

the black of the wings has become first blue-black, then brightly shot with bluish purple, and finally streaked at the base with metallic blue and green. Then, again, if the white of the secondaries was first modified into yellow and orange as in *Bracca* and *Præsos* (in which the primaries are still black and white), one can see how the bands on the primaries of *Milionia drucei* and *M. snelleni*, if derived from such a source, may have remained orange after those of the secondaries had become vivid crimson.

It has been said that colour is of no value as a guide in classification, but I am not at all sure that, if the natural order of its development were strictly looked to, it would not be of assistance in guiding one to a judicious arrangement of allied genera.

EXPLANATION OF PLATE XXXI.

- Fig. 1. *Bracca bajularia*, p. 294.
 2. *Craspedosis extenuata*, p. 295.
 3. *Lithopsyche antiqua*, from the typical specimen, p. 294.
 4. Fore wing of *Præsos mariana*, p. 294.
 5. *Calospila leucomela*, p. 295.
 6. Restoration of *Lithopsyche*. p. 294.

3. Descriptions of new Genera and Species of Odonata in the Collection of the British Museum, chiefly from Africa. By W. F. KIRBY, F.E.S., Assistant in the Zoological Department, British Museum, Natural History, S. Kensington.

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On looking through the collection of Odonata in the British Museum lately, I found examples of some very interesting species which appear to be undescribed, and which form the subject of the present paper. Among these, the most important is *Tatocnemis malgassica*, a species representing in Madagascar two remarkable Eastern genera, *Priocnecnemis* and *Idiocnemis*, hitherto only known from the Philippines and New Guinea respectively.

The following is a list of the genera and species which I propose to describe:—

ODONATA.

LIBELLULIDÆ.

LIBELLULINÆ.

- Orthetrum camarense*, n. s. Cameroons.
Æthriamanta rezia, n. s. Madagascar.

ÆSHNIDÆ.

GOMPHINÆ.

- Pseudogomphus* (n. g.) *insignis*, n. s. Cameroons.

ÆSHNINÆ.

- Anax striatus*, n. s. Chili.

AGRIONIDÆ.

CALOPTERYGINÆ.

Sapho pulchella, n. s. Cameroons.

AGRIONINÆ.

Tatocnemis (g. n.) *malgassica*, n. s. Madagascar.

Protosticta gracilis, n. s. Menado, Celebes.

Lestes wallacei, n. s. Sarawak, Borneo.

ORTHETRUM CAMARENSE.

Exp. al. 22 millim.; long. corp. 49 millim.

Male. Black, vertex metallic blue; abdomen inflated at base, with the third segment pulverulent blue. Wings brownish hyaline: fore wings with 19 antenodal and 14 postnodal cross-nervures; the 3 first postnodals not continuous; triangle traversed by one or two cross-nervures; one supratrangular nervure; 3 cells in the sub-triangular space; three rows of post-triangular cells, increasing, commencing on one side with four. Hind wings with 14 antenodal and 13-14 postnodal cross-nervures, the base tinged with smoky yellow, the membranule dark smoky brown, and a basal stripe of the same colour in the second costal space as far as the third cross-nervure, and another in the lower basal cell, shorter, and not extending to the base of the triangle, which is traversed, though there are no supra-triangular nervures on the hind wings. Tips of all the wings slightly clouded with brown beyond the pterostigma; appendages of 2nd segment large; anal appendages black, about as long as the last two segments (the lower one as long as the others) and of the ordinary form. Pterostigma dark brown, covering 3 or 4 cells.

Hab. Cameroons.

Allied to *O. albistyla*, Selys, from which the darker wings and black appendages will abundantly distinguish it.

ÆTHRIAMANTA REZIA.

Long. corp. 27 millim.; exp. al. 50 millim.; long. pter. 2 millim.

Male. Size, shape, and neuration of the Indian *Æ. brevipennis*, Ramb., except that the sectors of the arculus rise from a short but distinct stalk. The left fore wing has two cross-nervures instead of one in the lower basal cell, and the triangle of the right fore wing is traversed, and that of the left free.

Body reddish above (probably bright red when living), pectus and pleura inclining to green, legs black, femora greenish beneath. Abdomen with the second and third segments carinated; the dorsal carina black on the fourth and following segments. Anal appendages as long as the 8th segment; lower appendage very broad, spatulate.

Wings hyaline; pterostigma olive, between black nervures; hind wings strongly and fore wings slightly tinged with yellow at the base; a dark streak in the lower basal cell, commencing beyond the base, and filling up about two fifths of the length of the cell.

Hab. Madagascar.

Genus PSEUDOGOMPHUS.

Male. Eyes contiguous, frontal tubercle slightly bifid; labium cleft. Wings long and rather pointed, triangles rather small, free, those on the hind wings rather longer than those on the fore wings: fore wings with 6-8 cross-nervures in the lower basal cell, and four supratrangular nervures: hind wings with 2 or 3 supratrangular nervures, and 5 in the lower basal cell; membranule rather large; inner margin concave between this and the anal angle. Abdomen with the appendages of the second segment large, upper anal appendages about as long as the lower, which is broad and truncated; at their base rises a strong vertical conical spine, pointed at the apex.

Probably allied to *Cordulegaster*, but very distinct from any described genus.

PSEUDOGOMPHUS INSIGNIS.

Expl. al. 94 millim.; long. corp. 83 millim.

Male. Dark brown, tinged with reddish, especially on the face and pleura; vertex punctured, shining with green and violet; thorax green above and on the sides in certain lights; third segment of the abdomen yellow.

Wings yellowish hyaline, darkest at the edges; pterostigma black, covering rather less than 3 cells; fore wings with 16-18 antenodal and 10-12 postnodal nervures; triangles and subtriangular space free.

Hab. Cameroons.

ANAX STRIATUS.

Exp. al. 105 millim.; lat. al. ant. 12 millim.; lat. al. post. 17 millim.; long. pter. 3 millim.; long. corp. 75 millim.

Testaceous yellow; head with the front raised, rugosely-punctate, and marked with a blackish spot on the summit; the region of the ocelli, the lower edge of the nasus, and all the mouth-parts reddish brown, more or less varied with yellow at the sutures. On the thorax the septa are very strongly ridged, and are marked with black in front and within; there are also four black spots on the depressions of the pleura; legs reddish. Abdomen with the first and second segments much swollen, the hinder half of the second segment with black markings diverging on each side of the carina; the following segments with two blackish spots at the base, two smaller ones beyond the middle, and an irregular blackish stripe crossing the carina before the extremity; the incisions are also marked with black in the middle; on the 7th and 8th segments these marks become more suffused and irregular, and are not continued further.

Wings very broad, clear hyaline, the space between the costal and subcostal nervures filled up with smoky yellow, very dark at the base, and ceasing, like the costal nervure, at the nodus; the lower basal cell is also stained with yellow as far as the lower triangle; pterostigma brown, very short. Fore wings with 20-21 antenodal

and 15 postnodal nervures; triangle about three times as long as broad, consisting of 4 cells, followed by 5 or 6 cells, and then by 2 increasing; 2 supratrangular nervures; 3 cross-nervures in the sub-triangular cell; lower triangle free (which corresponds to the sub-triangular space in *Libellulinæ*). Hind wings with 15 antenodal and postnodal nervures; triangle about twice as long as broad, consisting of 4 cells, followed by 4 or 5 cells, and then by 3 increasing; 2 supratrangular nervures; 4 cross-nervures in the lower basal cell; lower triangle transverse.

Chili (*Edmonds*).

The specimen appears to be a male, but the abdominal appendages are too much damaged for description. It is the first *Anax* described from Chili, and is remarkable for the very short pterostigma, which separates it from all the other species of the genus with which I am acquainted.

SAPHO PULCHELLA.

Exp. al. 64–70 millim.

Male. Bronzy black above, head spotted with tawny, the ocelli being placed in the middle of four tawny spots; thorax with the lateral lobes almost entirely surrounded with tawny, the pleura striped with the same colour, and the under surface somewhat pruinose; legs black, femora testaceous, marked with a black line. Abdomen with a tawny spot on the sides, at the base of the first five segments, and a tawny lateral stripe on the sides of the first segment, continued more narrowly on the second and third, where it is coppery. Wings bright orange-tawny or coppery, iridescent, paler at the base; stigma brown, enclosed by black lines, about four times as long as broad, the lower side projecting basally in a point; venuration very close; antenodal nervures upwards of 40, and postnodal nervures numbering 50 or 60.

Female. Body similarly coloured, but wings brownish hyaline, with a fiery copper iridescence in certain lights, and a narrow milk-white band on both wings, not quite extending to the costa or inner margin, and curved on the hind wings, placed considerably beyond the nodus. On the abdomen, the tawny spots at the base of the segments and the tawny lateral line are continued on all the five segments which remain.

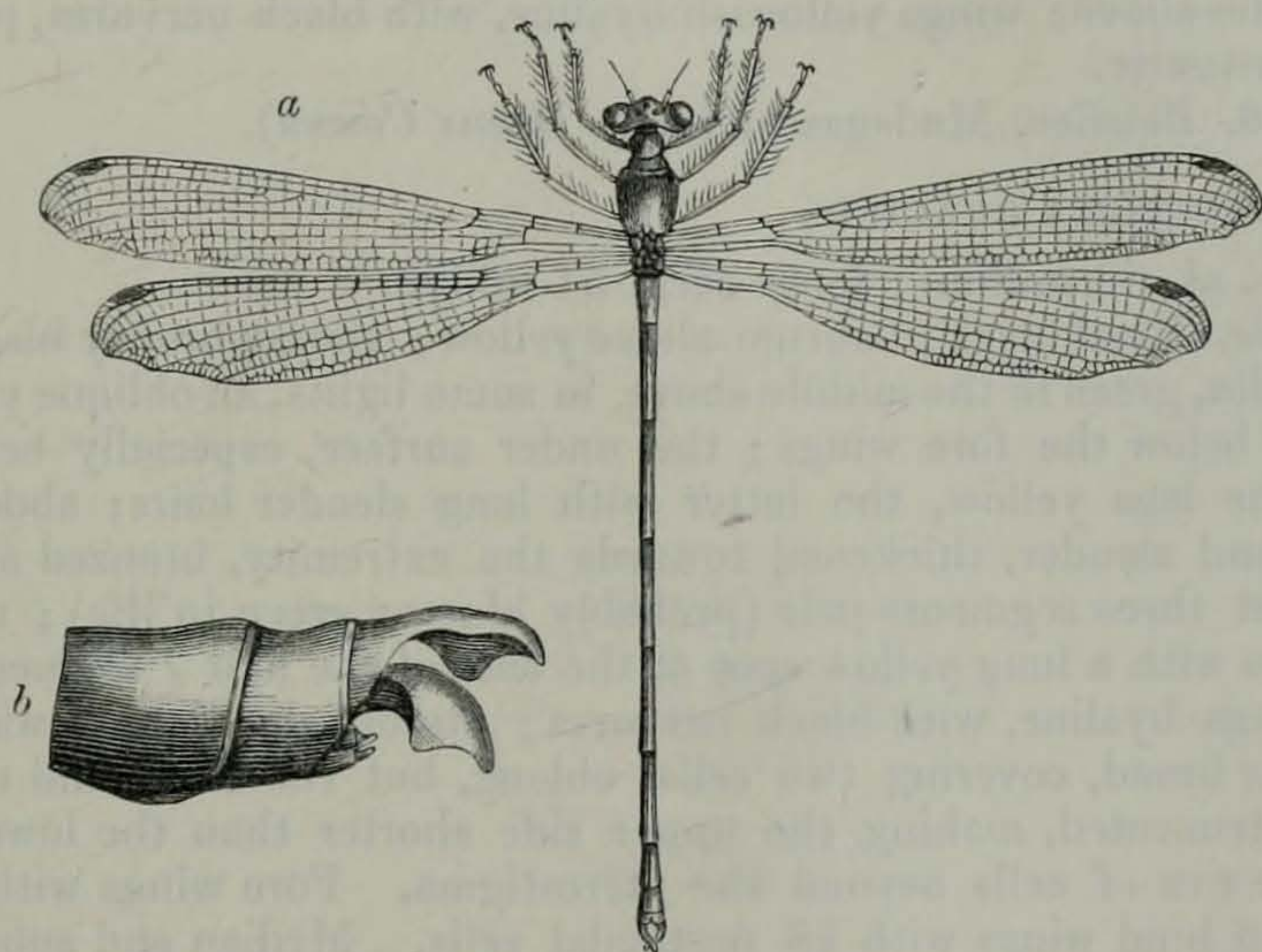
Hab. Cameroons.

Size and shape of *S. longistigma*, Selys, a specimen of which was received in the same collection, but with the abdomen rather shorter and stouter.

Genus TATOCNEMIS.

Male. Wings long and narrow, petiolated to the level of the arculus, with three concavities on the hind margin, between the subcostal radius and the lower sector of the arculus; fore wings with 24–28 and hind wings with 20–21 postnodal nervures; pterostigma broad, lozenge-shaped, covering $1\frac{1}{2}$ or 2 cells. The median sector rises at or a little beyond the nodus, the subnodal

sector from the second postnodal cross-nervure on the fore wings (exceptionally from the first or third), and from the first on the hind wings; the nodal sector rises at the 9th to the 13th cross-nervure (usually from the 10th) on the fore wings, and between the 6th and 8th on the hind wings; and the ultranodal sector rises from two to four (usually two) cross-nervures further. The first postcostal nervule is placed very little beyond the first antenodal cross-nervure. The arculus is angulated, and placed distinctly beyond the level of the second antenodal cross-nervure. The trapezium is about twice as long as broad; its basal side is shorter than its outer, which is oblique, and its upper side is shorter than



Tatocnemis malgassica.

a. Insect, natural size.

b. Extremity of abdomen, showing appendages, magnified $7\frac{1}{2}$ times.

its lower; there are from two to four cells (usually two) between the trapezium and the first transverse cross-nervure from above; the lower sector of the trapezium rises on a level with the middle of the trapezium, and runs to the hind margin beyond the level of the origin of the ultranodal sector. Nodus placed at about one fourth of the length of the wing.

Abdomen long and slender, first joint very short, second about $2\frac{1}{2}$ times as long as broad, 3rd 4 times longer than the second, the rest gradually shortening to the 7th; 8th about half as long as the 7th; 9th and 10th each about half as long as the preceding; upper anal appendages as long as the 9th segment, arched, with a large semi-circular protuberance beneath; lower appendages very short.

Legs slender, not dilated, with long slender spines.

A very remarkable genus, most nearly allied to *Priocnecnemis*, Selys (= *Hypocnemis*, Selys, olim), from the Philippines, and *Idiocnemis*, Selys, from New Guinea, the only genera of Odonata known with emarginate wings. It differs abundantly from both

in the extremely petiolated wings, the large pterostigma, and the different points of origin of the sectors

TATOCNEMIS MALGASSICA. (Woodcut, p. 301.)

Exp. al. 72 millim.; long. corp. 50 millim.

Male. Head black above, pale reddish beneath; ocelli, the base of the labrum, two spots within the eye, and the occiput tawny or reddish; thorax black above and on the sides, yellowish beneath; middle of prothorax dull reddish above; mesothorax with two oblique tawny shoulder-stripes, connected by an oblique line at the base of the wings; legs red, yellow at base of femora, knees blackish; abdomen bright red, the first joint with some blackish markings on the sides above; wings yellowish hyaline, with black nervures, pterostigma tawny.

Hab. Betsileo, Madagascar (*Rev. Deans Cowan*).

PROTOSTICTA GRACILIS.

Exp. al. 62 millim.; long. corp. 51 millim.

Male. Head black; labrum above yellow; thorax bronzy black on the sides, green in the middle above, in some lights, an oblique yellow stripe below the fore wings; the under surface, especially behind, and the legs yellow, the latter with long slender hairs; abdomen long and slender, thickened towards the extremity, bronzed above, the last three segments pale (probably blue or green in life); under surface with a long yellow spot at the base of the first 7 segments.

Wings hyaline, with black nervures; pterostigma large, twice as long as broad, covering two cells, oblong, but the inner and upper angle truncated, making the upper side shorter than the lower; a double row of cells beyond the pterostigma. Fore wings with 21-22, and hind wings with 18 postnodal cells. Median and subnodal sectors rising just before and after the nodal cross-nervure respectively; the nodal sector rising 5 or 6 cells beyond, and the ultranodal one or two cells further. Trapezium regular, about twice as long as broad, its upper sector extending to the level of the origin of the nodal sector; its lower sector absent. Two basal postcostal nervures, the first halfway between the base and the first antenodal cross-nervure, the second just before the level of the second antenodal cross-nervure. Two cells between the trapezium and the first descending nervure.

Upper anal appendages as long as the 9th segment, incurved, the lower ones shorter, but their exact structure not visible.

Hab. Menado, Celebes (*Wallace*).

The generic characters differ a little from those assigned to *Protosticta simplicinervis*, Selys (also from Celebes), which is not before me, and I have therefore included them in the description.

LESTES WALLACEI.

Exp. al. 55 millim.; long. pter. $2\frac{1}{2}$ millim.; long. corp. 46 millim.

Female. Head buff, a bronzed spot, shading into green between

the ocelli, a black spot on each side of the frontal ocellus, a black stripe before it, and a short stripe bordering the inner orbits; the upper mouth-parts are also almost entirely black. Thorax buff, transversely striated, with a broad green stripe on each side of the dorsal carina, and a narrower bronzed shoulder-stripe, showing green in certain lights, beneath. Legs buff, clothed with long fine black bristles; femora with a black line beneath; tarsi black. Abdomen buff, bronzed above, except at the sutures. Wings hyaline, slightly clouded at the tips; fore wings with 14 and hind wings with 15 postnodal cross-nervures; pterostigma large, covering 3 or $3\frac{1}{2}$ cells.

Hab. Sarawak, Borneo (*Wallace*).

Appears to be allied to *L. viridula*, Ramb., but much larger.

4. On the Taxonomic Value of the Intestinal Convolution in Birds. By HANS GADOW, Ph.D., M.A., Strickland Curator and Lecturer on the Advanced Morphology of Vertebrata in the University of Cambridge.

[Received May 1, 1889.]

(Plate XXXII.)

In 1879 I published, in the 'Jenaische Zeitschrift'¹, two lengthy articles on the digestive system of birds, and I laid particular stress upon the convolutions of the small intestine, *i. e.* upon the mode in which this part of the alimentary canal is stowed away in the abdominal cavity.

Accounts of these convolutions are exceedingly meagre, and this is all the more surprising as Cuvier long ago drew attention to the remarkable diversity which prevails in the arrangement of the intestinal folds. However, there are only a few dozen birds described in his 'Leçons d'Anatomie Comparée,' no generalizing conclusions are drawn, and with few exceptions (MacGillivray) this part of descriptive ornithotomy has slept ever since.

My former researches were based upon the examination of about 200 different birds, an ample material, but not large enough to warrant all the taxonomic conclusions which I then drew, especially as these were marred by the fetters of certain antiquated traditions, now fortunately superseded.

In preparing the account of the alimentary canal of birds for Bronn's 'Klassen und Ordnungen des Thierreichs,' I have recently had occasion once more to take up this question on a much broader basis and in a more elaborate way. I therefore take the opportunity to lay before the Society a condensed account of the taxonomic value of the intestinal convolutions in birds.

¹ "Versuch einer vergleichenden Anatomie des Verdauungssystemes der Voegel," Jenaische Zeitschrift für Naturwissenschaft, xiii. pp. 92-117, 339-403, pls. iv.-xi. & xvi.