely

that this dragonfly is seen flying so high as in the instance cited above, but during high winds, on unsheltered tanks, they are driven to find

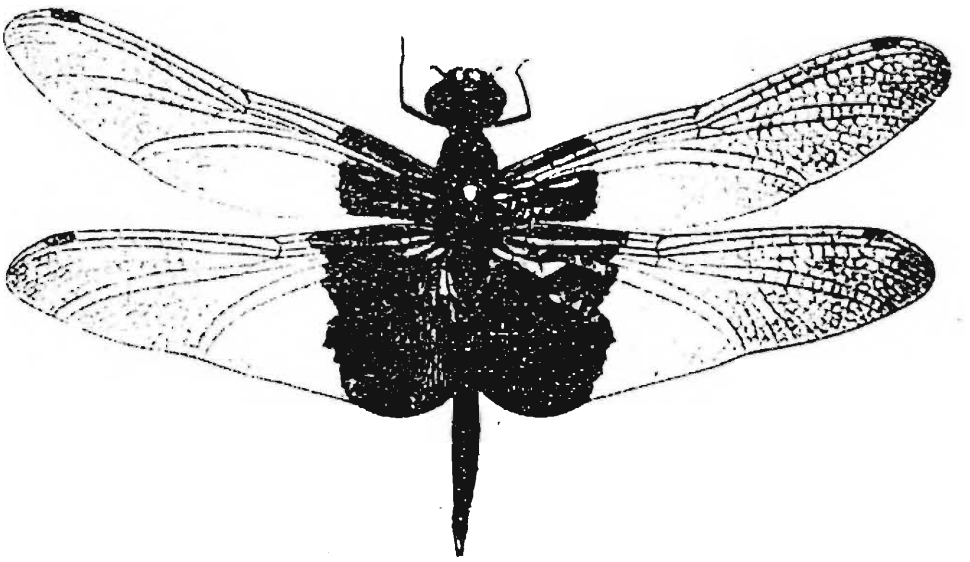

FIG. 1.—*Rhyothemis triangularis.* Male.

cover under the lee of neighbouring trees where they find an abundance of food in the shape of small mango flies and Chironomids, which have taken shelter there from the same cause.

The species is found also in Ceylon and Assam. (Mr. T. Bainbrigge Fletcher took a few males at Margherita, 19.v.20, which do not differ from Coorg specimens.) The true or original zoo-centre is however in Malaysia and what has been said about the radiating emigration of *Onychothemis testacea* is equally true when applied to this species.

Mr. Herbert Campion has sent me the following note based on an examination of Coorg specimens sent to the British Museum:—"Your specimen of *Rhyothemis triangularis* is considerably larger than Kirby's type from Borneo and the wing-markings are emphatically blue, instead of being brown, with blue reflections. The type of *Rh. lankana*, Kirby, from Ceylon, is still smaller and browner than the Bornean type."

The Coorg form is probably in process of becoming a distinct sub-species.

43. **Hydrobasileus croceus** (Brauer.)

I found this species quite common throughout Coorg during 1923 before which year it had not been recorded from within Indian limits.

Its distribution is a significant parallel of that of the last species, records of its capture coming from Burma and Ceylon. Like *Rh. triangularis*, however, its correct zoo-centre is Malaysia and the same theory of radiating emigration applies here.

Breeds in weedy tanks, over which males are found ceaselessly perambulating awaiting the arrival of females. Should a pair of males

meet, they at once engage in fierce combat, ascending to a great height and often lost to sight. The conquering male, however, soon returns to the tank and this with magical swiftness. A male and female, when linked up, travel low over the water's surface tandem fashion, searching for a suitable spot to oviposit in. Meanwhile the female steadily exudes a mass of eggs which can be clearly seen, even from a distance, as a rapidly growing white spot at the end of the abdomen. Often the pair hover for a time over a definite spot and then apparently not satisfied pass on to another. The reasons for this are the dangers of being snapped up by fish or frogs, very real dangers too as frogs are constantly seen to leap at the hovering insects. The male apparently assumes full responsibility for the safety of any spot for it voluntarily releases the female which drops swiftly and deposits her bunch of eggs on some floating weed and again rises, the male adroitly resuming his hold on her neck. The search for a fresh spot is then resumed.

On hot close days, a number of both sexes will often rise to a great height and mingle amicably in the air. I saw such a swarm near Gonicopal, Coorg, 16-v-23, flying at an altitude of about 200 ft. and accompanied by a number of *R. triangularis* and *T. limbata*.

44. **Tramea limbata** (Desj.)

A common insect throughout the greater part of the area but not rising usually above 4,000 ft. Has habits very similar to those of the last. Solitary specimens are often seen hawking far away from water, often for days together in the same spot. I noticed one in the hospital compound, Mercara, Coorg, which occupied one of the walks for nearly two weeks. Breeds in weedy ponds. Specimens from the Laccadives collected by Mr. C. A. Souter do not differ from Indian types.

45. **Tramea besilaris burmeisteri** (Burm.)

A rather more local insect than the last and with a more restricted season. Found widely throughout the area, even up to altitudes of over 7,000 ft. Breeds in weedy ponds and has habits very similar to *Hydrobasileus*. During September and October it joins the annual migration of *P. flavescens*.

47 **Urothemis signata signata** (Burm.)

A sparsely distributed species throughout the district, up to an altitude not exceeding 3,000 ft. Breeds in weedy tanks or sluggish streams. Males are commonly seen settled on rank herbage round the borders of tanks, its pose and bright red colouring closely resembling *C. servilia* with which it is often seen in company.

48. **Aethriamanta brevipennis brevipennis** (Ramb.)

The only records of this insect from Western India are Malabar and Coorg. Mr. T. N. Hearsey collected a large number of specimens at Palghat in the former district, and I have seen some half dozen speci-

mens on a weedy tank at Virajpet, Coorg. It is probably extremely local, but common where found. I have seen a single female ovipositing in grassy covered shallows, closely accompanied by the male.

The male is the brightest coloured dragonfly I know of. On the Virajpet tank, at any one time, the following bright crimson dragonflies could be seen,—*U. signata signata*, *C. servilia*, *O. pruinosum*, *R. rufa* and *A. brevipennis*. Although there was never more than a single male of the last species, it was always possible to pick it out from among the others at a single glance by the vividness of its crimson abdomen. Its flight is low and very swift, it rarely settles for more than a few seconds at a time, especially when over water, and then only at the extreme tip of a blade of grass, its wings fluttering in the meanwhile to maintain its frail footing.

Sub-family CORDULIINAE.

Western India is comparatively rich in Corduliinae. I have been able to list no less than 17 species belonging to four genera,—*Hemicordulia*, *Azuma*, *Macromia* and *Idionyx*.

49. **Hemicordulia asiatica** Selys.

A montane species which has well established itself in the Nilgiri and Palni Hills and Coorg. In the former place I have found it breeding freely in the Ooty, Lovedale and Snowdon lakes and in the pond in Sims Park, Coonoor. Mr. Bainbrigge Fletcher and Major Frere have found it breeding in the lake at Kodai Kanal; in Coorg, I have found it confined to a single small tank about three miles out of Mercara, 3,500 ft.

This appears to be the lowest elevation at which it will breed, this tank being the highest situated in Coorg. Mr. Fletcher remarks on the large numbers of tenerals which perish in spider webs on the Kodai Kanal lake and I have observed the same, although not to the same extent, on the Ooty lake (7,250 ft.). The insect emerges long before dawn and remains for many hours clinging to reeds, its metallic colours rapidly developing but its wings remaining opaque for at least six hours. A vast number, when rising from their reedy birth-place, fall victims to minas, indeed it is a marvel that any manage to escape these birds. Found from April to June and again in October in the Nilgiris, but continuously from May to October in the Palnis.

50. **Azuma cyanocephala** Hagen.

Widely but sparingly distributed from Igatpuri to Malabar and probably to the extreme south of Travancore. I found it moderately common at Mahableshwar and Poona during April and May and at the latter place took quite a number sleeping at midday in mango trees in the Empress Gardens. Here exuviae were occasionally found along the banks of the rapidly flowing Mullah canal but in Coorg it breeds in still waters and I have found numbers of exuviae clinging to grasses bordering the small pulp tanks in coffee plantations. Kallar is the only

locality in the Nilgiris in which I have observed it and it is unknown from the Palni Hills. Mr. T. N. Hearsey has sent me a number from Palghat, Malabar, where he states that it is fairly common. (In the Bombay Nat. Hist. Journal I quoted *A. vittata* in error for this insect as from Poona).

Genus **Macromia.**

No less than nine species of *Macromia* are distributed throughout Western India ; *M. flavicincta* and *cingulata* occur at Poona and the latter is also found from thence as far as Coorg, which province boasts of four species peculiar to itself, as well as two others which it shares with the Nilgiris. The latter district has one entogenic species, *M. ellisoni*. *M. binocelliata* is only known from the Palni Hills. From the rest of the area under discussion, so far, not a single species has been reported. Systematic collecting in the Palni Hills has been carried out only at elevations far too high for *Macromias* which rarely rise above 3,000 ft.

Species of the genus are rather uniform in shape and markings and thus considerable difficulty often arises in discriminating them. Martin, Ris and Laidlaw have defined several groups within the genus by employing the following characters,—the presence or absence of a yellow stripe across the postclypeus, presence or absence of a humeral stripe and the presence or absence of a robust spine on the dorsum of the tenth abdominal segment. To these may be added the presence or absence of a spine on the outer side of the superior anal appendages and lastly the shape of the hamules and lobe of the genitalia on the second abdominal segment. The latter character is by far the most reliable for determining species. All oriental species possess a tooth on the outer side of the superior anal appendages save *M. ellisoni* from the Nilgiris, but in *euterpe* from Borneo the spine is almost imperceptible. (In four species from North America which I have examined, the spine is almost imperceptible, so that its robustness in oriental species would appear to be essentially an old world character.)

In addition to the nine species from Western India, I have described below, one other from North East India, thinking that with so much new and old material before me it would not be altogether out of place. In order however not to confuse it with western species I have placed the description in brackets.

Group 1. *westwoodi.*

Segments 2 to 5 metallic coloured, humeral band present or absent, no well defined yellow stripe on face, spine on dorsum of 10th abdominal segment present. *No Indian representatives.*

Group 2. *cincta.*

Segments 2 to 5 matt black, marked with yellow, humeral band absent, no well defined yellow stripe on face, spine on dorsum of 10th abdominal segment present. *M. indica.*

51. **Macromia indica,** sp. nov.

(Pl. XXV, fig. 5).

Male. Abdomen 57 mm. Hindwing 46 mm.

Head : lips, face and frons dark brown, the latter dull violety metallic, vesicle dull black, occiput glossy black, eyes deep emerald green.

Prothorax black with two diffuse reddish brown marks on dorsum.

Thorax deep chestnut brown, the upper half of dorsum and area between humeral and postero-lateral sutures metallic green. *No humeral stripe,* the alar sinus, a medio-lateral stripe and a spot continuous with latter in front of insertion of hindwing bright citron yellow.

Legs black, femora coated with minute spines, hind femora extends to apical border of 2nd segment.

Wings hyaline with a dark brown ray in subcostal space of hindwing extending halfway to first antenodal nervure ; pterostigma black over $1\frac{1}{2}$ to 2 cells, small, unbraced, membrane white, 7 cells in loop, nodal index :—$\frac{8-15}{11-10}\Big|\frac{15-10}{9-10}$.

Abdomen deep black, nonmetallic marked with citron yellow as follows :—segment 2 with its basal half, 3 with a complete medial ring covering nearly one fourth of segment and continued basad along ventral border as far as base, 4 to 6 with medial rings gradually reducing in thickness as far as 6 and all finely divided by black of dorsal carina, 7 with its basal half (but less so laterally than dorsally), 8 similar but the yellow much reduced on dorsum and expanding again along ventrum, segments 9 and 10 unmarked, the latter bearing a robust middorsal spine with a keel running the whole length of dorsal carina.

Anal appendages black, equal in length. Superior a little compressed, sloping and tapering to a fine point turned up and a little out, inner border slightly concave, outer bearing a minute spine at its middle, some fine teeth beneath the apex. Inferior triangular, concave above as seen in profile, its apex turning slightly up between the superiors.

Genitalia. Hamules long, fine and tapering, a little tumid at base, the apex with a fine imbricated point which extends to extreme apex of lobe, the latter directed almost straight back, very narrow and tongue-like.

Female. Abdomen 54-56 mm. Hindwing 48-50 mm.

Exactly similar to the male save for sexual differences in shape of abdomen. Much more robust, abdomen stouter and laterally compressed.

Wings usually more or less enfumed or broadly saffronated, the dark brown subcostal ray very conspicuous in both fore and hindwings, extending to 2nd antenodal in hindwing, halfway to 2nd in the fore ; membrane white ; loop 11 to 13 cells, nodal index similar to the male.

Abdomen. Yellow rings on segments 4 to 6 broader and all prolonged along ventral border as far as base, as on segment 3, markings on 8 reduced to small dorsal and ventral spots.

Ventral border of segment 8 prolonged into a long vulvar scale half the length of segment 9, deeply cleft into two triangular tongue-like processes, posterior to which are two small robust spine-like processes

projecting from the ventral plate, similar to those seen in some species of Libellulinae.

Distribution. Type male and female from the Nilgiri Wynaad, Gudalur, 14-ix-23 and 20-ix-23. One male from Sigur, Nilgiris, 7-x-23, and one female seen ovipositing at Burliyar, Nilgiris. In Coorg, males are not uncommonly seen hawking along roads or in forest clearings but more commonly keep to the neighbourhood of streams and are found from the source of the Cauvery as far as Fraserpet on the Coorg-Mysore frontier. Females oviposit by lashing the surface of water over sandy shallows along the banks of the Cauvery. This magnificent species is the largest *Macromia* so far described. Type male and co-type female have been deposited in the B. M.

Group 3. *calliope.*

Segments 2 to 5 matt black, humeral band present, a well defined yellow stripe on face, spine on 10th abdominal segment absent

M. ida, M. miniata, M. binocellata.

52. **Macromia ida,** sp. nov.

(Pl. XXV, fig. 4).

Male. Abdomen 42 mm. Hindwing 38 mm.

Head : labium bright chrome yellow, borders of lateral and middle lobes broadly black ; labrum black, mandibles bright yellow, face and frons glossy black, a broad even transverse stripe crossing the post-clypeus and the bases of mandibles bright citron yellow ; eyes deep emerald green ; occiput small, black ; face and frons, except the yellow area, coated with short stiff black hairs.

Prothorax blackish brown.

Thorax bluish green metallic marked with bright citron yellow as follows :—well-defined humeral stripes extending for two thirds up the height of dorsum, a complete medial stripe on each side, a stripe covering the posterior third of metepimeron and the underneath of thorax.

Legs black, hind femora with a row of closely-set minute spines.

Wings hyaline but often more or less tinted or enfumed, the apices often brownish ; membrane pale brown ; pterostigma small, black over $1\frac{1}{2}$ cells, unbraced ; loop with 6 to 8 cells ; costa bright yellow ; nodal index $\frac{8-16}{10-11}\left|\frac{17-7}{10-11}\right.$.

Abdomen black marked with citron yellow as follows :—segment 2 with a middorsal basal spot, broad baso-lateral and small apico-lateral spots, 3 with large baso-lateral spots on each side and a pair of dorsal lunules lying slightly basad to the middle of segment, 4 to 6 with similar dorsal lunules but almost or quite obsolete on segment 6, the basal third of 7, a large baso-lateral spot and a tiny quadrate subdorsal spot on 8, segments 9 and 10 usually unmarked but the former with an occasional baso-lateral spot. *Segment 10 without a dorsal spine.*

Anal appendages black, of equal length. Superiors sloping strongly down and back, tapering to a fine point, parallel and with a robust external spine situated slightly apicad to middle of segment. Inferior

triangular, convex dorsally, its apex curling gently up between apices of superiors.

Genitalia. Lobe rather long, truncate, sinuous, pointed; hamules foliate, tumid in basal two thirds, then abruptly narrowed into a long fine spine with an imbricated apex extending slightly beyond apex of lobe.

Female. Abdomen 41 mm. Hindwing 35 mm.

Exactly similar to the male but bulkier in build, its abdomen stouter and laterally compressed throughout, its markings broader and better defined but segment 9 unspotted. (Markings of abdomen rather variable according to age of specimen).

Wings hyaline or more or less enfumed, sometimes an uniform mahoghany brown. (In one specimen, which I picked up on a sand spit in a stream near Bhagmandala, Coorg, and which was apparently in its death throes from old age, the wings are a fine deep reddish brown, so that this colour is probably a sign of senility). Nodal index as for male.

Anal appendages pointed conical, black, rather long.

Vulvar scale about one third the length of segment 9, deeply-cleft into two tongue-like processes, with sinuous contiguous borders and pointed apices.

Distribution. Type male and female taken in the Nilgiri Wynaad at Gudalur, 20-ix-22 and 1-x-22. These were the only ones seen or taken in the Nilgiri District but the insect subsequently was found to be quite common in Coorg and S. Kanara. Mr. Souter, Commissioner of Coorg, took about a score at Bhagmandala during October 1923 and a number of others were taken by myself at elevations above 3,000 ft. Below this its place seems to be taken by *cingulata*. Breeds in all streams throughout Coorg and is usually taken hawking over these. Its small size and general dark colouring distinguish it from all other species except the next described, *M. miniata*, which resembles it closely in size and markings, but the two differ entirely in the shape of the genitalia.

53. **Macromia miniata**, sp. nov.

(Pl. XXV, fig. 7).

Male. Abdomen 47 mm. Hindwing 37 mm.

Head: labium brownish yellow at base, broadly black along borders, labrum black, mandibles bright yellow, face and frons black with a broad citron yellow band traversing the postclypeus from eye to eye, occiput black, frons and vesicle obscurely metallic, eyes emerald green.

Prothorax black.

Thorax metallic bluish green marked with citron yellow as follows:— a well-defined humeral stripe extending for two thirds the height of dorsum, the alar sinus, a broad medial lateral stripe continuous over tergum and a narrow posterior bordering stripe on metepimeron.

Legs black, tibial keel white, base of anterior pair of femora and coxae yellow. Armature as for *indica*.

Wings hyaline, a little enfumed ; pterostigma blackish brown, over 1½ to 2 cells, small unbraced ; membrane black ; loop 6-7 cells, nodal index :—$\frac{7-16}{11-9}|\frac{14-6}{10-11}$.

Abdomen black marked with citron yellow as follows :—the basal half of segment 2, a triangular baso-lateral spot on 3 and a pair of mid-dorsal spots, 4 to 6 with similar dorsal spots but becoming progressively smaller until almost lost on segment 6, segment 7 with a basal ring occupying rather less than one third the length of segment, 8 with a large triangular baso-dorsal spot and a quadrate latero-basal, 9 with a small ventro-basal spot, 10 unmarked and *without a dorsal spine.*

Anal appendages black, equal in length, superior tapering but slightly, ending in a fine point turned slightly outward. Outer border a little distal to middle of appendage, with a very robust tooth. Inferior appendage triangular, concave above as seen in profile, its apex turning up between superiors.

Genitalia : hamules tumid at base but rapidly thinning and drawn out into a very long attenuated spine running parallel with the lobe, whose apex it nearly reaches, latter small triangular directed straight back.

Female unknown.

Distribution. Two males taken in Coorg, one at Somwarpet, 1-vii-23, the other at the top of the Cannanore Ghat, 28-v-23, both hawking over rivers. Its small size and restricted markings will distinguish it from all other species except *M. ida,* to which it bears a remarkable resemblance, a comparison of the genitalia, which are markedly different, will however serve to separate it from the latter.

54. **Macromia binocellata,** sp. nov.

(Pl. XXV, fig. 12).

Male. Abdomen 53·5 mm. Hindwing 46·5 mm.

Head : labium dark brown, labrum brown, black at its middle and marked at the base with two ill-defined yellow spots, anteclypeus brownish black, postclypeus black marked with a narrow sinuous yellow line from eye to eye which wraps round the anteclypeus and bifurcates on either side of the middle line above, thus forming a mark shaped like a pair of spectacles, frons in front and above metallic blue with a small spot of yellow on either side against the eyes, vesicle metallic blue deeply cleft, occiput black, eyes emerald green.

Prothorax blackish brown.

Thorax metallic bluish green marked with citron yellow as follows :—a humeral stripe extending nearly up to the alar sinus, the alar sinus, a narrow medio-lateral stripe and the extreme posterior border of the metepimeron.

Legs black, armature similar to *indica.*

Wings slightly enfumed, the apices narrowly bordered with diffuse brown, base of hindwing around the tornus slightly saffronated ; pterostigma black, very short, 3·5 mm., loop 6 to 7 cells, nodal index :—$\frac{7-14}{9-9}|\frac{14-6}{10\frac{1}{2}-10}$. (The very rare occurrence of an outer incomplete antenodal nervure in one of the hindwings is worthy of note.)

Abdomen blackish brown to black marked with citron yellow as follows:—a narrow oblique ring on 2nd segment running from middorsum to the base of ventrum, 3 with a similar but more oblique stripe, 4 to 6 with paired middorsal lunules diffuse on the basal side, well defined on the apical, separated above by the black of dorsal carina, 7 with its basal fourth yellow, 8 with a very narrow basal ring, 9 an uniform brown, 10 entirely yellow, not possessing a dorsal spine but two small reddish brown tubercles near base.

Anal appendages pale brown, the inferior a little longer than superiors, the latter bearing a robust spine a little apicad to its middle and with a series of minute spines below its apex, its end pointed and turned up slightly. Inferior triangular narrow curving up between the apices of superiors.

Genitalia : hamules very stout ending in a very short sharply curved spine which does not extend as far as apex of lobe, the latter somewhat quadrate like *Azuma*, large, broad, directed straight back.

Distribution. A single male, received from Mr. C. M. Inglis and at present in his collection, collected in the Palni Hills.

Group 4. *cingulata.*

Segments 2 to 5 matt black, humeral band present, no well defined yellow stripe on face, spine on 10th abdominal segment present.

M. cingulata, M. flavicincta, M. irata, M. bellicosa, M. ellisoni, (M. pallida).

55. **Macromia cingulata** Ramb.

(Pl. XXV, fig. 1).

Not uncommon at Poona from April to June, breeds in the Mullah canal and Byrobah nullah. Distributed all along the Western Ghats from Khandala to Coorg. Several specimens were seen at Mahableshwar in April, a single male was taken on the banks of the Cauvery River, Fraserpet, Coorg, 14-xi-23, and another was seen hawking in the hospital compound at the same place on 25-xi-23. The species appears to become increasingly rare as traced southwards, *M. ida* probably crowding it out.

The Coorg specimens are decidedly smaller (abdomen 39 mm., hindwing 32 mm., equal to the smallest known *Macromia*) and the markings are more restricted than in those from Poona and Mahableshwar, the genitalia however agree so that I do not think that they can be regarded as more than a local race.

56. **Macromia flavicincta** Selys.

(Pl. XXV, fig. 2).

So far only reported from Mahableshwar and Poona within western limits. At the latter place I found it moderately common during May and June. It probably breeds in similar situations to those of *cingulata* but I never once saw it flying over water, it preferred the wooded ridings of the Empress Gardens, where it could be seen collecting together in

considerable numbers, many paired and taking their midday siesta among the branches of oleander bushes. In its colouring *flavieincta* resembles *Azuma* closely and stands widely apart from all other species of *Macromia* that I have been able to examine. Its gregarious habits too are quite foreign to the genus.

57 **Macromia bellicosa,** sp. nov.

(Pl. XXV, fig. 9).

Male. Abdomen 45-47 mm. Hindwing 40-43 mm.

Head: labium yellow, the lateral lobe bordered diffusely with brown, labrum and anteclypeus dark brown, rest of face and frons pale yellow, the latter marked in front with a broad black semicircular stripe, which, by meeting a broad stripe of black in floor of sulcus on upper surface of frons, forms a broad T-shaped mark. (In some specimens the arms of this "T" meet the base of the stem and thus enclose two large yellow spots on upper surface of frons). Eyes emerald green, vesicle black, occiput brown.

Prothorax dark brown.

Thorax brilliant metallic bluish green marked with citron yellow as follows :—a humeral stripe on the lower half or less of dorsum, its upper end sometimes brownish and diffuse, the alar sinus, a moderately broad medial stripe on the sides continuous with a stripe on the tergum, and the posterior border of metepimeron.

Legs black, anterior and middle coxae yellow, armature as for *indica.*

Wings slightly or not enfumed ; pterostigma black, over 2 cells, unbraced ; costa yellow ; membrane pure white ; loop 8 to 9 cells, nodal index :—$\frac{7-16}{9-11}\left|\frac{15-7}{10-9}\right.$, $\frac{7-14}{9-10}\left|\frac{04-7}{10-10}\right.$.

Abdomen black marked with yellow as follows :—the basal half of segment 2 or a subbasal ring irregularly indented by the ground colour, 3 similar but the yellow divided dorsally by a broad triangular spot of black with its base to base of segment, 4 to 6 with rings lying slightly basad to middle of segments, all deeply invaded basalward by the ground colour, 7 for its basal half but the yellow falling short of the base at the sides, 8 with a narrow complete basal ring, 9 and 10 unmarked, the dorsal carina of the former ending in an apical spine and the latter with a robust spine at the centre of dorsal carina.

Anal appendages reddish yellow, of equal length. Superior flattened and tapering to a fine point with a medial robust spine on outer side. Some small teeth beneath apex. Inferior curved gently up, narrowly triangular, the apex faintly bifid.

Genitalia. Hamules broad at base rapidly thinning to a robust long hook lying parallel to the lobe, its end curved round regularly like a button hook ; lobe very small, *lying in the same sinuous line as ventral border of segment, not angulated out at all to latter,* produced backwards but slightly and *well angulated with apical border of segment.*

Female unknown.

Distribution. Coorg. Three males only taken, two of which were hawking close together on a stream at the top of the Cannanore Ghat, 28-v-23, and the third from Madapur, Hatti River, 27-v-23. The distinc-

tive marking of frons paralleled only by some American species, will serve to distinguish this species from others of the Oriental groups. Its genitalia at first glance appear to resemble those of the next species, *M. irata*, but the angle of the lobe to the segmental border will serve as a guide to separate them, as will also the markings on frons and the second abdominal segment, and the reddish yellow anal appendages. It appears to be closely related to *M. pallida* from Bihar, a comparison with which is made below.

58. **Macromia irata,** sp. nov.

(Pl. XXV, fig. 6).

Male. Abdomen 47 mm. Hindwing 43 mm.

Head : labium and labrum dark reddish brown, the base of lobes of former bright ochreous, the base of latter dirty citron yellow, face and frons dull citron yellow, anteclypeus darker. A short but broad blackish brown band encircling the crest of frons and enclosing a large citron yellow spot on the upper surface, occiput blackish brown.

Prothorax blackish brown.

Thorax bluish green metallic, the lower part of dorsum mahogany brown, marked with citron yellow as follows :—a very short vestigial but well defined humeral band below, the alar sinus, a medio-lateral stripe confluent over the tergum with its fellow, and the posterior third of metepimeron.

Legs black, armature as for *indica*.

Wings hyaline or patchily enfumed ; pterostigma black, small, over 2 to 2½ cells, unbraced ; 8 cells in loop ; costa black with a very fine yellow line as far as node ; nodal index :—$\frac{9-17}{10-12}\Big|\frac{18-8}{12-13}$, $\frac{7-17}{10-12}\Big|\frac{17-8}{13-11}$.

Abdomen black marked with citron yellow as follows :—a baso-ventral spot on 2nd segment connected by a fine yellow line across the auricle to a large dorsal spot, which is almost cut in two before and behind by an invasion of the ground colour, 3 with a ventral stripe which sends up a fine basal streak along the basal border of segment which may or may not form a complete basal ring, a pair of middorsal spots confluent with each other and in one specimen with the ventral stripe also, 4 to 6 with median spots only, becoming almost obsolete on segment 6, 7 with nearly the basal half yellow, this colour prolonged along the mid-dorsum, 8 with a baso-dorsal triangular spot, 9 and 10 unmarked, the latter bearing a very robust acute middorsal spine.

Anal appendages black, but in some the inferior dark reddish brown. Superior tapering to a fine point turned slightly out and upwards and bearing a sharp robust spine at the middle of its outer border. The sub-apical fine teeth not at all evident. Inferior narrowly triangular, curved up as seen in profile and extending slightly but distinctly beyond the superiors.

Genitalia very similar to the last (*bellicosa*), differing only in the shape of the loop which is of the same small size but is strongly angulated out from the ventral border of segment and in nearly the same straight line as the apical border, *viz*, exactly the opposite condition to that found in *bellicosa*.

Female. Abdomen 46 mm. Hindwing 46 mm.

Exactly similar to the male in colour and markings. Wings with dark brown rays in subcostal median and cubital spaces, the brown changing insensibly to saffron as far out as arc and considerably beyond this level in subcostal and cubital spaces. Anal appendages small, black.

Vulvar scale about one third the length of segment 9, deeply cleft into two foliate processes with rounded outer border and straight inner, and with the apices turned in towards one another.

Distribution. Confined to Coorg. A considerable number of these insects were seen by the author towards the end of April 1923, all flying high and often resting on the uppermost branches of the tallest forest giants. Several males were subsequently seen hawking over a neighbouring stream near Bhagmandala. The single female described above was brought down from a height of about 150 ft. with a charge of dust shot from a ·22 Winchester rifle. The markings of this insect are very distinctive and will serve to distinguish it from other species.

59. **Macromia** sp.

Female. Abdomen 47 mm. Hindwing 42 mm.

Head. Labium bright citron yellow, lobes with well defined black borders, labrum and face black, a broad bright citron yellow stripe crossing the postclypeus from eye to eye, eyes deep emerald green, frons a little metallic, vesicle and occiput black.

Prothorax blackish brown.

Thorax metallic bluish green marked with citron yellow as follows :— a humeral stripe on lower two thirds of dorsum, the alar sinus, a broadish medio-lateral stripe and the posterior part of metepimeron.

Legs black, anterior and middle coxae yellow.

Abdomen black marked with citron yellow as follows :— a broad continuous stripe on sides of segments 1 and 2, a pair of lunules on the middorsum of latter segment, 3 with a large baso-lateral spot and a pair of middorsal lunules, 4 to 6 with similar lunules decreasing a little in size on 5 and 6, segment 4 with an additional small ventrobasal spot on each side, a quadrate spot covering the dorsum and subdorsum of 7 and a small basal subdorsal spot on 8.

Wings saffronated, rather deeply so along the costal margins and even more deeply at the base as far out as the arc ; pterostigma black ; nodal index :— $\frac{9-18}{11-11}\Big|\frac{19-9}{11-11}$.

Anal appendages small, conical, tapering, pointed at apex.

Vulvar scale almost indiscernible, two tiny excresences marking its position.

Habitat. Hatti River, Madapur, Coorg, 6-vi-23. A single female only, which I have been unable to assign to any of the foregoing species. It is nearly related to both *bellicosa* and *irata* but differs in its markings from both, so that I incline to the view that it is a distinct species. It is important to note that the differences are not due to age, for in my experience a *Macromia* which has not obtained its mature colouring is unknown. These insects mature in the briefest interval after emerging

and those emerging before dawn will have their metallic colours fully developed before the sun has risen on them. I have noted this also in the case of *Hemicordulia* and *Idionyx* so that it would appear to be a character shared by all the Corduliinae. Teneral females both of *Macromia* and *Idionyx*, in which the chitin, especially of the abdomen, has not yet hardened are common but the colours are always fully developed. These remarks are to be borne in mind when considering the following species *M. pallida.*

[60. **Macromia pallida,** sp. nov.]

(Pl. XXV, fig. 8).

Abdomen 50 mm. Hindwing 43-45 mm.

Head : labium bright chrome yellow, labrum face and frons pale opaque whitish yellow, the former narrowly bordered with black, the latter with a thick curved blackish brown stripe on its crest which forms a thick T-shaped mark by meeting a streak of the same colour lying in floor of sulcus on upper surface of frons. In one specimen the arms of the " T " curve round to meet the base of its stem and thus enclose two spots of the ground colour. Vesicle high narrow, barely notched, black, occiput dark brown, eyes emerald green.

Prothorax yellowish brown.

Thorax pale whitish yellow marked with metallic green, the dorsum broadly to well behind level of humeral suture, this area enclosing a well defined humeral stripe on the lower three fourths of dorsum pale creamy yellow in colour, laterally a narrow stripe of metallic green on the postero-lateral suture continuous under chest between the middle and hind pairs of legs. Alar sinus and tergum pale whitish yellow.

Legs black, coxae and trochanters yellow, armature as for *indica.*

Wings hyaline, evenly enfumed, the apices tipped occasionally with brown ; pterostigma dark brown, *often braced,* over 2 to 2½ cells, rather longer than usual ; membrane white ; costa yellow as far as apex, as also the antenodal nervures ; 9 cells in the loop ; nodal index :—$\frac{9-16}{11-12}\left|\frac{16-9}{11-12}\right.$ $\frac{11-18}{12-11}\left|\frac{16-10}{12-12}\right.$.

Abdomen black marked with pale creamy yellow or whitish yellow, segment 1 with only a small dorsal spot of black, 2 all yellow except for two triangular spots in series on the middorsum, one with its base at base of segment, the other larger with its base on the transverse suture and confluent with an apical ring of black, 3 with the basal half yellow but the dorsal carina here with a broad triangle of black and a large oval subapical lateral spot of yellow on the apical half, lastly a streak of brownish runs from the black along the sides towards the base of segment, 4 similar to 3 but the apical spot on the sides much smaller, 5 to 6 similar but without the subapical yellow spot, 7 with its basal half creamy yellow and 8 with a broad basal ring, segment 9 with a small lateral spot near the base, 10 unmarked, bearing a robust spine on its middorsum.

Anal appendages. Superior creamy yellow, bases and apices tipped with dark brown, as also a ridge on the outer side running from base to

the apex of a small spine on outer border of appendage, situated slightly proximal to its middle. Minute spines beneath the apex. Inferior appendage narrowly triangular with apex curling up between the tips of superiors, reddish brown.

Genitalia very similar to *bellicosa*, hamules tumid at base, rapidly thinning to a long robust spine, whose apex is curved regularly, like a button hook, and extends slightly beyond the apex of lobe, latter very small, hardly perceptible, except at the angle at which borders of segment meet, directed straight back.

Distribution. Two males taken by Mr. H. V O'Donel at Hasimara, Duars, Bengal, 22-v-23, 22-vi-23. The species is remarkable for the great extent and markedly pale colour of its markings which occupy a greater area on the thorax than the metallic ground colour. This, as has been noted in discussing the last species, is not in any way due to the specimens being teneral. The pale colour is again exhibited in the wings. The marking of the frons exactly resembles that in *bellicosa* and there is also the closest resemblance in their genitalia.

In *pallida*, however, the hamule is considerably longer and the lobe smaller and the pale markings are more extensive. This latter character will serve to distinguish it from all other species.

61. **Macromia ellisoni,** sp. nov.

(Pl. XXV, fig. 3).

Male. Abdomen 49 mm. Hindwing 49 mm.

Head: labium pale brown, labrum and anteclypeus dark yellowish brown, the former margined with black, rest of face and frons metallic bluish green, eyes deep greenish blue, occiput black.

Prothorax black.

Thorax dark green metallic marked with citron yellow as follows:—a humeral stripe tapering slightly above and not reaching the alar sinus, the latter bright yellow, also a medio-lateral narrow stripe.

Legs black, armature as for *indica*.

Wings hyaline, palely enfumed especially costalward; pterostigma black over 1 to 1½ cells, unbraced, costa black, membrane white, nodal index:—$\frac{12-17}{12-11}|\frac{18-11}{12-12}$, 10 cells in the loop.

Abdomen black marked with citron yellow as follows:—Segment 2 with a narrow subbasal ring interrupted above by the black of dorsal carina, 3 to 5 with middorsal annules progressively smaller from 3 to 5, segment 6 unmarked, 7 with its basal third yellow, 8 to 10 unmarked, the latter strongly keeled but dorsal spine poorly developed, segments 4 to 9 with ventral yellow spots.

Anal appendages black, of equal length, the superior tapering, pointed, *without an external spine at the middle,* some minute spines beneath the middle third. Inferior narrowly triangular, almost straight, curving a little up at the apex.

Genitalia. Hamules very stout and tumid not tapering but with a tiny spine springing abruptly from the apex, lobe short and rounded, directed ventralward.

Female. Abdomen 41 mm. Hindwing 35 mm.

Exactly similar to the male but bulkier in build, the abdomen of even width throughout, laterally compressed, the yellow markings are better defined and there are a pair of lunules on segment 6 also.

Wings rather deeply enfumed, especially towards the apices, nodal index :—$\frac{7-17}{10-11}|\frac{16--8}{11-10}$, pterostigma over $1\frac{1}{2}$ to 2 cells.

Legs black. Anal appendages black, small, conical, pointed.

Vulvar scale cleft to its base into two narrow conical processes barely one fourth the length of ninth segment.

Distribution. From the Nilgiris only. Males from Sigur, 4,000 ft., 7-x-21, female from Devalashola, Nilgiri Wynaad, 5-xi-22.

Easily distinguished from all other species by the absence of an outer spine on superior anal appendages and by the large number of post-nodal nervures in forewing. Types in Fraser collection.

Genus **Idionyx** Selys.

During the last six years no less than five species of *Idionyx* have been discovered in Western India all of which are entogenic to the region. Of these, two which are new, are described here, as also is the, so far undescribed, male of a third species. It will be useful, and not altogether out of place, to describe here also a new species from the Darjiling district.

In dealing with the six species before me I have not been able to derive much help from Dr. Ris' study of the venation of the genus given in *Supplementa Entomologica* No. 1, probably because they all appear to fall into one group. Characters which have proved the most useful are the following,—

1. Character and shape of anal appendages of male.
2. Presence or absence of a dorsal spine on segment 10 of male.
3. Shape of abdomen of female, especially of end segments.
4. Presence or absence of a humeral or antehumeral stripe.
5. Presence or absence of basal saffronation in wings of female.
6. Shape of vesicle in the female.

A study of the genitalia has been disappointing owing to their close similarity. The highly specialized character of the vesicle in at least two species, in the female sex, serves as an infallible guide to differentiate the particular species and the anal appendages serve an equally trustworthy guide in the males. To avoid confusion with Western species, the description of *Idionyx stevensi*, the new species from the Darjiling district, is placed in brackets.

62. **Idionyx saffronata,** sp. nov.

Male. Abdomen 33 mm. Hindwing 34 mm.

Head : Labium dirty yellow bordered diffusely with brown, labrum bright chrome yellow bordered with black, ante- and post-clypeus glossy black, frons dark metallic blue, vesicle dark metallic violet, tumid, nearly as broad as frons, rounded above, occiput black, eyes emerald green.

Prothorax blackish brown.

Thorax brilliant metallic green with a narrow medial stripe of citron yellow on the sides and the posterior half of metepimeron same colour.

Beneath striped alternately black and yellow, two stripes of each.

Legs black, middle and anterior femora yellow within, tibiae yellow striped narrowly with black on flexor surface.

Wings hyaline, very palely saffronated as far out as a little beyond outer angle of tornus, more deeply in subcostal and cubital spaces and anal triangle ; pterostigma black, small, over $1\frac{1}{2}$ cells ; membrane cinereous ; loop with 7 to 8 cells ; nodal index, 13 antenodals and 7 to 8 postnodal nervures to forewings, 8 antenodal and 9 postnodal nervures to hindwings.

Abdomen black, the first and second segments marked narrowly along ventral borders with citron yellow, 7 to 10 bordered with bright yellow beneath, tumid at base where genitalia are very prominent, narrow and cylindrical as far as apex of 7, becoming progressively broader as far as 10. The 9th segment only half length of 8, 10 nearly as long as 8, strongly and sharply keeled but with no actual dorsal spine.

Anal appendages black. Superior tapering from base to apex, flattened on inner side, outer third angulated obtusely inward. Inferior tumid and squarish for basal two thirds, apical portion narrow squared and bifid at end, a very robust spine springing from each side of apical portion which nearly equals it in length. The spines curving strongly upward, the apex less so.

Genitalia. Lamina broadly and deeply excavate, a thin plate projecting from beneath it which is also excavate along its free border, hamules very tumid chelate, outer claw tumid short, inner of same length prolonged as a long fine curled spine, lobe rounded, rather broad yellow coated with long yellow hairs.

Female. Abdomen 34 mm. Hindwing 35 mm.

Very similar to male, differs as follows :—Wings hyaline or more or less deeply enfumed especially towards apices, base a rich deep golden yellow as far out as level of outer end of trigones and for whole breadth of forewing, nearly to apex of loop in hindwing ; pterostigma black, rather small, unbraced, over 2 cells ; nodal index :—$\frac{7-13}{9-8}\left|\frac{12-7}{8-9}\right.$, $\frac{7-15}{9-9}\left|\frac{14-6}{9-9}\right.$.

Abdomen glossy black, ventro-lateral borders of segments 1 to 3 and apical borders of 1 and 2 moderately broadly chrome yellow.

Vulvar scale very prominent viewed from the side, acute, strongly keeled.

Distribution. Coorg at altitudes of 3,000 ft. and upwards. Found in jungle ridings or over ghat roads where they are protected from wind.

Swarms of 20 or 30 may sometimes be seen dancing up and down in the air like a swarm of midges. When so engaged they appear and disappear rapidly as the sun comes out or goes in. Only visits streams when ripe for ovipositing.

The male closely resembles *I. nilgiriensis* but the latter has no saffronation of the wings, and the tuft of hairs beneath segment 7 is bright yellow instead of blackish brown. The females are easily

separated by the shape of the abdomen and by the deep extensive saffronation of the wings. From *corona corona* and *corona burliyarensis* the saffronation of the wings and simple vesicle of female will serve to separate them, whilst the appendages of the male are entirely different from *optata* and *stevensi*. The female is separated from the next species by the saffonated wings.

64. **Idionyx nadganiensis**, sp. nov.

Female. (Male unknown). Abdomen 35 mm. Hindwing 35 mm.

Head. Labium bright chrome yellow narrowly bordered with brown, labrum bright citron yellow bordered narrowly with black, ante- and post-clypeus glossy black, frons and vesicle dark metallic blue, simple, comparatively small, occiput black, eyes emerald green.

Prothorax brownish.

Thorax brilliant metallic green marked with citron yellow as follows :—*a narrow well-defined humeral stripe on lower half of dorsum*, a narrow medial stripe on the sides and rather more than the posterior half of metepimeron, beneath yellow marked with three black stripes arranged in a triangle with its base directed analward.

Legs black, tibiae yellow on flexor surfaces except the anterior pair which are entirely black.

Wings hyaline, very palely enfumed, extreme bases saffronated as far out as level of cubital nervure or in some as far as distal end of cubital space ; pterostigma black, rather long, over $2\frac{1}{2}$ cells ; nodal index, $\frac{8-14}{9-9}\left|\frac{14-7}{9-9}\right.$, loop with 9 cells, membrane cinereous.

Abdomen black with narrow apical rings on segments 1 to 4 and the sides of 1 and 2 irregularly.

Vulvar scale lying along ventrum of segment 8, pointed apically and projecting slightly beyond the apical border, hardly visible in profile. Two small tubercles beyond it on ventrum of segment 9.

Anal appendages small, conical, pointed, black.

Distribution. Nilgiri Wynaad, Pundalur near the Nilgiri-Malabar border, also on the Malabar and Kanara Ghats, Coorg. Habits similar to those of last species in company with which they are often seen. Differs from all species except *stevensi* by the presence of a humeral band, but in the latter species this band is placed further inwards and is more antehumeral than humeral. The slight extent of basal saffronation will also serve to separate it from *saffronata*, *stevensi* and *optata*.

65. **Idionyx nilgiriensis** (Fras.)

(=*Phyllomacromia nilgiriensis*).

(Pl. XXVI, fig. 3).

Male. Abdomen 32 mm. Hindwing 32 mm.

Head large and globular, vesicles rounded tumid ; labium pale brownish yellow, labrum bright yellow, its border narrowly brown, base on either side marked with an elongate black spot. Rest of face and vesicle metallic blue. Eyes emerald green.

Prothorax dark brown.

Thorax bright metallic green, no humeral stripe, a narrow medial citron yellow stripe on each side and the posterior half of the metepimeron.

Tergum bluish black marked with citron yellow.

Legs yellow, femora lined with black externally and furnished with a row of closely-set hair-like spines.

Wings hyaline, pterostigma black, over $1\frac{1}{2}$ cells; membrane ashy grey, loop 7 cells, nodal index :—$\frac{6-13}{\varphi-8}\left|\frac{12-7}{\varphi-8}\right.$.

Abdomen tumid at base, narrow and cylindrical as far as segment 7, slightly dilated from base of latter to end of abdomen, slightly depressed. Glossy black marked with fine apical yellow rings on segments 1 to 3. Segment 10 strongly keeled and with an obtuse middorsal point at apical end. A small tuft of hairs beneath apical end of segment 7.

Anal appendages black Superior as long as the two end segments of abdomen, tapering and sloping slightly downward, the distal third turned in at a very obtuse angle, the extreme apex pointed downward. Inferior trifid from about its middle, the apical branch blunt, slightly notched, the lateral branches robust short spines, all three branches curving up, the whole appendage shaped like a bird's claw.

Genitalia. Lamina short, narrow, deeply bifid, rather depressed; hamules curled on themselves shell-like, the inner branch tumid at base and then abruptly tapering to a long fine hook, its apex curling inward lobe small, rounded, coated with long hairs.

Distribution.—Only known from a very limited locality, the Burliyar river in the Nilgiris. The type, a female in the British Museum, was described under the name of *Phyllomacromia nilgiriensis.* The terminal segments of the abdomen in the female are markedly depressed and dilated, thus differing from all other known species of *Idionyx.* In the absence of the male, this characteristic feature, which is shared by the African genus *Phyllomacromia*, led me to place it in that genus. The male which is now described does not differ in any respect from the generic characters common to other species of *Idionyx* and I therefore remove it to that genus.

The insect is remarkably swift on the wing and disports itself in the air with the activity and grace of a midge. Females are usually taken ovipositing in wet sand or mud. Dark corners beneath the undercut banks of streams or amongst boulders in the bed of the stream are favourite situations for this act.

66. **Idionyx corona burliyarensis** (Fras.)

(=*Idionyx corona nilgiriensis.*)

(Pl. XXVI, fig. 6).

Locally common in the bed of the Burliyar river, Nilgiri District, where the type was taken. Its distribution has now been extended to Coorg and probably Kanara and Malabar. Two females were taken down the Mangalore Ghat, above Sampaji, Coorg, near the Kanara frontier, 21-v-23, and more were seen and taken down the Cannanore Ghat, above Makut, Coorg, near the Malabar frontier, 29-v-23.

The species is inclined to be crepuscular in its habits and is rarely seen on the wing before 4 p.m. Usually found flying low in the bed of streams or, in Coorg, over roads, dirty cattle standings which attract flies being favourite spots.

As the specific name *nilgiriensis* is preoccupied by the removal of *P. nilgiriensis* to the genus *Idionyx*, it necessitates a change in the name of this subspecies.

67 **Idionyx corona corona** Fras.

The female type from the Bababudin Hills, Mysore, is in the Pusa collection. A second female was taken on the Coorg-Malabar frontier at Kunnut, 17-viii-23. The vesicle in this latter specimen seems even longer and more acute than in the type but I have not been able to compare the two. I was inclined to think that the vesicle in the type was the result of a deformity but Mr. Bainbrigge Fletcher, after re-examining it, expressed his opinion that its curious shape was natural and specific. The capture of a second specimen sharing the same curious character proves this opinion to be correct.

[68. **Idionyx stevensi,** sp. nov.]

(Pl. XXVI, fig. 1).

Male. Abdomen with appendages 32 mm. Hindwing 33 mm.

Head. Labium and labrum ochreous, ante- and post-clypeus glossy black, frons and vesicle metallic blue, latter rounded, comparatively small, simple, eyes emerald green, occiput black.

Prothorax brownish.

Thorax brilliant metallic blue on dorsum, green on sides, marked with citron yellow as follows,—*a short antehumeral stripe* not extending quite half way up dorsum, a medial stripe on the sides and the posterior half of metepimeron. Beneath yellow with a metallic green transverse stripe in front and a large triangular spot behind.

Legs. Hind femora black, middle and anterior pairs dark brown, hind and middle tibiae yellow on flexor surface, anterior pair brownish.

Wings hyaline, bases saffronated only as far out as half way to 1st antenodal nervure; membrane white; loop 8 cells; pterostigna black over $1\frac{1}{2}$ cells; nodal index :—$\frac{1-13}{11-9}\left|\frac{13-7}{9-11}\right.$.

Abdomen black with the ventral border of 2 narrowly yellow and narrow apical rings on segments 1 to 4.

Anal appendages black, superior rather flattened, irregular, with a long narrow digitate process beneath middle directed somewhat inwards, the apex slightly folded or twisted on itself, inferior appendage claw-like, longer than superiors, tapering to a point and with two robust digitate processes springing from its middle, equal in length to the part of appendix lying between their root and apex. (Fig. 1, pl. XXVI).

Genitalia. Very similar to that of *burliyarensis* but lamina more narrow and more deeply excavate, inner hamules rather longer, stouter, and more curled.

Female. Abdomen 33 mm. Hindwing 34 mm.

Almost exactly similar to male, differs as follows :—Abdomen stouter, laterally compressed and of even width throughout, segments 1 to 3 rather broadly bordered along ventrum with citron yellow ; membrane whiter; wings saffronated deeply and evenly as far out as distal end of trigones ; pterostigma longer and narrower, over 2 to 2½ cells.

Vesicle small, simple.

Vulvar scale pointed, extends along ventrum of segment 8, projecting very slightly beyond it, not very noticeable in profile.

Anal appendages black, small, conical.

Distribution.—A single pair from Mr. H. Stevens, taken at Gopaldhara, Rungbong Valley, Darjeeling district, Assam. Differs from other species by its very specialized anal appendages and by the possession of an antehumeral band.

I had taken this species for *optata*, having been misled by the appendages, but a comparison of these with the excellent figure of the appendages of the latter given by Dr. Ris in the above mentioned *Supplement. Ent.* 1, shows that the two are entirely different.

Subfamily AESCHNINAE.

69. **Hemianax ephippiger** (Burm.)

A common insect in the plains about Bombay, in fact distributed the whole length of the coast from Cochin to Karachi. I found it quite common at Poona and throughout the Satara district. Laidlaw remarks that it has not been recorded from any of the more densely forested areas, but during October I saw it in great numbers in many parts of Coorg. Many were beaten up from paddy fields which carpet the narrow valleys bisecting the forests of Coorg. They appeared to be resting here rather than breeding, for these lands are drained in November and any larvae starting life there would soon perish. I failed to find any larvae in any of the adjacent rivers nor did I expect to do so, as *H. ephippiger* breeds solely in stagnant waters. I took and saw several specimens at the great altitude of 5,000 ft., at Bhagmandala, Coorg, 17-x-23 ; these were hawking at a low altitude over the grassy summits of hills, which are surrounded by some of the finest and most extensive forests in India.

The species is much given to migration and one such flight was witnessed at dusk in Mercara towards the end of October.

70. **Anax immaculifrons** Ramb.

Found sparingly in most montane and submontane areas throughout Western India. I have taken it at Poona, 2,000 ft. Mahableshwar, 4,500 ft., throughout Coorg (rare at 2,000 ft., increasingly common up to 4,000 ft.), throughout the Nilgiris from 2,500 to 7,500 ft., where it breeds freely in all the small kundah streams. Both Mr. Bainbrigge Fletcher and Major Frere have taken it in the Palni Hills at 6,000 ft. and above.

Larvae are usually found in running water and at one time I was of opinion that they bred solely in rivers, but during 1922-23 I found

larvae in both the Ooty and Lovedale lakes, Nilgiris, and also in two ponds near Mercara, Coorg. In the first two weeks of March, 1922 I found several freshly emerged specimens hanging on reeds at dawn, around the banks of the Ooty lake. The first specimens observed on the wing appeared about the end of February.

By the end of March, great numbers were observed ovipositing in small streams on the kundahs, and from then onwards until the end of June the insect was tolerably common.

The onset of the monsoon, in June, soon exterminates them but a second and more scanty brood appears at its end.

Major Frere has sent me a piece of reed from the Palni Hills which is literally coated with the eggs of *immaculifrons*. These eggs have been laid by successive females, as it is obvious that they have been implanted from time to time, each section being exposed and dried as the level of the water fell. Major Frere watched one female at work on this piece of reed, the eggs being deposited well below water whilst the uppermost eggs were at least six inches above its surface. The situation was below a small waterfall, the brook for some distance having cut a deep channel through the peaty soil. The overhanging banks and coarse grass growing thereon had converted the channel into a gloomy tunnel, up which the female fearlessly found her way as far as the reed which lay some twenty five yards from the mouth of the tunnel. The sheltered position of the place probably led to females returning repeatedly to the same reed.

71. **Anax guttatus** (Burm.)

A common species in the plains and submontane areas throughout Western India. The form most commonly seen is one bearing bright orange markings on the abdomen. This is the form found so commonly in Bombay. I have, however, seen specimens of this and others with blue and greenish blue markings to the abdomen all occurring on the same tank at Fraserpet, Coorg, so am of opinion that they represent mere varieties.

The species is frequently seen flying from dusk until after dark, especially is this so in Coorg. At Hallery, near Mercara, during May, I found astonishing numbers sleeping in deep jungle during the daytime. Some of these were high up in trees and were brought down with a charge of dust shot for purposes of identification, others were resting at a moderate height from the ground and were easily secured with the net. The large species of *Anax* observed flying high, down the Mangalore ghat and mentioned under the heading of *Z. iris*, in all probability belonged to this species as I frequently saw numbers of *guttatus* flying over the forest at Hallery.

The species breeds in small weedy ponds, round which the males are often to be seen hawking or restlessly searching for females. The latter are however rarely seen and may possibly oviposit at or after dusk. I have bred them out in Poona, emergence taking place shortly before midnight and the insects taking to wing with the first sign of dawn.

72. **Anax parthenope parthenope** Selys.

Distributed widely throughout the area, frequenting similar situations and breeding in the same tanks as *ephippiger*. At Poona I have found these two species and *guttatus* all breeding together in a small tank measuring not more than twenty-five feet square.

It does not appear to occur above 2,000 ft., it is essentially a plain species and common all along the western coast line.

73. **Anaciaeschna jaspidea** (Burm.)

Records of this species from Western India are meagre, where, as far as I know, it has only been taken by myself. I secured a single female flying above the road bordering the Ooty lake, 7,250 ft., 8-iii-22, but never saw the species again in the Nilgiri district. In Coorg Mr. C. A. Souter and myself have taken it in conjunction, a few of both sexes amongst reeds on the Fraserpet tank and again over a swamp at Hoskoti, below Santakupa. All these specimens were put up by beating and none were seen on the wing until near sunset. Their flight is swift, erratic and frequently broken by long periods of rest. I found a few exuviae adhering to grasses along the borders of the Fraserpet tank. It is probably quite a common species, its immunity from capture being due to its secretive crepuscular habits.

74. **Anaciaeschna martini** (Selys).

(=*Anaciaeschna donaldi* Fras.)

Concerning this species which was described by Selys in 1897 as *Aeschna martini*, from a single male from Yokohama (female unknown), Dr. Ris writes to tell me that he has discovered that it is synonymous with my *Anaciaeschna donaldi*, described originally from a female from the Palni Hills (male unknown).

Anaciaeschna donaldi therefore gives place to *Aeschna martini* which is removed to genus *Anaciaeschna*. Dr. Ris thinks that the locality given for the male is erroneous. The original female, rather dilapidated, is in my own collection and was taken by myself in the Palni Hills, May 1908. Since then Mr. Bainbrigge Fletcher has taken it in the same locality (Kodaikanal), September 1921, Mr. T. N. Hearsey at Yercaud, Shevaroy Hills, September 1921, and I myself have found it in moderate numbers on the Ooty and Lovedale lakes, Nilgiris, from 1921 to 1922. The last record is from Hallery, near Mercara, Coorg, where I took a single female sleeping in dense jungle, May 1923.

The male described by Selys is apparently a teneral example and is similar to teneral males secured by myself. The adult male has never been discovered and its hiding places remain a complete mystery.

Mr. Bainbrigge Fletcher and Mr. Hearsey and myself have sought for it without success in every possible locality.

In March, 1922 I found a large number of exuviae clinging to bullrushes on the Ooty lake and thinking that the imago might emerge dur-

ing the night or early dawn, I sallied down to the lake-side at 5-30 the following morning and as the sky brightened eastwards I found quite a number of *martini* emerging. Quite half of these were males.

I placed them on the front of my jacket where they clung tenaciously and motored rapidly back to my bungalow. These specimens and others secured on following mornings were kept in a warm sunny room for a few days and soon developed their colours. Neither sex however developed any sign of the rich saffronation seen in the adult female, so that it is still imposssble to say whether the adult male has its wings saffronated or not, probably they are not. The lateral thoracic stripes, however, are almost certainly apple green in the adult as contrasted with the citron yellow bands found in tenerals.

Larvae abound in grassy shallows of the Ooty and Lovedale lakes and are almost black in colour, contrasting strongly with those from Kodaikanal lake, taken by Mr. Bainbrigge Fletcher, which are rust red.

These differences in colour are entirely due to adaptation to surroundings, the mud being black in the Nilgiri lakes and rusty in the Palnis.

75. **Gynacantha hyalina** Selys.

The only records I know of this insect from Western India are three specimens taken in thick jungle at Kallar, Nilgiris, 1,500 ft., a single female taken on the edge of the Lovedale lake, Nilgiris, 7,000 ft., a single female flying over a stream in the Nilgiri Wynaad, 3,000 ft. and a good number of specimens taken in various parts of Coorg, from 2,000 to 4,000 ft. (One of these latter came to light at the club, Mercara). All agree in size and general colouring with the Selysian description except for small details. One very old male with ragged dirtily enfumed wings taken at Kallar has the oreillets and a dorsal band connecting them azure blue, whilst the base and sides of segment 3 are similarly coloured. The abdomen in all specimens is pale at the base and sides of all segments from 3 to 7, the apical half and dorsum blackish brown, these oblique dark well-contrasted markings are very striking in younger specimens.

All specimens, except the three mentioned, were beaten up during the day from beneath deep shade at the bottom of deep narrow nullahs. Very few females were taken with the anal appendages whole, these having been fractured off during the process of ovipositing in dry soil.

76. **Gynacantha millardi** Fras.

Recorded from Palghat, Malabar, by Mr. T. N. Hearsey, and by myself from Coonoor, Ooty and Gudalur, Nilgiri District. Taken by Mr. C. A. Souter at Fraserpet, Coorg, 2000 ft. and by myself at Hallery and Hoskoti, Coorg. Specimens at Ooty were taken as early as February.

I took a pair at " Greenfields," Sidapur during January, and during February often saw them flying about the tennis courts, Mercara, at about dusk. The types come from Poona where the insect is common.

Subfamily CORDULEGASTERINAE.

77 **Orogomphus campioni,** sp. nov.

(Pl. XXVI, fig. 5).

Male. Abdomen 53 mm. Hindwing 45 mm.

Head rather broad from side to side, narrow and flattened from before back, frons as high as occiput. Eyes brilliant emerald green, labium pale yellow, labrum black, anteclypeus black, postclypeus traversed with a citron yellow stripe broadening at either end, frons black, its crest in front and above and a spot on either side against the eyes citron yellow. Rest of head black. Margins of face and frons fringed with long black hairs, vesicle with a tuft of hairs sloping forward, occiput with a stiff fringe slanting back.

Prothorax black with a large yellow spot on either side below.

Thorax deep black marked with bright citron yellow as follows : — a narrow slightly oblique antehumeral dorsal stripe with its upper end turning slightly out and almost confluent with the upper end of humeral stripe, its lower tapering to a point, not extending as far as anterior border of thorax, a humeral stripe slightly constricted above, broadening below where it becomes confluent with a spot on coxae, a posthumeral upper spot well behind upper end of last, a broad stripe lying between the two lateral sutures, lastly the hinder half of the metepimeron. (The shape and arrangement of the antehumeral and humeral stripes is exactly the same as that found in most species of Eppalagines.)

Legs black, coxae, trochanters and a stripe on outer sides of anterior femora yellow. A row of very closely set minute spines on femora with a single longer spine at distal ends.

Wings hyaline, the extreme apices dark brown ; pterostigma black, narrow, long, over 3 cells, unbraced ; a basal antenodal of second series in all wings ; nodal index $\frac{12-22}{13-15}\left|\frac{22-11}{16-13}\right.$, $\frac{12-21}{15-17}\left|\frac{21-11}{17-13}\right.$; median nervures $\frac{2}{2}\left|\frac{2}{2}\right.$, cubital nervures 7 and 6 in fore and hind wings respectively, trigones traversed once in all wings by a strongly curved nervure which runs from costal to outer side of trigone, hypertrigones traversed 3 times in all wings ; membrane brown ; greatest breadth of hindwing 15 mm.

Abdomen black marked with yellow as follows :—segment 1 with a small dorsal spot and the sides broadly, 2 with a complete apical ring, two lunules slightly separated by the dorsal carina lying just posterior to the jugal suture, the sides broadly basad to this suture and more narrowly apicalward, 3 with similar markings but the apical ring irregular and almost divided above by the dorsal carina, 4 to 7 with narrow paired apico-dorsal lunules, segment 4 with a minute dorsal spot at the jugal suture, remaining segments black.

Anal appendages black, superior as long as segment 10 and rather shorter than inferior, curling slightly inward, squared at apices where they bear a minute downwardly directed tooth, a second tooth on the outer side a little apical to the middle of appendages ; inferior appendage cleft nearly to base, branches widely divaricate, their ends

curling slightly up, furrowed on the outer side, a suggestion of a tooth on the outer side.

Genitalia. Lamina very depressed, slightly notched at its middle, its edges everted and bearing a small spine on either side, inner and outer hamules very similar, foliate, broad at base, rapidly tapering to a fine inwardly curled spine, inner hamules more narrow, slim and sinuous, lobe vesiculated, shaped like the bowl of a pipe with the adjacent portion of its stem.

The penis bearing a robust spine on its dorsum and two long fine spines distally, the whole genital sac literally bristling with this combination of spines.

Female. Abdomen 52-55 mm. Hindwing 50 mm.

Colour and markings very similar to the male but markings of abdomen much more restricted especially on segments 3 to 7, segment 8 has a small apical spot low down on sides and is spotted with yellow beneath where it bears a yellow U-shaped mark at its base. Abdomen a little tumid at base, laterally compressed, a little narrowed from 4 to 6, slightly dilated at 7 and 8, 9 and 10 rather abruptly narrowed and comparatively elongate, the latter glossy black.

Anal appendages small, conical, pointed, black, a large conical protuberance projecting between them.

Vulvar scale almost obsolete, a mere ventro-apical projection of the border of 8th segment, barely visible in profile.

Wings hyaline, apices diffusely tipped with blackish brown, almost the entire surface of wings richly saffronated, this more noticeable in teneral specimens, of a duller tint, and more restricted in adults.

The hinder border of the wing and area lying between *Rs* and the hinder border of wing almost clear, several nervures, especially *Miv*, *Cui* and *Cuii* heavily outlined in black.

Only a single row of cells between *Mi* and *Mia*, the latter beginning well after the distal end of stigma; trigones traversed 3 to 4 times, hypertrigones 4 to 5 times, nodal index $\frac{11-23}{14-1(}\left|\frac{22-13}{16-14}\right.$, $\frac{14-23}{15-19}\left|\frac{24-13}{19-15}\right.$, 8 to 10 cubital nervures; pterostigma black, over $2\frac{1}{2}$ cells, median nervures 2 to 3. Greatest breadth of hindwing 17·5 mm.

Distribution.—Coorg only. The first specimen, a female, (was taken along the Mercara-Napoklu Road, April 22·23. It was soaring in wide circles, wheeling slowly with the grace of an aeroplane, its wings very conspicuous from their deep saffronation. When first seen it was over dense jungle but as it circled out over the road at a height of about 150 ft. I brought it down with a charge of dust shot from a ·22 Winchester rifle. Unfortunately it wheeled and fell in very heavy jungle and after half an hour's fruitless search I was just giving up the hunt when I spotted it hanging from a twig at about twenty feet from the ground. To get at it, I had to cut through a heavy thorny belt of lantana and scale the tree. I had thought the insect would probably turn out to be a *Macromia* and was agreeably surprised when I found I had secured a new *Orogomphus*. I saw a second female about twenty minutes later in the same place but it was quite 200 ft. up and far out over the jungle and I did not get the chance of a shot at it.

No more specimens were seen until May 1st when I came on a female hawking flies round a cattle-shed and flying low over the ground, not more than a foot or two above its surface. I took it quite easily with my net and five minutes later secured a male which was hawking up and down over the road close by. From its flight and clear wings I again mistook the male for a *Macromia*. A third female was taken on May 2nd flying in company with another female over the Sidapur road about four miles from Mercara. On the same day about one mile out of Mercara I came on yet another female flying along the edge of the khud. Whilst following it up, it vanished into the scrub growing on the face of the hill-side. On approaching the spot I was surprised to see the female fly up with a male *in cop.* The nearest water was at least a mile away so that copulation takes place a long way from the breeding grounds and the female probably seeks these out afterwards and oviposits unaccompanied by the male. On May 3rd I saw a single female and no less than five males all flying too high to net and as I had run out of cartridges I failed to take a single specimen of this fine lot. The last specimen was seen on May 5th so that their season appears to be of very brief duration. Breeding places unknown.

The species is named after Mr. Herbert Campion. Type and cotype in B. M.

NOTE.—I had hoped to publish a wing photograph of this fine species and had delayed publication whilst awaiting its receipt from Mr. Herbert Campion. It is with deep regret that I now hear the melancholy news of his premature death. Entomology could ill afford to lose so scholarly and so painstaking a scientist and odonatology loses in him one of its chief exponents. It gives me great satisfaction to recall his pleasure when I informed him that I was naming the new *Orogomphus* after him.

78. **Orogomphus xanthoptera** Fras.

No more specimens of this fine insect have been taken since Mr. Prater took the type in the High Range, Travancore. I thought that this and the previous species might be conspecific but Mr. Campion after carefully comparing the types sent me the following report :—

"I am disposed to regard your *Orogomphus xanthoptera* as being more of a *Chlorogomphus* than an *Orogomphus*, because the eyes are more widely separated than in true *Orogomphus*, the hindwing triangle is more like that of *Chlorogomphus* and so is the length of the abdomen in relation to the length of the hindwing. Your new species (*O. campioni*) —for it is obviously a new one—seems to belong to both genera ; that is to say, if I had the male alone before me, I should place it without hesitation in *Orogomphus* whereas the female might very well go into *Chlorogomphus*. The differences between your male and female are certainly greater than in *Orogomphus dyak*, Laidlaw, from Borneo, which is the only true *Orogomphus* in our collection. The female of your new species is conspicuously smaller than the female of *xanthoptera* ; the wings are unequally suffused with warm brown, instead of being equally suffused with pale yellowish brown ; the abdomen lacks any yellow markings after segment 3 ; and the abdomen is less conspicuously dilated at segments 8 and 9. The difference in the coloration of the face may be due to difference in the state of preservation."

Subfamily Gomphinae.

79. **Ictinus rapax rapax** (Ramb.)
Ictinus rapax mordax Selys.
Ictinus rapax praecox Hagen et Selys.

I. mordax and *praecox* are undoubtedly synonymous with *rapax*. I have taken a large series of these in Coorg and find constantly all three on the same ponds. I have compared Assam specimens with those of South India and am unable to find any differences whatever. It occurs commonly throughout the whole of Western India especially in the plains and submontane areas. In Bombay it breeds in tanks, in Poona in the Mullah and Byrobah rivers, in Coorg equally in tanks and rivers. It is a dragonfly that is never seen away from the neighbourhood of water and males are found perched on prominent twigs around the borders of ponds or banks of canals and rivers.

80. **Gomphidia T-nigrum** Selys.

Only known from the Katraj lake, Poona, where it is not at all uncommon. The type is from North India but apart from the Selysian specimens I have never heard of it being taken elsewhere but at Poona. There is a specimen in the Pusa collection, labelled May 16th 1905, Lahore.

81. **Gomphidia fletcheri** Fras.

This magnificent species is known only from Hallery, Mercara, Coorg, where I took two males, 7th June 1923. I have recently dredged up some very large gomphine larvae in this same stream, from sand at the bottom of a waterfall, which I feel sure are the larvae of this species on account of their large size. The only other large *Gomphus* found on this stream is *M. hannyngtoni* the larva of which has been determined. Whilst reserving the description of this larva until its identity is definitely proven, I may say that it is fusiform in its length, narrow and cylindrical in diameter, *viz.*, quite different in shape to that of *Ictinus*.

82. **Gomphidia kodaguensis** Fras.

Only a single specimen of this insect is known, which was taken in jungle a short distance from the banks of the Cauvery river, Dubary, near Fraserpet, Coorg, 21st June 1923. Its finding in jungle is noteworthy, as so different from the habits of other known species of the group.

83. **Macrogomphus annulatus** (Selys.)

Within the area, known only definitely from Poona, where it is, during its season, quite common and breeds in the Mullah river. I found its exuviae abundantly, clinging to reeds and grass stems, along the banks of this stream. I have seen a single male at Mercara, which was resting on a twig at about 30 feet from the ground. I shot it down with a charge of dust shot but it fell into such dense jungle that I failed.

to retrieve it, so cannot say definitely as to whether it was *annulatus* or not. I found exuviae commonly along the banks of the Cauvery at the beginning of April but all were old specimens.

The species is an arboreal one and resting high in trees probably often escapes notice. Recently I took a young larva in a stream near Bhagmandala, Coorg, and I observe, in this specimen, that the anal syphon is as long as the rest of the body.

84. **Macrogomphus wynaadicus,** sp. nov.

Female.—(Male unknown.) Abdomen 53 mm. Hindwing 45 mm.

Head.—Mid-lobe of labium black, lateral lobes yellow ; labrum black with a tiny point of yellow on either side the middle line ; bases of mandibles yellow ; rest of face black except for a small spot against the eyes on either side, the postclypeus and a broad stripe on crest of frons ; vertex black ; occiput dark reddish brown, slightly raised in the middle ; eyes bottle green.

Prothorax black with a narrow anterior yellow collar.

Thorax black marked with greenish yellow as follows :—parallel dorsal stripes broadly confluent with a slightly interrupted mesothoracic collar, a broad stripe posterior to the humeral suture, the whole of metepimeron save for a narrow posterior border of black, a broken yellow stripe (interrupted below) marking the broad black medio-lateral stripe, a few yellow spots on tergum.

Legs entirely black.

Wings evenly enfumed, reticulation closer than in *annulatus*, thus the pterostigma covers 6 to 7 cells instead of only 4 and the nodal index is higher $\frac{14-20}{13-15}\left|\frac{20-14}{14-13}\right.$; pterostigma black, braced ; 2 cubital nervures in all wings ; 5 cells in anal triangle ; a basal antenodal nervure of the second series present in all wings.

Abdomen black marked with citron yellow as follows :—segments 1 and 2 broadly on the sides, 1 with a dorsal spot, 2 with a dorsal stripe rather broadly broken at its middle, 3 with a very large baso-lateral spot widely separated from its fellow, 4 to 6 with similar but smaller spots, 7 with its basal half yellow, this finely divided by the black mid-dorsal carina which expands basad, 8 with a small baso-lateral spot, 9 with a tiny yellow point in the same situation, 10 unmarked, longer and narrower than in *annulatus*.

Anal appendages short, stout, conical, pale yellow.

Vulvar scale a mere glossy black convexity at apical border of eight segment below.

Distribution.—A single female from Masnagudi, Nilgiri Wynaad, 18th August, 1922. The capture of this specimen was one of those lucky chance strokes which come but rarely to all collectors. I was walking along parallel to a small river, hidden from it however by a tall thick hedge of lantana. Quite suddenly this female came skimming over the hedge almost into my face and although taken by surprise I managed to take it with a rapid swish of my net. I quite think that the Coorg specimens mentioned above, under *annulatus*, will eventually turn out to be this insect.

Differs from *annulatus* by the longer 10th segment, by the yellow markings on face much more restricted, by the absence of a humeral spot, by the abdomen bearing lateral spots instead of complete basal rings, by the wings longer, more densely reticulated, etc. From *robustus*, which it resembles more closely, by its larger size, by the abdomen spotted instead of ringed, etc., from *montanus* by the yellow markings much more restricted (the median black stripe on sides of thorax in *montanus* being reduced to fine black sutural lines, and there is also a vestigial humeral stripe). From *parallelogramma* (Java), which it closely resembles, by its larger size, longer pterostigma, over more cells, by the occiput dark brown instead of yellow and by anterior femora black without a yellow spot. Otherwise it resembles this species by its mid-lateral broken yellow stripe and spots instead of complete rings to abdomen. Similar characters separate it from *albardae*, whilst the absence of a humeral stripe separates it from *decemlineatus*.

Genus **Davidioides,** gen. nov.

Three cross nervures between *Mi-iii* and *Miv* in forewing, only one in hind ; sectors of arc well separated at origin, approximately parallel for some distance, especially in the hindwing ; *Cui* and *Cuii* parallel in both fore and hind-wings; *Miv* and *Cui* in forewing parallel to beyond node ; no basal antenodal of 2nd series present ; trigones of forewing entire, that of hind traversed once by a vertical nervure, very narrow and elongate, inner side less than half the length of costal, outer side sinuous ; pterostigma shorter than one-fourth the distance between node and outer end of pterostigma ; base of hindwing deeply excavate ; 4 rows of postanal cells in hindwing, 1 or 2 in fore ; legs moderately long, extending to apical border of segment 1 ; anal appendages subequal, widely and equally divaricate, simple, without branches or ventral processes. Geno-type *D. martini.*

The genus is closely allied to *Gomphus* (*s. s.*), differing only by the long narrow traversed triangle of hindwings. It is clearly not even nearly allied to genus *Davidius* but comes into Laidlaw's series *Gomphus.*

85. **Davidioides martini,** sp. nov.

(Fig. 2).

Male.—Abdomen with appendages 38 mm. Hindwing 33 mm.

Head.—Eyes pale bottle green, labium dirty yellow, labrum black with a largish basal spot on each side widely separated from each other, mandibles yellow at base, anteclypeus yellow, postclypeus black, frons black on lower part of front, yellow on upper and above, its base above broadly especially at the middle, occiput black, simple, slightly concave.

Prothorax black marked with yellow :—a minute central spot on dorsum of posterior lobe, a large lateral on each side of middle lobe and a geminate spot on middorsum, an anterior collar of yellow.

Thorax black on dorsum, yellow on sides, a slightly interrupted mesothoracic collar, slightly oblique antehumeral stripes not extending to alar sinus and widely separated from mesothoracic collar, a minute upper humeral spot on each side. Laterally two medial narrow parallel

black stripes enclosing an equally narrow yellow one, a narrow black line on the posterior border of metepimeron confluent above and below with the medial black stripes. Beneath yellow.

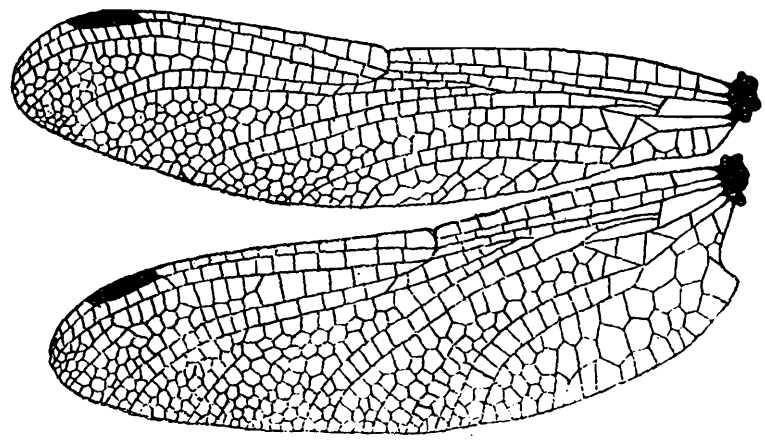

FIG. 2.—Wings of *Davidioides martini.* Male.

Wings hyaline, pterostigma dark reddish brown, braced, over 3 to 4 cells, 4 cells in anal triangle of hindwing, first postanal cell entire, nodal index $\frac{12-14}{12-10}\left|\frac{16-12}{10-13}\right.$.

Legs black, anterior and middle femora yellow within, hinder reddish brown, armed with a row of very short, very closely-set even spines.

Abdomen black marked with yellow as follows :—segment 1 with a large spot on dorsum and the sides broadly, 2 with the oreillets, lower part of apical and the ventral borders narrowly and a middorsal fusiform spot not extending to base or apex of segment, 3 to 7 with basal rings, narrow on 3 to 6, occupying basal half of 7, where also there is a small apico-lateral spot on each side, 8 to 10 unmarked.

Anal appendages.—Superior as long as segment 10, bright yellow, narrowly black at base, widely divaricate, conical, tapering to a point, with 5 to 6 minute black spines on the ventral surface. Inferior deeply cleft, branches widely separated from origin, equally divaricate but shorter than superiors, curled slightly up at apices, black.

Genitalia.—Lamina deeply cleft, very depressed, inner hamules long narrow thin flattened blades, outer hamules much more robust, tumid at base, tapering to a point which turns forward, projecting perpendicularly from genital sac ; lobe projecting, shortly truncate, outer end deeply notched, its base tumid yellow, extending forwards towards hamules.

Distribution.—A single male from Kunnoth, N. Malabar, 19th May 1923. Type in my own collection.

86. **Heliogomphus pruinans** Fras.

A very local insect known only from Coorg and the Nilgiris, where it is moderately common during the month of June. Found in the bed of the Burliyar river, Nilgiris and a small stream flowing through Hallery estate, near Mercara, Coorg. Usually seen settled on rocks in midstream or less rarely on foliage bordering the rivers. I have been unable to tell which is its larva from among a number of different Gomphines dredged from the Hallery stream.

87 **Microgomphus torquatus torquatus** (Selys.)

I took a good number of these in Poona, in the Byrobah nullah and Mullah River, in 1918. It breeds in those waters and is usually found resting on stones and rocks in the bed of the stream. When disturbed it at once rises into the neighbouring trees, where its shagreen of black and yellow renders it remarkably inconspicuous. The Selysian type, a female, is simply reported as from "India," without locality.

88. **Microgomphus torquatus souteri,** subsp. nov.

Very similar to *torquatus torquatus*, differs as follows:—In *torquatus torquatus* the lateral black stripe by meeting the finely black upper part of the postero-lateral suture forms a "Y" shaped marking, in *souteri* the area between the stripe and suture, *viz.*, between the arms of the Y is filled in to form a broad black stripe expanding above. The meso-thoracic collar is notched at its middle and there is no medial prolongation up the middorsal carina, the vestigial humeral spot is also absent. Beneath thorax pruinosed pure white. Legs black except anterior pair in which the femora are yellow within. Segment 2 with a broad basal ring but no other dorsal markings, 3 and 4 without dorsal markings,segm ents 8 to 10 entirely black.

Superior anal appendages very dark green, a minute but very distinct spine on outer side at junction of middle and apical thirds (I note that this is not shown or mentioned in Laidlaw's description but the spine is visible, although almost obsolete, in *torquatus torquatus*), the inner branches springing from nearer the base of appendages and converging, meeting and finally running in close apposition.

Genitalia similar, lamina very depressed, deeply notched, inner hamules long sinuous spines, outer thick tumid processes, projecting straight out, with a minute spine at apex, lobe enormously produced and tumid, rather deeply notched.

Distribution.—Coorg only. A teneral male found floating down river accompanied by its exuviae, Bhagmandala road, 29th April 1923. From lack of markings I took this to be *torquatus*. Two males seen settled on a gravelly beach in stream near Somwarpet, 5th May 1923, one of these was secured, the other rose into trees bordering the stream. A single male from Hallery, near Mercara, 7th June 1923 settled on a rock in mid stream. A single male put up in evergreen jungle Somwarpet, 1st July 1923. Four males Sampaji River, Mangalore Ghat. These were all settled on trees overhanging the stream and I managed to take three of them. All these specimens similarly marked. *Type* will be deposited in B. M. Named after Mr. C. A. Souter, Commissioner of Coorg.

89. **Cyclogomphus heterostylus** Selys.

The only record of this species from Western India is based on specimens determined by Laidlaw, which I took on the Kartraj lake, Poona. The specimens were taken among low herbage at the upper end of the lake, which is no more than an extensive marsh graduating into the lake,

90. **Cyclogomphus ypsilon** Selys.

Taken in company with the last and known only from Poona within the limits of Western India. Has similar habits to the last and breeds with it, in marshes.

91. **Burmagomphus laidlawi,** sp. nov.

This species was originally described from a female as "*Gomphus* sp." Fras. *Rec. Ind. Mus.* Vol. XXIV, p. 419, 1922. Since then I have discovered the male and am now able to definitely place it in genus *Burmagomphus*.

Male.—Abdomen 33 mm. Hindwing 27 mm.

Head.—Labium midlobe black, lateral lobes greenish white, labrum black marked with two transversely oval yellow spots, mandibles yellow, ante- and post-clypeus black, a spot of yellow at anterior lower margin of latter, very small and sometimes absent, frons bright citron yellow or with a greenish tinge, rest of head black, occiput almost straight, slightly raised in middle, fringed with long black hairs. Eyes bottle green.

Prothorax black with a large lateral spot and an anterior collar yellow.

Thorax black marked with greenish yellow or whitish green as follows :—a complete mesothoracic collar, oblique antehumeral stripes extending from the alar sinus but falling well short of the mesothoracic collar, minute upper humeral spots, the vestigial remnants of a humeral band, the alar sinus, the whole of the sides greenish yellow except lateral sutures which are rather broadly mapped out in black, the anterior stripe with an upper and lower projection of black backwards which may be confluent with the posterior stripe thus cutting the included yellow band into two or three pieces, usually though only the upper part of black stripes confluent. (In a specimen from South Kanara the medial yellow band is almost obsolete, the black stripes confluent for nearly their entire length, and there are no labial spots.)

Legs black, anterior femora yellow internally. Hind femora with a row of rather widely spaced robust gradually lengthening spines, middle pair with more numerous more closely-set smaller spines.

Wings hyaline slightly tinted with yellow at bases, and in some specimens a little enfumed apicalward, first postanal cell undivided, 4 rows of postanal cells in hindwing, 2 rows in fore. Pterostigma strongly braced, over 4 to 5 cells, dark brown. Two rows of cells in discoidal field of forewing as far as level of node, nodal index $\frac{13-16}{11-10}\left|\frac{15-12}{10-12}\right.$, $\frac{10-14}{10-9}\left|\frac{12-10}{10-11}\right.$.

Abdomen black marked with yellow as follows :—segment 1 with a dorsal spot extending from base to apex and the sides very broadly, 2 with a bilobed dorsal spot extending from base to apex and the sides broadly, a black vertical stripe running behind the auricles, 3 with the middorsal carina finely (only at the base of some specimens) and a large basal lateral spot, 4 to 6 with basal dorsal triangular spots confluent with lateral basal lunules, 7 with a broad basal annule occupying rather less than one-fourth the length of segment, 8 unmarked or with a minute

triangular basal dorsal spot and, in some, a still smaller apical spot, 9 with the apical half, or rather less, bright yellow, this colour sometimes extending irregularly along dorsal crest, 10 unmarked.

Anal appendages black, both strongly divaricate, but the inferior rather more than superiors, apices of superiors twisted in and down, very finely pointed, branches of inferior curling up. Equal in length and both shorter than segment 10.

Genitalia black.—Lamina very narrow, very depressed, hamules projecting, markedly squared, their outer straight borders in close apposition and bearing on the anterior corner a robust forwardly directed spine and on the hinder angle two or three similar robust spines directed down or back, lobe very prominent and tumid rounded, folded on itself longitudinally.

Female very similar to the male, markings much better defined, humeral spot larger and continued brokenly as a line below.

Distribution.—Type female from Gudalur, Nilgiri Wynaad, 3,500 feet. Co-type male from Kallar, Nilgiris 13th August 1922, taken *in cop* with a second female. Very scarce throughout the Nilgiris but moderately common in Coorg. Like *Macrogomphus annulatus* and *B. pyramidalis* this species is arboreal in habits, but quite occasionally it may be seen resting on rocks in midstream, awaiting the advent of females. The pair taken *in cop.* were taken flying up the bed of a small stream, a tributary of the Kallar River.

92. **Burmagomphus pyramidalis** Laid.

A moderately common insect at Poona where it breeds in the Byrobah nullah and Mullah canal, evenly distributed in the montane areas of Coorg, rare in the Nilgiris, but a small colony has established itself at the extreme southerly end of the Wynaad. Like *Macrogomphus*, this is an arboreal species and usually found resting on evergreens, to which it retires as soon as its wings are dry enough to take the air. (Species belonging to genera *Macrogomphus*, *Microgomphus*, *Burmagomphus*, and to a less degree *Heliogomphus* all agree in this habit). Mr. H. V. O'Donel has found this species common in the Duars, Bengal, during the past two years.

93. **Gomphus nilgiricus** Laid.

A rare species which is apparently being fast surplanted by the more dominant species of *Lamellogomphus*. The type is from the Nilgiris, where I took a solitary male in 1917 in the bed of the Burliyar river. A single female was found lying dead by the roadside at Coonoor, in the same month. During the two years 1921, 1922 I never saw another specimen on that side of the Nilgiris but took a single male at Gudalur, Nilgiri Wynaad on 24th May 1921. In June 1923 Major Frere found the species at Kodai Kanal, Palni Hills, 6,800 feet, on three streams, Cinchona, Reservoir and Bear streams. Three pairs were taken on the Bear stream, the females ovipositing where water filtered down through grass and mud, the males resting on stones in a shallow rapid. Two males were taken on the Cinchona stream (5. vii. 23) and a female ovipositing in the Reservoir stream on 27th July 1923.

During the same year I took a couple of males in Coorg, on a stream crossing the road two miles above the Hatti River. One of these was sitting on a stone below a culvert, the other was resting on twigs in a very gloomy jungle at the fount of the same stream.

No other records of this insect have come to hand but it is probably widely but sparcely distributed along the course of the Western Ghats, at altitudes above 3,000 feet.

94. **Lamellogomphus nilgiriensis** (Fras.)

Only known from the Nilgiri Wynaad and Coorg. In the former district it breeds in a single stream near Gudalur and is quite common during the month of October. In Coorg it is found on a number of streams, but more especially on small tributaries of the Cauvery, near Bhagmandala. It occurs also along the course of Sampaji River which flows down into South Kanara from Coorg. In Coorg it is fighting for its existence against the more dominant *L. acinaces* which bids fair to entirely surplant it. The distribution is, however, rather curious and goes to show that *acinaces* is not having it entirely its own way. On the Sampaji stream I found that about seven out of every eight Lamellogomphines were *nilgiriensis*, whilst Mr. C. A. Souter collecting on the Bhagmandala streams, a few miles away, took ten *acinaces* males to every single *nilgiriensis*, and of six females taken the whole belonged to the former species. It is clear that the two species cannot exist on the same streams and that one must eventually become extinct.

95. **Lamellogomphus acinaces** (Laid.)

Reported only from North and South Kanara and Coorg, the latter place being its apparent zoo-centre. Found together with the last species on rapid shallow jungly mountain streams. Its larva, like that of the last species, breeds in deep pools in the course of streams and is to be sought for amongst leaf mould at the bottom of such pools where its dark colour, broad and extremely flattened body closely resemble a dead leaf. *L. acinaces* and *nilgiriensis* are very closely allied, resembling one another, not only in size, shape and markings, but also in their entire habits.

96. **Lamellogomphus malabaricus** (Fras.)

Known only from a single female taken at Palghat, Malabar by Mr. T. N. Hearsey. Is evidently closely allied to the two last species.

97. **Mesogomphus lineatus** (Selys.)

Distributed sparingly throughout the whole of Western India. I have taken it as high as 6,000 feet in the Nilgiris but this is quite unusual, a submontane area of about 2,000 feet being the altitude of its greatest incidence. A riverine species usually found settled on the sandy foreshores of rivers, where its cryptic colouring renders it very inconspicuous.

98. **Onychogomphus striatus** Fras.

Known from a single male taken at Kallar, Nilgiris, 1,000 ft., May 1917 The specimen was taken in dry jungle about a mile from the Kallar river. It is the only true *Onychogomphus* known from South India and is closely allied to *bistrigatus*.

99. **Indogomphus longistigma** Fras.

Distributed throughout Coorg and the Nilgiri Wynaad at an altitude of 3,000 feet. In my definition of the genus, in the *Records of the Indian Museum*, I omitted two very important characters, the great length of the legs, their striking armature and the unusual length of abdominal segments 8 and 9; these two, and segment 7, being sub-equal. The armature of the legs is given under the description of the species and is well demonstrated in the accompanying plate in the *Records*.

The species shows some affinities to *Platygomphus*, but I think can not be included in Group *Gomphus* although it is somewhat of an oddity. The presence of a basal antenodal nervure of the second series and the large number of rows of cells between *Mi* and *Mia* is certainly foreign to that group and the anal appendages are an almost exact replica of those of *Heliogomphus*.

100. **Megalogomphus hannyngtoni** (Fras.)

This fine species is apparently restricted to Coorg where it is localised in two or three small streams at an altitude of 3,500 feet.

The habits of the species have been dealt with in conjunction with its description in the *Bom. Nat. Hist. Journal*, its exuviae has been described in the Memoirs of Pusa, recently however I have discovered its larva in a stream near Bhagmandala, Coorg and have been able to make some observations of its habits, at least in captivity. Five adult specimens were dredged up from the bottom of a pool lying just below a rapid. This pool was carpeted with sand in parts and with leafy debris in others, but I think it was in the former that my specimens were lurking. They resembled the exuviae in every respect except colouring, this being brown above, leaf green below, the terminal segments of the abdomen marked with a dark arrow-head of blackish brown above. This marking is present in some young larvae and, if it had not been present, I should not have thought that they were conspecific, as it is, it will prove a valuable asset in working out the life history by the examination of a series. Placed in a bowl, and given a generous allowance of sand, they for a time lay dogger on its surface, soon however they commenced to burrow and were rapidly lost to sight, nothing but the tips of the cerci being finally visible and even these of one being entirely buried. The larvae have now been under observation for some time, burrowing goes on actively judging from the continually altering contours of the sand which is thrown into ever changing hillocks and valleys. Occasionally the back of one is exposed but this is rare. I think that they must depend for their livelihood on what they find in the sand for a number of larvae placed in the bowl have so far enjoyed a perfect

immunity from attack. Possibly they live on smaller Gomphine larvae but I have not yet experimented in this direction. (A number of Gomphine larvae have since been introduced and were all devoured during the following night.)

Suborder ZYGOPTERA.

Subfamily AGRIONINAE.

101. **Neurobasis chinensis** (Linn.)

One of the commonest, most beautiful, and most widely distributed dragonflies in India, found throughout Western India at altitudes above 1,000 feet, usually in streams flowing through heavy jungle.

Probably the highest recorded altitude at which this insect has been taken is 7,500 feet in the Nilgiris, where I took a single pair on a kundah stream, May 1922. I have records of it for every month of the year, so that it is evident that there is a continuous succession of broods. When in flight, the hindwings are held practically flat, displaying a magnificent play of emerald green and blues, these wings acting as planes whilst the fore serve to propel the insect as it skims closely over the surface of the stream. Both sexes mingle unconcernedly, resting on rocks in midstream or on herbage bordering it, pairing rarely being seen. I saw two pairs ovipositing on a root, the male was partly submerged, the female completely so for at least ten minutes. The situation chosen was at the foot of a waterfall and it was astonishing how the two insects maintained their hold in the face of the rush of water, as it was, they were swept from side to side with the alternating phases of the current, the female steadily plodding its eggs into the root and apparently quite unconcerned. Larvae are found in plenty, clinging to grasses alongside shallow streams.

102. **Vestalis gracilis** (Ramb.)

Large colonies of this species occur scattered generally throughout the district. Unlike the last, it leaves its breeding grounds and takes to heavy shady jungle where it may be found in scores resting on bushes in some very circumscribed space. The female oviposits in reeds overhanging the surface of streams.

I watched one female ovipositing at a height of nearly two feet above water, the male accompanying it.

103. **Vestalis apicalis** Selys.

Distribution and habits exactly similar to the last species.

Subfamily EPALLAGINAE.

104. **Pseudophaea dispar** (Ramb.)

The distribution of this beautiful dragonfly has been extended during 1923 to Croog and South Kanara. Previously it was known only from the Nilgiris from where the type comes. It appears at the present time to be engaged in a losing fight with the more dominant

species *fraseri*, which is steadily driving it to higher altitudes at which *fraseri* does not appear to be able, to exist. Thus, except for Coorg, the line of distribution meets at altitudes varying from 3,000 to 4,000 feet, *but in localities where* fraseri *is unknown*, dispar *occurs at much lower elevations*. In the Nilgiris, Coimbatore side, where *fraseri* is unknown, I have taken it at 1,500 feet. In the Nilgiri Wynaad and in Coorg, both species meet from above and below respectively at an altitude varying between 3,500 and 4,000 feet, *dispar* being however by far the least common species of the two. On the other hand *dispar*, where not confronted with the competition of *fraseri*, is common enough. I know of a small colony near Coonoor which I have watched for the past fifteen years, and of whic the population appears to be on the increase.

105. **Pseudophaea fraseri fraseri** Laid.

This small form appears to be restricted to Kanara. In a previous note, in the *Records of the Indian Museum*, I had commented on the disparity in the size of Laidlaw's form and the one taken in the Nilgiri Wynaad. Since then I have had an opportunity of collecting specimens from Kanara and find that they are *invariably smaller* than those from the Wynaad and Coorg, and are obviously two distinct races, the differences between which have already been pointed out, *loc. cit.* The size of this small form is very constant, unlike that of the other, which is very variable and runs up to as large as the smallest *dispars*.

The larvae scarcely differ from that of *Pseudophaea variegata* described by Dr. Ris (*Uber Odonaten von Java und Krakatau*), and is found lurking among leafy debris at the bottom of deep pools in the course of mountain streams. In sections made for me by Col. Cornwall, I.M.S., I quite failed to find the peculiar tufts of fibrils occupying the alveoli of the saccus whic Dr. Ris demonstrated in the above mentioned species.

106. **Pseudophaea fraseri wynaadensis** Fras.

Occurs in vast numbers on all streams in the Nilgiri Wynaad, and to a less extent throughout Coorg above 3,000 ft. It appears on the wing in April and is found from then onward until well into November. In Coorg, at Hallery, I have seen great numbers of females perched in trees in heavy jungle. Most of these have the wings darkly enfumed and many have the apices a very dark brown.

It is quite common too, to find the male leaving its parent stream and taking to the jungle, thus differing markedly from other species of the genus which are never found away from the neighbourhood of streams. In spite of its great numbers, I have never once seen a female ovipositing, although on several occasions I have seen them *in cop.* in jungle.

107 **Dysphaea ethela,** sp. nov.

Male.—Abdomen 38 mm. Hindwing 33 mm.

Head velvety matt black, unmarked save for two triangular spots of yellow below and behind occiput. Eyes dark brown or black.

Prothorax black, mid-lobe above obscurely yellow.

Thorax matt black marked with greenish yellow,—fine antehumeral and humeral stripes confluent above, separated below (these obsolete in most adult specimens). Laterally greenish yellow shaded with olive and brown and marked irregularly with black,—a broken irregular stripe after 1st lateral suture and the anterior half of metepimeron black.

Legs black, femora with an inner stripe of yellow narrowing distally, coxae with a spot of the same colour. Spines on tibiae and femora few and very short.

Wings evenly enfumed with pale greenish brown or darker brown, this varying widely with age of specimen ; pterostigma very long, black. Wings very narrow, fore and hind of equal breadth.

Abdomen black marked with greenish yellow as follows,—segment 1 with a narrow apical annule and its ventral border, 2 with a broad lateral stripe constricted and then again dilated at apical border, and the ventral border narrowly, 3 to 6 with baso-lateral stripes confluent with a lateral stripe, which on 3 and 4 runs the full length of segment, on 5 for only the basal half, on 6 for the basal third, similar basal spots on 7 and 8 but no lateral stripe, the latter segment with a ventral stripe on its posterior two thirds, remaining segments unmarked.

Segment 10 flat on the dorsum, superior anal appendages as long as segment 9, tapering, curving gently inward, the apices nearly meeting, inferior appendages aborted, almost obsolete.

Female.—Abdomen 32 mm. Hindwing 33 mm.

Head.—Eyes dark olivaceous brown, bluish grey beneath, rest of head black with a vertical white stripe margining the eyes and confluent with a transverse white stripe at base of epistome.

Prothorax black, with a transversely oval spot of yellow on each side of middle lobe.

Legs black, unmarked, save for the coxae which bear a yellow spot.

Thorax black marked with bright citron yellow as follows :—antehumeral and humeral stripes squarely confluent above and meeting at a point below, thus enclosing a large oval spot of the ground colour. Laterally bright yellow broken up by a narrow anterior and broad irregular posterior black stripe.

Wings hyaline, palely or deeply enfumed but not to the extent found in the male, fore and hind wings narrow and of nearly equal breadth and length, pterostigma very long, 4·5 mm, blackish brown.

Abdomen black with markings similar to, but better defined and more extensive than in male. Segment 3 marked very similarly to 2 and with a latero-ventral stripe, segments 4 to 7 all marked similarly, and oblique lateral stripe confluent with a basal narrow ring which is narrowly broken on the middorsal carina. Segment 9 has a large triangular spot of yellow on each side.

Anal appendages very short, conical, pointed.

Distribution.—Coorg only, along the course of the Cauvery river from Napoklu to Fraserpet, less common in the Hatti and Harrangay rivers, tributaries of the Cauvery. Only two females taken, one of which is in the B. M., and the other in my own collection. These were taken at Dubary, near Fraserpet, in a teak plantation about a quarter of a

mile from the river. A good number of males were taken at Napoklu, Madapur, Murnad, Sidapur, Dubary and Fraserpet. All were taken on the river's bank perched on reeds or bushes overhanging the water or less commonly settled on rocks far out in the stream. They are very shy insects and difficult to take. When disturbed they at once rise into neighbouring trees, sometimes to a great height and remain there until the source of danger is removed. Breeds in the Cauvery.

The species is of great interest as being the first of its genus to be taken within Indian limits, the nearest relation coming from Java, Sumatra and Borneo. The insect is named after my wife, the constant companion of my collecting trips. Types in B. M.

In a female specimen taken recently, the mandibles are bright yellow and there is an oval yellow spot on each side of the labrum and a finer one on each side of the epistome. The wings in this specimen are very palely enfumed. It was taken perched on the parapet of a wooden bridge spanning a small tributary of the Cauvery.

Subfamily LIBELLAGINAE.

108. **Rhinocypha laidlawi,** sp. nov.

Male.—Abdomen 17·5 mm. Hindwing 20 mm.

Head black spotted with vermilion, a large spot at the apex and dorsum of epistome, a pair of small oval spots at its base, a pair of larger oval spots behind these, one lying on each side of the ocelli and finally minute round postocular spots.

Prothorax black, unmarked.

Thorax black, the mesothoracic triangle extending the whole length of dorsum, bright vermilion in colour. Laterally azure blue, a small spot of this colour at upper part of humeral suture, the upper and lower ends of postero-lateral suture broadly black.

Wings hyaline, *the outer third of all black*, the margin of this quite straight and sharply defined from the hyaline part of wing, *no vitreous spots* on this black area which is violety metallic blue by reflected light. Pterostigma black, lying very near apex of wings, so near that they take part in the curving of apex. Wings equal in length and breadth, both pairs very narrow, apices markedly rounded.

Legs black, flexor surfaces of two hinder pair of femora pruinosed white.

Abdomen black marked with azure blue on sides of segments 1 to 8, sides of segments 1 to 3 broadly blue, from 4 to 8 broad at base, tapering apically, segments 3 to 8 with paired basal subdorsal lunules.

Anal appendages black, superior as long as segment 9, tapering to a point, slightly convex outwards, inferior appendages half the length, small pointed stilettes.

Distribution.—South Kanara only. Twelve males taken on one stream in the Kanara-Coorg enclave Nov. 9th 1923. Eight of these were taken by myself on one branch of the river, and four by Mr. C. Souter on another, on the same date. No females were seen but we may have confused them with the females of *R. bisignata* which were about in considerable numbers. All specimens were found in very shady parts

of the river, settled on herbage by the side of the stream or on partially submerged logs in the bed of the stream. When hovering or disporting over the water, the red markings are very conspicuous and coupled with the blue give a close resemblance to *Pseudagrion rubriceps* for which I mistook the first specimen seen. The species is named after Dr. Laidlaw, in acknowledgment of much friendly help and advice.

109. **Rhinocypha bisignata** Selys.

The type is from the Nilgiris where it is a common insect. Found above 1,000 feet, throughout the whole district, except from Poona; is scarce at Khandala. In Coorg and South Kanara it is taken in every month of the year, a continuous succession of broods appearing, the first one during April. At higher levels, such as Ootacamund, it only appears during the warmest months and disappears totally from about October to April.

Breeds in rivers, the larvae hiding up among leafy debris in deep pools and, unlike most Rhinocyphine larvae, never very difficult to find.

110. **Micromerus lineatus** (Burm.)

A common insect on all streams around Poona, Khandala and throughout the Satara district, less common in Coorg, along the whole course of the Cauvery and on many of its tributaries. Unknown from elsewhere in the district. Breeds in similar situations to *Rhinocypha*, its eggs being inserted into floating debris or reeds. During the day the imago is found perched on reeds or bushes overhanging the streams in which they breed, but towards evening they rise into the surrounding trees where they form "rookeries," made up of many scores of individuals. (After finishing this MS. I received some specimens from Mr. C. A. Souter, taken in S. Kanara, Feb. 24th 1924, Hakkal River, 300 ft.)

Subfamily LESTINAE.

Seven species of Lestinae are known from Western India, three of which are entogenic in Coorg and one in the Palni Hills. The remaining species, *L. elata* and *praemorsa* are widely distributed throughout the area and together with *L. patricia* and *dorothea* (new species from Coorg) belong to Selys First Section of the genus *Lestes* characterized by the moderately broad wings and similarly shaped quadrilaterals of fore and hindwings. *L. viridula* is known from Bombay and Coorg.

The two remaining species, *gracilis birmanus* and *pulcherrima* belong to the Second Section of the genus characterized by the relatively narrow wings, and quadrilaterals varying in fore and hindwings. This section, in the first instance, included a number of Australian and Ceylon forms, the former of which were separated by Tillyard to form genus *Austrolestes*. In *Austrolestes* we find the nervure *ac* (anal crossing) lying at the level of the first or proximal antenodal nervure. *A. colensonis* is the only exception, but even in this the nervure *ac* lies slightly proximal to the middle of the distance between the two antenodal nervures, and its general facies and colouring resemble so closely other species of the

genus that it may be considered as a slightly atypical member of the genus.

In the remaining, or Ceylon forms, we find on the contrary that *ac* always lies distal, sometimes very much so, of the middle of the distance between the two antenodal nervures. This characteristic forms a very natural cleavage of the Second Section and as the Ceylon group has not been named up to the present, I propose to call it genus *Ceylanicolestes*.

It must be noted that the new genus is closely related to both *Sympycna* amd *Indolestes*, but in these latter the ground colouring is some shade of yellow or brown and the wings are more or less deeply enfumed or saffronated. In all species of *Ceylanicolestes* on the contrary, the ground colouring is bright blue and the wings are uncoloured. The pterostigma in the last genus is usually relatively short and blackish brown, whereas in the two former genera it is relatively long and some shade of pale brown or bicolorous. Lastly, species of all three genera rest with their wings closed over the back, in sharp contrast to the habit, of other members of the subfamily.

111. **Lestes elata** Selys.

A common plain, or more rarely submontane species, not usually rising above altitudes of 2,500 feet and distributed throughout the whole area.

In the Nilgiris and Coorg I have taken it during every month of the year so that there would appear to be a succession of broods or an overlapping of several. Its life history is very short. At Hallery, below Mercara, I saw great numbers of paired specimens busy ovipositing in rice stems at about six inches above the level of water. This was on June 26, the paddy only having just been flooded, and previous to that date no *elata* had been seen at such an altitude. I was of opinion that a swarm had come up from the plains below, probably representing an annual immigration. On September 8th I observed great numbers of tenerals emerging from these same fields so that they could not have been much more than two months in the larval stage. During June vast numbers were observed over tanks on the Mysore-Coorg frontier.

112. **Lestes praemorsa** Selys.

Less common than *elata* but distributed widely throughout the area at altitudes of over 2,000 feet, becoming increasingly common up to 3,500 feet.

Found throughout the year and even as late as December, great numbers of tenerals are observed emerging in Coorg. Does not appear to rise above 4,000 feet in any part of Westerr India.

113. **Lestes dorothea,** sp. nov.

(Pl. XXVI, fig. 8.)

Male.—Abdomen with appendages 40 mm. Hindwing 26 mm.

Head.—Eyes sapphire blue above, turquoise blue beneath; labium yellowish white; labrum, cheeks and frons turquoise blue, rest of head matt black.

Prothorax matt black.

Thorax black, the sides pruinosed white, greenish yellow beneath. On the middorsum two linear metallic green stripes with an upper and median lateral expansion similar to that found in *praemorsa*. The area behind these bands paler, followed by a diffuse black humeral stripe.

Laterally a large diffuse black spot just in front of upper part of postero-lateral suture, another smaller at middle of antero-lateral suture and a similar over spiracle, tergum, pruinosed blue, no visible spots below but this area obscured by heavy pruinescence.

Legs greenish yellow striped laterally with black, tibial spines long, femoral short, 14 on hind femora.

Wings hyaline, a little enfumed, pterostigma black, rather less than two and a half times as long as broad, the ends squared but a little oblique, 15-16 postnodal nervures in forewings, 14-15 in the hind.

Abdomen azure to greenish blue marked with black as follows :— segment 1 broadly black on dorsum, apical border finely blue, 2 with a broad mark shaped like the head of a thistle, 3 to 6 all with a broad dorsal stripe expanded and again contracted at the apical ends where they join up with a fine apical ring, basalward tapering to a point which just meets the apical ring of the segment before and leaves a minute spot of blue on either side. The expanded apical part of stripe passes right round each segment as a broad subapical ring, segment 7 with a similar stripe but not reaching basal end of segment, towards which it tapers, 8 to 10 entirely black save for a fine blue basal ring on 8, segment 10 pruinosed on the dorsum.

Anal appendages bluish during life, pale yellow after death, broadly black at base and apex. Directed straight back, the apices turned down and curved in at an angle of 45 degrees. Basal half expanded on the inner side and with a very robust blackish spine at its root. Apex with some fine spines on the outer side. Inferior appendages very short black tipped with whitish hairs, extending only as far as basal spine of superiors, not visible from above, widely separated.

Female.—Abdomen 36 mm. Hindwing 27 mm.

Differs from male in its ground colouring and broader markings. Eyes olivaceous, bluish behind. Thorax olivaceous green, pale greenish yellow at the sides. Ninth segment with a large midlateral spot of blue on each side, 10 entirely blue save for the middorsal carina which is finely black.

Anal appendages small, black.

Distribution.—Found breeding in nearly every tank throughout Coorg, often in company with the two preceding species. Easily distinguished from *elata* by the shape of its dorsal thoracic bands and from *praemorsa* by its much larger size and by the absence of markings on sides of segments 8 and 9.

When at rest, it holds its wings nearly horizontal and with the abdomen curved strongly up dorsalwards, constantly swinging it pendulumwise. Types in B. M., paratypes in Indian and Pusa Museums and in my own collection. First specimens seen 16th April 1922, last seen 29th September 1922.

114. **Lestes praemorsa decipiens** Kirby.

The species is synonymous with *praemorsa* of which it represents the heavily pruinosed adult. Specimens were found dotted sporadically throughout the Nilgiris and Coorg, generally during the winter months.

After making careful comparisons with specimens of medium age I am convinced that *decipiens* cannot even claim subspecific rank.

115. **Lestes patricia,** sp. nov.

(Pl. XXVI, fig. 7.)

Male.—Abdomen 37 mm. Hindwing 23·5 mm.

Head.—Eyes deep azure blue above, turquoise blue beneath; labium ashy grey; labrum, cheeks and frons azure blue, rest of head matt black.

Prothorax greenish blue on the sides, matt black above.

Thorax bluish green above and on sides, ventrum pale greenish white. A middorsal stripe of matt black with straight borders, extending on each side to about half way to the humeral suture, latter very finely black above, the area between the humeral and postero-lateral sutures dark greyish green for its anterior two thirds. Beneath obscurely spotted with black as follows:—2 spots at anterior part of unpaired sclerites, an oblique spot at metepimeron-metasternum suture on each side.

Legs bluish outwardly, reddish on flexor surface, black on extensor. Spines on femora short, on tibiae long. (About 11 spines on femora).

Wings hyaline, very faintly saffronated or enfumed, this only noticeable when the wings are superposed. Pterostigma dark brown, nearly four times as along as broad; 14 postnodal nervures in forewing, 10 in the hind. Quadrilaterals equal, *ac* midway between the antenodals.

Abdomen bluish green marked with matt black on segments 1 and 2 and from 6 to 10, segments 3 to 5 warm brown above, non metallic. All segments with a broad dorsal stripe dilating apically and not quite extending to base of segments, segment 1 with only its basal half black, 2 with an even stripe only, slightly dilated apically, on 7 the stripe broadens gradually apicalward and 8 to 10 are entirely black. Segments 9 and 10 pruinosed white on the dorsum.

Anal appendages.—Superior black with the inner dilatation white, this latter rather broad and with a sharp robust black spine at its base. Apical ends turned in at nearly a right angle, with some small obscure spines on the outer border. Inferior very short, digitate, black, extending nearly to the end of expanded part, apices naked, rounded.

Distribution.—Only known from a single male taken on a tank at Virajpet, Coorg, 24th June 1923. Easily distinguished from all others by its solitary middorsal band of matt black. I had mistaken it for a slighthly teneral specimen of *pulcherrima* described below until I noticed its broad wings and equal quadrilaterals.

116. **Lestes viridula** Ramb.

This species is more or less confined to the plains, especially inland to Bombay. I found it common on Elephanta Island, Bombay and sparingly so about Poona and Khandala. This year (1924) I have discovered a very localised colony at Gonikopal, Coorg, where in about half an hour I took twenty couples. It is probably very seasonal as well as local, occurring during the dry hot months of the year when other species are yet in the larval stage. In its normal hiding place, amongst tall dry grasses, its dull khaki colouring renders it very inconspicuous.

Genus **Ceylanicolestes,** gen. nov.

Jungle haunting species resting in bushes or trees with their wings folded close over the back. The nervure *ac* distal to the middle of the distance between the antenodal nervures and in *pulcherrima,* at least, nearly at the level of the outer antenodal. Quadrilateral narrow, with very acute outer angle, that of hindwing considerably longer than that of forewing and with its inner side not more than one third the length of upper side. Spines of tibiae relatively long, those of hind tibiae longer than tarsal claws of same leg. Colour blue marked with bronzed black. Pterostigma unicolorous, usually blackish brown. Wings narrow.

Species and subspecies : *C. gracilis gracilis, gracilis birmanus, gracilis perigrinus, divisa* and *pulcherrima.*

117 **Ceylanicolestes gracilis birmanus** (Selys.)

Found only in the Palni Hills within the area under discussion. Dr. Ris has redescribed the species from Shembaganur, Palni Hills, and since then the insect has been collected at Kodai Kanal in the am i hills at 7,500 feet by Mr. Bainbrigge Fletcher and Major Frere, both o whom sent me large series. The latter collected most specimens from the end of June till well into August, some coming from Pannaikadu, E. valley, 5,000 feet.

118. **Ceylanicolestes pulcherrima,** sp. nov.

(Pl. XXVI, fig. 9.)

Male.—Abdomen 34 mm. Hindwing 21 mm.

Head.—Eyes above and behind sapphire blue, paler turquoise blue in front, greenish yellow beneath ; labium white ; labrum and lower epistome turquoise blue, upper epistome darker blue marked with two small black points, rest of head black with a dull green metallic green reflection.

Prothorax bluish at the sides, brownish above marked with two parallel green stripes.

Thorax a beautiful turquoise blue, the dorsum narrowly dark metallic green, the middorsal carina and margins of alar sinus finely blue. Laterally a large black spot behind the upper part of first lateral suture and a smaller behind its middle, the extreme upper ends of sutures black.

Beneath dirty white with two large black spots converging at the anterior part of unpaired sclerites and a larger blackish brown spot on either side posterior to them.

Legs brown, flexor surfaces black.

Abdomen turquoise blue marked with black as follows :—segment 1 with a small basal dorsal spot, 2 with an apical ring and a broad dorsal stripe shaped like the head of a thistle, 3 to 7 with broad dorsal stripes not extending as far as base of segments but expanding and again contracting near apical end of segments to join fine apical rings, 8 entirely black on dorsum except for apical suture which is blue, 9 with the basal third black, 10 entirely blue.

Anal appendages.—Superior blue at base turning to dirty white and finally brown at apices which are tipped with white hairs, of nearly even width throughout, furnished with a very robust white spine at junction of apical and middle thirds. The apices curving gently in, furnished with four or five minute spines on the outer side. Inferior appendages small, blackish brown, paler at apices, about half the length of superiors but much stouter and closely apposed in the middle line, apices hairy.

Wings hyaline, postnodal nervures in forewing 12, in the hind 11. Pterostigma blackish brown with paler borders, twice as long as broad, inner side oblique, outer straight.

Female.—Abdomen 33 mm. Hindwing 24 mm.

Head.—Eyes olivaceous green above, paler greenish yellow beneath ; labium whitish ; labrum very pale blue, rest of head as for male.

Prothorax and thorax pale olivaceous brown sometimes with a violaceous tint, markings as for male, the middorsal carina and margins of alar sinus are, however, a fine reddish brown.

Legs pale yellowish brown marked as in male.

Abdomen violaceous brown with a warm reddish tint towards the anal segments, marked with black as follows :—segment 1 with a basal dorsal spot, 2 with a broad stripe split by the dorsal carina for its apical two thirds, the carina reddish brown, the stripe unevenly expanded towards the base of segment, abruptly expanded towards the apex, 3 to 5 marked as for male, basal rings on segments 5 to 7 bluish. The dorsal marking on segment 2 dark green metallic, on 6 and 7 very diffuse basalward, more defined at apex of segments, segments 8 to 10 dark brown.

Anal appendages rather long, pale blue.

Distribution.—Found only in Coorg, in most swampy areas from 2,500 to 3,500 feet. At Hoskoti only did I find it leaving its jungly retreats and resting among reeds. Often numbers were seen perched up in trees at a height of four to fifteen feet from the ground. In these situations it rested at the extreme ends of twigs and in spite of its bright blue colouring was wonderfully inconspicuous. Most species were taken on Hallery Estate, near Mercara, in swampy ravines, the females being somewhat scarce and keeping to the shelter of the surrounding coffee. Easily distinguished from others of the genus by the large extent of blue colouring and especially by the terminal blue on segments 9 and 10.

An additional feature is the widely distal position of the nervure *ac*. Rests with wings closed.

Subfamily COENAGRIONINAE.

119. **Onychargia atrocyana** Selys.

Within the limits of the area under survey, only known from Coorg. I have found it breeding in the tank at Fraserpet, on a tank beyond Sidapur and another near Virajpet and in a marsh above the Hatti River, about six miles beyond Mercara. Whilst great numbers of tenerals are continually seen emerging, the adult insect is comparatively rarely come across, except when actually pairing. I believe this to be due to the fact that the adult retires to the shelter of trees on which I have occasionally seen them at a great height from the ground, a very rare habit amongst Coenagrionines. The original home of the species is Malaysia but zoo-centres have been established in Assam, Ceylon and Western India, so that here again we come on the oft recurring radiating emigration.

Coorg specimens are rather larger than the type, abdomen and hindwing of male measuring 26 mm. and 19 mm., respectively, otherwise they do not differ in any respect.

120. **Ischnura aurora** (Brauer)

Distributed throughout the whole area from sea-level up to over 7,000 feet. This tiny dragonfly has established itself on the Ooty lake, 7,250 feet, and has there formed a distinct race, with the yellow segments of the abdomen bright red. At Coonoor, 12 miles away and 1,750 feet lower down, specimens are true to type, with citron yellow abdomen. It is interesting to note that the Ooty lake is a purely artificial one, dating back less than a century, so that this race has developed within a remarkably short space of time. I failed to find it elsewhere on the Nilgiri plateau.

121. **Ischnura senegalensis** (Ramb.)

Distribution similar to the last species. An uncommon dragonfly in Coorg, occurs sparingly on the Fraserpet tank and on a few tanks in North Coorg. It has also established itself on the Ooty lake, where it swarms in thousands, to the almost total exclusion of all other small species. Apart from rivers, the Nilgiri plateau has no other water supplies other than the Ooty and Lovedale lakes, thus it has happened that species accustomed to breeding in still waters, emigrating across the hills, have been trapped by these two lakes. The Ooty lake has been successfully colonised by *senegalensis* and to a less extent by *aurora*, the Lovedale lake, only two miles away, has been colonised by *Aciagrion hisopa* to as great a degree as the Ooty lake has been by *senegalensis*. Thus it is almost impossible to find a specimen of *hisopa* on the Ooty lake and on the other hand a *senegalensis* on the Lovedale lake. Now one must remember that both these lakes are artificial and at their inception both were entirely free of dragonfly larvae. It follows

that any species, arriving from without, would have, if it were first on the spot, an existence absolutely free from competition and that its numbers would therefore rapidly increase. Once having obtained a firm footing, it would easily be able to cope with small immigrations from outside. I think there can be no doubt but that *senegalensis* was first on the spot as regards the Ooty lake, and *hisopa* on the Lovedale.

The orange form of the female is merely a teneral condition, as in other species of *Ischnura* and *Agriocnemis*. In spite of the hundreds of red females present on the Ooty lake, I have never once seen any *in cop.*, whereas other females are commonly seen so. In addition to the red female, andromorph specimens are common and so similar to the male that only their sexual organs differentiate them. *Normal* females are probably the most common, whilst the tenerals (heteromorphs) are of course more common than either.

122. **Mortonagrion varralli** Fras.

Known only from the Vihar Lake, Bombay. On the wing the species is very inconspicuous and resembles *Aciagrion pallidum*. I took it amongst undergrowth in rather dark jungle near the Vihar and Pawai lakes in the month of March 1920 but no other specimens have been taken since. As it was in great numbers there, it should not be difficult for any collector on the spot to find it again. It was apparently breeding in an old brick tank close to the lakes.

123. **Agriocnemis pygmaea** (Ramb.)

Distributed throughout the whole of Western India at all altitudes up to 6,500 feet. Breeds in marshes, sluggish brooks and weedy tanks.

124. **Agriocnemis pieris** Laid.

A submontane species found throughout the Wynaad (Malabar and Nilgiri), Kanara and Coorg, up to an altitude of 4,000 feet. Breeds entirely in marshes. This tiny species is found stealing along in short jerky flights through lush grass or rank vegetation. Its white colouring is very conspicuous in spite of its small size, and must be a source of peril to it, especially from other predacious insects such as dragonflies. The female, with its black coating obscuring most of the ground colour, is much less conspicuous.

125. **Agriocnemis splendidissima** Laid.

A submontane species like the last and not found below 2,000 feet. Occurs on various ponds throughout Coorg, being especially common on ponds near Virajpet and Somwarpet. I do not know the altitude of Castle Rock, Kanara, or Chalakudi, Cochin, where the original specimens were taken, but I should imagine that they are nearer sea-level, personally however I have not taken this species below the altitude given. (It has a very scattered distribution throughout Western and Central India.) Found round the borders of ponds resting on short grasses about an inch above the water and therefore quite difficult to

take without wetting ones net. At Gonikopal I found females fairly common, hiding among sensitive plants not far from the pond. It has not been recorded from the Nilgiri district or Palni Hills.

126. **Enallagma parvum** Selys.

Common everywhere up to an altitude of 4,000 feet, breeding in weedy ponds. Females are taken with or without the humeral stripe enclosed, the latter character being I believe unique in the genus.

Rests on grasses rather far out from the borders of weedy ponds.

127. **Aciagrion pallidum** (Selys.)

Confined so far as I know to the northern part of the area and coastal line. It swarms in long grass in Poona, especially along the banks of the Mullah river. Not uncommon in many parts of the Satara district and at Khandala. I took a single female at Mahableshwar, but this must be very high for it. Unknown from Coorg, the Nilgiri or Palni Hills.

128. **Aciagrion occidentalis** Laid.

(Fig. 3, iii, p. 496.)

This species was described by Laidlaw as a race of *hisopa* and named by myself as a distinct species under the name *paludensis*. Mr. Laidlaw however recognised his *occidentalis* in the latter, and it now takes specific rank. The species has a wide distribution throughout Western India and Ceylon, preferring submontane and montane areas. My first specimens were taken over marshes at Avalanche, Nilgiris, 7,000 feet and since then I have taken it in many parts of the Nilgiris and Coorg. One finds it cropping up in many unexpected places, thus Avalanche is an open grassy country, whilst other situations, in which I have found it, are beside weedy ponds, in the depths of jungly ravines amongst rank herbage or in sequestered spots on coffee estates. All males have the 8th abdominal segment marked with a black wedge with its apex directed basad, extending nearly or quite up to the base of the segment. It is a smaller and much more slender and fragile insect than *hisopa* and is easily distinguishable from the latter, even when on the wing.

129. **Ceriagrion coromandelianum** (Fabr.)

Extremely common over the whole area up to an altitude of 4,000 feet. Breeds in weedy ponds and lies up among long grass bordering such places.

130. **Ceriagrion rubiae** Laid.

A widely distributed species, more common in the northern part of the area, comparatively rare in the Nilgiris and unknown from the Palnis. In Coorg it is the commonest species of the genus, almost entirely replacing *coromandelianum* at altitudes of 3,000 to 4,000 feet. I have found it on tanks in country at the foot of Khandala but it is

unknown from Poona or Bombay. Found in similar situations to the last but usually in submontane areas only.

131. **Ceriagrion aurantiacum,** sp. nov.

Male.—Abdomen 35-37 mm. Hindwing 22 mm.

Head.—Eyes olivaceous green above, golden yellow laterally and beneath; labium yellowish; labrum bright orange bordered with yellow; face olivaceous, vertex and occiput olivaceous brown with a reddish tinge.

Prothorax and thorax uniform old gold, slightly paler beneath and low down on the sides.

Abdomen orange with a distinct reddish tinge, segments 5 to 7 gradually darkening, 8 to 10 paler and without any red tinting, 3 to 6 with fine apical black rings and equally fine yellow basal annules.

Legs ochreous or reddish orange.

Wings hyaline, palely and evenly enfumed; pterostigma reddish yellow; 11 to 12 postnodal nervures in forewing, 10 to 11 in the hind.

Anal appendages similar to those of *olivaceum*, ochreous or olivaceous, equal, half the length of segment 10; superior ungulate, obtusely hooked inward and downward at apex. Inferior broad at base rapidly tapering to a rather fine point, sloping steeply upwards towards the superiors.

Female.—Abdomen 35 mm. Hindwing 24 mm.

Very similar to male but the whole colouring duller, the thorax olivaceous, abdomen warm brown above, legs yellow, labium and cheeks bright citron yellow. Forewing with 12 to 13 postnodal nervures, hind with 10 to 11.

Distribution.—Nilgiri Wynaad and Coorg. Like *olivaceum* this species is restricted to jungles and is often found in great numbers where occurring, keeping to low scrub or tall grasses.

Is closely allied to *olivaceum* but is distinguished from it by its brighter colouring, enfumed wings with fewer postnodal nervures and by its slightly smaller size.

132. **Ceriagrion olivaceum** Laid.

Restricted to the more northern part of the district and usually in submontane areas. Is a very common insect in Poona and throughout the Satara district, where it is found swarming in long dry grass. This species and the last are rarely if ever found over water, they appear to breed in swampy jungles. The type is from Burma but I have received specimens from Mr. Bainbrigge Fletcher taken in Shillong, Assam, so that the species has a wide distribution.

133. **Ceriagrion cerinorubellum** (Brauer)

Within the limits of Western India known only from North Coorg, where it has established a very definite zoo-centre. The Coorg specimens probably constitute a definite race, differing from type by a total absence of blue on sides of thorax. Mr. Bainbrigge Fletcher points

out that this species is only found in Bihar on heavily weeded ponds. This holds good also for Coorg, where it is usually taken on tanks so thick with grass that the water's surface is quite obscured. Mr. C. A. Souter found it in vast numbers on a tank at Hulsi, N. Coorg, at the end of October, but when I visited the same tank at the end of November not a single specimen was to be seen.

134. **Pseudagrion praeclarum,** sp. nov.

(Fig. 3, vi, p. 496.)

Male.—Abdomen 39 mm. Hindwing 27 mm.

Head.—Eyes blue above, pale greenish blue to yellow beneath; labium white; labrum turquoise blue; face and frons greenish blue; vertex black with a large pyriform azure blue postocular spot behind each eye united by a transverse linear stripe on occiput.

Prothorax pale blue, posterior lobe unmarked, middle lobe with subdorsal and lateral longitudinal parallel lines of black united posteriorly. Laterally and beneath pruinosed white.

Thorax azure blue changing to greenish and finally yellow low down on sides. Middorsal carina finely black, a narrow black line running parallel to this on either side, the area between bright ochreous. Humeral suture finely black expanding above to inner side into a large quadrate spot and as a small tongue of black to outer side of suture. The suture and markings framed in bright ochreous. A small spot of black in front of and another behind lower anterior end of humeral suture, a third spot lying midway between the two lateral sutures, finally a small spot of black on upper end of postero-lateral suture.

Legs white, femora with a longitudinal stripe of black on outer side, tibiae with a black stripe on the flexor surface, spines black.

Wings hyaline, pterostigma equal in all wings, pale sepia. Postnodal nervures in forewing 16, in hindwing 14.

Abdomen with segments 1 and 2 bluish, 3 to 7 greenish yellow, 8 to 10 azure blue marked with black, except the three latter segments. Segment 1 with a large basal dorsal quadrate spot, 2 with a goblet-shaped mark bearing a large oval blue spot at its centre, 3 to 6 with broad dorsal black stripes expanding apically and then contracting again to join fine apical rings, 7 somewhat similar but the apical dilatation continuing to the apical border, segments 8 and 9 have an apical ring of black spines.

Anal appendages dirty white edged and tipped with black. Superiors as long as segment 10, bifid as seen in profile, expanded apically as seen from above. Inferior about two thirds the length of superior, white tipped with black, ungulate.

Distribution.—A single male taken at Makut, Coorg, 250 feet, 28th November 1923, in dense primaeval jungle where a perpetual twilight prevailed. The nearest water supply was a small mountain stream where the sunlight filtered through fitfully. The insect was perched on a twig, lit up by a thin shaft of sunlight and thus attracted my attention. No other specimens were found on the Baripola River near by

or any other streams about Makut, although a prolonged search was made for them.

This new species differs widely from all other known Pseudagrions by the great length of its abdomen and the large number of postnodal nervures. Its colouring is both striking and beautiful.

135. **Pseudagrion malabaricum,** sp. nov.

Male.—Abdomen 33 mm. Hindwing 20 mm.

Head.—Labium white, labrum and epistome azure blue with 3 minute points on epistome and a small central point behind frons black, vertex blue traversed by a broad black band from eye to eye, occiput black marked with two very large blue postocular spots. Eyes turquoise blue with a black cap above. In adult specimens often the whole of upper surface of head posterior to epistome is black save for the postocular spots.

Prothorax black with an anterior collar, the posterior lobe, two dorsal spots near hinder margin and a spot on either side blue.

Thorax azure blue marked with three broad black bands on dorsum, a medial and humeral, and on the sides a small spot between the lateral sutures above and a second on upper part of postero-lateral suture.

Abdomen blue marked with black as follows :—segment 1 with a broad quadrate basal spot, 2 with an apical ring, a short goblet-shaped mark on the dorsum extending for three fourths the apical end of segment, hollowed out basalwards and with a very thin stem which joins the apical ring, lastly a basal ring on dorsum and sides extending as a point along dorsal carina, which projects into mouth of goblet, segments 3 to 6 with broad dorsal stripes expanding apicalward and connected with narrow apical rings, 7 with similar stripe which broadens steadily as far as apical border, 8 and 9 with fine apical rings only, 10 broadly black on dorsum. Legs blue, femora with black stripe behind.

Wings hyaline, pterostigma dark brown, postnodals in forewing 10 to 11, usually the latter number, 9 in hind.

Anal appendages black, superior slightly shorter than segment 10, pale within, *not bifid*, diverging strongly, apices curling strongly inward as a robust tooth. Seen from the side bluntly pointed and bevelled from apex below. Inferior very small, pointed obtusely.

Female.—Abdomen 32 mm. Hindwing 22 mm.

Labium white, labrum and epistome pale olive green deepening to black on vertex. Postocular spots peacock blue. Eyes olivaceous with dark brown cap.

Prothorax as for male but anterior collar broader, and posterior lobe and processes yellow.

Thorax peacock blue *marked similarly to the male* but shoulder stripes slightly narrower and lying in a background of golden green.

Wings hyaline, pterostigma pale brown, postnodal nervures to forewing 11 to 12, in the hind 10.

Abdomen bluish broadly marked with black on dorsum, the spot on segment 1 reaches apical border on 2, the goblet is filled up and is more of the shape of a thistle-head, extending whole length of segment, 8 and 9 all black, 10 blue save for a narrow basal ring black.

Distribution.—First taken in Kodai Kanal, Palni Hills by Mr. T. Bainbrigge Fletcher, September 1922, and almost at the same time by myself at Ootacamund, Nilgiris, 7,250 feet. A few specimens were taken by Major Frere at Kodai in 1923 and in the same year I took it abundantly throughout Coorg which seems to be its real headquarters. From September to December, the tanks in North Coorg are literally blue with the vast numbers present. I had at first named this species wrongly as *bengalense* from which it is hardly distinguishable, but the finding of the female, which is the only one of the group *microcephalum, australasiae, bengalense, malabaricum* which resembles its male in thoracic markings, made me reconsider the determination and I now consider it a distinct species or at least new subspecies.

The anal appendages of the male differ from those of the three others mentioned above by not being bifid at the apex, they are shorter than *bengalense* and longer than *microcephalum.* Its abdomen is longer than any of the other species of the group. *P. bengalense* is confined to North India, *microcephalum* to the coast line and sea-levels of Western India and *malabaricum* to the montane and submontane areas of the Western Ghats.

136. **Pseudagrion indicum,** sp. nov.

(Fig. 3, i, ii, iv and v.)

Male.—Abdomen 34 mm. Hindwing 22 mm.

Head.—Labium white, labrum, face and cheeks pale yellowish green, eyes black above, greenish at sides and beneath, vertex and occiput black, large azure blue postocular spots behind eyes.

Prothorax azure blue marked with fine subdorsal and lateral longitudinal lines confluent behind black, posterior lobe blue.

Thorax black on dorsum with grass green humeral stripes on each side, azure blue laterally, changing to grass green along borders of the dorsal black, the upper half of first lateral suture and an upper spot on second lateral suture black.

Legs yellowish green, the femora striped with black outwardly.

Wings hyaline, pterostigma blackish brown, 12 postnodal nervures in forewings, 10 in the hind.

Abdomen.—Segments 1, 2 and basal half of 3 azure blue, 3 to 7 greenish, 8 to 10 azure blue, all segments marked with black as follows :—1 with a dorso-basal spot not quite reaching apical border, 2 with a dorsal marking similar to that in *Agrion mercuriale*, confluent with a fine apical ring, 3 to 6 with narrow dorsal stripes expanding and then contracting again near apical border, where they join narrow apical rings, 7 with a broader dorsal stripe widening progressively as far as apical border, 8 and 9 with narrow apical rings subject to much variation, usually split into two points by the blue dorsal carina invading it, or with a single point at its middle on dorsal carina, or the border of ring, facing basalward, may have three points on dorsum and another point laterally, segment 10 black on dorsum, blue apically and laterally. In Coorg specimens the marking on segment 2 shows much variation, it may be simply goblet-shaped with a stunted stem and hollowed basalward

or it may have a long slender stem, the cup deeply hollowed above and receiving a pointed process of black at its middle which extends from

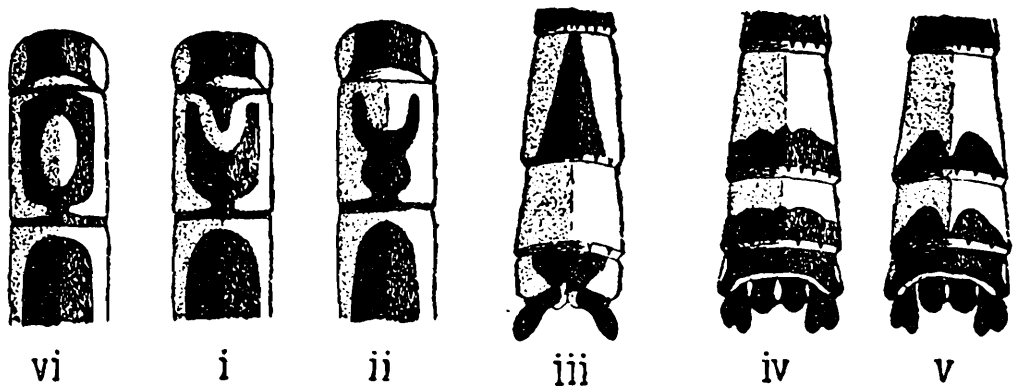

FIG. 3.—i. First and second abdominal segments of *Pseudagrion indicum* (Coorg form). ii. The same of type male. iii. Segments 8 to 10 of *Aciagrion occidentalis*. iv. Segments 8 to 10 of *Pseudagrion indicum*. v. The same variety. vi. Segments one and two of *Pseudagrion praeclarum*.

a narrow basal ring. The apical rings on segments 8 and 9 are broader than in Wynaad specimens and their basal border is usually irregularly pointed. The sides of thorax are usually entirely blue without any green bordering to the black.

Anal appendages black, superior bifid seen in profile, as long as segment 10, widely separated and slightly divaricate as seen from above. Inferior appendages very minute and aborted.

Female.—Abdomen 32 mm. Hindwing 22 mm.

Differs widely from the male in colour and markings. The head is pale green, the eyes dark emerald green above, with or without a small black cap. The vertex and occiput are tinted with golden yellow, the black very restricted and the postocular spots pale green.

Prothorax pale green, finely marked with black.

Thorax grass green on dorsum, pale yellowish green on sides. Three fine parallel lines of black on middorsal carina and a fine black humeral line (not amounting to a stripe), vestiges of a black stripe on upper part of first lateral suture.

Wings hyaline, pterostigma pale brown, 12 to 13 postnodal nervures in forewings, 10 to 11 in hind.

Abdomen with similar ground colour to the male, markings on segments 1 to 7 similar except that the goblet mark on 2 is filled in to form a thistle-head, which extends to base of segment. Segments 8 and 9 are black save for fine apical blue rings, 10 is all blue save for a very fine basal ring.

Anal appendages black, very small.

Distribution.—Nilgiri Wynaad, Kanara and Coorg. The types, which have been deposited in the British Museum, are from the former locality and differ only in unimportant details from the Coorg specimens.

The species is a riverine one, is never found in plenty but widely distributed along the course of most rivers in the districts mentioned at altitudes of 3,000 feet and upwards. It has a long season and I have taken specimens in nearly every month of the year.

Distinguished from all other species by the colour of the thorax, and markings on segments 2, 8 and 9. The only species it is likely to

be confused with is *P. williamsoni* Fras., from Burma, which has the thorax coloured similarly, but in this species the horns of the goblet are connected across by a thick black band so as to enclose a triangular blue spot within the black. The apical rings on segments 8 and 9 are finer and have a regular border. The two species are undoubtedly closely related.

137 **Pseudagrion decorum** (Ramb.).

A common species in and around Bombay, where the type was probably taken. Occurs very sparingly in submontane and montane areas and is almost entirely limited to sea-levels. I saw a few males on the Masnagudi tank, Nilgiri Wynaad, 13th January 1921, and took a single male on the Ootacamund lake, 9th April 1921, 7,250 feet, which I should consider to be a record altitude for this insect. These two are the only records from the Nilgiris and I have none whatever from the Palnis. An uncommon insect in parts of Coorg.

The species breeds in weedy tanks, keeping well out and low over the water, often hovering for long periods over one spot. In September, 1919 I saw a flight of this insect which was in company with *P. microcephalum*. I was living in the Bombay Docks at the time and observed the flight for the space of two weeks, during which time millions must have passed over. The surface of the water in the docks was alive with them and they settled in such numbers along the copings of deck houses, on ships in harbour, that at times it looked as if these structures were growing a strange coarse grass on their roofs. Great numbers perished by sticking to freshly painted deck houses.

138. **Pseudagrion microcephalum** (Ramb.).

Has a similar distribution and habits as the last. A plain species, rarely found at or above 2,000 feet. Very common on tanks in and around Bombay.

139. **Pseudagrion rubriceps** Selys.

A riverine species occurring sparsely throughout Western India, at 2,000 to 3,500 feet. I have no records from the Palni Hills and only two from the Nilgiris, where I took three males at Kallar, 28-i-22, and a single male on a stream at Masnagudi, Nilgiri Wynaad, 18-vi-22. In Coorg it is a moderately common insect on the Cauvery River about Fraserpet, 2,000 feet, especially during October. At Poona and Khandala it occurs in fair numbers for most months of the year.

The highest recorded altitude for this insect in Western India is 3,500 feet, North Coorg.

140. **Pseudagrion hypermelas** Selys.

Only known from the northern part of the area under survey. Occurs in moderate number at Poona along the banks of the Mullah river and small streams flowing into it. Distributed sparingly throughout the Satara district and moderately common at Mahableshwar. Like

the last species, it lives on rivers and is found settled on grasses along the banks. Very inconspicuous when on the wing.

141. **Coenagrion dyeri** Fras.

A moderately common insect on most tanks throughout South Coorg, especially so on the lotus tank at Fraserpet. A small colony has established itself on the minature lily pond in the Empress Gardens, Poona, and I have seen it sparingly on the tank at Masnagudi, Nilgiri Wynaad. This tiny species is found settled on the floating leaves of lotus lilies, in the tissues of which it inserts its eggs.

When in flight it hugs the waters surface very closely and this coupled with the nature of its resting place renders it a most difficult insect to take. Eggs are inserted well within the upcurled rim of the lotus leaf so that the newly hatched larva must be an active creature to be able to find its way to water.

Legion Platycnemis.

142. **Copera marginipes** (Ramb.).

Reported from the Palni Hills, S. Kemp, 22-ix-1922 (Tope 500—800 ft.), Mahableshwar, 20—30-iv-1920, very common; Fraserpet and Somwarpet, Coorg, during most months of the year; Poona and Khandala, common, especially in the Byrobah nullah where it often swarms.

This species is restricted to dry, hot zones and is usually found amongst undergrowth along river banks. The so-called "ghost" forms are tenerals usually of a pure white or minutely spotted with black, and are very conspicuous as they steal with jerky movements through the dark undergrowth.

143. **Copera vittata deccanensis** Laid.

The name is a misnomer as the species is unknown from the Deccan. Where the distribution of *marginipes* leaves off, that of *deccanensis* begins, unlike the last it prefers regions of heavy rain-fall, hence it is found commonly in districts like Coorg and the Malabar and Nilgiri Wynaad, up to altitudes of 4,000 feet. Apart from this, its habits are similar to the last species. The larva seems to make a fuller use of its caudal gills than most species and is to be seen clinging to roots in rapid flowing streams, its gills erect over its back and swayed constantly from side to side in the current. At the approach of danger, it lowers the gills and lies flush on its resting place or manoeuvres this betwcen itself and the point of danger.

Legion Platysticta.

143A. **Platysticta deccanensis** Laid.

Here again the name is a misnomer, the species coming from Cochin and Travancore, neither of which have any part in the Deccan.

The type male and female are in the Indian Museum (Nos. 8230-20 and 8272-20) and were taken by Dr. Gravely in Cochin State, ·24-ix-15.

I have a single male which was taken at Trichur by Dr. Henderson (late Superintendent Madras Museum) in the same month 1913. This species is the only representative of its genus so far reported from within Indian limits.

Genus **Protosticta** Selys.

Six species of the genus are found in Western India of which one is recorded from N. Kanara, four from the Nilgiris and three from Coorg, one species being common to Coorg and Kanara and one common to Coorg and the Nilgiris. All are submontane species.

144. **Protosticta gravelyi** Laid.

The type is from Kavalai, Cochin, and was taken by F Gravely, 24-ix-1914. A second male was taken by S. Kemp at Castle Rock, N. Kanara and a third male has been taken by myself at Makut, Coorg, 13-vii-1923. The latter specimen was taken under the lee of a fallen tree in dense jungle, well above the Barapole river.

145. **Protosticta stevensi** Fras.

Confined to the Coimbatore side of the Nilgiris, Burliyar and Kallar rivers. Found during June and July, disappears with the advent of the monsoon.

146. **Protosticta hearseyi** Fras.

Confined to a single river about halfway down the Gudalur Ghat, Nilgiri Wynaad. A single male was taken in the Ochterlony valley, June 1922. Differs from all other species by the abdomen being of equal length in the sexes.

147 **Protosticta sanguinostigma** Fras.

Found on the Burliyar and Kallar rivers, Nilgiris, unknown on the Mysore side of the plateau. Not uncommon in several parts of Coorg, especially Hallery, Mercara, and Mangalore Ghat. In Coorg I found it from the beginning of May until the first week in July; in the Nilgiris it appears later and lasts until the end of July. (It is of interest to mention here that Dr. F. Gravely has found the species recently in the Chingleput District, Madras, Kambakkam Hill, 28-viii-1923 this being the first record of any species of the genus from the East Coast.) A single male has been collected at Dhoni Forest, Malabar, by E. Barnes.

148. **Protosticta cerinostigma,** sp. nov.

Male.—Abdomen 44 mm. Hindwing 25·5 mm.

Head.—Eyes deep ultramarine blue with a black equatorial band, back of head reddish brown. Segment 8 pale blue with a broad black apical ring covering apical third on sides and extending as a gradually narrowing band along middorsal carina as far as base of segment.

Only 15 to 16 postnodal nervures in forewings, 14 to 15 in hind. Quadrilateral in right forewing with a traversing nervure at its middle, the right forewing with a vestigial anal bridge running from hinder border of wing to underside of quadrilateral (as in *Drepanosticta*.).

In all other respects similar to *sanguinostigma*.

Distribution.—A single male collected in the Ochterlony Valley, Nilgiris, 3-viii-22. Differs from *sanguinostigma* by the marking on segment 8 being much more extensive and covering most of the dorsum. Possibly it may be only a subspecies of *sanguinostigma* which it so closely resembles; I never once came across the latter on the Mysore side of the Nilgiri plateau. Type in Fraser collection.

149. **Protosticta mortoni,** sp. nov.

(Pl. XXVI, fig. 4.)

Male.—Abdomen 43 mm. Hindwing 20 mm.

Head.—Eyes ultramarne blue, paler beneath, capped with black above, labium black, labrum turquoise blue broadly bordered with black, anteclypeus turquoise blue, rest of head black. Basal segments of antennae white.

Prothorax pale blue, posterior lobe and two small processes springing from it black.

Thorax black with two narrow lateral blue stripes, one traversing the spiracle, the other the hinder border of metepimeron. Legs white.

Abdomen black marked with turquoise blue or white,—the sides of segment 1 blue, basal two-thirds of sides of segment 2 white, 3 with a narrow basal ring interrupted above and prolonged for a short distance apicalward along sides, 4 to 7 with broad white basal rings occupying one-sixth of segments and prolonged low down apicalward along the sides, 8 with the basal half turquoise blue but extending along sides nearly as far as apex, and separated from the base of segment by a very narrow black basal ring, 9 and 10 and appendages all black. The 7th segment is very long, 8 is only slightly more than one-fourth the length of 7, 9 is equal to about half the length of 8 and 10 is very minute.

Anal appendages.—Superior chelate, the apex broadened, unequally bifid, with a small process between the arms of bifurcation, a robust backwardly directed dorsal spine at junction of basal and middle thirds.

Inferior appendages a little shorter than superior, stilette shaped.

Wings hyaline, pterostigma black with a narrow frame of pale brown between bordering nervures and membrane, 13 postnodal nervures to forewings, 12 to the hind.

Female.—Abdomen 33 mm. Hindwing 20 mm.

Very similar to male but shorter and stouter. Segment 7 with its basal third turquoise blue, 8 with only a small lateral spot on its side. Segment 9 is longer than 8, 10 is moderately short.

Anal appendages short, black. Ovipositor very robust, projecting beyond end of abdomen, with a very robust upwardly directed dorsal spine near its apex. Forewing with 13-14 postnodals, 11-12 in hind.

Distribution.—Coorg only. I found a small colony of these insects on a mountain stream about halfway down the Sampaji Ghat, 23-v-23. They had established themselves under a small bridge, the mossy sides of which were literally alive with them. I never found a single specimen on any of the streams above or below this point.

Most nearly related to *P. stevensi* and *gravelyi* from both of which it is distinguished by the prothorax blue with its posterior lobe black and by the markings on segment 8, the basal half of dorsum being immaculate. Its abdomen is 6 mm. shorter than *stevensi*. The female of *gravelyi* has the abdomen 7 mm. longer than the female of *mortoni*.

Table showing relative lengths of abdomen.

Species.	Male.	Female.
P. gravelyi	44 mm.	40 mm.
P. stevensi	49 mm.	37 mm.
P. mortoni	43 mm.	33 mm.
P. sanguinostigma	47 mm.	39 mm.
P. cerinostigma	44 mm.	(Unknown).
P. hearseyi	35 mm.	33 mm.

Legion PROTONEURA.

150. **Chloroneura quadrimaculata** (Ramb.).

Restricted almost entirely to Western India, at altitudes from 2,000-4,500 feet. A common insect at Poona where the type was probably taken. (Rambur's type is labelled Bombay but this is an error as the species is not taken at sea-level. The Bombay Government and civilians from that city were accustomed to spend the hot season at Poona so that the type was probably taken by a Bombay civilian and subsequently sent home from that port). The species has been taken by myself in Mahableshwar and by F. H. Gravely in the Satara district.

During 1923 I found it sparingly along the lower course of the Cauvery river, Coorg. Found hovering over water along river banks or settled in rocks in mid-stream. Unknown from the Nilgiri and Palni Hills. Outside the area it occurs sparingly in the Central Provinces.

151. **Chloroneura apicalis,** sp. nov.

(Fig. 5.)

Male.—Abdomen 31 mm. Hindwing 20 mm.

Head.—Eyes reddish brown changing to olivaceous beneath; labium whitish; labrum brownish yellow, cheeks ochreous, rest of head black traversed from eye to eye at the level of middle ocellus by a brick red stripe.

Prothorax black with a geminate spot of reddish brown at middle of dorsum of mid-lobe.

Thorax black on dorsum with a dull green metallic sheen, pruinosed on the sides and beneath in adults. A narrow humeral stripe of brick red is present in moderately young specimens but this is soon lost in the adult. There is also a brownish white stripe on the sides between the lateral sutures which is almost or quite obsolete in full adults.

Legs black, femora pruinosed on the flexor surface, tibiae bright yellow on extensor surface.

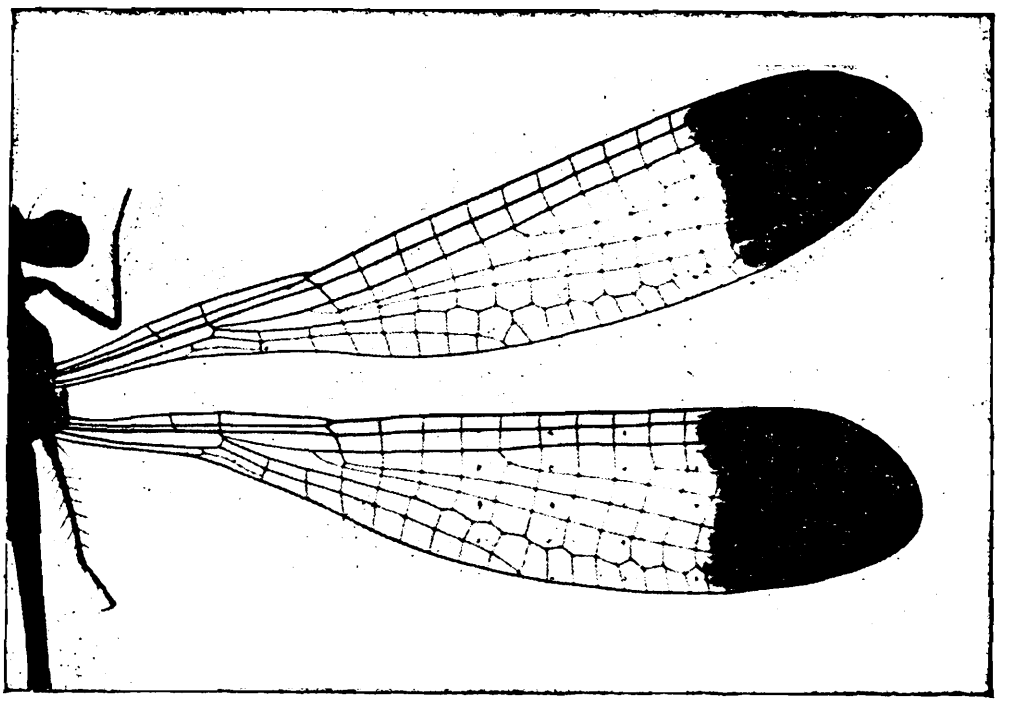

FIG. 4.—Wings of *Chloroneura apicalis.* Male.

Wings hyaline, the apices for rather more than the outer fourth of wings deep blackish brown; 15 postnodal nervures in forewing, 13 in the hind; *Cuii* absent, *Cui* extending well beyond half the length of wing. Pterostigma reddish, well braced.

Abdomen reddish brown, black on dorsum with small paired dorsal basal whitish spots on segments 3 to 7

Anal appendages black, superior tipped with white. Superior appendages trigger-shaped, triangular seen from above, pointed and with a broad short robust spine beneath, seen from the side. Inferior, viewed laterally, broad at base tapering and sloping downwards, its apices curling strongly inward.

Female.—Abdomen 31 mm. Hindwing 18 mm.

Eyes bluish above, whitish green below, with a small polar cap above and an equatorial belt of warm brown. Labium white, labrum, cheeks and face pale greenish white (or in some, the cheeks reddish brown). A narrow belt of black connects the equatorial belts of eyes across face and a broader belt of the same colour runs between the polar caps, between which belts lies a pale yellowish stripe corresponding to the red stripe seen in the male.

Prothorax black marked with a longitudinal subdorsal and a lower lateral stripe on each side, below the latter two small spots of yellowish. The processes on posterior lobe long, forked, yellow.

Wings hyaline, slightly enfumed, apices unmarked. Pterostigma brown, 14 postnodal nervures in forewings, 12 to 13 in the hind.

Thorax black on dorsum, pale greenish white laterally, a humeral stripe of the same colour. The black, posterior to the latter stripe, marked with a sinuous upper ochreous spot and in some specimens

two warm brown spots about its middle. Postero-lateral suture finely mapped out in black, its upper part more broadly so.

Abdomen greenish white, dorsum broadly blackish brown. On segment 1 the ground colour present as an apical ring and two parallel yellowish green stripes, on 2 the black on dorsum expands broadly apicalward and joins a fine apical black ring, its dorsum finely yellow along the carina, segments 3 to 6 somewhat similar but the black expands basalward as well as apicalward. The ground colour on these segments passes up at the base and is nearly confluent over the dorsum (seen from above this appears as paired spots), segment 7 broadly black except the sides, 8 and 9 with the middorsum and latero-ventral borders narrowly whitish yellow, 10 whitish on middorsum, apical border and ventrum.

Anal appendages very short, whitish yellow.

Distribution.—Coorg only. The species occurs in small colonies along the banks of the Cauvery near Fraserpet, shady spots where trees overhang the banks being preferred. Females are found hiding up in scrub lining the banks or more rarely are taken *in cop.* with the males. I have never come across it on the upper reaches of the Cauvery but suspect that it probably occurs lower down in Mysore territory, nor have I found it haunting the banks of any of the Cauvery's tributaries, even the larger ones. Quite frequently it is found in company with *C. quadrimaculata*, the only other member constituting Laidlaw's genus.

152. **Disparoneura tetrica** Laid.

Described by Laidlaw from specimens taken at Talewadi, N. Kanara, by S. Kemp in 1916. The species was rediscovered by myself in Coorg, 1923, where I found it moderately common on the lower reaches of the Cauvery river. Named happily by its author as "sombre," it is found in dark sombre surroundings, hiding up in deep shade on the banks of streams where overhanging trees and vegetation produce a perpetual twilight.

It has a short season ended abruptly by the onset of the monsoon, towards the end of June. I took a single male at Nagahole, S. Coorg, in December, but this was a very adult specimen and probably a survivor of the summer brood.

153. **Disparoneura nigerrima** Laid.

Moderately common at Poona, on streams and tributaries of the Moolah river but unknown from elsewhere in Western India. On the wing it closely resembles *Pseudagrion hypermelas*, and as the two occur together I have often taken one for the other. The type is from Nagpur, Central Provinces, and specimens have been taken by myself at Mhow, Central India. Its distribution is probably confined to parts of the Deccan and Central India.

154. **Caconeura verticalis annandalei** Fras.

When I took the type at Mahableshwar in May, 1920 I was inclined to treat this insect as a distinct species. Since then I have been struck

with its close resemblance to *C. verticalis* Selys, and now consider it to be not more than a subspecies of the latter.

This opinion is supported by the discovery of another subspecies of *verticalis* by Dr. Annnadale in the Andaman Islands, which shares about equally the characters of *verticalis* and *annandalei*. The Andaman species is in short a link between the two forms. In the light of my remarks on radiating emigration from the Malay States and Lower Burma, the discovery of the Andaman form bears special significance, as the Andaman Isles lie in a direct line between Lower Burma and South India. Moreover *C. annandalei* has lately been discovered on the East coast below Madras by F. Gravely, in the Palnis by S. Kemp and by myself in the Nilgiris and Coorg, so that we have a very complete line of localities connecting the three forms, ranging from Borneo to Mahableshwar near Bombay. On the other hand, no specimens or related species have been found from Upper Burma, Assam or the rest of India, thus cutting out this route as a possible line of emigration.

155. **Caconeura canningi** Fras.

I include this species with doubt as from India. I labelled the type as from Coonoor, Nilgiris, 1917, but as I collected the same year for a short period in Ceylon, it may well be that I took the species there. I am more inclined to this view as during two whole subsequent years spent in the Nilgiris I never once came across the species. Collecting during the War was sporadic and often hasty and packets were occasionally left unlabelled, so that a mistake may well have occurred here. If collected in Ceylon, then the species comes from Dyatalawa, 5,000 feet and was taken on one of the many tiny mountain streams on the patnas.

Group Indoneura.

156. **Melanoneura bilineata** Fras.

(Pl. XXVII, fig. 1.)

This species was described in the *Memoirs* of Pusa (1922) from a single imperfect teneral male, taken in Sidapur, Coorg. During the following year I took some thirty odd specimens of both sexes in t ree localities in Coorg and am now able to complete the description given in the above Memoirs.

In the absence of the last four segments of the abdomen of the type specimen, I placed the genus wrongly in Legion *Platycnemis*; with the evidence now before me, of the anal appendages and full colouring of the adult insect exactly paralleling that of *Indoneura* and *Esme*, it is clear from a fresh examination of the neuration that the species is a true *Protoneura* and belongs to the group *Indoneura*.

Male.—Abdomen 41–45 mm. Hindwing 27–30 mm.

Head.—Eyes azure blue for the lower two-thirds, black for the upper third; labium ashy white; labrum and anteclypeus metallic blue black, rest of head matt black traversed by a moderately broad band across postclypeus and cheeks.

Prothorax black, the sides broadly azure blue, posterior lobe rounded, simple.

Thorax matt black marked with a narrow antehumeral azure blue stripe and two broad blue stripes on the sides, the posterior one covering the metepimeron.

Legs black, coxae and trochanters blue, tibiae yellow on extensor surfaces.

Wings hyaline, pterostigma black, over 1½ cells; 20 to 22 postnodal nervures in forewing, 19 to 20 in the hind; anal bridge absent; position of *Mili* variable, usually arising opposite or distal to the line of node.

Abdomen black marked with azure blue, segments 1 and 2 broadly on the sides, 3 to 6 with tiny basal lunules confluent over dorsum, 7 *unmarked*, 8 to 10 blue with very narrow basal rings of black.

Anal appendages black, equal, similar to those of *Indoneura*. Superior directed at first straight back and then down and slightly back at a rather acute angle, a robust spine on dorsum springing from the point of angulation, the whole appendage shaped like a wrist and hand held in the attitude of clasping a ball, the spine representing the thumb, the distal two-thirds, the fingers. Inferior broad at base, conical, tapering to a point which is slightly recurved at the apex.

Female.—Abdomen 37–43 mm. Hindwing 27–31 mm.

Very similar to the male, the markings blue only in very adult specimens, usually citron yellow or pale bluish green, especially the facial and antehumeral stripes, the sides of thorax nearly always yellow. Segments 8 and 9 with apical *fleur-de-lys* shaped markings, blue. Pterostigma pale brown.

Distribution.—Coorg only, at altitudes of 3,000 feet to 4,000 feet. A fairly large colony has established itself near the head of the Sampaji River, where the insect shelters among cane brakes, appearing only after 4 P.M. A smaller colony has made its home on a small steam at Santikupa in a coffee estate and a few occasional specimens are found on the stream at Hallery, near Mercara. I failed to rediscover it at Sidapur where the type was taken.

M. bilineata is occasionally taken in company with *Indoneura ramburi*, but the two can always be distinguished by the absence of the conspicuous basal blue annules, so marked a feature in the latter.

The total absence of the anal bridge will distinguish it from all other species of the group.

157 **Indoneura ramburi** Fras.

(Pl. XXVII, fig. 2.)

Distributed throughout the Nilgiris, Coorg and Kanara. Occurs singly or at the most in twos and threes. Breeds in mountain streams, at altitudes not above 6,000 feet.

158. **Indoneura gomphoides** (Ramb.).

Found only in the Nilgiris, on a few kundah streams around Ooty, at an altitude of 7,500 feet. Gregarious in habits, occurring in vast numbers on ferns and grasses alongside streams in which it breeds.

159. **Esme cyaneovittata** Fras.

(Pl. XXVII, fig. 3.)

Confined to the Palni Hills at elevations from 5,000 to 6,800 feet. I have seen a single male which is labelled as having been taken by Dr. S. Kemp at the foot of the Palni Hills, at the low altitude of 500 to 800 feet. The specimen was mixed up with several others which are usually taken at low elevations, so that I am of opinion that the altitude given in this instance is incorrect. I have never taken any species of the group below 2,500 feet.

160. **Phylloneura westermanni** (Selys.).

(Pl. XXVII, fig. 4.)

Confined to the Nilgiris and Coorg at elevations of about 3,000 to 4,000 feet. The Coorg specimens are distinctly smaller but otherwise do not differ from Nilgiri ones. Measurements are :—Abdomen 46 mm., hindwing 32 mm. (51 mm. and 38 mm. respectively in the Nilgiri specimens).

Found in small colonies, the largest of which known to me is one on a small mountain river just above Gudalur, in the Nilgiri Wynaad. Occasional specimens are taken in the bed of the Burliyar river, on the Coimbatore side of the Nilgiris and there is a small colony on a river about half-way down the Sampaji Ghat, Coorg.

The finding of *Melanoneura* provides us with a complete series of very closely allied dragonflies in which the development(or reduction *?*) of the anal bridge and nervure *Cuii* can be traced from beginning to end.

In *Melanoneura* we find *ab* entirely absent, in only one specimen out of a large number examined was there any trace of it to be seen. In one wing *ac* forks shortly as it joins the posterior margin of the wing, in two others this can only be seen under a quarter inch objective, whilst in the fourth there is a mere triangular thickening of the end of *ac* at the point where it meets the margin of the wing. This single specimen gives us sure proof that a bridge is either being produced or reduced, in *Melanoneura*.

In *Indoneura* the nervure *ab* is invariably present but only vestigial in character. After examining some hundreds of specimens, I have found none in which the bridge was entirely absent or entirely complete although its length is variable within limits. The condition here is practically static and the most that we can say is that some lengthening or shortening of the bridge is taking place.

In *Esme* we find the bridge fully developed but its form in a very plastic state. Either production or reduction in its length is going on, often distal to the nervure descending from the distal end of the quadrangle (*Cuiib*). This latter prolongation, when present, represents a vestigial nervure *Cuii*.

Major Frere very kindly took a lot of trouble and time in examining the various forms of *ab* met with in *Esme*. He not only sent me some scores of specimens for study but examined and reported on large numbers himself, our results being finally correlated. We found that

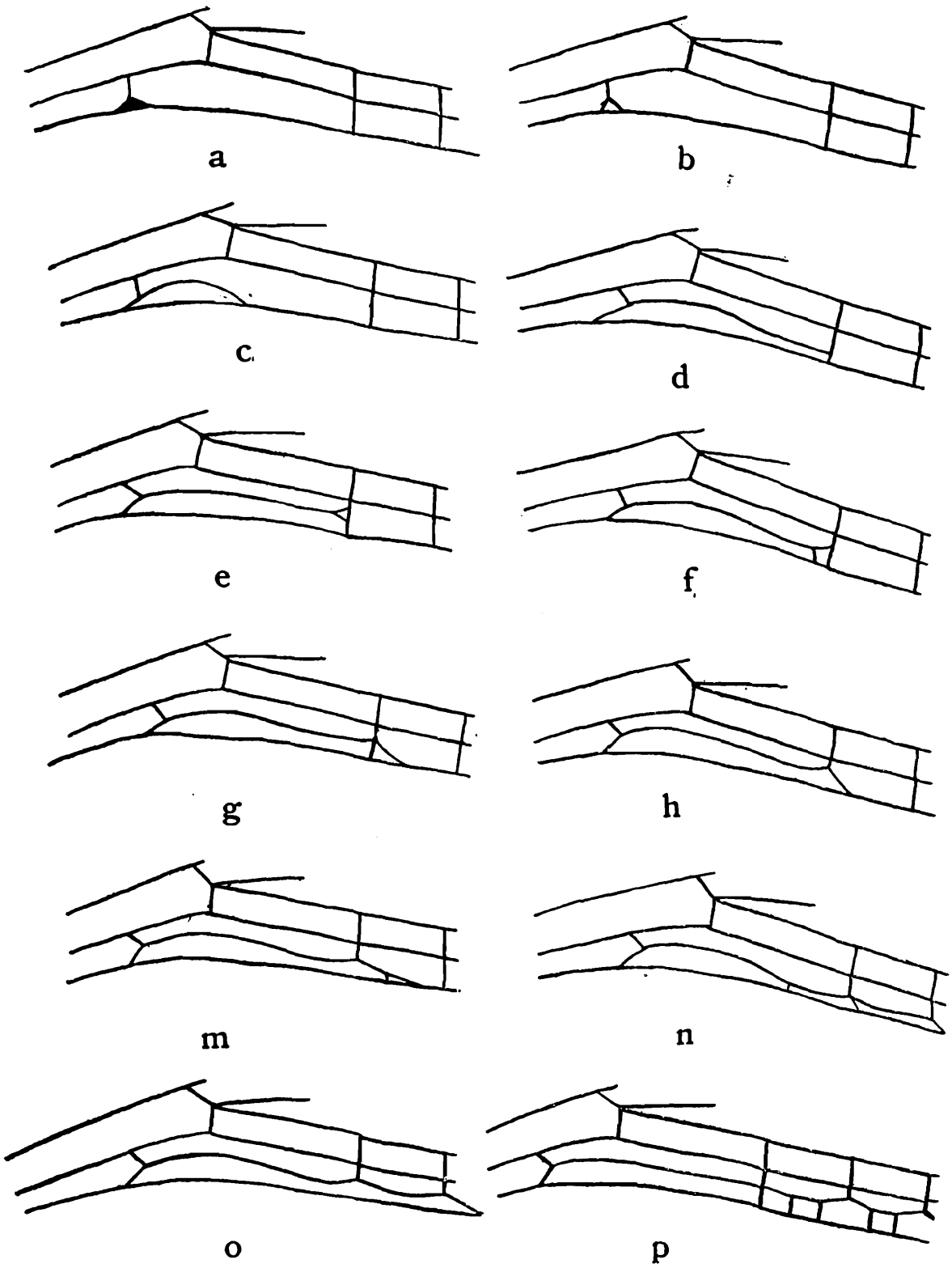

FIG. 5.—Diagram showing evolution of the anal bridge as demonstrated in Group *Indoneura*.

a. Thickening of *ac* at the posterior margin of wing in *Melanoneura bilineata*. b. Bifurcation of *ac* in the same species. c. Incomplete bridge (*ab*) found in *Indoneura*. d. Complete bridge found in *Esme*. e. Bifurcation of outer end of bridge as found occasionally in *Esme*. f. Another form of bifurcation of *ab* found in the same species. g. The beginnings of the nervure *Cuii* as found in some specimens of *Esme*. h. A further stage of same. m. A still further stage of same. n. A still further stage of same. o. The furthest stage yet reached in *Esme cyaneovittata*, contrasted with, — p. The fully developed nervure *Cuii* found in *Calicnemis pulverulans*.

in 31 per cent the distal end of the bridge inclined towards and fused with the hinder margin of the wing at a variable distance from *Cuiib*, that is the nervure descending from the distal end of the quadrangle.

In 14 per cent *ab* was abnormal as shown in the accompanying diagrams and in only 55 per cent was it complete and normal or subnormal. (By this latter is meant that the distal end of the bridge joins the nervure *Cuiib* at a point much nearer the hinder margin of wing than the quadrilateral).

On the whole, the evidence points to the evolution of *ab* and *Cuii*, rather than to a reduction of these structures. In fig. *o* of the diagram, the absence of supporting nervures to the suspended loops of *ab* and *Cuii* seem to me to be an insuperable difficulty against the theory of reduction. These are invariably present in all species where *Cuii* is developed and would be present in *Esme* until the nervure finally fused with the margin of the wing, if reduction and not development were going on.

I read the history of development of *ab* and *Cuii*, so well demonstrated in this group, as follows :—

In *Melanoneura*, the most primitive of the group, we find an undue strain put upon the hinder margin of the wing at the point where *ac* meets it. In order to distribute the pressure more evenly, at first a thickening and then an actual bifurcation of the end of *ac* occurred as shown in figs. *a* and *b*. In this bifurcation lies the birth of the anal bridge.

In *Indoneura* a continuation of the same strain led to a broadening of the bifurcation so as to further distribute the strain along the wing margin. As the stress was from the distal end of the wing, it was but natural that the outer arm of the bifurcation should lengthen more than the inner and so a comparatively long but incomplete bridge was formed in *Indoneura*, fig. *c*.

In *Phylloneura* and *Esme* the factor which brought the bridge into being is still acting, producing a complete bridge in the former and a continuation of it as the nervure *Cuii* in the latter, figs. *d* and *e*.

As soon as *ab* formed contact with the transverse nervure descending from the distal end of the quadrilateral, a point of strain was set up in the latter, *ab* pulling towards the base of wing.

Several expedients were apparently tried here but being mechanically unsound were given up in favour of carrying *ab* on and beyond the transverse nervure, as the new nervure *Cuii*. Two of these expedients are illustrated in two specimens and shown in figs. *e* and *f*. In one we see the end of *ab* bifurcating just as *ac* did initially, in order to distribute the strain evenly over the nervure. In the other, *ab* has again bifurcated but one arm goes to the transverse nervure and the other to the hinder margin of wing.

In the case of *ac* no other alternative was possible and its very unsoundness led to the necessity of lengthening *ab*. In the present case, however, there is no reason why the anal bridge should not continue on the same course and we see this process in course of development, figs. *g*, *h m* and *n*.

If we compare the rudimentary nervure *Cuii*, found in some specimens of *Esme* (fig. *o*), with the fully developed nervure found in such a species as *Calicnemis pulverulans* (fig. *p*), we shall note that the supporting nervures of *Cuii* are entirely absent in *Esme*.

It is perfectly clear that if *Cuii* and *ab* were undergoing reduction, the nervures supporting them on the wing-margin side would be present until they (*Cuii* and *ab*) met and fused with the wing-margin. On the other hand, if these structures were evolving, supporting nervures would become a necessity, but if that necessity had not yet arisen, as in the present case, the nervures would be absent. In no other way can we explain their absence in *Esme*, and the fact that they are missing presents us with an insuperable difficulty when theorising on the reduction of the base of the Zygopterous wing.

Dr. Kennedy theorises that, as the Zygopterous wing amplified, the node moved distad leaving the origin of *Miii* behind. If this be so then we should expect to find the origin of *Miii* in *Phylloneura* relatively more proximal to the node than in members of the other genera of the group, as *P. westermanni* is a much larger insect and more richly veined than the others. I find this to be actually the case. The same author says that undoubtedly in the Zygoptera many instances occur where a richly veined wing is merely the response to the necessity of greater wing area to support a larger body.

In *P. westermanni*, the largest species of the group, we find a much richer venation than in any of the others.

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APPENDIX I.

Since the above was written, two important communications, bearing on Western India Odonates, have been received by me.

The first communication is the description of a new subspecies of *Indothemis limbata*, from Ceylon, by the late Mr. Herbert Campion. [*Ann. Mag. Nat. Hist. No.* 61 (9) p. 28 (1923)].

On reading this description, it occurred to me that the Coorg form was much more likely to conform to a subspecies from Ceylon than to the holotype and I therefore made a careful comparison of the Coorg form with the descriptions of the latter and that of the subspecies, with the result that I found my conjecture was correct.

The new subspecies has been named *Indothemis limbata sita* by Campion and except that it has a somewhat higher nodal index than the Coorg form, resembles it in all respects. As regards the female, there are some differences in the markings of the thorax which I feel sure are merely due to differences in the ages of the two. Thus the female described above is the female of *I. limbata sita* and not that of *I. limbata limbata*, which still remains to be discovered.

The second communication comes in the shape of a letter from Mr. T. Bainbrigge Fletcher, in which he points out that the specimens of *Pseudophaea dispar* from the Palni Hills show constant differences to those from the Nilgiris. Upon comparing my specimens from the respective localities, I find that this is quite correct and that the differences are so broad as to warrant giving specific rank to the Palni form. I therefore proceed to describe it under the name of *Pseudophaea cardinalis.*

Pseudophaea cardinalis, sp. nov.

Male. Abdomen 41 to 45 mm. Hindwing 36 to 41 mm.

Abdomen and forewing of nearly equal length, 40 to 41, or 43 to 45 mm.

Head. Labium dirty straw yellow, brown at its middle; labrum bright ochreous with the narrowest bordering of reddish brown and a medial line of dark brown, almost obsolete in some; clypeus dark glossy brownish black; frons bright ochreous narrowly bordered at base with black, from which four narrow tongues of black proceed forward, two submedial two sublateral; cheeks bright golden yellow; vertex and occiput black, the fore part of former and basal joints of antennae dark reddish brown or dark ochreous, almost black in some. Lastly a small round spot of ochreous in front and to outer side of each lateral ocellus. Eyes brown.

Prothorax velvety-black with two large subdorsal bosses on midlobe, a large spot on each side and narrow lateral linear stripe on posterior lobes, all old gold.

Thorax matt black on dorsum, bright ochreous on sides, some spots on the tergum, bases of wings, a spot on each side of alar sinus, submedial and antehumeral lines connected above and enclosing a long oval spot of the black ground colour, a posthumeral stripe connected above to an incomplete stripe posterior to it, the two partially enclosing a second oval spot of the ground colour, all old gold.

Legs dark reddish, distal ends of tibiae and tarsi black.

Wings. The fore hyaline, very narrow and almost as long as abdomen, palely saffronated, especially so towards the bases, palely enfumed towards the apices, pterostigma elongate, narrow, 4·5 mm. long, quadrangle entire or traversed once or twice.

Hindwings broader and shorter than fore, apices markedly rounded, opaque black for nearly the outer half (quite half the wing opaque in one specimen), the distance of the inner margin of the opaque part from the node varying from 4 to 8 mm., this part dull coppery metallic above, dull-blackish blue beneath. (In one male, the upper surface is brilliant fiery coppery as in *Rhinocypha ignipennis*). The inner half of wing hyaline, palely enfumed and saffronated more deeply than in forewing; quadrangle entire or traversed once, twice or three times.

Abdomen bright red as far as apical end of segment 6 where it gradually darkens, the remaining segments black. All segments clouded narrowly with black at intersegmental joints. Segment 10 with a very pronounced keel on dorsum. Segment 8 and 9 with dense tufts of black hair on the ventral surface.

Anal appendages black, flattened from side to side and cupped within like a pair of sugar-tongs, very similar to those of *P. dispar.* Apices blunt and rounded. Inferior black, very small, short but robust, backwardly and downwardly directed spines.

Genitalia. Lamina deeply cleft into two prominent projecting triangular broad spine-like processes ; vesicle matt black, its surface corrugated, smaller than in *dispar.* The apico-ventral border of the tergite produced into a very prominent triangular tongue-like process, which is directed outward, downwards and backwards. (Quite absent in *dispar*).

Female. Abdomen 36 mm. Hindwing 37 mm.

Head. Labium black ; labrum similarly coloured to the male, cheeks bright yellow, as is also a large diamond shaped spot confluent with them, which runs inward and nearly anastamoses with the spot on the opposite side. Spots on outer side of ocelli pale yellow, rest of head matt black. Eyes dark oblivaceous brown.

Prothorax and thorax similar to the male but the sides and markings bright yellow instead of red or ochreous. The antero-lateral stripe is completed by a narrow black stripe which crosses the spiracle and there is a similar lateral black stripe on the second lateral suture.

Legs brownish black, flexor surfaces of femora obscurely yellow.

Beneath thorax and prothorax, the bases of principal nervures of wings and bases of legs densely pruinosed white.

Wings evenly enfumed, with a greenish tinge, the hind more deeply than the fore, the apices slightly clouded ; pterostigma very long, black ; nodal index $\frac{33-21}{27-18}\Big|\frac{24-31}{18-26}$; all quadrilaterals traversed once.

Abdomen black marked with yellow, the sides of segments 1 to 3 broadly, a linear stripe on sides of segments 4 to 7 narrowing gradually as traced from base to apex and from segment to segment, and with a narrow basal dorsal prolongation on each segment. Segments 8 and 9 with a subquadrate apico-lateral spot, segment 10 wholly black.

Anal appendages black, conical, very short.

Distribution. Confined to the Palni Hills, at elevations from 800 ft. to 6,000 ft.

The type in British Museum, paratypes in Indian Museum (4 males, coll. S. Kemp, at foot of Palni Hills, 22. ix. 22, paratypes in Pusa collection, collected by Mr. T. Bainbrigge Fletcher, Oct. 22, also in Fraser collection, coll. Major Frere, Tiger Shola, 5,500 ft., 21. vii. 23 and on Ghat Rd., 3,500 to 4,000 ft., Palni Valley, 28-31.viii. 23.

This fine new species is distinguished from *P. dispar* by the labrum ochreous instead of pale turquoise blue, by the cheeks bright ochreous instead of matt black, by the broader black fascia of the hindwings, the inner border of which extends to within 4 to 8 mm. of the node, instead of 12 mm. as in *dispar*, by the hindwings considerably broader, by the length of forewing and abdomen almost similar, by the legs red instead of yellow marked with black and lastly by the large triangular process on the tergite of 2nd abdominal segment. Very closely allied to *P. dispar* and *P. fraseri.*

APPENDIX II.

Since the body of this report was written several new species have been discovered necessitating the addition of a first appendix and now a second appendix.

This new material includes the female of *Rhinocypha laidlawi*, thus enabling me to complete the description of that species. A new species and a new subspecies of *Idionyx* and a new *Disparoneura* are also described below but perhaps the most interesting discovery is a new Corduline, closely allied to *Macromidia* and belonging to the *Macromia* group which has recently come to light in Coorg. *Macromidia* is a monotypic genus from Tonkin and its inclusion here strengthens the affinities between the Odonate fauna of Western India and Malaysia.

Lastly there is a new *Gomphus* belonging to the *Epigomphus* series which Mr. Laidlaw is describing and which was taken in Coorg this year.

Genus **Macromia.**

M. ellisoni Fras.

A second female of this rare species has been taken by Mr. C. Souter at Kudremukh, 4,500 ft., S. Kanara, 22. v. 24. It is remarkable for its enormous size, being quite the largest *Macromia* ever taken, abdomen 59 mm., hindwing 56 mm. Mr. Souter states that he saw but failed to capture two males. Markings as for type, nodal index $\frac{11-18}{13-12}\left|\frac{18-10}{10-13}\right.$, loop 16-17 cells, hypertrigones $\frac{32}{42}$, cubital nervures 6 in forewings, 4 in the hind.

Genus **Indomacromia,** gen. nov.

Reticulation very close; hypertrigones traversed twice; sectors of arc fused at their base; all triangles entire, followed by a single row of cells for a distance of 7 cells; trigone of forewing with equal sides, that of hindwing elongate in length of wing, situated well distad of arc; basal space entire; cubital space traversed by one nervure in forewing, two in the hind; membrane moderate in size; pterostigma long but decidedly shorter than in *Macromidia*; *Cuii* in forewing separated from the trigone, in the hind arising from the trigone and straight as far as its forking; space between radius and *Mi* adjacent to node free of transverse nervures for some distance; anal loop subrotundate, of 7 cells; base of wings slightly excavate; anal triangle of 2 cells. Legs moderately short, *middle tibiae with a keel* as well as the other two pairs. Abdominal segments 8 and 9 a little dilated. Anal superior appendages parallel, closely apposed throughout their entire length.

This new genus is very closely allied to genus *Macromidia*, so closely so that I am a little diffident in separating it. If as I suspect, the genotype of the latter should prove to have the middle pair of tibiae keeled, I think there will be no doubt but that the two are congeneric, for this feature is unique in the subfamily Corduliinae.

Indomacromia differs from *Macromidia* by the following characters:— the discoidal field begins with a single row of cells instead of 2, there is

a maximum of two rows of cells posterior to *Cuii* in the forewing, instead of 3, the cubital spaces have 1 to 2 transverse nervures instead of 2 to 3, the pterostigma is decidedly shorter although longer than in *Macromia.* The anal superior appendages are differently shaped although strongly analagous.

Indomacromia donaldi, sp. nov.

Male. Abdomen with appendages 34 mm. Hindwing 30 mm.

Eyes deep emerald green changing to yellowish green beneath ; labium citron yellow narrowly bordered with brown ; labrum blackish brown with a dark metallic green reflex ; frons dark metallic green, as is also the vesicle, the former pitted coarsely ; anteclypeus dirty yellow, postclypeus black with a metallic bluish green reflex ; occiput small, black.

Prothorax pale yellow.

Thorax a beautiful metallic emerald green marked with citron yellow as follows :—the alar sinus, a yellow stripe on the sides crossing the spiracle but extending only half way up the thorax, a similar stripe on anterior border of metepimeron and the posterior border of same structure. The lower part of dorsum of thorax chestnut brown. The three lateral stripes all crossing under the thorax and meeting their fellows from the opposite side, so that the underside bears three yellow stripes and three metallic-blue, the green here changing to blue.

Legs black, coxae and trochanters yellow behind and laterally, the anterior femora pale towards their proximal ends. The tibial keel extending for the outer six-sevenths on hinder tibia, for the distal half of middle tibia and for not quite the outer half of anterior pair. Femoral spines tiny and closely set.

Abdomen black marked with citron yellow as follows :—segment 1 with a broad lateral spot and a minute baso-dorsal one, 2 with a linear middorsal stripe broad and expanded proximal to the jugal suture,

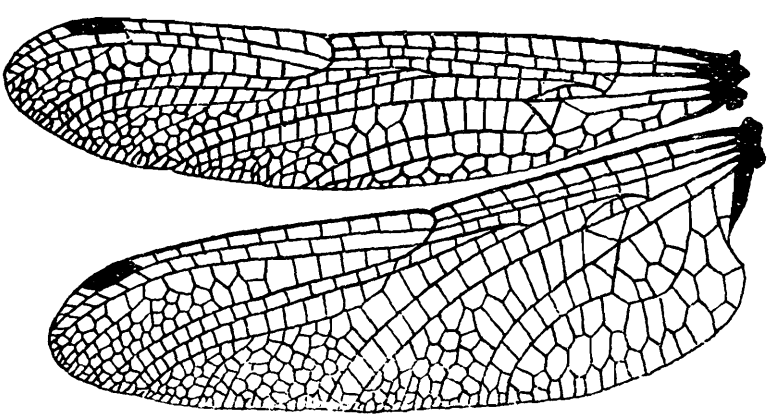

Fig. 6.—Wings of *Indomacromia donaldi* ♂.

fine and linear thereafter as far as apical border of segment, laterally the oreillets and the sides low down somewhat broadly, segments 3, 4 and 5 with a fine linear stripe on the middorsal carina which is attenuated and nearly broken in the middle of each segment by the jugal suture, on 6 a similar stripe begins at the jugal suture, 7 with a broad subbasal dorsal spot shaped somewhat like the ace of clubs, its stalk tapering api-

calwards nearly as far as the border, 8 to 10 black. Ventro-laterally segments 3 to 6 bordered finely with yellow.

Anal appendages not quite as long as segments 9 and 10 taken together, the superiors closely apposed, a spot of daylight only showing through between them near the apex, subcylindrical, narrow, broadening into a robust lateral spine subapically and then thinning to a point, separating slightly opposite the spine to form a small fenestra by the apices meeting again. Seen in profile slightly sinuous, broadened below at near the apex, finely hairy especially at apex, black. Inferior shorter, black, narrowly triangular, curled up but very slihgtly near the apex, invisible when viewed from above, that is, they are completely eclipsed by the superiors.

Wings slightly saliated, yellow rays in the subcostal, cubital and anal triangular spaces. Membrane greyish white. Stigma black over 2 cells, weakly braced, distinctly longer than in *Macromia* and *Idionyx*, bevelled acutely at either end. One cubital nervure in forewing, 2 in the hind, nodal index, $\frac{7-12}{10-9}\left|\frac{12-7}{9-10}\right.$, hypertrigones all traversed twice, the nervures close together in middle of structure, trigones and subtrigones entire, loop made up of 7 cells, stunted, rounded, 1 row of discoidal cells as far the inner end of bridge. Tornus marked, anal triangle of 2 cells only, trigonal and basal sides of subtrigone not meeting but joined up by a transverse nervure, *Cui* arises from the lower end of trigone, and *Cuii* from the lower end of subtrigone, 2 rows of postanal cells in forewing, 4 in the hind, *Rspl* well marked in both wings, *Mspl* only well defined in the fore.

Distribution. A single male taken by myself, 7. vi. 24, at the head of the Sampaji Ghat, about a mile from the source of the Sampaji river.

The river at this spot is covered in by an overarching of cane brakes through which the sun penetrates only in places. It was in one of these shafts of sunlight that I saw the specimen whirling in rapid figure of eights, disappearing over and again for short periods. Finally I marked where it settled amongst the canes, where it was resting and looking like an *Idionyx*, and secured it without much trouble. I can remember seeing a second specimen in the same place about the same date in the previous year, but I failed to take it. At the time I felt sure this was merely an *Idionyx*.

In size and general daintyness of build, this species closely resembles *Macromidia rapida* Mart.

Genus **Idionyx.**

One new species and one new subspecies have been discovered since the body of this report was written, both from Coorg but one also from South Kanara where Mr. Souter took it at about the same time as myself.

Idionyx corona fulvia, subsp. nov.

The females of this subspecies differ markedly from those of *corona burliyarensis* by the more or less extensive saffronation of the base of both wings but more especially the hind. In some this is but poorly developed, but in most it is present as a rich deep golden brown extend-

ing outwards for a variable distance, in some almost as far as the node. Darker rays are present in the subcostal, cubital and anal triangular spaces. The males do not differ from *burliyarensis*. The habits of the subspecies however differ from those of the latter in that they leave their parent streams and fly over open spaces, ridings in forests or country roads. Dirty cattle standings are favourite spots for the females and as they fly low over such spots they are remarkably inconspicuous. This appears to be directly due to the saffronation of the wings, its function evidently being protective. As they pass and repass, one is often only conscious of a mere shadow passing and as they fly low it is often difficult or impossible to see them against a sky-line. Females are more open to attack from enemies, which may explain why they alone are protected by saffronation of the wings. This unisexual colouring is again and again cropping up, and one has only to turn to this article to see in how many species the feature is shared, thus we have the females of *I. saffronata*, *galeata*, *fulvia*, *stevensi*, *O. campioni*, and *A. martini*. Instances of this may be multiplied indefinitely.

Idionyx galeata, sp. nov.

Male. Abdomen with appendages 35 mm. Hindwing 35 mm.

Head. Labium, labrum and face dark blackish brown ; frons rounded metallic green ; vesicle rather large, bluntly conical, metallic bluish green and violet ; eyes emerald green ; occiput small, black, fringed with dark brown hairs.

Prothorax black.

Thorax metallic green with a golden lustre laterally. No humeral stripe. A narrow oblique stripe of pale yellow bordering the hinder margin of the first lateral suture and a similarly coloured band on the hinder and lower part of metepimeron. Dorsum coated with long yellow hairs.

Legs black, anterior and middle coxae yellow, anterior tibiae with the keel extending along the distal third, hind tibiae with keel extending from near proximal end to the extreme distal end, near the latter, however, there is an interruption in the continuity of the keel equal in extent to the distal cut-off portion. (This is an unique feature in the genus).

Wings hyaline, very palely and evenly saffronated. (In one male there is a regular narrow areola around the whole of the reticulation of the wings, which gives them a dirty blotchy appearance). The costal side of trigone in forewings usually bent and this as marked as in genus *Tetrathemis*. All hypertrigones traversed once ; loop of usual form, of 8 cells ; nodal index $\frac{8-4}{9-9}\left|\frac{14-8}{9-9}\right.$, $\frac{8-13}{10-9}\left|\frac{14-7}{9-9}\right.$. One row of cells between *Cui* and *Cuii* at the beginning ; pterostigma short, over $1\frac{1}{2}$ cells, black ; membrane ashy black.

Abdomen black, borders of genitalia on second segment yellow as is also a fine incomplete apical ring running up from it.

The underneath of hinder part of thorax yellow marked broadly with black with a metallic green sheen, the paired sclerites black in front and sending off an oblique stripe on either side outwards and

backwards which is confluent with a large posterior spot of black. The median suture between the paired sclerites dark brown.

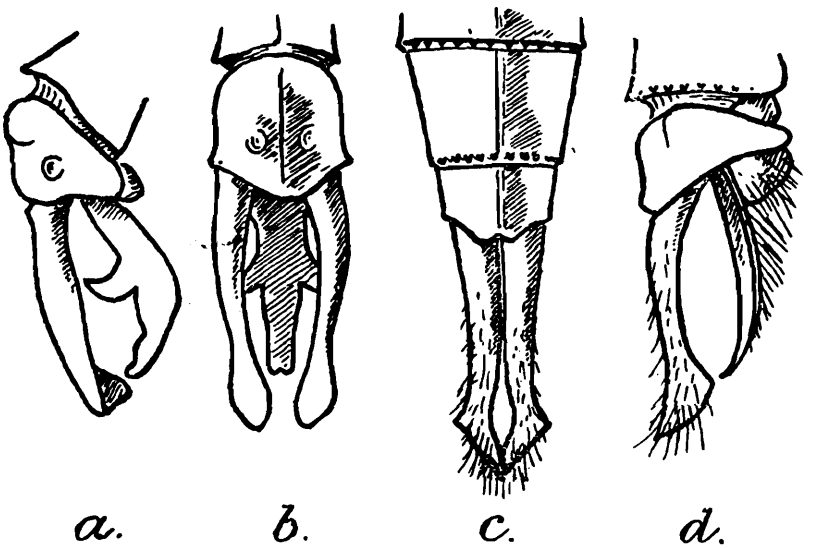

Fig. 7.-*a.* Anal appendages of *Idionyx galeata* ♂ seen in profile. *b.* The same seen from above. *c.* The same of *Indomacromia donaldi* ♂ seen from above. *d.* The same seen in profile.

Anal appendages black, subequal, the superiors subcylindrical, at first tapered nearly to apex where they dilate, the apical part turned or twisted on itself in a downward direction, seen from the side, slanting very slightly downward. Inferior seen from above, broad at base nearly as far as its middle where it gives off on each side a very robust spine, afterwards much narrower with parallel sides, apex very slightly notched. Seen from the side, it is at first directed strongly downward and then upward, its apex nearly touching the apex of superiors, the lateral spine seen pointing strongly upward.

Female. Abdomen 37 mm. Hindwing 37 mm.

Head coloured similarly to that of male. Vesicle remarkably specialized, very high, its apex shifted posteriorwards and shaped like a medieval turret and spire, the latter very acutely pointed, the false apex in front, obtuse.

Posterior lobe of prothorax paler brown, narrow but projecting, slightly notched at its middle, middle and anterior lobes dark brown.

Thorax as for male but the two posterior stripes lacking.

Abdomen glossy black, a fine apical lateral creamy yellow stripe on segment 2, continued on ventral border of 2 and 3.

Vulvar scale projecting, acute, its median carina strongly keeled.

Wings hyaline, bases palely saffronated as far as the third antenodal nervure in forewing, as far as the second in hind. Forewings more extensively saffronated than the hind. In some specimens the wings are diffusely enfumed, especially towards the apices, where the cell middles are alone clear. Two females taken have the wings much more extensively saffronated, the sepia tinting is deepened to a warm brown, the clear cell middles show here as a fine grain of stippling, especially distad of the node, the saffronation in the hindwings extends as far as the outer end of trigone. In another female, the saffronation extends as a broad deep amber fascia to well beyond the trigones, deepening along its outer

border. In all these various females the vesicle is the same shape, moreover in all there is a double row of cells between the origins of *Cui*

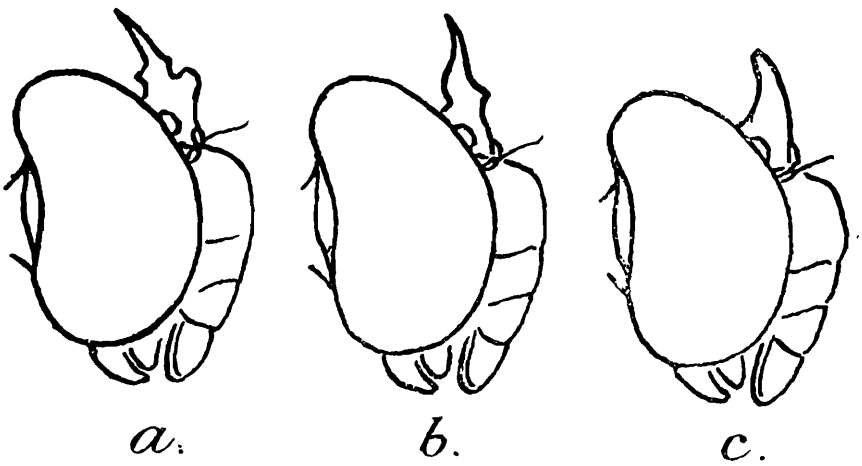

Fig. 8. Heads of : *a. Idionyx galeata* ♀, *b. Idionyx corona corona* ♀, *c. Idionyx corona burliyarensis* ♀, showing curious shape of vesicle.

and *Cuii*, a feature unknown in other species of the genus ; nodal index $\frac{7-13}{8-9}\left|\frac{12-8}{9-9}\right.$, $\frac{8-16}{8-9}\left|\frac{15-9}{9-10}\right.$. A further curious feature in these females is that the anal loop is separated from the subtriangle at its base by the interception of a single cell, the loop appears to be, but is really not, 3 cells wide at its base.

Distribution. Coorg and South Kanara only. The types were taken on Katlkad Estate near Mercara, 17. v. 24 by myself. Two more also females were taken on the following day at the same place, all flying low over paths in the estate (3,800 ft.) A fourth female was taken on 25. v. 24, flying low round coffee bushes in company with a female of *saffronata.*

Two males, the first taken by myself, were captured on 30. v. 24. These also were flying very low and hawking along the borders of a fern covered bank, as late as 5-30 P. M. Subsequently Mr. C. A. Souter sent me a number of both sexes which he had mistaken for *I. corona fulvia*, not having noticed the distinctive vesicle. These he took on Kudremukh, 4,500 ft., from 16 to 22.v.24, South Kanara. (Were simply swarming here.)

The anal appendages of the male and the vasicle of the female will serve to distinguish this species from any others.

Genus **Rhinocypha.**

Rhynocypha laidlawi Fras.

Eight females of this strikingly new species have been taken since the male was described in the body of the report, so that I am now able to complete the description of the species. These females were taken on the same stream and a neighbouring one, as that on which the males were discovered. Mr. C. A. Souter discovered the first females on 17.v.24 and I took four more on the following day. They appear to be closely allied to *R. ustulata* Br., from Amboina and the Moluccas.

Female. Abdomen 17 mm. Hindwing 24 mm.

Differing markedly from the male, in that all the markings are bright yellow instead of red and azure blue, the forewings hyaline and the hind with only the apex diffusely marked with dark brownish black.

Head. Labrum black with two large yellow spots covering the greater part of its surface, rest of head velvety black marked with a number of yellow spots as follows :—a large triangular spot on tip of epistome, followed posteriorly by two parallel chains of spots, an anterior rather large triangular spot, a minute point behind it followed by a reniform spot which lies just outside the posterior ocellus. The bases of mandible and sides of cheeks yellow, the latter bordering the eyes far up. A small spot on each side of the epistome, the bases of antennae and finally a postocular rounded spot behind and inside each eye.

Prothorax black marked with yellow as follows :— a middorsal stripe running from the posterior lobe nearly as far as anterior border, a subdorsal medial spot and a chain of 3 large spots low down on the ventral border.

Thorax black marked with greenish yellow as follows :—2 minute spots on the alar sinus, the middorsal carina finely, a long fine antehumeral stripe, its outer end curling abruptly outward, a short stripe just posterior to the humeral suture and incomplete below, a still shorter vestigial stripe just posterior to the upper part of first lateral suture, a long stripe traversing the whole length of the sides, crossing both sutures obliquely and with both its upper and lower borders serrated and very irregular.

Legs black, femora dirty yellow on inner side ; anterior tibiae with two rows of long rapidly decreasing spines on proximal half, and an inner row of very short, very closely-set, evenly-sized spines on distal half.

Wings hyaline, the hind with the apices broadly brown, this marking extending inward proximal to the stigma for about its own length and much deeper tinted in the hinder two-thirds of the wing, anteriorly the cell middles of the marking are clear and at the apex of wing the brown is replaced by a small area of opalescent white.

Pterostigma black at its inner half, opaque white in the outer, margined with black. Wings petiolated to distad of *ac* ; primary antenodal nervures, the first and third.

Abdomen black marked with yellow and greenish yellow,—segment 1 with a large lateral spot and a minute middorsal apical linear spot, all segments from 2 to 8 with the middorsal carina finely yellow, and from 2 to 7 a long narrow stripe followed by a large apical spot on the sides, a subventral stripe is present on all, running parallel to the underside of the lateral stripe. Segments 9 and 10 wholly black.

Anal appendages black, long, acuminate.

From *R. ustulata* the species is determined by the markings being blue in the male instead of golden yellow and by the wings petiolated to well distad of the nervure *ac*, instead of well proximad. The species appears to have two distinct seasons, the above described females being taken in April (18.iv.24), whilst the originals were taken in November. The species was quite absent in the intervening months.

Genus **Disparoneura.**

Disparoneura souteri, sp. nov.

Male. Abdomen 30 mm. Hindwing 18 mm.

Head black marked with bright cherry red. Labium brown; labrum and anteclypeus dark brown; postclypeus and cheeks pale red, this colour forming a broad band across the face from eye to eye and most intensely red on the clypeus, rest of head velvety black traversed by a broad band of bright cherry red with its hinder border at level of posterior ocelli. Eyes reddish brown above changing gradually to greenish yellow beneath.

Prothorax velvety black with a fine point of cherry red at middle of posterior lobe and a subdorsal stripe of the same colour in continuation of the humeral stripes.

Thorax velvety black marked with a broad cherry red humeral stripe on each side of dorsum, these stripes being of the same breadth as the intervening black. Laterally a stripe of citron yellow limited in front by the first lateral suture and with its anterior border bright cherry red. Finally the hinder half of the metepimeron primrose yellow.

Legs black, femora pale on inner side, tibiae yellow on extensor surface.

Abdomen black, segment 1 marked with bright cherry red at its base and with an angulated yellow marking on the sides, segment 2 broadly cherry red on the dorsum, this marked subapically with two moderately large spots of black and a narrow black apical ring, laterally and apically the red changing to yellow, the sides entirely black below. Segment 3 with its base cherry red for the basal sixth, changing to yellow on the sides, a diffuse apical spot of yellow on the sides which is repeated on segments 4 and 5 but more obscurely so, rest of abdomen black.

Wings hyaline, pterostigma black, over a single cell; nodal index 17 in forewing, 15 in the hind.

Anal appendages. The superiors black marked above with a large dash of cherry red, directed straight back, constricted at base, ending in a point. Seen in profile they dilate rapidly towards the apex and are furnished below with two robust spines, one medial, one subbasal. Inferior black, slightly longer than superiors, directed straight back, tapering to an obtuse point, apices curled inward rather abruptly and nearly meeting at the middle line.

Female. Abdomen 28 mm. Hindwing 18 mm.

Eyes dark brown above, greenish yellow in the lower half, the two zones of colour sharply limited from one another. Labium, labrum and anteclypeus pale brown, cheeks greenish yellow and connected across the postclypeus by a golden yellow stripe. The red band on vertex of head replaced by a golden yellow one.

Prothorax and thoracic markings similar to male but bright greenish yellow instead of red, these stripes margined by a fine margining of golden yellow.

Abdomen black marked with golden brown and olivaceous. Segment 1 with an olivaceous angulated mark on the sides, 2 with a fine golden yellow line on the middorsal carina, which is continued on to

segment 3 nearly as far as its apical border, laterally segment 2 has a hasp-shaped mark of yellowish brown and beneath it a streak of yellow on the ventral border, 3 to 5 have the sides broadly golden brown, the basal portion nearly cut off by an invasion of the black, apically it expands into a diffuse olivaceous spot, 6 to 7 have this marking very obscure, 8 to 10 have a lateral greenish yellow stripe continuous from segment to segment. The dorsal carina on these segments is golden yellow, this colour expanding broadly on segment 9 and less so on 10.

Anal appendages brownish yellow, short, conical.

Wings hyaline, pterostigma dark brown, nodal index,—15 post-nodals in forewing, 13 in hind.

Legs black, the yellow markings brighter and more extensive than in male.

Distribution.—South Kanara only, on the same streams as *R. laidlawi* was taken, 18.iv.24. The type male and female were taken *in cop.* ovipositing on weeds and debris alongside the river bank. Subsequently I took other specimens, usually over runlets where the water was shallow and ran over a gravelly bottom. The favourite spots were found to be within tunnels formed by overarching bushes springing from the banks of the river. I made several drives over rivulets running through such dark tunnels and drove into the open quite a swarm of *Caconeura verticalis annandalei*, *Disparoneura tetrica* and a single *D. souteri* keeping them company. The species is readily distinguished by its cherry red markings which when on the wing are so bright as to give the impression that the whole of head and thorax are uniformly bright red. Types will be lodged in the British Museum.