

A REVISION OF THE GENUS *IDIONYX* SELYS.

By LT.-COL F. C. FRASER, I.M.S., F.E.S.

Twenty years ago only four species of this interesting and archaic genus were known. In 1912 Dr. Ris added two more species to this number and gave some details of what he thought to be a pair of *optata* from South China. These insects, however, turn out to be a distinct species, which I have named in this paper "*carinata*." Since that date seven species have been described by myself, one from Assam and six from South India. In addition to the new species *carinata* already mentioned, I now have three more new ones to describe, all from North India and Burma. As I have before me nearly one hundred specimens, representing fourteen species of the genus, which is by far the largest collection of specimens ever brought together, the moment seems opportune for a revision of the genus as a whole.

The large amount of material, and accompanying notes, have not afforded much help in establishing definite groups. A careful study of the venation and genitalia has proved both to be valueless for this purpose, the one because of its inconstancy, the other because of its homogeneity. Employing the list of characters given below, I have been able to establish only three fairly-defined groups, but quite a number fall outside these. The characters exhibited are shared in such a haphazard way, that one is forced to the conclusion that many of them have had an independent origin. In support of this, I may mention that none of the S. India species occurs in N.E. India and Burma, and *vice versâ*, but yet we find species in both areas possessing similar characters allotted differently. Thus a female from Burma will have saffronated wings and a specialized vesicle, whilst one from S. India will have the wings saffronated but the vesicle simple. Another from Assam will have the vesicle simple, saffronated wings and a humeral stripe, whilst one from Coorg presents a specialized vesicle, saffronated wings but no humeral stripe. Instances like this may be multiplied. The only explanation which can be offered to this riddle, is that the forces of natural selection responsible for moulding the species, have been similar in both areas, and have thus called forth parallel characters. A varying exposure to these forces would explain why the characters have been differently allotted. There is no doubt that similarity of environment calls forth similar characters in species, even when not nearly related, as the following note clearly proves. Mr. E. B. Williamson sent me two species of *Perilestes* from S. America and I was profoundly struck by their close similarity to *Protostictas* from S. India. Writing to him later, I sent him a description of the surroundings in which *Protosticta* was found, *viz.*, dark rocky haunts in the beds of mountain streams. In reply, he stated that my description might well have been written for that of *Perilestes*.

The habits of *Idionyx* are not very well known, and I have to rely almost entirely on my own observations in S. India. Mr. T. Bainbrigg

Fletcher has, however, given me a few notes relative to species from Shillong, Assam. Their flight is usually high, light and airy, some being gregarious in habit especially *saffronata* and *nadganiensis*, whilst others are solitary. *Saffronata* may be seen often in large numbers, 30 or more at a time, disporting themselves in the air like a swarm of gigantic midges. For this "nuptial dance," they choose small sunny glades in dense forest, or rather, in what I call a "jungle chimney," a small clearing in high forest where the sun only penetrates at its zenith. Their flight takes place only during sunlight, a cloud passing over being the signal for their immediate disappearance. On dull days they may be seen resting high up in trees, clinging to twigs. Other species ramble over a long course in their flight, *galeata* and *burliyarensis* especially having this habit. A riding through a forest is a favourite path for their wanderings. Mr. Fletcher has observed this habit in *optata*. Some species are sub-crepuscular in habit, that is, they do not appear on the wing until late in the day. *Burliyarensis*, and more especially its subspecies *fulvia*, have this habit; numbers may be seen flying low over paths or dirty cattle standings at about four or five in the afternoon, and seemingly find an abundance of food in such localities. This species may also be seen ascending and descending ravines, following the course of mountain streams, and hugging the water closely, apparently searching for females. The latter oviposit in mud or wet sand, often penetrating deep undergrowth for this purpose. A favourite spot is at the foot of a steep bank, where springs have found their way to the surface, and a thin sheet of water covers the soil percolating slowly to the river below. *Nilgiriensis* will enter small natural caves in river banks and there deposit its eggs in the wet sand which floors such gloomy retreats. The saffronation of the female wings appears to be rather of a protective nature than decorative, for those so adorned are remarkably invisible during flight. Viewed from below they are of course, very conspicuous, but from above, and when skimming over the ground, they are most puzzling insects to capture on account of their invisibility.

I have employed the same characters for differentiating the species as I used in the survey of the Western India species. Of these features, I regard saffronation of the wings as least important, as with the exception of *stevensi* and *saffronata*, it is an unstable character and dependent on the age of specimens. The hindwing of the female is invariably broader than that of the male and the reticulation is decidedly closer. Thus the discoidal field is often made up of two rows of cells instead of one, the interval between the nervures *Cui* and *Cuii* in the hindwings is frequently filled with a double row of cells instead of one, and there are always 3 rows of cells between the base of the wing and the inner margin of the loop, although only 2 are found in the male.

As regards the genitalia on the second abdominal segment of the male, in the species which I have examined,—*optata*, *yolanda*, *dohrni*, *montana*, *intricata*, *saffronata*, *imbricata*, *galeata*, *unguiculata* and *stevensi*, the differences are so slight as to be worthless for purposes of practical differentiation. I have however figured some of these on Plate X in the hope that they may be of use to future students.

The following is a list of the species at present known, together with their localities. The numbers following each species correspond to those given below for individual characters, and serve to show how they are shared by each :—

1. *Idionyx optata* Selys (nec Ris). Assam. 1, 3, 5, 7, 10=11=13.
2. *Idionyx carinata* nom. nov. (*optata* Ris nec Selys). S. China. 1, 3, 5, 7, 10, 11, 13.
3. *Idionyx intricata* sp. nov. Assam. 1, 3, 5, 7, 9, 11, 13
4. *Idionyx yolanda* Selys. Penang. 8, 9, 11, 13.
5. *Idionyx nadganiensis* Fras. Nilgiris and Coorg. 8, 9, 11, 13.
6. *Idionyx stevensi* Fras. Assam. 1, 3, 5, 8, 9, 11, 13.
7. *Idionyx claudia* Ris. S. China. 2, 4, 5, 8, 9, 11, 14.
8. *Idionyx corona* Fras. Mysore and Malabar. 7, 10, 11, 14.
9. *Idionyx burliyaensis* Fras. Nilgiris and Coorg. 2, 4, 6, 7, 10, 11, 14.
10. *Idionyx galeata* Fras. Coorg and S. Kanara. 2, 4, 6, 7, 9, 10, 11, 14.
11. *Idionyx unguiculata* sp. nov. Burma. 2, 4, 6, 7, 10, 11, 14.
12. *Idionyx dohrni* Kruger. Sumatra and Malaysia. 2, 4, 6, 8, 10, 11, 14.
13. *Idionyx montana* Karsch. Java and Borneo. 2, 4, 6, 8, 10, 11, 14.
14. *Idionyx imbricata* sp. nov. Assam. 2, 4, 6, 8, 10, 11, 14.
15. *Idionyx philippa* Ris. Philippines. 8, 10, 11, 13.
16. *Idionyx saffronata* Fras. Nilgiris and Coorg. 2, 4, 6, 8, 9, 11, 14.
17. *Idionyx selysi* sp. nov. Burma. 2, 4, 5, 8, 10, 11, 13.
18. *Idionyx nilgiriensis* Fras. Nilgiris. 8, 10, 12, 13.

Of these, the female alone is known of *nilgiriensis*, *corona*, *nadganiensis*, *yolanda* and *philippa*, whilst both sexes of all the other thirteen species have been discovered.

The following are the principal characters by which species are differentiated :—

Male characters :—

- (1) Superior anal appendages shorter than inferior.
- (2) Superior anal appendages longer or of same length as inferior.
- (3) Superior anal appendages with a ventral spine.
- (4) Superior anal appendages without a ventral spine.
- (5) Tenth abdominal segment with a well-marked dorsal spine.
- (6) Tenth abdominal segment without any dorsal spine.

Female characters :—

- (7) Vesicle highly specialized.
- (8) Vesicle simple, rounded.
- (9) Base of wings as far out as outer side of trigone deeply saffronated.
- (10) Base of wings not or only poorly saffronated.
- (11) End of abdomen markedly compressed.
- (12) End of abdomen markedly depressed.

Bisexual characters :—

- (13) Antehumeral yellow stripe present.
 (14) Antehumeral stripe absent.

Group I. *optata*.

Female with abdomen markedly compressed, not dilated at the end, vesicle simple or specialized ; wings variably saffronated. Male (where known) with a well-defined dorsal spine on segment 10 ; superior anal appendages shorter than the inferior, and with a ventral spine ; both sexes with a humeral stripe—*optata*, *yolanda*, *carinata*, *intricata*, *stevensi*, and *nadganiensis*.

Group II. *corona*.

Female with abdomen markedly compressed ; not dilated at the end ; vesicle specialized ; wings not saffronated at the base, or if so, then only as far as the inner angle of trigone. Male (where known) with superior anal appendages longer than inferior, and without a ventral spine ; no dorsal spine on segment 10 ; antehumeral stripe absent in both sexes—*corona*, *burliyarensis*, *galeata* and *unguiculata*.

Group III. *dohrni*.

Characters similar to the last group save that the vesicle is simple—*dohrni*, *montana*, *imbricata* and *philippa*. (The female of *imbricata* has a short humeral stripe hidden entirely by the head.)

Group IV *saffronata*.

Female with abdomen markedly compressed, not dilated at the end ; vesicle simple ; wings saffronated as far out as outer side of trigone ; male with superior anal appendages longer than inferior, and without a ventral spine ; antehumeral stripe absent in both sexes—*saffronata*.

Group V *claudia*.

Female with abdomen markedly compressed, not dilated at the end ; vesicle simple ; wings saffronated as far out as outer side of trigone. Male with superior anal appendages of the same length as inferior, both very simple and Libelluline in character, with no ventral spine ; a robust spine on dorsum of segment 10—*claudia*.

Group VI. *nilgiriensis*.

Female with abdominal segments 7 to 9 markedly dilated and depressed as in *Phyllomacromia* ; vesicle simple ; antehumeral stripe present—*nilgiriensis*.

Group VII. *selysi*.

Female with abdomen markedly compressed, not dilated at the end ; vesicle simple ; wings not saffronated. Male with a long spine on dorsum of segment 10 ; superior anal appendages slightly longer than the inferior, and without a ventral spine ; both sexes with an antehumeral stripe, much better defined in the female—*selysi*.

Genus **Idionyx** Selys.

Hagen, *Zool. bot. Wien.* XVII, p. 58 (1867); Brauer, *Ib.* XVIII, p. 370, 742 (1868); Selys, *Ann. Soc. Ent. Belg.* (C. B.) p. 6, (1871); *Id. Add. Syn. Cord., Bull. Acad. Belg.* (ii), XXXVII (1874); *Id. ib. 2nd Add. Syn. Cord., (ii)* XLV (1878); Kirb., *Cat. Odon.* p. 56 (1890); Karsch, *Ens. Nachr.* XVII, p. 27 (1891); Mart., *Cat. Coll. Selys., Cordulines*, p. 57, 80, (1906); Ris, *Suppl. Ent. No. 1*, p. 79 (1912).

Dragon flies of medium size belonging to the subfamily *Corduliinae*. Head very large, as large as the thorax; eyes broadly contiguous; occiput small; frons and vesicle metallic, the latter tumid and rounded in the male, extremely variable in the female, rounded, conical, bifid, pointed or prolonged into a long intricate spine. Prothorax small, hinder lobe simple.

Thorax very small, metallic, coloured with bright citron yellow. Legs long and slim, hind femora extending a little beyond hinder end of thorax and armed with numerous minute closely-set, imbricated spines on the flexor surface, and two rows of fine hair-like spines on all three pairs. Tibial spines numerous, fine, long and closely-set; all tibiae keeled, the hind pair with a long keel, the middle and anterior pairs with a short distal keel; tibial claws bifid. Armature similar in the female but the tibial keels absent.

Wings hyaline, often saffronated at the extreme base, and very broadly so in several females; occasionally deeply enfumed in the female; nodal index rather high; reticulation moderately close; apices somewhat rounded, apices shallowly notched in the male, broadly and evenly rounded in the female; hindwing much broader than the fore, especially in the female. Usually 1 cubital nervure in the forewings, 2 in the hind; loop variable, rather long and blunt and without the Libelluline toe, of about 4 to 7 cells in the male, 8 to 10 in the female; hypertrigones traversed once or twice in the forewings, once in the hind; trigones and subtrigones entire, the former, in the forewing, equilateral and usually smaller than the subtrigones, its base far distad of level of arc; in the hind, the trigone with distal and costal sides longer than basal, the base slightly distad of level of arc; sectors of arc in all wings fused for a long distance; only a single row of discoidal cells in forewing nearly as far as border of wing, in the hind a single or double row for a distance of about 5 to 6 cells; 2 rows of postanal cells in forewing; a single row of cells between the bases of *Cui* and *Cuii* in the hindwing of male, 1 or 2 rows in the female; pterostigma very short, unbraced, acute and oblique at both ends, over about 2 cells; membrane short.

Abdomen cylindrical in the male, markedly compressed in the female, tumid at base and somewhat expanded at anal end, from segments 7 to 10; the 10th segment in the male usually carinated, and often bearing a robust dorsal spine, simple and much abbreviated in the female. (In *nilgiriensis* the terminal segments of abdomen are much expanded and depressed as in *Phyllomacromia*.) Anal appendages of male markedly variable and intricate, simple and aborted in the female. Genitalia of second segment of male homogeneous in the species; lamina depressed; anterior hamules fine stilette-shaped organs, the posterior tumid, with

broad, rounded, conical base and short robust hook, shaped like the beak of a parrot. Vulvar scale variable, usually short and inconspicuous.

Distribution.—North and West India, Burma, Indo-China, Java, Sumatra, Borneo and the Philippines. (Not so far recorded from Ceylon.)

Genotype,—*yolanda* Selys.

The nomenclature of the genus is rather obscure. Selys in his "*Cause-ries Odonatologique No. 4*," states that more than 30 years prior to the writing of the *Cause-rie*, he sent the descriptions of the genera *Idionyx* and *Zygonyx* to his friend and collaborator Dr. Hagen, being too fully occupied with his *Synopsis des Agrionnes* to describe them himself. He cited as the genotype of *Idionyx*, *yolanda*, the only known species of the genus at that time, and which had never been described. Hagen in 1867, and Brauer in the following year, published a very short description of the genus. The former, at the time, had possession of Burmeister's type *Epophthalmia gracilis* (regarded at the present time, and probably correctly so, as a *Syncordulia*), and fell into the error of supposing that *gracilis* and *yolanda* were one and the same species, owing to the details sent by Selys being of so meagre a nature as to fit both species equally. Hagen cited both names in his description, but added a note to say that he regarded them as conspecific. Unfortunately *yolanda* was then a nomen nudum, whereas *gracilis* had been described—thus *gracilis*, masquerading as *yolanda*, appears as the genotype of *Idionyx*. It is a clear case of impersonation, and *yolanda* and not *gracilis* was intended as the genotype by Selys. When the latter finally described *Idionyx* and *yolanda* fully in the *Synopsis des Cordulines*, 1871, he gave the latter as the true genotype. Although, strictly speaking, *gracilis* is the genotype owing to an unfortunate error on the part of Hagen, I think that the only commonsense line to take under the circumstances, is to assume *yolanda* to be the real type, a course I follow in this paper. References to the literature concerned is given below.

I take this opportunity of thanking Mr. T. Bainbrigge Fletcher, Col. F. Wall and Dr. Laidlaw for their valuable help and contributions, without which, much of this paper could not have been written.

***Idionyx optata* Selys (nec Ris).**

(Plate VII. fig. 1, Plate X, fig. 2.)

Idionyx optata Selys, 2nd Add. *Syn. Cord. Bull. Acad. Belg.* (ii) XLV, p. 196 (1878); Mart., *Cat. Coll. Selys*, p. 80, (*Cordulines*) (1906); Fras. (*Idionyx ornata*), *Mem. Pusa*, Vol. VII, pp. 64, 65 (1922); Ris (*Idionyx optata*) *Suppl. Ent. No. 1* (1912); Selys, *Ann. Mus., Civ. Gen.* 30, p. 472 (1891).

In the Pusa Memoirs, l.c., I described an *Idionyx* as a new species under the name of *ornata*. Since that was published, Mr. T. Bainbrigge

Since the above was written, Mr. Nathan Banks of Washington, U. S., has kindly re-examined the type of *Epophthalmia gracilis* Burm., for me, and sends the following notes:—"The wings closely resemble those of *Syncordulia atrifrons* as given by Martin; all hypertrigones entire; sectors of arc separated at origin; trigone of hindwing just distad of line of arc; discoidal field of forewing parallel to termen; pterostigma longer than in *atrifrons*; 8 antenodal nervures in forewings, 5 in the hind; 6 postnodal nervures in the hindwings. The species is a true *Syncordulia*, and indeed is the type of the genus." Our thanks are due to Mr. Banks for finally settling the true place of this most interesting insect.

Fletcher has secured a male at Shillong, Khasia Hills, Assam, where the female was originally taken. An examination of this male proves it to be *optata* Selys, the female of which had not been described. The Selysian type comes from Cherrapunji, a distance of only twelve miles from Shillong.

Dr. Ris has described a species from South China as *optata*, and has figured the anal appendages, which I have reproduced on Plate VIII, fig. 1. A comparison of the respective appendages of the Shillong and South China specimens with the Selysian description, shows clearly that the former is the real *optata*. I have therefore shown Dr. Ris' species as new under the name of *carinata*.

The Shillong male does not differ in any way from the original Selysian description, but I am able to amplify the latter by the following particulars:—nodal index male $\frac{7-12}{8-8} \left| \frac{12-7}{8-8} \right.$, female $\frac{7-3}{10-8} \left| \frac{13-7}{9-1} \right.$; discoidal field in the male single-celled for a distance of 12 cells; anal loop male 9 cells, female 12 cells. Genitalia as shown on Plate X, fig. 3.

Distribution.—Khasia Hills, Assam, Shillong and Cherrapunji.

Distinguished from *carinata* by the smaller ventral spine on superior appendages and by the inferior appendage with an upper spine on each side and their much greater length. The females are easily distinguished by their respective vesicles. In *optata* this is conical, the apex divided into four small evenly-sized tubercles. In *carinata* the apex is trifid, the middle of the three small spines the longer.

***Idionyx yolanda* Selys.**

Idionyx yolanda Selys, *Ann. Soc. Ent. Belg.* (C. R.) p. vi (1870);
Id., *2nd. Add. Syn. Cord. Bull. Acad. Belg.* (ii) XLV (1878); Id.
ib. XXXI, p. 520 (1871).

The type, in the Selysian collection, is a female from Singapore, and from the original description, it is quite clear that it does not belong to the supposed allotype male from the Karen Hills, Burma. Our knowledge of the genus shows us that the individual species have a remarkably restricted range, so that it is hardly possible that a female from Singapore would be related to a male from Upper Burma. Convincing proof has, however, been obtained by the capture of both sexes of the Burmese form by Col. F. Wall. *Yolanda* has the lower part of the front of thorax, very much like what is found in *Macromias* of the *moorei* group, and there is no well-defined antehumeral stripe. The wing bases are also extensively saffronated.

The male of *yolanda* therefore still remains unknown, and the male from Upper Burma constitutes a new species which I have named after De Selys.

***Idionyx selysi* sp. nov.**

(Plate IX, fig. 6, Plate X, fig. 6.)

Selys (*Idionyx yolanda* pars) *2nd. Add. Cord. Bull. Acad. Belg.* (ii) XLV (1878).

Male.—Abdomen 31 mm. Hindwing 30 mm.

Agrees entirely with the description given by Selys for the supposed male of *yolanda* from the Karen Hills, except that the dorsal spine on segment 10 is tipped with bright yellow. This however appears to be a

variable character, as in one specimen it is hardly noticeable, and in another, the whole spine is yellow as well as the carina running from its base to base of segment. The loop has 8 cells, the nodal index $\frac{5-13}{8-8} \left| \frac{12-6}{8-8} \right.$.

Female.—Abdomen 27 mm. Hindwing 30 mm.

Head similarly coloured to the male. Vesicle simple, rounded. Thorax with the markings much broader than in the male, the antehumeral stripe better defined than in any other species, bright citron yellow, extending nearly up to the alar sinus, tapering from its middle to a fine point above, converging on its fellow and sharply defined throughout. The yellow on metepimeron not bordered with black behind or below.

Markings of legs and abdomen similar to the male. In one specimen, segments 7 and 8 have the dorsal carina marked with yellow.

Wings only slightly saffronated at the base and not much more so than in the male (*yolanda* female has the bases of wings broadly saffronated). Nodal index $\frac{6-13}{8-9} \left| \frac{13-6}{8-7} \right.$; 9 cells in the loop, only a single row of cells at the commencement of the discoidal field and also between the origins of *Cui* and *Cvii*.

Vulvar scale prominent, projecting, scoop-shaped, not bifid at apex.

Distribution.—The male in the Selysian collection from the Karen Hills, N. Burma. Two males and three females from Maymyo, N. Shan States, Upper Burma, collected by Col. F. Wall, I.M.S., 12-15. vi. 24 and 7 vii. 24.

The species is remarkable for the large extent of colouring, both on thorax and abdomen, especially in the female. The latter is again remarkable on account of its open reticulation, which exactly parallels the male, contrary to the usual rule of the genus.

***Idionyx intricata* sp. nov.**

(Plate VIII, fig. 5.)

Male.—Abdomen 28 mm. Hindwing 30 mm. (Female unknown.)

Head. Labium, labrum and a small medial spot on anteclypeus, yellow, the labrum darker and with a bronzed appearance along its borders, postclypeus dark bronzed metallic, frons dark green, and vesicle dark steely blue metallic; occiput black; eyes emerald green.

Prothorax black, pale yellow low down on sides.

Thorax dark bronzed green with a vestigial, very short, lower, dorsal stripe of palest yellow; laterally metallic green with a narrow medial pale yellow stripe and a similar coloured bordering to the hinder part of metepimeron.

Legs. Femora dark reddish brown, tibiae yellow except for the proximal ends which are dark red. Tibial keels:—three-fourths the length of hind tibia, one-fifth of the middle and rather more than one-third the length of anterior pairs.

Wings hyaline, slightly but distinctly enfumed along the costal and subcostal spaces; pterostigma blackish brown, over 2 cells; nodal index $\frac{6-13}{10-10} \left| \frac{13-7}{1-1} \right.$; loop with 8 cells; hypertrigones $\frac{2-2}{1-1}$; discoidal field in hindwings with a single row of cells, only one row between *Cui* and *Cvii* in the same wings.

Abdomen black, the ventro-lateral borders of segments 1 and 2 broadly yellow, segment 2 has also a narrow mid-dorsal bilobed yellow stripe. The tenth segment with a long acute dorsal spine not quite as long as that of *optata*.

Anal appendages black (Plate VIII, Fig. 5). Superiors short and robust, a little dilated at base, then with parallel sides until near the apex where it expands into a flattened organ shaped like the human hand shorn of its fingers save the stumps, of which, four may be noted,—one a robust spine at the inner corner sloping inward and downward, a second adjacent to the last, directed almost straight back, the fourth a robust spine directed straight out from the outer corner, and lastly a third which is a mere knuckle lying between the two latter digitations. The inferior appendage considerably longer and very similar to that of *optata*, but the lateral spines with a greater spread and larger, and with their inner margins crenulate. The terminal portion curving steeply upward.

Female.—Abdomen 31 mm. Hindwing 35 mm. (Male unknown.)

Very similar to *stevensi* and *nadganiensis*, but differs from both by its highly specialized vesicle.

Head. Labium, labrum and mandibles bright citron yellow, the labrum more especially; clypeus bronzed black; frons and vesicle metallic blue or green, the latter standing very high, cone-shaped, its apex bifid, split into two small lateral points. Eyes green; occiput black.

Prothorax blackish brown, an anterior collar, the posterior lobe, and its sides low down pale yellow.

Thorax metallic green or bluish green, marked with a short antehumeral pale yellow stripe, extending not more than halfway up the dorsum and lying midway between the mid-dorsal carina and humeral suture. Laterally a narrow median pale yellow stripe and the hinder half of metepimeron the same colour.

Legs black, the anterior pair of femora reddish brown, the proximal parts yellowish, tibiae bright yellow, tarsi reddish brown.

Wings evenly and diffusely enfumed, their bases bright golden amber as far out as the outer ends of trigones; pterostigma black, over $2\frac{1}{2}$ to 3 cells; reticulation closer than usual, nodal index:— $\frac{8-14}{10-10} \left| \frac{14-8}{9-11} \right.$; hypertrigones $\frac{2-1}{1-1}$; loop 10-11 cells; 2 rows of cells between *Cui* and *Cui* in hindwings, and 2 rows of discoidal cells in the same wings.

Abdomen black, markings similar to *intricata*:—the ventral border of segments 1 to 3 pale yellow, rather broadly so on segment 2, where is also found a bilobed narrow mid-dorsal stripe. Vulvar scale robust, prominent, produced back in a beak-like manner.

Distribution.—A single male from Cherrapunji, Khasia Hills, Assam, by Mr. T. Bainbrigg Fletcher, and a single female by the same collector from Tura, Garo Hills, Assam, 3,500-4,000 ft., between 15. vii and 30. viii. 23. Belongs to the *optata* group; the male easily identified by its anal appendages, and the female by its bifid vesicle. The basal saffronation in the latter is more extensive than in *optata*, and in this respect resembles *stevensi* and *nadganiensis*. I have paired this with *intricata* rather than with *imbricata* from the same district, as it more nearly resembles the former.

Idionyx unguiculata sp. nov.

(Plate VIII, fig. 3.)

Male.—Abdomen 32 mm. Hindwing 31 mm.

Head. Labium pale brownish yellow, labrum citron yellow framed in a narrow black border; a small spot of yellow at centre of anteclypeus, the latter and the postclypeus black with bronzy reflex; frons bluish green metallic as is also the vesicle; occiput black; eyes green.

Prothorax brown, the posterior lobe pale yellow.

Thorax metallic green, without a dorsal stripe. A narrow medial lateral stripe citron yellow, as is also the hinder and ventral border of metepimeron. Legs entirely black, tibial keels exactly similar to those of *intricata*.

Wings hyaline, only a faint saffronation at base of hindwings. Pterostigma black, over $1\frac{1}{2}$ to 2 cells; nodal index $\frac{7-13}{9-8} | \frac{14-7}{8-8}$; 9 to 10 cells in loop; single rows of cells in discoidal fields and between *Cui* and *Cui* in hindwings. Membrane white, greyish externally.

Abdomen black, the ventral borders of segments 1 to 3 and a middorsal narrow stripe running from segment 1, over 2, to a little beyond the middle of segment 3, citron yellow. The basal joints of segments 3 to 7 narrowly ringed with yellow. Segment 7 has a small ventral tuft of golden hairs. Segment 10 strongly keeled, this almost amounting to the nature of a dorsal spine.

Anal appendages black (Plate VIII, fig. 3). Superiors as long as the combined length of segments 9 and 10, broad at base, tapering slightly to apex which has a spiral twist from within, down and out, the end of the spiral fringed with a tuft of bright golden hairs. On the outer side of appendage, a rough and distinct eminence which represents an atrophied ventral spine. Inferior appendage considerably longer and much more robust, rather more than its basal half thick and broad and directed horizontally back, the apical smaller portion curving rapidly and strongly upward, tapering to a fine point. Above deeply grooved and hollowed out, and presenting at about its middle, on the thin edge of the groove, on each side, a small delicate upright spine.

Genitalia similar to type.

Female.—Abdomen 31 mm. Hindwing 28 mm.

Very similar to the male but differing in the following respects:—The vesicle enormously produced into a long thin drawn-out spine very similar to that seen in *corona*, and as equally acute and long. (In one specimen the horn is perfect; in a second the tip has been fractured off by pressure of the paper packet, in which the broken part was found; in a third, the vesicle has been crumpled up and folded on itself by the same agency as the last, but its real shape is easy to distinguish.) There is a short vestigial dorsal yellow thoracic stripe, only seen with difficulty. In the teneral specimens the bases of all wings are deeply saffronated as far out as the 3rd antenodal nervure and the proximal border of trigone in forewing, and distal border of trigone in hindwing. In the adult specimen, the saffronation is restricted to two dark amber rays in the subcostal and cubital spaces and a pale intervening saffronation as far out as the 2nd antenodal nervure. The wings of the adult are evenly

and palely enfumed; nodal index $\frac{8-13}{9-8} | \frac{14-7}{8-9}$, $\frac{7-13}{8-8} | \frac{12-8}{7-10}$, $\frac{5-13}{8-8} | \frac{12-6}{7-9}$; loop 9 to 11 cells; discoidal field and space between *Cui* and *Cuii* in hindwings with 2 rows of cells at commencement.

Distribution.—Maymyo, N. Shan States, Upper Burma, collected by Col. F. Wall, I.M.S., 31. v to 10. vi. 25. A male and three females.

The males are easily distinguished from all other species by the unique spiral twist of the superior appendages. The females are as easily distinguished on account of the character of their long spine-shaped vesicle, copied only by *corona* and *burliyarensis*, both of which however come from South India and have no trace of a dorsal thoracic stripe. Only in the subspecies *fulvia* do we find extensive saffronation, but of a different brownish tint. The atrophied ventral vestigial spine of the superior appendages suggests a distant relationship to the *optata* group.

Idionyx imbricata sp. nov.

(Plate IX, fig. 4, Plate X, fig. 1.)

Male.—(Female unknown.)

Head. Labium bright yellow, lateral lobes slightly tinged with brown; labrum bright citron yellow finely margined with black; ante- and postclypeus black, the former with a small diffuse spot of yellow at its middle, which is confluent with the yellow of labrum; frons and sides of postclypeus greenish blue metallic, the former broad and rounded, coarsely pitted; vesicle metallic blue, rounded and depressed.

Eyes green; occiput black.

Prothorax black, its posterior lobe bright yellow.

Thorax metallic green or bluish green with a golden reflex, humeral stripe absent. Laterally a narrow median stripe, and the hinder half of the metepimeron bright citron yellow. Beneath, two oblique metallic blue stripes continuous with the same colour of the sides, and between and behind these, a large triangular spot of black.

Legs black, the two hinder pairs of tibiæ bright yellow, the anterior pair with an outward stripe of the same colour. The keel on the hinder tibiæ extending for four-fifths from distal end, for rather less than the distal half of the anterior pair. Femora and trochanters black, but the anterior coxæ and a spot on the anterior trochanters yellow. Claws bifid, yellow.

Wings hyaline, bases palely saffronated as far out as trigones; nodal index $\frac{6-12}{9-8} | \frac{12-7}{9-9}$; only a single row of cells between *Cui* and *Cuii* in hindwing; loop with 9 to 10 cells; pterostigma black, over 2 cells, moderately long, unbraced; discoidal field of forewing with a single row of cells as far as node.

Abdomen black, segments 1 and 2 with a broad bright yellow mid-dorsal stripe extending from base to apex of each segment, each also with a broad latero-ventral stripe of yellow, which is continued on to the adjacent basal portion of segment 3. The latter segment with the mid-dorsal carina finely yellow. The apical half of segment 7 and the whole length of segments 8 and 9 yellow ventro-laterally. Segment 10 with

a blunt keel not amounting to a definite spine. Segment 7 with a tuft of bright yellow hairs at the distal end of its ventral surface.

Female.—Abdomen 31 mm. Hindwing 33 mm.

Head. Labium and labrum yellow; anteclypeus brown, postclypeus yellowish, frons and vesicle metallic green, the latter simple, rounded; occiput black.

Prothorax light brown.

Thorax metallic bluish green marked with citron yellow as follows:—a lower vestigial humeral stripe extending upwards for not more than one-third the length of dorsum of thorax, a mediolateral oblique narrow stripe and the hinder border of the metepimeron. Legs blackish brown.

Wings hyaline, brightly saffronated at the extreme bases, as far out as the first antenodal nervure and slightly more so in the cubital space; nodal index $\frac{8-13}{10-9} \left| \frac{13-8}{9-10} \right|$; 1 cubital nervure in forewings, 2 in the hind; 10 cells in the loop; only a single row of cells between *Cui* and *Cuii* in the hindwings; all hypertrigones traversed once; pterostigma small, dark brown, over 2 to $2\frac{1}{2}$ cells.

Abdomen laterally compressed, black, the dorsal carina of segments 2 and 3 narrowly yellow, as also the joint between these segments. The ventral borders of segments 7 and 8 narrowly yellow.

Anal appendages short, conical, black. Vulvar scale very short, rounded, with an obtuse point in the middle.

Distribution.—Shillong, Assam, 6,000 ft., one male collected by Mr. T. Bainbrigg Fletcher, 8. vi. 24, the type, and now in the Brit. Mus. Two females from the same locality, 6. viii. 25, in the Morton collection.

***Idionyx carinata* sp. nov.**

(Plate VIII, fig. 1.)

Idionyx optata, Ris nec Selys, Suppl. Ent. No. 1, pp. 81-83 (1912).

One male, one female from Tsa-Yiu-San, 16-14. vii. 1910, Mus. Konigsberg.

Male.—Abdomen 35 mm. Hindwing 33 mm.

Closely similar to *optata* Selys, from which it is only distinguishable by the difference in shape of the anal appendages. There are however only 4 to 6 cells in the loop, instead of the 10 present in the male, and 12 in the female of *optata*. The tibiae are all bright yellow on the extensor surface, whereas in *optata* male only the hind pair are yellow, the middle pair brownish yellow, and the anterior pair dark brown. The anal appendages vary as follows,—the ventral spine of superiors is much more robust and nearly double the size of that found in *optata*; seen in profile, this appendage is much stouter; the inferior appendage in profile is also stouter and thicker at the apex, and the small spine surmounting the lateral lobe of *optata* is altogether absent. Seen from above, the inferior appendage is much longer in *optata*, and the superiors are more slim. The dorsal spine on segment 10 is considerably shorter and stouter than in *optata*.

Female.—Abdomen 33 mm. Hindwing 36 mm.

Also very similar to *optata*, but differs by the smaller loop (6 to 9 cells as against 12 in *optata*), and by the vesicle which is bluntly conical, crowned with three blunt spines, the middle one the longest (Conical with four blunt tubercles in *optata*).

Distribution.—A single pair from Tsa-Yiu-San, S. China. Type and allotype in the Konigsberg Museum.