NEW AND RARE ODONATA FROM THE NILGIRI HILLS.

By MAJOR F. C. FRASER, *I.M.S.*

(Plate I.)

The Odonate fauna of the Nilgiris is of more than ordinary interest in that these hills have furnished some of the earliest known types of Dragonflies.

The Nilgiris were first explored by Europeans in 1822 and Rambur described several species of dragonflies in 1842 which had been collected from those hills during the two decades which had elapsed.

Unfortunately the descriptions given by this entomologist, although good, are often not too exact and lead to doubt as to what particular insect was described, especially in a case where there are several insects closely similar. Amongst these latter is the description of *Indoneura gomphoides* (*Argia gomphoides* Ramb.) which was obviously made from an immature insect and which does not give the exact measurements.

The Baron de Selys in his *Synopsis des Agrionines*, p. 20, 1842, redescribed *I. gomphoides* and gave the measurements of the abdomen and hindwing. It is evident that he knew the type and made his description from it, for in 1886, in his *Revision des Agrionines*, p. 171, he described under the same name, two specimens which he had received from Mr. McLachlan and, concerning them, noted that they differed from the type by being larger, by having the wings more rounded and Cu_1 rather longer. This implies a close, personal comparison of two types and leaves no doubt as to which was the original of *Indoneura gomphoides*, viz. the smaller of the two species.

Of the two other closely related species found in the Nilgiris *Disparoneura canningi* Fraser has no blue markings and *Disparoneura westermanni* Hagen is much larger than either of the two species described by Selys.

During the last decade I have had several opportunities of collecting and examining large numbers of specimens of *Indoneura* over a wide range of the Nilgiris, and I find that there are two very distinct types of *I gomphoides* as described by Selys, the smaller of which is undoubtedly Rambur's type, and the larger a new species for which I propose the name *Indoneura ramburi*.

Indoneura gomphoides (Ramb).

Argia gomphoides, Ramb., *Ins. Nevrop.*, p. 256 (1842); *Alloneura et Disparoneura gomphoides*, Selys, *Syn. des Agrionines*, p. 448 (1860)

id., *Rev. des Agrionines*, p. 171 (1886); *Indoneura gomphoides*, Laid., *Rec. Ind. Mus.* XIII, p. 347 (1917).

Male. Abdomen 36 mm. Hindwing 26 mm.

The markings in the adult stage are all turquoise blue, the thoracic ground colour is citron yellow only in teneral specimens and soon passes to pale blue whilst the humeral stripes take on a deeper shade.

The abdomen is moderately robust and short, and built more on the lines of *Calicnemis eximia*.

The wings are moderately sharply pointed at the apex; *ac* is situated midway between the two antenodal nervures and meets *ab* well away from the posterior margin of the wing; Cu_2 is 11 cells in length: the stigma is dark brown framed in black nervures; the postnodal nervures in the forewing number 19-22.

Female. The markings in this sex are a dirty grey, the humeral stripe often having an ochreous hue. The markings on the end segments of the abdomen are bluish.

Habits. This species frequents streams on the kundahs (open grassy country) around Ootacamund, where in restricted localities it may be seen swarming during the early months of the year before the onset of the monsoon. The break of the rains in June leads in a few days to its total disappearance although on fine days or during temporary breaks in the monsoon, a few stragglers may be seen.

Indoneura ramburi, sp. nov.

Disparoneura gomphoides, Selys, l.c. (1886).

Male. Abdomen 44 mm. Hindwing 30 mm.

The markings do not differ markedly from those of *Indoneura gomphoides* and are coloured turquoise blue in the adult, citron yellow in immature specimens.

The abdomen is very long and slim when compared to that of *I. gomphoides* and is built more on the lines of that of *Coeliccia renifera*.

The wings are more blunt at the apex; *ac* is situated much nearer the basal antenodal nervure and meets *ab* almost or just at the posterior margin of the wing; Cu_2 is 13 or more cells in length; the stigma is black; the postnodal nervures number in the forewing 22–32.

The anal appendages do not differ from those of *Indoneura gomphoides*.

Female. Abdomen 42 mm. Hindwing 30 mm.

Except for its greater length, not differing from the female of *I. gomphoides*. Stigma pale brown. Postnodal nervures in forewing 22–23.

Habits. This species is found at a lower level than the former and has a much more scattered and extended range between 3000 ft. to 6500 ft. It is never found in swarms as is *I gomphoides* and it often travels far from the neighbourhood of its native streams, extending deep into the jungle.

Unlike *I gomphoides* it does not appear much before the onset of the monsoon in June and from that time onwards during the rains, gradually increases in number. I have never found the two species in company and they are certainly quite distinct. The type described by Selys is presumably in the McLachlan collection but I cannot say for certain as I omitted to take the measurements when examining the collection in 1920.

In males taken at an elevation of 3000 ft., abdominal segments 8 and 9 show an almost constant invasion of the blue by the black ground colour from the base. This latter colour projects into the blue as a subdorsal streak on each side and limits it also laterally so that on each segment an inverted blue "T" is formed. In all other respects these specimens agree with *Indoneura ramburi* so that they are probably not more than a local variety of it.

Type in my own collection, paratypes in British and Indian Museums.

Phylloneura westermanni (Selys).

Alloneura westermanni, *Bull. Acad. Belg.* (2) X, p. 447 (1860); *Disparoneura westermanni*, Selys, *Mem. Cour.* XXXVIII, p. 171 (1886); Laidlaw, *Rec. Ind. Mus.* XIII, p. 347 (1917).

Male. Abdomen 51 mm. Hindwing 38 mm.

This insect has been lost sight of for many years and some doubt exists as to what genus the insect really belonged to. Recently I have secured twelve male specimens of a dragonfly from near Gudalur, Nilgiris, 4500 ft., 26·vi·1921, which fit the description and measurements given for *P. westermanni* so exactly that there can be no doubt but that they belong to that species.

The colouring is closely similar to that of *I. gomphoides* so that the two insects are apt to be mistaken for one another when resting or on the wing and I fell into this error when I took the first specimen of *P. westermanni* and imagined that I had taken a particularly fine and large specimen of *I. gomphoides*. The former insect is, however, very much larger and the blue on the abdominal segments more extensive, covering the apical half of the 7th segment as well as the whole of the 8th to 10th.

The venation of the wing is irregular and is of interest in that it shows well-marked traces of a transitional reduction from a complex to a simple form of venation. Rudiments of intercalated sectors are found in the wings of many specimens and the straightening out of a zig-zagged M_2 is well illustrated.

P. westermanni is even more primitive than *Indoneura* and is not congeneric with the latter as Dr. Laidlaw had surmised; I have therefore placed it in a genus of its own. On the contrary it is more closely allied to *Disparoneura*, as *ab* extends outwards as far as Cu_2a which it joins, as in all species of the latter genus. It thus differs markedly from *Indoneura* in which *ab* curves downward to meet the posterior margin of the wing so as to enclose a marginal cell. The primitive nature of the venation, however, separates it from *Disparoneura* as sharply as the same feature separates *Indoneura* from typical *Caconeura*.

Postnodal nervures to the forewing 27–29 ; stigma black; Cu_2 is 13 cells in length or less than half the wing length.

Female. Abdomen 46 mm. Hindwing 35 mm.

Very similar to the male but of stouter build, differing as follows:—

Wings uniformly enfumed. In the right hindwing *ab* is connected to the posterior border by 2 transverse nervures. In both forewings it is nearly confluent with the posterior border at its outer part and the space between the 2 nervures can only be detected with the aid of a strong magnifying glass. In 3 out of the four wings there are rudiments of intercalated sectors. No blue on segment 7.

Segments 8 and 9 have blue dorsal markings shaped like a German helmet with the top spike directed basalwards but not quite reaching the base on the 8th. Segment 10 has the whole of the dorsum blue.

Ovipositor of great size and much more conspicuous than in *Indoneura*.

Habits. This species haunts the neighbourhood of mountain streams but, unlike *Indoneura*, is rarely found on low herbage but keeps to the shelter of overhanging branches at a height of 8 to 10 feet from the ground.

The female is described from a single specimen taken at the same place as the males, near Gudalur, 14·viii·21. It was captured *in copula* whilst ovipositing in water trickling over the surface of a rock.

Genus **Protosticta** Selys.

In addition to *Protosticta gravelyi* Laid. described in these *Records* from Cochin and Kanara, I have to record three new species from the Nilgiris, all closely allied but differing in markings and in the case of one species, in morphology.

Two of these were found in company and all have the same characteristic habits. They are found in the beds of rocky, mountain streams, where they keep to the cover of the banks or rocky boulders.

In the dark shadows of the latter they may be detected sitting with the body and abdomen held horizontally out and almost invisible save for the chain of tiny white spots on the head, prothorax and abdomen.

When disturbed they hover continually with the abdomen held rigidly out in spite of its enormous length and move forward with a series of short, jerky flights. The females are found in almost nocturnal darkness, small caverns amongst the rocks being especially favoured by them for purposes of concealment. They appear to breed in the patchy morass bordering the streams they frequent.

Sufficient stress has not been laid on the extraordinary morphology of these dragonflies. The enormous size of the eyes and the length of the abdomen are outstanding features and with regard

to the latter, if compared to the length of the thorax, it is probably the longest abdomen found in any known dragonfly not excepting *Mecistogaster*.

Key to the Protosticta *from Southern India.*

1.	Abdominal segments 8 and 9 of nearly equal length; stigma blood red	*P. sanguinostigma.*
	Abdominal segment 8 more than twice the length of segment 9; stigma black	2.
2.	Prothorax white marked with a posterior, dorsal, triangular spot	3.
	Prothorax entirely bluish white	*P. hearseyi.*
3.	Abdominal segment 8 entirely black	*P. gravelyi.*
	Abdominal segment 8 with the basal third or half bluish white, the apical third or half black, the dorsal carina of this segment on its basal half finely black ...	*P. stevensi.*

Protosticta hearseyi, sp. nov.

(Plate I, figs. 3, 4.)

Two males and 15 females, 26·vi·21, Gudalur, Nilgiris, 4500 ft.

Male. Abdomen 35 mm. Hindwing 21 mm.

Head black, labium ashy white, labrum and genae palest blue, the former margined finely with black, the two basal joints of antennae pale blue. Eyes pale blue changing to olivaceous on the crown and paling beneath.

Prothorax pale blue, unmarked.

Thorax glossy black, almost metallic on the dorsum, pale blue at the sides. The mid-dorsal carina strongly defined in pale blue. Laterally a broad, black stripe on the 2nd suture and foreborder of metepimeron.

Beneath a black spot between the two hind legs and a pair of elongated spots posteriorly which converge on one another as they approach the first spot.

Legs bluish white, the two posterior pairs with a linear, black stripe on the femora.

Wings hyaline, the apices rather elongate; stigma black, its costal border shorter than the posterior, the inner border oblique; 14 postnodal nervures in the forewing.

Abdomen blackish brown marked with pale blue, this colour most marked on the end segments. The sides of segments 1 and 2 whitish, as is also a diffuse streak on the mid-dorsum, incomplete on the apical half of segment 2; pale basal annules on segments 3 to 7 which broaden laterally and obliquely; segment 8 turquoise blue marked narrowly and apically with black; segments 9 and 10 black, the former having a bluish marking on its side shaped like a crescent and star.

Relative size of the abdominal segments as for *P. gravelyi* Laid.

Anal appendages of subequal length, about as long as the two last abdominal segments. The superior stout at the base with a spine on the inner side of smaller size and nearer the base than that

found in *P. gravelyi*, somewhat bayonet-shaped in profile and chelate at the apices, one arm however expanded and roughly quadrate (figs. 3 and 4). Inferior appendages stout at the base, simple, tapering to a fine point and curving up slightly.

Female. Abdomen 32·5 mm. Hindwing 22 mm.

Very similar to the male and differing as follows:—

The labrum is more broadly bordered with black; the eyes are pale olivaceous green changing to pale brown on the crown; the mid-dorsal carina of the thorax is only obscurely whitish at its upper part.

The basal annule on segment 7 is much broader and its border crenate, segment 8 is brownish black with a lateral, quadrate spot of white, whilst 9 is paler brown and marked with a broad, lateral spot of dirty white connected to a smaller spot subdorsally. Segment 10 very small, black.

Habits. Found in marshy spots hiding in the shadow of rocks or amongst scrub at the sides of precipitous ravines. This species differs from all others by the two sexes being of nearly equal length, by the male having the mid-dorsal carina of the thorax strongly marked with white, and by the prothorax being quite unmarked.

Protosticta sanguinostigma, sp. nov.

(Plate I, figs. 5, 6.)

Two adult males, 2 teneral males, 3·vii·1921 and 23·vii·1921, Coonoor Rd., 10th mile, 1500 ft., Nilgiris.

Male. Abdomen 47 mm. Hindwing 25·5 mm.

Head. Eyes bottle green, pale greenish blue beneath and marked uniquely with a broad band of dark blackish brown which begins above and behind and passes obliquely forward and downward along the sides.

Labrum turquoise blue, narrowly bordered with black: lower part of epistome blue, the rest of head jet black save for an obscure, transverse fascia of pale brown at the back of head. Anterior surface of the two basal joints of antennae pale.

Prothorax black above with an oval spot of blue at each side in the middle, the sides whitish.

Thorax jet black with a coppery, metallic sheen above, the sides pale blue marked with a lateral stripe of black on the 2nd suture which is bordered diffusely behind with brown.

Legs white with a broad, diffuse, pale brown annule near the dorsal end of the femora which are striped in their length with black on the extensor surface.

Wings hyaline, the stigma blood red, its costal side much shorter than the posterior, its inner side much shorter than the outer, the latter strongly convex; postnodal nervures to forewing 16–18.

Abdomen very long and slender, black on the dorsum, paler brown on the sides, marked with pale turquoise blue. Segment

3 with a very narrow and obscure basal annule, segments 4 to 7 with broader annules, increasing in breadth from the 4th to the 7th; 8th segment turquoise blue with the apical border more or less narrowly bordered with black, this colour being continued very narrowly along the dorsal carina and tapering gradually towards the basal end of the segment; segments 9 and 10 all black. The relative size of the segments is much the same as in the former species but 8 is only very slightly longer than 9.

Anal appendages much the same as in the last species but the spine at the base is more on the outer side and much stouter, the chelate ends are broader and the broader arm bifid at its extremity.

Female. Abdomen 39 mm. Hindwing 26 mm.

Very similar to the male but of much stouter build and with a shorter abdomen.

Head. Eyes deep bottle-green above, paler green beneath, these two shades of green separated by a thick, equatorial line of black. Rest of head as for male but the blue on labrum and lower epistome is of a deeper shade.

Prothorax blackish above, dirty white at the sides; the posterior lobe with lateral prolongations shaped as two projecting points.

Thorax as for male but blue markings of a deeper shade.

Wings hyaline; postnodal nervures to forewing 16, in the hind 15, stigma a cherry red, arc distal to the 2nd antenodal nervure.

Abdomen black with white or blue markings as follows:— 1st segment with a blue lateral spot, segment 2 has a bluish lateral basal marking prolonged along the ventro-lateral border, segment 3 has the middle two-thirds or three-fifths of its ventro-lateral border a pale whitish brown, segment 4 has very obscure basal and ventro-lateral markings, segment 5 has a well-marked basal white annule, segment 6 obscure basal and ventro-lateral markings, segment 7 has a broad basal annule bluish in colour, occupying about one-third of its length, the remaining segments entirely black.

Habits. Found in similar situations to the last but more retiring and never coming out into the open. The four specimens taken were in the deepest jungle clinging to maiden-hair fern sprouting from crevices in the rocks The insect is readily distinguished from others by its red stigma and by the equality in size of segments 8 and 9.

Type in my own collection, paratypes in British and Indian Museums.

Protosticta stevensi, sp. nov.

(Plate I, figs. 1, 2, 7.)

Five females and a considerable number of males taken on the Coonoor-Metuppalayam Rd., 10th mile, 1500 ft., 3·vii 1921 and 24·vii·1921.

Male. Abdomen 49 mm. Hindwing 22 mm.

This species is very closely related to *P. gravelyi* from which it differs by the greater length of the abdomen and by the 8th abdominal segment having its basal third of half pale blue instead of all black as in *P. gravelyi*. The dorsal carina of this segment is narrowly black in its basal half.

Female. Abdomen 37 mm. Hindwing 23 mm.

Differing from *P. gravelyi*, which it much resembles, by the difference in the relative lengths of hindwing and abdomen and the markings of the abdomen. The basal annule on segment 7 occupies about the basal fourth and there is no basal annule to segment 8 but a lateral, irregular spot. There is also a large diffuse white spot on the outer side of the eye which is not present in *P. gravelyi*.

The ovipositor of this and other species has a large, prominent, stout, upward-turned spine on its dorsal apical surface.

Habits. As for the genus, but bolder and to be seen frequently flying in mid-stream. Large numbers of males were seen on the 3rd of July all with their heads facing up stream and travelling slowly in that direction. A few were seen paired, but the females as a rule kept to the shelter of the scrub lining the stream, where apparently the males sought them. By the 23rd of July the numbers had greatly diminished and few were seen.

Type in my own collection, paratypes in British and Indian Museums.

Pseudophaea fraseri Laidlaw.

Rec. Ind. Mus. XIX, p. 23 (1920).

Two females and a large number of males, Gudalur, 4000ft., Nilgiri Wynaad, 9·vii·1921.

Thanks to the kindness of Mr. Laidlaw I have been able to compare the above specimens taken by myself with a paratype of *P. fraseri* and I find that the differences are so marked as to constitute a very distinct race if not a new species. For the present and until I receive Mr Laidlaw's opinion I propose to call this race *wynaadensis*.

The differences are as tabulated :—

P. fraseri.	*P fraseri*, race *wynaadensis.*
Length of forewing 35 mm.	Length of forewing 38 mm.
Greatest breadth 6·5 mm.	Greatest breadth 7 mm.
Apical third of hindwing opaque, from 8·5 to 10 mm. long.	Considerably more than the apical third opaque, from 12 to 13 mm. long.
Length of abdomen 38 mm.	Length of abdomen 43 mm.

In addition to the above the anterior pair of femora are brownish black on the flexor surface, bright yellow on the extensor. The dorsal wedge-shaped line is bright turquoise blue and is so sharply contrasted with the black background as to give the impression

that it is phosphorescent and in fact it appears to glow like the lamp of a glowworm.

The second line on the thorax is ochreous in colour, and the first 6 segments of the abdomen are blood-red.

Female. Measurements of the two specimens :—

Abdomen 34 mm.	Forewing 35 mm.	Hindwing 32 mm.
,, 34·5 mm.	,, 36 mm.	,, 34 mm.

The wings are slightly enfumed throughout and the apices of both are tipped with brown, especially the hindwing where this colour extends in as far as the proximal end of the stigma. For the rest, the female does not differ from typical *P. fraseri* except that the antehumeral lines do not meet anteriorly on the thorax, but are parallel throughout.

Habits. This insect is found perched on plants and twigs overhanging the borders of the streams it frequents. Unlike most if not all other *Calopterygines* it is frequently seen settled with the wings outspread and the abdomen raised at an angle like many Libellulines.

The females are rarely found near water, but penetrate into the neighbouring jungle where they may be found paired with the males.

Type male and female in my own collection, paratypes in British and Indian Museums.

The distribution of this insect and *P. dispar* is extraordinarily local. The two never apparently occur together, but may be found on the same stream at different altitudes. At Gudalur *P. dispar* is found at an elevation of 4000 to 4500 ft., often in considerable numbers, whilst two miles further down the valley at an elevation of 3500 ft., *P. fraseri* is quite common. On the opposite side of the Nilgiris *P. dispar* is met with at elevations varying from 3500 to 6000 ft. at Coonoor, *P. fraseri* being entirely absent.

Phyllomacromia nilgiriensis Fraser.

Female. A single female, 24·vii·1921, near Kalar.

The type is in the British Museum and was taken in June, 1917, by myself at a stream not far above Kalar. I have now secured another specimen, also a female, taken on the same stream at about 100 yards from where the type was caught.

The wings of this specimen are enfumed throughout, the colouration forming a diffuse network corresponding to the nervures. The saffronation extends out nearly to the trigones; otherwise it does not differ from the type.

Taken whilst ovipositing in wet sand which formed the floor of a small, dark cavern amongst rocks bordering a mountain stream.