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5.—*The Odonata or Dragonflies of South Africa.* By F. Ris.
(With Plates V–XII, and 77 Text-figures.)

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5.—*The Odonata or Dragonflies of South Africa.*—By F. Ris.

(With Plates V–XII and 77 text-figures).

The origin of the present paper is a request by Dr. L. Péringuey to the author to write a paper which would help the resident entomologist to get a reliable knowledge of the South African dragonflies. In 1908 the writer had published in "Schultze's Forschungsreise im westlichen und zentralen Südafrika" ('Denkschrift mediz.-naturw. Ges. Jena,' xiii, pp. 303–346, 1908) an annotated catalogue of the fauna herein discussed, and this catalogue, in the opinion of Dr. Péringuey, would have to be modified for the purpose above mentioned. The collection of the Schultze expedition being a small one, and other material available at the time very limited, the paper of 1908 was a compilation to a large extent; also its character as a catalogue made its value doubtful for the student who had no access to the libraries and collections of European cities. The need of the local collector and student was a descriptive and fully illustrated paper. But to attain this object an extensive collection was indispensable, and Dr. Péringuey kindly agreed to provide specimens for the purpose; the results of his initiative reached me in a considerable number of consignments, and were in the long run amply sufficient to serve as a basis for the present work. Moreover, the author had at his disposal an interesting collection of South African dragonflies made by Miss Margaret Fountaine, of Bath, loaned through the kindness of her friend, Mr. K. J. Morton, of Edinburgh, and an extensive lot of very interesting specimens from the British Museum, loaned through the good offices of Messrs. G. Meade-Waldo and Herbert Campion. At a somewhat later date Mr. E. B. Williamson, of Bluffton, Indiana, U.S.A., forwarded a large collection, consisting of various lots sent him by Mr. G. F. Leigh, of Durban, Natal, and by Mr. G. A. K. Marshall, when this gentleman was a resident of Salisbury, Mashonaland. Other specimens from the Marshall collections were also included in the British Museum lots as well as in material sent for study by the Swedish Imperial Museum at Stockholm. The Congo Museum at

Tervueren sent a very important lot of specimens from Katanga, which lot, though not strictly belonging to the fauna in question, has been repeatedly quoted.

In the writer's own collection South African species are chiefly represented by material from the Delagoa Bay region, kindly forwarded by the Rev. Henri A. Junod, of the Suisse Romande Mission. With other lots of minor importance obtained from dealers, all these contributions made a collection sufficient to characterise the fauna under discussion. Differing in this respect from the paper of 1908, the present one is entirely original; supplementary notes have been restricted to an appendix, and all descriptions and figures are made from actual specimens in the various collections mentioned.

But even now the work remains fragmentary. Nothing can be said about the natural surroundings of the various species, their manner of life and development, their place and value in the insect life of their surroundings. It is the author's ambition that these lines may awake sufficiently the interest of some resident entomologist to have these lacunae eventually filled by observation and record. Although no nymphs or larvae of dragonflies are at hand from the country under discussion, except that of *Chlorolestes conspicua*, see p. 445, it was found desirable to give an idea of what these nymphs are; the examples were taken from the writer's own country, and they may serve their purpose inasmuch as they are taken from groups represented in South Africa either by identically the same or by very closely allied genera.

No general history of the Order Odonata is attempted, and it is supposed that the more important facts of the external and internal anatomy of insects are known to the student. Only such particular structures are illustrated as are most characteristic of the Order and important in its classification, namely the head, thoracic segments, venation of wings and external genital organs of both sexes.*

Thus the essential part of this paper is systematic, descriptive and faunistic. The faunal limits have been drawn somewhat artificially and also purposely; they embrace the States of the South African Union, but materials from the contiguous Portuguese Colony and from Rhodesia are also included as far as they were found in the collections under study.

* Since the present paper was written, most fortunately a model text-book has been given to the student of Odonata, where every aspect of the organisation, physiology, ecology, etc., of this order is discussed and illustrated by a very large number of original figures: 'The Biology of Dragonflies,' by R. T. Tillyard, Cambridge, 1917 (Cambridge Zoological Series).

The question then arose whether an extensive enumeration of synonymy and bibliography should be added to the descriptive part; the addition would not have been difficult, because the writer has at his disposal a very detailed manuscript catalogue of all described recent Odonata. But after mature reflection it was found that for the present paper and its special purpose this would be of no practical value. It would have been a repetition of a great amount of material already published, some of it quite recently. To the reader interested in this side of the study it may be said that (1) the sources of the original descriptions can be easily traced by the aid of Kirby's well-known and indispensable catalogue; (2) as to the additions up to 1907, all bibliographical notes interesting South Africa have been collected and published in the writer's catalogue for L. Schultze's voyage, mentioned at the beginning of this introduction and published in 1908; (3) for the entire subfamily Libellulinae the writer's monograph of this subfamily gives a very detailed and, as far as possible, complete bibliography; it would have been tedious and useless to repeat this here. For these reasons the synonomy and bibliography are abandoned, and the quotations limited to the author's name and the year of publication of each specific and generic name. The writer wishes to indicate here his opinion regarding authors' names in zoological nomenclature. Authors' names should not be considered as part of the animal's name, as is largely accepted, but simply as a citation in a conventionally abridged form. Under this view any author is free to extend the citation to other details besides the name of the first describer, such as the year of publication; and no doubt this has a certain historical interest, giving as it does an abridged sketch of the chronological development of knowledge. The ideal would be, according to the writer, to abandon authors' names altogether, and for a group or a fauna sufficiently known to a broader public, or for a paper specially intended for those already initiated, this may be perfectly admissible even in the actual state of knowledge. But it would not have been advisable to have followed this method for this paper, which aims to be an introduction to an insufficiently known and as yet very imperfectly studied fauna.

1. Introduction and Terminology.

Dragonflies have retained the essential parts and segmentation of a primitive insect or Hexapod through a long series of geological periods. Far back in the Mesozoic age they were essentially what they are now, and the systematic groups of the present time are

curiously foreshadowed even in those remote ages. But evidently they represent a type of adaptation without any reduction of parts, which was in its way a definitive and ideal solution of a mechanical problem, fully as efficient as widely different solutions that involve a far greater modification of the primitive insect plan, as, for instance, the most highly specialised groups of *Lepidoptera*, *Diptera* or *Hymenoptera*. Indeed, a living dragonfly of the larger kinds, in full vigour,

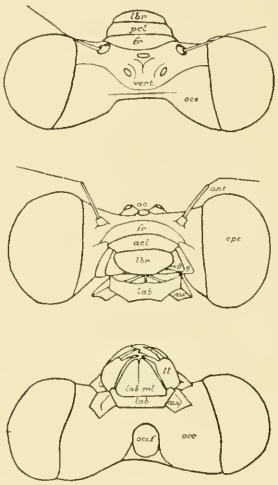

Fig. 1.—*Chlorolestes longicauda*. Dorsal, frontal and ventral views. *fr.* Frons. *vert.* Vertex. *occ.* Occiput. *occf.* Occipital foramen. *cpe.* Compound eye. *oc.* Ocelli. *ant.* Antenna *lab.* Labium. *lab. ml.* Median lobe. *lab. ll.* Lateral lobe. *mdb.* Mandible. *g.* Gena. *lbr.* Labrum. *acl.* Anteclypeus. *pcl.* Postclypeus.

is one of the splendours of Nature in the skill, grace and sustained strength of its movements, the gay colours of the slender body, the strong lace-like wings, which are seldom ornamented, and mostly nothing but wings. Curiously enough, our poor human attempts to construct an inanimate flying thing resemble, if anything in Nature, a dragonfly.

The three essential parts of the insect body—head, thorax and abdomen—all have characteristic features in the Odonata.

The *head* is distinguished by the extreme development of the com-

pound eye. Vision is evidently the dominant sense of the dragonfly; parallel with the hypertrophy of the eye we find an extreme reduction of the antennae—the organs of scent. A similar combination is found in the Order Ephemeridae or Mayflies, and to some degree in many of the more highly specialised Diptera. The configuration of the compound eyes largely affects in dragonflies the arrangement of the other parts of the head, and a better idea than any description can

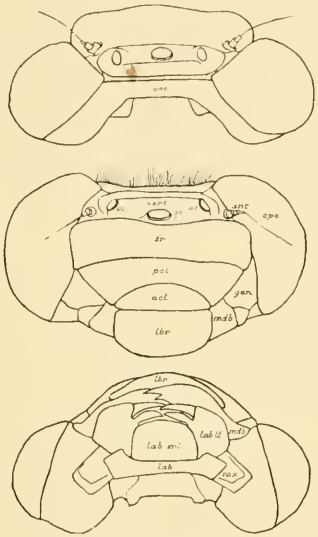

Fig. 2.—*Podogomphus praetorius.* Dorsal, frontal and ventral views of head. Lettering as in Text-fig. 1.

give will be conveyed by our Text-figs. 1–3, where three modifications are shown: the zygopterous head with widely separate, almost hemispherical eyes, in Text-fig. 1; the Gomphine head, which is intermediate between the zygopterous and the regular anisopterous configuration in Text-fig. 2; the Libelluline head in Text-fig. 3 is a representative of this fully developed anisopterous configuration, where the eyes meet in the median line for some length. Three ocelli are present in the entire order; their position is open in the

Zygoptera (Text-fig. 1); covered by a special structure, the frontal vesicle, in the Libellulidae and Aeschninae (Text-fig. 3); surrounded by sculptures of various development in the other subfamilies of Anisoptera (Text-fig. 2). Nothing certain is known about their special function.

The mouth-parts correspond to their masticatory function in the primitive insect type; they are of the regular three pairs—labium,

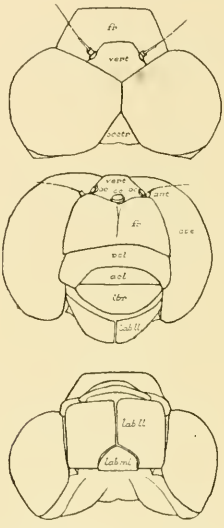

Fig. 3.—*Trithemis arteriosa*. Dorsal, frontal and ventral views of head. Lettering as in Text-fig. 1. *occtr*. Occipital triangle.

maxillae and mandibles—the labial and maxillary palpi being much reduced (or modified?), the mandibles particularly strong. Their size is relatively small in the Zygoptera (Text-fig. 1), but they are very much stronger in the anisopterous line (Text-figs. 2, 3). The labium is a very highly specialised structure in the family Libellulidae (Text-fig. 3), being a spoon-like or mask-like organ, which covers the entire mouth from beneath by the greatly developed lateral lobes, their free mesial borders being connected in a long and straight line. The other groups of Anisoptera (Family Aeschnidae) remain true to

the zygopterous type of this organ, and thus nearer to structures generally found among insects with masticatory mouth-parts.

The frontal, vertical and occipital sclerites are mostly not easily distinguished in the fully mature insect, but as a matter of convenience in all the groups the part bearing the antennae and ocelli, the fronto-vertical complex, may be termed, in an abridged form, "the frons"; what is posterior to it may be named "the occiput."*

The latter especially is subject to great modification in consequence of the development and disposition of the eyes. Largely visible in a dorsal view in Zygoptera and Gomphinae (Text-figs. 1, 2), it is reduced in this view to a mere trace, in other Anisoptera (Text-fig. 3), where the occipital triangle and just a small margin on the posterior side of the eye are the only parts attributable to the occiput. Its ventral view is also chiefly determined by the shape of the eyes; only in the Zygoptera is the occipital foramen (Text-fig. 1) visible in a strictly ventral view; in Anisoptera the foramen is drawn forward by the globose form of the head and covered from beneath by the basal pieces of labium and maxillae.

Whereas the fronto-occipital suture is obscure and often uncertain, there is a very distinct suture between the frons and the sclerites anterior to the frons. There are three of these transversely disposed. The first, from the anterior pole, is the labrum or upper lip, which partly covers the mouth-parts from above, but not entirely; part of the mandibles (or even of the maxillae) remain free and partake of the colour differentiation of exposed parts. The second is the anteclypeus, the third the postclypeus. Labrum, anteclypeus and postclypeus are disposed very nearly in the same vertical plane in the Anisoptera, which plane is continued dorsally by the frons. As a rule there is here an inflection, with or without a ridge, to the horizontal plane within the frons itself (only some of the Gomphinae do not clearly show the fracture in the frons), as shown in Text-figs. 2 and 3. In the Zygoptera the labrum is very nearly horizontal, the anteclypeus vertical, the postclypeus horizontal again; and from the suture of postclypeus and frons this latter rises mostly in a gentle curve to give a nearly horizontal position to the fronto-occipital complex, the ocelli looking upward. Something similar to the transverse frontal ridge of most Anisoptera may exceptionally be observed in the Zygoptera (Ceriagrion). Between the lateral margin of ante- and postclypeus

* For details of the rather complicated structural homologies of the exoskeleton of the head special handbooks of anatomy must be consulted; their discussion would exceed the aims of this summary introduction.

and the eye there are small, roughly triangular sclerites, the genae, well developed in the Gomphinae, small in the other Anisoptera, large but not distinctly limited towards the frons in the Zygoptera. The anteclypeus and postclypeus have often been named "nasus" and "rhinarium" respectively; but the writer always found it difficult to distinguish between the nasus and the rhinarium, since the two terms apply to the same thing in Latin and in Greek respectively; the significative terms "ante"- and "postclypeus" seem preferable for obvious reasons.

The antennae are mere rudiments, as shown by our figures; their value for systematics and description is not important.

The *thorax* of Odonata is highly characteristic of the Order, and a wonderfully elaborate adaptation to the needs of an aërial creature that finds its food on the wing, will in very many cases even eat without alighting, will play and mate and sometimes even oviposit in flight. The first thoracic segment, the prothorax, is separated from the two following wing-bearing segments by an extremely loose joint, similar to the joint between head and prothorax; both these joints are largely moveable in every direction, together giving to the large-eyed head a remarkable freedom of movement. The prothorax as a whole is very small, and its single sclerites not easily recognisable. The other segments, the mesothorax and metathorax, are joined to form a strong and solid unit, compact in outline and with the sutures firmly soldered, so as to form a strong support for the wings as well as an ample box for the vigorous muscles. The specific feature of Odonata in this structure is the reduction of sternites and especially of tergites and the extreme development of the lateral sclerites, the episterna and the epimera of each segment. These lateral sclerites being, moreover, placed with their longer, dorso-ventral axis in an oblique position, the lower end cephalad, the upper caudad, another most important feature of the Odonata thorax results, viz. the throwing forward of the coxae and legs well in front of the wing bases, almost under the head and the mouth. This position of the legs, unique among insects, explains the position of rest adopted by most dragonflies, this position being not one of sitting, but rather of suspension. Also it is in strict correlation with their feeding habits, as Dr. Wesenberg-Lund, of Hilleroed, very justly remarks in a recent paper.*

The feet have for function the holding of the prey, when, as is very often the case, the dragonfly eats an insect just captured without

* C. Wesenberg-Lund, "Odonaten-Studien," 'Internat. Rev. ges. Hydrobiol.,' 1913, pp. 155-228, 373–422.

interruption of flight. The thoracic sutures, as given in our Text-figs. 4 and 5, show clearly the homologies of the parts. In the Zygoptera all the sutures drawn in Text-fig. 4 are visible in many cases, though there are genera and groups where the first lateral suture is obliterated, at least in its upper half. In the Anisoptera this suture disappears regularly upward from a level which corresponds approximately to the metastigma; but the homology of parts is not seldom still visible in the disposition of the colours and

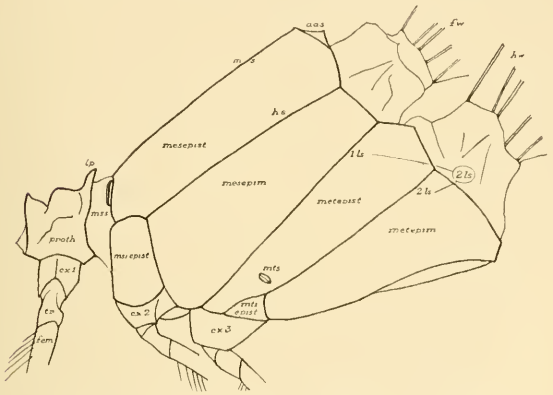

Fig. 4.—*Phaon iridipennis.* Lateral view of thorax. *proth.* Prothorax. *tp.* Posterior lobe of prothorax. *cx.* Coxa. *tr.* Trochanter. *fem.* Femur. *mesepist.* Mesepisternum. *mesepim.* Mesepimeron. *metepist.* Metepisternum. *metepim.* Metepimeron. *msiepist.* Mesinfraepisternum. *mtiepist.* Metinfraepisternum. *ms.* Median suture. *hs.* Humeral suture. *1ls., 2ls.* First and second lateral sutures. *mss.* Mesostigma. *mts.* Metastigma. *aas.* Antealar sinus. *fw.* Forewing. *hw.* Hindwing.

pattern. There are two pairs of respiratory stigmata on the thorax: the mesostigma is in a concealed position in the joint between the pro- and mesothorax, and the metastigma is comparatively large and a leading feature in the structure and pattern of the thoracic side.

The feet are slender, though comparatively strong, spiny, with various adaptations of their armature, according to systematic position and sex. The coxae are free, relatively small, the trochanters double; the femora and tibiæ of about equal length; the tarsi short, three-jointed; the claws mostly with a tooth on their ventral edge.

The *wings* bear neither hair nor scales, only some minute, almost

microscopic stiff bristles along the veins; when coloured the various tints result from the pigmentation of the wing membrane itself, or from some waxy exudation. The pigmentation mostly results in tints from clear yellow through brown to deep black, often with metallic lustre; in some cases also blood-red may occur. Waxy exudation produces an opalescent white, or bluish when on a background of black. But the immense majority of the dragonfly wings are hyaline or bear only small basal coloured spots.

The venation of these wings is of the utmost importance to the systematist. From the early times of odonatology some of the more

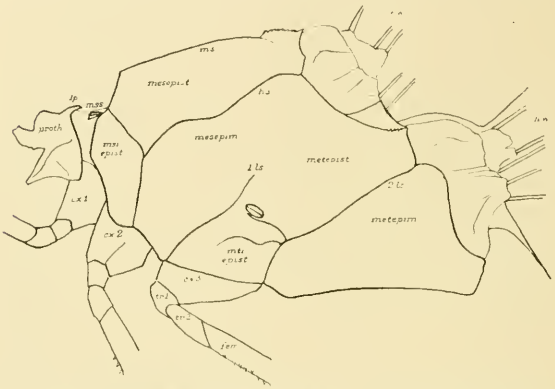

Fig. 5.—*Crocothemis erythraea*. Lateral view of thorax. Lettering as in Text-fig. 4.

obvious features have been adopted as distinctive characters for the larger systematic units; but in more recent times patient investigation of many minute (but often morphologically significant) details has shown that characters for the smaller groups, down to genera and sometimes even to species, may be drawn with great advantage from the neuration. An advantage is to be found in these characters being common to both sexes of one species or genus (unlike many other important distinctive characters in dragonflies), and in their being easily described and exactly figured, especially by photography. The introduction of photography into the descriptive scheme of our modern odonatological literature is undoubtedly one of its distinctive features when confronted with the writings of the classical time, and

the writer considers this introduction as a marked progress. Besides being of comparatively easy application, the study of venational details has the great merit of leading very often to the true lines of development within the Order, of helping us to a really phylogenetic, and therefore natural classification—all due reserve being made, of course, for incomplete knowledge and possible, or even probable, mistakes. The greatest progress in this branch of study is due to a paper of J. C. Needham, of Ithaca, New York: "A Genealogic Study of Dragonfly Wing-Venation" ('Proc. U.S. Nat. Mus.,' xxvi, pp. 703–764, tab. 31–54, 1903); from this essay most or all of the more recent authors have taken their starting-point, and its terminology has rapidly become almost universally adopted. This terminology, with some very slight and merely formal modifications, made as the writer found them practical in his various studies on the subject, is here also adopted and illustrated in its main features in Plate V, figs. 1, 2.

Prof. Needham's studies of venation were made chiefly on the wings of the Suborder Anisoptera, and interpretations of doubtful structures and terminology were therefore immediately derived from observations of this systematic unit. Needham arrived at his conclusions by following the ontogenetic development of wing-venation as foreshadowed in the tracheation of the larval wing; by his text and beautiful photographic figures the following facts were emphasised as being more especially characteristic for the (Anisopterous) Odonate wing: (1) A branch of the radius (*R*), the single radial sector (*Rs*) present in Odonata, branches off from the main trunk in the nodal region, crosses in an oblique transverse direction over two branches of the media (*M*1 and *M*2) before taking up again the longitudinal direction; the point where *Rs* becomes longitudinal again is linked to a considerably more proximal level of branch *M*1–2 by an accessory structure of veins named "the bridge" by Needham. In the mature wing *Rs* would appear to the observer unacquainted with the larval conditions as a branch of *M*; but there is an absolutely constant oblique cross-vein behind *M*2 and a little distally from the nodus to indicate still what has taken place during the development. (2) The discoidal triangles of the basal part of both wings—structures already observed and named by early observers—are demonstrated to be built up as follows: The proximal side of the triangle is part of the main branch of the cubitus (*Cu*); the costal and distal sides of the triangle are medio-cubital cross-veins modified in length, structure and final position in various ways, according to systematic group and to differences between front and hind wing; but the modifications are evidently determined by the mechanical needs of the wing structure.

(3) The conditions of the anal vein (*A*) were not insisted upon by Needham either in his diagrammatic figures or in his terminology, though they are clearly demonstrated in some of his photographic figures (*l. c.*, pl. xxxi, fig. 1, pl. xxxii, fig. 2). What we are used to name the cubito-anal cross-vein appears, indeed, to be part of the main branch of *A* itself. The trachea, *A*, in the larval wing is, in its proximal part, fused with, or indeed very closely applied to, *Cu*; where it gives up this fusion to bend hindward we have the "cubito-anal cross-vein," and the part of *A* in the mature wing proximal to this vein appears indeed as a recurrent secondary branch of *A*—as a kind of "bridge" again. Recently Mr. R. J. Tillyard has developed and illustrated these conditions, and proposed to draw the consequences for the purpose of terminology ('Proc. Linn. Soc. N.S. Wales,' xxxix, pp. 163 *sqq.*, 1914).

Needham and others, the writer amongst them, have applied the results drawn from the anisopterous wing to the interpretation and terminology of the Zygopterous wing. There is no need here to insist on the conditions of the wing base, much less complicated in the Anisoptera by a minor grade of specialisation of the region between *M* and *Cu* (quadrangle instead of triangle and supratriangular space) and also by the reduction of *A* to an almost rudimentary state. Applying the anisopterous terms to the Zygopterous wing (from apex to base; *R*, *M1*, *M2*, *Rs*, *M3*, *M4*), we have full accordance between the two large groups; but the conditions of these various branches at their origin, especially in the nodal region, are far from giving a satisfactory insight into their primitive interdependence (insight which is by no means difficult to obtain in the mature anisopterous wing). A larval wing of *Lestes* (*l. c.*, pl. xxxi, fig. 2) gave apparently the key to the question, confirming the full analogy between an anisopterous and a zygopterous wing; the oblique vein (in the larval and in the mature wing) and the long radio-medial bridge are clearly there, and it might be overlooked that the proximal part of *Rs*, its origin out of the main branch of *R*, is altogether absent. But this detail and other embarrassing disagreements in the Agrionine wing and in some of the Calopterygidae might provisionally be accepted as being the consequences of coenogenetic differentiation by reduction. The writer gradually became sceptical about this entire interpretation of the zygopterous wing on the "Anisopterous" scheme. When discussing the position of *Chlorolestes* (in Agrioninae or Lestinae) with Mr. Herbert Campion, in consequence of observations first made by this gentleman when studying some genera of Calopterygidae (*Philoganga*, *Bayadera*), and discussing analogous questions with Mr.

Tillyard in a spirited correspondence, he felt the desirability of new observations and probably of a different orientation. Larval preparations of *Calopteryx* and of *Ischnura* were photographed, compared with various other important photographs furnished by Mr. Tillyard (*Lestes*, *Synlestes*, *Pseudagrion*, *Neosticta*, etc.), and the following conclusion was arrived at provisionally, and for which Mr. Tillyard and the writer alone have to accept for the present the responsibility: (1) Zygoptera are radically different from Anisoptera, having the radius unbranched in larval and mature wing; what has been termed *Rs* is, in fact, a branch of the media. (2) This particular branch of the media (*Rs* of our terminology) has undergone the following (gradual) changes of position: (*a*) a very proximal origin in the quadrangular region (most primitive position—*Calopteryx* and many others of the Calopterygidae); (*b*) considerably more distal origin, very near the nodus (the bulk of Agrionidae); (*c*) still more distal origin, shifted so far distally as to become a secondary branch of the following branch (*M*2) of the media. In this condition a bridge (a very long one in *Lestes*, a shorter one in *Chlorolestes* and *Synlestes*) appears between this "*Rs*" and the main branch of the media (the structure thus resulting in an apparent analogy with the anisopterous condition, though actually different). Under this assumption (unbranched radius, distally migrating branch of media at place of anisopterous [*Rs*]) most of the difficulties of interpretation vanish for the mature as well as for the larval zygopterous wing, and as far as the writer's observations go, all ontogenetic preparations, even of earlier stages (*Calopteryx* and *Ischnura*), are fully in favour of this theory and none contrary to it.

Nevertheless I hesitate to draw conclusions from this view in proposing a new terminology for the Zygopterous wing. Mr. Tillyard has done so, and says: "*Ms* in Zygoptera for the vein in place of *Rs* in Anisoptera." Fortunate as this term appears to be, I refrain from accepting it, as long as the question is not fully settled by the discussion that must certainly follow.

The *abdomen* is joined to the thorax in a free but rather broad joint. It is composed of ten fully-developed segments of subequal value, although the first and the last are somewhat reduced in size, and the second, eighth and ninth distinguished by their relation to sexual organs. The dorsal sclerites, the tergites, are predominant; the lateral and even part of the ventral surface belong to the tergite. The ventral sclerites, the sternites, are, as far as not modified in the genital segments, narrow, flat plates, mostly of indifferent structure and colour, folded under the ventrally produced margins of the

tergites, to which they are joined by a thin, transparent, completely infolded membrane. There are rudiments of an eleventh abdominal segment: supra-anal tubercle in female, superior appendage in male of Anisoptera as rudiments of the tergite; subanal plates in Anisoptera, inferior appendages in male of Zygoptera as rudiments of the sternite. The superior appendages of both sexes in the entire Order are considered by most authors as being appendages—cerci—of the tenth segment.

The disposition of copulatory organs in the male is another distinctive and unique feature in the Order Odonata. The opening of the seminal vessel is constant, on the eighth sternite, covered by a pair of small, roughly triangular, slightly projecting plates. But the copulatory organ is to be found on the second and third segment, where a complicated pocket is formed of elements of the second sternite, and a penis-like organ projects from the framework of the second sternite in Zygoptera, and from the anterior margin of the third sternite in Anisoptera. No detailed account can be here given of these very complicated structures (*cf.* Erich Schmidt, "Vergleichende Morphologie des ii und iii: Abdominal segments bei männlichen Libellen," 'Zool. Jahrb. Anat.,' xxxix, pp. 87–120, tab. 9–11, 1915). No use, for diagnostic purposes, is here made of them in the groups Zygoptera and Aeschninae; but they are of great importance and comparatively easy application in Gomphinae and Libellulidae. The Gomphinae show in the appendages of the second sternite (1) a small anterior lamina, (2 and 3) two pairs of hamuli, in the third sternite (4) a cap-like organ which covers the penis, and (5) the penis itself. In the Libellulidae the anterior lamina is somewhat more important and only one pair of hamuli is present (the first pair is, as it appears, fused to the anterior lamina); the ventral margin of the second tergite is mostly produced in a flat organ, the genital lobe; between the genital lobes the penis is included, and no cap-like organ of the third sternite exists.

In the female no modification exists on the second segment. The organs of copulation and oviposition have their regular position on the eighth and ninth sternites; eventually a modification of the tenth partakes of the function. There are two rather widely different types of organisation. The more simple type shows the genital opening at the posterior end of the eighth sternite, either practically free, or covered by a very simple chitinised plate, which is very often bifid to various degrees; the vulvar scale; on the ninth sternite only two minute styles or tubercles can be observed. This type is common to the large family Libellulidae and to the Gomphinae in the Anisoptera.

The other type shows an elaborate boring mechanism, a terebra very much like the same organ in many other groups of insects (Hymenoptera, Tenthredinoidea, Orthoptera and others). There are two pairs of slender, acute saws, the lateral and somewhat anterior ones belonging to the eighth sternite, the medial, posterior and smaller ones to the ninth sternite. All four are, when out of function, included between a pair of valves, derived from the ninth sternite, and bearing each a slender, small, one-jointed process near its end. This terebra is common to the entire Suborder Zygoptera and to the Aeschninae in the Anisoptera. Its presence means that the insect will deposit its eggs singly into holes made in dead or living plant tissues, in the water or only near it, as the case may be. The eggs of the valvulate groups, on the other hand, are laid entirely unprotected, or only included in a mass of gelatinous matter or jelly, like frogs' eggs.

The relative position of the copulatory organs in both sexes involves a complicated act of copulation. This act has attracted the attention of naturalists from a very early time, and has often been described. Nevertheless the knowledge of its more intimate details is of recent date only. The most elaborate description, based on the statements of other observers and a great many personal observations, is given by Dr. Wesenberg-Lund in his paper already mentioned. The act may be briefly described as follows: The male seizes his mate first with his spiny feet, takes for a moment a position on the head of the female, at which moment the spermatic fluid is transmitted from the opening on the eighth to the copulatory apparatus on the second segment; then the male takes hold of its mate by the terminal appendages, which are applied to the prothorax in Zygoptera, to the head in (at least most of) the Anisoptera; the female, somehow aided by the male, curves her abdomen so that her genital opening will join the male's second sternite, and the act is thus consummated. In most cases its later stages take place on some supporting plant or even on the ground; but there are some curious and most remarkable cases (*Libellula quadrimaculata* and *depressa* of the European fauna), where the entire complicated function is performed when the two actors continue their rapid flight, and in these cases it lasts only a few seconds. In other cases it may last even for hours.

Oviposition is also a very attractive study for the thoughtful observer, and various different manners are described, the chief difference being given, as already indicated, by the different structure of the female organs; but other differences scarcely less interesting result from the local and seasonal conditions of each species.

2. Systematic and Descriptive Part.

I. Suborder ZYGOPTERA.

Front and hind wings similar in outline and also in venation (except for some minute details). In the basal part of wings between *M4* and *Cu* the quadrilateral (*q*), the proximal side of which is the anal half of the arculus; the quadrilateral free or crossed.

Head transversely cylindrical, the hemispherical eyes separated by a broad space, broader than the length of the diameter of each eye. Median lobe of labium broader than lateral lobes, more or less bifid. In the male sex two pairs of terminal abdominal appendages, the lower pair being the sternite of the eleventh abdominal segment. Female ovipositor consisting of two pairs of saws and a pair of valves (p. 259).

II. Suborder ANISOPTERA.

Front and hind wings dissimilar in outline and venation: the anal field is more developed in the hind wing. The difference in the triangular region of the front and hind wings is slight in the first family of the Suborder, considerable in the second. Between *M4* and *Cu* in the region of the zygopterous quadrilateral there are two spaces superposed in the transverse axis of the wing—the supratriangular space (*ht*) and the triangle (*t*); the proximal side of *ht* is the anal half of the arculus. Head roughly hemispherical or spherical in outline. In the male sex a pair of superior terminal abdominal appendages, and a single (often bifid) inferior appendage, being the tergite of the eleventh abdominal segment.

I. Suborder ZYGOPTERA.

There is a marked difference in general appearance between a zygopterous and an anisopterous dragonfly. With very little experience the observer will distinguish at a glance to which of the two large and systematically equivalent groups a given insect may belong. Zygoptera are comparatively weak insects; their long and extremely slender body, long and mostly very narrow, even petiolate, wings are not suited to the wonderful display of flying power shown by many of the Anisoptera. Their existence is more bound to the immediate surroundings of their native waters, where they cling to the vegetation, take rather short flights, will rarely go very high up into the air

although these tiny and fragile looking creatures are occasionally capable of very rapid movements. Their shape and coloration are in most cases highly cryptic in their natural haunts. Under the influence of conditions resulting from the full sunlight on open space, reflected from the water's surface, or broken into the intricate maze of vegetation, even their bright colours—metallic green, light azure blue or vivid blood-red—cease to be conspicuous, and often vanish to a point which is a just cause of admiration to an observant mind.

In the fauna under discussion there is a fair representation of the Suborder, and it is probable that a certain number of species will be added to our list as the result of a more thorough investigation of the country.

There are representatives of two families:

A. Numerous antenodal cross-veins (*Anq*); the nodus distant a long way from the wing base. Quadrilateral (*q*) nearly rectangular, long, crossed by one or more veins (Plate VI, figs. 6, 7) . . . . *Calopterygidae.*

B. Two antenodal cross-veins only; the nodus near the wing base. Quadrilateral a single cell, nearly rectangular, or oblique in various degree (Plate VI, fig. 8, etc.) . . . . . *Agrionidae.*

1 A. Family CALOPTERYGIDAE.

This family is poorly represented in our fauna by two species belonging to very widely removed genera.

a. Wings petiolate (*i. e.* the vein *A* is for a short extent the actual hind margin of the wing). Two of the antenodal cross-veins are decidely stronger than the rest, and run right through from *C* to *R*. Quadrilateral two-celled. *M* 4 strongly convex costal.
A long and narrow pterostigma present in both sexes (Plate VI, fig. 6). Ante- and postclypeus much enlarged, projecting in a helmet-like structure . . . . . *Libellago.*

aa. Wings not petiolate (*i. e.* there is a narrow anal field between vein *A* and the actual hind margin of the wing right from the base). All antenodal cross-veins about equal, and most of them running through from *C* to *R*. Quadrilateral long and narrow, rectangular, with 5–6 cross-veins. *M* 4 straight. Only exceptionally, and in the male sex alone, a small pterostigma, scarcely larger than two or three cells (Plate VI, fig. 7). Head of the regular zygopterous form . . . . . *Phaon.*

LIBELLAGO (Sélys, 1840).

This genus is in Africa the representative of de Sélys' "Légion Libellago," a group of Calopterygidae that might eventually rise to the rank of a subfamily.

The peculiar structure of the head, the very characteristic venation of the narrow, petiolate wings, as represented in our Plate VI, fig. 6, are distinctive features of the "Légion." This group is represented in tropical Asia by the large genera *Rhinocypha* and *Micromerus*, in Africa by the almost equally numerous genus *Libellago*.

Most of the species are found in tropical Western Africa, but they are very imperfectly known, because specimens are not numerous in collections and the existing descriptions are in a state of hopeless confusion. The only species found in South Africa has a wide distribution in East Africa, but does not occur, as it seems, on the other side of the continent. The generic name will eventually have to be altered, as it seems that the name *Libellago* must, according to nomenclatorial rules, be applied to what is now universally accepted as *Micromerus* (Rambur, 1842); but the present paper is not the place for such an alteration.

A larva from the Tanganyika region (Mus. Tervueren) agrees in all essential points with another one figured by Karsch ('Berlin. Entom. Zeitschr.,' xxxviii, tabs. 1, 2, 3, 4, fig. 11, 1893); it is almost certainly a *Libellago*.

The Tanganyika nymph is reserved for another publication.

Libellago caligata (Sélys, 1853).

S. Afr. Mus.: 1 ♂, Kranspoort, Pretoria district, Transvaal (17 . xii . 1906); 1 ♂, Waterfall, Transvaal (5 . xii . 1901); 25 ♂, 15 ♀, M'Fongosi, Zululand (ii, iii, iv, v, x, xi, xii . 1911 (W. E. Jones); Acornhoek, Transvaal (xii . 1918, Tucker). Mus. Stockholm: 2 ♂, Zululand (x . Trägardh). Coll. K. J. Morton: 1 ♂, 1 ♀, Umzinto, Natal (26 . iv . 1909, Miss Fountaine). Coll. E. B. Williamson: 10 ♂, 9 ♀, Princetown, Natal (8, 14 . xii . 1908; 5 . i, 16, 19 . ii, 11 . iii . 1909; 16, 21 . ii . 1910, G. F. Leigh). Coll. Ris: 1 ♂, Amans, Natal (23 . iii . 1908, H. Junod).

♂ (adult). Head deep black. Labium reddish brown, darker at the tips. Dorsally three yellowish spots; a larger one from the occipital margin almost to the posterior ocelli and in two lateral points to the base of antennae; two small triangular ones between the median spot and the eyes, nearly in the position of the "postocular spots" of many Agrionidae.

Thoracic dorsum deep black; a narrow white line on the median suture, and a triangular white spot in the antealar sinus and a broad forked yellowish band at the humeral suture; the lateral branch touching the narrow black line of this suture nearly for its whole

length, the median branch terminating in a point at two-thirds of its height. Sides yellowish (or reddish in life?); a rather broad and almost complete black mesepimeral band; a narrow black line in the dorsal third of the first lateral suture; a broader black line on the second lateral suture for its entire length. Ventral surface yellowish with very narrow black lines on the sutures. Femora black; tibiae foliaceous, lanceolate, bright scarlet red on the outer, pure white on the inner surface; tarsi black.

Abdomen short, depressed, not much narrower than the thorax at the base, very gradually narrowing to the end. Dorsum light blue (often badly discoloured in dead specimens); sides of segments 1 to 3 crimson; ventral side of 1 to 3 crimson with a blackish hue, 4 to 10 blackish.

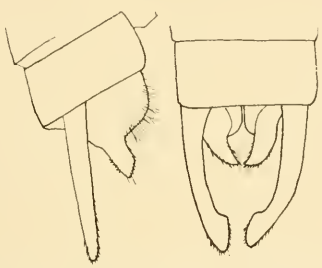

Fig. 6.—*Libellago caligata*, ♂. M'Fongosi. Appendages, right side and dorsal view.

Black markings on dorsum: Segment 1 a triangular dorsal spot; 2 a longitudinal dorsal line and an incomplete transverse line near the segment's end, a latero-ventral somewhat diffuse longitudinal band; 3 a U-shaped dorsal marking, a narrow medial dorsal line and an almost complete latero-ventral longitudinal band; 4 narrow nearly rectangular transverse apical spots; 5–6 the trace of a transverse ante-apical line; 7–10 wholly blue. Appendages deep black (Text-fig. 6).

Wings hyaline; a yellowish tint of the base gradually vanishing towards the quadrilateral. Pterostigma blackish at the ends, dark reddish brown in the centre. Venation (Plate VI, fig. 6).

Teneral males are much like females in colour and pattern of head and thorax; dull grey or violet on the dorsum; yellowish on the sides of segments 1–3 of abdomen. Their dilated tibiae show various tints of pale yellow on the inner, of yellow or orange on the outer side.

♀. Labium whitish yellow. Labrum yellow, rather broadly black

at base, and this colour extending in a median line; mandibles and genae yellow; anteclypeus yellow with a U-shaped black marking; dorsum of head (postclypeus and fronto-occipital region) mostly yellowish with an olivaceous tinge; the part between the eyes to the base of antennae shows the male pattern; only the lateral branches of the medial spot are very nearly fused in front of the anterior ocellus; the part in front of the antennae, the basal joints of antennae and the postclypeus are largely olivaceous, with narrow black lines in the depth of folds and suture.

Thoracic pattern much as in male, the black colour somewhat reduced, the light colours dorsally dull olivaceous, passing into light greenish yellow on the sides.

Feet blackish with grey pruinosity; outer side of tibiae light yellowish; no dilatation of tibiae.

Abdomen comparatively shorter than in male, less flattened, more nearly cylindrical. Dorsum dull olivaceous brown, with black markings: Segments 1–3 as in ♂; 4–7 a U-shaped marking and a median dorsal line; dorsum almost entirely black; 1–8 a broad latero-ventral longitudinal band, fused to the dorsal black colour on 9–10. Ventral side: Sternites black, tergites olivaceous, bordered laterally with black; bluish pruinose in very adult specimens. Appendages black, straight, acute.

Wings longer than in male, often tinged with light yellow; pterostigma mostly whitish, dark brown to black at both ends. Venation (Plate VI, fig. 6).

♂, *Abd.* 21, *hdw.* 22, *pt.* 2 mm. ♀, 19, 25, 2·5.

PHAON (Sélys, 1853).

The genus represents in South Africa the Sélysian "Légion Calopteryx," which division, like the "Légion Libellago," may eventually rise to subfamily rank. There are two other closely allied genera (*Sapho* and *Umma*) in tropical Africa and the "Légion" is represented in most of the great faunal regions.

The earlier stages of *Phaon* are unknown; but it is to be expected that the larva will not be essentially different from allied forms which have been described, such as *Calopteryx* from Europe and North America, *Neurobasis* and *Vestalis* from tropical Asia.

Phaon iridipennis, Burmeister, 1839.

S. Afr. Mus.: 7 ♂, 5 ♀, M'Fongosi, Zululand (ii, iii, v, x, xii, 1911, W. E. Jones); Kaapmuiden, Transvaal (xii. 1918, Tucker).

Rhodesia Museum: 1 ♂, Lusita River, Zambesi, Rhodesia (v. 1912). Mus. Stockholm: 1 ♂, Natal (Tragardh). Coll. E. B. Williamson: 1 ♂, 3 ♀, Salisbury, Mashonaland (iv. 1900, G. A. K. Marshall); 1 ♀, Umtali 3700 ft. (x. 1900, *id.*); 10 ♂, 5 ♀, Natal (G. F. Leigh); 1 ♂, 2 ♀, Woodside off Umbilo Road, Congella, Natal (*id.*).

Widely distributed, and, as it seems, often common in Tropical Africa, West and East; a very slightly different form in Madagascar.

♂. Labium whitish. Occiput black, bluish pruinose. Upper side of head light reddish or greyish brown; a ring of brilliant metallic green encloses the region of the ocelli, broader laterally along the eyes, narrow on the occipital margin, narrow and sometimes interrupted in front of the ocelli.

Prothorax reddish brown, dorsum brilliant metallic green. Thorax reddish or greyish brown, lighter on the sides, almost whitish ventrally;

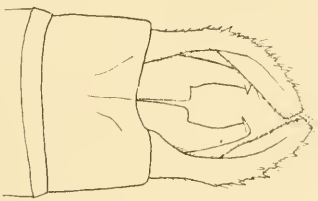

Fig. 7.—*Phaon iridipennis*, ♂. M'Fongosi. Appendages, dorsal view.

each side four metallic green stripes: the first, mesepisternal, the largest, almost rectangular and covering the sclerite to the narrow margins on the sutures; the second, mesepimeral, cuneiform, broadest ventrally; the third and fourth, metepisternal and metepimeral, also cuneiform, but much smaller and broadest dorsally. Feet reddish brown, tarsi and spines black; very long and slender, the tibiae curved; very numerous, extremely long and fine spines on the femora and tibiae.

Abdomen long and slender, cylindrical; dorsally dark brown with a slight metallic reflection, laterally reddish brown, ventrally blackish. Superior appendages slightly longer than the tenth segment, forcipate; inferior not fully two-thirds as long, nearly straight and parallel.

Front wings hyaline with a beautiful blue iridescence, costal margin and tips light yellowish; hind wings uniformly light yellowish; pterostigma, when present, light greyish brown.

♀. Similar to ♂ in ground-colour, but the metallic markings of

head and thorax are somewhat reduced in extent, the metepisternal stripes uncomplete or interrupted; their colour dark brassy or coppery with a slight greenish lustre. Wings almost uniformly yellowish, the colour duller than in the male and the bluish iridescence far less brilliant.

♂, *Abd.* 58, *hdw.* 38, *pt.* 1·5 mm. ♀, 53, 41.

1 B. Family AGRIONIDAE.

1. Pterostigma comparatively large, covering two or more cells. Supplementary short sectors between the distal ends of some or most of the regular veins. Quadrilateral with the anal-distal angle very acute. (Plate VI, fig. 8, Plate VII, figs. 1, 2, 3, 4, 5, 6.) Spines of femora and tibiae long. Superior appendages of males forcipate . . . 2.
   Pterostigma small, covering one cell or less, only exceptionally more. No supplementary short sectors. (Plate VII, figs. 7, 8, 9, 10, Plate VIII, fig. 1). Superior appendages of males not forcipate . . . . 3.
2. Origin of *M3* and bridge of *Rs* nearer to the arculus than the nodus. Origin of *A** at *Cuq*. (Plate VI, fig. 8) . . . . . *Lestes.*
   Origin of *M3* and bridge of *Rs* in the nodal region, predominantly *M3* at the submodus and bridge of *Rs* one or two cells distally. Origin of *A** distal to *Cuq*. (Plate VII, figs. 1, 2, 3, 4, 5, 6) . . . *Chlorolestes.*
3. Quadrilateral rectangular or very nearly so. (Plate VII, figs. 7, 8, 9, 10.) Spines of tibiae long . . . . . 4.
   Quadrilateral oblique, the anal-distal angle acute. (Plate VIII, fig. 1.) Spines of tibiae short . . . . . 7.
4. Origin of *A** at *Cuq* or very little proximal, not more than the length of *Cuq*. (Plate VII, figs. 7, 8, 9) . . . . . 5.
   Origin of *A** very considerably proximal to *Cuq*, several times the length of *Cuq*. Quadrilateral slightly more oblique than (5) and shorter, approaching the form of (7). *Rs* at submodus, *M3* proximal by one cell. (Plate VII, fig. 10) . . . . . *Metacnemis.*
5. *Cuq* fully developed, exceeding the level of nodus by a number of cells. Origin of *A** at *Cuq*.
   M3 at submodus, *Rs* distal by one cell. (Plate VII, fig. 7). *Allocnemis.*
   Cu 2 incomplete or absent, exceeding the level of nodus at most by one cell. (Plate VII, figs. 8, 9) . . . . . 6.
6. *Cu* 2 exceeding the distal side of quadrilateral by one cell in front wing, by two cells in hind wing.
   Origin of *A** at *Cuq*, *M3* at submodus, *Rs* one or two cells distal. (Plate VII, fig. 8.) Abdomen excessively long and slender. *Chlorocnemis.*
   Cu 2 not developed; *A** stopping at the vein which continues the distal side of quadrilateral. Origin of *A** slightly proximal to *Cuq*. *Rs* at submodus, *M3* proximal by one cell. (Plate VIII, fig. 9.) Abdomen moderately long and slender . . . . . *Disparoneura.*

7. Origin of A^* at *Cuq* or very slightly proximal, scarcely more than the length of *Cuq*. Females without a vulvar spine at the sternite of segment 8 . . . . . 8.
Origin of A^* considerably proximal to *Cuq*, more than the length of *Cuq* . . . . . 9.
8. No transverse ridge at the frons. Most of the species with light-coloured postocular spots. Colour scheme mostly blue and black. Superior appendages of most species bifurcate. Most females with two small styles on the posterior border of prothorax . . . *Pseudagrion*.
Frons with a transverse ridge parallel to the suture anteclypeus-postclypeus. No postocular spots. Colour scheme orange or reddish. Superior appendages of male not bifurcate. No styles on female prothorax . . . . . *Ceriagrion*.
9. Arculus a long way distal to the second *Anq*. *M2* in front and hind wing at third postnodal cross-vein.
Tenth segment of male not elevated at posterior margin. No vulvar spine in female. Smallest forms of family and order . *Agriocnemis*.
Arculus at second *Anq* or only very slightly distal. Females with vulvar spine . . . . . 10.
10. *M2* in front wing mostly at fifth, in hind wing at fourth postnodal cross-vein. Tenth segment of male not or very slightly elevated at posterior margin. Pterostigma of male similar in front and hind wing.
Enallagma.
M2 in front wing mostly at fourth, in hind wing at third postnodal cross-vein. Tenth segment of male raised at posterior margin. Pterostigma of male black and white in front wing, of one colour only in hind wing.
Ischnura.

1 Ba. Subfamily LESTINAE.

The cosmopolitan genus *Lestes* together with some smaller allied groups, not represented in the present fauna, are considered unanimously as a rather widely different stirps from the rest of the family *Agrionidae*. The authors of the present time do not agree on the other hand about the systematic position to assign to this group: we find it, for instance, paralleled to *Calopteryginae* and *Agrioninae* under a family *Agrionidae* (P. P. Calvert, 'Biologia Centrali Americana'), or paralleled to the various other Selysian "Légions" of *Agrionidae* (de Sélys, R. J. Tillyard, 1913). The question cannot now be settled when we remember the greatly unstable condition of generally accepted views on zygopterous venation (see p. 256, *ante*). Probably Dr. Calvert's view will eventually prevail with the difference of families instead of his subfamilies; but for the moment and for the needs of the present paper the author thinks best to adopt a view which still subordinates the *Lestes* group to the family *Agrionidae*, but

co-ordinates the same to all the rest of the family, instead of the single Sélysian "Légions."

The subordination of the genus *Chlorolestes* to the *Lestinae* means an innovation of considerable taxonomic importance. *Chlorolestes* figures to this day in the Sélysian "Légion Podagrion"—a group not otherwise represented in the fauna under discussion. The distinctive feature of *Lestinae* has been, to the present time, the origin of *M3* and *Rs** near the arculus, as in most or all of the *Calopterygidae*. With this character as a leading one, *Chlorolestes* would not fall under the *Lestinae*, since the origins in question are (apparently or truly, as it may be) in *Chlorolestes* in the nodal region, much like the immense majority of *Agrionidae*. But Needham has already ascertained that the proximal origin of *Rs* in *Lestes* is not real but apparent, the real *Rs* being marked by an oblique vein, whereas the part proximal to that oblique vein is a "bridge"—a very long one, but otherwise corresponding in position to the bridge of *Anisoptera*. The same oblique vein exists in *Chlorolestes*, as Mr. Herbert Campion, of London, has first suggested in his correspondence to the writer. The same oblique vein also exists in the Australian genus *Synlestes*, the only one which may be reasonably claimed as a very close ally to *Chlorolestes*; and for *Synlestes* Mr. R. J. Tillyard has not only discovered the existence of the important oblique vein, but also ascertained the absolute coincidence of wing tracheation in ontogeny with the facts illustrated for *Lestes* by Prof. Needham, besides other Lestine affinities in the *Synlestes* larva. With this evidence in view, we believe there can be little doubt that the true position of *Chlorolestes* is with the *Lestinae*. The form of quadrilateral and *Cu* point in the same direction, as does the general facies of *Chlorolestes*. Thus even now, although our knowledge of tracheation and ontogeny in zygopterous wings is still fragmentary, the removal of *Chlorolestes* from the "Légion Podagrion" to the *Lestinae* may be proposed with a fair possibility of it being on right lines. The guides for the systematic position and definition of *Lestinae* are now the oblique vein and corresponding bridge, of which there is no evidence known to the author in all the rest of the *Agrionidae*.

LESTES (Leach, 1815).

The cosmopolitan genus is fairly represented in South Africa, and a large number of species are described from the Ethiopian region.

* *Rs* is here applied as generally accepted in terminology; regarding the real nature of this vein in Zygoptera, see p. 257 *ante*.

Recent observations by Dr. Wesenberg-Lund give us a good insight into the reasons why species of *Lestes* may be particularly fit to exist under conditions not otherwise favourable for dragonfly life. The European species observed by that author hibernate as eggs (which are concealed and protected in plant tissues, where they are inserted by the female); when hatched at the beginning of the warm season they develop with astonishing rapidity, reaching the imaginal state in a few weeks. Thus they do not strictly need permanent water, and may exist in regions where great drought prevails and suitable water is only available for a comparatively short period of the year. *Lestes* larvae are exceedingly slender, half transparent creatures, jerky and swift in their movements, voracious feeders on Crustacea and small larvae of Ephemeridae and Diptera, as may be expected from their rapid growth and development. Our Plate XII, fig. 1, photographed from the European *Lestes virens*, will give an idea of their general appearance.

1. Thoracic dorsum yellowish, olivaceous or reddish brown. No metallic green or black stripes. Superior appendages of male forcipate . 2.
   Thoracic dorsum greenish, olivaceous or reddish brown with dark or metallic green stripes . . . . . 3.
   Thoracic dorsum black, with three (one medial, two humeral) reddish brown lines; ventral surface of thorax black. Pterostigma rectangular, narrow, reddish brown, yellowish in the distal third. Superior appendages of male forcipate. Small species. (Female unknown.) . *Wahlbergi.*
2. Venation mostly ochre yellow. Pterostigma very light yellowish. No dark markings on thorax, not even on ventral surface . . *ictericus.*
   Venation dark. Pterostigma reddish brown. On ventral surface of thorax a very distinct black point each side near the ventral and anterior angle of metepimeron. Somewhat variable other dark markings on thorax; four (or six) dark brown points on dorsum, a narrow brown stripe on mesepimeron . . . . . *ochraceus.*
3. Thoracic dorsum greenish or olivaceous with a broad median black or slightly bronzy band, joined laterally to three rectangular spots. Wings hyaline or very slightly tinged with yellow. Pterostigma very dark brown, slightly dilated in the middle. Superior appendages of male very long, whitish with black tips, their distal third strongly curved downward . . . . . *uncifer.*
   Dark or light markings of thoracic dorsum straight lines . . . 4.
4. Thoracic dorsum ferrugineous, with two lines of brilliant metallic green in males and immature females, darker, bronzy or coppery in mature females.
   Wings strongly tinged with yellow; pterostigma dilated in the middle. Superior appendages of male forcipate . . . . . 5.
   Thoracic dorsum as in (5) in females and immature males, black with a narrow median line and broad humeral bands greenish in adult males.

Wings hyaline or very slightly tinged with yellow. Pterostigma narrow, rectangular, yellowish brown. Superior appendages of male bent downward in distal third . . . . . *plagiatus.*

5. Yellow colour of wings gradually deeper towards the tips. Pterostigma yellowish in the central, brown in the marginal parts. Superior appendages of males with three distinct medial teeth . . . . . *virgatus.*
Yellow colour of wings suddenly deepened to golden yellow in the pterostigmatic region. Pterostigma yellowish throughout. Superior appendages of males with an acute sub-basal median tooth and a trapezoid distal dilatation . . . . . *amicus.*

Lestes ictericus (Gerstäcker, 1869).

This species is not represented in the collections forwarded by Dr. L. Péringuey. It is originally described from an incomplete

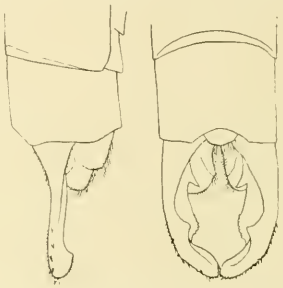

Fig. 8.—*Lestes ictericus*, ♂. Okosongomingo. Appendages, right side and dorsal view.

male from Mombasa. The writer has examined specimens from the White Nile (Vienna and Stockholm Museums), an old female from Dakar in the Sélysian collection (Brussels Museum), a good series from the Kalahari desert (Berlin Museum, alcoholic specimens, described in my paper on Schultze's voyage), and he can now add 2 ♂, 1 ♀, from South-West Africa, "Farm Okosongomingo am Kleinen Waterberg" (H. Thomsen, i–ii. 1913, Hamburg Museum).

♂ (Okosongomingo.) Labium and occiput whitish.

Dorsum of head reddish ochreous; free margin of labrum, ant clypeus and genae lighter, more whitish.

Thoracic dorsum reddish ochreous, a mere trace of a lighter yellowish line at the humeral suture; the same ochreous colour on mesepimeron; metepisternum and metepimeron very light yellow, turning to whitish on the ventral surface. A very small brownish

point in the anterior ventral angle of metepimeron is present in these specimens. Feet whitish yellow with black spines. Abdomen greyish ochreous dorsally, gradually turning to lighter shades on the sides; sternites black. On segments 3–6 a very narrow brownish transverse line near the apical end; a narrow, blackish, mid-dorsal longitudinal line on 9–10. Appendages (Text-fig. 8) very light yellowish, the tips of superior black; inferior appendages short, very slightly divergent, ending in a distinct little knob.

♀. The colours agree almost exactly with the male, only there is on segments 3–6 a distinct trace of a mid-dorsal, longitudinal brownish line.

♂, *Abd.* 33, *hdw.* 20·5, *pt.* 1·5 mm. ♀, 31, 22, 1·5.

Lestes ochraceus (Sélys, 1862).

S. Afr. Mus.: 1 ♂, Salisbury, Mashonaland (17. xii. 1911).

The species was originally described from a male specimen labelled "Afrique, probablement du cap de Bonne-Espérance"; the type is in a very mutilated condition, but what remains is sufficient to be identified as very probably the species here described. The writer has examined and described under the name *unicolor*, MacLachl., specimens from Madagascar and the White Nile. Mr. Herbert Campion describes, as *ochraceus*, a series from the islands of Aldabra and Cosmoledo. A ♀ in perfect condition of colours was recently received from Dar-es-Salaam (16. xii. 1913, Dr. A. Dampf).

♂ (Salisbury). Labium light yellowish. Occiput whitish yellow, slightly pruinose. Dorsal surface of head dark brown; base of mandibles and genae whitish Thoracic dorsum dark reddish brown, this colour extending on part of mesepimeron (the limits not exactly visible in the specimen here described).

Side light yellow with a reddish hue, turning to whitish on the ventral surface. In the ventral and anterior angle of metepimeron a sharply defined, deep black point (no other dark thoracic markings in the present specimen). Feet whitish yellow, spines black; a trace of dark lines on the lateral surface of femora. Some whitish pruinosity at the coxae and the interalar space. Abdomen dark reddish brown dorsally, turning to lighter shades on the sides. Segments 8–9 blackish (discoloured?); segments 3–6 with indication of darker terminal annular marking, sternites black. Superior appendages (Text-fig. 9) reddish brown, darker at the tips; the difference from *ictericus* very slight, even doubtful in some specimens; there is at the level of the ante-apical serrate projection of the medial dilatation a slight ridge on the lateral margin. Inferior appendages longer than

in *ictericus*, their end slender and rather abruptly narrowed (this character seems to be of some importance and pretty regular when compared with the knobbed end of the same organ in *ictericus*).

♀ (Dar-es-Salaam). The dorsal colour of head, thorax and abdomen is decidedly lighter than in the male from Salisbury, and not so reddish, more greyish, with a shade of olivaceous. On thoracic dorsum six brown points in two straight lines of three, almost equidistant from the median and humeral sutures; the foremost of these points very small.

The dorsal colour occupies the anterior half of the metepimeron, where two more dark points exist at the ventral third. Sides otherwise yellowish, turning to greenish white on the ventral surface; the

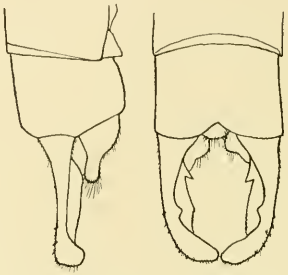

Fig. 9.—*Lestes ochraceus*, ♂. Salisbury. Appendages, right side and dorsal view.

ventral metepimeral points sharp and deep black. Feet light yellowish, distinct dark lines on the external surface of femora and also of first tibiae. Abdomen dorsally like the thorax throughout; very narrow transverse darker lines near the distal ends of segments 2–6; a very narrow mid-dorsal, longitudinal line on 8–10.

♂, *Abd.* 34, *hdw.* 22·5, *pt.* 1·5 mm. ♀, 32, 21, 1·5.

Lestes Wahlbergi, n. sp.

Mus. Stoekholm: 1 ♂, Caffraria (Wahlberg).

This single example very probably represents a distinct and otherwise undescribed species. It is not to be expected that individual colour varieties or stages of maturity in *ochroceus* or *ictericus* should culminate in the black-and-reddish colour scheme of this example.

The superior appendages are not characteristic; the inferior are nearer to *ictericus*, which species is more widely different in colours.

♂ (adult, colours in good condition). Labium and occiput whitish. Labrum light yellowish brown with a greenish shade. Dorsum of head otherwise dull brownish black and light reddish brown. Reddish brown also are the base of the mandibles and genae, the anteclypeus, and a narrow transverse line slightly concave anteriorly across the base of the antennae and the anterior ocellus. Prothorax dull black. Thoracic dorsum dull black with three about equally broad light reddish-brown lines on the median and at the humeral sutures, the latter ones not reaching quite to dorsal or ventral end of suture. Sides dull black; a rather broad metepisternal reddish band from the metastigma dorsal not quite to the dorsal end; latero-ventral margin of metepimeron very narrowly lined with reddish brown. Ventral side

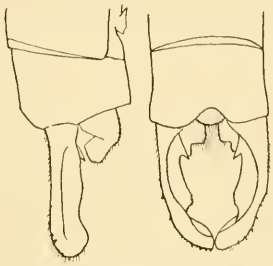

Fig. 10.—*Lestes Wahlbergi*, ♂. Caffraria. Appendages, right side and dorsal view.

black; a double triangular yellowish spot on the unpaired sclerite of metasternum. Some pruinose blue points in the interalar space. Legs very light yellowish brown; narrow blackish lines on the external side of femora and internal side of tibiae; spines black. Abdomen dark reddish brown dorsally, turning to very light yellowish brown ventrally, marked with dark brown; dorsum of segments 1 and 2, 3–6 narrow terminal rings and almost circular, anteriorly diffuse ante-terminal spots; 7 black with a lateral longitudinal reddish stripe on two-thirds of length; 8–10 wholly black. Appendages black and yellow; the dorsal ridge, sub-basal tooth and tips of superior, basal portion of inferior black. Inferior appendages very short, ending in a blunt, slightly upturned knob (Text-fig. 10). Wings hyaline; venation blackish; pterostigma rectangular, narrow, proximal two-thirds dark reddish brown, distal third turning gradually to light yellowish brown.

Abd. 31, *hdw.* 18, *pt.* 1 mm.

LESTES VIRGATUS (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, 1 ♀, King William's Town District, St. Mathews (iv . 1894, R. M. Lightfoot); 1 ♀, Dunbrody (3 . vi . 1912); 1 ♂, Matopa Dam, Bulawayo (16 . ii . 1911); 1 ♀, Zambesi River, near Sunyati River (v . 1912). Collections of Brit. Museum, Stockholm and E. B. Williamson: 8 ♂, 6 ♀, Salisbury, Mashonaland (iii, iv . 1900, iv . 1904, iii, iv, v . 1905, G. A. K. Marshall). Brit. Museum: 1 ♂, 2 ♀, Chirinda Forest, Gazaland, 3600–4000 ft. (3, 7, 19 . x . 1905, *id.*); 1 ♀, Mangesi River, S.E. Mashonaland (25 . x . 1905, *id.*). Coll. K. J. Morton: 1 ♀, Durban, Natal (16 . xii . 1907, Miss M. Fountaine). Coll. E. B. Williamson: 1 ♂, Natal, 1 ♀, Princetown, Natal

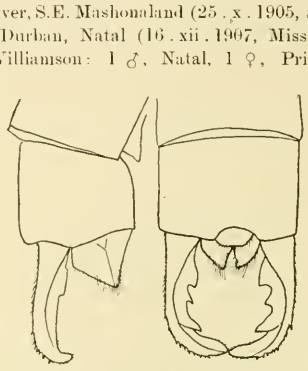

FIG. 11.—*Lestes virgatus*, ♂. Chirinda Forest. Appendages, right side and dorsal view.

(7 . ii . 1910, G. F. Leigh). Mus. Tervueren: 3 ♂, 2 ♀, Kapiri, Katanga (ix . x . 1912, Legros).

♂. Labium and occiput whitish yellow. Labrum and anteclypeus olivaceous. Genae and base of mandibles yellowish. Postclypeus and anterior margin of frons ferruginous. Dorsal surface of head otherwise blackish brown with metallic green reflections; towards the eyes and the posterior border dull reddish brown, this colour projecting anteriorly in two variable and irregular spots between the lateral ocelli and the eyes. Prothorax dull reddish brown with the merest trace of metallic sheen. Thoracic dorsum ferruginous; two parallel bands of brilliant metallic green occupy almost exactly the median third of each mesepisternum. Sides ferruginous on the mesepimeron and anterior half of mesinfraepisternum, turning abruptly to sulphur yellow on metepisternum and metepimeron; a metallic green stripe on the upper three-fourths of mesepimeron, an incomplete brownish

stripe on the second lateral suture. Ventral side whitish yellow; metasterna bordered laterally by a narrow but very distinct blackish line, which begins at the posterior third (where there is a break in the outline of the sclerite) and continues anteriorly to the median ventral suture, projecting as a very narrow branch on the metepimeron near its anterior end. Legs yellowish brown; lateral side of femora, ventral side of tibiae, tarsi and spines black.

Dorsum of abdomen metallic green, passing gradually into dull blackish brown on the terminal segments; a very narrow median line ferruginous on segments 2–5.

Sides yellowish or reddish brown on segments 1–7, the blackish colour of dorsum projecting in rather broad terminal rings on 3–7. Appendages dark brown (Text-fig. 11). Wings (see p. 270).

♀. Very similar in colour and markings to male. In some very mature specimens the metallic colour of the thoracic bands and dorsum of abdomen turns to coppery or dark bronzy green.

♂, *Abd.* 39 + 1, *hdw.* 27, *pt.* 2 mm. ♀, 38, 29, 2.

Lestes amicus (R. Martin, 1910).

British Museum: 2 ♀, N.E. Rhodesia, Upper Luangwa River (27.vii.1913, viii.1910, S. A. Neave). Mus. Tervueren: 1 ♂, 3 ♀, Kapiri, Katanga (ix, x. 1912, Legros); 1 ♀, Kibsenda (12.vi.1912, Dr. Bequaert).

♂. Labium whitish. Occiput yellowish, a black spot on each side on the anterior half. Labrum and anteclypeus dull reddish brown; postclypeus blackish with two dull reddish-brown transverse lines. Genae and base of mandibles light yellow. Dorsal surface of head black along the eyes and over the ocelli, ferruginous at the occipital border and anterior to the ocelli. Prothorax ferruginous, with two small dorsal metallic green spots. Thoracic dorsum ferruginous; two brilliant metallic green parallel stripes, each nearly as broad as the ferruginous band on the median suture. Sides ferruginous on the mesepimeron, where another metallic green stripe occupies the dorsal two-thirds of the sclerite; otherwise whitish yellow, a metepisternal ferruginous stripe, broader dorsally, narrow ventrally, running from the dorsal end of the second lateral suture across the metastigma to the third coxa. Ventral side whitish; blackish lines on the metasterna much as in *L. virgatus*. Legs reddish brown; lateral side of femora, ventral side of tibiae, tarsi and spines black.

Abdomen dorsally metallic green, less brilliant than the thoracic stripes and gradually darkening on the terminal segments; sides and

narrow basal rings on segments 2–7 light yellowish brown; a narrow mid-dorsal line on segments 2–8 ferruginous. Appendages dark brown (Text-fig. 12). Wings (see page 270).

♀. Very similar to ♂ in colour and markings. Sides of segments 8–10 and valves ferruginous.

♂. *Abd.* 35 + 1, *hdw.* 25, *pt.* 2 mm. ♀, 35, 27, 2·5.

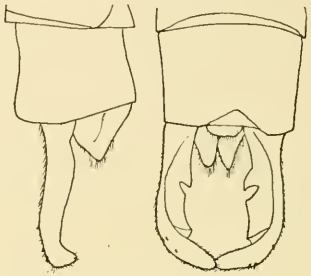

Fig. 12.—*Lestes amicus*, ♂. Kapiri. Appendages, right side and dorsal view.

Lestes plagiatus (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, 1 ♀, Waterval, Transvaal (9 . xi . 1899; 16 . xi . 1902); Acornhoek, Transvaal (xii . 1918, Tucker); 1 ♂, East London (1885, J. Borcherd); 2 ♀, Dunbrody (4 iii . 1912); 1 ♀, Rietfontein (30 . x . 1904); 1 ♀, M'Fongosi, Zululand; 1 ♀, Matopo Dam, Bulawayo (16 . ii . 1911); 1 ♂, Zambesi River, near Sanyati River (v . 1912). Brit. Mus. and Coll. E. B. Williamson: 5 ♂, 2 ♀, Salisbury, Mashonaland (iv . 1899; ii . 1900; iv . 1905, G. A. K. Marshall). Brit. Mus.: 1 ♀, Mazoe 4000 ft., Mashonaland (25 . xii . 1905, *id.*). Coll. K. J. Morton: 1 ♂, Natal. Coll. E. B. Williamson: 1 ♀, Princetown, Natal (9 . xii . 1908, G. F. Leigh). Mus. Tervueren: 1 ♂, Sankina (30 . vii . 1911, Dr. Bequaert). Coll. Ris: 3 ♂, 2 ♀, Botchabelo, Transvaal, 1200 m. (17, 23 . ii . 1914, H. Junod).

♂ (adult). Labium and occiput whitish yellow. Labrum anteclypeus, genae and base of mandibles olivaceous. Dorsal surface of head dull black. Prothorax dorsally black. Thoracic dorsum black; a very narrow line on the median suture and a rather broad band at the humeral suture olivaceous, the latter occupying nearly the lateral third of the mesepisternum and stopping slightly short of the ventral

end of the suture. Sides black at the humeral and second lateral sutures, yellowish on anterior half of mesepisternum and posterior half of metepimeron, the black bands being considerably broader than the yellowish ones. Ventral side yellowish: narrow black lines along the anterior half of the lateral margins of metasterna, not reaching to the median ventral suture. Legs yellowish, largely lined with black as in the two preceding species.

Abdomen dorsally black, a dark metallic lustre gradually vanishing towards the end; the merest trace of a mid-dorsal yellowish line on the basal segment. Sides yellowish, this colour ascending to form very narrow, incomplete basal rings; ante-apical dilatation of dorsal black colour very slight. Appendages black (Text-fig. 13).

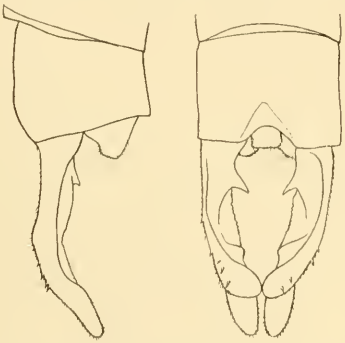

Fig. 13.—*Lestes plagiatus*, ♂. Waterval. Appendages, right side and dorsal view.

The thoracic pattern is liable to be still more obscured in some very mature specimens (as shown by specimens from Zambesi and Salisbury). The thorax becomes black, the ventral side included, only a very narrow line on the median suture, narrow juxtahumeral and metepisternal bands remaining yellowish or olivaceous. Immature males are almost exactly like the females in colour and pattern.

♀. Labrum ferruginous. Dorsal surface of head dark brown. Prothorax and thoracic dorsum ferruginous, more ochre yellow in very mature specimens. Two narrow mesepisternal stripes, bright metallic green in younger, blackish in more mature specimens; the stripes narrower than in *L. virgatus*, and considerably nearer to the median than to the humeral suture.

Sides ferruginous or ochre yellow, ventral side whitish; a narrow and much abbreviated mesepimeral stripe metallic green or blackish, and a very narrow black line on the lateral margin of metasterna, not reaching to the median ventral suture anteriorly and little exceeding the middle of the border posteriorly. Abdomen much as in male, the metallic colour green in younger, coppery or dark bronze in very mature specimens.

Immature males and females are very similar in colour and markings; mature individuals show a sexual dimorphism of colour that might make the association of sexes difficult if we had not the various stages of the male pattern and the characteristic form of appendages as guides.

♂, *Abd.* 34 + 2, *hdw.* 25·5, *pt.* 1·5 mm. ♀, 31, 24·5, 1·5 (unusually small) to 36, 38, 1·5 mm.

Lestes uncifer (Karsch, 1899).

Coll. Ris: 1 ♂, Lorenço Marques (6.xii.1911). Mus. Tervueren: 1 ♂, 1 ♀, *in cop.*, Kasenga (1.ii.1912, Dr. Bequaert).

♂. Labium whitish; occiput very light greenish. Labrum, anteclypeus, postclypeus, genae and base of mandibles whitish green. Dorsal surface of head dull black. Prothorax olivaceous, dorsally widely black.

Thoracic dorsum olivaceous, a broad median band black, this band covering slightly more than the median third of each mesepisternum and projecting laterally as two spots, the larger one rectangular at the dorsal end, the smaller one nearly square at the ventral third (in the less mature specimen from Lorenço Marques only these two spots on each side are black, the median band being but slightly darker in colour than the rest of the mesepisterna). Sides very light greyish passing to olivaceous posteriorly and ventrally, marked with black; three dots at the humeral suture; a narrow stripe near the posterior border of the mesepimeron, over about the median third; a line on the dorsal third of the first lateral suture, bent forward at its upper end; a line on the dorsal third of the second lateral suture; two dots on the latero-ventral border of metepimeron. Ventral side whitish, marked with black; a large triangular spot pointed forward on each metasternum; a narrow line on the median suture; dots on the coxae. Legs light yellowish, three lines on femora, the inner side of tibiae black.

Abdomen very slender, light greenish to olivaceous, gradually darker towards the end; dorsum blackish. Segment 1 green almost entirely;

2–6 with narrow dorsally incomplete greenish basal rings, the black dorsal band comparatively narrow, widened towards the end; 7 almost wholly blackish; 8 largely olivaceous at the sides; 9–10 wholly dark.

Appendages (see p. 269 and Text-fig. 14).

♀. Very similar to male. Labrum bluish grey; dorsal surface of head not so deep black. On thoracic dorsum the black band reduced to a narrow line on each side with corresponding lateral projections, the central part reddish brown. Ventral black spots smaller. Abdomen

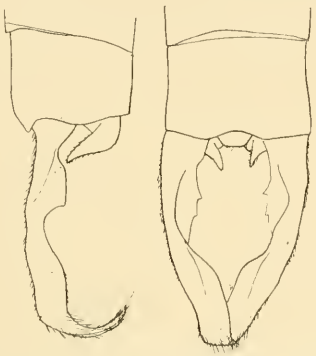

Fig. 14.—*Lestes uncifer*, ♂. Lorenço Marques. Appendages, right side and dorsal view.

on segments 7, 8 and 10 rather light in colour, a round light spot on each side of 9. Appendages small, shorter than segment 10, whitish.

♂, *Abd.* 39 + 2, *hdw.* 25, *pt.* > 1 mm. ♀, 34, 24, > 1.

CHLOROLESTES* (Sélys, 1862).

This genus is, as far as our present knowledge goes, limited to the faunal region discussed in the present paper. For a description of the larva of *Chlorolestes conspicua* see p. 445.

1. Origin of *A** at the level of the proximal side of 9. *Cuq* at the level of first *Anq* or slightly proximal thereto. Inferior appendages of male not bifid at tips . . . . . 2.

* Dr. Ris intended to add to his MSS. the description of the larva and oviposition of *Chlorolestes* from specimens supplied to him, but as this was not received in time for incorporation Mr. Barnard's notes and figures are given at the end of this paper. [Editor.]

Origin of A^* distal to the level of proximal side of 9. One row of cells in field $Rs-M3$. Pterostigma less than three times as long as broad. Medial edge of superior appendages of male smooth. Occiput blackish. Inferior appendages of male bifid at tips . . . . . 3.

2. Pterostigma long, nearly four times as long as broad. Two rows of cells in distal half of field $Rs-M3$. Medial edge of superior appendages in male smooth. Occiput yellow. Largest species of genus . *conspicua.*
   Pterostigma less than three times as long as broad. One row of cells in field $Rs-M3$ throughout. On medial edge of superior appendages in male a sub-basal tooth and a sub-apical lobe. Occiput metallic green. Smaller species . . . . . *Peringueyi.*
3. *Cuq* distal to the level of first *Anq*. Pterostigma mostly two coloured, black at the proximal, yellow or reddish brown at the distal end (almost wholly black in some very mature specimens) . . . . . 4.
   Cuq at the level of first *Anq* or slightly proximal. Pterostigma uniformly coloured, light yellowish or reddish brown. Smallest species of genus *umbrata.*
4. Abdomen very long, its metallic colour dull. On the humeral suture a broad yellowish or olivaceous band. On the second lateral suture at most some indistinct traces of darker colour. Metasterna with dark markings . . . . . 5.
   Abdomen much shorter, its metallic colour brilliant green. Anterior to the humeral suture a narrow yellowish band not entirely to the dorsal end. A sharply defined blackish band at the second lateral suture. Metasterna with a very narrow dark line on the median suture only. *fasciata.*
5. Wings of adult male whitish pruinose from 9 to about the proximal third of the distance between nodus and pterostigma, dark brown on the second third of this distance or slightly more on front wing, for two to three cells more in hind wing . . . . . *tessellata.*
   Wings of all specimens hyaline, at most a very narrow brownish border of the tips. Otherwise very similar to preceding species . *longicauda.*

Chlorolestes conspicua (Sélys, 1862).

S. Afr. Mus.: 1 ♂ (old, no locality or date); 1 ♀, Cape, but no exact locality; 1 ♀, Cape Town, Table Mountain (ii. 1894, R. M. Lightfoot).

♂ (apparently almost mature, but very old and perhaps discoloured). Labium whitish yellow, occiput ochreous, blackish in the upper fourth. Labrum shining black. Anteclypeus dull yellow; genae and base of mandibles bright yellow. Dorsal surface of head deep reddish brown, blackish in the ocellar region, brilliant metallic green in a narrow band on each side along the eye. Prothorax dark reddish brown, with a round orange spot on each side. Thoracic dorsum very deep brown, almost black, a narrow orange band near the humeral suture, distant from the suture slightly less than its own

breadth, from the inferior margin to about three-fourths height of the mesepisternum. Sides of the same deep brown colour on mesepimeron; a sharply defined bright yellow band on metepisternum, not quite to the second lateral suture; a brown band of about the same breadth on this suture and the antero-dorsal half of metepimeron; postero-ventral half of metepimeron and metasterna whitish. Legs moderately long, blackish; femora reddish brown at base and inferiorly.

Abdomen slender; deep reddish brown, gradually passing to blackish on the ends of each segment; sides narrowly bright yellow; this colour ascending in narrow, dorsally incomplete basal rings on segments

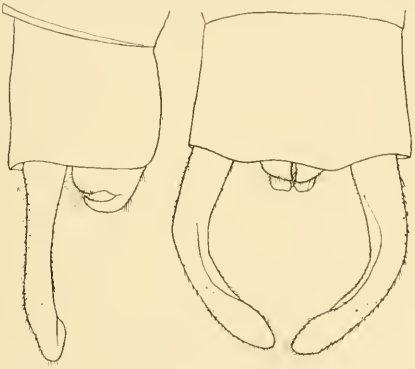

Fig. 15.—*Chlorolestes conspicua*, ♂. Cape. Appendages, right side and dorsal view.

3 to 7 and interrupted by broad ante-apical black rings on the same segments; 8 blackish with broad lateral ferruginous bands; 9 wholly blackish; 10 blackish dorsally, ferruginous ventrally. Appendages black (Text-fig. 15); the end of inferiors upturned in the shape of a simple, very acute claw.

Wings hyaline. Pterostigma rich reddish brown. Neuration (Plate VII, fig. 1).

♀. Of stouter build, but almost exactly similar to male in colour and pattern. Dark dorsum of abdomen with some bronzy metallic lustre (the specimen is more mature than the above-described male); ninth segment dark ferruginous. Neuration (Plate VII, fig. 2).

♂, *Abd.* 51 + 2, *hdw.* 33, *pt.* > 3 mm. ♀ 45, 35, 3.

Chlorolestes Peringueyi, n. sp.

S. Afr. Mus.: 2 ♂, Ceres, Cape Colony (iv. 1913, R. M. Lightfoot).

♂ (adult). Labium very light yellowish brown. Occiput black, turning to metallic green ventrally, to brown medially. Labium metallic green. Anteclypeus, genae, base of mandibles light yellowish brown.

Dorsal side of head metallic green. Antennae black, the basal joint yellow. Prothorax greenish, coppery, narrowly bordered with reddish brown, two reddish-brown spots near the anterior angles. Thoracic dorsum black with dark green and coppery lustre; a very narrow reddish-brown line on the median suture and three such spots at the

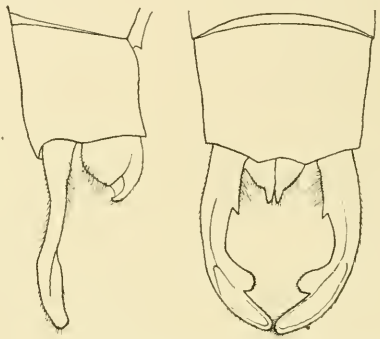

Fig. 16.—*Chlorolestes peringueyi*, ♂. Ceres. Appendages, right side and dorsal view.

humeral suture; a very small one at the dorsal end, a somewhat larger and square one just above the middle and an oblong one at the ventral third. Mesepimeron bronzy black, an oblong reddish-brown spot at the dorsal fourth of first lateral suture; metepisternum reddish brown, this colour passing narrowly to mesepimeron at the ventral end; dorsally to metastigma a rhomboid black spot narrowly confluent with the mesepimeral black colour; metepimeron reddish brown, a cuneiform metallic stripe on the dorsal end of second lateral suture, passing into a narrow black line on the inferior half of the suture. Ventral side reddish brown, slightly whitish pruinose, part of the sutures narrowly lined with black. Legs reddish brown, black lines at the lateral side of femora and ventral side of tibiae; tarsi and spines black.

Abdominal segment 1 reddish brown, dorsally black, whitish pruinose; 2 bronzy green, a narrow basal ring and the lateral border to the middle, where this colour ascends dorsally, reddish brown; 3 to 6 light reddish brown, marked with dark bronzy green; a broad terminal ring, somewhat less than the apical fourth; a dorsal band, broad at the beginning at about one-fifth of the segment's length from the anterior margin, gradually narrowing to a somewhat diffuse confluence with the terminal ring; 7 black, a narrow basal brownish ring, dorsally interrupted; 8–10 black, 9–10 with thin whitish pruinosity. Appendages black (Text-fig. 16).

Neuration (Plate VII, fig. 3). Pterostigma dark brown, the distal end very narrowly lighter.

Abd. 38 + 1·5, *hdw.* 27, *pt.* < 2 mm.

Chlorolestes umbrata (Sélys, 1862).

Mus. Brussels (formerly de Sélys' Collection); 1 ♂, being a type of the original description, as testified by the following labels: (*Chlorolestes umbratum*, H. ♂ [in Sélys' hand]/ Schneider Charpentier. (*id.*) / *L. umbrata* . . . Cap. b. sp. [in Hagen's hand] Prom. b. sp. / Mus. Berol.) Brit. Museum: 1 ♂, bearing an old round label C[ape of] G[ood] H[ope] 42 70.

Both specimens belong to the same species, which is not otherwise represented in our series and is evidently a very distinct species. In the Sélysian specimen the abdominal segments 7–10 are lost (replaced by the corresponding segments of *Allocnemis leucosticta*); in the British Museum specimen the colours are not in good condition and the left pair of wings is lost.

♂. Labium dull brown. Occiput black. Labrum, anteclypeus, genae, base of mandibles and frons to the base of antennae dull reddish brown (discoloured and probably lighter in well-preserved specimens); dorsal side of head otherwise black, with an appearance of rather large reddish brown (as above) postocular spots. Prothorax metallic green, sides narrowly yellowish. Thoracic dorsum brilliant metallic green, this colour occupying also part of the sides, the mesepimeron entirely; a large cuneiform stripe on the metepisternum, the entire breadth of the sclerite at the dorsal end, a point just above the metastigma; on the metepimeron a small spot near dorsal end of second lateral suture, narrowly joined to metepisternal black stripe. Light yellowish brown or orange: a very narrow line on humeral suture stopping a little short of the dorsal end; a small round spot in the antero-dorsal angle of mesepimeron; ventral half of metepi-

sternum, ascending in a very narrow line almost to the dorsal end of the first lateral suture; most of metepimeron; ventral side. The suture of metepimeron and metasternum edged with two narrow black stripes; the anterior one metasternal, the posterior one metepimeral; a short median black stripe near the posterior end. Legs reddish brown; external side of femora and ventral side of tibiae with black lines; tarsi and spines black.

Abdomen brilliant metallic green on dorsum, gradually darker to the end. Segment 1 the sides yellowish with an oblique black line; 2 sides broadly yellowish; 3–6 a very narrow yellowish line at lateral margin, stopping at about three-fourths of the length, and very narrow, incomplete basal rings; dorsum of 8–10 with thin whitish pruinosity (specimen in Brit. Mus.).

Appendages of the same type as in the three following species.

Wings whitish pruinose from 9 to fifth post-nodal vein in front wing, to fourth in hind wing; smoky brown more distally, to the pterostigma in hind wing, two cells less in front wing (Sélys) or distal end of pterostigma in hind wing, proximal end in front wing (Brit. Mus.). Pterostigma bright orange yellow, narrow (Sélys), or light reddish brown and a little broader (Brit. Mus.).

Abd. hdw. 20, *pt.* 2 mm. (Sélys); 37 + 1, 22, > 1·5 (Brit. Mus.).

Chlorolestes fasciata (Burmister, 1839).

S. Afr. Mus.: 1 ♂, Cape, Albert District (8. iv. 1884); 1 ♂, 1 ♀, Burghersdorp (1833, Dr. Kannemeyer). Brit. Mus.: 1 ♂, 1 ♀, Burghersdorp (1883, Dr. Kannemeyer); 6 ♂, 4 ♀, Estcourt, Natal, Will Brook (20. i, 9. ii. 1913, R. C. Wroughton); 3 ♂, Natal, 1 ♀, Zululand (1897, Rev. W. H. Heale). Coll. K. J. Morton: 2 ♀, Dargle, Natal (13. ii. 1909, Miss Fountaine). Coll. Ris: 1 ♂, 1 ♀, Estcourt, Natal, Will Brook (30. iii, 27. iv. 1913, R. C. Wroughton, *ex* Brit. Mus.).

♂ (adult). Labium yellowish. Occiput brilliant metallic green. Labrum metallic green; anteclypeus, base of mandibles and medial half of genae yellow; postclypeus yellow with a basal metallic green spot of variable size. Dorsal side of head otherwise brilliant metallic green; basal joint of antennae yellow, the rest black. Prothorax metallic green; a broad yellow longitudinal band half way from the coxa to the mid-dorsal line. Thoracic dorsum metallic green, mostly very brilliant; a narrow yellow line at the humeral suture, stopping at four-fifths of the height. Mesepimeron metallic green; metepisternum yellow with a metallic green line of variable dimensions;

metepimeron largely black, this colour occupying the space from the second lateral suture to a rather narrow band at the latero-ventral border where there is another small, longitudinal black dash; this metepimeral band has a metallic green lustre and is often covered with bluish pruinosity. Ventral side yellow; a small median metallic green line at the posterior end. Legs yellowish; lateral side of femora black with metallic green lustre; ventral side of tibiae, tarsi and spines black.

Abdomen bright metallic green, turning gradually to coppery or bronze towards the end. Sides of segments 1–2 broadly yellow; a very narrow lateral line and basal ring on 3–7; 1 and 8–10 dull greyish pruinose.

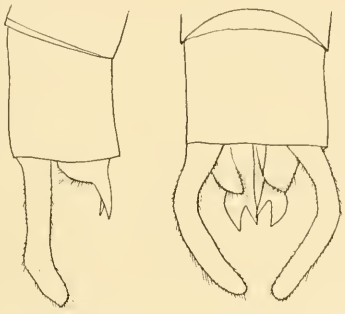

Fig. 17.—*Chlorolestes fasciata*, ♂. Burghersdorp. Appendages, right side and dorsal view.

Appendages black (Text-fig. 17).

Wings comparatively broader on their distal half than in the two following and also the preceding species, more densely veined (Plate VII, fig. 4); opalescent white (waxy exudation) from 9 or the nodus to about one-third the distance from nodus to pterostigma in front wing, nearly one-half in hind wing; the white band followed by another of smoky brown, shorter in front wing, longer in hind wing, as shown in the figure. Pterostigma rich ferruginous brown, the proximal end blackish to a variable extent between a mere trace and almost half the length.

The metallic colour of the immature males is more brilliant; the white and brown wing bands are absent; but there are some specimens with hyaline wings, where texture and colour of integuments are not

far from maturity; some doubt exists about the existence of a male form that remains hyaline throughout the imaginal life. Of the series here described, 6 males are banded, 7 hyaline.

♀. Very similar to male in colour and pattern. On the prothorax an anterior transverse yellow band; the humeral and lateral yellow bands very slightly broader than in male. Abdomen shorter and much stouter; a broad yellow lateral band from base to segment 8, a narrow one on 9. Wings hyaline in all specimens examined.

♂, *Abd.* 32 + 1·5, *hdw.* 25, *pt.* 2 mm. to 38, 28, 2·5. ♀, 32, 26, 2.

Chlorolestes tessellata (Burmeister, 1839).

S. Afr. Mus.: 2 ♂, old specimens, no locality or date. Brit. Mus.: 1 ♂, Grahamstown (1885); 1 ♂, Pirie Bush, S. Africa (1898, A. N. Stenning).

♂ (adult). Labium yellowish brown. Occiput bronze black. Labrum metallic green; anteclypeus, base of mandibles and medial half of genae yellow; postclypeus dull reddish brown. Dorsal side of head dull black with a greenish metallic lustre between the eyes and ocelli. Prothorax black, two broad lateral bands and the anterior third entirely dull ochre brown. Thoracic dorsum bronze black; a broad entire oblique greyish ochreous humeral band, in front of the ventral end of humeral suture, divided in two about equal halves by the dorsal end of the same. Mesepimeron bronze black not fully to the ventral end; rest of sides ochreous yellow with an indistinct brownish shade on dorsal end of mesepisternum and metepimeron. Ventral side ochreous yellow; a rather broad lateral brown stripe at the anterior half of metasterna. Legs ochreous; antero-external side of femora, ventral side of tibiae, tarsi and spines black.

Abdomen dorsally dull reddish brown with metallic green lustre, this metallic colour shading to darker bronze towards the end; a broad but somewhat diffuse terminal blackish ring on segments 3–7. Appendages black, very much like the following species.

Wings with opalescent white and smoky brown bands, as described in key, and illustrated in Plate VII, fig. 5. Pterostigma broad and comparatively short; the proximal part blackish, the distal rich ferruginous; the proportion of both colours somewhat variable.

One immature specimen (S. Afr. Mus.) shows the opalescent band alone, with no trace of smoky brown; it is very probably of the same species; the terminal abdominal segments are lost.

♂ *Abd.* 44 + 1·5, *hdw.* 31, *pt.* 2 mm.

No females have been examined by the writer.

Chlorolestes longicauda (Burmeister, 1839).

S. Afr. Mus.: 12 ♂, 10 ♀, Barberton, Transvaal (Edwards, dated 1 ♂ v. 1911, 1 ♀ xi); 4 ♂, 2 ♀, M'Fongosi, Zululand (W. E. Jones, dated 20. ii, iv. 1911). Coll. K. J. Morton: 1 ♂, Natal; 1 ♂, 1 ♀, Eshowe, Zululand (16, 17. iii. 1908, Miss Fountaine).

♂. Colour and pattern of head and thorax almost exactly similar to preceding species. Postclypeus bronze black to metallic green. On metepimeron an interrupted and somewhat diffuse brown band near the second lateral suture; this band covered in fully mature specimens by a whitish pruinosity, which also invades the metasterna. Abdomen dorsally black (none of the specimens of *tessellata*

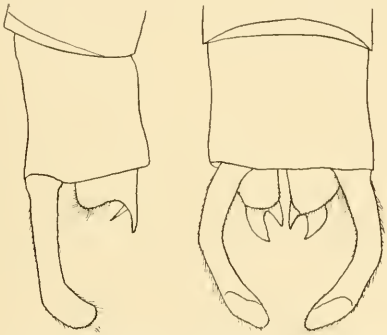

Fig. 18.—*Chlorolestes longicauda*, ♂. Barberton. Appendages, right side and dorsal view.

examined are fully mature, the difference in colour of abdomen being probably due to age), with a metallic green lustre, rather brilliant on segments 1–2, gradually passing to dull bronze and black to the end; sides of 1–2 broadly yellow, of 3–8 with a very narrow lateral yellow line, interrupted by a broad terminal black ring and narrow basal yellow ring. Dull greyish pruinosity on segments 1 and 8–10, brilliant white on 9 in some specimens. Appendages black (Text-fig. 18).

Wings hyaline, narrowly and faintly brown at the tips. Pterostigma bi-coloured in younger specimens: black in proximal half, whitish yellow in very immature examples, rich ferruginous in the distal half in more mature specimens. In fully mature individuals the

ferruginous colour passes gradually to black, the final result being a unicolorous blackish pterostigma.

♀. Very similar to male in colour and pattern. Abdomen comparatively shorter and much stouter; lateral yellowish band broad on segments 3–7, although interrupted by the terminal blackish-brown rings; 8–10 dull reddish brown with thin greyish pruinosity. The two colours of pterostigma more sharply defined than in male.

♂, *Abd.* 44 + 1·5, *hdw.* 29, *pt.* 2 mm. ♀, 45, 33, 2·5.

This and the preceding species are so exactly alike in proportions, structural characters, venation and colour pattern that the possibility remains open of their being forms of but one species. The present material excludes the eventuality of *longicauda* being the immature, *tesselata* the mature colour of male (as shown for *fasciata*, ante), but the two might well be geographical races or subspecies.

I Bb. Subfamily AGRIONINAE.

Of the Sélysian "Légions," three are represented in the present fauna (after removal of *Chlorolestes* from the "Légion Podagrion" to the *Lestinae*, as discussed on p. 268). The "Légion Platycnemis" includes, in de Sély's own papers, the genera *Allocnemis, Chlorocnemis* and *Metacnemis*. *Disparoneura* is representative of the "Légion Protoneura." The remaining genera *Pseudagrion, Ceriagrion, Enallagma, Ischnura* and *Agriocnemis* are the South African representatives of the "Légion Agrion," one of the largest and most homogeneous units of the entire Order Odonata. We must admit that at various points the limits of the "Légions" as given by de Sélys are doubtful. The present paper is not one where the questions here arising might be profitably discussed; nevertheless, small as the number of genera represented in our faunal limits may be, there are two points where accepted views appear in an unfavourable light: When we confront the venation of *Allocnemis, Chlorocnemis* and *Disparoneura* (Plate VII, figs. 7, 8, 9) on one side, *Metacnemis* (Plate VII, fig. 10) on the other side, there can be no doubt about the great analogy between the three of the former group in the region of the quadrilateral and the conditions of *Cu* 2 show a natural line of reduction from *Allocnemis* through *Chlorocnemis* to *Disparoneura*. Further, the three have in common the peculiar shape of head, much restricted in the frontal region with the eyes very strongly prominent; the terminal appendages of males are built on the same plan; finally, the colour scheme and its ontogenetic development in *Disparoneura* is about the

same as in many members of the "Légion Platycnemis." On the other hand, in *Metacnemis* the configuration of the quadrilateral, with its distal side slightly more oblique and sensibly strengthened, together with origin of *Cu* 2, the origin of *A** unusually proximal to *Cuq*, are features extraneous to the other group of three genera; the head of *Metacnemis* is much more of the Agrion- than of the Platycnemis-type, being broad in the frontal part, with the eyes not excessively prominent; the femoral and tibial spines are very long in *Metacnemis*. Thus for the purpose of this paper we have adopted the subdivisions as given by de Sélys; we give the genera *Allocnemis*, *Chlorocnemis* and *Disparoneura* in an apparently natural order, and place *Metacnemis* in the immediate line with the true "Agrion."

Of our genera, *Ischnura* and *Enallagma* alone are known in the larval stage from Europe and America. Plate XII, fig. 2, photographed from living full-grown larvae of the European *Platycnemis pennipes*, may give a general idea of Agrionine larvae of the opaque type. This opaque type exists, to a large extent independently of systematic position, whenever a nymph lives on the bottom of water, partly covered by mud, detritus or algae; *Platycnemis pennipes* is the truest representative form of this type in the European fauna. At the opposite pole, as the truest representative of the transparent larval type, we have *Enallagma cyathigerum*—larvae not living at the bottom of the water, in the living green plants and wonderfully adapted to this surrounding by colour, pattern and transparency.

ALLOCNEMIS (Sélys, 1863).

The South African species is not recorded from beyond our faunal limits, and but one other species of this genus (unknown to the writer) is described from tropical West Africa.

Allocnemis leucosticta (Sélys, 1863).

S. Afr. Mus.: 2 ♂, 1 ♀, Waterval (3, 26 . ii . 1899); 1 ♂, Groenvleikloof (6 . i . 1907); 8 ♂, 6 ♀, Barberton, Transvaal; 6 ♂, 2 ♀, 2 ♂ ♀ *in cop.*, M'Fongosi, Zululand (iii, iv, v, xi . 1911, W. E. Jones). Brit. Mus.: 1 ♂, 1 ♀, Estcourt, Natal, Will Brook (i, ii . 1913, R. C. Wroughton). Coll. K. J. Morton: 1 ♂, Stutterheim, Cape Colony (9 . i . 1908, Miss Fountaine); 2 ♂, Barberton, Transvaal (18, 20 . xi . 1908, *id.*). Coll. E. B. Williamson: 6 ♂, 1 ♀, Princetown, Natal (23–27 . ii . 1909, G. F. Leigh).

♂ (adult). Labium whitish, the points of lateral lobes black. Occiput

black. Labrum light greenish, turning to yellowish anteriorly; in some specimens a small black spot at the base. Frontal view of head remarkable for three transverse, straight, nearly equal stripes that run right across the compound eyes, two greenish, the median, slightly narrower one black. Labrum, base of mandibles and genae, anteclypeus, postclypeus and the sides of frons in equal breadth, black; the frons not quite up to the base of antenna is green. Dorsal surface of head and antennae otherwise wholly black. Prothorax black dorsally; a transverse whitish median anterior mark; sides greenish, narrow anteriorly, broader to the posterior end, also to the coxae. Posterior lobe broad, regularly curved, raised to an angle of 45°. Thoracic dorsum black; narrow, straight, completely greenish are the ante-humeral lines, distant from the humeral suture by not

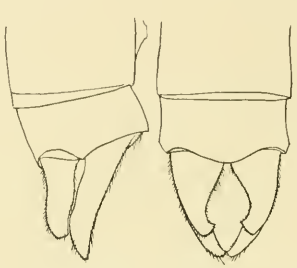

Fig. 19.—*Allocnemis leucosticta*, ♂. Barberton. Appendages, right side and dorsal view.

fully their own breadth. Black colour invading the sides to about two-thirds the distance from humeral suture to metastigma, just a little beyond the (only visible) dorsal end of first lateral suture; sides otherwise very light greenish shading into whitish, right to the ventral side; a narrow, complete black line on second lateral suture. Legs black externally, internally very light greenish or bluish; long spines of tibiae fine and very long, at least three times the angle of the space between each; teeth of claws small, near the tips.

Abdomen slender, deep black; sides of segments 1–2 light greenish; on 3–7 very narrow basal whitish rings shortly interrupted on dorsum; a brilliant creamy yellow dorsal spot on the end of segment 8 and segments 9–10 entirely; on ventral side the tergites 3–7 are narrowly lined with greenish, 8 yellow. Appendages creamy yellow (Text-fig. 19).

Wings of a rather deep, but not pure yellow, shading to grey or

greenish. Pterostigma heavy, opaque, cream to sulphur yellow on dorsal, almost pure white on ventral side.

♀ (adult). Very similar to male. Dark line on second lateral thoracic suture somewhat indistinct, or present only on the dorsal half. Whitish basal rings of abdominal segments narrower. Dorsal spot of terminal segments beginning on anterior half of segment 8, but duller, more reddish brown. Ventral margin of tergites 8–9 lined with yellowish, the line continuing to the dorsal half of valves. Tips of valves slightly exceeding the abdominal end.

Posterior lobe of prothorax raised in the middle, deeply divided in two small rounded lobes, bent slightly forward; on dorsal view this raised part appears cut out of the entire lobe and bent forward over its own base; correspondingly on side view its base is anterior to the margin by the height of the raised lobe except in the median line, where the base is slightly projecting posteriorly.

♂, *Abd.* 32, *hdw.* 22 to 35, *pt.* 25 mm. ♀ 31, 23 to 33, 25.

The series of males from Barberton shows various stages of maturity; it is worth mentioning that the black line of the second lateral thoracic suture appears gradually, and that the yellow colour of the wings is also gradually developed from hyaline through light greenish shades. The females from this locality have according to successive stages of maturity the pterostigma light greyish to rather deep reddish brown, showing no difference between dorsal and ventral side. But there is no reason to consider such specimens as distinct from those with white and yellow pterostigma.

CHLOROCNEMIS (Sélys, 1863).

A small genus of tropical African species.

The species here described is evidently a stranger to the South African fauna, even at its extreme limits.

Chlorocnemis Marshalli, n. sp.

British Museum: 1 ♂, Mazoe, 4000 ft., Mashonaland (24. ii. 1905, G. A. K. Marshall). Coll. E. B. Williamson: 1 ♂, Umtali, 3700 ft., Mashonaland (*id.*).

♂ (adult). Labium whitish, pointed with black. Occiput black. Labrum light blue, very narrowly lined with black. Anteclypeus brown; postclypeus black; genae black, but in part within the limits of the blue frontal band.

Frons black; a broad, complete light blue transverse band occupying nearly the anterior half of dorsum, to a very narrow black margin

towards the postclypeus, including posteriorly the base and the first joint of antennae. Prothorax black, with light blue sides, anterior margin, posterior lobe and two transversely oblong dorsal spots. Thoracic dorsum black; broad, complete blue ante-humeral lines nearly equal to the median black part of each mesepisternum; their ventral half touching the humeral suture, dorsal half slightly distant and not quite touching the ante-alar sinus. Black colour invading the sides to half way between the humeral suture and the metastigma; a moderately broad black line on the second lateral suture; sides otherwise blue, shading to whitish on ventral side. Legs long and slender; spines extremely fine, numerous, long; legs black, tibiae

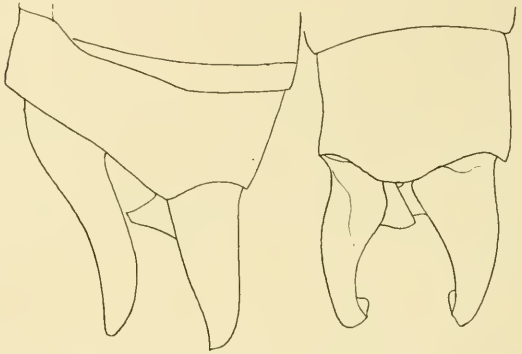

Fig. 20.—*Chlorocnemis Marshalli*, ♂. Mazoe. Appendages, left side and dorsal view.

externally reddish brown; internal side of first femora in basal half, and of second femora wholly shining white (third femora lost).

Abdomen very long and slender, black, marked with light blue and whitish. Segment 1 with sides and a narrow terminal ring whitish; 2 with sides narrowly whitish, a blue mid-dorsal line, much narrowed near the posterior end, the black colour forming a narrowly interrupted U-shaped figure; 3 with a blue mid-dorsal line, broad at base, rapidly narrowed and reaching to two-thirds of the length of the segment as a very narrow line; 4–7 with narrow basal rings; 8–10 with a broad mid-dorsal band, slightly broader than each black margin. Appendages black, the small dilatation near the end of superior light reddish brown. Text-fig. 20.

Wings light greenish yellow. Pterostigma small, nearly square, deep black (Plate VII, fig. 8).

Abd. 37·5, *hdw.* 23·5 mm.

DISPARONEURA (Sélys, 1860).

This genus, the only form in the present fauna representative of the Selysian "Légion Protoneura," includes a considerable number of species, a few of which are recorded from tropical Africa, many more from India, Ceylon, the Malay Peninsula and the western half of the Malay Archipelago.

Disparoneura mutata (Sélys, 1886).

Burmeister's *Agrion glaucum* was mistaken by Sélys for this species and consequently described as *D. glauca;* but Calvert proved Burmeister's species to be the *Enallagma glaucum* of the present paper. Very probably *Disparoneura mutata,* also described by Sélys from the MacLachlan Collection, is our species, and certainly it is the same which Calvert described under that name; this author gives a small but very characteristic figure of the male appendages (printed upside down).

The name here adopted appears therefore well established.

S. Afr. Mus.: 2 ♂, 1 ♀, Waterval, Transvaal (12 . x, 10 . xi . 1899; 6 . xi . 1902); 5 ♂, 7 ♀, M'Fongosi, Zululand (iii, iv, x, i, xii . 1911, W. E. Jones). Mus. Brussels (formerly de Sélys Collection): 1 ♀, *Dispar glauca,* ♀, Brit. Mus. (Sélys' hand) (Stev.); Port Natal (Hagen's hand). Brit. Mus.: 1 ♀, Willow Grange, Mooi River, Natal (30 . i . 1913, R. C. Wroughton); 1 ♀, Colenso, Weenen, Natal (30 . i . 1913, R. Turner); 1 ♂ ♀, *in cóp.,* Mazoe, 4000 ft., Mashonaland (25 . xii . 1905, G. A. K. Marshall). Mus. Stockholm: 1 ♂, 1 ♀, Caffraria (Wahlberg); 1 ♂, Salisbury, Mashonaland (x . 1903, Marshall). Coll. K. J. Morton: 1 ♂, Durban, Natal (27 . i . 08, Miss Fountaine); 1 ♀, King Williamstown (4 . i . 08, ead.); 1 ♀, Stutterheim (9 . i . 08, ead.). Coll. E. B. Williamson: 9 ♂, 6 ♀, Princetown, Natal (7, 30 . xii . 1909, G. F. Leigh); 1 ♂, 1 ♀, Salisbury (x . 1900, Marshall). Coll. Ris: 1 ♀, Rikatla, Delagoa Bay (1 . x . 1913, H. Junod); 4 ♂, 2 ♀, Botchabelo, 1200 m., Transvaal (18 . ii . 1914, *id.*).

♂ (adult). Labium dark brown to almost black. Occiput dark brown, black in the middle with bluish pruinosity. Labrum, anteclypeus, postclypeus and dorsal surface of head wholly black, a transverse band of dense bluish pruinosity between postclypeus and ocelli.

Prothorax black, slightly bluish pruinose; posterior lobe broad, regularly curved, not raised, with a slightly prominent narrow mid-dorsal ridge, its anterior margin being a straight edge slightly projecting laterally at the ends. Thoracic dorsum black, pruinose blue not quite to the humeral suture; the black colour, somewhat metallic green and not pruinose, invades the side to near the level of the metastigma; on the metastigma a narrow reddish-brown line; a broader black one on second lateral suture; ventral half of metepimeron reddish brown; also the metasterna except narrow lateral lines and small median dots; sides from the first (obliterated) lateral suture and ventral side whitish pruinose. Legs black, femora and tibiae bluish pruinose; spines fine and very long; tooth of claws small, near the end.

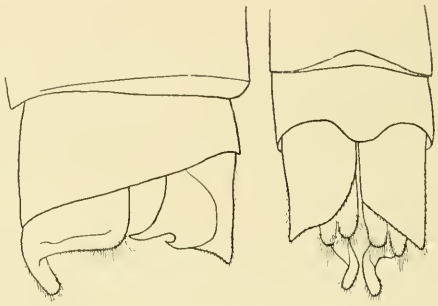

Fig. 21.—*Disparoneura mutata*, ♂. M'Fongosi. Appendages, left side and dorsal view.

Abdomen very slender, black; segments 1–2 and also 8–10 pruinose greyish blue; sides of 1–2 narrowly yellowish brown; 3–6 with very narrow, dorsally interrupted basal whitish rings, and the sides dull reddish brown except a terminal black ring of nearly one-fifth the segments' length; on 2–6 a very narrow mid-dorsal whitish line. Appendages blackish (Text-fig. 21).

Wings hyaline; pterostigma dark reddish brown to almost black.

♀ (adult). Labium and occiput light reddish brown.

Dorsal surface of head light reddish brown with black markings; a dot on labrum and anterior margin of anteclypeus, two dots on post-clypeus, very narrow, a complete transverse line at base of antennae, somewhat broader transverse line between posterior ocelli and occipital margin, this latter black band irregularly indented posteriorly.

Prothorax light reddish brown, marked with black dorsally in the middle and the sides, both parts indented posteriorly by reddish brown. Posterior lobe divided into two pairs of processes; the median ones nearly a horizontal plane and slightly convergent with their broadly rounded ends; the lateral ones nearly vertical, somewhat longer and narrower, their rounded ends slightly divergent; medial processes black, lateral ones reddish, black in their distal half in very mature specimens. Thoracic dorsum light reddish brown lined with black; a line over the median suture and the ante-alar sinus; a narrow, ventrally incomplete line near the median suture; an equally narrow, complete line on the humeral suture. Sides black from the humeral suture to half way towards the metastigma, this colour interrupted by a narrow, cuneiform, ventrally incomplete reddish band near the humeral suture and a round spot on the mesinfraepisternum; sides and ventral side otherwise light reddish brown, very slightly whitish pruinose, a narrow black line on second lateral suture. Legs very light reddish brown; lines on first and second femora, rows of points on third femora, internal side of tibiae, tarsi and spines black.

Abdomen light greyish brown marked with black; a transverse dorsal line and lateral points near the posterior end of segment 2; on 3–6 terminal rings, slightly distant from the end and narrowing to a complete mid-dorsal longitudinal band which is divided by a fine median whitish line; 7–10 reddish brown dorsally; this colour narrows on 7, and is broader on 8–10; sides black, interrupted on 7 by a longitudinal reddish line. Valvae black, not exceeding the abdominal end.

Pterostigma slightly larger than in male, its colour lighter. Immature females are light yellowish brown to almost white; all dark markings are absent, except the thoracic lines (which are also reduced in extent and less deep in colour), the lateral black of segments 8–10 and the terminal dorsal points on 3–6. First to appear are evidently the transverse lines on head, last the longitudinal stripes on segments 3–6. Immature males are much like the females at the same stage, their abdomen being almost pure white.

♂, *Abd.* 26, *hdw.* 19 mm. ♀, 29, 19 to 30, *pt.* 2·1.

Vein A^* is slightly variable; most specimens are like Plate VII, fig. 9, viz. with A^* very nearly parallel to the anal side of 9, ending in the middle of the cross-vein which continues the distal side of 9 to the wing's edge, or bent only very slightly towards the anal margin.

In some specimens this deflection is stronger, in one male to the confluence of A^* with the anal end of said cross-vein; in one (otherwise abnormal) the hind wing of a female A^* reaches the anal margin at one half the length of 9.

METACNEMIS (Sélys, 1863).

This genus, placed by Sélys in his "Légion Platycnemis" (see p. 288) is characterised by some important venational features; the quadrangle approaching the rectangular form (but less so than in the genera *Allocnemis*, *Chlorocnemis* and *Disparoneura*), *A** separating from the wing's edge at a level widely proximal to the cubito-anal cross-vein, about three times the length of this vein; *Cu* 2 broken at the level of nodus or even proximal thereto; the antenodal cross-veins being closely set and convergent towards *R*. Besides these characters drawn from reticulation, the long spines of the legs, the *Agrion*, not *Platycnemis*-like shape of head give to *Metacnemis* and the small group of allied African species a decided resemblance to the large American genus *Argia*, a resemblance which might well be one of real affinity and not of mere convergence.

Metacnemis valida (Sélys, 1863).

Coll. K. J. Morton: 1 ♀, King Williamstown (4. i. 1908, Miss Fountaine).

Mr. Morton very kindly agreed to sacrifice this unique specimen for the purpose of obtaining a good photographic figure of a most remarkable pair of wings as given in Plate VII, fig. 10.

♀ (somewhat immature). Labium broad, median lobe not conspicuously cleft, nearly semi-circular in outline, with a very small and shallow notch and a fine median suture over the whole length; very light reddish brown, median lobe whitish. Occiput dull reddish brown. Labrum, anteclypeus, postclypeus, frons and vertex light ferruginous, rather densely covered with long, soft, blackish hair. Postclypeus broad, projecting slightly over the labium, anteclypeus very narrow (perhaps by compression). No transverse ridge on the frons; in front of base of antennae two transversely oval low tubercles; ocelli very small, the posterior ones on slightly elevated bases. Transverse edge of occiput very long, distance of eyes great.

First and second antennal joints short, third about three times the length of second; ferruginous to end of third joint, the rest black.

Prothorax ferruginous, narrowly obscure in the impressed lines. Structure of posterior lobe very complicated. Hind margin of anterior lobe concave posteriorly in its median third, the almost semi-circular concavity bordered by an elevated ridge, low in the middle, elevated in obtusely triangular blades at the lateral ends;

the posterior lobe fits into this concavity as a trapezoid process, very slightly narrower posteriorly; on this lobe a transverse anterior ridge, almost vertical and rather high, cut in a straight line with slightly projecting lateral ends; further, two lateral longitudinal ridges, low anteriorly, rising at the posterior end, arched on lateral view. The posterior, nearly straight edge of this lobe fits on the mesothorax into a groove between two narrowly triangular, transverse mesostigmal laminae.

Thorax ferruginous, gradually shading into lighter tints laterally and posteriorly; a blackish dot in the dorsal end of humeral suture; a very narrow black line on dorsal edge of mesepimeron; black dots on anterior and posterior dorsal end of metepimeron.

Legs long and robust. Spines of femora and tibiae long, fine and very numerous, about 15 on each side of third femora, 12 on third tibiae. Tooth of claws robust near the point. Legs light yellowish brown, internal side of tibiae, tarsi and spines black.

Abdomen comparatively robust, dull reddish brown; terminal joints of segments 1–7 narrowly blackish; from 2–7 a narrow somewhat diffuse dark longitudinal mid-dorsal line, widened into a fine transverse line near the end of each segment. Posterior edge of tenth segment with a small triangular notch, and a group of small blackish spines on each side. Appendages very small, yellowish. Valvae moderately long, the styloids just reaching the end of abdomen.

Wings (Plate VII, fig. 10) light greyish yellow, from base to nodus in costal half to distal end of quadrilateral in anal half deeper yellow. Pterostigma whitish yellow, very opaque.

Abd. 32, *hdw.* 28·5 mm.

The male as described by de Sélys and very probably also the adult female must be very much darker insects.

PSEUDAGRION (Sélys, 1876).

As originally defined by de Sélys this genus embraces a large number of species inhabiting the inter-tropical regions of the Old World, a few of them extending beyond the limits of the tropics in South Africa, in Australia, and along the frontier of the Palaearctic region. Continental Africa appears as the chief centre of *Pseudagrion*, not less than 24 species from this continent being known to the writer. Unfortunately in the actual state of literature their identification is extremely difficult; nearly all existing descriptions are given without the all-important figures of structural details, and many of them are not comparative at all; thus their condition may

well be termed chaotic, and it is to be hoped that a paper on its 24 species prepared by the writer will contribute to some extent to bring light into this tediously obscure matter. The following table and descriptions of nine regional species are an extract from that more extensive study.

The original generic definition cannot (as in many other cases) be literally applied, unless unnatural and undesirable sub-divisions be the consequence. The origin of *A** at the *Cuq* (and not proximal), although an important feature on the whole, must be interpreted with some allowance to a more proximinal origin, even for as much as nearly the length of *Cuq* itself; variation between nearly allied species and even individuals of the same species makes such an allowance necessary. The same must be said of the most important structural character of the female sex, the styloid processes of the posterior prothoracic border (*P. acaciae*). Absence of light-coloured postocular spots would exclude the two species *furcigerum* and *caffrum*, otherwise clearly congeneric, had we to apply the definition literally. No writer on systematics will fail to observe that giving definitions in a few words and applying them to the letter will very often be satisfactory as long as a limited faunal district is under observation, or a small proportion of existing forms only known; but with an increasing knowledge, and the extension of the area under discussion, the matter becomes rapidly more difficult, and with a clear insight into natural affinities it may be impossible for the moment to give any short and comprehensive definitions to do justice to such affinities. Of course minute subdivision of genera will apparently overcome such difficulties, but the advantage is much more apparent than real: it is often better to wait for the right word to be found at some later date for a new definition of an old genus than splitting it up into fragments for the apparent needs of the moment.

The following table is given for the males only.

Females may be identified by consulting the single descriptions, and it must not be forgotten that isolated females will sometimes present great difficulties and even be found impossible of identification. The reason is obvious: definition of species is largely based on the structural characters of the males, and even the colour schemes are much more precisely differentiated in this sex. As a rule, a very intimate knowledge of a group—a knowledge accessible in many cases only to the naturalist observing the species in nature—is needed for ready identification of closely-allied females that lack structural characters. This is true for many of the *Agrionidae* and obvious for *Pseudagrion*.

1. No light-coloured postocular spots. Thoracic dorsum bronze black without ante-humeral stripes . . . . . 2.
   Light-coloured postocular spots present. Thoracic dorsum mostly with ante-humeral stripes . . . . . 3.
2. Labrum and frons anteriorly olive-green. Pterostigma greyish brown. Superior appendages with an acute sub-basal medial tooth *furcigerum*.
   Labrum and frons bright orange-yellow. Pterostigma carmine. Proximal sub-basal median tooth of superior appendages truncate . . *caffrum*.
3. Postocular spots round or transversely oval, often united by a line along the occipital margin. Frons black anteriorly to the postocular spots, at least to base of antennae . . . . . 4.
   Postocular spots very large, mostly reddish, lined anteriorly at most by a narrow black band, the dorsal surface of head being thus chiefly red. Superior appendages not distinctly furcate . . . . . 7.
4. Thoracic dorsum and abdomen of adult specimens more or less pruinose blue; light markings bluish or greenish; postocular spots separate. Comparatively robust species . . . . . 5.
   No pruinosity on thorax and abdomen of adult specimens. Light markings on head reddish or orange, on thorax shading from yellowish to bluish. Postocular spots united by a transverse line. Very slender form. Dorsal branch of superior appendages in lateral view much narrower than ventral one, slightly hooked. Pterostigma reddish brown *angolense*.
5. Labrum dull olive-green or bluish . . . . . 6.
   Labrum deep black. Ante-humeral stripes broad, greenish in more or less immature specimens, pruinose blue in adults. In superior appendages viewed laterally the ventral branch projecting a long way beyond the dorsal one . . . . . *praetextatum*.
6. Thoracic dorsum entirely bronzy black with slight greyish pruinosity; at most a very slight indication of ante-humeral lines. Branches of superior appendages in lateral view of almost equal length, the dorsal slightly more obtuse than the ventral one. Pterostigma blackish. Smaller species . . . . . *salisburyense*.
   Thoracic dorsum pruinose blue; close to the humeral suture a narrow, somewhat irregular, sometimes interrupted greenish or olivaceous line. Superior appendages in lateral view, with the ventral branch obliquely ascending as a rather narrow border to the somewhat shorter and rounded dorsal branch. Pterostigma dull red. Largest species of the present fauna . . . . . *natalense*.
7. Postocular spots entirely bordered with black. Dorsum of second abdominal segment predominantly black . . . . . 8.
   Postocular spots only partially and sometimes incompletely bordered with black, confluent to the concolorous occiput or frons. Dorsum of second abdominal segment predominantly blue, with a U-shaped black mark Black lines of thoracic sutures very narrow . . . . . *acaciae*.
8. Comparatively short and robust species, in size much like the preceding one. Black lines of thoracic median and humeral sutures comparatively broad and sinuate. Dorsum of second abdominal segment black including one or two bluish points . . . . . *massaicum*.
   Slender and more elongate species. Black lines of thoracic sutures narrow Dorsum of second abdominal segment black . . . . *sjöstedti*

PSEUDAGRION FURCIGERUM (Rambur, 1842).

Of this species, Rambur's type in the de Selys' Collection at Brussels is the only specimen known to the writer. It is testified to as being that type by the following labels: *furcigerum* (Sélys' hand) / Ramb. (*id.*) / *furcigera* (Rambur's hd.) / Cap. (*id.*). There are other specimens associated with the type, but they belong to different species.

The specimen is in an adult male, with the colours not in good condition; but the appendages were found in sufficiently good condition for a drawing, which will, it is hoped, facilitate the identification

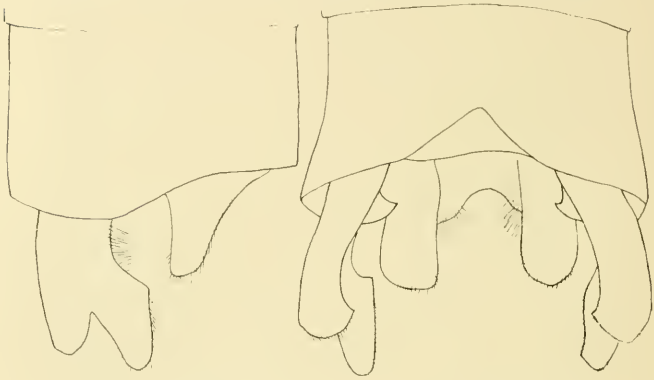

FIG. 22.—*Pseudagrion furcigerum*, ♂. Cape. Appendages, right side and dorsal view.

of the species. Occiput and labium yellowish. Labrum, anteclypeus, base of mandibles and genae olivaceous. Dorsum of head, prothorax and thorax black. Sides of prothorax narrowly yellowish; sides of thorax yellowish or olivaceous, this colour beginning somewhere between the humeral suture and the stigma, but nearer the latter; the exact limits not visible, as the thorax is partly destroyed. Legs black on the lateral, light olivaceous on the medial service. Abdomen comparatively short and robust; dorsum wholly black, sides yellowish olivaceous. Appendages blackish (Text-fig. 22). The superiors are similar in outline to those of *praetextatum*, but more robust, the ventral branch shorter, a strong sub-basal acute tooth projecting from the lower edge of the dorsal branch. Origin of A^* distinctly

proximal to *Cuq*, but not by the entire length of that vein. Pterostigma narrow, the distal side very oblique, dull greyish brown.

Abd. 30, *hdw.* 21·5 mm.

Pseudagrion caffrum (Burmeister, 1839).

Coll. K. J. Morton: 1 ♂. Brit. Mus.: 3 ♂, 2 ♀, Willow Grange, Mooi River, Natal (20 . i, 1 . ii . 1913, R. C. Wroughton).

♂. Occiput and labium whitish. Labrum orange with one to three blackish dots at base. Anteclypeus orange; postclypeus black, narrowly lined with orange anteriorly; frons orange to the base of

Fig. 23.—*Pseudagrion caffrum*, ♂. (Coll. Morton.) Appendages, right side and dorsal view.

antennae and anterior ocellus. Dorsal surface of head otherwise deep bronze black, no postocular spots. Prothorax bronze black, sides narrowly whitish. Thoracic dorsum bronze black, this colour invading the sides to half way between humeral suture and metastigma, still further at the dorsal end. Sides otherwise greenish yellow with thin whitish pruinosity; a black dot in the dorsal third of second lateral suture. Ventral side whitish. Legs light greenish yellow on the medial surface, on the lateral surface broad deep black lines on femora, narrower ones on tibiae. Abdomen relatively short and stout. Dorsum bronze black, rather densely pruinose blue; sides light greenish yellow on segments 2 to 5, greenish blue on 6 to 10. Appendages (Text-fig. 23): Dorsal branch of superior black, ventral

branch and inferior light reddish yellow. *A** very slightly proximal to *Cuq* in front wing, scarcely so or at *Cuq* in hind wing. Pterostigma very small, bright red or orange; the distal costal angle very acute.

♀. Head anteriorly as in male, or of a more dull olivaceous colour; the black on postclypeus limited to a narrow basal spot; rather large, transversely oval, olivaceous postocular spots united by a narrow line on the occipital ridge. Prothorax black, a small dorsal, two larger lateral spots and the sides dull orange. Posterior lobe convex in the middle; the usual styles long and narrow, depressed; styles and a point on the lobe orange. Thoracic dorsum black; broad ante-humeral bands and a narrow line on median suture dull orange; black colour not reaching fully to humeral suture at the upper, slightly beyond at lower end; small black dots in dorsal end of first and second lateral sutures. Black lines on legs much narrower than in male. Dorsum of abdomen black, only segments 1–2 and 8–10 slightly bluish pruinose. Sides dull olivaceous, orange or greenish blue. Wings as in male.

♂, *Abd.* 25, *hdw.* 19 mm. ♀, 25, 20.

Calvert gives a very exact description of Burmeister's type-specimen and a figure of the appendages. Although in the latter the truncate sub-basal median tooth is not shown, the figure and description agree otherwise so perfectly with our specimens that very little doubt remains about their identity.

Pseudagrion angolense (Sélys, 1876).

S. Afr. Mus.: 6 ♂, M'Fongosi, Zululand (iv, v, xii . 1911, W. E. Jones); 1 ♂, Barberton, Transvaal (i . 1912, H. Edwards). Coll. K. J. Morton: 1 ♂, Macequece (9 . x . 1908, Miss Fountaine). Brit. Mus.: 1 ♂, Brit. East Africa, S.E. slopes of Kenya, 6000–7000 ft. (3–12 . ii , 1911, S. A. Neave); Mus. Brussels, de Sélys' Coll.: 1 ♂ (Angola—MacLachlan's hd.), cotype.

♂. Occiput and labium light greyish ochreous, labrum orange with three basal blackish dots; genae and anteclypeus orange; postclypeus black. Frons and vertex black with orange markings; broad transverse band over the base of antennae, laterally turning to the same colour as the genae; good-sized transversely oval postocular spots, united by a narrow line on occipital ridge. Prothorax black, sides lined with dull yellow; three orange spots, one transverse at the anterior margin, two triangular ones on the disc. Posterior lobe narrow, erect, black in the middle, narrowly lined with orange on sides.

Thoracic dorsum black, slightly bronzy; narrow greenish ante-humeral lines distant from humeral suture by about their own breadth.

Black colour invading the sides to about half-way between the humeral suture and metastigma; sides otherwise greenish; a complete narrow black band on second lateral suture; a similar band on dorsal half of (obliterated) first lateral suture, joining the humeral black colour at dorsal end. Metepimeron and metasterna slightly whitish pruinose. Legs light reddish brown, black lines on lateral surface, broad on femora, narrow on tibiae. Abdomen very slender; segments 1–7 bronzy black dorsally, light greenish yellow on sides; 8–10 greyish blue (probably bright blue in living insect).

Appendages (Text-fig. 24) blackish. In some specimens the ventral

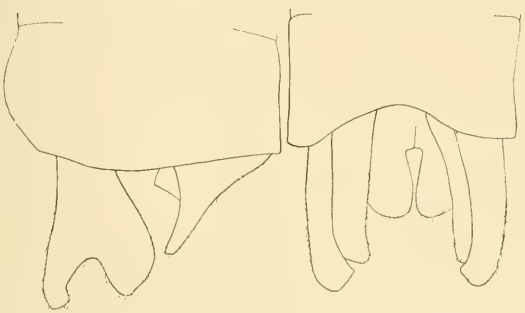

Fig. 24.—*Pseudagrion angolense*, ♂. M'Fongosi. Appendages, right side and dorsal view.

medial margin of dorsal branch is seen to end proximally in a sharp, upturned, medially protracted angle, those of both sides touching in median line; in others this structure is concealed by the tenth segment (as in the specimen figured). Wings slightly tinged with yellowish. *A** at *Cuq*. Pterostigma rather long, not very oblique, reddish brown.

No females in the examined collections.

♂, *Abd* 33, *hdw*. 21·5 to 35·5, *pt*. 2·4 mm. (M'Fongosi).

The co-type from Angola is slightly more robust, comparatively large (*Abd*. 35, *hdw*. 24 mm.). There can be no doubt about the identity.

Pseudagrion praetextatum (Sélys, 1876).

S. Afr. Mus.: 28 ♂, 20 ♀, M'Fongosi, Zululand (ii, iii, iv, v, x, xi, xii. 1911, W. E. Jones); 14 ♂, 12 ♀, Barberton, Transvaal (v. 1911, Edwards); 1 ♂, Blue Cliff, Dunbrody (ii. 1912). Brit. Mus.: 1 ♂,

Salisbury, Mashonaland (iv . 1904, G. A. K. Marshall); 1 ♂, 2 ♀, Mazoe, 4300 ft., Mashonaland (29 . xii . 1905, *id.*); 3 ♂, Kambove, 4–5000 ft., Katanga (14 . ii, 16 . vi . 1907, S. A. Neave); 1 ♂, N.W. shore of L. Nyassa, from Florence Bay to Karonga, 1650 ft. (30 . vi, 6 . vii . 1910, *id.*); 1 ♂, Nyassaland, Valley of S. Rukuru Riv., 3000 ft. (20–27 . vi . 1910, *id.*). Coll. K. J. Morton: 1 ♂, Durban, Natal (15 . iv . 1908, Miss Fountaine); 1 ♂, 1 ♀, Macequece (7 . ix . 1908, ead.). Mus. Hamburg: 1 ♂, 3 ♀, Uropapa, near Grootfontein, S.W. Africa (1913, H. Thomsen); 2 ♂, 2 ♀, Grootfontein (7–11 . vi . 1911, W. Michaelsen). Coll. E. B. Williamson: 6 ♂, 5 ♀, Princetown, Natal (xii . 1908; ii . 1909, G. F. Leigh).

This species is recorded, and also known to the writer, from other regions of East Africa, not contiguous with our faunal district, northward to Abyssinia; but it is not yet known from tropical West Africa.

♂. Occiput and labium light ochreous yellow. Labrum shining black. Ante- and postclypeus dark brown to almost black; genae dull olivaceous. Frons and vertex black; frons whitish pruinose anteriorly to base of antennae and anterior ocellus. Very small, almost circular, dull greenish postocular spots. Prothorax black, somewhat lighter at the sides, rather densely whitish pruinose. Thoracic dorsum black, a narrow line on median suture and a broad ante-humeral band pruinose blue; the latter about half the breadth of each mesepisternum, touching laterally the humeral suture. Sides rather densely pruinose, but the pattern still recognisable; black from humeral suture to half-way to metastigma, also a line in dorsal end of first (obliterated) and a rather broad band on full length of second lateral suture. Ventral surface ochreous with sutures lined with black to almost black, whitish pruinose. Legs black, external side of tarsi and claws reddish brown, femora pruinose.

Dorsum of abdomen black, pruinose blue, the pruinosity ending at narrow black terminal rings of segments 3–7; sides dull reddish brown. Appendages (Text-fig. 25) dull reddish brown, tips of superior blackish. The most characteristic feature is the long inferior branch, beginning with a rather sharp angle, and the absence of a sub-basal median tooth. *A** at *Cuq* or very slightly proximal; pterostigma dark brown to almost black, comparatively large, its costal distal angle very acute.

♀. Black and light olivaceous, sometimes with a more yellowish tinge, the black markings much reduced. Labrum only dark at base, but this colour not deep black; anteclypeus olivaceous, postclypeus obscure anteriorly; frons olivaceous to base of antennae and anterior ocellus.

Postocular spots larger than in ♂, transversely oval, connected by a line over the occipital margin. Prothorax black in the middle with two median olivaceous spots, olivaceous in front and on the sides. Posterior lobe black in the middle to base of styles, styles olivaceous with blackish point. Thoracic dorsum as in male, but light olivaceous instead of pruinose blue. Sides olivaceous, the black band at humeral suture narrow, scarcely more than one-half as broad as ante-humeral stripe; in dorsal end of first and second lateral sutures only small blackish dots. Legs very light yellowish; narrow, partially interrupted black lines on lateral surface of femora.

Dorsum of abdomen bronze black, sides olivaceous, passing ventrally into yellowish; very narrow basal olivaceous rings on segments 3–7;

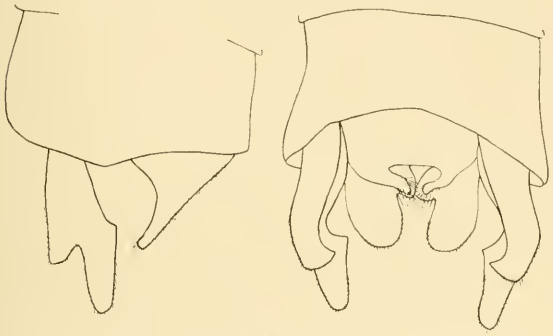

Fig. 25.—*Pseudagrion praetextatum*, ♂. Barberton. Appendages, right side and dorsal view.

dorsal olivaceous spot on posterior half of 9 and 10 entirely. Appendages blackish Pterostigma in shape like male, but very light greyish yellow.

♂, *Abd.* 30, *hdw.* 20·5 to 32, *pt.* 2·2 mm. ♀, 31, 22 to 32, *pt.* 2·3.

This species is undoubtedly de Sélys' *P. praetextatum*, the types of which (from Zanzibar) were compared with our South African series. Considerable uncertainty exists about the older names *Kersteni* and *Deckeni*, both given by Gerstacker to specimens from the region of Mombasa. It is possible that one or both of these names (absolute priority would belong to the name *Kersteni*) apply to the species here described; but since no certainty could be reached, it was thought preferable to adopt the name for which the types could be examined.

PSEUDAGRION SALISBURYENSE, n. sp.

S. Afr. Mus.: 2 ♂, M'Fongosi, Zululand (iii, ix . 1911, W. E. Jones); Waterberg, S.W. Protectorate (i . 1920, Tucker); 1 ♂, King Williamstown Distr., St. Mathew's (R. M. Lightfoot, 1894). Brit. Museum, Mus. Stockholm and Coll. E. B. Williamson: 9 ♂, 12 ♀, Salisbury, Mashonaland (i, ii, x . 1900; x, xi . 1903; iv, 1904; iv, 1905, G. A. K. Marshall). Coll. E. B. Williamson: 5 ♂, 3 ♀, Princetown, Natal (xii . 1908, 1 . ii . 1909, G. F. Leigh).

♂. Occiput and labium greyish ochreous. Labrum, ante- and postclypeus and genae dull olivaceous, rather obscure. Frons black to the anterior margin, slightly bronze-green. Postocular spots small, almost circular, dull olivaceous. Prothorax black, very narrowly

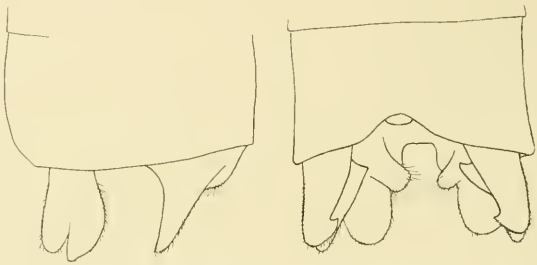

FIG. 26.—*Pseudagrion salisburyense*, ♂. King Williamstown. Appendages, right side and dorsal view.

reddish-brown on sides, slightly bluish pruinose. Thoracic dorsum wholly bronze black, very slightly bluish pruinose; the pruinosity a little more dense in a stripe near the humeral suture (only in part of specimens examined). Black colour invading the sides to half-way between humeral suture and metastigma; broad black band on second lateral suture, slightly incomplete ventrally; this band confluent dorsally with the anterior black colour in part of specimens. Sides and ventral surface otherwise very light reddish brown, with thin whitish pruinosity. Legs black, external surface of tibiae and tarsi ochreous, femora whitish pruinose. Dorsum of abdomen bronze black; segments 1 to middle of 2 bluish pruinose, 8–9 violet-blue (in pigment) with the lateral border narrowly black. Appendages (Text-fig. 26) superior dark brown, inferior reddish ochreous. *A** at *Cuq*; pterostigma varying from greyish ochreous to almost black according to

maturity; pterostigma somewhat narrower than in *praetextatum*, costal-distal angle very acute.

♀. So similar to the female of *praetextatum* that it is scarcely to be distinguished otherwise than by its smaller size. The relation of both females to the respective males is made certain by pairs taken *in copulâ*.

♂. *Abd.* 26·5, *hdw.* 19 mm. ♀, 27·5, 21.

Pseudagrion natalense, n. sp.

S. Afr. Mus.: 8 ♂, 5 ♀, M'Fongosi, Zululand (iii, iv, v, ix, x, xi . 1911, W. E. Jones). British Museum: 1 ♂, 1 ♀, Willow Grange, Mooi River, Natal (20, 21 . i . 1913, R. C. Wroughton). Coll. K. J. Morton: 1 ♂, Stutterheim, Cape Colony (13 . i . 1908, Miss Fountaine).

♂. Occiput and labium dull ochreous. Labrum olivaceous brown, a black point at base. Anteclypeus very dark olivaceous, postclypeus blackish, genae light olivaceous brown. Frons and vertex black; a band of dense whitish pruinosity between base of antennae and anterior ocellus posteriorly and the base of postclypeus anteriorly. Postocular spots comparatively large, transversely oval, dull greenish. Prothorax black, sides rather narrowly reddish ochreous, slightly whitish pruinose. Thoracic dorsum bronze black, slightly whitish pruinose; very narrow, greenish ante-humeral lines, complete or interrupted, nearer to humeral than to median suture. Dark colour invading the sides to not fully half-way between humeral suture and metastigma; narrow black lines on dorsal half of (obliterated) first, on full length of second lateral suture; sides and ventral surface otherwise light ochreous. Legs black, external side of tibiae and tarsi ochreous, femora pruinose. Dorsum of abdomen bronzy black with rather dense, greyish-blue pruinosity, gradually diminishing to the terminal segments; sides and ventral side light reddish ochreous. Appendages (Text-fig. 27) reddish ochreous, dorsal branch of superior blackish. *A** at *Cuq* or very slightly proximal; pterostigma very narrow, proximal-anal and distal costal angle almost equally acute, very light reddish-brown to almost pure red.

♀. Similar to *praetextatum*, but easily distinguished by its larger size and peculiar narrow shape and the reddish colour of the pterostigma. Labrum, ante- and postclypeus, genae, frons to anterior ocellus orange-brown. Postocular spots larger than in male, dull greenish, connected by a narrow line over the occipital margin. Prothorax with a longitudinal median band and two lateral spots olivaceous; posterior lobe rather prominent, almost semicircular;

styles narrow, half as long as prothorax, olivaceous, black at tips. Light colours of thorax olivaceous brown to dark bluish green; rather broad band on median suture, very broad ante-humeral stripe; black band at humeral suture, but half as broad as ante-humeral stripe; very minute black dots in dorsal end of first (obliterated) and second lateral suture. Legs light olivaceous; narrow black lines on lateral surface of femora. Dorsum of abdomen bronzy black, segments 8–10 dull bluish olivaceous, almost complete lateral bands on 8 and lateral anterior spots on 9 black. In very adult specimens interalar space and dorsum of segments 1–3 bluish pruinose. Pterostigma as in male, more reddish brown than pure red.

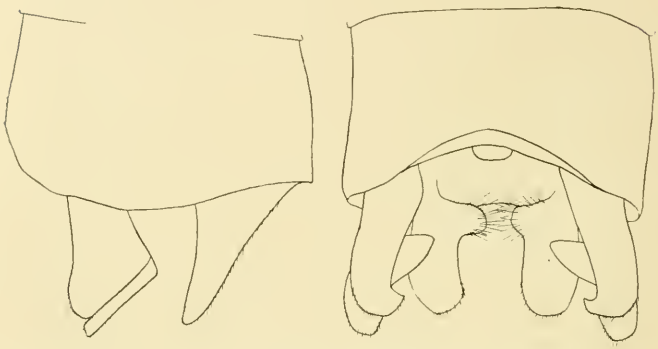

Fig. 27.—*Pseudagrion natalense*, ♂. M'Fongosi. Appendages, right side and dorsal view.

♂. *Abd.* 33, *hdw.* 24 mm. ♀, 35, 26·5.

This comparatively large species is in stature and system of coloration very similar to a species from tropical East Africa, which I believe I identify correctly as *P. Gerstäckeri*, Karsch; but *natalense* differs from that species by the peculiar shape of the dorsal branch of the superior appendages.

Pseudagrion acaciae (Förster, 1906).

S. Afr. Mus.: 7 ♂, 6 ♀, M'Fongosi, Zululand (iii, iv, xi, xii. 1911, W. E. Jones). Brit. Mus.: 1 ♀, Nyassaland, lower Shire Valley, near Chikawa, 600 ft. (12–16. iv. 1910, S. A. Neave); 1 ♂, N.E. Rhodesia, Niamazi River, near Nawalia, 2000 ft. (17–22. vii. 1910, *id.*); 1 ♂,

N.E. Rhodesia, mid. Luangwa Valley, 13–1800 ft. (23–31 . viii . 1910, *id.*).

♂. Occiput whitish, a small dark spot at the foramen. Labium light ochreous, labrum, ante- and postclypeus, genae, frons to level of posterior ocelli brick red; towards the occipital margin greenish or bluish shades become gradually mixed to this colour. Very scanty black markings; a point in front of anterior ocellus, short and narrow dots at side of same; in level of posterior ocelli fragments of a narrow transverse band; a few points on occipital margin; a kind of very large postocular spots are indistinctly limited by these markings. Antennae red, terminal joints obscure.

Prothorax light yellowish red, laterally shading to whitish; narrow black lines in the transverse sutures. Thoracic dorsum yellowish red,

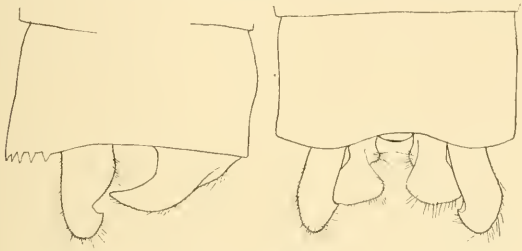

Fig. 28.—*Pseudagrion acaciae*, ♂. M'Fongosi. Appendages, right side and dorsal view.

sides very light greenish, shading gradually to whitish and slightly pruinose ventrally and posteriorly; marked with blackish; complete narrow line on median suture; complete slightly broader line at humeral suture, broader in ventral half and behind the suture than across the suture and very narrow at dorsal end; small dots in dorsal end of first and second lateral sutures. Legs black, external surface of tibiae and tarsi light reddish ochreous; femora pruinose. Abdomen comparatively short. Segments 1–7 dull greenish blue, with bronze-black marks; small dorsal spot on segment 1; U-shaped mark and, not connected thereto, narrow terminal ring on 2; 3–7 narrow, but successively broader mid-dorsal line, not fully reaching anterior end and slightly enlarged immediately before posterior end of each segment. Segments 8–10 marked black dorsally—8 less, 9 more than posterior half, 10 full length. Appendages (Text-fig. 28) reddish brown. *A** slightly proximal to *Cuq*, not fully the length of *Cuq*;

pterostigma oblong, angles moderately acute; light reddish brown to full red.

♀. Dorsal surface of head light ochreous, turning posteriorly to duller, olivaceous shades; black markings similar to male, but still more reduced. Posterior lobe of prothorax rather broad, erect; styles comparatively short and broad, not quite bent down to the dorsal surface. Thorax light ochreous, turning to still lighter shades laterally and ventrally; black markings as in male, but considerably narrower throughout. Legs light reddish ochreous; femora narrowly and incompletely edged with black on lateral surface. Abdomen comparatively robust, dull ochreous; black markings much reduced. Segments 2–6 with a very narrow, partially interrupted mid-dorsal line and a small round spot near posterior end; 7 complete mid-dorsal band, broader, enlarged near the posterior end; 8 dorsal spot at base, finally united to a narrow terminal ring; 9 complete dorsal band; on the tenth two basal dots. Pterostigma light greyish ochreous.

♂, *Abd.* 30, *hdw.* 19 mm. ♀, 28, 21.

We have examined examples of this species from regions as far remote as Abyssinia and Egypt and found those specimens to agree perfectly with the South African series.

P. acaciae and the two species following appear closely allied, though almost certainly distinct. They have in common the red colour dominant on head and at least partially on thorax, and in the male the comparatively short superior appendages of very simple structure.

Pseudagrion massaicum (Sjöstedt, 1909).

S. Afr. Mus.: 2 ♂, 1 ♀, M'Fongosi, Zululand (v, x. 1911, W. E. Jones). Mus. Brussels, de Sélys' Coll.: 1 ♂, Port Natal (very old specimen). Mus. Stockholm: 1 ♀, Caffraria (J. Wahlberg); 1 ♂, Kibonoto, Kilimandjaro (Sjöstedt).

♂. Occiput reddish ochreous in lateral and ventral, black in medial and dorsal half (black reduced to a spot at foramen in specimens from M'Fongosi). Labium reddish ochreous. Dorsal surface of head brick red, marked black (the red colour slightly darker than in *P. acaciae*); small dots at base of labrum and postclypeus; narrow transverse line in front of anterior ocellus; complete, comparatively broad transverse band across posterior ocelli, this band continued to a complete, rather broad outline of the large postocular spots; these spots united by a line at the occipital margin. Prothorax black, sides and three small dorsal spots reddish. Thorax

dark red, or olivaceous red dorsally, shading into yellowish red or dull greenish at the sides, marked black; rather broad line on median suture extended ventrally to join the humeral black stripe; a rather broad stripe on humeral suture shortly enlarged medially on dorsal third, enlarged ventrally to mesepimeron and mesinfraepisternum; lines in dorsal half of first, dorsal third of second lateral suture. Sides posteriorly and ventral side whitish pruinose. Legs black, pruinose, external surface of tibiae and tarsi ochreous. Abdomen comparatively short and robust; dorsum bronzy black, sides olivaceous; olivaceous colour broad to apical sixth of segments 3–7 and forming very narrowly interrupted basal rings; black colour of dorsum widened at apical sixth almost to ventral margin; large U-shaped black spot on dorsum of segment 2, joined to apical black

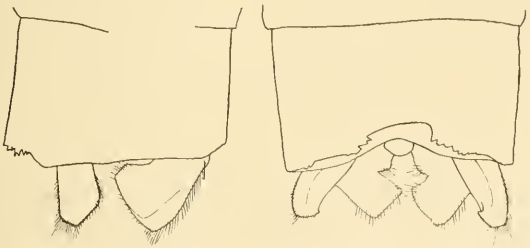

Fig. 29.—*Pseudagrion massaicum*, ♂. Port Natal. (Coll. Selys.) Appendages, right side and dorsal view.

ring and sometimes both branches touching anteriorly to include an isolated spot of reddish olivaceous or bluish colour; segments 8–10 dull blue (bright blue in life?). Appendages (Text-fig. 29): The somewhat peculiar shape of inferior appendages is the same in all specimens examined. *A** proximal to *Cuq* by about the length of *Cuq*. Pterostigma oblong, angles comparatively acute, reddish brown.

♀. Dorsal surface of head dull reddish ochreous, shading to olivaceous posteriorly. Black markings much reduced; transverse band at posterior ocelli complete, but narrower than in male; post-ocular spots outlined with black at the posterior margin only; black spot at occipital foramen present. Prothorax ochreous, narrowly lined with black in the sutures; posterior lobe comparatively broad, erect; styles obliterated to a merest trace, the lobe being only slightly thickened at the two points where they would have their base. Thorax

light olivaceous, shading to whitish on metepimeron and ventral surface; black markings as in male, but reduced in size.

Legs very light ochreous, femora lined with black laterally, pruinose. Abdomen olivaceous, dorsally bronze black, the black bands being considerably narrower than in the male; on segment 2 a very narrow lanceolate black spot; dorsum of segments 8–9 black, 10 olivaceous. *A** proximal to *Cuq* by a little more than the length of *Cuq*; pterostigma ochreous.

♂, *Abd.* 27, *hdw.* 19·5 (Sélys), to 31, 21·5 mm., M'Fongosi, Zululand. ♀, 30·5, 22.

This form has been described by Sjöstedt as a subspecies of *P. punctum*, Ramb. (from Mauritius). We have compared one of Sjöstedt's type-specimens and also the mutilated type of *punctum*. De Sélys had doubtfully regarded his specimen from Natal as belonging to *punctum*. What remains of the type *punctum* appears different, and at the present state of our knowledge it seems safest to consider *massaicum* as a distinct species.

Pseudagrion Sjöstedti (Förster, 1906).

Brit. Mus.: 1 ♂, Lualaba River, 2500–4000 ft. (7 . v . 1907, S. A. Neave); 1 ♂, Edjai, Ashantee, Gold Coast (31 . i . 1913, Dr. J. J. Simpson). Coll. E. B. Williamson: 4 ♀, Salisbury, Mashonaland (iii . 1905, G. A. K. Marshall). Mus. Tervueren: 1 ♂, Katwamba (10 . xi . 1911, Dr. Bequaert).

♂. Occiput dull greyish ochreous. Labium whitish. Head anteriorly brick-red, and so are the labrum, anteclypeus, postelypeus, genae, frons to somewhat beyond the anterior ocellus, base of antennae and anterior two-thirds of eyes. Posterior part of frons and vertex blackish, a moderately broad border of large, round, reddish or ochreous postocular spots; a yellowish line across the occipital margin. Prothorax black, whitish pruinose, marked red, the sides rather broad; large round dorsolateral spots and a medial line, the posterior lobe erect, narrow, faintly tripartite. Thoracic dorsum red (more dull than frons, but perhaps the shade is the same in the living insect); narrow (Lualaba) or slightly broader (Gold Coast) black line on median suture; black band on humeral suture at dorsal end slightly enlarged medially (Lualaba), or medially and laterally (Gold Coast), very narrow (Lualaba) or but slightly narrower than ante-humeral red stripe (Gold Coast). Sides dull olivaceous, whitish pruinose; metepisternum and a narrow ventral border on metepisternum dull brown (in both specimens, though possibly caused by post-mortem decomposition).

Ventral surface dull reddish ochreous, whitish pruinose. Legs black, external side of tibiae and tarsi broadly and conspicuously yellowish. Abdomen very slender, dorsum bronzy black, bluish pruinose on segment 1, basal half of 2, basal two-thirds of 8 and basal half of 9; narrow, dorsally interrupted terminal rings on segments 1 to 5 reddish ochreous; ventral surface reddish ochreous. Appendages (Text-fig. 30) obscure. *A** proximal to *Cuq* in hind wing. Wings slightly tinged with yellowish grey; pterostigma reddish, costal-distal angle acute.

♀. Dorsal surface of head olivaceous; black border of postocular spots reduced to narrow and slightly incomplete anterior and posterior lines. Prothorax olivaceous, the impressed lines rather narrowly black; posterior lobe erect, produced in the middle in a nearly semicircular projection; styles comparatively long, about one-third the

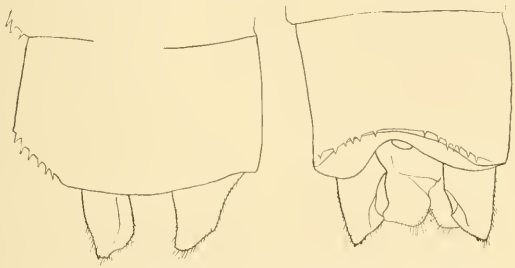

Fig. 30.—*Pseudagrion Sjöstedti*, ♂. Lualaba River. Appendages, right side and dorsal view.

length of prothorax, depressed, narrow, slightly divergent. Thoracic dorsum olivaceous with the merest trace of a reddish shade; narrow black lines on median and humeral sutures, the latter slightly irregular and shortly interrupted near the fourth. Sides and ventral surface dull ochreous; black dots in dorsal end of first and second lateral sutures.

Legs ochreous, lateral surface of femora and internal surface of tibiae edged with black. Abdomen long and slender; ochreous or olivaceous, a black dorsal band of rather broad lanceolate stripes interrupted at anterior ends of segments 3 to 7; terminal dilatations of black on same segments to almost ventral margin; 8 black on dorsum, 9 with a broad basal triangular black spot, 10 olivaceous. Wings as in male, pterostigma greyish ochreous.

♂, *Abd.* 35, *hdw.* 22·5 mm. (Lualaba). ♀, 32, 21 (Gold Coast).

The males agree well with Förster's description of that sex; the association of Mr. Marshall's females with them is not quite certain, but it may claim a good deal of probability. The colour system, stature and condition of *A** and *Cuq* is very much the same; the difference between these females and the same sex of *acaciae* and *massaicum* lies in the size and especially in the well-developed prothoracic styles. They are to some degree similar to *praetextatum* and *salisburyense*, though distinct by the reduction of black lines on the thoracic dorsum, which reduction goes beyond what may reasonably be expected even in extreme specimens of those darker species.

CERIAGRION (Sélys, 1876).

This genus embraces a small number of species inhabiting the tropical part of the Old World. They are common and widely distributed in low levels and coast districts, and consequently have been described comparatively early (*glabrum, coromandelianam, erubescens, cerinorubellum*). Recently additional species have been found in tropical Asia and especially Africa, which there is evidence to suppose is the centre of the genus. One species is found within our faunal limits in almost universal distribution; a second one, from Katauga, may be advantageously described here, as its occurrence in Rhodesia is probable.

1. Wings of adult male decidedly yellow, of female variable from hyaline to greyish yellow. Abdomen of male bright orange, of female dull greyish ochreous. Caudal end of tenth segment in male with a regularly arched excision; the lateral edges of this excision projecting as blackish, denticulate tubercles. The superior appendages distinctly shorter than the inferior . . . . . *C. glabrum.*
2. Wings of adult male very light yellowish grey, of female almost hyaline. Abdomen of male pinkish ochreous dorsally, turning to whitish ochreous at the sides. Caudal end of tenth segment in male with a similar excision, but the lateral tubercles absent. Superior appendages as long, or very slightly longer than the inferior. Abdomen comparatively longer and narrower than in *glabrum* . . . . . *C. suave.*

Ceriagrion glabrum (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, Blue Cliff, Dunbrody (ii. 1912); 1 ♀, Barberton, Transvaal; 6 ♂, 5 ♀, M'Fongosi, Zululand (iii, iv, v. 1911, Jones); 9 ♂, 5 ♀, Lorenço Marques (24, 25. ix, 22. x, 1, 5. xii. 1911); 1 ♀, Bulawayo (21. iii. 1912). Coll. E. B. Williamson: 9 ♂, Natal (G. F. Leigh); 5 ♂, 1 ♀, Princetown, Natal (8, 18. xii. 1908: 18, 22. ii. 1909, *id.*); 2 ♂, 1 ♀, woodside off Umbila Road, Congella, near Durban, Natal (20. x. 1904, 29. iii. 1905, *id.*); 1 ♂, Hilton Road, 3500 ft.,

Natal (21 . xii . 1909, *id.*) ; 2 ♂, 2 ♀, Salisbury, Mashonaland, 5000 ft. (10 . i . 1900, G. A. K. Marshall). Mus. Stockholm : 2 ♂, Cap. Bon. Spei (Victoria) ; 1 ♂, Caffraria (Wahlberg) ; 1 ♂, 1 ♀, Natal (Tragardh) ; 1 ♂, Mashonaland (Marshall). Mus. Hamburg : 2 ♂, Lorenço Marques (17 . ix . 1911, Michaelsen) ; 3 ♂, Beira (22 . ix . 1911, *id.*) ; 1 ♂, Grootfontein, South-West Africa (7–11 . vi . 1911, *id.*). Coll. Ris : 3 ♀, Rikatla, near Lorenço Marques (i . 1914, Junod). Coll. K. J. Morton : 1 ♂, Macequece (19 . ix . 1908, Miss Fountaine).

This common species is known from all parts of the African continent south of the desert belt, also from the Seychelles and Madagascar.

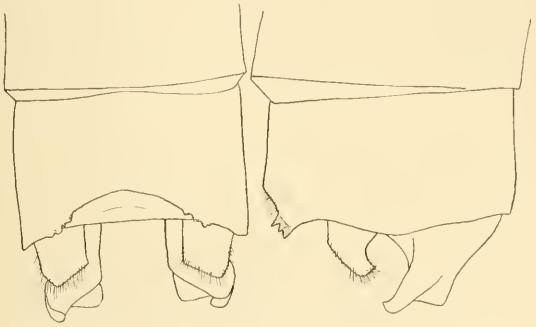

Fig. 31.—*Ceriagrion glabrum*, ♂. Lorenço Marques. Appendages, right side and dorsal view.

♂. Occiput whitish ochreous ; labium light yellow. Labrum, anteclypeus, postclypeus and vertical part of frons bright ochreous yellow ; genae lemon-yellow. Vertex and dorsal surface of frons ferruginous, gradually turning to yellowish anteriorly. Thoracic dorsum ferruginous, sides yellow, turning gradually to whitish on ventral surface ; a mere trace of blackish dots in the dorsal end of humeral and second lateral sutures. Legs yellow with black spines. Abdomen bright orange red, turning to yellowish ventrally. Tenth segment and appendages (see Text-fig. 31). Wings conspicuously yellow ; pterostigma very light yellowish grey.

Immature specimens do not show the yellow tinge of wings ; and the bright orange, ferruginous and yellow colours of the adult stage are gradually developed from dull ochreous shades.

♀. Occiput and labium whitish. Labrum, anteclypeus, genae and vertical part of frons whitish. Postclypeus, frons superiorly and vertex dull ferruginous brown. Thoracic dorsum olivaceous, turning to whitish on the sides and ventral surface. Legs whitish ochreous with black spines. Abdomen olivaceous, turning to whitish ochreous ventrally. Colour of wing membrane less intense than in male and of a greyish rather than pure yellowish shade.

Size variable, independently of origin. ♂, *Abd.* 29, *hdw.* 19 to 33, *pt.* 2·2 mm. ♀, 30, 20·5 to 35, 2·3.

Ceriagrion suave, n. sp.

Mus. Tervueren: 4 ♂, Kapiri, Katanga (x. 1912, Legros).

♂ (adult). Occiput and labium whitish. Labrum light yellow, genae and vertical face of frons greenish white; anteclypeus, post-

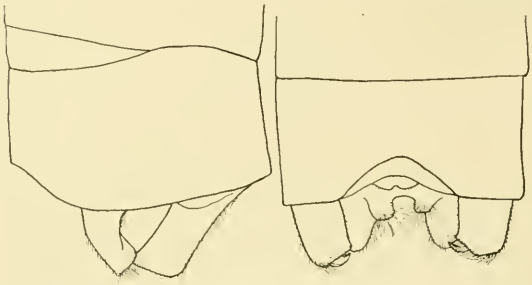

Fig. 32.—*Ceriagrion suave*, ♂. Kapiri. Appendages, right side and dorsal view.

clypeus, frons and vertex superiorly light ferruginous. Thoracic dorsum ochreous brown, turning gradually to very pale ochreous on the sides, to whitish on ventral surface. Legs whitish ochreous with black spines. Abdomen very long and slender; dorsum pale ochreous with a pinkish shade, turning to very pale ochreous on the sides. Tenth segment and appendages (see Text-fig. 32). Wings very slightly tinged with greyish, pterostigma very pale ochreous with a pinkish shade.

Abd. 36, *hdw.* 22·5 mm.

Besides the marked structural differences in the tenth segment and appendages, this species differs from *C. glabrum* by its much more slender build, head, thorax and abdomen being conspicuously narrower,

the latter also relatively longer. The colours are rather conspicuously different from fully coloured, much less so from immature *glabrum*. The female remains unknown. We must expect to find it difficult of identification from the female of *glabrum*.

ENALLAGMA (Sélys, 1876).

This genus is chiefly North American; it is represented in Europe by a single species, in Africa by a group of closely allied forms which are very imperfectly known.

No sufficient reason can be found for separating this African group generically from the main body of the genus, although geographical reasons might suggest such a separation. Two species not yet known from within the limits of the present fauna are described here, as it was found desirable to take notice of all the species known to the writer from continental Africa.

Table of Males.

1. Dorsum of tenth segment somewhat abruptly elevated in the middle, the projection divided by a narrow excision in two small rounded lobes. Superior appendages directed caudad, with no medial ventral projection, somewhat furcate in side view; conspicuously longer than the inferior. 2.

   Dorsum of tenth segment gradually (if at all) elevated in the middle with a narrow triangular or broadly arched excision, not distinctly bilobed. Superior appendages, see under 3 and 4 . . . . . 3.

2. Two elevated, almost circular lobes at the ventral end of median thoracic suture. Pterostigma conspicuously longer than broad; wings narrower than in following species . . . . . *E. subfurcatum.*

   No elevated lobes at the median thoracic suture. Pterostigma very little longer than broad, wings comparatively broader than in *subfurcatum* (and other species here described) . . *E. rotundipenne.*

3. *Cuq* nearer the level of first than of second *Anq*. Superior appendages shorter than tenth segment, directed caudad and very slightly ventral, obtuse; tenth segment very broadly and shallowly excised. Dorsum of thorax and abdomen chiefly black . . . . *E. nigridorsum*

   Cuq at equal distance from first and second *Anq* or nearer second . 4.

4. Superior appendages directed caudad, roughly triangular in dorsal view, their medial border projecting ventrad nearly as long as tenth segment. 5.

   Superior appendages bent strongly ventrad, at least in their basal half; no distinct medial ventral dilatation . . . . . 8.

5. Pale colours light ochreous, bluish only on terminal segments. Pterostigma and appendages very light yellowish . . . . . *E. subtile.*

   Pale colours blue. Pterostigma greyish ochreous to black. Appendages blue and black to almost black . . . . . 6.

6. Very slender and elongate form (*abd.* 26, *hdw.* 19·5 mm.). No blue line on median thoracic suture. Pale colours very pure sky blue, yellowish on sides of segments 3–6.
   *A** proximal to *Cuq* by the length of *Cuq* or less . . *E. elongatum.*
   Form less elongate (*abd.* 20, *hdw.* 13·5 to 24·5, *pt.* 1·7). A blue line on median thoracic suture. Blue colour with a slight greenish shade. *A** proximal to *Cuq* by more than the length of *Cuq* . . . . 7.
7. Postocular spots comparatively small, united by a narrow blue line on occipital border, bordered with black posteriorly. Superior appendages chiefly black . . . . . *E. glaucum.*
   Postocular spots very large, not bordered with black posteriorly, thus confluent to bluish colour of occiput. Superior appendages chiefly blue. Black colour on thorax and abdomen much reduced compared to *E. glaucum* . . . . . *E. schultzei.*
8. Superior appendages broken on side view, the basal part spinulose, directed ventrad, the apical part directed caudad, obtuse. Dorsal spine of inferior appendages comparatively long and slender. Smaller than following species . . . . . *E. fractum.*
   Superior appendages bent ventrad for their entire length, almost straight on side view, distinctly sinuate in dorsal view. Dorsal spine of inferior appendages short.
   Larger than preceding species . . . . . *E. sinuatum.*

Table of Females.

(No females of *Schultzei* are known.)

1. Black lines on legs, at least on first femora and tibiae. A black line on humeral suture (both comparatively narrower than in corresponding males) . . . . . 2.
   No black lines on legs, a very narrow one or none at all on humeral suture . . . . . 5.
2. *Cuq* nearer to first than second *Anq.* Green or bluish ante-humeral line very little broader than in corresponding male, narrower than humeral black stripe. Hind lobe of prothorax very narrow, almost straight, very slightly convex in the middle . . . . . *E. nigridorsum.*
   Cuq at equal distance from first and second *Anq*, or nearer second. Green or bluish ante-humeral line broader than in corresponding male by the reduction of humeral black stripe . . . . . 3.
3. Posterior lobe of prothorax regularly convex or projecting in a very low triangle . . . . . 4.
   Posterior lobe of prothorax raised in the middle in a trapezoid projection, which is regularly and shallowly concave at the posterior free margin. Wings comparatively broad; pterostigma very little longer than broad . . . . . *E. rotundipenne.*
4. Posterior lobe of prothorax very narrow, its median third projecting as a very low and obtuse triangle. Slightly larger and more robust than the following species . . . . . *E. subfurcatum.*
   Posterior lobe of prothorax broader, regularly convex, sometimes with an indication of a median tubercle . . . . . *E. glaucum.*

5. Thoracic dorsum each side with a blackish band along the median ochreous line; each black band about as broad as the ochreous ante-humeral stripe of the mesepisternum. Pterostigma greyish ochreous . . 6.
   Dark bands of thoracic dorsum golden brown, only centrally darkened to a narrow blackish line. Pterostigma pale yellow. Posterior lobe of prothorax comparatively broad, regularly convex, slightly depressed in the middle . . . . . *E. subtile.*
6. Smaller species. 1 *abd.* 26, *hdw.* 19 mm. Hind lobe of prothorax comparatively broad, regularly convex, slightly depressed ventrad in the middle. *E. fractum.*
   Larger species. *Abd.* 28·5, *hdw.* 20 to 30, *pt.* 2·1 mm. . . . . 7.
7. Hind lobe of prothorax moderately broad, almost regularly convex at free margin, very slightly depressed in middle. Dorsal black band of abdomen very narrow, light colour of sides largely visible in a dorsal view. *E. sinuatum.*
   Hind lobe of prothorax narrow at the sides, broader in medial third, where it is depressed and dorsally concave. Dorsal black band of abdomen broad, light colour of sides not visible in a dorsal view. *E. elongatum.*

Enallagma subfurcatum (Sélys, 1876).

Coll. E. B. Williamson: 1 ♂, Salisbury, Mashonaland (iv. 1905, G. A. K. Marshall). Coll. Ris: 1 ♂, 1 ♀, Eritrea (Kristensen); 3 ♂, 8 ♀, Harrar, Abyssinia (*id*).

♂. Occiput light blue, rather broadly bordered with black at the foramen. Labium whitish. Dorsal surface of head light blue, marked with black; narrow line at base of labrum; postclypeus entirely black; vertex from the base of antennae backward, interrupted by cuneiform postocular spots and a narrow line on the occipital margin, which are blue. Prothorax black, marked with blue; narrow line on anterior margin interrupted in the middle, lateral borders and small dorsolateral triangular spots. Posterior lobe black, narrow, erect, in a low arc, from the vertex of which a small bluish point projects horizontally backward. Thoracic dorsum black; complete, straight, blue ante-humeral lines, distant slightly more than their own breadth from humeral suture. Humeral black colour extending laterally to about half-way between humeral suture and the stigma, somewhat irregular in posterior outline; projecting posteriorly at the ventral end, a narrow blue stripe cutting into the dorsal end obliquely towards the humeral suture. Sides otherwise blue; a black dot in dorsal end of second lateral suture. Ventral side blue. Legs greyish blue; external side of femora and tibiae broadly black; tarsi ochreous, obscure at the joints.

Abdomen moderately stout; segments 1 to middle of 3 and 8 to 10 blue, middle of 3 to 7 dull yellowish or light olivaceous, marked

with black. Segment 1 transversely oblong basal spot over one half of the length; 2 complete dorsal longitudinal band, dilated at anterior end and still more near posterior end, this dilatation immediately followed by a contraction and then by a narrow complete posterior ring; 3–7 broad dorsal longitudinal band, not fully interrupted by very narrow, dorsally incomplete basal rings, very slightly enlarged near the posterior end of 3–6 (the band as a whole being too broad to make these usual dilatations conspicuous); 8–9 entirely blue, exceptionally a terminal dorsal black dot on 9; 10 broadly black on dorsum. Appendages (Text-fig. 33) black, tips of superior yellowish.

Wings hyaline, slightly tinged with greyish in adults. Pterostigma black, very narrowly bordered with whitish.

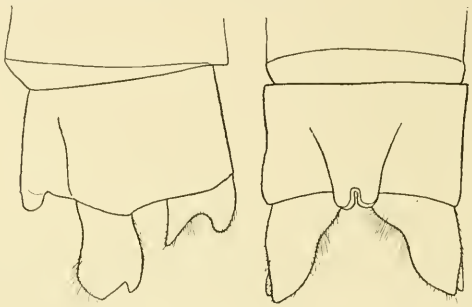

Fig. 33.—*Enallagma subfurcatum*, ♂. Harrar. Appendages, right side and dorsal view.

♀. Light ochreous, to olivaceous and greenish blue according to maturity. Dark colour at occipital foramen lighter and more diffuse. Postocular spots larger, lined posteriorly only by a narrow line of blackish or altogether fused to light colour of occiput; line on occipital border rather broad. Ante-humeral stripes considerably broader, their lateral margin approaching very closely the humeral suture. Humeral black limited to a narrow line at the suture; black dots in dorsal end of first and second lateral sutures. Black lines on legs much narrower, interrupted at third femora and tibiae. Abdomen much stouter than in male, dorsal black band comparatively narrower, otherwise much the same. Strong vulvar spine, vulva to end of abdomen. Pterostigma larger than in male, rather light greyish ochreous.

♂, *Abd.* 24·5, *hdw.* 17 to 25, *pt.* 1·8 mm. ♀, 24, 19.

The position of M_2 and M_{1a} relatively to post-nodal cross-veins shows considerable variability, the extremes of the series being $\frac{5+2\,.\,5+2}{4+2\,.\,4+3}$ and $\frac{6+3\,.\,6+3}{5+3\,.\,5+3}$, the most regular position apparently being $\frac{5+3\,.\,5+3}{4+3\,.\,4+3}$.

Enallagma rotundipenne, n. sp.

Mus. Stockholm: 1 ♂, Caffraria (Wahlberg). S. Afr. Mus.: 1 ♀ not dated, but most probably from M'Fongosi, Zululand.

These two specimens belong most probably to the same species—a form not otherwise represented in the material examined. They are similar in stature and in colour scheme to *E. nigridorsum*, but the appendages are rather widely different, and both sexes are distinct by their wings broadly rounded apically, the pterostigma being dilated accordingly in the antero-posterior dimension. *Cuq* half-way between first and second *Anq* or slightly more distally. *A** proximal to *Cuq* by almost twice the length of *Cuq*. Arculus very slightly distal to second *Anq*; M_2 and M_{1a} $\frac{5+3\,.\,5+2}{4+3\,.\,4+3}$ in ♂, $\frac{5+3\,.\,5+3}{4+3\,.\,4+3}$ in ♀.

♂. Occiput light blue, black spots at the foramen. Labium whitish. Dorsal surface of head, a rather broad line at base of labrum, postclypeus entirely, frons and vertex to half-way between anterior ocellus and postclypeus light blue marked with black; blue postocular spots narrow, cuneiform, no blue line on occipital border.

(Prothorax damaged.) Thoracic dorsum black; complete, narrow, blue ante-humeral lines, less than one-half the breadth of median black of corresponding side. Humeral black posteriorly to first lateral suture in dorsal third slightly less ventrally; black dot in dorsal end of second lateral suture. Sides otherwise blue, ventral side whitish. Legs very light greenish; femora broadly, tibiae narrowly lined with black externally.

Abdomen segments 1 to middle of 3, 8 to 10 blue, middle of 3 to 7 yellowish, marked with black; very broad dorsal band (almost as in *nigridorsum*), very narrow, dorsally interrupted light basal rings on 3 to 6; 8 entirely blue; 9 terminal transverse black spots; dorsum of 10 broadly black. Appendages (Text-fig. 34).

Pterostigma grey, rather broadly bordered with blackish, slightly larger and darker in front than in hind wing.

♀. Sides of prothorax greenish blue, dorsum black with two large dorsal posterior bluish spots and the anterior margin broadly blue. Posterior lobe erect to an angle of about 60°, narrow, trapezoid, the

free margin regularly and shallowly concave, the centre of the excavation thickened into an antero-posterior direction by a kind of bridge towards the margin of the median lobe, the thickening projecting as a small blunt point horizontally backward; this small bridge and projection ochreous, the margin otherwise black.

Colour of head, thorax, base and end of abdomen light greenish blue (instead of pure blue in male). Postocular spots larger, bordered only by a narrow black line posteriorly and united by a narrow line over the occipital border. Very narrow greenish line over median thoracic suture; ante-humeral lines broader, about as broad as humeral black colour, which projects very little posteriorly beyond the suture. Small black dots in dorsal end of first and second lateral sutures. Black lines of legs much narrower, interrupted on third

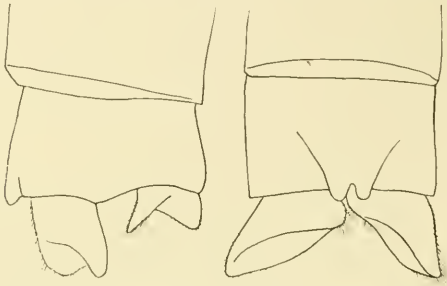

Fig. 34.—*Enallagma rotundipenne*, ♂. Caffraria. Appendages, right side and dorsal view.

femora and tibiae. Abdomen segments 1–7 as in male, but the dorsal black band comparatively narrower on the stouter abdomen; segment 8 blue in anterior half, black in posterior half and a very narrow transverse line on anterior margin; broad and complete dorsal black band on 9–10. Pterostigma very light, greyish ochreous, broadly lined with whitish.

♂, *Abd.* 19·5, *hdw.* 13·5 mm. ♀, 19·5, 14, *pt.* 3·5.

Enallagma nigridorsum (Sélys, 1876).

S. Afr. Mus.: 1 ♂, Lorenzo Marques (24. ix. 1911). Coll. Ris: 3 ♂, 3 ♀, Delagoa Bay (1892, H. Junod); 1 ♂, Lorenço Marques (25. ix. 1911).

♂. Occiput light bluish grey. Labium whitish. Dorsal surface of head greenish blue, marked with black, also postclypeus from base

of antennae backward; very narrow cuneiform blue postocular spots united by a narrow blue line on occipital margin. Prothorax black, sides narrowly blue, posterior lobe very narrowly bordered with blue.

Thoracic dorsum black; rather broad, blue ante-humeral stripes, nearer the humeral than the median suture, about as broad as the median black band of same side. Humeral black extending laterally to be divided about equally by the humeral suture. Sides otherwise light blue; a small black dot in dorsal end of second lateral suture. Ventral side whitish. Legs greyish blue; external side of femora broadly, of tibiae narrowly black.

Abdomen almost pure light blue, with a very slight greenish shade, marked with black; quadrangular spot over the entire length of segment 1; segment 2 with a complete broad dorsal band, slightly

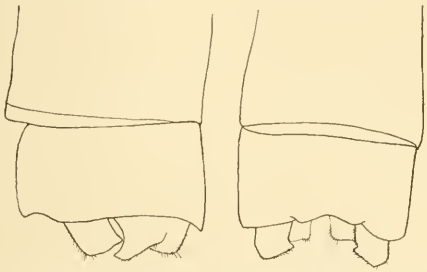

Fig. 35.—*Enallagma nigridorsum*, ♂. Lorenço Marques. Appendages, right side and dorsal view.

contracted towards the middle, contracted at the end, where it joins a narrow terminal black ring; 3–6 broad dorsal band very narrowly interrupted at base and enlarged at end of each segment; 7 black except narrow lateral stripes and a very narrow basal ring; 8 blue, a black spot on anterior half of dorsum; 9 entirely blue; 10 blue with dorsal black band. Appendages (Text-fig. 35) superior black, inferior black in lateral, ochreous in median half.

Pterostigma greyish, finely marginated with whitish. M_2 and M_1a $\frac{5+2}{4+3}$. $\frac{5+3}{4+3}$. *Abd.* 21, *hdw.* 14 mm.

♀. The females are not in sufficiently good condition for description.

From Madagascar there are in the writer's collection 3 ♂, 2 ♀, given him years ago by M. R. Martin. These specimens differ somewhat

from the continental type, and might eventually be described as a distinct subspecies or even species.

♂. Different from the above-described specimen by—(1) ante-humeral blue stripes very narrow, invaded by the median black stripe, distant about their own breadth from humeral suture; (2) black dorsal band on segment 8 for about two-thirds the length, black dorsal spot on anterior half of segment 9, dorsal black band of segment 10 broader; (3) appendages slightly different, the medial prominence of superior being more distinct and a latero-ventral projection visible in side view (Text-fig. 36). M_2 and M_1a $\frac{5+2\,.\,5+2}{4+3\,.\,4+3}$, $\frac{5+3\,.\,5+2}{4+3\,.\,4+3}$, $\frac{5+3\,.\,5+3}{4+4\,.\,4+3}$.

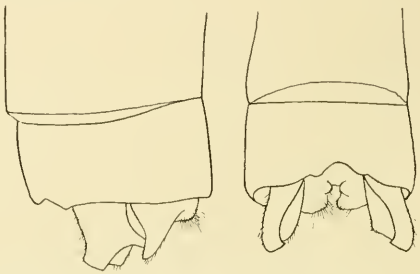

Fig. 36.—*Enallagma nigridorsum*, forma *b*, ♂. Madagascar. Appendages, right side and dorsal view.

♀. Head and thorax as in male; light colour of head dull ochreous; postocular spots bluish green; ante-humeral stripes ochreous; sides of thorax whitish. Abdomen as in male, but instead blue olivaceous on segments 1–2, ochreous 3–7, bluish green 8–10; dorsum of 8 wholly black; 9 black except a narrow terminal ring; 10 with narrow dorsal transverse black line. Strong vulvar spine. Pterostigma very light greenish ochreous. M_2 and M_1a $\frac{5+3\,.\,5+3}{4+3\,.\,4+3}$ in both specimens. *Abd.* 20, *hdw.* 14 mm.

Enallagma elongatum (R. Martin, 1906).

S. Afr. Mus.: 4 ♂, Eldoret, Brit. East Africa (viii . 1913, W. E. Fry). Mus. Stockholm: 1 ♀, Kilimandjaro (29 . iii . 1906, Y. Sjöstedt).

From Sjöstedt's description it seems most probable that these

specimens belong to what this author and originally R. Martin described as *Ischnura elongata*. This supposition is made, although Prof. Sjöstedt sent the female under another name. This female is here associated with the males chiefly according to its elongate stature and also as coming from the same geographical region (outside our faunal district!). The species is evidently not an *Ischnura*, but clearly an *Enallagma* of the African group.

♂. Occiput light greyish blue. Labium whitish. Labrum blue, very narrowly obscure at base; anteclypeus blue; postclypeus black; frous and vertex blue to base of antennae, black posteriorly; rather large cuneiform postocular spots and a narrow line on occipital margin blue. First joint of antennae blue, the rest black. Prothorax black, marked blue; the sides broadly so, lateral cuneiform, and a small median posterior spot. Posterior lobe moderately high, erect to an angle of about 60°, shallowly trilobate, the median lobe much the broader, its free margin very slightly and regularly convex. Thoracic dorsum black; broad blue ante-humeral stripes, about as broad as the corresponding half of median black stripe, slightly narrowed dorsally. In some of the specimens only a very narrow whitish line on median suture, humeral black about as broad as blue ante-humeral stripe, divided about equally by dorsal end of humeral suture just touching the suture at ventral end. Sides blue; black dot in dorsal end of second lateral suture. Ventral side light bluish grey. Legs bluish grey, femora and tibiae broadly black anteriorly.

Abdomen comparatively long and slender. Segment 1 blue with dorsal black spot; 2 blue, a posterior transverse black band, slightly convex anteriorly to one-half the segment's length, straight behind and distant there about by one-half its own breadth from the segment's end, sides broadly blue over the entire length, a very narrow black ring on joint; sides of 3 blue in anterior third, yellowish in the posterior two-thirds of length, dorsum black, the broad band narrowed to a point in first fifth, broadened to lateral margin in last fifth; 4–6 light yellowish on sides, black dorsally, and to lateral margin in last fifth, interrupted by a very narrow bluish ring at anterior joint 7 black, merest trace of a yellow line at lateral margin and very narrow anterior and posterior blue rings; 8 9 blue; 10 black on dorsum and in a narrow anterior ring, blue laterally, yellowish ventrally.

Appendages (Text-fig. 37) blackish, lighter on ventral side.

Pterostigma very dark reddish brown to blackish. *A** proximal to *Cuq* by the length of that vein or slightly more. M_2 at sixth, exceptionally fifth *Pnq* in front wing, fifth *Pnq* in hind wing; M_{1a} 3 or 4 veins more distally. *Abd.* 26, *hdw.* 19·5 mm.

♀. Occiput and labium light ochreous. Labrum olivaceous, narrowly bordered with ochreous. Base of mandibles and genae light yellowish olivaceous. Anteclypeus, postclypeus, frons and vertex dull olivaceous except a transverse blackish band across the ocelli; postocular spots not divided from the light colour of occiput.

Prothorax dull yellowish green, narrow black lines in the sutures. Posterior lobe less distinctly trilobate than in male, medial higher third slightly depressed and dorsally concave. Thoracic dorsum mostly olivaceous; median suture lined with ferruginous, then a black stripe of about one-third the breadth of each mesepisternum and a very narrow black line in humeral suture. Sides olivaceous, shading into ochreous behind and ventrally; black dot in dorsal end

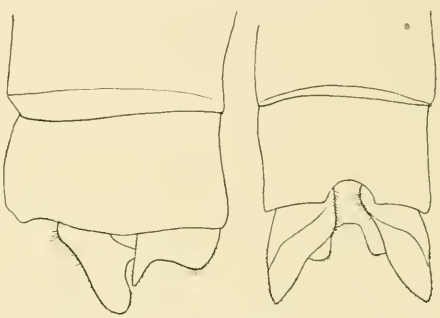

Fig. 37.—*Enallagma elongatum*, ♂. Eldoret. Appendages, right side and dorsal view.

of second lateral suture. Legs ochreous, black dots at distal end of femora and only traces of very narrow and interrupted lateral dark lines on tibiae. Abdomen light olivaceous green on sides, black on dorsum; the light colour of sides cutting into the black of dorsum before the end of segments 2–7; 8 with complete dorsal black band about one-third the segment's breadth; 9 dull olivaceous with two dorsal narrow cuneiform black stripes; 10 and appendages olivaceous.

Pterostigma light greyish brown; venation partly ochreous. M_2 and M_1a $\begin{matrix} 5\frac{1}{2}+4 \\ 5+4 \end{matrix} \cdot \begin{matrix} 5\frac{1}{2}+4 \\ 5+3 \end{matrix}$. *Abd.* 28·5, *hdw.* 20 mm.

Enallagma glaucum (Burmeister, 1839).

S. Afr Mus.: 8 ♂, 1 ♀, King Williamstown, Cape Colony; 1 ♂, Barberton, Transvaal; 10 ♂, 2 ♀, 1 ♂ ♀ *in cop.*, M'Fongosi, Zululand

(iii, iv, v, ix . 1911, W. E. Jones); 3 ♂, Rietfontein (2, 9, 30 . x . 1904); 1 ♂, Salisbury (26 . xii . 1911); 1 ♂, 1 ♀, Matopo Dam, Bulawayo (11 . ii . 1911); Otjituo, S.W. Protectorate (Tucker). Brit. Mus.: 1 ♂, 1 ♀, Deelfontein (Col. Sloggett, 1903); 1 ♂, Kroonstad, Orange Free State (E. Eckersley, 1904); 1 ♂, Boksburg, Johannesburg (C. H. Pead, 1907); 1 ♂, Salisbury, Mashonaland (xi . 1905, G. A. K. Marshall). Mus. Stockholm: 6 ♂, 6 ♀, Cap. Bon. Spei (Victoria); 1 ♂, Port Elizabeth (Dubon); 1 ♀, Caffraria (Wahlberg); 2 ♂, 1 ♀ Swakop., S. West Protect. (Wahlberg); 2 ♂, Salisbury (x, xi . 1903, Marshall). Mus. Hamburg: 3 ♂, 1 ♀, Grootfontein, South-West Africa (7, 11 . vi . 1911, Michaelsen). Mus. Tervueren: 1 ♂, Kapiri, Katanga (x . 1913, Legros). Coll. E. B. Williamson: 4 ♂, 2 ♀, Natal (G. F. Leigh).

This is evidently the most common of the smaller *Agrionidae* throughout the faunal region here discussed. There is some variation in the relative extent of light blue and black colour, but no serious difficulty was found in separating specimens from the allied species, males especially being readily identified by the shape of the appendages. The following description is taken from specimens from M'Fongosi.

♂. Occiput very light greenish blue. Labium whitish or yellowish. Dorsal surface light greenish blue, marked black, also the postclypeus, frons and vertex to base of antennae or slightly more in front; blue postocular spots more variable in size and shape than usually in this genus; mostly narrow, transverse, slightly cuneiform stripes, united by a line on the occipital border, or much broader, separated only by a narrow black line from the occipital blue; or almost circular lateral small spots, which may be exceedingly small, or even disappear almost completely.

Prothorax blue and black, also variable; blue at the sides and a narrow anterior border only, or also a double dorsal spot and the border of the posterior lobe. Thorax light blue and black, also considerably variable. Dark specimens: Dorsum black, blue ante-humeral band slightly narrower than corresponding half of mid-dorsal black stripe; humeral black about equally broad, more so behind humeral suture at ventral end, before at dorsal end; sides ligh greenish blue, very small black dot in dorsal end of second lateral suture; ventral side turning to whitish. Light specimens: Complete blue line on mid-dorsal suture; ante-humeral blue stripe broader than median black stripe of same side, a narrow black line only on humeral suture. Legs greenish, external side of femora broadly, of tibiae narrowly black.

Abdomen light greenish blue, marked black; quadrilateral dorsal

black spot on segment 1; 2 complete dorsal band, slightly enlarged before posterior end, then narrowed and joined to a very narrow terminal black ring; 3–6 a terminal almost circular spot narrowed to a dorsal stripe which joins the anterior end in a point; 7 black, sides very narrowly blue; 8–9 blue; 10 narrow mid-dorsal black stripe. Appendages (Text-fig. 38), superior black externally, blue internally; inferior variable from light blue to almost black. The relative extent of black and blue colours on abdomen varies in correlation to thorax and head, but remains the same in principle.

Pterostigma black, very narrowly bordered with whitish.

♀. Yellowish ochreous to light olivaceous and black. Markings on head and thorax much as in the lighter forms of male; postclypeus

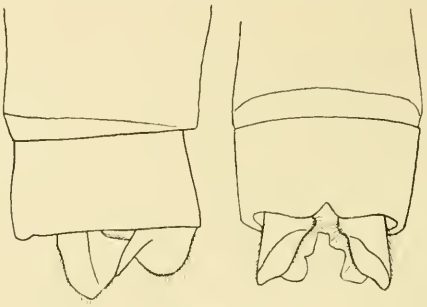

Fig. 38.—*Enallagma glaucum*, ♂. M'Fongosi Appendages, right side and dorsal view.

rather broadly bordered with ochreous; postocular spots as where they are largest in male. Black lines of legs much reduced, partly incomplete and paler. Abdomen segments 1 and 2 as in male; 3–7 as in dark forms of male, but dorsal black band not pointed anteriorly, only partially interrupted by a very narrow basal ring; black dorsal band also over segments 7–9 and basal half of 10, or only a small basal triangular black spot on 10. Vulvar spine long, vulva to end of abdomen.

Pterostigma conspicuously larger than in male, light ochreous.

♂, *Abd.* 20, *hdw.* 13·5 to 24·5, *pt.* 1·7 mm. ♀, 23, 16·5 to 25, 1·8.

A^* proximal to *Cuq* by considerably more than the length of that vein. Position of M_2 and $M_1{}^a$ mostly $\frac{5+3}{4+3}$.

E. obliteratum, which is represented by the single type described by

de Sélys, was carefully compared with our series of *E. glaucum*. It was found to agree in all respects, except that the postocular spots are entirely absent (and appear to be so originally, not only by post-mortem discoloration). But clearly this is only the extreme grade of the variation as described above from our specimens of *glaucum*, and *obliteratum* must be considered as a variety not deserving of a name.

Enallagma schultzei (Ris, 1908).

No other specimen of this form has come to hand, so it stands based on the unique type. When the description was published only a very limited number of specimens of *E. glaucum* were available for comparison. It is obvious that the differences from *glaucum* (see p. 318) may only represent an extreme degree of reduction of black and invasion of light blue elements. Although I believe that the species stands as a doubtful one, further discoveries will settle the question.

Enallagma fractum, n. sp.

Mus. Tervueren: 4 ♂, 2 ♀, Kapiri, Katanga (ix. 1912, Legros). Coll. E. B. Williamson: 4 ♂, 1 ♂ ♀ *in côp.*, Salisbury, Mashonaland (ii. 1900, G. A. K. Marshall); 1 ♂, *ibid.* (v. 1905, *id.*).

♂. Occiput very light bluish grey. Labium whitish. Dorsal surface of head greenish blue; a black transverse band from slightly behind the base of antennae to somewhat beyond the posterior ocelli; a narrow line on occipital margin and large postocular spots remaining blue; the latter confluent with light colour on occiput. Prothorax greenish blue, narrowly black in mid-dorsal line. Thoracic dorsum greenish blue and black; narrow blue line on median suture; black band something less than one-half the breadth of mesepisternum, otherwise blue with a narrow black line and a somewhat stronger dot in the dorsal end of humeral suture. Sides very light greenish blue; very small blackish dot in dorsal end of second lateral suture. Ventral side whitish; indication of partially interrupted blackish lines on external side of femora and tibiae.

Abdomen very slender; very light blue shading to greenish-marked black. Segment 1 black spot at base of dorsum; 2 lanceolate black spot, joined to a very narrow terminal ring by a fine line, reaching the anterior end in a fine point (slightly dilated at anterior end in part of the specimen); 3–6 narrow terminal ring, joined to a dorsal spot which, rounded at the posterior end, abruptly contracts to a line and remains slightly short of the anterior end; 7 an analogous marking at the posterior end running into a black

mid-dorsal stripe of one-third the segment's breadth; 8–9 blue; 10 black mid-dorsal band. Appendages obscure (Text-fig. 39 and p. 318).

Wings slightly yellowish; venation obscure. Pterostigma rather dark greyish brown, narrowly lined with whitish. M_2 and M_{1a} at *Pnq* 5 + 3 in front wing, 4 + 3 in hind wing.

♀. Head and thorax scarcely different from ♂ in pattern. Colour light olivaceous, turning to bluish at the postocular spots, to reddish brown at thoracic dorsum, to whitish at sides. Abdomen light olivaceous; complete black mid-dorsal band from segment 1 to terminal third of 8, with ante-terminal dilatations on 2 6; 10 olivaceous. Vulvar spine strong; valvae projecting slightly beyond

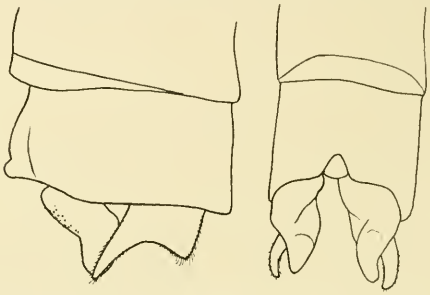

Fig. 39.—*Enallagma fractum*, ♂. Kapiri. Appendages, right side and dorsal view.

the end of abdomen. Pterostigma considerably lighter than in male and slightly larger. Venation as in male.

♂, *Abd.* 26, *hdw.* 17 mm. ♀, 26, 19.

Enallagma sinuatum, n. sp.

S. Afr. Mus.: 1, ♂ Salisbury, Mashonaland (1894, G. A. K. Marshall); 3 ♀, M'Fongosi, Zululand (iv. 1911, W. E. Jones). Coll. E. B. Williamson: 1 ♂, 1 ♀, Salisbury (iv. 1905, Marshall). Mus. Tervueren: 1 ♂, 1 ♀, Kapiri, Katanga (ix, x. 1912, Legros).

Very similar to *fractum* in stature and colour system, but slightly larger and with marked difference in the appendages of male.

♂ (Kapiri). Occiput light greyish ochreous. Labium whitish. Dorsal surface of head greyish blue. A transverse black band from slightly behind the base of antennae to near the occipital margin,

where a narrow line on this margin and large postocular spots remain blue, the latter merging into the light colour of occiput. Prothorax greyish blue, lighter at the sides, a small mid-dorsal dark spot. Thoracic dorsum (discoloured?) light golden brown; a narrow ferruginous line at median suture, black contiguous stripes of something less than one-half the breadth of mesepisterna; narrow black line in humeral suture, lightly enlarged in ventral third and ending in a black point dorsally; yellowish colour extending narrowly beyond humeral suture; sides otherwise very light greenish blue, small black dot in dorsal end of second lateral suture; ventral side whitish. Legs very light greyish ochreous; a mere trace of dark lines on external side of femora and tibiae.

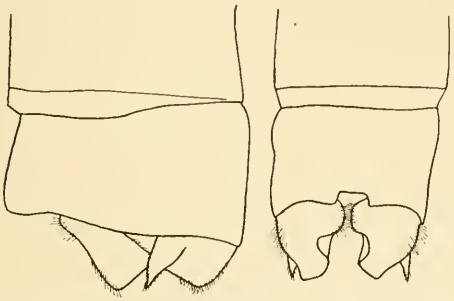

Fig. 40.—*Enallagma sinuatum*, ♂. Kapiri. Appendages, right side and dorsal view.

Abdomen very slender; light greenish blue, marked black, sides of segments 3–6 yellowish. Segment 1 very small black dorsal spot at base; 2 small mid-dorsal posterior spot, narrowly joined to lanceolate dorsal line, which ends in a point at the anterior fourth; 3–6 narrow mid-dorsal line, shortly interrupted at anterior end and slightly dilated near posterior end of each segment; 7 broader mid-dorsal band remaining slightly short of both ends; 8–9 blue; 10 blue with narrow mid-dorsal black band. Appendages dark reddish brown (Text-fig. 40).

Venation dark; pterostigma dark greyish brown. M_2 and M_1a at *Pnq* 6 + 4 in front wing, 6 + 3 in hind wing.

♀. Very light reddish ochreous; sides and ventral side of thorax whitish. Black transverse band of frons as broad as ocellar region in

the middle, narrowed to about one-half at the sides; narrow ferruginous lines from posterior to anterior ocellus and from this to anterior margin of black transverse band; in front of anterior ocellus a very narrow black transverse line, concave anteriorly. On thoracic dorsum the median yellowish line broader, the black stripes narrower than in male, about one-third of breadth of mesepisterna. Black dorsal spot of segment 2 only slightly narrowed in front of the terminal dilatation and running through to anterior end; 3–6 mid-dorsal band slightly broader, otherwise as in male; 7 as in male; 8 mid-dorsal black band on anterior two-thirds; 9 two dorsal basal black spots; 10 entirely light coloured. Vulvar spine strong; vulvae level with the abdominal end.

Pterostigma light greyish ochreous, larger than in male. M_2 and $M_1{}^a$ in front wing at *Pnq* 6 + 2, 6 + 3 or 6 + 4, in hind wing 5 + 3 or 5 + 4.

♂. *Abd.* 28, *hdw.* 19 mm. ♀, 30, 21.

Enallagma subtile, n. sp.

Mus. Tervueren: 2 ♂, 5 ♀, Kapiri, Katanga (ix, x. 1912, Legros).

♂. Occiput and labium whitish. Labrum light ferruginous, lined with whitish. Dorsal surface of head light ferruginous; a black transverse band across the ocelli, as broad as the ocellar region in the middle, narrowed laterally, and partially cut through by narrow oblique ferruginous lines from posterior ocellus to base of antennae. First and second joint of antennae ferruginous, the rest black. Prothorax light ferruginous dorsally, very light ochreous at the sides. Thoracic dorsum light ferruginous; at each side of the ferruginous median suture a narrow black line, not broader than the ferruginous line on the suture. Extremely narrow black line on humeral suture and small black dot in its dorsal end. Sides and ventral side very light ferruginous, almost whitish, a very small black dot in dorsal end of second lateral suture. Legs whitish ochreous, spines alone blackish.

Abdomen very slender. Segments 1–7 very light ochreous at the sides; dorsally blackish as a band of about one-third the segment's breadth, narrowly interrupted at anterior end and slightly dilated before posterior end of each segment; dorsal band deeper black and slightly broader on 7; 8–10 very light greyish blue, shading laterally into whitish ochreous. Appendages very light ochreous, only the extreme tip of the inferior obscure (Text-fig. 41).

Venation very thin, partly greyish ochreous. Pterostigma thin, very light ochreous. M_2 and $M_1{}^a$ at *Pnq* 5 + 2 or 5 + 3 in front wing, 4 + 3 or 4 + 4 in hind wing.

♀. Very similar to male in colour, the following being different: dark lines at median thoracic suture not blackish, only reddish brown with a small blackish nucleus. Blackish mid-dorsal band of segments 1–7 slightly narrower, narrowly extended on anterior half of 8; no bluish shade on terminal segments. Vulvar spine strong; valvae slightly projecting beyond abdominal end. M_2 and M_{1a} in male.

♂, *Abd.* 25, *hdw.* 15 mm. ♀, 24, 16 to 26·5.

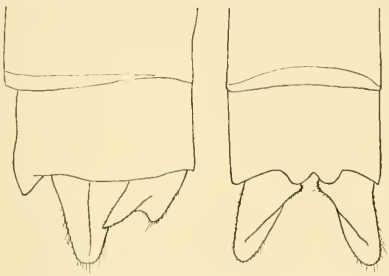

Fig. 41.—*Enallagma subtile*, ♂. Kapiri. Appendages, right side and dorsal view.

ISCHNURA (Charpentier, 1840).

A cosmopolitan genus, somewhat peculiar in the geographical distribution of its species. Some species range over an exceedingly wide area, but there is generally only a very small number of species in one geographical region—mostly one or two; certain other species have a rather narrowly limited distribution, inhabiting chiefly dry regions (Western North America, Mediterranean, Europe and North Africa, Central Asia). The European *I. elegans* is one of the most common *Odonata* of that continent, and remarkable for not being at all particular to the quality of water it inhabits, resisting evidently a considerable amount of pollution. Similar resistance may account for the wide distribution of other species.

Ischnura senegalensis (Rambur, 1842).

S. Afr. Mus.: 1 ♀, King Williamstown, Cape Colony; 1 ♂, Dunbrody, Blue Cliff (ii. 1912); 1 ♂, 1 ♀, Newcastle, Natal (1893, A. E. Hunt); 3 ♂, Lorenço Marques (18, 22. xi. 1911); Otjituo, S.W. Protectorate (i. 1920, Tucker). Brit. Mus.: 4 ♂, 4 ♀, Deelfontein (6. i. 1903, Col. Sloggett). Mus. Stockholm: 2 ♂, 3 ♀, Caffraria

(Wahlberg); 1 ♂, 1 ♀, Mashonaland (Marshall). Coll. Ris: 1 ♂, Lorenço Marques, "bord de la mer" (1914, H. Junod). Mus. Hamburg: 2 ♂, 1 ♀, Lorenço Marques (17 . ix . 1911, Michaelsen); 1 ♀, Beira (22 . ix . 1911, *id*).

♂. Occiput and labium whitish. Labrum, anteclypeus, genae, frons not quite to base of antennae green. Postclypeus brilliant metallic blue. Dorsal surface of head otherwise bronzy black; small, circular bright blue postocular spots. Prothorax bronzy black, sides and a narrow anterior border bluish; hind lobe small, shallowly divided in three rounded lobes, the lateral ones very narrow, the median one slightly broader and semi-erect. Thoracic dorsum bronzy black; narrow regular ante-humeral lines bluish, ventral side yellowish

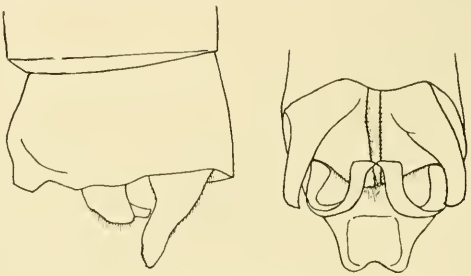

Fig. 42.—*Ischnura senegalensis*, ♂. Blue Cliff. Appendages, right side and postero-ventral view.

white. Legs yellowish, external side of femora broadly, of tibiae narrowly black.

Abdomen moderately stout. Segment 1 blue with a mid-dorsal black band; 2 blue on sides, brilliant metallic blue on dorsum; 5–7 yellowish on sides, bronzy black on dorsum, the yellow colour ascending in very narrow basal rings; 8 blue; 9–10 blue on sides with black mid-dorsal band. Appendages (Text-fig. 42).

Pterostigma narrow, slightly elongate, rhomboid, of equal form in both wings; black in proximal, whitish in distal half in front wing, light greyish ochreous in hind wing.

♀. *a*. (Andromorphous or homoeochromatic form.) Almost entirely similar to male in colour, the only appreciable differences being dorsum of segment 2 bronzy black with only an indication of metallic blue, sides of segments 3–7 rather olivaceous than yellowish. Pterostigma concolorous, greyish ochreous in both wings.

b. (Heterochromatic form.) Light colour on thorax and head bright orange in immature specimens, shading to dull orange, brownish or olivaceous in fully mature specimens. Light colour extended on head, thorax and base of abdomen; postocular spots large, cuneiform, united to pale colour of occiput; prothorax only with a narrow mid-dorsal black band. Segment 1 entirely pale; 2 with a narrow terminal ring and small terminal dorsal spot bronzy black. On the other hand, the eighth abdominal segment is not of the light colour in this form, but bronzy black dorsally, like the preceding and following segments.

Hind lobe of prothorax in both forms similar to male, but narrower and less distinctly trilobed.

♂, *Abd.* 23, *hdw.* 15 mm. ♀, 24, 17.

This species is known from Africa, the islands of the Indian Ocean, tropical and sub-tropical Asia in continental and insular distribution, common in coast districts, perhaps frequenting brackish waters, and consequently omnipresent in collections, be they ever so scanty, brought from those vast regions. The relatively small number of *senegalensis* in our South African collections is rather surprising, and may indicate that at least the temperate parts of the region are beyond the limits of the best conditions for its existence. *I. senegalensis* is the only *Ischnura* known from Africa south of the desert belt. It seems to be common in Eygpt (Cairo, the Pyramids, etc.), and the only *Ischnura* yet found there; but it is not yet recorded from Algeria, Tunisia or Tripolitania, where three other (Mediterranean) species of the genus occur.

AGRIOCNEMIS (Sélys, 1877).

A genus known from the inter-tropical parts of the Old World. The species are probably rather numerous, but very imperfectly known. The analogies (and probably affinities) of *Agriocnemis* and *Ischnura* are striking in colour system as well as in some physiological features.

Some of the *Agriocnemis* species are, in spite of their dwarfed stature and exceedingly fragile frame, found over immense areas (*pygmaea* and *femina*). *Agriocnemis* contains the smallest known species of Odonata.

Agriocnemis exilis (Sélys, 1872; Sjöstedt, 1909).

Mus. Hamburg: 2 ♂, 6 ♀, Beira (22. ix. 1911, W. Michaelsen).

♂. Occiput and labium whitish. Labrum brilliant metallic green. Genae, mandibles and a narrow transverse band in front of antennae light green. Dorsal surface of head otherwise bronzy black; very

small circular blue postocular spots. Prothorax black, sides and anterior margin broadly light green, a very narrow green border at posterior lobe. Posterior lobe moderately broad, semi-erect, nearly semicircular in outline, with a small notch near each lateral end. Thoracic dorsum black, this colour invading the sides to first lateral suture; narrow, complete ante-humeral lines; remainder of sides and ventral side very light green; a minute black dot in dorsal end of second lateral suture. Legs whitish, incomplete black lines on lateral side of femora; indication of two dark rings on second and third femora.

Abdomen segments 1–3 bronzy black on dorsum, with a shade of metallic blue, 1–2 greenish, 3 ochreous laterally; 4–5 ochreous or light orange, with a narrow mid-dorsal dark line, which is enlarged near the end, and followed by a narrow complete orange ring at the

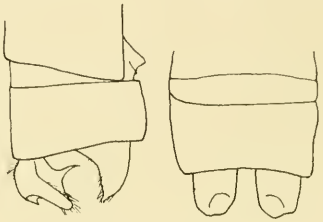

Fig. 43.—*Agriocnemis exilis*, ♂. Beira. Appendages, right side and ventral view.

end of each segment; 7 black dorsally, orange laterally, and in a complete terminal ring; 8–10 bright orange red. Appendages orange red (Text-fig. 43).

Pterostigma greyish ochreous; 6 post-nodal cross-veins in front wing, 5–6 in hind wing.

♀. Labium, ante- and postclypeus orange, very narrow black transverse lines at base of labrum and postclypeus. Postocular spots orange, very large, cuneiform, fused to light colour of occiput. Hind lobe of prothorax trilobate; median lobe very narrow in antero-posterior direction; side lobes nearly semicircular in outline, projecting by about twice the height of median lobe. Thoracic dorsum black in a broad median stripe and a very narrow line in humeral suture; the much enlarged ante-humeral band and side to first lateral suture ochreous or very light orange; rest of sides and ventral side gradually shading through light green to whitish.

Abdomen ochreous or dull orange at sides; dorsum of segments 1–5 bronzy brown, 6–9 black, 10 orange with a basal black spot.

Pterostigma very light ochreous. Post-nodal cross-veins 8 in front wings, 7 in hind wings.

Immature females have abdominal segments 1–6 orange, with very narrow black rings at the joints; in one specimen the dark colour of dorsum appears in narrow and incomplete lines.

♂, *Abd.* 16·5, *hdw.* 10 mm. ♀, 19, 12.

A badly damaged female from Bukama (29. v. 1911, Dr. Bequaert) is probably of the same species (Mus. Tervueren). In Mr. E. B. Williamson's collection there is a pair of *Agriocnemis* from Salisbury, Mashonaland (ii. 1900, Marshall) which probably belong to a different species, but they are too much damaged for identification. The same reservation is to be made for two males in the British Museum collections, one labelled "Marshall collection 1910," without locality, the other one "N.E. Rhodesia, Upper Luangwa River (27. vii, 13. viii, 1910, S. A. Neave)."

Probably several species of the genus exist in the faunal region here discussed, but none is to be expected outside that part of the region where climatic conditions are of the tropical type.

II. Suborder ANISOPTERA.

Anisoptera are the "dragonflies" in restricted sense, the strongly built, swiftly moving and generally larger members of the Order. American authors give, in contrast to them, the name "damsel-flies" to the tiny *Zygoptera*.

The various divisions of Anisoptera are rather different in habits, and some indications regarding them may better be reserved to the single groups. The larger subfamilies are represented in the fauna under discussion by a fair number of species, only the *Cordulinae* being poor; three subfamilies, all belonging to the family *Aeschnidae* and each consisting of a very limited number of species, are absent from the South African as well as from the Ethiopian fauna and not likely to be found there (the oriental *Chlorogomphinae*, palaeo-nearctic *Cordulegasterinae* and the *Petalurinae*, of which a few species persist as a kind of "living fossils" in Australia, Chili, North America and Japan).

C. Lateral lobes of labium of about equal size as median lobe, two-jointed, the terminal joint narrow and pointed (Text-fig. 2). Triangles similar in both pairs of wings, their longer axis in the long axis of the wing; their proximal side distal to the arculus in both wings.

Ante-nodal cross-veins predominantly not coincident in costal and subcostal space; two of them always coincident and crossing the double space as triangular membranes. Proximal anal border of hind wings (*Anax* excepted) excised in males; lateral earlets on second abdominal segment of males . . . . . Fam. *Aeschnidae.*

Ca. Eyes separated by a large space (Text fig. 2). Ocelli free or only partly covered by a transverse ridge.
Costal side of triangle not exceeding considerably in length the proximal side. No radial supplement parallel to vein *Rs.* Female genital opening covered by a vulvar scale. Inferior appendage of male bifid
Subfam. *Gomphinae.*

Cb. Eyes contiguous in the median line for a considerable space. Ocelli situated at the foot of a frontal vesicle. Costal and anal side of triangle considerably exceeding the proximal side in length. A radial supplement roughly parallel to vein *Rs.* Female genital opening armed with an ovipositor in the manner of *Zygoptera.* Inferior appendage of male not bifid . . . . . Subfam. *Aeschninae.*

D. Lateral lobes of labium very large, touching each other in the median line to form a mask-like structure; median lobe very small; no second joint to the lateral lobes (Text-fig. 3). Triangles dissimilar in both pairs of wings; their longer axis in the short transverse axis in the front wing, in the long axis in the hind wing; very often dissimilar also in position; distal to the arculus in front wing, at the arculus in hind wing. Antenodal cross-veins coincident in costal and subcostal space (except in many cases the last one, which remains limited to costal space); all of them equal in structure. Females with vulvar scale. Inferior appendages of males not bifid . . . . . Fam. *Libellulidae.*

Da. Proximal anal border of hind wings excised in males; lateral earlets on second abdominal segment of males. A small projection at the occipito-temporal border of eyes in both sexes. Mostly metallic colours on body
Subfam. *Cordulinae.*

Db. Proximal anal border of hind wings rounded in both sexes; no earlets on second abdominal segment.
No distinct projection (indicated in *Urothemis*) at the occipito-temporal border of eyes. Colour system mostly not metallic
Subfam. *Libellulinae.*

II Ca. Subfamily GOMPHINAE.

Gomphinae are a very homogeneous lot throughout the world in the superficial (though probably phylogenetically very important) character of colour system. Their numerous species show an infinite variation of a pattern of black and yellow, the black parts of which may pass through many shades of brown to light ferruginous or greyish ochreous in the palest forms, whereas the yellow parts may pass to orange or through various shades of olivaceous to pure green, very rarely to blue.

Coloured wings are exceedingly rare in this subfamily.

Almost as uniform as the colour system is the neuration in its principal features and even down to rather minute details; nevertheless a careful investigation (initiated chiefly by Mr. E. B. Williamson) has brought forth a number of pretty constant and systematically valuable differences. To the uniformity in colour and neuration the great and conspicuous variety in the male terminal appendages is in strong contrast. It is natural that these differences, which form an attractive object of study, should have guided the first monographers in their descriptions, and, unfortunately, also in their attempts at a systematic arrangement. Great difficulties arise from this latter point before the student, especially where females alone are at hand. A new disposition of the subfamily, based, not on unisexual characters, but chiefly on neuration, as a bisexual as well as phylogenetically important character, is a need of the time, and the chief lines of such a disposition are drawn by Mr. Williamson for a limited geographical (Oriental) group. This disposition will be followed here as well as in other publications of the writer.

Uniform as their colour pattern is also the manner of life of *Gomphinae* (and both uniformities may well be esteemed interdependent). Their flight is exceedingly swift but not lasting; they mostly stay on the ground, or very close to the ground on low vegetation, rarely ascending to some height in bushes; from their resting-place they take swift flights, darting upon some prey, or upon an intruder of their own or an allied kind, and then return with equal rapidity to their starting-point or alight not far from the same. Most of them are very wary insects, and this quality, together with the highly cryptic character of their pattern in natural haunts, answers for the fact that many *Gomphinae* are very rare in collections, many described from single specimens, and many still to be discovered in the less worked districts of the globe. Perhaps there are more species of limited range in *Gomphinae* than in most other groups of *Odonata*, though wide ranging forms are by no means absent. Where they are better known most species have been ascertained to inhabit running waters, from very slow to quite swift kinds. A few only are known to live in still waters, but the larger number where there is motion in the water, and very few are inhabitants of small ponds and swamps which abound in many other kinds of dragonflies.

Plate XII, fig. 3, gives an idea of the larvae of the more typical groups; the flat body, short labium, elongate and flattened third joint of antennae, fossorial structure of the hard and villose legs are the characteristic external features of the *Gomphus* nymph. But the

subfamily is rich in various adaptations to live on the ground, or even buried in sand or mud; some curious and even grotesque forms exist in tropical Africa.

The South African representation of the subfamily is comparatively poor; but it is not improbable that more species remain to be discovered.

1. Legs short, third femora not reaching beyond the joint between thorax and abdomen. Discoidal field in front wings more distally and less widened than in (2), divergence of M_1 and Cu_1 beginning at the level of nodus or more distally. Between M_{1-3} and M_1 in hind wing a single cross-vein (Plate VIII, figs. 3, 4, 5, 6). Lateral margin of abdominal segments 9, or 8 and 9, foliate.

   Legs long, third femora reaching to the joint between abdominal segments 2 and 3. Discoidal field in front wings much dilated to the border, divergence of M_1 and Cu_1 beginning proximally to the level of nodus. Between M_{1-3} and M_4 in hind wing two cross-veins. No indication of anal loop in hind wing, all branches of A running parallel in about right angles to the anal margin (Plate VIII, fig. 2). Abdomen cylindrical. Lateral margin of terminal abdominal segments not foliate. Superior appendages of male scarcely longer than tenth segment, simple; inferior appendage of about equal length, divided in two widely divergent branches . . . . . *Podogomphus.*

2. A distinct anal loop in hind wing, by convergence of A_3 and A_4 at their beginning and coincidence of cross-veins (Text-fig. 5, Plate VIII, figs. 5, 6) . . . . . 4.

   No distinct anal loop in hind wing, at most some convergence of A_3 and A_4 at their beginning, but no coincidence of cross-veins (Plate VIII, figs. 3, 4). Segments 8 and 9 foliate . . . . . 3.

3. Pterostigma large. Third to seventh abdominal segments comparatively robust. Superior appendages of male but little longer than tenth segment, not approximate nor touching each other in the mid-dorsal line; inferior appendage of about equal length. Structure of female genital segments much as in preceding genus . . . *Crenigomphus.*

   Pterostigma moderate. Third to seventh abdominal segments very slender. Superior appendages of male considerably longer than tenth segment, approximate in the mid-dorsal line, so much as to be contiguous at least in the basal half or two-thirds; inferior appendage considerably shorter, deeply divided in two contiguous branches. Female with vulvar scale broad and comparatively short; on ventral plate of ninth segment a corresponding shallow groove, bordered by a low ridge . . . . . *Mesogomphus.*

4. Anal loop two-celled (Plate VIII, fig. 5). Segments 8 and 9 foliate. Male with appendages much longer than tenth segment.

   Female with vulvar scale and ninth ventral plate much as in *Mesogomphus*

   Onychogomphus.

   Anal loop of more than two cells (Plate VIII, fig. 6). Only the eighth segment foliate at lateral margin. Male with appendages much shorter

than tenth segment. On dorsum of tenth segment an acute process which fits into a groove on dorsum of ninth segment. Female with vulvar scale long and narrow, fitting into a corresponding groove on ventral plate of segments 9 and 10 . . . . . *Ceratogomphus.*

PODOGOMPHUS (Karsch, 1890).

A genus of African, mostly East African, distribution; a small number of species are described from a very limited number of specimens. *Podogomphus* is closely allied to the large palaeonearctic genus *Gomphus*, from which it differs chiefly by the extremely developed third pair of legs; the neural characters, type of genitalia and appendages, and the colour system being much the same as in *Gomphus*.

Podogomphus praetorius (Sélys, 1878).

S. Afr. Mus.: 1 ♂, M'Fongosi, Zululand (xii . 1911, W. E. Jones); 1 ♂, Barberton, Transvaal. Brit. Mus.: 1 ♂, Mazoe, 4000 ft., Mashonaland (29 . xii . 1905, Marshall). Coll. K. J. Morton: 1 ♂, Stutterheim (13 . i . 1908, Miss Fountaine). Mus. Tervueren: 1 ♀, Elizabethville, Katanga (9 . iii . 1912, Dr. Bequaert).

Colours in adult specimens very light yellow with a shade of greenish, and deep black.

♂. Labium, labrum, face and frons yellow; a narrow and slightly diffuse transverse black line in the middle of anterior surface of frons, slightly curved dorsal in the middle to touch an opposite curve of the frontal ridge. Base of frons rather narrowly black (less than one-third of dorsal surface). Vertex black with a narrow laterally incomplete black line at the ocelli. Occipital plate yellow, the free margin narrowly bordered with black, slightly convex, with black lines. On vertex a narrow transverse ridge, rounding the ocelli in a lateral curve; in front of its median straight part a second, more obtuse transverse ridge between the lateral ocelli. Thoracic pattern, Plate IX, fig. 1. Legs robust, the first pair the shorter, third pair very long (femora 10 mm.). Third femora besides the regular two rows of short spines with 3–4 long and very acute spines at the medial, 2–3 equal spines at the lateral side. Legs mostly yellow, black lines on first and second femora rather broad, very narrow on third femora; internal side of tibiae black; tarsi black.

Abdomen slender, segments 1–2 slightly dilated, 3–10 almost regularly cylindrical and comparatively long. Yellow complete lateral black bands from 1 to 10, distant from the lateral margins by slightly

less than their own breadth, and approaching dorsally so that the dorsal yellow band is narrower than each black band. This mid-dorsal yellow band trilobed on segment 2, narrowly interrupted by terminal black rings on the other segments. Appendages (Text-fig. 44) —superior black, inferior yellow with black tips. Genitalia of second

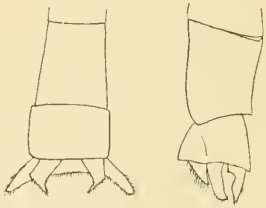

Fig. 44.—*Podogomphus praetorius*, ♂. M'Fongosi. Terminal segments, dorsal and left side view.

segment (Text-fig. 45) yellow, extreme tips of hamuli black, sheath dark brown.

Wings very light greenish yellow to level of *t*, and still lighter from half-way between nodus and pterostigma and to apex. Pterostigma bright yellow between narrowly black veins.

♀. Free margin of occipital plate not deeply trilobate; vertex as in male. Third femora as in male, but spines still more robust, 5–6

Fig. 45.—*Podogomphus praetorius*, ♂. M'Fongosi. Genitals, second segments left, side view.

medial, 4 lateral strong spines. Abdomen more robust, slightly contracted in segments 9–10. Sub-anal plates and supra-anal tubercle yellow, appendages black. Appendages, sub-anal plates, and supra-anal tubercle pointed, all of about equal length. Vulvar scale half as long as ninth ventral plate, comparatively narrow, slightly contracted at the end, where there is a small triangular excision, continued in a furrow over about half the length of the plate.

♂, *Abd.* 36, *hdw.* 31, *pt.* 4 mm. ♀, 38, 34, 4·5.

MESOGOMPHUS (Forster, 1906).

An African genus, probably also embracing some species from India. No doubt it is closely allied to *Onychogomphus*, but the neural character given in the table (p. 340) seems quite constant, and has the advantage of uniting a group which is also distinguished by a peculiar type of male appendages. For the moment I do not know of other than geographical reasons for separating *Mesogomphus* from the American genus *Erpetogomphus*. From a note by M. René Martin it would appear that the larval type of *Mesogomphus* (Hageni) is rather widely different from the *Onychogomphus* larva and approaching *Gomphus*; but I have reasons to suspect that some error of observation has occurred, and that *Mesogomphus* larvae are really of the *Onychogomphus* type.

The name as given by Forster is homonymous with a fossil genus, *Mesogomphus*, named by Handlirsch. But as both publications date apparently from the same month and cannot be dated to a day, I thought it advisable to adopt the name as given for the living group.

Table of Males.

1. Tips of superior appendages parallel, acute. Obscure band of base of frons light ochreous or absent. Obscure markings of thorax limited and comparatively light . . . . . 2.
   Tips of superior appendages divergent, blunt and dentate. Broad black band on base of frons. Obscure markings of thorax comparatively large, dark brown. Costa light yellow. Pterostigma blackish brown *M. cognatus.*
2. Pterostigma dark ferruginous. Superior appendages more robust than in the following species, almost straight at base, strongly curved downward in distal fourth; inferior appendages less than half as long as the superior . . . . . *M. elpidius.*
   Pterostigma light ochreous, encircled by a greyish shade. Superior appendages very slender, curved downward in a gentle curve in their second half; inferior appendage more than half as long as the superior *M. Hageni.*

Table of Females.

1. Pterostigma dark brown . . . . . 2.
   Pterostigma light ochreous, encircled by a greyish shade, between strong black veins. No obscure markings on face and anterior surface of frons. Thoracic markings pale reddish brown, often diffuse . . *M. Hageni.*
2. Face and frons anteriorly without obscure markings. Thoracic markings dull reddish brown (Plate IX, fig. 3). . . . . *M. elpidius.*
   Face and frons anteriorly with black transverse lines. Thoracic markings blackish brown to almost black (Plate IX, fig. 4) . . *M. cognatus.*

Mesogomphus Hageni (Sélys, 1870).

S. Afr. Mus.: 1 ♂, 1 ♀, Waterval, Transvaal (3, 14 . xi . 1899); 1 ♀, Dunbrody, Cape Colony (6 . iii . 1912). Brit. Mus.: 1 ♂, N.E. Rhodesia, Mid. Luangwa, 13–1800 ft. (23–31 . viii . 1910, S. A. Neave). Mus. Tervueren: 1 ♀, Bukama (17 . vii . 1911, Dr. Bequaert). Mus. Rothschild, Tring: 1 ♀ Biskra. Coll. Ris: 1 ♂, 2 ♀, River Errer, Harrar, Abyssinia (vi, vii . 1911, Kristensen); 1 ♂, Eritrea (*id.*); 1 ♂, Tozeur, Tunisia (10 . v . 1913, Dr. A. v. Schulthess).

Dull olivaceous, probably light and rather pure green on head and thorax in living specimens; markings light and somewhat dull ferruginous, slightly variable individually in depth of colour and extent.

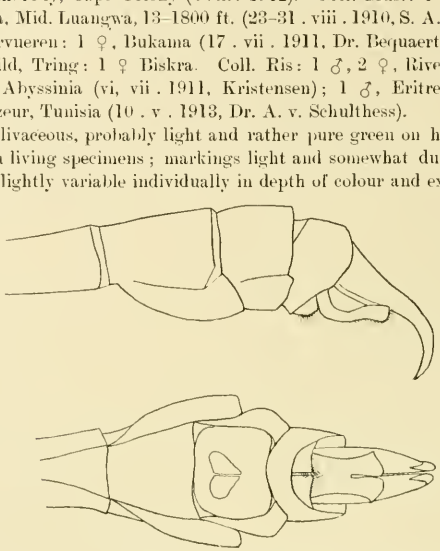

Fig. 46.—*Mesogomphus Hageni*, ♂. Waterval. Terminal segments, ventral and left side view.

♂. Labium whitish. Labrum, face, frons, vertex and occipital plate light green, the only obscure marking being a transverse band across the ocelli on anterior part of vertex and base of frons. Anterior ridge of frons strongly convex, sinuate in the middle, with two irregular lateral groups of black granulations. Free margin of occipital plate slightly concave, a low and indistinct longitudinal ridge on the plate. Vertex projecting in a low, anteriorly convex ridge over the ocelli. Occiput dull ochreous. Thoracic pattern, Plate IX, fig. 2.

Legs olivaceous, spines black; a mere trace of black lines on first and second tibiae; third tibiae blackish internally.

Abdomen very slender, segments 1–2 slightly dilated, 3–7 cylindrical, 8–10 dilated in lateral and dorso-ventral dimensions; lateral margin of 8–9 foliate.

Segments 1–7 dull olivaceous, obscure markings small and rather diffuse: basal half of segment 1; lateral and dorsolateral bands on 2; narrow ring at anterior transverse carina, broader terminal ring and indistinct lateral and posterior spots on 3–6; 7 greenish on anterior, dull ferruginous on posterior half; 8–10 ferruginous, dilatations of 8–9 darker to almost black.

Fig. 47.—*Mesogomphus Hageni*, ♂. Eritra. Genitals, second segment, left side view.

Appendages ochreous, Text-fig. 46. Genital organs of second segment, Text-fig. 47.

Wings hyaline, lightly tinged with greenish yellow in very adult specimens; costa yellow to base of pterostigma; pterostigma, see p. 343.

♀. Very similar to male. No structural differences in vertex and occipital plate. Abdomen considerably more robust; terminal abdominal segments comparatively less dilated. Appendages longer than tenth segment, very fine and pointed, light yellowish, tips black

Fig. 48.—*Mesogomphus Hageni*, ♀. Waterval. Terminal segments, ventral view.

Ventral plate of ninth segment concave, the cavity bordered near the segment's end by a sharp, almost semicircular ridge. Vulvar scale slightly less than one-half the length of segment 9, roughly triangular in outline, excised (Text-fig. 48).

♂, *Abd.* 31 + 3, *hdw.* 23, *pt.* 3 mm. ♀, 32, 26, 3 (Waterval).

♂, *Abd.* 28+3, *hdw.* 22, *pt.* 2·5 mm. (Eritrea). ♀, 32, 27, 3 (Harrar).

No appreciable differences in structure or colour exist between South African, Abyssinian and Algerian specimens of this wide-ranging species.

MESOGOMPHUS ELPIDIUS, n. sp.

S. Afr. Mus.: 2 ♂, M'Fongosi (Zululand, iii, iv. 1911, Jones). Mus. Tervueren: 1 ♀, Kapiri, Katanga (xi. 1912, Legros).

Similar in colour to *M. Hageni*, but obscure markings deeper in colour and more sharply defined.

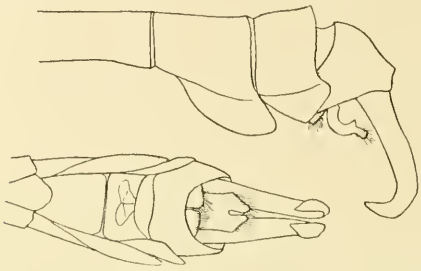

FIG. 49.—*Mesogomphus elpidius*, ♂. M'Fongosi. Terminal segments, ventral and left side view.

♂. Labium dull whitish ochreous. Labrum, face and frons very light yellowish green, light and very diffuse brownish traces at anterior margins of labrum, ante- and postclypeus; brownish transverse band on anterior face of vertex across the ocelli, slightly encroaching on the base of frons. Vertex as in *M. Hageni*; occipital plate without the

FIG. 50.—*Mesogomphus elpidius*, ♂. M'Fongosi. Genitals, second segment, left side view.

longitudinal ridge. Thoracic pattern, Plate IX, fig. 3. Legs dull ochreous; narrow lines on femora and their ends darker brownish; internal side of tibiae, lateral side of third tibiae, tarsi and spines blackish.

Abdomen similar in form to *M. Hageni*, but still more slender, the dilatation of terminal segments being comparatively greater, the lateral foliaceous dilatations of segments 8–9 broader. Dull olivaceous, markings dark ferruginous, very diffuse (both specimens rather dis-

coloured). Segments 1–2 discoloured; 3–7 dorsally a small spot in front of anterior carina and terminal half ferruginous, laterally a spot at the carina and terminal third; 8–10 bright ferruginous, 8–9 darker dorsally at base; foliaceous dilatations blackish. Appendages ferruginous (Text-fig. 49). Genital organs of second segment, Text-fig. 50.

Wing light yellowish, especially along veins; costa light yellowish to base of pterostigma, other venation dark. Pterostigma dark ferruginous between black veins.

Abd. 26 + 3, *hdw.* 22, *pt.* 3 mm.

♀. No certainty exists about the identity of this female with the typical males; but since the thoracic pattern is very much the same, the identification here suggested seems probable. In this female the anterior, dorsally directed branch of the obscure band on second lateral suture is longer and broader, the same colour at latero-ventral border of metepimeron is more developed than in the male figured (Plate IX, fig. 3). The markings of the abdomen seem somewhat different

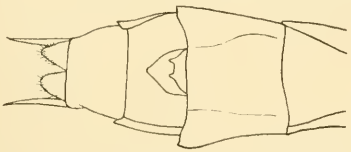

Fig. 51.—*Mesogomphus elpidius*, ♀. Kapiri. Terminal segments, ventral side view.

(in better condition). Abdomen reddish ochreous, a blackish lateral longitudinal line on segments 2–6, dilated dorsally at the anterior carina, and narrowly interrupted at the anterior margin and contracted in the middle of each segment; segment 7 ochreous in basal, dark ferruginous in apical half; 8–10 dark ferruginous. Only a slight indication of the foliaceous dilations on segments 8–9. Groove on ventral plate 9 much smaller than in *Hageni*; roughly triangular in outline; vulvar scale smaller, with broader terminal excision (Text-fig. 51). Appendages very fine and pointed, light ochreous. Yellow line on costal vein narrower than in male. Pterostigma as in male.

Abd. 32, *hdw.* 28, *pt.* 3·5 mm.

Mesogomphus cognatus (Rambur, 1842).

S. Afr. Mus.: 1 ♂, 1 ♀, Waterval, Transvaal (10. x, 14. xi. 1899); 1 ♂, Barkley West, Cape Colony (xii. 1893, L. Péringuey); 1 ♀, White

River, East Transvaal (i . 1910, A. T. Cooke); 2 ♂, M'Fongosi, Zululand (iii, xi . 1911, Jones); Otjituo and Gaub, S. W. Protectorate (i . 1919, Lightfoot). Brit. Mus.: 1 ♂, Cap. Bon Spei (very old specimen); 1 ♀, Natal; 1 ♀, Durban, Natal (iii . 1896); 2 ♂, 1 ♀, Mazoe, 4000 ft., Mashonaland (24, 26 . xii . 1905, Marshall). Coll. E. B. Williamson: 2 ♀, Princetown, Natal (9, 19 . xii . 1908, G. F. Leigh); 3 ♀, Hilton Road, 3800 ft., Natal (20, 21, 23 . xii . 1909, *id.*); 1 ♂ ♀, *in cop.*, Salisbury, 5000 ft., Mashonaland (i . 1900, Marshall); 1 ♀, Umtali, 3700 ft., Mashonaland (xii . 1900, *id.*). Mus. Tervueren: 1 ♂, 3 ♀, Kapiri, Katanga (x, xi . 1912, Legros). Coll. Ris: 2 ♂, River Errer, Harrar, Abyssinia (vii . 1911, Kristensen).

Dull yellowish, markings dark brown to almost black.

♂. Labium light yellowish, points of lateral lobes dark. Labrum, face and frons yellow with blackish marks, the free margin of labrum very narrow, a broader transverse line on base of labrum projecting anteriorly in the median line; anterior margin of postclypeus rather broadly marked; broader transverse band across anterior side of frons, convex dorsally and touching the ridge in the median line; dorsally anterior half of frons yellow, posterior half black, an irregular row of black granulations along the anterior ridge. Vertex dull ferruginous above, passing anteriorly into yellowish, blackish in front across the ocelli. Occipital plate yellow; free margin very slightly convex; anterior surface very shallowly concave with a round, low, central convexity. Vertex almost continuous to occipital plate, very slightly convex, then with a shallow transverse groove and a slightly concave, almost horizontal plane, which ends in a blunt ridge above the ocelli. Thoracic pattern, Plate IX, fig. 4 (slightly variable individually; in some specimens the yellow spot at the ante-alar sinus is fused to the juxta-humeral line, in some the humeral suture is narrowly lined with yellow). Legs yellowish, three narrow, almost complete black lines at the femora; tibiae black with two external yellow lines; tarsi black.

Abdomen moderately dilated at segments 1–2; 3–7 cylindrical, very slender; 8–10 rather considerably extended in lateral and dorsoventral dimensions, foliate dilatations of 8 9 large. Black with yellowish markings; dorsum of segment 1 except a narrow mid-dorsal line; segment 2 dorsolateral bands including a yellow mid-dorsal band, which is narrow in the anterior, broad in the posterior half; 3–7 longitudinal bands, very close to lateral margin, narrowly interrupted at anterior end, dorsally projecting at anterior carina and dilated to form a complete ring at the end of each segment; a narrow mid-dorsal line slightly dilated at the anterior carina, more dilated near the

terminal ring; on segments 3–4 two separate points instead of this latter dilation. Segments 8–9 reddish ochreous; broad slightly diffuse and sinuate latero-dorsal blackish bands; margin of foliaceous dilatations narrowly lined with black. Segment 10 reddish ochreous, dorsally obscure at base. Appendages (Text-fig. 52)—

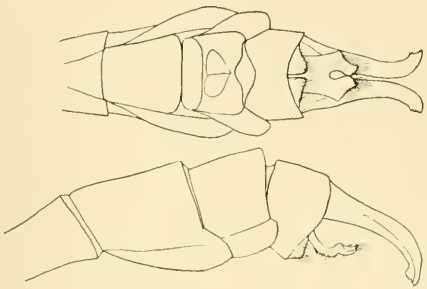

Fig. 52.—*Mesogomphus cognatus*, ♂. M'Fongosi. Terminal segments, ventral and left side view.

superiors reddish ochreous in proximal, blackish in distal half, inferior reddish ochreous. Genital organs of second segment, Text-fig. 53.

Wings hyaline. Costa lined with yellow to base of pterostigma, other venation dark. Pterostigma very dark ferruginous to almost black.

Fig. 53.—*Mesogomphus cognatus*, ♂. M'Fongosi. Genitals, second segment, left side view.

♀. Very similar to male in colour; structure of head much the same. Abdomen rather robust, extension of terminal segments comparatively slight, foliaceous dilatations of segments 8–9 very small. Groove on ventral plate of segment 9 large (similar to *M. Hageni*); vulvar scale scarcely more than one-third the length of segment 9, broadly excised to about one-half its length (none of the

specimens examined is in sufficiently good condition for a drawing). Appendages long and fine, sharply pointed.

♂, *Abd.* 28+3, *hdw.* 24, *pd.* 3 mm. (Waterval) Transvaal; 26+< 3, 22, 3 (M'Fongosi), Zululand; 27+>3, 23, 3 (Harrar). ♀, 32, 28, < 3 (Kapiri); 32, 28, 3·5 (Waterval).

CRENIGOMPHUS (Sélys, 1892).

A small genus, originally established for two Abyssinian species. It does not seem to be separated by very important characters from the group here united under *Mesogomphus*. In case of a fusion of the two genera the name *Crenigomphus* would have priority.

Crenigomphus Hartmanni (Forster, 1898).

S Afr. Mus.: 3♂, 5♀, 1♂♀, *in cop.*, M'Fongosi, Zululand (iii. iv. v, xi, xii. 1911, W. E. Jones).

Colour light greenish yellow and dull ferruginous, the latter colour deeper and better defined than in *M. Hageni* and *elpidius*, but not so deep as in *cognatus*.

♂. Labium whitish yellow. Labrum, face and frons very light greenish yellow. On anterior ridge of frons a narrow brownish stripe not reaching quite to the lateral ends and behind 1–3 irregular rows of black granulations.

Occipital plate and upper surface of vertex duller yellowish than frons. Anterior surface of vertex across the ocelli and base of frons rather broadly brown. Free margin of occipital plate very slightly convex, lined with short yellow hair; on the anterior surface a low round convexity. On upper surface of vertex a transverse furrow near the fronto-occipital suture, the surface ascending from the furrow to a blunt anterior ridge, which, concave in the median line, projects slightly over each lateral ocellus. Thoracic pattern, Plate IX, fig. 5. Legs light yellow; spines, claws and internal side of tarsi black, merest trace of dark lines on tibiae and femora.

Abdominal segments 1 and 2 very moderately dilated; 3–6 rather robust, cylindrical; from middle of 7 gradually dilated to 10, strongly in lateral, less in dorsoventral dimension; tenth segment broadest in both dimensions; foliaceous dilatations of 8–9 moderate. Segments 1–7 rather pure yellow, a shade olivaceous; 8–10 reddish yellow; markings almost black; most of dorsum in segment 1; longitudinal dorsal band on 2 divided by a very narrow mid-dorsal line; 3–6 narrow line at anterior carina and round spot on the last third of dorsum, fused to a terminal ring; lateral longitudinal stripe, narrowly

interrupted at anterior end of each segment; 7 with analogous marking, but no line at anterior and lateral stripe narrower; 8–10 dark on dorsum, with a mid-dorsal light band, complete, narrow and parallel on 8, contracted to a point anteriorly and dilated posteriorly

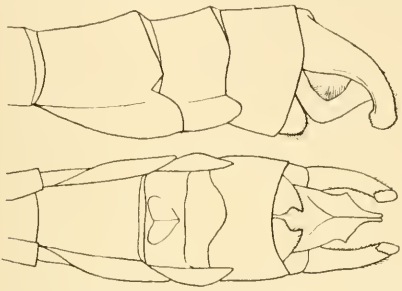

Fig. 54.—*Crenigomphus hartmanni*, ♂. M'Fongosi. Terminal segments, ventral and left side view.

on 9 and 10. Foliaceous dilatations of 8–9 light ferruginous, broadly lined with black. Appendages light yellow, only the extreme tip of the superior blackish (Text-fig. 54). Genital organs of second segment, Text-fig. 55.

Wings rather deeply tinged with yellow, more in the distal half.

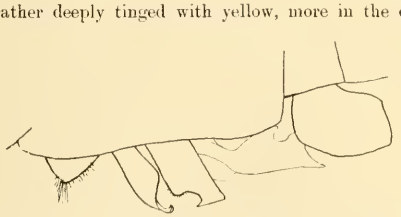

Fig. 55.—*Crenigomphus hartmanni*, ♂. M'Fongosi. Genitals, second segment, left side view.

Costa conspicuously yellow to apex, in sharp contrast to the deep black pterostigma; great part of venation in costal and proximal half of wings ferruginous.

♀. Free margin of occipital plate with a round median projection and on each side with 5 strong black spines. Dorsal surface of vertex divided longitudinally by a deep groove, which begins over the

median ocellus, being about the breadth of the ocellus, and ends posteriorly in a point near the transverse furrow (evidently in copulation the point of the inferior appendage of male fits exactly into this groove). Dark markings of abdomen considerably reduced; terminal spots shorter, pointed anteriorly; lateral stripes very narrow, rather widely distant from the margins. Segments 8–9 but little

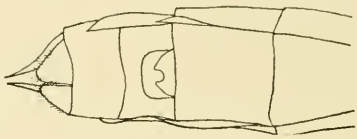

Fig. 56.—*Crenigomphus hartmanni*, ♀. M'Fongosi. Terminal segments, ventral view.

different from male, foliaceous dilatations only slightly narrower. Tenth segment narrow and short; appendages slightly longer, fine, sharply pointed. Groove on ventral plate of segment 9 small; vulvar scale small, triangular, excised (Text-fig. 56). Wings as in male.

♂, *Abd.* 30+2·5, *hdw.* 28, *pt.* 4 mm. ♀, 35, 30, 4·5.

ONYCHOGOMPHUS (Sélys, 1854).

A genus containing numerous palaearctic and oriental species. Of the African species formerly attributed to *Onychogomphus*, the majority are not quite homogeneous and will eventually pass to *Mesogomphus*.

Onychogomphus supinus (Sélys, 1854).

S. Afr. Mus.: 1 ♂, Barberton, Transvaal (xi. 1918); 1 ♀, Kranzkop (21. xii. 1908); 1 ♀, M'Fongosi, Zululand (xi. 1911, W. E. Jones).

Light yellow and deep black.

♂. Labium light yellow, margin of median lobe and tips of lateral lobes blackish. Labrum, face and frons yellow; base of labrum narrowly black; a black transverse line on the median part of the fronto-nasal suture, which line crosses laterally over the postclypeus almost to its lateral inferior angles. Basal half of dorsal surface of frons black; two lateral irregular groups of black granulations near the anterior ridge. Vertex blackish, except the ridge over the ocelli, which is yellow. Occipital plate yellow, narrowly lined with black at the free margin; free margin almost straight, with long black hair.

Vertex joining the occipital plate in an obtuse angle, almost plain and horizontal, forming an obtuse ridge above the ocelli. Thoracic pattern Plate IX, fig. 6. Legs yellow, femora with two black lines, internal side of tibiae and tarsi black.

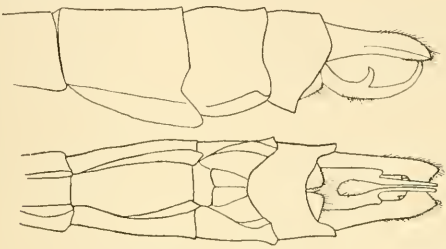

Fig. 57.—*Onychogomphus supinus*, ♂. Barberton. Terminal segments, ventral and left side view.

Abdominal segments 1–2 moderately dilated, 3–6 cylindrical, rather robust, posterior half of 7 to 9 gradually dilated, 10 slightly narrower than 9; lateral margin of 8–9 moderately foliaceous. Yellow, with black markings on segment 2, broad dorsolateral bands, and narrow lines at anterior joint and transverse carina; 3–7 lateral bands, distant from lateral margin by slightly less than their own breadth, narrowly

Fig. 58.—*Onychogomphus supinus*, ♂. Barberton. Genitals, second segment, left side view.

interrupted at anterior end, and dorsally dilated at transverse carina and posterior third of each segment; complete narrow black rings at the end of each segment; 8–9 ferruginous, yellowish at the sides, a dorsal blackish mark on anterior half interrupted on 8 by a sinuate yellow spot, on 9 by two yellow points; foliate dilatations black; 10 black on basal third, yellow posteriorly.

Appendages (Text-fig. 57), superior yellow, inferior black. Genital organs of second segment, Text-fig. 58.

Wings hyaline, costal vein lined with yellow in front. Venation partly ferruginous in basal and costal part of wing. Pterostigma light yellow between thick black veins.

♀. Similar to male, black markings somewhat reduced; black on labrum indistinct, absent on postclypeus; black markings on abdomen comparatively narrower throughout, absent on tenth segment. Appendages and supra-anal tubercle yellow. On free margin of occipital plate two strong spines directed forward and laterally; on anterior surface of plate a small rounded tubercle; vertex as in male. Abdominal segments 7–10 but moderately extended; no foliaceous dilatations on 8–9. Groove on ventral plate of 9 comparatively small; vulvar scale broadly triangular, excised (Text-fig. 59). Appendages comparatively short and robust. Wings slightly tinged with yellow in sub-costal and cubito-anal space.

♂, *Abd.* 31 + 2·5, *hdw.* 28, *pt.* < 4 mm. ♀, 34, 30, 4.

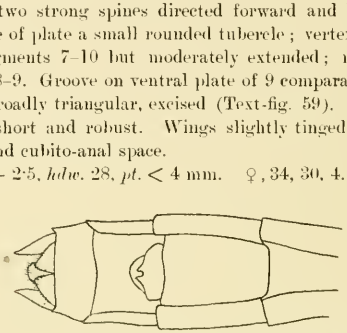

Fig. 59.—*Onychogomphus supinus*, ♀. Kranspoort. Terminal segments, ventral view.

(*a*) A female from M'Fongosi, Zululand (xii. 1911, W. E. Jones) agrees in most characters with the other specimen from this locality, but differs in the following points: (1) Pterostigma almost black, turning to brown only at posterior margin; (2) wings tinged with yellow all over to half-way from base to nodus in costal and sub-costal space, to the triangle in cubito-anal space; (3) vulvar scale more broadly and deeply excised.

Of the occipital spines only the left one is developed, the right one indicated by a rudiment. *Abd.* 33, *hdw.* 29, *pt.* 3 mm. This specimen might belong to a distinct species, but in absence of the male it would not be safe to accept this view.

CERATOGOMPHUS (Sélys, 1854).

This genus was established for the single species here described, which is rather widely different from *Onychogomphus* in its male appendages and female genital segments, though the affinity is clearly indicated by the neural characters.

Ceratogomphus pictus (Sélys, 1854).

S. Afr. Mus.: 1 ♂, 1 ♀. Dunbrody (11. x, 6. iii, 1912); 1 ♀, Waterval (ii,x. 1900). Brit. Mus.: 1 ♂, Salisbury (xi. 1905, Marshall); 1 ♀, S. Africa (very old specimen). Coll. K. J. Morton: 1 ♀, King Williamstown, Cape (4. i. 1908, Miss Fountaine); 1 ♀, Stutterheim, Cape (7. i. 1908, ead). Coll. E. B. Williamson: 2 ♀, Princetown, Natal (28. i, 12. ii. 1909, G. F. Leigh). Coll. Ris: 1 ♀, Botchabelo, 1200 m. (20. ii. 1914, H. Junod).

Yellow at the sides of thorax with a greenish shade; markings sharply defined, black, dark reddish-brown on thorax.

♂. No male in good condition for a description or drawing of structural details was available.

♀. Labium whitish, tips of lateral lobes blackish. Labrum, base of mandibles, genae whitish; face and frons yellow, the following markings black; transverse line on suture of labrum and anteclypeus; narrow sinuate line on anterior margin of postclypeus; narrow line on nasofrontal suture. Dorsal surface of frons yellow, broadly black at base; vertex black with a transversely oblong, dull yellowish spot at the ocelli; occipital plate yellow, narrowly lined with black at free margin. This margin slightly convex with a row of numerous, robust, slightly irregular black spines; anterior surface slightly concave with a low, transversely oblong central tubercle. Vertex at occipital suture slightly convex, transversely rugose; more forward a shallow transverse furrow and then a very slightly concave plane, ending in a sharp transverse ridge over the ocelli. Thoracic pattern Plate IX, fig. 7.

Legs very robust, longer than in preceding species of *Onychogomphus* and *Mesogomphus*, the end of third femora just reaching the joint of thorax and abdomen; femora yellow with black lines, incomplete on third femora; tibiae black with yellow external lines; tarsi black.

Abdominal segments 1–2 moderately extended, 3–8 comparatively robust, cylindrical, 9–10 narrowed. Lateral margins of 8 with broad foliaceous dilatations; similar dilatations only just indicated on 9. Yellow, with black markings; dorsolateral bands on segment 2, which include a trilobate median yellow band; 3–7 lateral bands, interrupted at anterior end of each segment, including a small yellow spot at each posterior end; narrow terminal ring; mid-dorsal line narrowed posteriorly and slightly dilated at transverse carina. On segment 8 lateral bands dilated in middle to touch each other in mid-dorsal line; foliaceous dilatations yellow; 9 yellow, mid-dorsal line and incomplete transverse band in middle black; 10 black with

three yellow points. Appendages and supra-anal tubercle yellow. Ventral surface of abdomen whitish.

For vulvar scale and other structures of genital segments see p. 340, and Text-fig. 60.

Wings slightly tinged with yellowish, especially along the veins. Costal vein, costal and subcostal cross-veins yellow. Pterostigma black.

Abd. 40, *hdw.* 32, *pt.* 3·5 mm.

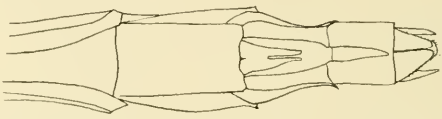

Fig. 60.—*Ceratogomphus pictus*, ♀. Waterval. Terminal segments, ventral view.

The anal loop as described in the table (p. 340), and figured in Plate VIII, fig. 6, is sometimes not fully developed, the transverse veins failing to meet exactly for the formation of its anal side. Such specimens may easily be identified by the structure of the terminal segments, which is very characteristic in both sexes.

II Cb. Subfamily AESCHNINAE.

The largest and most conspicuous *Odonata* of South Africa (and most other regions) are the *Aeschninae*. Everybody, not the entomologist alone, knows the beautifully built, gaily coloured giants of the Order. Their restless hunting of insect prey over every sheet of water as long as there is bright sunshine, their swift movements and keen evolutions never fail to attract the interest and the delight of a thoughtful observer. But what means beauty and delight to the unselfish spectator is often delusion and bitterness to the collecting entomologist, who may observe a great prize for hours without having the chance to get it into his treacherous net. Only a few members of the subfamily are slower in their movements, less defiant, less attached to open water and therefore an easier prey among vegetation, sometimes far from water, in woods, gardens, even in towns. *Aeschninae* are the "dragonflies" in the restricted sense, and the numerous vernacular names in many languages nearly always mean some conspicuous *Aeschna* or *Anax* in preference to other members of the Order. It is difficult to say why these insects have in some regions (as, for instance, in the writer's Swiss home) a very

bad reputation with the people, as being highly dangerous to man and venomous stingers. But dangerous and terrible as they are to any flying insect up to a middle-sized dragonfly, they are utterly harmless to man, and incapable to do the least harm. The long abdomen is a steering apparatus in the mad flight, and the more or less pointed appendages at its end are, as we know, copulatory organs. No sting, no poison, not even a trace of smelling secretion is found either in this group, or any other in *Odonata*. There is a good representation of the genus *Anax* in the fauna under discussion; but otherwise the region appears poor in *Aeschninae*, though discovery of some other species is not improbable.

Larvae of *Aeschninae* (Plate XII, fig. 4) are of a rather uniform type throughout the subfamily. Body elongate, ventral side flat (as in all nymphs of *Anisoptera*), dorsal side convex to almost half-cylindrical shape.

Labium long and flat, its lateral lobes hook-like. Legs long and slender, not fossorial.

1. *Rs* forked proximal to pterostigma; more than two rows of cells between the branches. Between *Rs* and *Rspl* a uniform network of cells, also between M_4 and *Mspl*.
   Origin of M_4 in middle of arculus or slightly behind; origin of M_{1+3} nearer to M_4 than to the costal end of arculus. Proximal anal margin of hind wing excised in male, with anal triangle. (Plate VIII, figs. 7, 8, 9) 2.
   Rs forked distally to middle of pterostigma, costal branch of fork continuing the main direction of sector; fork narrow with but two ranges of cells between the branches. Between *Rs* and *Rspl* a number of small additional sectors parallel and similar to anal branch of fork. Similar structures between M_4 and *Mspl*. Origin of M_4 in front of middle of arculus, of M_{1+3} nearer to costal end of arculus than to origin of M_4. Proximal anal margin of hind wing similar in both sexes, rounded, no distinct anal triangle. (Plate V, fig. 1.) No earlets at second abdominal segment of male. M_2 abruptly bent toward the costa in level of distal end of pterostigma . . . . . 4.
2. Frons and face comparatively broad, more than one-third of the transverse diameter of head. Anterior ridge of frons moderately convex, rounded. Eyes moderately large, their line of contact not much longer than length of dorsal surface of frons. Tenth ventral plate of female not projecting, covered with many fine denticles in distal half. Membranule large. (Plate VIII, figs. 8, 9.)
   Frons and face comparatively narrow, less than one-third of the transverse diameter of head. Anterior ridge of frons produced in an almost right angle. Eyes very large, their line of contact about twice the length of dorsal surface of frons. Abdomen very slender. Tenth ventral plate of female produced in two long, fine, ventrally curved spines. Membranule very small. (Plate VIII, fig. 7) . . . *Gynacantha*.

3. Cells between *Rs* and M_3 not distinctly arranged in rows. End of M_2 slightly and gradually convex towards the costa. (Plate VIII, fig. 8) . *Aeschna.*
   Cells between *Rs* and M_3, in part at least, distinctly arranged in transverse rows, especially a regular supplementary sector in front of and parallel to M_3, distant by one row of cells. M_2 convex towards the costa in a rather abrupt curve in level of distal end of pterostigma. (Plate VIII, fig. 9) . . . . . *Anaciaeschna.*
4. Cu_2 in hind wing following the general direction of Cu_1 throughout, in distal half running to wing's edge parallel to Cu_1 and distant by one row of cells. A supplementary lateral keel on part of the abdominal segments, at least 7–9 . . . . . *Anax.*
   Cu_2 in hind wing circumscribing with base of Cu_1 a roughly quadrangular or circular field with three to four rows of cells, where it approaches Cu_1 to run into parallel direction, but distinct recurrent branch (Plate V, fig. 1). No lateral keels on abdomen . . . . . *Hemianax.*

GYNACANTHA (Rambur, 1842).

A genus of circumtropical distribution. Some isolated species penetrate into higher latitudes in various regions. The two species here recorded are evidently outposts of tropical character and cannot be expected much farther south than the present records. Collectors' notes from far distant regions (Malayia and South America) mention crepuscular habits for at least part of the species, and from their colour system and perhaps also general stature one would deduce that the entire group consists of wood-loving insects. The facies of *Gynacantha* is quite peculiar—much more so than can be said in a few words—and an expert will scarcely ever fail to locate even a male (without the more characteristic female) at the first glance.

Comparatively large species: ♂ *abd.*, 56 + 6·5, *hdw.* 52, *pt.* 4 mm.; ♀, 55 + 5, 55, 4·5. More than 25 ante-cubital cross-veins in front wing. Superior appendages of male excised at internal margin, broadly cut at end. *G. villosa.*

Much smaller species: ♂ *abd.*, 43 + 5, *hdw.* 36, *pt.* 25 mm.; ♀, 47 + 3, 39, < 3. About 15 ante-cubital cross-veins in front wing. Superior appendages of male not excised at internal margin, pointed . *G. manderica.*

Gynacantha villosa (Grunberg, 1902).

Coll. Ris: 1 ♂, 1 ♀, Delagoa Bay (Junod).

This pair was identified in the Schultze paper as *G. bispina*, Ramb., from descriptions alone. I have examined since the types and other specimens of *bispina*, which is certainly distinct, whereas the description of *villosa* agrees perfectly.

♂ (adult, preservation of colours somewhat poor). Labium and

labrum dull ferruginous. Face and frons anteriorly olivaceous. Dorsal surface of frons olivaceous, passing into ferruginous medially, with a brownish-black T-spot; longitudinal part of T-spot narrow,

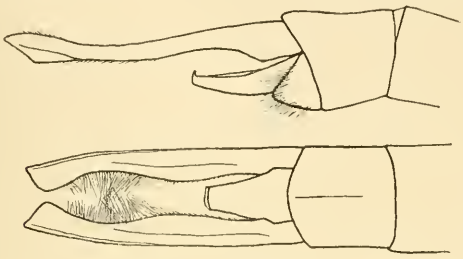

Fig. 61.—*Gynacantha villosa*, ♂. Delagoa Bay. Terminal segments, right side and dorsal view.

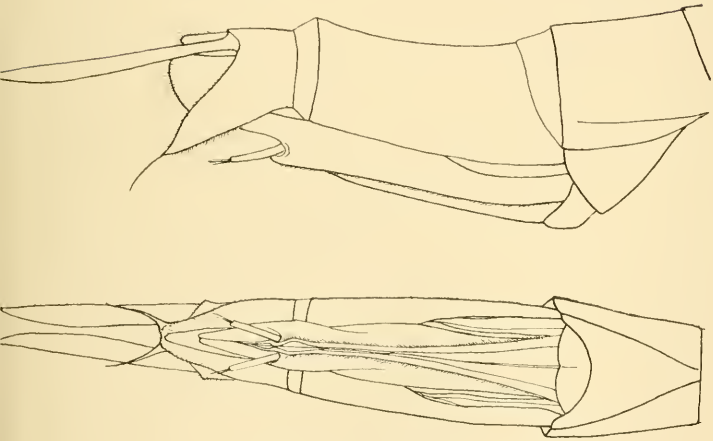

Fig. 62.—*Gynacantha villosa*, ♀. Delagoa Bay. Terminal segments, right side and ventral view.

transverse part filling up the anterior part of front, which is produced to form almost a right angle. Vertex blackish brown. Antennae light ferruginous. Occipital triangle very small, light yellow. Occiput

light greyish ochreous. Thorax short and robust, dorsum densely covered by minute granulations which get scarcer laterally, with dense and rather long greyish pubescence. Dorsum dark greyish brown with a distinct greenish shade; sides and ventral side gradually lighter. Metastigma black. Legs uniform light ferruginous.

Abdominal segments 1–2 moderately enlarged in lateral, very little in dorsoventral dimension; 3 moderately contracted, end of 3–10 almost cylindrical, slender. Earlets of second segment moderate, cut straight with 6 rather robust denticles. Abdomen dull ferruginous, joints and carinae narrowly blackish; no distinct markings (destroyed?). Appendages, Text-fig. 61.

Wings irregularly tinged with greyish yellow (as nearly always in fully mature specimens of *Gynacantha*); sub-costal and cubito-anal space yellowish at base, this colour not deep and rather indistinct. Pterostigma dull ochreous. Venation much denser than in following species (fig. 13 in the Schultze paper).

♀. Very similar to male in colour, somewhat lighter (not so mature). Abdomen more robust, less contracted at third segment. Ovipositor very long and robust, and consequently the ninth segment elongate (6 mm.) and also dilated in dorsoventral dimension (Text-fig. 62).

GYNACANTHA MANDERICA (Grunberg, 1902).

Coll. E. B. Williamson: 1 ♂, Salisbury, Mashonaland (ii. 1900, Marshall). Mus. Tervueren: 1 ♀, Kitompo Fungwe (18. vi. 1911, Dr. Bequaert).

A very distinct species, resembling by its comparatively short and broad wings and small size a type represented by the Asiatic species *G. bayadera*, Sélys. It is the smallest of known African *Gynacanthae*.

♂. Labium and labrum ochreous. Face and frons anteriorly olivaceous. Dorsal surface of frons ochreous in basal half, turning gradually to olivaceous anteriorly. T-spot deep brown, longitudinal part broad, lined by a very narrow light yellowish line; transverse part reduced to a rather small, almost rhomboid dilatation. Thorax greyish olivaceous; dorsum finely granulate, with rather long, fine, whitish hair; a few blackish-brown markings; a round point near the dorsal end of humeral and second lateral suture, traces at the ventral sutures and a transversely triangular spot on metasternum. Legs short. Femora ferruginous, very slightly and gradually darker at distal end; tibiae black internally, light ochreous externally; tarsi black.

Abdominal segments 1–2 considerably dilated, base of 3 much

contracted, end of 3 to 10 cylindrical, slender. Earlets of second segment large, rounded, with 7–8 strong denticles. (Colours not in very good condition.) Segment 1 light ochreous, greyish olivaceous in posterior half of dorsum ; 2 light ochreous at sides, olivaceous in anterior, light blue (probably a very distinct mark in the living insect) in posterior half of dorsum ; 3 8 dull ferruginous, with a black line at transverse carina, and behind the carina a blackish-brown dorsolateral spot, which increases gradually from the third to the eighth segment, and includes on each side a terminal, roughly triangular dull ochreous spot ; 9–10 ochreous with mid-dorsal blackish band. Superior appendages deep black, inferior light yellow ; superior lanceolate, not excised internally, with a not very dense row of fine black ciliae at internal margin, produced into a slender and very acute point ; inferior one triangular, obtuse, between one-third and one-half the length of the superior, not in good condition for a drawing, agreeing well with R. Martin's figure.

Wings hyaline, reticulation in costal and basal part greyish ochreous ; costa light ochreous. Brown, fumose basal mark along the veins in costal, sub-costal and cubito-anal space to first cross-vein. Pterostigma greyish ochreous between black veins. Neuration, Plate VIII, fig. 7.

♀. Very similar to male. No blue on second abdominal segment ; dark dorsal spots of following segments smaller and not so deep in colour. Ninth segment moderate (3 mm.) ; ovipositor similar in structure, but much less developed in dimensions than in *G. villosa*.

AESCHNA (Fabricius, 1775, *emend.*).

A large cosmopolitan genus, not fully homogeneous, most species belonging to the temperate regions of the Northern hemisphere. African species are not numerous. Of our two species one (*minuscula*) is of uncertain affinities ; the other (*subpupillata*) is representative of a group otherwise known from tropical East Africa.

Larger species. On superior surface of frons an oculate mark ; black median basal spot surrounded by light yellow and then by bluish grey. Genital lobe in second segment of male much produced . *A. subpupillata*.
Smaller species. On superior surface of frons a T-spot with broadly triangular base and broad, crescentic horizontal part along anterior frontal ridge. Genital lobe of male not produced . . . *A. minuscula*.

Aeschna subpupillata (MacLachlan, 1895).

Coll. K. J. Morton : 1 ♂, 1 ♀, Stutterheim, Cape Colony (9, 14 . i . 1908, Miss Fountaine).

♂. Labium light ochreous. Labrum, face and frons anteriorly very light greenish yellow; a very narrow and incomplete black line at base of labrum. On dorsal surface of frons a black basal band, narrowly descending along the eyes; fused to that band an almost circular black spot; rather widely separated from this spot a narrow black line on anterior frontal ridge; the black basal spot surrounded by a narrow light yellow line, which is limited anteriorly by the black line on frontal ridge, laterally by greyish blue shades, which do not fully reach the basal black band. Vertex yellow above, black in front. Occipital triangle yellow. Occiput ferruginous with black margin. Thorax dull olivaceous brown, with light yellow markings; narrow ante-humeral bands to about mid-height, slightly nearer to median than to humeral suture; transverse spot in angle between alar sinus and dorsal end of humeral suture; humeral suture narrowly lined with ochreous; two almost equally broad (1 mm.) lateral bands, passing from light yellow to more greenish shades dorsally, distinctly lined with dark brown in ventral half; first band in middle of mesepimeron, bent at mid-height to more nearly vertical direction; second band on middle of metepimeron, slightly widened dorsally and slightly concave anteriorly; a triangular metepisternal spot behind dorsal half of mesepimeral band. Metasterna dark brown with two small yellow spots. Legs robust; femora ferruginous, black at the joints; internal side of first pair light yellow; tibiae and tarsi black.

Abdominal segments 1–2 moderately inflated, 3 considerably contracted, end of 3 to 10 robust with parallel sides. Colour of living insect probably green (or blue) and dark brown in about equal parts, in dead and discoloured specimen dull olivaceous and dull brownish ferruginous. Light (green?) colour distributed as follows: sides of segment 1; complete basal ring on 2, to transverse carina, laterally to the earlets; 3 large mid-dorsal anterior spot to transverse carina, two small triangular spots behind carina, large terminal, lateral, semicircular spots, touching at mid-dorsal line; 4–7 complete basal ring to carina, behind carina each side two median spots, the larger one lateral, the smaller one dorsal, and a semicircular terminal spot; 8 small lateral anterior and large semicircular terminal spot; 9 the semicircular terminal spots alone; 10 ferruginous on anterior, light green on posterior half, the two colours separated by a narrow black line, which is continued posteriorly on the mid-dorsal carina. Ventral surface blackish, second segment dull brown, and also basal lateral small spots on segments 4–8. On first ventral plate a transverse, anteriorly convex field covered with numerous small black spinules. Earlets of second segment small with three dorsally directed spines. Margin of

genital pocket posteriorly (posterior genital lobe) projecting in a long obtuse lobe, which projects ventrally considerably beyond the general outline of abdomen; lobes of both sides touching in median line. On the anterior lamina two long and acute horizontal spines directed backwards; hamuli small (not clearly visible).

Mid-dorsal carina of tenth segment raised in a short tooth in middle of length, obsolete in posterior half, accompanied by one or two slight folds on each side. Appendages (Text-fig. 63) dark reddish brown.

Wings hyaline; costal vein yellow anteriorly, cross-veins in basal and costal part yellowish to nodus, triangle and case of *Cu*. Membranule dull brown, rather broadly whitish at base. Pterostigma very light ferruginous. Reticulation, Plate VIII, fig. 8.

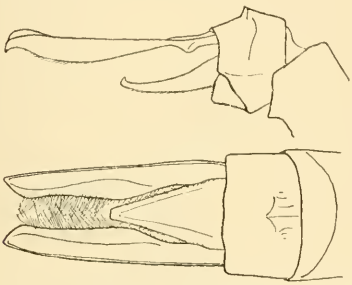

Fig. 63.—*Aeschna subpupillata*, ♂. Stutterheim. Terminal segments, right side and dorsal views.

♀. Labium and labrum darker ferruginous; face and frons anteriorly dull ferruginous with a shade of olivaceous. Frons above as in male. Thorax and abdomen as in male, but dark part of pattern lighter and light parts slightly more extended (discoloured in our specimen); basal dorsal spots present on segment 8 and basal lateral ones joined to terminal spots; 9 light coloured entirely, except a narrow, slightly sinuous transverse anterior line. Ventral plate of first segment as in male; terminal half of tenth ventral plate densely covered with small black spinules. Valvae obtuse, projecting little beyond end of abdomen. Wings as in male; membranule whitish in basal, grey in apical half.

♂, *Abd.* 42 + 5, *hdw.* 40, *pt.* 3·5 mm. ♀, 44 + 4·5, 43, 35.

This pair agrees well with MacLachlan's original description of *A. subpupillata*, but almost as well with Calvert's (earlier) and

Sjöstedt's (later) descriptions of *A. Rileyi*. Nevertheless the present specimens are smaller than the smallest dimensions given for *A. Rileyi*, and I have before me a single female (head lost) of an *Aeschna* from Kapiri, Katanga (Mus. Tervueren, collector Legros, x. 1912), which seems to be specifically distinct from the pair above described and may be the true *A. Rileyi*.

It differs by the following points: (1) Considerably larger (*abd.* 51 + 5, *hdw.* 50, *pt.* 4), and much more robust in thorax and abdomen; (2) lateral bands of thorax narrower, ochreous line at humeral suture and yellow transverse mark in front of antealar sinus absent; (3) membranule wholly dark grey.

Aeschna minuscula (MacLachlan, 1895).

S. Afr. Mus.: 2 ♀ (old specimens, not dated); 1 ♀, M'Fongosi, Zululand (i. 1912, W. E. Jones); Nurugas, Tsintsabis, and Otjiwarongo, S.W. Protectorate (i. 1920, Tucker).

♀. Labium ochreous. Labrum, face and frons anteriorly dull ferruginous. Postclypeus laterally, frons laterally and above light yellow. A narrow black line at base of frons, descending along the eyes; broadly fused to this line a medial black spot, abruptly contracted anteriorly to join a transverse black line on the frontal ridge, thus forming a T-shaped spot. Vertex yellow above, black in front. Occipital triangle light yellow; occiput black. Thorax light golden brown. Yellowish green, narrow, almost complete ante-humeral bands, nearer the median than humeral suture, slightly convergent dorsally. Two very broad (1·5 mm.) lateral bands yellow, shading to greenish dorsally, lined with darker colour in ventral half; anterior one in middle of mesepimeron, posterior one slightly in front of middle of metepimeron. Legs black, basal half of femora ferruginous.

Abdominal segments 1–2 much inflated, 3–5 gradually contracted, 6–10 cylindrical. Ferruginous with light yellow and blackish markings: broad latero-ventral longitudinal bands on segments 1–2, narrow mid-dorsal line on 2; 3–8 basal ventral spot of nearly one-half the breadth and two-thirds the length of each segment, this spot pointed behind and narrowly lined with black on ventral, broadly on dorsal side, yellow; 3–7 small yellow spot behind transverse carina; the carina lined with black; 9 latero-dorsal, triangular yellow spots pointed posteriorly; 10 yellow, except a narrow dark median and basal line. Appendages very short, ferruginous. Posterior half of tenth ventral plate densely covered with minute black spines. Valvae obtuse, short, projecting but little behind the end of tenth segment

(Text-fig. 64). On first ventral plate a flat transverse tubercle covered with minute spinules.

Wings rather rich golden yellow in basal and costal half to distal end of pterostigma. Pterostigma light ochreous.

Membranule white in proximal, blackish in distal half. Costa light yellow; cross-veins to nodus, triangle and *Cu* light yellow. Venation as in *A. subpupillata* in all essential points.

♀, *Abd.* 42 + 2, *hdw.* 39, *pt.* < 4 mm.

MacLachlan's original description agrees perfectly with our specimens, only the wings of the typical pair are hyaline and not yellow; but in a note another female with "wings much tinged with yellowish" is mentioned as "possibly a distinct species." The (later) description

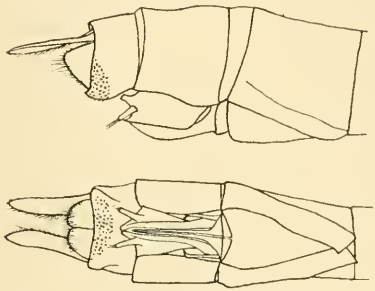

Fig. 64.—*Aeschna minuscula*, ♀. Cape. Terminal segments, right side and ventral view.

of *A. dolabrata* by Karsch agrees also with our specimens so well that I strongly suspect this species to be the same as MacLachlan's.

ANACIAESCHNA (Sélys, 1878).

The genus was originally founded for a single widely distributed and common species, *A. jaspidea*, Burm., which ranges from India to Polynesia, but has not yet been observed in Africa. From this continent a second species was described by MacLachlan from Delagoa Bay; it is evidently less common than *jaspidea* seems to be in its haunts. Our description is taken from an Abyssinian specimen, which agrees with the original description in all essential points. The definition and name of the genus were originally taken from the presence of accessory lateral carinae in the abdomen of *A. jaspidea*. But I find these carinae often indistinct in the female of *jaspidea*, and

altogether absent in the female of *triangulifera*. Therefore I preferred to omit this character from the definition and base it on neural characters.

ANACIAESCHNA TRIANGULIFERA (MacLachlan, 1895).

Coll. Ris: 1 ♀, Camp Hardim, River Hawark, Harrar, Abyssinia (x-xii.1910, Kristensen).

♀ (slightly immature). Labium and labrum dull ferruginous. Face and frons anteriorly olivaceous, laterally light yellow. Frons above light yellow with dark brown markings; broad triangular basal spot, reaching laterally to slightly beyond the base of antennae, broadly fused to a line on anterior ridge, this ridge slightly produced in an obtuse angle. Vertex blackish, with two round yellow spots above. Thorax dark brownish grey, no ante-humeral lines. Sides with two equal, straight, parallel, rather narrow (< 1 mm.) light yellow bands; anterior one obliquely crossing mesepimeron, distant at ventral end by about its own breadth from humeral suture, ending dorsally half way between humeral and second lateral suture; posterior one crossing obliquely metepimeron, distant at ventral end by less, at dorsal end by more than its own breadth from second lateral suture; a small mesinfraepisternal yellow spot. Legs black, extreme base of first femora yellow internally.

Abdominal segments 1–2 much inflated, spherical; base of segment 3 much contracted, the rest relatively long and slender. Dark ferruginous, shading to grey, with blackish and light yellow markings. Blackish: terminal joints of segments rather broadly, transverse carinae narrowly and a diffuse lining of the single yellow spots. Light yellow: a transverse posterior line on segment 1, narrowing dorsally; complete, narrow (< 1 mm.) longitudinal lateral band on segment 2, very narrow transverse line in front of carina of 2, dilated in mid-dorsal line; 3–7 small round spot behind ventral end of transverse carina and narrow transversely triangular spot at dorsal end of same; 8 small latero-anterior spots; 9–10 sides broadly ochreous. Ventral side dull brown, base of 3 greyish yellow, 4–7 small basal yellowish spots. Valvae with a small, very acute spine at ventral angle. Terminal third of tenth ventral plate densely covered with minute black spines.

Appendages narrow, foliaceous, obtuse.

Wings hyaline, very light yellow at base in sub-costal and cubito-anal space. Costa light yellow. Pterostigma ochreous. Membranule white in proximal, dark grey in distal half. Venation, Plate VIII, fig. 9.

♀, *Abd.* 48 + 4·5, *hdw.* 43, *pt.* 3·5 mm.

ANAX (Leach, 1815).

A cosmopolitan genus of large, strongly built and beautifully coloured species, more numerous in the Old than in the New World, some of them very widely distributed.

Probably *Anax* is of typical origin, and has spread to higher latitudes as a result of migratory power and facility of adaptation to various conditions of environment, and on the assumption that a sufficiently high water temperature is available in the period of larval development. The writer's observations of *Anax imperator* in Switzerland seem to indicate that this development is comparatively rapid, being completed in one year, whereas *Aeschna* nymphs, as observed by Dr. Walker in Toronto, Canada, by Dr. Wesenberg-Lund in Hilleroed, Denmark, and by the writer in his Swiss home, need two, or even three and more years to complete their larval life. *Anax* larvae, as far as known, are living in the open water of ponds and small lakes amongst aquatic vegetation and are consequently of the transparent type, vividly coloured green or yellowish and with a highly cryptic pattern. There is evidence that this mode of living in standing water applies also to some of the most widely distributed Odonata of various systematic groups (*Enallagma cyathigerum*, *Anax imperator* and *junius*, *Pantala flavescens*, *Tramea limbata*). The conditions of environment are very much the same for this type of larvae all over the world, checks to be found only in the low temperature and in the competition of other species of their own kind. The phenomenon seems a parallel to the world-wide distribution of the aquatic plants themselves, among which those larvae pass their existence. *Anax* larvae are very swift in movements and voracious feeders, as shown by their rapid growth.

1. Thorax light green. No red colour . . . . . 2.
   Thorax brick red, with a greenish shade at the sides. Most of the body venation and pterostigma brick red. Frons immaculate . *A. speratus.*
2. Abdomen in male light blue with a mid-dorsal sinuate, longitudinal black band; in female green with the mid-dorsal band ferruginous to brown. Frons with a broadly lanceolate or rounded basal black spot and a light blue or greyish transverse band at anterior ridge *A. imperator mauricianus.*
   Abdomen mostly black with small light green spots . . . 3.
3. Very large species, with enormously long abdomen in male. Base of hind wings with a dark brown spot at the membranule Frons with a broadly triangular basal black spot . . . . . *A. tristis.*
   Much smaller species. No blackish-brown spot at base of hind wings. Frons with triangular black marks at base and anterior ridge, the two spots narrowly fused . . . . . *A. georgius.*

Anax speratus (Hagen, 1867).

S. Afr. Mus.: 1 ♂, Rietfontein (19 . x . 1904); 3 ♂, M'Fongosi, Zululand (iii, x, xii . 1911, W. E. Jones); 1 ♂, Umhlali, Natal (i . 1913, K. H. Barnard); Acornhoek, Transvaal (xii . 1918, Tucker). Coll. E. B. Williamson: 1 ♀, Hilton Road, Natal (19 . xii . 1909, G. F. Leigh). Mus. Tervueren: 1 ♀, Baudouinville (30 . iii . 1911, B. Valdonis). Mus. Stockholm: 1 ♀, Congo, 1 ♀, Mukimbungu, Congo (Laman). Mus. Hamburg: 2 ♂, Nguelo, Usambara. Coll. Ris: 1 ♂, Abyssiuia; 1 ♂, Harrar, Abyssinia (1911, Kristensen). Coll. Petersen-Silkeborg: 1 ♀, Asmara, Eritrea (1907, Kristensen).

♂. Lips, face and frons ferruginous, with a very slight greenish shade in some specimens. Thorax brick red, also with a trace of greenish at the sides; latero-ventral sutures with black dots. Legs very long and robust; femora ferruginous, tibiae and tarsi black. Abdomen, the appendages included, brick red, first to second segment faintly greenish laterally. Superior appendages spatulate; median border produced as a broad triangle with point in middle of length; end of appendage an almost circular plate with anterior median border sharply upturned. Inferior appendage half as long as superiors, slightly narrowed distally and shallowly excised at end. Wings hyaline, base light yellow from the costa to vein *A* and to about half way to arculus; venation light brick red in basal and costal part, gradually turning to darker brown towards apical and anal margin; pterostigma brick red; membranule white in proximal, dark grey in distal half.

♀. Similar to male in colour; but the greenish shade much more developed on the thorax, sides of first and second abdominal segment decidedly greenish. Appendages simple, broadly lanceolate. Wings tinged with yellow in the costal part to almost the level of M_4.

♂, *Abd.* 50 + 7, *hdw.* 53, *pt.* 5 mm. ♂, 58 + 6, 59, 5·5.

This *Anax* must be, in the full beauty of living colour, a most conspicuous and elegant insect. Its colour system has analogous though not identical representatives in the Oriental *A. immaculifrons* and the American *A. longipes*.

Anax imperator mauricianus (Rambur, 1842).

S. Afr. Mus.: 1 ♂, Waterberg, Zoutpansberg Distr. (20 . x . 1901); 1 ♂, Salisbury, Mashonaland (17 . xii . 1911); 1 ♂, 1 ♀, Lorenço Marques (24, 27 . ix . 1911). Coll. K. J. Morton: 1 ♂, Dargle, Natal (i, ii . 1909, Miss Fountaine). Coll. E. B. Williamson: 2 ♂, Salisbury

(ii, iii . 1900, Marshall). Coll. Ris : 3 ♂, Delagoa Bay (H. Junod) ; 1 ♀, Lorenço Marques (29 . xi . 1911) ; 1 ♂, 1 ♀, Harrar, Abyssinia (1911, Kristensen). Mus. Stockholm: 1 ♂, Madagascar. Mus. Hamburg : 1 ♂, Nguelo, Usambara ; 1 ♀, Chiroma, Brit. E. Africa ; 1 ♀, Nossi Be ; 1 ♂, 1 ♀, Mauritius (Robilliard).

♂. Labium and labrum yellowish. Face and frons light green. On base of frons a narrow black line, descending very narrowly along the eyes, broadly fused to a black median spot, which is individually variable in outline, more rounded, or broadly lanceolate, more or less pointed anteriorly ; along anterior ridge of frons a broad band somewhat variable in colour between bluish grey and almost pure blue. Thorax pure light green, the latero-ventral sutures lined with blackish. Legs long and robust, black, basal half of second, two-thirds of third femora ferruginous, gradually passing to black distally ; interior side of first femora whitish yellow. Abdomen light green on first and basal third of second segment, otherwise light sky blue ; from segment 2 to 10 a mid-dorsal black band, sinuate by dilatations at transverse carinae and in posterior third of segments 3–7 ; lateral margins and supplementary carinae narrowly lined with black. Appendages black, ventral side of inferior one ochreous ; superiors very slightly convex laterally, strongly convex medially, rounded at the ends ; densely covered with long greyish pubescence in distal half of median margin ; inferior about two-fifths the length of superiors, very little narrowed to end, the end slightly upturned and very shallowly emarginate. Wings very slightly tinged with greyish yellow from the triangles outward. Costal vein light yellow ; pterostigma greyish ochreous ; membranule white in proximal third, black in distal two-thirds.

♀. Abdomen green to bluish olivaceous, all the markings (dorsal band and carinae) dull ferruginous instead of black. Second and third femora ferruginous out to a narrow black ring at the distal joint. Appendages simple, broadly lanceolate. Wings rather deep yellow between triangles and distal end of pterostigma.

♂, *Abd.* 51+5, *hdw.* 48, *pt.* 4·5 mm. ♀, 50+4, 50, 5.

The differences between this form and the European *A. imperator* have been discussed in the Schultze paper (*q.v.*) ; the additional materials here recorded prove once more these differences to be extremely slight. One of the males from Lorenço Marques is stuffed, and shows the ground-colour of abdomen to be of just the same light and pure sky blue that we know in the European form. Indeed, if there was not the old name with a historical right, the writer would scarcely find the African form worthy of sub-specific distinction.

Anax tristis (Hagen, 1867).

S. Afr. Mus.: 1 ♂, Bulawayo, Rhodesia; Grootfontein, S.W. Protectorate (i. 1919, Lightfoot). Mus. Bruxelles: 1 ♀, Kinchassa (26. x. 1899, Waelbroeck). Mus. Tervueren: 1 ♀, Kiambi (19. ii. 1911, B. Valdonis); 1 ♂, Kunga (iii. 1913, Verschueren). Mus. Hamburg: 1 ♂, Quitta, W. Africa (J. Cordts).

♂. Labium and labrum dull ferruginous, gradually passing to blackish at free margins. Face and frons light green; at base of frons a triangular black margin, the obtuse angle of which reaches to half-way between base and anterior ridge. Thorax light green, latero-ventral sutures marked with dull ferruginous. Legs black, femora dull ferruginous at extreme base. Abdomen inflated at base, considerably contracted in segment 3, almost cylindrical, rather slender from end of 3 to 7, gradually widened to the end, to be broadest at segment 9. Segments 3–6 very long, 10 strongly convex dorsally, almost globose. Segments 1–2 light green, terminal joints lined with black, a broad bilobate black spot on dorsum of 2; 3 green to transverse carina, black posteriorly, this colour projecting almost to anterior margin in a narrow mid-dorsal line; 4–7 black, each side with a rounded light green spot at both ends, the anterior spots slightly larger on 4–5, the posterior ones on 6–7; 8–9 black with only the posterior green spots; 10 wholly black. Appendages dark brown; superiors nearly straight at lateral margin, the median margin triangularly projecting with angle slightly beyond the middle; apex truncate, medially rounded, laterally produced in a short point which is the end of the dorsal carina; distal half of median margin densely covered with long brown pubescence. Inferior appendage nearly two-fifths longer than the superior, broadly triangular, truncate and slightly emarginate. Wings hyaline; at base of the posterior a dark golden-brown spot along the membranule; slightly beyond the triangle, between M_4 and anal margin, a diffuse light-brown cloud. Costal vein with a yellowish line; pterostigma dark brown on upper, ochreous on under side of wing. Membranule white in proximal third, black in distal two-thirds.

♀. Exactly similar to male in colour. Abdominal segments 3–6 much less elongate. Appendages comparatively short, foliaceous, elliptic in outline.

♂. *Abd.* 84 + 6·5, *hdw.* 61, *pt.* < 6 mm. ♀, 70 + 4, 63, < 6.

This wonderful insect is one of the largest dragonflies, the female of otherwise regular proportions, the male conspicuous by the greatly elongate abdomen. No doubt it is a powerful flier, and it would be of interest to learn something regarding its habits and behaviour.

ANAX GEORGIUS (Sélys, 1872).

This species is represented by the single male type in the Brussels Museum (formerly Sélysian Collection), a very old specimen, bearing besides other labels of later date an old label in de Sélys' hand—"Vanderh. Timor ? ou Natal ?." There are under the same collector's (Vanderhoffen) name other South African, but also Malaysian and Japanese insects in the collection. The home of this unique specimen remains thus uncertain; if I may venture a supposition, I would rather locate it in Africa than in Malaysia, since it is something of a reduced edition of *A. tristis*, though certainly a very distinct species. De Selys and R. Martin give somewhat summary descriptions. Martin also a coloured figure of the entire insect and a very good figure of its appendages. The following is a more detailed description of the type.

♂ (adult, rather badly discoloured, colours of living insect possibly black and green as in *tristis*). Labium and labrum dull orange. Face and frons anteriorly light green. Dorsal surface of frons greenish, blackish brown at base, this colour triangularly projecting, narrowly fused to a black line at the anterior ridge; this black line bordered by a light bluish-grey band. Thorax badly discoloured, probably light green in life; latero-ventral sutures very slightly lined with brown. Light blue small spot at wing bases. Legs black; base of first femora ferruginous internally.

Abdomen moderately inflated at base, much constricted in third segment, very gradually dilated from end of third segment, broadest at 8–9. Rather badly discoloured, markings not easily distinguished. Segment 1 greenish laterally, reddish brown on dorsum, anterior half depressed, posterior half gradually rising but not above the height of segment 2, the elevated part densely covered with short ferruginous hair. Segment 2 greenish with three laterally incomplete, tranverse blackish bands: behind a first transverse carina which projects angularly hindward in mid-dorsal line, on a second transverse carina with a mid-dorsal dilatation, at posterior margin. Segment 3 black, anterior half of sides whitish, this colour widened anteriorly and narrowly ascending to mid-dorsal line at anterior end; very small, round, lateral dull ferruginous spots near posterior end. Segments 4–8 black, on each side two small, rounded dull ferruginous spots, near anterior and near posterior end; a third spot on segments 7–8 in middle of length between a supplementary and latero ventral carina. 9–10 dark reddish brown (discoloured). Supplementary lateral carinae distinct only on segments 7–9. Appendages dull ferruginous; lateral margin of the superior ones almost straight, bending rather abruptly near the end to the obtusely rounded apex; median margin

not produced in dorsal view, bent downward in a triangular projection near the end in lateral view; dorsal carinae raised towards the end, rather densely pubescent in distal half. Inferior appendage about two-thirds the length of the superior (much longer than in *tristis*), slightly narrowed distally and rather deeply excised at apex.

Wings comparatively narrow; two rows of cells between Cu_1 and Cu_2 in hind wing. Very slightly tinged with greyish yellow; in hind wing a deeper yellowish, diffuse cloud between M_4 and anal margin. Membranule brownish black, whitish at extreme base. Costal vein lined with ochreous. Pterostigma very dark brown, almost black.

Abd. 65 + 5·5, *hdw.* 53, *pt.* 4 mm. Length of segments 3, 13; 4, 10; 5, 10; 6, 9; 7, 5 mm. Breadth: end of 3, 2·3; of 5, 2·8; middle of 8, 4 mm.

HEMIANAX (Sélys, 1883).

The single species of this genus is not widely different from *Anax*. The original definition was based on the absence of supplementary lateral carinae in the abdomen, and a triangular instead of truncate outline of the inferior appendage in the male. Under that definition a second species, the Australian *A. papuensis*, would belong to *Hemianax*. But the supplementary carinae are rather different between species, being sometimes reduced to a few terminal segments, sometimes only faintly indicated (*A. immaculifrons*). The shape of the inferior appendage is obviously not a character of generic value. The genus could be retained by applying the neural detail given in the table page (after Karsch!) as distinctive, although even this character is not of great weight. The field between Cu_1 and Cu_2 in hind wing is variable to some extent, even individually, and specimens approaching the *Hemianax* condition may occur in various species of *Anax*. The venation of the single *Hemianax*, as reproduced in Plate V, fig. 1, shows a wonderful example of highly elaborate specialisation, not by reduction of elements (as in many other Odonata), but by differentiation of the single elements: strengthening or weakening of veins, relative disposition of the various morphologically important forks and ramifications, fusion of cross-veins to form supplementary sectors in the various principal fields, etc. In all those points the *Hemianax* wing surpasses still the already highly specialised *Anax* neuration; and it may well be asserted that *Hemianax* has the most beautifully organised wing of all living *Odonata*. I suppose that a mechanical expert (which I am not) would find great delight in a study of this marvellous work of Nature.

HEMIANAX EPHIPPIGER (Burmeister, 1839).

S. Afr. Mus.: 1 ♀, Barberton, Transvaal (i. 1912, H. Edwards); 1 ♀, Salisbury, Mashonaland (x. 1910); at sea on SS. "Eurypides," 2° 4′ S., 10° 12′ W. Mus. Hamburg: 1 ♂, Delagoa Bay (1893, W. Joost). Coll. E. B. Williamson: 3 ♂, 1 ♀, Mashonaland (xi. 1900, Marshall).

♂. Face and frons light yellow; at base of frons a broadly triangular black mark and a rather broad black line on anterior ridge, the two marks not fused. Thorax light greyish ochreous, passing gradually to light greenish-yellow shades at the sides. Latero-ventral sutures broadly lined with black; stigma and a small point above it black. Legs moderately long, not robust; black, extreme base of third femora ferruginous, first femora light yellowish internally. Abdomen moderately inflated at base, slightly constricted in third segment, rather slender and very gradually widened from end of 3 to 10. Segment 1 light yellowish laterally, greyish dorsally; 2 light yellowish laterally, brilliant sky blue dorsally (often discoloured in dried specimens); 3–7 ochreous to light ferruginous, with a narrow, sinuate, mid-dorsal blackish band; 8-10 blackish brown with large posterior lateral ochreous spots. Appendages ferruginous; superior in dorsal view gradually convergent in last third, to end in a rather sharp point; on lateral view the broad dorsal fold rises to a pointed tubercle at beginning of distal third. Inferior appendage not quite one-half the length of the superior, broadly triangular, its lateral ridges each armed with a row of dorsally directed sharp black spines.

Wings very slightly tinged with yellowish grey, with a broad cloud of deeper yellow in hind wing between M_1 and anal margin. Venation in great part light ochreous. Pterostigma ferruginous. Membranule white at base, passing gradually into light grey at the wings' edge.

♀. Very similar to male in colour, but apparently no blue on dorsum of second abdominal segment. Appendages foliate, rather broadly elliptical in outline, with pointed apex.

♂, *Abd.* 40 + 5, *hdw.* 43, *pt.* 5 mm. ♀, 38 + 4·5, 47, 5.

The species has a very wide range over the whole African continent, Asia to Turkestan and India and the islands of the Indian Ocean; it is found, at least casually, in Mediterranean Europe, and isolated specimens have even been taken in the British Isles, in Belgium and in Switzerland. Various records testify to it being a wanderer and sometimes assembling in immense numbers. It is repeatedly found in desert regions (as in Egypt and in oases of the Sahara). Its colour system is strikingly desertic. The larva is as yet unknown.

II D. Family LIBELLULIDAE.

II Da. Subfamily CORDULINAE.

As shown in the table (p. 338), it is not possible to give a short definition of the two subfamilies of *Libellulidae* without giving at least one unisexual character (the angulate hind wings of male in *Cordulinae*), and even this character is not universal, as it is wanting in the rather important genus *Hemicordulia* (like *Anax* in the *Aeschninae*, and also like *Anax* a highly specialised type). The only bisexual character of *Cordulinae*, the temporal projection of the eyes, is rather inconspicuous and also suffers exceptions, since a few *Libellulinae* (of the group *Urothemis*) show similar projections. Other characters of *Cordulinae* are also unisexual: semitransparent narrow lamellae at interior margin of tibiae in males (strictly proper to *Cordulinae* if confronted with *Libellulinae* alone, but present also in *Chlorogomphinae*); strongly developed and differentiated terminal appendages in males (a character of only relative value, more for the *Cordulia*- than for the *Macromia*-line of the subfamily); unbranched hamuli in genitalia of male (regular for all the *Cordulinae*, but existing also in not a few *Libellulinae*); a pair of anterior hamuli visibly developed, against the anterior lamina of same organs, seems more characteristic for the *Macromia*-line, though existing in rudiments also in the *Cordulia*-line. The bisexual character of predominant metallic colours is a very conspicuous one, though not fully distinctive: there are some *Cordulinae* with no metallic colours, and not a few *Libellulinae* with highly metallic ground-colour or pattern. With all these exceptions and restrictions the two subfamilies are well justified, and an expert will scarcely ever have a moment's doubt about the correct placing of any given specimen.

Cordulinae are much less homogeneous than *Libellulinae*; evidently some very ancient developmental lines have been retained and exist in a few, now isolated, representatives. Various attempts to a rational classification have been recently made; the best of them (according to the writer's opinion) is by Mr. E. B. Williamson. Without regard to minor and partly intermediate groups two main branches may be distinguished: the *Macromia*-line with *Aeschnid* (more especially Chlorogomphine) affinities in general build and also to some extent in venational characters, and the *Cordulia*-line which approaches *Libellulinae* in both these characters.

In Africa only the *Macromia*-line is fairly represented, and only a few members of this line are met with in our present faunal limits.

Cordulinae, as far as known to the writer by personal observation and as far as precise records exist, have in common a peculiar manner of flight. Their motion is particularly sustained, even more so than in *Aeschninae*, and the same individual may be, with sufficient patience, observed for an almost indefinite time planing to and fro without a moment's pause, and they stand—this particular motion is more developed in them than in any other group of dragonflies—often for a long time on the same point. Their particular manner of motion makes some of them an easy prey, as the collector will know perfectly where the insect will turn up within a short time and be within reach of his net. But he must not wait to see his *Cordulina* taking rest; he might wait for half an hour or more and then see it fly suddenly away; the very regularity of the motion makes a stroke at the flying insect pretty efficacious. But this is not the rule; in most species the flight is not only sustained but also exceedingly swift, and the insect, moreover, defiant, and not ready to leave the open water or some high level over a forest road. This may be particularly the case for the *Macromia*-line of the subfamily, as proved in Mr. Williamson's interesting report. Material from the exotic regions, where dragonflies have rarely been collected by specialists, is scarce, and descriptions are often made from a few, or even from single specimens.

There is no other group of large, conspicuous and beautiful forms amongst *Odonata* where our knowledge is so poor and so fragmentary as for the *Macromia*-group of Cordulinae. Only the North American species are now well known, and even these only since a few years. The material at our disposal for the present paper is fragmentary. The existence of a greater number of species in the temperate part of the country does not seem probable, but a few more may be expected from these parts where tropical conditions of climate prevail.

Corduline nymphs of the *Macromia* groups are similar to *libelluline* nymphs (see before) in structural details, but characterised by their exceedingly long legs and a cylindrical horn-like process on the frons. They may be looked for in standing as well as in running waters.

MACROMIA (Rambur, 1842).

The African *Macromia*, all or part of them, may at some later date be separated from the main body of the genus; a fraction has even been placed in a subgenus (genus according to R. Martin) *Phyllomacromia* by de Sélys. The characters given for *Phyllomacromia*

as distinct from *Macromia* are: (1) a single row of post-trigonal cells; (2) eighth segment of male dilated, sides foliaceous; (3) tenth segment not raised; (4) superior appendages of male not dented externally. Unfortunately this definition will not hold good even with the very limited material seen by the writer: (1) is an unusually variable character just in the group under discussion; differences are mostly sexual, but also individual; (2) seems a good character, though it will probably not unite all species of real affinity; (3) is evidently of no generic value; there are species otherwise very closely similar with a plain tenth segment in males (*M. africana*) and with dorsally pointed tenth segment (*M. picta*); (4) seems a good character, although unisexual, but it seems to be common to all African *Macromia*, not to the Sclysian *Phyllomacromia* alone. Most probably a definition can be found to characterise the whole of the African *Macromiae*—under the name *Phyllomacromia*—but the definition cannot be attempted here owing to a lack of the greater number of described species. Also I prefer not to adopt the name *Phyllomacromia* here, with a definition that would be in flagrant contradiction to the one given it by its author; it seems better to record our few species under the general name of *Macromia*.

1. Pterostigma black. Abdominal segment 3–6 at most with a bilobate transverse yellow band in anterior third. Superior appendages black. Pointed elevation of tenth segment in male almost as high as the rest of the segment 2.
   Pterostigma ochreous or light ferruginous. Abdominal segments 3–6 basal half to basal third yellow, a mid-dorsal black spot in the yellow ring producing a pupillate pattern. Superior appendages ochreous. Pointed elevation of tenth segment in male about one-half the height of the rest of the segment . . . . . *M. picta.*

2. Face and frons ferruginous, with small greenish spots at the sides and in the median furrow of frons. Abdominal segments 5–6 wholly black in male, with very small dorsal yellow spots in female. Inferior appendage of male of about the same length as the superior; superior parallel. Hamuli black, with an ante-apical transverse ridge light yellow. Posterior end of dorsal ridge of ninth segment projecting as a sharp spine. *M. thetis.*
   Face and frons anteriorly ferruginous with a crescentic spot on post-clypeus yellowish; a broad light yellow band on dorsal surface of frons, descending along the eyes to lateral ends of post-clypeus. Abdominal segments 5–6 with dorsal yellow spots in male (female unknown).
   Inferior appendage of male sensibly shorter than superior; superior diverging posteriorly. Hamuli wholly black. Dorsal ridge of segment 9 not projecting in a posterior spine . . . . . *M. clymene.*

Macromia picta (Sélys, 1871).

S. Afr. Mus.: 1 ♂, Barkley West (xii . 1893, L. Péringuey); 1 ♂, Durban, Natal (iv . 1890, J. H. Bowker); 1 ♂, Barberton, Transvaal; 1 ♀, Kranspoort (21 . xii . 1906). Coll. K. J. Morton: 1 ♂, Eshowe, Zululand (4 . iii . 1908, Miss Fountaine); 1 ♀, King Williamstown, Cape Colony (3. i. 1908, ead.). Coll. E. B. Williamson: 2 ♂, 1 ♀, Hilton Road, Natal, 3800 ft. (23 . xii . 1909, G. F. Leigh); 1 ♀, Princetown, Natal (20 . iii . 1909, *id.*). Mus. Hamburg: 1 ♂, Bothaville, Orange Free State (8 . xi . 1898, Dr. H. Brauns).

♂. Median lobe of labium light ochreous with black longitudinal line; lateral lobes dull ferruginous, gradually turning to ochreous medially. Labrum ferruginous with two basal yellow spots (confluent to form a transverse band in the specimen from Bothaville); ante-clypeus olivaceous; post-clypeus olivaceous in anterior half, yellowish in posterior half and at the sides (almost wholly yellowish in the specimen from Bothaville). Frons ferruginous anteriorly; dorsal surface black at base, with an anterior bright yellow band that descends along the eyes (the yellow band broadest in the specimen from Bothaville); vertex black, with small double yellow spot at tip to yellow with black base. Occipital triangle yellow. Thorax dull ferruginous with metallic blue reflections and light yellow bands: rather broad ante-humeral stripes, slightly convergent dorsally, not fully reaching to ante-alar sinus; broad transverse band filling up the ante-alar sinuses; first lateral (metepisternal) band crossing the stigma, rather conspicuously widened dorsally; second lateral (metepimeral) band filling somewhat less than posterior half of metepimeron, also widened dorsally.

Legs very long and robust, dark brown to blackish; third femora ferruginous, at least internally; first femora light yellow internally in basal two-thirds. Tibial laminae along the full length of third pair, distal half of first pair, absent on second pair.

Abdominal segments 1–2 moderately inflated, 3 moderately constricted, 4–6 cyliudrical, 7–9 dilated in lateral and more in dorsoventral dimension, the sides of 8 projecting in a triangular, foliaceous extension; 10 small, dorsum elevated in a conical tubercle of about one-half the segment's height, very sharply pointed. Segments 1–2 dark brown, 3–6 black, 7–10 dark ferruginous with light yellow markings; on segment 2 sinuate transverse band, over the auricles, posterior ventral incomplete narrow band from the genital lobe to one-half the segment's height; segment 3 complete narrow basal ring and anteriorly bilobed median spot; 4–6 basal

ring and sub-median dorsal bilobate spot confluent at the sides, the black colour thus forming a rhomboid mid-dorsal spot within yellow ground; 7 basal yellow ring to nearly one-half the segment's length; 8 narrow transverse lines near anterior end not quite reaching to lateral nor to mid-dorsal line and a very narrow line at posterior margin to two-thirds of the segment's height; similar terminal narrow line on segment 9; 10 ferruginous, gradually turning to yellowish in posterior half.

Superior appendages light ochreous, rather widely distant, parallel; inferior appendage very little shorter, broadly cut at end, ochreous, bordered with fuscous. Genital organs of segment 2: anterior lamina small, not elevated; behind this, two obtuse vertically projecting lobes (anterior hamuli); these lobes and the lamina clothed with long ferruginous hair. Hamuli strong, roughly rhomboid in outline, with their fine point curved outwards, an obtuse ridge running from the dorsal posterior to the ventral anterior angle; black, the fine point yellowish. Lobe projecting very nearly as much as the hamule, nearly rectangular in outline, with rounded edge.

Wings hyaline, slightly tinged with greyish yellow in highly mature specimens. Pterostigma light ferruginous. Costal vein rather broadly lined with yellow. Membranule whitish to greyish. A single row of cells in beginning of discoidal field in both front and hind wings; between Cu_1 and Cu_2 in hind-wing but once, at base, two cells, otherwise a single row. Reticulation (Plate X, fig. 1) less variable than in female.

♀. Slightly more robust than male, but very similar in shape and colour; the terminal abdominal segments chiefly dilated in lateral, much less in dorsoventral dimensions. Yellow markings of abdomen slightly more extended than in male, the pupillate pattern approximately developed also on segment 3. Appendages short. Genital segments much as figured for the following species, but the very small valvular scale more deeply excised.

Wings light golden yellow from slightly beyond the nodus to near the tip, and with the base golden yellow to first antenodal and first cubito-anal cross-veins (yellow colour least of all our specimens in the one figured—Plate X, fig. 1). Neuration much more dense and much more variable than in male. The specimen figured is nearest to the male of all those examined. Others show evident transition to conditions of following species, mostly so the specimen from Hilton Road: fully two rows of discoidal cells in both front wings and right hind wing, one cell but twice in left hind wing; fully two rows between Cu_1 and Cu_2 in right hind wing, two rows twice interrupted by single

cells in left hind wing. The other specimens are intermediate between this condition and the figured pair of wings.

♂. *Abd.* 40, *hdw.* 34, *pt.* > 2 mm. ♀, 40, 36, > 2.

The nomenclatorial questions regarding this species have been discussed in the paper on Schultze's voyage. I have no reason not to follow now the conclusion there arrived at.

Macromia thetis, n. sp.

Brit. Mus.: 1 ♂, Chirinda Forest, Gazaland, 3600 ft. (9. x. 1905, G. A. K. Marshall); 1 ♀, Mazoe, 4700 ft., Mashonaland (28. xii. 1905, *id.*). S. Afr. Mus.: 1 ♀, Barberton, Transvaal.

♂. Labium light yellow, an oblique fuscous stripe on lateral lobe. Labrum ferruginous. Ante- and postclypeus ferruginous with an olivaceous shade. Frons ferruginous in front and dorsally, olivaceous laterally turning to yellowish towards the eye; base rather broadly, but diffusely darkened and metallic blue, a small and diffuse yellowish spot in the very deep furrow. Vertex blackish, with metallic blue sheen, diffusely turning to ochreous above and in front. Occipital triangle black; occiput very dark ferruginous. Thorax dark ferruginous, marked with greenish yellow and black, with metallic blue sheen. Yellowish: narrow line on median suture; ante-alar sinus; broad antehumeral band, beginning on mesinfraepisternum, just touching ventral end of humeral suture, distant from dorsal end of same suture by about one-half of its own breadth, not quite reaching to ante-alar sinus; first lateral band at the stigma, broader by about one-half; second lateral band somewhat less than posterior half of metepimeron. Blue-black; diffuse stripes bordering the yellow bands, the antehumeral one behind, the first lateral one on both sides and the second lateral one in front. Legs robust, very long, black, base of femora diffusely dark ferruginous. Tibial laminae as in *picta*.

Abdominal segments 1–2 moderately inflated, 3–6 slender, cylindrical; 7–10 scarcely dilated in lateral, much in dorsoventral dimension; lateral margin of 8 broadly rounded, not distinctly foliaceous; ninth and tenth segment, see p. 376 and Text-fig. 65. Segment 1 dull ferruginous, an indistinct yellowish spot at ventral margin; 2–6 black, 7–10 dark ferruginous, with yellow markings: segment 2, complete transverse band, touching anterior end at ventral margin separated from end in mid-dorsal line by a ferruginous space; narrow line bordering genital pocket and lobe; 3 narrow, dorsally interrupted basal ring and submedian bilobed dorsal spot; 4 very small submedian dorsal double spot; 5–6 wholly black; 7 complete basal ring

to about one-third length of the segment's length; 8 very small spots at ventral margin. Appendages blackish; superior parallel in dorsal view, narrow, gradually narrowed to end, obtuse; in side view very slightly curved downward; inferior appendage of about equal length, squarely cut at end. Genital organs on segment 2 similar to *M. picta*; a transverse obtuse ridge on anterior lamina densely fringed with black hair; hamuli broadly elliptical in outline, curved points turned hindward and laterally, a transverse ridge conspicuously yellow, the hamule otherwise blackish. Lobe larger than hamule, almost rectangular, inclined to an angle of about 45°.

Wings hyaline; costal vein black with a very narrow yellow line. Pterostigma black. Minute brown spot at base of hind wings from *C* to *A*. Membranule white in proximal, diffusely light grey in distal half.

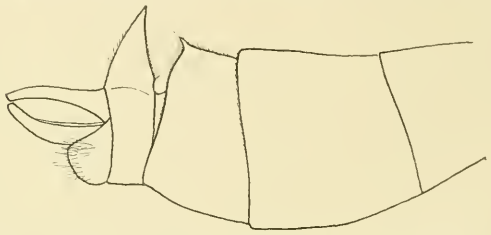

Fig. 65.—*Macromia thetis*, ♂. Chirinda Forest. Terminal segments, right side view.

Ang. $\frac{16\frac{1}{2} \cdot 16}{11 \cdot 11}$, *Cuq.* $\frac{5 \cdot 5}{4 \cdot 4}$, *ht.* $\frac{5 \cdot 5}{2 \cdot 2}$; in front wing two rows of discoidal cells to level of bridge; in right hind wing 3, in left one 2 cells running from M_4 to *Cuq*.

♀. Similar to male. Sides of frons and postelypeus at the eye more distinctly yellowish. Thorax as in male. Abdomen more robust, very little dilated on segments 7–9; yellow markings generally slightly more extended, except in second segment, where the transverse band appears dissolved into four spots; on segment 3 the narrow basal ring is very nearly complete and the submedian dorsal spots extend posteriorly beyond the transverse carina; 4 submedian spots almost as on 3 and also minute spots behind the carina; 5–6 very minute submedian spots. Appendages short, sharply pointed, black; supra-anal tubercle with a sharp dorsal keel. Genital segments as in Text-fig. 66, a conspicuous light yellow spot on the otherwise obscure ninth ventral plate.

Wings hyaline, very light golden yellow from nodus outward; very small golden yellow basal spot. Costal vein wholly black. *Anq.* $\frac{14\,(\frac{1}{3})\,.\,15\,(\frac{1}{2})}{10\quad .\quad 11}$, *Cuq.* $\frac{7\,.\,6}{4\,.\,5}$; in front wings two rows of discoidal cells to level of bridge, also in hind wing; two full rows of cells between Cu_1 and Cu_2 in hind wing.

♂, *Abd.* 48, *hdw.* 39, *pt.* < 3 mm. ♀, 50, 43, 3.

The above description is made from the typical pair in the British Museum; the ♀ from Barberton is very probably of the same species. It is immature, smaller (*Abd.* 40, *hdw.* 40, *pt.* 3 mm.), and has the wings richly coloured with golden yellow, darkening to brownish at base, as

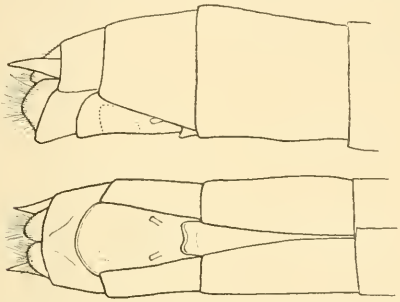

Fig. 66.—*Macromia thetis*, ♀. Mazoe. Terminal segments, right side and ventral view.

shown in Plate X, fig. 2. Of existing descriptions *Phyllomacromia aequatorialis*, Mart., comes nearest to this species, but it must be a considerably smaller species, its yellow markings still more reduced, the frons is metallic black above, the pterostigma brown, a single row of discoidal cells in front wing of male; *aequatorialis* is said to come from "Afrique occidentale."

Macromia clymene, n. sp.

Mus. Tervueren: 2 ♂, Kapiri, Katanga (x. 1912, Legros).

Very similar to preceding species. Nenration of the same type, having two rows of discoidal cells in frong wing, a short stretch of but one row in hind wing. A single row of cells between Cu_1 and Cu_2 in hind wing throughout, or two cells but once at the beginning of this field.

The differences are as indicated in the table (p. 376) to which may be added: antehumeral yellow band broader, fused to yellow of antealar sinus in one specimen, very nearly so in the other one; basal yellow ring of segment 7 much broader, between one-half and two-thirds of the segment's length; dorsal process of tenth segment slightly smaller and different in shape, as shown in Text-fig. 67.

Abd. 51, *hdw.* 41, *pt.* 2–5 mm.

These differences, slight as they are, may safely be claimed as specific, since differences in colour appear together with other structural ones. Especially important is the presence of a frontal yellow band in *clymene*. The pair of forms here described recalls another pair

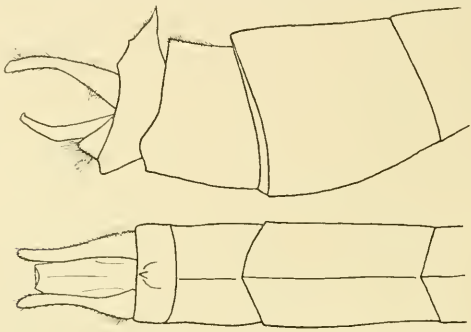

Fig. 67.—*Macromia clymene*, ♂. Kapiri. Terminal segments, right side and dorsal views.

closely similar to each other—*terpsichore*, Forst., and *melpomene*, Ris, from New Guinea, which we have good reasons to consider as distinct species. Mr. Williamson's studies on North American *Macromia* give also evidence of specific differences being sometimes very slight in this genus.

II De. Subfamily LIBELLULINAE.

In a collection of dragonflies from almost every region of the globe individuals belonging to this systematic unit will probably be in majority over those of all the other units taken together, supposing that the material is not accumulated by a specialist more interested in it than in groups. *Libellulinae* are numerous in species, many of these

common where they occur, and little given to hiding; although swift flyers, they often settle on vegetation or on the ground, and are therefore an easier prey than *Aeschninae* or *Cordulinae*; many of them are not very particular about the kind of waters they inhabit, the great majority preferring standing water, from large areas down to pools and swamps. Most species are wide ranging, some occurring over immense areas, either without any appreciable differences or with division into subspecific forms in various degrees of divergence. Three species of the present fauna occur as well in South Africa as in Mediterranean Europe (*Orthetrum chrysostigma*, *Crocothemis erythraea*, *Sympetrum Fonscolombei*); others are more of the inter-tropical type and occur only at the frontiers of both faunae—European and South African, but not commonly (*Orthetrum trinacria*, *Trithemis annulata*); a good number are common to the entire African continent, or at least

Fig. 68.—*Orthetrum trinacria*, ♂. East Africa. Genitalia, second segment, left side view.

to the region south of the desert belt; others are found even beyond this limit in parts of tropical and sub-tropical Asia, etc.

The subfamily is morphologically a very homogeneous unit; there are many constant and important differences in venation between genera and groups of genera, but the differences are mostly slight or inconspicuous, and were almost overlooked by the earlier systematists, who found great difficulties in subdividing the great and homogeneous group. From various reasons—morphological, biological and geographical—we may safely conclude that *Libellulinae* are a caenogenetic group, flourishing and in full development in the present age of the globe. In this respect they have in the suborder *Zygoptera* a parallel in the subfamily *Agrioninae*, more especially in the "Légion Agrion."

Libelluline nymphs are of remarkably uniform type. Body short, dorsal surface moderately convex. Labium short; lateral lobes broad and convex, their mesial margins touching in a long line, the whole forming when stretched out a spoon-like structure, with long and stiff

spines or bristles on the inner surface of mentum and lateral lobes forming a kind of basket. When closed the labium covers the inferior and anterior side of the head like a mask. Plate XII, fig. 5 and fig. 6 represent two principal types of Libelluline nymphs.

(*a*) The *Orthetrum*-type: Head with nearly parallel sides, small eyes, antennae inserted well in front of the eyes; legs robust and hairy; integument opaque; mostly living half-buried in mud at the bottom of water.

(*b*) The *Sympetrum*-type: Head with sides very convergent posteriorly, eyes large, antennae inserted scarcely in front of anterior margin of eyes; legs slender, less hairy; living often free between plants—in this case semitransparent, greenish or yellowish, often with a rich pattern of dark tints.

In the following descriptions structural details of male and female genital organs are generally omitted, though their diagnostic value is evident in many cases of doubtful specimens. For the limited fauna here concerned, amply sufficient distinctive characters were available in details of colour, pattern and venation. The genital structures are fully described, and a great many of them also figured in the writer's monograph of the *Libellulinae*; it was therefore not desirable to repeat descriptions and figures here without diagnostic necessities. The only exception was made for the genus *Orthetrum*, where the male genital structures are indispensable for identification of many specimens with the original pattern covered by the blue pruinosity of adults, and where these characters are the only sure guide in a very intricate group of closely allied species.

1. Arculus distal to second *Anq*. (Plate X, fig. 4) . . . . . 2.
   Arculus proximal to second *Anq*. (Plate XI, figs.) . . . . . 4.

2. Last *Anq* in front wing complete . . . . . 3.
   Last *Anq* in front wing incomplete, existing only in costal field, ending at the subcosta. 2 *Cuq* in hind wing. Proximal side of *t* in hind wing a little distal to arculus. *t* free in both wings. Discoidal field in front wing beginning with two rows of cells; M_4 and Cu_1 divergent from a level proximal to nodus, the field considerably widened to wing's edge. No distinct *Mspl*. One row of cells *Rs–Rspl*. 10½ *Anq*. Posterior lobe of prothorax large, erect, ciliate. Abdomen short, slender and slightly fusiform in ♂, robust and cylindrical in ♀. Third femora with 4–5 (♀) or 8 (♂) long and robust spines. ♀ with margins of eighth segment folded; vulvar scale small . . . . . *Porpax*.

3. Discoidal field in front wing beginning with one row of cells. M_4 and Cu_1 divergent from a level proximal to nodus, discoidal field much widened to wing's edge. *t* in front wing almost equilateral; proximal side of *t* in hind wing a little distal from arculus. *t* free in both wings. 2 *Cuq*

in hind wing. One row of cells *Rs–Rspl*, *Rspl* not very distinct. 11 *Anq*. Hind lobe of prothorax moderate, erect, emarginate in middle, ciliate. Abdomen thin, cylindrical in ♂ (♀ unknown). Third femora in ♂ with very numerous (about 40) denticles, triangular in proximal, quadrangular in distal half . . . . . *Notiothemis*.

Discoidal field in front wing beginning with 3 rows of cells; M_4 and *Cuq* divergent from a level proximal to nodus and very much widened to wing's edge; *Mspl* very distinct. *t* in front wing with costal side short, proximal and distal sides very long. Proximal side of *t* in hind wing at arculus. *t* crossed in front wing, free in hind wing. 1 *Cuq* in hind wing. One or two rows of cells *Rs–Rspl*. M_2 in deep double curve. More than 10 *Anq*. (Plate X, fig. 4.) Hind lobe of prothorax large, erect, ciliate. Frons prominent, with distinct anterior ridge, flattened anteriorly, where two roughly triangular fields are circumscribed by a fine elevated line. Abdomen depressed in male, otherwise variable in form; constricted at third segment and fusiform, or broader and very gradually narrowed to end; in female more cylindrical; margins of eighth segment foliate; vulvar scale small or absent. Legs short and robust, spines small in femora, longer and more robust in tibiae . . . . . *Orthetrum*.

4. Last *Anq* in front wing incomplete. (Plate X, figs. 5, etc.) . . . 5.
   Last *Anq* in front wing complete. (Plate XI, fig. 8) . . . 20.

5. Costal vein in front wing in continuous curve from base to nodus. (Plate X, figs. 11, etc.) . . . . . 6.
   Costal vein in front wing with an infraction about half way between base and nodus. Wings variegated with black or black and yellow. Sectors of arculus with separate origin or a very short common stalk in front wing, a slightly longer common stalk in hind wing.
   1–2 *Cuq* in hind wing. *Bqs* mostly present (only genus of present fauna with this character). Cu_1 in front wing short and strongly convex; 3 (2) to 4 rows of cells in discoidal field, discoidal field not much widened to wing's edge, a parallel curve of M_4 compensating the convexity of *Cu*. Costal side of *t* in front wing comparatively long; *t* crossed in both wings. Anal field broad in hind wing; A_2 almost straight; cells between A_3 and wing's edge distinctly disposed in transverse rows. Pterostigma large, two-coloured. (Plate X, figs. 5 10.)
   Hind lobe of prothorax moderate. Abdomen short and depressed in both sexes; margins of eighth segment folded in female, no distinct vulvar scale . . . . . *Palpopleura*.

6. *t* in front wing considerably, by 3 or more cells' distance, distal to level of *t* in hind wing. Anal field in hind wings very broad. (Plate XI, figs. 6, 7) . . . . . 18.
   t in front wing on same level with *t* in hind wing, or but slightly, by not more than 2 cells' distance, distal to same. (Plate X, fig. 11, and Plate XI, figs. 1 5) . . . . . 7.

7. M_4 and Cu_1 in front wing divergent from a level proximal to nodus, discoidal field considerably widened to wing's edge. (Plate X, fig. 11, and Plate XI, figs. 1–3) . . . . . 8.

M_4 and Cu_1 in front wing approximately parallel at least to a level of nodus; discoidal field between parallel veins to wing's edge, or contracted, or widened only for a short distance in a level far distal to nodus. (Plate XI, figs. 4, 5) . . . . . 13.

8. In discoidal field of front wing two rows of cells at *t*; *t* in front wing free. (Plate XI, fig. 2) . . . . . 9.
In discoidal field of front wing, 3 4 rows of cells at *t*; *t* in front wing crossed (Plate X, fig 11, and Plate XI, figs. 1, 3) . . . . . 11.

9. In hind wing proximal side of *t* at arculus. Origin of Cu_1 in hind wing separate from anal angle of *t*. *Mspl* distinct, at least in front wing. *ti* in front wing free or of 2 (rarely 3) cells $6\frac{1}{2}$ $7\frac{1}{2}$ *Anq*. (Plate XI, fig. 2) . . . . . 10.
In hind wing proximal side of *t* distal to arculus.
Origin of Cu_1 in hind wing at anal angle of *t*. No distinct *Mspl*. *ti* in front wing of 3 cells $8\frac{1}{2}$–$10\frac{1}{2}$ *Anq*. One row of cells *Rs–Rspl*. Hind wings comparatively narrow; between A_3 and wing's edge 2 rows of cells in middle of field. Pterostigma light coloured in central, dark in peripheral parts. Hind lobe of prothorax moderate. Abdomen short, depressed in male, cylindrical in female. In male a large bifid process on first ventral plate; in female margins of eighth segment folded; no distinct vulvar scale . . . . . *Chalcostephia*.

10. Basal segments of abdomen (1 4 or 5) much widened, vesiculate, their joints soldered; terminal segments thin, cylindrical. Hind lobe of prothorax large. Female with margins of segment 8 folded, small but distinct vulvar scale. In hind wing cells between A_3 and wing's edge very large, disposed in transverse rows. (Plate XI, fig. 2) . *Acisoma*.
Basal segments of abdomen of ordinary form, terminal segments slightly fusiform in male, cylindrical in female. Hind lobe of prothorax moderate. Female with genital segments as in preceding genus. In hind wing cells between A_3 and wing's edge of ordinary size, not distinctly disposed in transverse rows . . . . . *Diplacodes*.

11. Pterostigma unicolorous. No black stripe in subcostal field. (Plate XI, fig. 3.) Hind lobe of prothorax small. Abdomen depressed, comparatively broad . . . . . 12.
Pterostigma two-coloured, white in proximal, black in distal half. Male with black stripe in subcostal space of front wings. (Plate X, fig. 11.) Female with tips of wings blackish brown. (Plate XI, fig. 1.) Hind lobe of prothorax moderate. Abdomen narrow, slightly fusiform in male, cylindrical in female. Margins of eighth segment in female folded, vulvar scale rather large . . . . . *Hemistigma*.

12. Double curve of M_2 moderately developed. In hind wing cells between A_3 and wing's edge not distinctly disposed in transverse rows. *t* in front wing with one cross-vein, in hind wing predominantly free. Three rows of cells in discoidal field of front wings, predominantly one row *Rs–Rspl*, one row M_4–*Mspl*. (Plate XI, fig. 3.) Angles of frons not projecting. Females with margins of eighth segment folded, vulvar scale erect, large. On anterior surface of frons two distinct triangular flattened spaces . . . . . *Crocothemis*.

Double curve of M_2 very deep. In hind wing cells between A_3 and wing's edge distinctly disposed in transverse rows. *t* in front wings mostly with two cross-veins, crossed in hind wings. Mostly 4 rows in discoidal field of front wings; 2 3 rows *Rs–Rspl* and M_4–*Mspl*.
Angles of frons projecting, acute. General forms as in preceding genus, also genital segments of female. No triangular flattened spaces on anterior surface of frons . . . . . *Bradinopyga*.

13. Number of *Anq* small, mostly under 8. (Plate XI, fig. 4) . . . 14.
Number of *Anq* greater, more than 8, mostly over 10. Hind lobe of prothorax small. (Plate XI, fig. 5) . . . . . 16.

14. Hind lobe of prothorax large, bilobate, erect, ciliate. Cu_1 in front wing but feebly convex. Abdomen comparatively short, more or less fusiform in male, cylindrical in female. Margins of eighth segment folded in female; vulvar scale variable . . . . . 15.
Hind lobe of prothorax small. Fourth segment of abdomen with distinct transverse carina. Discoidal field in front wing approximately parallel, by Cu_1 and M_4 being about equally convex. In front wing costal side of *t* long, *t* free or crossed. Cu_1 in hind wing variable, at anal angle of *t* or separate. Abdomen short and robust; depressed in male, more cylindrical in female.
In female margins of eighth segment folded, small but distinct vulvar scale; ventral plate of ninth segment broad . . *Brachythemis*.

15. *t* in front wing crossed, costal side comparatively long. Discoidal field beginning with 3 rows of cells, distinctly narrowed to wing's edge. Cu_1 in hind wing at anal angle of *t*: cells between A_3 and wing's edge not disposed in transverse rows. (Plate XI, fig. 4) . . . *Sympetrum*.
t in front wing free, costal side short. Discoidal field mostly beginning with two large cells, then 3 rows; almost parallel to wing's edge. Cu_1 in hind wing separate from anal angle of *t*; cells between A_3 and wing's edge distinctly disposed in transverse rows . . . *Philonomon*.

16. Anal loop in hind wing long, external angle 3 4 cells' distance beyond level of distal angle of *t*. Large forms . . . . . 17.
Anal loop in hind wing shorter, external angle about 2 cells' distance beyond level of distal angle of *t*.
Medium sized and smaller forms. *Rs* straight; M_2 convex in simple curve or with very slight indication of double curve. 2 rows *Rs–Rspl*. Discoidal field in front wing between almost parallel veins or slightly narrowed to wing's edge. Cu_1 almost straight. (Plate XI, fig. 5.) Pterostigma small. Colour system red with various mixture of black, or black and yellow, with or without blue pruinosity. Abdomen variable. *Trithemis*.

17. Spines of tibiae fine. Pterostigma comparatively small. Moderate or deep double curve of M_2. Colour system black and yellow, often metallic. Abdomen variable . . . . . *Pseudomacromia*.
Spines of tibiae robust. Pterostigma large. Very deep double curve of M_2. Colour system as in preceding genus.
Abdomen much inflated in basal segments, very slender hindward. *Olpogastra*.

18. One cubito-anal cross-vein in hind wing. M_2 almost straight. Basal abdominal segments with not more than one transverse carina . 19.
In hind wing a second cubito-anal cross-vein, running obliquely to proximal angle of *t*. Very deep double curve of M_2. Very long anal loop, consisting of two rows of cells, or at most one interpolated cell at external angle, with A_2 bent in gentle curve; A_3 fractured near base; a supplementary sector arising at the angle divides the anal field in a proximal part of small cells, which are arranged in transverse rows, and a distal part of more ordinary, less regularly arranged cells. Pterostigma small, longer in front than in hind wing. Abdominal segments 3 and 4 with two supplementary transverse carinae (besides the normal one), 5 also with a transverse carina . . . . . *Pantala.*

19. Pterostigma small, longer in front than in hind wing.
Costal side of *t* in front wing very short, proximal and distal sides very long. Anal loop long, with interpolated cells at anal angle of *t* and at external angle; with A_2 strongly bent and distal part of A_3 often partially dissolved. Anal field between A_3 and wing's edge as in *Pantala*. Colour predominantly red; brown or brown and yellow basal spot in hind wings. Large forms . . . . . *Tramea.*
Pterostigma about equal in both pairs of wings. Costal side of *t* in front wing comparatively long. Anal loop less elongate, with A_2 almost straight and end of A_3 not dissolved. Partition of anal field between A_3 and wing's edge not so distinct. Colour predominantly bronzy black; wings with metallic black or black and yellow markings. (Plate XI, figs. 6, 7.) Smaller forms . . . . . *Rhyothemis.*

20. Number of *Anq* small (6 7). Sectors of arculus in front wing separated or with common stalk very short. *t* in front wings free. Two rows of cells in discoidal field of front wings, or once 3 cells at *t*. One row *Rs–Rspl.* (Plate XI, fig. 8) . . . . . 21.
Number of *Anq* greater (more than 10). Sectors of arculus with long common stalk in both wings. *t* in front wings crossed, 3 rows in discoidal field; 2 rows *Rs–Rspl.* General facies, colour system and genitalia much as in *Trithemis* . . . . . *Helothemis.*

21. Larger forms. *ti* in front wings 3-celled; about 5 rows between A_3 and wing's edge in hind wing. (Plate XI, fig. 8.) Abdomen comparatively short and broad, depressed, gradually narrowed hindward in male, more cylindrical in female. No external branch in hamule of male; vulvar scale large in female . . . . . *Urothemis.*
Small forms. *ti* in front wing free; 2–3 rows between A_3 and wing's edge in hind wing. Abdomen similar in shape to preceding genus, also genitals of both sexes . . . . . *Tetbriamanta.*

NOTIOTHEMIS, nov. gen.

This genus is isolated in the present fauna, and belongs to a group of forms well represented in tropical Asia, in Madagascar and also in continental Africa, though everywhere in a limited number of species.

The single genera and species of this group bear the characters of archaic relics: many primitive features in venation on one side; highly specialised structures in some other respects, as in the armature of legs and in genital organs of both sexes; black and yellow colour system, which is at the same time an archaic feature and an adaptation to life in wooded land. *Notiothemis* is nearest to *Neodythemis* (from Madagascar) and *Micromacromia* (from continental Africa) in venation, but near *Tetrathemis* (from tropical Asia, Madagascar and Africa) and *Calophlebia* (from Madagascar) in genital structure of male.

Head small; eyes contiguous on a short line. Frons rounded, with no distinct anterior ridge. Vertex broadly rounded, very little emarginate.

Posterior lobe of prothorax moderate, rounded, with a small median notch, ciliate. Thorax comparatively small, legs long and robust. Third femora of male with very numerous—about 40—denticles, triangular in proximal half, gradually passing to quadrangular outline in distal half, a long spine at distal end. Second femora with similar triangular denticles in proximal half, gradually longer spines in distal half. Spines of tibiae numerous, fine. Tarsal claws with robust tooth near the middle.

Abdomen little widened in basal segment, thin, almost cylindrical posteriorly. Male genitalia small. (Female unknown.)

Wings comparatively long and narrow, rather close venation *t* in front wing in same level with *t* in hind wing. Sectors of arculus with long common stalk. Arculus between second and third antecubital. Cu_1 in front wing at anal angle of *t*, separate in hind wing. 9–11 *Anq*, the last one complete.

t in front wing at level of arculus or very little distal. 1 *Cuq* in front wing, 2 *Cuq* in hind wing. No *Bqs t* in front wing free, almost equilateral, distal side but little longer than proximal and costal one. *t* in hind wing free. *ht* crossed in front wing, crossed or free in hind wing. *ti* in front wing free, regular, or its costal side (the second cubito-anal cross vein) not exactly meeting the proximal angle of *t*. *Rs* and M_2 very slightly convex; *Rspl* not very distinct; one row of cells *Rs–Rspl*. Discoidal field of front wing beginning with one row, two rows at level of bridge, considerably widened to wing's edge; no *Mspl*. In discoidal field of hind wing about four cells running through between M_4 and Cu_1. Distinctly developed anal loop in hind wing, with two rows of about five cells each; external angle of loop very obtuse, mostly no interpolated cells. Membranule very small. Pterostigma moderate.

Notiothemis Jonesi, n. sp.

S. Afr. Mus.: 2 ♂, M'Fongosi, Zululand (v. 1911, W. E. Jones); 1 ♂, Eldoret, Brit. East Africa (viii. 1913, W. E. Fry). Coll. K. J. Morton: 1 ♂, Bulwa, Usambara.

♂ (M'Fongosi). Labium yellow, median lobe black, also a corresponding narrow, anteriorly convergent stripe over the side lobes. Labrum, face and frons dull yellowish; vertex and a broad basal band of frons metallic blue. Prothorax black, free margin of posterior lobe yellowish green. Thorax brownish black with light green markings and thin whitish pruinosity. Light green: narrow line on median suture; cuneiform antehumeral spots to about mid-height; rather broad band in front of humeral suture, more narrowly continued along ante-alar sinus to median line; indistinct narrow line between humeral suture and metastigma; broad complete band touching metastigma with anterior margin; similar band on posterior half of metepimeron. Ventral surface greenish, sutures lined with fuscous. Legs black, base of first femora greenish internally. Abdomen black with greenish markings: segments 1 lateral spots; 2 lateral spot and two transverse bands; 3 large, anteriorly almost confluent spots in front of, smaller spots behind transverse carina; 4–5 small antero-dorsal, larger medio-lateral spots; 6 very small antero-dorsal spots; 7 complete transverse band of more than one-half the segment's length, very near anterior, more distant from posterior margin of segment; 8–10 wholly black. Ventral surface black, slightly whitish pruinose.

Superior appendages in dorsal view almost parallel, gradually narrowed to end. In lateral view regularly convex, ventral margin slightly projecting beyond the middle, then retracted and again projecting at the end, which is cut obliquely. Apex of inferior appendage corresponding to the shallow incision in ventral outline of the superior. Genitalia of second segment: Anterior lamina small, depressed, finely granulate, with long greyish hairs. Hamule very small, depressed; internal branch a fine acute, moderately bent hook, those of both sides touching each other; external branch shorter, obtusely triangular. Lobe large, free margin directed hindward, cut in a straight line almost vertical to long axis of body.

Wings hyaline; very light yellowish at base, diffusely to level of *t*, colour somewhat deeper in *sc* and *cu*. Pterostigma black.

Anq. 9·8; *ht.* $\frac{1}{0}\cdot\frac{1}{0}$. *Abd.* 19, *hdw.* 22, *pt.* > 2 mm.

A specimen from Bulwa, Usambara, is somewhat larger: *abd.* 22, *hdw.* 25, *pt.* 2·5 mm. *Anq.* 11·11; *ht.* $\frac{1}{1}\cdot\frac{1}{1}$. Otherwise identical.

ORTHETRUM (Newman, 1833).

A genus of many species, many of them common and dominant in large parts of the Old World, more common in tropical and subtropical that in temperate regions, especially dominant in continental Africa in number of species and of individuals. Species of *Orthetrum* are very wide-ranging (with but a few exceptions): none of those found in the present fauna is limited to South Africa; most of them are known from the entire continent South of the desert belt; two (*chrysostigma*, *trinacria*) are also from Mediterranean Africa and Europe.

They are medium-sized or larger *Libelludinae*; all the species here discussed similar in colours: male pruinose blue with a pattern of black or reddish brown and yellowish, greenish or whitish, often also covered by dense pruinosity in fully mature specimens, in younger individuals similar to females; females not pruinose in most species, in some others only so in very old specimens, with pattern similar to male in principle, but mostly with the dark elements reduced. The condition of these species in collections has long been chaotic; studies by P. P. Calvert and more recently by the writer have established reliable specific characters, and but little uncertainty remains now for some females particularly, or for males in which the genitalia of second segment are not in sufficiently good condition for examination.

The following table was established chiefly on characters of colour and pattern. For certain identification the study of genital structures on second abdominal segment of males is always useful, often necessary, and the figures given for those structures are indispensable in addition to the table.

1. Basal segments of abdomen much widened in lateral and especially in dorsoventral dimension; segment 3 constricted, following segments comparatively narrow, fusiform or almost parallel in males, cylindrical in females . . . . . 2.

   Basal segments of abdomen not widened in lateral, very little in dorsoventral dimension; segment 3 comparatively broad, not constricted; following segments very gradually narrowed to end of abdomen and depressed in male, less distinctly narrowed, more cylindrical in female.

   Ante-nodal cross-veins in sub-costal space of ambiguous colour, blackish in dorsal view, ochreous if seen from the sides. Pterostigma very large, ochreous or light ferruginous between black veins. Membranule whitish or light grey. Base of wings hyaline with no trace of yellow spot. Adult ♂ with face fuscous, frons above shining black; thorax and dorsum of abdomen (entirely or to segment 6) with very dense whitish blue pruinosity; terminal abdominal segments black with a middorsal, basal, cuneiform ochreous spot on segment 6–7 (similar spots on

more anterior segments in immature specimens). Female with face and frons dull olivaceous, a narrow medially interrupted black basal line of frons. Thorax olivaceous, sides yellowish; light yellowish mid-dorsal longitudinal band from prothorax to inter-alar space; one or two incomplete dark lines each side between this band and humeral suture. Abdomen dull ochreous; continuous, more rarely interrupted, lateral black bands from segments 2 to 10, distant from lateral carina not fully by its own breadth. Tips of wings brown to distal end of pterostigma. ♂, *Abd.* 28, *hdw.* 33, *pt.* < 4 mm. ♀, 27, 30, 4 . . . . *O. farinosum.*

2. Ante-nodal cross-veins in sub costal space ochreous or whitish. Pterostigma light coloured . . . . . 3.
Ante-nodal cross-veins in sub-costal space black. Pterostigma of mature specimens very dark ferruginous or almost black. Membranule black. Basal spot in base of sub-costal and cubito-anal space and along membranule, golden yellow to brown in male, lighter yellow in female. Thoracic pattern of non-pruinose males two dorsal and five lateral about equally developed black stripes on uniformly greenish ground, of females similar, but with reduction of black area, especially at the sides. Abdominal pattern of non-pruinose males transverse median ochreous or olivaceous bands on segments 4–6, very variable in extent; similar in females, but with light-coloured area more extended, especially along mid-dorsal line; terminal abdominal segments wholly black in mature specimens of both sexes. Males pruinose blue first on abdomen, later on thorax, leading in some very mature specimens to the disappearance of every trace of pattern. Frons greyish olivaceous, darker in male, with basal black line, broader in male, narrow in female. ♂, *Abd.* 28, *hdw.* 32, *pt.* < 3 mm. ♀, 29, 32, 3 . . . . . *O. stemmale capense.*

3. Abdominal pattern in non-pruinose males and in females a mid-dorsal longitudinal black band, widened at the joints. Pterostigma large. Cu_1 in hind wing regularly separated from anal angle of *t* . . . . 4.
No mid-dorsal longitudinal black band on abdomen. Cu_1 in hind wing but occasionally separated from anal angle of *t* . . . . 5.

4. Large species. Wings hyaline at base. Pterostigma very light yellow, almost whitish. Lips, face and frons greenish white; narrow basal black line on frons. Thorax olivaceous dorsally, light greenish at sides; median and incomplete antehumeral stripes fuscous, narrow black lines in humeral and second lateral sutures. On abdomen besides mid-dorsal also lateral black bands, narrowed or almost interrupted in median third of each segment.
Female with foliaceous dilatations of segment 8 very narrow and appendages comparatively long. Mature males pruinose on abdomen to the disappearance of pattern, less densely on thorax. ♂ ♀, *Abd.* 36, *hdw.* 34, *pt.* 3·5 mm. . . . . *O. trinacria.*
Smaller species. Wings in male hyaline or with golden yellow spot at base, in female with golden yellow spot of various extent, sometimes to level of Cu_2 and apex of membranule. Pterostigma bright ochreous. Labium yellow with median black band; face and frons yellowish; broad basal black band on frons and sometimes more black on anterior

ridge or anterior flattened spaces of frons. Thorax yellowish with broad, deep black stripes; median, ante-humeral, humeral on suture; narrow black lines between humeral suture and metastigma, above metastigma and on second lateral suture. Mid-dorsal black band on abdomen comparatively broader than in last species; no lateral black bands, only narrow black lining of lateral carinae; ventral surface black. Female with foliaceous dilatation of eighth segment broader and appendages short. Mature males pruinose to disappearance of pattern first on abdomen, finally also on thorax. ♂, *Abd.* 29, *hdw.* 29, *pt.* 3·5 mm. ♀, 28, 30, 4 *O. icteromelas.*

5. Almost regularly two rows of cells between *Rs* and *Rspl*, at least for a short space . . . . . 6.
Regularly but one row of cells between *Rs* and *Rspl*. Abdominal pattern of non-pruinose males and of females consisting of broad lateral continuous black bands. Pterostigma large, light yellowish between black veins . . . . . 8.

6. Abdominal pattern of non-pruinose males consisting of lateral black bands, complete or not fully touching lateral carinae or even interrupted in middle of segments, of females similar but reduced in various degrees and almost regularly interrupted . . . . . 7.
Abdominal pattern of non-pruinose males and of females similar to *O. stemmale capense*; on segments 3–7 broad median transverse yellowish bands, interrupted by a narrow mid-dorsal black line, almost regularly extended narrowly along that line to anterior margin of segments. Thoracic dorsum greenish or olivaceous; a mere vestige of blackish on median suture, incomplete ante-humeral and humeral blackish lines; sides with four dark lines of variable development; in specimens in perfect condition of colours two broad bands whitish (or lighter greenish than rest of sides), mesepimeral and metepimeral, gradually obscured from ventral to dorsal margin. Lips yellowish, often with median lobe of labium dark. Face and frons light olivaceous, very narrow basal black line on frons. Pterostigma light yellow between black veins, the costal one mostly thickened. Variable golden yellow spot on base of hind wings to apex of membranule. Mature males mostly pruinose on abdomen and thorax to the complete disappearance of pattern. ♂, *Abd.* 31, *hdw.* 33, pt. > 3 mm. ♀, 31, 32, 3 . . . . . *O. brachiale.*

7. Thoracic sides with two distinct whitish stripes; immediately behind humeral and second lateral sutures; these stripes most distinct at ventral end, where they are lined with blackish, gradually darkened to dorsal end. Thorax otherwise olivaceous, shading to ferruginous, a mere vestige of blackish on median suture and an incomplete ante-humeral blackish line, which is accompanied (at least in part of specimens) medially by a third somewhat diffused whitish stripe. Lateral abdominal black bands narrow and sometimes interrupted in males, very narrow and often indistinct in females, when the abdomen appears ferruginous almost without markings. Face and frons olivaceous with very narrow black basal line. Pterostigma shorter and narrower than in following species, ferruginous. Small golden yellow basal spot at membranule of

hind wing. Pruinosity of male appearing early on abdomen, very late on thorax. ♂, *Abd.* 31, *hdw.* 33, *pt.* 3 mm. ♀, 27, 31, 3 . . *O. caffrum.* Thoracic sides with but one distinct whitish stripe, behind humeral suture, lined with black in ventral half and gradually obscured dorsally. Thorax otherwise similar to preceding species, only there is no trace of a dorsal black stripe and the general colour has more of greenish and less of ferruginous shade. Lateral abdominal black bands broad and complete in male; narrow and not touching lateral carina in middle of segments, but often not interrupted in female. Face and frons as in preceding species. Pterostigma longer, broader and generally lighter in colour as in preceding species. Base of wings similar. Pruinosity of male as in preceding species. ♂, *Abd.* 29, *hdw.* 30, *pt.* > 3 mm. ♀, 27, 29, > 3 . . . . . *O. chrysostigma.*

8. Slightly larger species. Male with internal and external branch of hamule of about equal length. Thoracic pattern in mature but not yet extremely pruinose males an ante-humeral and two lateral greenish stripes on black ground; in female black colour much reduced, to vestige of a line at median suture, incomplete ante-humeral and humeral and parts of 4 to 5 lateral lines. In immature males, and especially females, the sides are wholly greenish yellow with at most vestiges of black lines. Frons dull olivaceous to bluish grey in mature males, greenish yellow in females, with black basal line, broader in males. ♂, *Abd.* 28, *hdw.* 29, *pt.* 3 mm. to 33, 33, 3·5. ♀, 25, 28, 3 to 31, 32, 3·5 . . . . *O. guineense.* Smaller species and smallest *Orthetrum* of the present fauna. Internal branch of hamule in male decidedly longer than external branch, Thoracic pattern in mature, even fully pruinose males somewhat variable and with irregular light green spots; at dorsal end of mesepimeron, dorsally and ventrally from metastigma on metepisternum, posterior and dorsal half of metepimeron. Female very similar to preceding species, not always readily distinguishable, the differences being only relative; smaller size and still more reduced dark colour on thorax, the lines being mostly indicated by faint vestiges only. Face and frons whitish in male, light yellowish in female; basal black line of frons broad; not rarely fine black lines on anterior ridge of frons and around anterior flattened spaces. ♂ ♀, *Abd.* 29, *hdw.* 30, *pt.* 3 mm. *O. Abbotti.*

Orthetrum trinacria, Sélys, 1841.

S. Afr. Mus.: 1 ♀, Johannesburg, Transvaal (C. H. Pead); 1 ♀, Lorenço Marques (12 . xii . 1911).

This largest species of *Orthetrum* known from the present fauna is easily identified by its abdominal pattern, and when pruinose, by the large whitish pterostigma, hyaline base of wings, very elongate abdomen with basal segments much inflated. The species was first discovered in Sicily, but it seems that it has not been obtained again from this European island for the last seventy years. It is probably most frequent in desert regions such as Mediterranean Africa and

Abyssinia; evidently it is not a common species in the South African fauna.

Orthetrum icteromelas (Ris, 1909).

S. Afr. Mus.: 1 ♀, Boksburg, Transvaal. Brit. Mus.: 1 ♂, 2 ♀, Boksburg, Johannesburg (C. H. Pead). Coll. E. B. Williamson: 3 ♂, 2 ♀, Salisbury, Mashonaland (ii. 1900, Marshall).

Similar in general form and size and also the large, bright yellowish pterostigma to *O. guineense*, *Abbotti* and *chrysostigma*. Of this group the pterostigma is generally largest in *icteromelas*, smallest in *chrysostigma*. Females and non-pruinose males are easily identified by the abdominal pattern; pruinose males, although very closely resembling the above-named three species, especially *guineense*, are

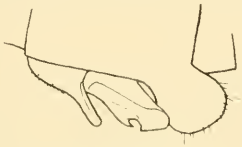

Fig. 69.—*Orthetrum icteromelas*, ♂. Salisbury. Genitalia, second segment, left side view.

unmistakable when the peculiar hamuli are in good position for examination.

Orthetrum caffrum (Burmeister, 1839).

S. Afr. Mus.: 3 ♀, Burghersdorp, Cape, Worcester; 1 ♂, 1 ♀, M'Fongosi, Zululand (v. 1911, W. E. Jones); 1 ♂, Rietfontein, Pretoria District (2. x. 1904); 2 ♂, 3 ♀, Eldoret, Brit. E. Africa (viii. 1913, W. E. Fry); Acornhoek, Transvaal (xii. 1918, Tucker); Grootfontein and Otjituo, S.W. Protectorate (i. 1920, Tucker). Brit. Mus.: 1 ♂, Mahakata River, Gazaland (24. ix. 1905, Marshall); 1 ♀, Johannesburg (H. Crawford-Cruger); 1 ♂, Zululand (Rev. W. H. Heale); 1 ♂, Willow Grange, Mooi River, Natal (9. ii. 1913, R. C. Wroughton). Coll. E. B. Williamson: 1 ♂, 1 ♀, Salisbury, Mashonaland (iii. 1900, v. 1905, Marshall); 1 ♂, Hilton Road, Natal (23, xii. 1909, G. F. Leigh). Mus. Stockholm: 1 ♀, Cap. b. Spei (Wahlberg).

The thoracic pattern of two lateral and often also an ante-humeral whitish stripe is a conspicuous and regular character of this species.

It is somewhat more robust in stature than the group *chrysostigma-guineense-Abbotti*, though being often smaller in dimensions than *chrysostigma*. Its reticulation is closer (regularly two rows *Rs–Rspl*) and its pterostigma smaller than in those related species. Males with the thorax entirely pruinose to disappearance of the whitish bands are not often met with; they may easily be identified by the peculiar shape of hamuli (Text-fig. 70).

This species is East African (North to Abyssinia) and South African; specimens formerly recorded (by the writer) from some West African stations very probably do not belong to *O. caffrum*, but to *O. microstigma*, an essentially tropical and chiefly West African species, which was not recognised when the group was first studied for the monograph. A very close ally of *O. caffrum* is *O. laeniolatum* found in Somaliland and Eritrea, Mediterranean Asia and India.

Fig. 70.—*Orthetrum caffrum*, ♂. M'Fongosi. Genitalia, second segment, left side view.

Orthetrum chrysostigma (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, 2 ♀ (no locality); 1 ♂, Livingstone, Zambesi; 1 ♂, Matopo, Rhodesia (28 . v . 1911, C. H. Pead); 1 ♂, 1 ♀, Lorenço Marques (26 . v, 12 . xii . 1911); 1 ♂, M'Fongosi, Zululand, (W. E. Jones); 3 ♂, Barberton, Transvaal. Whole of Cape Colony and South West Africa. Brit. Museum: 1 ♂, Salisbury, Mashonaland (iv . 1904, Marshall). Coll. K. J. Morton: 3 ♂, 1 ♀, Umtali, Rhodesia (19, 21 . viii, 7 . ix . 1908, Miss Fountaine). Coll. Ris: 2 ♀, Lorenço Marques (29 . ix, 15 . xii . 1911). Coll. E. B. Williamson: 10 ♂, 11 ♀, Salisbury, Mashonaland (i, ii, iii . 1900, iv . 1905, Marshall); 4 ♂, Natal (G. F. Leigh); 1 ♂, Princetown, Natal (19, ii, 1909, *id.*).

The mesepimeral whitish stripe is a good guide for the identification of this species, as first indicated by P. P. Calvert. The pterostigma is rather variable in size, but almost regularly smaller than in *guineense*, *Abbotti* and *icteromelas*, larger than in *caffrum*, in colour entirely between the bright yellowish shades of the former three and the more ferruginous colour of the latter species. Females of *chrysostigma*,

guineense and *Abbotti* are sometimes not easily distinguished: as a rule *chrysostigma* is the largest of the three, has almost regularly two rows *Rs–Rspl* at least for a few cells' length, has the pterostigma smallest and lateral black bands on abdomen reduced, often interrupted; in mature colour and good condition the mesepimeral whitish stripe is a fairly constant character also for the female of *chrysostigma* (Text-fig. 71).

This species, first described from the Canary Islands, is found throughout the African Continent from Algeria to Natal, also in the

Fig. 71.—*Orthetrum chrysostigma*, ♂. Barberton. Genitalia, second segment, left side view.

extreme south of Europe and in part of Mediterranean Asia. There is no other than individual variability recognisable. When working out *Orthetrum* for the *Libellulinae* monograph, the writer supposed the two following forms to be geographical sub-species of *chrysostigma*; but more extensive materials and more careful study of the matter made this view untenable, and a new arrangement (like the one given here) is adopted for the additions to the monograph.

Orthetrum Abbotti (Calvert, 1892).

S. Afr. Mus.: 3 ♂, 3 ♀, and 2 ♂ ♀, *in cop.*, M'Fongosi, Zululand (ii, iii . 1912, W. E. Jones). Brit. Mus.: 1 ♀, Willow Grange, Mooi

Fig. 72.—*Orthetrum abbotti*, ♂. M'Fongosi. Genitalia, second segment, left side view.

River, Natal (9 . ii . 1913, R. C. Wroughton). Coll. Ris: 1 ♂, Botchabelo, 1200 m., Transvaal (23 . ii . 1914, H. Junod).

Extremely similar to following species in abdominal pattern, large, bright yellowish pterostigma and general outline; but different by

hamuli of male, thoracic pattern of pruinose males and generally smaller size (Text-fig. 72).

First described from East Africa (Kilimandjaro), and probably most developed in that region; but specimens examined by the writer from the Belgian Congo, Kamerun and Sierra Leone give it a much wider range, similar to the habitat of the following species.

Orthetrum guineense (Ris, 1909).

S. Afr. Mus.: 1 ♂, M'Fongosi, Zululand (xi . 1911, W. E. Jones); 1 ♂, Umhlali, Natal (i . 1913, K. H. Barnard). Coll. E. B. Williamson: 1 ♂, Salisbury, Mashonaland (iv . 1905, Marshall); 1 ♀, Umtali, 3700 ft., Mashonaland (xii . 1900, *id.*); 2 ♂, 5 ♀, Natal (G. F. Leigh); 1 ♂, 1 ♀, woodside off Umbilo Road, Congella, Natal (19 . x . 1904; 17 . i . 1905, *id.*).

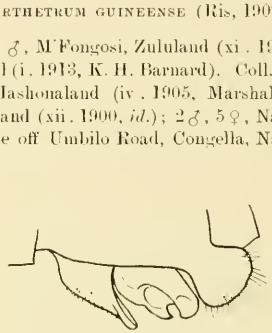

Fig. 73.—*Orthetrum guineense*, ♂. M'Fongosi. Genitalia, second segment, left side view.

The specimens here recorded (and described in table, p. 394) agree perfectly with the type series of *O. guineense* as described from Angola and other parts of equatorial West Africa. The chief distinctive character is the hamule of males. But this structure is subject to misleading differences in position in this species more than in the others here discussed, and careful examination is often necessary. Differences in colour and pterostigma are extremely slight in comparison with *O. Abbotti*, not even considerable with many specimens of *chrysostigma*. The hamule is nearest *O. stemmale capense*, and extremely old and obscured specimens may resemble this species in colour of body and basal spot in hind wing (though not easily in pterostigma).

A series of specimens mentioned and described under *guineense* (from the Sélysian Collection and Stockholm Museum) in the additions to my Libellulinae monograph is purposely omitted here, as its identification is somewhat doubtful and the specimens are no more at hand.

As far as our experience goes, the area of *guineense* is much the same as that of *Abbotti*, but the latter seems chiefly eastern, the former western in distribution.

Orthetrum brachiale (Palisot de Beauvais, 1805).

S. Afr. Mus.: 1 ♀, Lorenço Marques. Mus. Hamburg: 1 ♂, Lorenço Marques (17. ix. 1911, Michaelsen). Coll. Ris: 1 ♀, Rikatla, Delagoa Bay (iv. 1914, H. Junod). Coll. E. B. Williamson: 3 ♂, 1 ♀, Salisbury, Mashonaland (iv. 1905, Marshall).

Generally larger than the species of the *chrysostigma* group, which it resembles by the mostly rather light coloured pterostigma; anterior vein of pterostigma conspicuously thickened in *brachiale* more often than in any other species of the group. Abdominal pattern much as in *stemmale capense*, but with black elements reduced; the

Fig. 74.—*Orthetrum brachiale*, ♂. Lorenço Marques. Genitalia, second segment, left side view.

same may be stated for the thoracic pattern, at least for specimens in which the two broad lateral light-coloured stripes are obliterated by age or destroyed by decomposition. The excellent group character (first applied by P. P. Calvert) of colour of ante-nodal cross-veins in sub-costal space is often treacherous in *O. brachiale* (also sometimes in *guineense* and even in *chrysostigma*), where mature specimens not rarely have those veins much obscured, although they are conspicuously whitish in less mature specimens. For males the quite peculiar form of hamuli is a guide in any case (Text-fig. 74).

O. brachiale is chiefly an inter-tropical species, found about equally in Western and Eastern regions of the African continent, also in Madagascar and some of the smaller islands.

Orthetrum stemmale capense (Calvert, 1893).

S. Afr. Mus.: 2 ♂, 5 ♀, Lorenço Marques (ix, xi, xii. 1911); 6 ♂, 8 ♀, M'Fongosi, Zululand (ii, iii, v, xi. 1911, W. E. Jones); 13 ♂,

1 ♀, Barberton, Transvaal; 1 ♀, White River, East Transvaal (9 . xii . 1909, A. T. Cooke); 1 ♂, Groenvleikloof, Pretoria District (6 . i . 1907). Brit. Mus.: 1 ♀, Chirinda Forest, 4000 ft., Gazaland (18 . x . 1905, Marshall); 1 ♂, 1 ♀, Mazoe, 4000–4300 ft., Mashonaland (29 . x, 24 . xii . 1905, *id.*); 2 ♂, Natal. Coll. K. J. Morton: 1 ♂, 1 ♀, Macequece (25 . ix, 8 . xi . 1908, Miss Fountaine); 1 ♂, 1 ♀, Eshowe, Zululand (27 . ii, 5 . iii . 1908, ead.); 2 ♂, 3 ♀, Durban, Natal (30 . xi, 26 . xii . 1907; 20, 27 . i . 1908, ead.); 1 ♀, Wolhuterkop, Transvaal (i . xii . 1908, ead.). Coll. Ris: 4 ♂, 2 ♀, Lorenço Marques (14 . iii, 6, 14, 15 . xii . 1911); 2 ♀, Rikatla, Delagoa Bay (ii . 1914, H. Junod). Coll. E. B. Williamson: 3 ♂, 6 ♀, Natal (G. F. Leigh); 2 ♀, Hilton Road, 4 ♂, 2 ♀, Princetown, 4 ♂, 7 ♀, woodside off Umbilo Road, Congella, all in Natal (12 . x . 1904; 10 . i . 1905; 18, 23 . xii . 1908; 18, 19 . ii . 20; xii . 1909; 17 . ii . 1910, *id.*).

Similar in general outline to *O. brachiale*, wings somewhat more

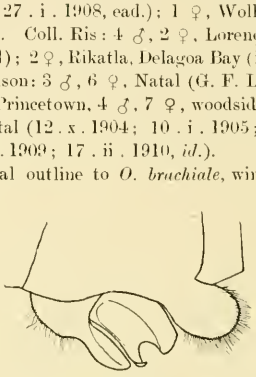

Fig. 75.—*Orthetrum stemmale capense*, ♂. M'Fongosi. Genitalia, second segment, left side view.

rounded, most often a single row of cells *Rs–Rspl*. Though analogons to *brachiale* in elements of pattern, this species is darker in every respect, and the darkest of the pruinose blue African species of *Orthetrum*. Black colour in female and non-pruinose male almost equally light-coloured area, or surpassing it in many males; pterostigma regularly very dark brown or blackish in mature specimens; ante-nodal cross-veins in sub-costal space black even in very immature examples; basal spot in hind wings mostly darker in mature specimens than in other species (some isolated specimens of *guineense* excepted), deep golden brown to almost blackish and not rarely pruinose in very mature males; golden yellow in females; not rarely females with yellowish colour of base diffusely extended to level of triangles and even more distally. Hamuli nearest *O. guineense*, but internal branch more slender and excision between the two branches not so deep.

A very common species in equatorial Africa, West and East

(western forms generally darker in colour), South to Natal, North to Eritrea. Representative forms in Madagascar and the smaller islands.

ORTHETRUM FARINOSUM (Forster, 1898).

S. Afr. Mus.: 2 ♂, Dunbrody (6. ii. 1912); 1 ♂, Matopo (E. C. Chubb); 1 ♀, Waterval, Zoutpansberg District, Transvaal (13. xii. 1899). Coll. K. J. Morton: 3 ♀, Durban, Natal (13. xii. 1907, 27. i. 1908, Miss Fountaine). Brit. Mus.: 1 ♀, Mpudzi River, Manica (26. x. 1901, Marshall). Coll. Ris: 1 ♀, Botchabelo, 1200 m., Transvaal (18. ii. 1914, H. Junod). Coll. E. B. Williamson: 1 ♀, Salisbury, Mashonaland (ii. 1900, Marshall); 1 ♂, 1 ♀, Princetown, Natal (18. ii. 1909, G. F. Leigh).

The male of this species resembles superficially the European *O. brunneum* by the comparatively broad and depressed abdomen with base but little widened, and by the very light shade of its blue

FIG. 76.—*Orthetrum farinosum*, ♂. Dunbrody. Genitalia, second segment, left side view.

pruinosity. The female is easily recognised by the analogous characters of abdomen, by the large, light-coloured pterostigma and conspicuously brownish tips of wings, as well as by the lateral abdominal blackish lines a little distant from the lateral carinae, and thus producing a pattern of marginal lunules, somewhat similar to the European *O. cancellatum*.

Not a common species, but very widely distributed in Eastern Africa from Egypt (Cairo) to Natal, and also found in West African stations (Sierra Leone, Kamerun and the Congo).

PALPOPLEURA (Rambur, 1842).

A genus of comparatively small to very small forms, conspicuous by coloured wings, short depressed abdomen and the curious sinuate course of the costal vein in its ante-nodal part. One of its species is certainly a characteristic insect of the Ethiopian faunal region, and present practically in every collection brought from inter-tropical

Africa ; others are either more local or much less commonly distributed in their habitat.

Systematically this genus is part of a small group of forms, interesting for its geographical distribution. Old-world species are Ethiopian, except one, which occurs in parts of India, in Assam, Indo-China and South China. But a more numerous group is American (*Diastatops*, *Zenithoptera*, and of very probable affinity also is *Perithemis*). Forms common to the Ethiopian and Neotropical regions have been discussed in interesting zoo-geographical speculations by v. Ihering for instance, and amongst such forms the *Palpopleura*-group of *Libellulinae* may be cited as a conspicuous example.

1. Thoracic sides predominantly yellow. Face very light yellow or olivaceous in both sexes . . . . . 2.
   Thoracic sides predominantly black or blackish fuscous, with two very oblique stripes, light yellow to dark bluish grey in mature males. Face dark brown to blackish in males, ferruginous in females. Males with frons above brilliant metallic blue; dorsum or thorax and abdomen pruinose blue. Males (a. *lucia*) with front wings metallic black over entire breadth to about middle of pterostigma to tip in costal space; hind wings similarly coloured, but the coloured area ending in a sinuate line at variable distance (for instance, between two and three cells' breadth) from the anal margin. Other males (b. var. *portia*) with black colour in front wings not reaching anal margin, only approaching it in level of *t* and between nodus and pterostigma, thus roughly forming a broad costal stripe with two transverse bands of black. Females with black pattern similar to second form of male, but having the second transverse black band slightly more proximal, with about equal parts proximal and distal to nodus; base of both wings yellow, from a very light shade to deep golden yellow, distally to end of second black band. Frons ferruginous; abdomen ochreous with three longitudinal sinuate black bands.
   ♂ (*lucia*), *Abd.* 15, *hdw.* 21, *pt.* 3·5 mm. to 19, 25, 4.
   ♂ (*portia*), *Abd.* 14, *hdw.* 18, *pt.* 3 mm. to 19, 23, 3·5. ♀, 12, 18 > 3 to 16, 25, 4 . . . . . *P. lucia.*

2. Smallest species. Legs mostly light yellow, black lines internally in males much reduced in females. Males with both wings black at base, mostly to distal end of triangles and two or three rows of cells beyond anal vein, the black area longitudinally divided by a hyaline or yellow stripe in *m* and space between *R* and M_{13}; veins in black space light yellow; small black dot at nodus of front wings; base of wings otherwise yellow to nodus in front wing, almost to pterostigma in hind wing; from very light shades to rather deep golden yellow. Wings of female similar at base, distally with variable transverse black bands; with proximal margin at nodus in front wing, one or two cells distally in hind wing; yellow colour mostly deeper than in males, but concentrated in broad borders to the black basal spots and distal bands. Dorsum of abdomen

pruinose blue in male, ochreous with three longitudinal black lines in female. ♂, *Abd.* 13, *hdw.* 16, *pt.* 2 mm. to 16, 19, 2·5. ♀, 13, 18, 2·5.

P. jucunda.

Larger species. Legs black, first femora yellowish internally. Infraction in costal vein not so deep as in other species. Males with a radiate pattern of deep black; in front wing stripe in *sc* to 6th–8th *Anq*, stripe in space between M_{13} and M_1 to distal end of *t*, large spot of about four cells at nodus; in hind wing only a small sub costal stripe to *Anq* 2; costal space of front wings yellowish to tip, this colour deeper in postnodal part. Females with similar pattern of black, but reduced in all its components. Dorsum of abdomen pruinose blue in male, olivaceous, with three longitudinal black lines in females. ♂, *Abd.* 19, *hdw.* 26, *pt.* 3 mm. ♀, 19, 27, 4 . . . . . *P. deceptor.*

Palpopleura lucia (Drury, 1773).

S. Afr. Mus.: 5 ♂, 2 ♀, Lorenço Marques (7, 20 . v, 26 . ix, 3 . x, 1 . vii . 1911); 2 ♂, 3 ♀, M'Fongosi, Zululand (ii, iii, iv . 1911, W. E. Jones). Coll. Ris: 11 ♂, 9 ♀, Lorenço Marques (6 . xi . 1910; 17, 18 . i, 10 . ii, 11, 14, 24 . iii. 5, 7, 11 . v . 1911); 4 ♀, Rikatla, Delagoa Bay (iii, iv, 17 . iv, 10 . v . 1914, H. Junod). Coll. E. B. Williamson: 5 ♂, 1 ♀, Natal (G. F. Leigh); 2 ♂, 1 ♀, Princetown, Natal (7, 14 . ii . 1909, 21 . ii . 1910, *id.*); 1 ♂, woodside off Umbila Road, Congella (20 . x . 1904, *id.*); 1 ♀, Hilton Road (23 . ii . 1909, *id.*).

♂ *portia*: S. Afr. Mus.: 9 ♂, M'Fongosi, Zululand (ii, iii, iv . 1911, W. E. Jones). 1 ♂, Otavi, S.W. Africa (i . 1920, Lightfoot). Coll. E. B. Williamson: 11 ♂, Princetown, Natal (12 . xii . 1908; 7, 18 . ii, 11 . iii . 1909; 24 . ii . 1910, G. F. Leigh).

The *portia* forms were first introduced by the writer as male varieties; formerly *portia* had been considered as a distinct species. The reasons why this view was abandoned were chiefly given by the existence of intermediate forms, which, though rather scarce in collections from various parts of Africa, intergrade almost completely between extreme *lucia* and extreme *portia* pattern. Nevertheless the question still remains open; it cannot be resolved in museums but only by exact observations in the field. Females also intergrade between forms with very little yellow at base of wings and extremes with both wings deep golden yellow to distal limits of dark pattern. The deeper-coloured females are apparently more often associated with *lucia* males, the lighter ones with the *portia* form. But there are exceptions, and a clear separation is still more difficult for females than for males. Geographically it might appear that *lucia* is more the form of low levels and very hot districts, *portia* of the opposite conditions, but

here, too, there is no certainty, and many exceptions occur in the material examined by the writer.

Palpopleura jucunda (Rambur, 1842).

S. Afr. Mus.: 1 ♀, Rietfontein (13. x. 1904); 1 ♂, 1 ♀, Waterval (16, 17. xi. 1900); 7 ♂, 12 ♀, M'Fongosi, Zululand (ii, iv. 1911, W. E. Jones); 1 ♂, Machava, Delagoa Bay (14. xi. 1911), Waterberg, S.W. Protectorate (ii. 1920, Tucker). Coll. E. B. Williamson: 9 ♂, 8 ♀, Salisbury, Mashonaland (v, vi. 1899; ii, iii. 1900; v. 1905, Marshall). Coll. Ris: 1 ♂, 4 ♀, Botchabelo, 1200 m. (18, 23. ii. 1914, H. Junod). Brit. Mus.: Knysna, Delagoa Bay, Pretoria.

This elegant little dragonfly is one of the characteristic species of the present fauna. There is some variability in the single elements of wing pattern in both sexes, though the pattern remains the same in principle. Its range in Africa is very wide, since it has been recently found in Abyssinia (though in a slightly different form, with considerable reduction of black colour on wings, especially in male), and also in the interior of Nigerian West Africa. A closely allied though distinct species is found in India and South China.

Palpopleura deceptor (Calvert, 1899).

Coll. E. B. Williamson: 1 ♂, Salisbury, Mashonaland (xi. 1900, Marshall). Coll. Sélys: 3 ♀, Delagoa Bay.

Somewhat different in facies from the other species of *Palpopleura*, by the relatively longer and more slender abdomen, more elongate wings with the wave in costal vein only faintly indicated; but otherwise in venational and structural characters and colour system clearly congeneric. Evidently of wide distribution though rare in collections, and probably to be found more in the interior of the continent than on the coast districts; found North of Khartoum, West of Sikasso and Zungeru.

CHALCOSTEPHIA (Kirby, 1889).

A genus containing only two forms, which were considered as subspecies by the writer in his *Libellulinae* monograph, one (the first described) from Madagascar, the other one from continental Africa. Conspicuous by its short abdomen and elongate, comparatively narrow wings; a remarkable feature of its venation is the position of the proximal side of triangle in hind wing distal to arculus. Male distinguished by ventral process of first abdominal segment.

Chalcostephia coronata flavifrons (Kirby, 1889).

S. Afr. Mus.: 1 ♂, Lorenço Marques (4. xii. 1911). Coll. E. B. Williamson: 1 ♂, 1 ♀, Natal, woodside off Umbilo Road, Congella (22. x. 1904, G. F. Leigh).

♂. Labium ochreous; labrum and face light yellowish to rather bright orange; frons above brilliant metallic green. Thorax and abdomen entirely light blue pruinose (with pattern similar to female in immature specimens). Ventral plate of first abdominal segment raised in an almost vertical, deeply furcate process. Wings hyaline, tips narrowly bordered with brown. Pterostigma ferruginous in central, diffusely dark brown in peripheral parts.

♀. Thoracic dorsum black with greenish-yellow markings: slightly diffuse line at median suture; broad almost quadrate spot in front of ventral half of humeral suture, narrow line at superior half of same suture and along ante-alar sinus. Sides greenish yellow with black lines at metastigma, second lateral suture and latero-ventral margin of metepimeron. Legs black. Abdominal segments 1–2 greenish yellow with black rings at transverse carinae; 3–7 black with greenish or yellowish lateral spots, large on 3, small and interrupted on 4–5, none on 6, small and rounded on 7; 8–10 black. Margin of eighth segment folded; vulvar scale small, triangular. Wings as in male.

♂. *Abd.* 24, *hdw.* 28, *pt.* 2·5 mm. ♀, 22, 29, 2·5.

Found in tropical Africa, East and West, but evidently not a common species.

HEMISTIGMA (Kirby, 1889).

Like the preceding genus, consisting of two forms, one continental, the other one from Madagascar.

Hemistigma albipuncta (Rambur, 1842).

S. Afr. Mus.: 12 ♂, 7 ♀, Lorenço Marques (24, 25, 27. ix, 15. x, 29. xi, 3, 4, 5. xii. 1911); 6 ♂, 10 ♀, Barberton, Transvaal. Coll. Ris: 4 ♂, 4 ♀, Lorenço Marques (10, 11, 17, 25. iii. 1911); 3 ♂, 1 ♀, Rikatla, Delagoa Bay (i. x. 1913, H. Junod). Coll. E. B. Williamson: 3 ♂, Natal, woodside off Umbilo Road, Congella (12. x. 1904, G. F. Leigh).

♂. Lips and face whitish yellow; frons brilliant metallic blue with two whitish lateral spots. Thorax pruinose blue, sides with variable pattern of light yellow; in most specimens, even when fully mature, there remain of this colour three spots, confluent or separated, on ventral half of mesepimeron, metepisternum and metepimeron

respectively. Legs black. Abdomen slender, slightly fusiform, pruinose blue. Immature specimens with pattern of female. Wings hyaline; a costal stripe, distally to pterostigma, yellowish, mostly deeper in colour between nodus and pterostigma; in sub-costal space of front wings a deep black stripe of variable length (4 to 8 cells, very rarely reduced to a vestige), exceptionally a similar but smaller stripe in space between M_{1-3} and M_4. Pterostigma large, sharply divided in a proximal white and a distal black part, the latter slightly the longer.

♀. Frons fuscous with median transverse whitish-yellow band. Thoracic dorsum dark brown with somewhat diffuse yellowish lines; broad at median, narrow at humeral suture. Sides light greenish yellow with narrow, interrupted blackish lines between humeral suture and metastigma, at metastigma and at second lateral suture. Abdomen ochreous with three longitudinal black bands: median one beginning as a narrow line, gradually widened to end; lateral ones of equal breadth throughout, touching lateral margins of segments from segment 5 backward. Vulvar scale erect, elliptical in outline, about half as long as ninth segment. Wings mostly diffusely yellowish besides yellow costal stripe; no sub-costal black stripe; tips of all wings deep brown in variable length, mostly to about middle of pterostigma.

♂, *Abd.* 21, *hdw.* 23, *pt.* < 3 mm. to 25, 30, 4. ♀, 21, 24, 3 to 24, 29, < 4.

Very widely distributed in tropical Africa (North to Bahr el Ghazal) and often common; evidently a very common species at Delagoa Bay.

PORPAX (Karsch, 1896).

Similar in outline to *Chalcostephia*, but abdomen much narrower, especially in male. Only genus of present fauna with arculus at second *Anq* or distal thereto combined with incomplete last *Anq*. Most specimens with 2 *Cuq* in hind wing. Superficially resembling also *Diplacodes*, but wings more elongate and venation more close, besides differences in many venational details. The affinities are evidently with *Chalcostephia*, *Hemistigma* and *Thermochoria*. Only one species known.

Porpax asperipes (Karsch, 1896).

Brit. Mus.: 1 ♀, Mashonaland, up Buzi River, Gazaland (25. ix. 1905, G. A. K. Marshall).

This single specimen is not in very good condition; somewhat

different from those originally described from equatorial West Africa (pterostigma larger; cross-veins in sub-costal space yellow instead of black; yellow on thorax and abdomen more extended), it might belong to a second species. But it does not seem advisable to name a form from a single immature female.

♀ (immature). Labium light yellow, a very broad black median band. Labrum yellow, black at anterior margin. Anteclypeus brown, postclypeus light yellow. Frons black anteriorly, light yellow with broad black basal line above. Vertex black, light yellow above. Thoracic dorsum black with yellow markings: triangular spot in front of ante-alar sinus, separated by a narrow black space from a broad antehumeral band; antehumeral bands slightly convergent dorsally. Sides light yellow with two rather narrow black lines; slightly in front of metastigma and on second lateral suture. Metasterna chiefly black.

Legs black, first femora light yellow internally. Abdomen cylindrical, rather robust. Black with light yellow markings: sides on segments 1–6, this colour widened dorsally at base of 4–6; 7–9 small lateral spots; 1–3 sinuate yellow line on mid-dorsal carina; 4–9 narrow line on mid-dorsal carina, slightly widened in distal third of 4–6. Appendages and supra-anal tubercle light yellow. Ventral surface black with marginal yellow spots. (Vulvar scale not visible.)

Wings hyaline, pterostigma ochreous, sub-costal cross-veins light yellowish. *Anq* $9\frac{1}{2}$–$9\frac{1}{2}$; *t* 0.0; *ti* 2.3; *Cuq* $\frac{1.1}{2.1}$; in front wing two rows of discoidal cells to level of bridge or slightly beyond (in left wing but one cell in third series); in left hind wing two cells running through between M_4 and Cu_1 (right side damaged). Arculus in front wing at Anq_2, in hind wing slightly beyond.

Abd. 18, *hdw.* 24, *pt.* 2·5 mm.

In a typical West African series adult males have considerably more black on thoracic sides and the abdomen pruinose blue; females are similar on thorax to male, with yellow markings of abdomen smaller; a very mature specimen also with abdomen pruinose blue.

ACISOMA (Rambur, 1842).

The peculiar structure of the basal abdominal segments induced Rambur to establish this genus, which is therefore one of the earliest named genera in the subfamily *Libellulinae*. Its affinities are evidently with *Diplacodes*, of which it might be considered a specialised branch. One form is common throughout tropical Asia, continental

and insular, East to Celebes. But the genus is more fully developed in Africa.

Forms that have been considered as racially distinct from the Asiatic *A. panorpoides* exist in the vast region between Algeria, Delagoa Bay and Madagascar, and a second very distinct species (*trifidum*, Kby.) is known from tropical West Africa.

Acisoma panorpoides ascalaphoides (Rambur, 1842).

S. Afr. Mus.: 1 ♂, 1 ♀, Lorenço Marques (25, 27 . ix . 1911); 2 ♂, Ovamboland Otymbora. Coll. Ris: 12 ♂, 8 ♀, *ibid.* (11 . ii, 10, 11, 17, 25 . iii . 1911).

♂. Labium and labrum whitish. Face and frons light blue, fronto-nasal suture and base of frons broadly black. Thorax light greenish blue with an intricate pattern of deep black: black lines on medial, humeral, lateral and latero-ventral sutures, antehumeral, mesepimeral and metepimeral lines, these lines of variable breadth, sometimes interrupted, mostly with an undulating longitudinal anastomosis. Legs robust, black, narrowly lined with bluish or yellowish externally. Abdomen light blue with black markings: mid-dorsal longitudinal band; lateral bands, trilobate ventral spots and transverse carinae on inflated basal segments; latero-ventral band on segments 5–7; segments 8–10 wholly black. Superior appendages whitish above, black beneath, inferior appendage black.

Wings hyaline, very slightly and gradually fumose at tips; a very small yellowish spot at base of hind wings. Pterostigma whitish yellow.

♀. Similar to male in outline, slightly more robust. Frons olivaceous, black only at base, instead of an anterior black line a ferruginous shade. Thorax greenish or olivaceous; the pattern of male only indicated by rather diffuse darker olivaceous or ferruginous shades, often interrupted and sometimes quite indistinct. Abdomen olivaceous; dark pattern similarly reduced, blackish only at the carinae and on terminal segments. Legs mostly olivaceous, with interrupted blackish lines. Wings as in male.

♂. *Abd.* 20, *hdw.* 21, *pt.* < 3 mm. to 22, 24, 3·5. ♀, 19, 21, 3 to 22, 25, 3·5.

The series of specimens here recorded illustrates an East African form, named *A. variegatum* by Kirby and Sjöstedt (specimens from Nyasaland and from Kilimandjaro respectively), the writer's form B of the subspecies. Its distinctive features are—comparatively large size, dilatation of fifth abdominal segment very slight.

DIPLACODES (Kirby, 1899).

A genus embracing a small number of species, but several of them very widely distributed in tropical and sub-tropical Africa, Asia, and Australia, and common where they occur; a parallel to the American genus *Erythrodiplax*, although not equal to this one in importance for the respective faunal region.

Smaller species. Adult males with labium, face and frons whitish yellow, a broad basal black band of frons. Thorax pruinose blue, elliptical ante-humeral spots indicated by lighter colour of pruinosity. Abdomen black with segments 1-3 pruinose blue. Wings hyaline with very small brownish spot at base of second pair; only one or two cells at membranule. Females and immature males black and light yellow, much like the following species. ♂, *Abd.* 18, *hdw.* 20, *pt.* < 2 mm. ♀, 13·5, 16, < 2 to 15, 19, < 2 . . . . . *D. exilis.*

Larger species, but very variable in size. Adult males wholly black, ventral surface of thorax and abdomen very slightly whitish pruinose. Wings mostly with a diffuse greyish cloud at tips; basal spot of second pair brown to *Cuq* or slightly beyond and to end of membranule; pterostigma greyish ochreous to dark ferruginous Immature males gradually passing from a black and yellow pattern similar to female to the mature colour. Females with lips, face and frons light yellow; black basal line on frons. Thorax light yellow with blackish markings; line near median suture; broader line on humeral suture and an oblique band between ventral third of humeral and dorsal end of ante-humeral line; line between humeral suture and metastigma dorsally incomplete; at metastigma ventrally incomplete on second lateral suture; on met-epimeron dorsally incomplete (this pattern gradually developing from an almost unmarked condition). Abdomen light yellow with mid-dorsal black band on segments 1 10, latero-ventral black bands on segments 3–10; lateral bands mostly broader on posterior half of each segment and fused to dorsal band by a small terminal dilatation of the latter on segments 6 10. Wings hyaline, no terminal greyish cloud; basal spot in posterior pair similar in extent to male, but deep golden yellow; pterostigma light yellowish ochreous. ♂. *Abd.* 17, *hdw* 19, *pt.* 2 mm. to 25, 29, 3·5. ♀, 17, 23, 2·5 to 20, 23, 3 . . . . . *D. Lefebvrei.*

Diplacodes exilis (Ris, 1911).

Coll. E. B. Williamson: 1 ♀, Salisbury, Mashonaland (ix. 1900, Marshall).

The present specimen is the only one known to the writer from continental Africa; the type series came from Madagascar. Although mature males are widely different from *D. Lefebvrei* in similar condition, looking much like a minute edition of the Asiatic *D. trivialis*, immature males and females are not easily defined. Owing to the great variability of pattern in *Lefebvrei* (by degrees of maturity

and also truly varietal), there remains scarcely more than the very small size for the definition of the female of *exilis*. In the present specimen the shape of abdominal black bands seems worthy of mention: mid-dorsal band comparatively broad, nearly equally broad throughout from segments 4 to 10, no terminal dilatations; lateral bands narrower, dilatations of posterior half only very slight on segments 5 to 7.

Abd. 13·5, *hdw.* 16, *pt.* < 2 mm. Ante-nodal cross-veins in front wing $6\frac{1}{2}$. $6\frac{1}{2}$; terminal triangles free.

Diplacodes Lefebvrei (Rambur, 1842).

S. Afr. Mus.: 4 ♂, 5 ♀, Lorenço Marques (24, 25 . ix, 22 . x, 3, 5, 13, 15 . xii . 1911); 1 ♂, M'Fongosi, Zululand (x . 1911, W. E. Jones); 1 ♂, Inhambane (xii . 1912, K. H. Barnard); 1 ♀, Gwaai, S. Rhodesia (15 . ii . 1912); Kaapmuiden, Transvaal (xi . 1918, Tucker); S.W. Protectorate, Otjituo (i . 1910, Lightfoot); Tsumeb (i . 1920, Tucker). Coll. K. J. Morton: 1 ♂, 2 ♀, Beira (19 . x . 1908, Miss Fountaine). Coll. Ris.: 3 ♂, 3 ♀, Lorenço Marques (24 . ix, 26 . xi, 13, 15 . xii . 1911); 1 ♂, 3 ♀, Rikatla, Delagoa Bay (ix . 1913; iii, 17 . iv . 1914, H. Junod).

The specimens here recorded indicate the southern limits of this species, which is known from all parts of the African continent, including the Mediterranean region; it is also recorded from Asia Minor, Syria and Arabia, Madagascar and Mauritius, but not from the Seychelles, where the Asiatic *D. trivialis* has been found. Considerable variability in size, neural details (number of ante-nodal cross-veins, internal triangle free, two-celled, rarely even three-celled) and colour pattern does not appear dependent on geographical conditions, or colour varieties even when due to different stages of maturity than on true individual variation. A number of names given to such varieties by earlier and later authors was therefore abandoned by the writer, following in this the example of MacLachlan.

The development of colour in male from a black and yellow pattern similar to female to almost uniform black, according to maturity, as found in *D. Lefebvrei*, has parallel cases, of which *Sympetrum danae* from Europe, Northern Asia and boreal America is a long known one, and another is *Erythrodiplax nigricans*, a South American species about equally common in its habitat in the Argentine Republic.

CROCOTHEMIS (Brauer, 1866).

A genus of predominantly African distribution. One of the African species (*erythraea*) penetrates into Europe, even beyond the Mediter-

ranean zone, into Western and Central Asia, and is followed east and southward by a very closely allied form (*servilia*).

1. Venation close in apical portion of wings; two rows of cells between *Rs* and *Rspl.* Cu_1 in hind wing regularly separated from anal angle of *t*. Base of front wings unmarked, of hind wings with a small yellow spot at membrannle . . . . . 2.
   Venation wider in apical portion of wings; but one row of cells between *Rs* and *Rspl.* Cu_1 in hind wing as a rule at anal angle of *t*, but not rarely a little separated in individual varieties. Base of front wings with a small, of hind wing with a large deep golden-yellow spot to base of *t* and anal margin . . . . . 3.
2. *t* in hind wings crossed, not rarely 2 *Cuq* in hind wings. Very minute black markings on thorax and abdomen. Male lips and face whitish yellow, frons ochreous or olivaceous. Thorax light reddish brown dorsally, turning to yellowish and gradually to whitish at the sides; dorsum with numerous elevated black points and a faint indication of dark ante-humeral lines. Abdomen similar in shape to *sanguinolenta*, but still a little narrower; ferruginous, with a narrow mid-dorsal blackish line and the lateral margins of segments 4–7 narrowly blackish, except at both ends. Wings hyaline, with a very minute light yellow spot at the membrannle of second pair. Pterostigma ferruginous, distinctly widened in the middle. Female similar to male in shape, colour and markings. (Described from slightly immature specimens; mature males are probably more distinctly red, especially on abdomen.) ♂, *Abd.* 22, *hdw.* 27, *pt.* 4 mm. ♀, 21, 27, 3·5 . . . . . *C. divisa.*
   t in hind wings free, regularly 2 *Cuq* in hind wings. An extensive chequered pattern of black or dark brown on thorax and abdomen. *C. saxicolor.*
3. Abdomen comparatively narrow, 2·5 to 3 mm. Lateral carinae strongly toothed (for instance, 10–12 robust denticles at lateral carina of segment 5). Pterostigma 3 mm. and less, scarlet red in adult males. External branch of hamule less abruptly pointed, vulvar scale larger than in following species. Male: Face and frons brilliant scarlet. Thorax scarlet with a shade of golden yellow. Abdomen brilliant scarlet; narrow black lines on mid-dorsal carina of segments 3–9, on anterior half of each segment 4–7, less on 3, entire length on 8–9; small black points on middle of lateral margin of segments 3–7. Female: Full ochreous, brown instead of scarlet colour in male; narrow and slightly diffuse whitish stripe in front of humeral suture; blackish markings of abdomen usually more distinct than in male. ♂, *Abd.* 20, *hdw.* 26, *pt.* < 3 mm. ♀, 20, 27, 3 . . . . . *C. sanguinolenta.*
   Abdomen broad, 3·5 to 4·5 mm. Denticles of lateral carinae much finer (for instance, 20–22 very minute denticles on lateral carina of segment 5). Pterostigma 3·5 to 4 mm., light yellowish between black veins in adult males. Male deep blood red with no black markings except a narrow line on mid-dorsal carina of segments 8–9. Female ochreous yellow to yellowish olivaceous, immature specimens and sometimes also adult specimens with indication of yellowish ante-humeral bands. Basal spot

of wings deep golden yellow in male; mostly lighter, less brilliant in colour and veined with light yellow in female. ♂ ♀, *Abd.* 26, *hdw.* 29, *pt.* 3·5 mm. to 28, 32, < 4 . . . . . *C. erythraea.*

Crocothemis divisa (Karsch, 1898).

Coll. E. B. Williamson: 3 ♂, 1 ♀, Salisbury, Mashonaland (ii . 1900, iv . 1905, Marshall).

A widely distributed but evidently not common species, known from a limited number of specimens. From the extreme points where it was found, its existence in Africa between Zungeru in Nigeria, Gondokoro in Uganda, Salisbury, Diego Suarez in Madagascar can be admitted.

Crocothemis saxicolor, n. sp.

Coll. E. B. Williamson: 1 ♂, 5 ♀, Salisbury, Mashonaland (iv . 1900, 1905, Marshall).

♂ (immature). Light ochreous yellow, markings similar to adult females. Genitalia of segment 2; hamule slightly different from *divisa*; external branch broader, not produced in a point; internal branch rather shorter, shorter than external branch. Superior appendages almost straight, inferior angle but faintly indicated, near apex, a few minute black denticles preceding.

♀ (adult). Lips whitish yellow. Face and frons anteriorly greyish olivaceous, triangular flattened spaces very distinct; frons above and vertex similar in colour, but darker. Thorax light greyish ochreous with an olivaceous shade, marked with black; numerous elevated points, densely arranged on dorsum, less numerous on sides and not reaching behind metastigma; maculate, not sharply-defined stripes at median suture and half way between median and humeral suture; spot in front of humeral suture at mid-height, all fused by somewhat diffuse anastomoses; laterally incomplete narrow brownish stripes between humeral suture and metastigma on ventral half, at metastigma in dorsal third; narrow black line on dorsal half of second lateral suture, and longitudinal line on dorsal margin of metepimeron. Ventral surface whitish. Legs very light ochreous, spines black. Abdomen comparatively slender, almost cylindrical, very little narrowed backward. Dull greyish ochreous with an olivaceous shade, marked with blackish; dorsum of segment 1 except a small median yellowish spot; 2–3 lateral band, a little distant from ventral margin, and narrow lines at the carinae; 4–7 mid-dorsal line, a little widened in middle and near posterior end of each segment; lateral band,

shortly interrupted at joints and touching lateral carinae in middle of each segment; 8–9 elliptical spot on mid-dorsal carina and broad lateral bands; 10 small median and lateral spots. Ventral surface light yellow, somewhat greenish at base, lateral carinae very narrowly lined with black. Appendages light greyish. Vulvar scale a little shorter than ninth ventral plate, narrowly elliptical, not much raised (similar to *divisa*); end of ninth ventral plate somewhat produced ventrally.

Wings hyaline; pterostigma light greyish ochreous, broad, somewhat widened in middle. Venation blackish, cross-veins in *sc*, between *R* and *M* outward to bridge, and in *cu* whitish. Membranule dark grey. *Ang* 9½.

♂, *Abd.* 23, *hdw.* 27, *pt.* 3 mm. ♀, 24, 29 > 3.

One of the females bears the collector's note: "Settles only on granite boulders at a distance from water; very difficult to detect, also very local." This observation is of special interest with regard to the most peculiar chequered pattern of this species, a pattern which might be justly claimed as granite colour. This and the preceding species are somehow intermediate between *Crocothemis* and *Bradinopyga* in neural characters and in general facies, though probably the *Crocothemis* characters may be claimed as prevalent.

Crocothemis sanguinolenta (Burmeister, 1839).

S. Afr. Mus.: 5 ♂, 1 ♀, Barberton, Transvaal; 2 ♂, 3 ♀, M'Fongosi, Zululand (ii, iii, xi. 1911, W. E. Jones); 1 ♀, Livingstone, Zambesi; 1 ♂, Victoria Falls (vii. 1911); 1 ♂, 1 ♀, Matopo, Rhodesia (16. ii, 28. v. 1911); Kaapmuiden, Transvaal (xi. 1918, Tucker); St. Lucia Bay, Zululand (x. 1919, Bell-Marley); Otavi, S.W. Africa (i. 1920, Lightfoot). Brit. Mus.: 1 ♀, Cap. Bon. Spei (Sowerby, very old specimen); 1 ♂, Port Natal; 1 ♂, 2 ♀, Chirinda Forest, Gazaland, 3600–4000 ft. (27. ix, 3, 17. x. 1905, Marshall); 3 ♂, Salisbury (1904, *id.*). Coll. K. J. Morton: 1 ♂, Macequece (23. ix. 1908, Miss Fountaine); 1 ♂, 1 ♀, Wolhuterkop, Transvaal (i, xii. 1908, ead.). Coll. E. B. Williamson: 2 ♀, Salisbury (ii. 1900, v. 1904, Marshall); 2 ♂, Hilton Road, Natal, 3500 ft. (17. xii. 1909, G. F. Leigh); 1 ♀, Natal (17. iii. 1909, *id*).

Although found north to Nigeria, Sierra Leone and Abyssinia, this species is more decidedly South African than *C. erythraea*. No true intermediates between the two species are known to the writer; specimens of *sanguinolenta* lacking the blackish markings of abdomen are found in intertropical Africa and Abyssinia, but their forms and

structural details clearly indicate their identity. No true affinity exists with *Trithemis*, in which genus the species had been located by some of the earlier authors.

Crocothemis erythraea (Brullé, 1832).

S. Afr. Mus.: 5 ♂, Uitenhage, Stellenbosch, Matjesfontein, Potchefstroom, Durban; 1 ♂, Waterkloof (20. xii. 1906); 1 ♂, Rietfontein (9. x. 1904); 1 ♂, Warmberg, Zoutpansberg District Transvaal (6. xii. 1903); 1 ♂, 2 ♀, Dunbrody, Blue Cliff (ii, iii. 1912); 1 ♀, M'Fongosi, Zululand (iii. 1911, W. E. Jones); 4 ♂, Lorenço Marques (7. vi, 13. xi, 4. xii. 1911). Brit. Mus.: 2 ♂, Salisbury, Mashonaland (1904, Marshall); 2 ♂, Deelfontein (1902, Col. Sloggett); 1 ♂, Johannesburg 2 ♂, 1 ♀, Natal; 2 ♂, Cape. Mus. Berlin: 5 ♂, 6 ♀, Rooibank (L. Schultze). Coll. K. J. Morton: 1 ♀, Durban (27. i. 1908, Miss Fountaine). Coll. E. B. Williamson: 4 ♂, 5 ♀, Salisbury (v. 1899, i, ii, x. 1900; iii. 1905, Marshall); 1 ♂, 1 ♀. Princetown, Natal (8. xii. 1908, 17. iii. 1909; G. F. Leigh). Coll. Ris: 1 ♀, Waterval Boven, Transvaal (15. ii. 1914, Junod).

One of the most conspicuous, common and characteristic dragonflies of the Mediterranean zone in Europe and Africa, this species is evidently rather common almost everywhere in Africa, except in the zones of heavy tropical rains and corresponding forest vegetation. It is also found in Madagascar. If a series of *C. erythraea* from Southern France is compared with material from the faunal region here discussed no appreciable differences can be found.

BRADINOPYGA (Kirby, 1893).

Very closely allied to *Crocothemis*; two African and one East Indian species.

Bradinopyga cornuta (Ris, 1911).

S. Afr. Mus.: 1 ♂, Salisbury, Mashonaland (vi. 1913); 2 ♂, 2 ♀, Kaapmuiden, Transvaal (30. x. 1918, R. E. Tucker). Coll. E. B. Williamson; 1 ♀, Salisbury (iv. 1900, Marshall); 1 ♀, Princetown, Natal (19. ii. 1909, G. F. Leigh).

♂. Lips ochreous. Face and frons dull olivaceous, frons darker above. Anterior ridge of frons rather indistinct, its lateral ends projecting in the form of small sharp spines. Vertex deeply emarginate, also projecting in two acute points. Thorax very robust, mid-dorsal carina strongly projecting; anterior margin of ante-alar sinus with a

row of sharp denticles. Dark chocolate brown with a chequered pattern of whitish spots; narrow line at median suture; sinuate, dorsally interrupted ante-humeral stripe; double spot between this stripe and humeral suture; three rounded spots, an interrupted line and some minute points between on mesipimeron; sinuate ventral band and triangular dorsal spot on metepisternum; four spots on metepimeron. Ventral surface dull brown, darker at sutures. Legs olivaceous, end of second and third femora conspicuously whitish, internal side of tibiae and spines black. Abdomen moderately widened at base, from third segment almost cylindrical; segments 7–9 very slightly widened in dorso-ventral dimension with a pattern of olivaceous and black, the latter colour predominant. The pattern consists in a rather narrow mid-dorsal and broad lateral black bands, both confluent in the middle and towards the end of each segment, the lateral bands being a little distant from the lateral carinae; olivaceous colour broadest on segment 7, where it forms a transverse band over almost the anterior two-thirds of the segment. Appendages olivaceous, superior ones almost straight; no distinct inferior angle, a row of minute denticles on a blackish ridge instead; inferior appendage but little shorter. Genitalia of second segment small; hamule with external branch broadly rounded, internal branch but little shorter, a strongly curved hook; lobe higher than hamule, rounded, almost circular.

Wings hyaline; a sharply defined narrow brown edge at tips; pterostigma dark brown in costal half, gradually passing to ferruginous in anal half; membranule greyish. *Anq* $9\frac{1}{2}$. $9\frac{1}{2}$. $t\ \frac{2\ .\ 2}{1\ .\ 1}$; *ti* 4 . 4; 4 rows of discoidal cells in front wing from level of bridge, once 4 cells at triangle on right side; 2 rows *Rs–Rspl.*

Abd. 29, *hdw.* 37, *pt.* 3·5 mm.

♀. Very similar to male. Abdomen shorter and more robust. Vulvar scale narrowly elliptical, raised, a little shorter than ninth segment dorsally; ninth ventral plate projecting in a broad, rounded tongue almost to end of tenth segment. Wings brown at tips almost to distal end of pterostigma. *Anq* $10\frac{1}{2}$. $10\frac{1}{2}$; $t\ \frac{1\ .\ 1}{1\ .\ 1}$; *ti* 4 . 4 (Salisbury);

Anq $10\frac{1}{2}$. $10\frac{1}{2}$; $t\ \frac{1\ .\ 2}{1\ .\ 1}$; *ti* 4 . 4 (Princetown).

Abd. 25, *hdw.* 36, *pt.* 3·5 mm.

The type male (from Mozambique) differs from the present specimen by rather large golden-brown spots at base of both wings; the incomplete female type (from East Africa) is similar to the present females. On the Salisbury female the collectors note: "Habits same

as *C. Crocothemis saxicolor*." Together with the habits the peculiar "granitic" pattern is also common to these remarkable two species.

BRACHYTHEMIS (Brauer, 1868).

Two African and two Asiatic species, one of each group of very wide range and common.

Brachythemis leucosticta (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, Waterval, Transvaal (13. v. 1900); 1 ♂, Kafue River, Rhodesia (v. 1912); 1 ♂, Matopo Dam, Bulawayo (16. ii. 1911); Potgietersrust, Transvaal (x. 1914, Dr. Melle); Otjituo, S.W. Protectorate (i. 1919, Lightfoot); Otiembora (xi. 1887, Eriksson) and Mafa (ii. 1921, Barnard), S.W. Protectorate. Coll. Sélys: 2 ♂, 1 ♀, Delagoa Bay.

♂ (adult). Labium dark brown; labrum, face and frons brownish black. Thorax and abdomen wholly black, very slightly whitish pruinose. Legs brownish black. Wings hyaline with a broad blackish-brown transverse band, occupying in most specimens the whole space between nodus and proximal end of pterostigma. Pterostigma whitish yellow in proximal two-thirds, dark grey in distal third. Immature males similar to female, gradually passing to the mature black colour; black band of wings also gradually appearing, very rarely absent in fully mature males.

♀. Lips whitish yellow; ante and postclypeus very light olivaceous, frons and vertex whitish yellow, narrow black line at base of frons. Thorax and abdomen bright ochreous, with an olivaceous shade, marked with black; lines at median and humeral suture, bifurcate ante-humeral band; lines between humeral suture and metastigma, dorsally from metastigma, at second lateral suture, and on metepimeron. Abdomen with narrow mid-dorsal line, broad lateral band nearer to lateral than to median carina, partially interrupted at the joints, narrow dots on lateral carina. Legs light yellowish, with narrow black lines. Wings hyaline with a small light yellow basal spot of second pair, to *Cuq* and end of membranule. Post-nodal band absent altogether, even in fully mature specimens, or present in various degrees of extent and depth of colour, but never fully as broad and as deeply coloured as in regular males. Pterostigma as in male.

♂, *Abd.* 20, *hdw.* 24, *pt.* 2·5 mm. to 21, 25, 3. ♀, 18, 22, 2·5 to 20, 26, 3.

The specimens here recorded indicate evidently the extreme southern

limits of this species, which is extremely common in tropical Africa, and known also from Algeria, where it is said to be gregarious in habits.

SYMPETRUM (Newman, 1833).

A genus of many species and wide distribution in the Northern temperate zone of the Old World and of America. A single species penetrates into South Africa.

Sympetrum Fonscolombei (Sélys, 1840).

S. Afr. Mus.: 1 ♂, Matopo Dam, Bulawayo (16.ii.1911); 1 ♂, 2 ♀, Rietfontein, Transvaal (6.ii, 13.x.1904); 1 ♂, Warmberg, Tv. (17.iv.1904); 1 ♂, 1 ♀, Waterval, Tv. (10.x.1899); 4 ♂, 8 ♀, Cape Town (ix.1913, L. Peringuey); 1 ♀, Stellenbosch (ix.1913, R. M. Lightfoot). Brit. Mus.: 1 ♀, N.E. Rhodesia, Luwumbu Valley, Upper Luangwa, 2500–3000 ft. (19, 26.vii.1910, S. A. Neave); 1 ♀, Salisbury (Marshall); 2 ♂, Boksburg, Johannesburg (C. H. Pead); 1 ♂, Transvaal (A. Ross); 4 ♂, 1 ♀, Deelfontein (1903, Col. Sloggett); 2 ♂, Orange River Colony (1902, G. E. B. Hamilton); 1 ♂, 1 ♀, Simons Town; 1 ♂, 3 ♀, Cape (very old specimen). Coll. E. B. Williamson: 2 ♀, Salisbury, 5000 ft. (i, iii.1900, Marshall). Mus. Berlin: 4 ♂, 2 ♀, Kalahari (L. Schultze).

♂. Labium yellow; labrum, face and frons brilliant scarlet, narrowly lined with bluish white at the sides; broad, deep black basal line on frons. Thorax rich reddish golden brown dorsally; sides with two broad whitish bands on mesepimeron and metepimeron, those bands turning gradually to greenish or olivaceous shades in dorsal half, or altogether fading in very mature specimens; intermediate space at metastigma dull red. Abdomen comparatively robust, scarcely contracted at third segment, brilliant scarlet; broad black mid-dorsal band on segments 8–9. Legs black; femora and tibiae with narrow external yellow lines. Wings with neuration light red, very gradually darker from nodal region outward; golden yellow basal spot in hind wings of variable extent, but at least to *Cuq* and apex of membranule. Pterostigma very light, ochreous yellow between black veins. Membranule white.

♀. Ante- and postclypeus greenish white, lips, face and frons very light yellowish. Thorax light yellowish brown instead of the reddish colour of males; lateral greenish-white bands not considerably darkened dorsally. Abdomen light ochreous. Neuration of wings very light ochreous instead of red; pterostigma as in male.

♂, *Adb.* 28, *hdw.* 29, *pt.* 3 mm. ♀, 28, 31, 3.

Very common in Mediterranean Europe and Africa, eastward to Turkestan and the mountains of South India. Not a regular inhabitant of the extra-Mediterranean regions in Europe, but appearing there (in Switzerland, Germany to the Baltic Sea, Great Britain to the Firth of Forth) at irregular intervals and sometimes in vast numbers. The unusually early appearance in some cases (middle of May, 1908, in Switzerland) clearly indicates that these swarms are emigrants from the South; all local examples of *Sympetrum* do not appear in this country before July and most of them not before August; in years when there is no immigration *Fonscolombei* is not altogether absent, but is very rare and local. Very probably corresponding habits will be observed in South Africa; the series taken in Cape Town at the early date of September, 1913, may have been immigrants like those found in May at the writer's Swiss home. Observations made by the writer and Mr. Morton in Southern France seem to indicate that the species is not at all particular as to the quality of water; we found it abundantly at a very badly polluted canal near the city of Narbonne. This and the migrating habits may have favoured the dispersal of this species so far beyond the limits of its palaearctic congeners.

PHILONOMON (Forster, 1906).

A single African species, evidently allied to *Sympetrum* and resembling this genus in facies.

Philonomon luminans (Karsch, 1893).

S. Afr. Mus.: 1 ♂, Lorenço Marques (15 . xii . 1911). Coll. Ris: 2 ♀, *ib.* (12, 15 . xii . 1911).

♂. Labium whitish with a narrow median black band; labrum and anteclypeus ochreous; postclypeus and frons brilliant scarlet; narrowly and diffusely yellow at the sides; narrow basal black line on frons. Thoracic dorsum light golden brown, sides greenish yellow; black dot in dorsal end of humeral suture; black line at metastigma half way to dorsal margin; very narrow black line on second lateral suture; latero-ventral sutures broadly black; ventral surface yellowish with two broad transverse black bands. Legs black. Abdomen moderately inflated at base, gradually narrowed in third and fourth segment, then almost cylindrical; greenish yellow and black; black mid-dorsal line, narrow on basal segments, wider from segment 4

backward; oblong black spots at posterior half of segments 4 to 7, fused to dorsal black at end of each segment, narrowly 4–5, broadly 6–7; eighth segment with sides wholly black, only cuneiform basal lateral spots remaining yellow; 9–10 wholly black; dorsum of segments 2–4 bright orange to scarlet red. Wings slightly stained with greyish yellow: broad, deep golden-yellow basal spot on second pair, to basal side of *t* and anal angle; smaller and not so deeply coloured spot on first pair. Pterostigma whitish at both ends, diffusely greyish ferruginous in middle; membranule greyish ferruginous.

♀. Very similar to male, but no red colour on face, frons and dorsum of basal segments of abdomen. Colour of basal spot in hind wings lighter yellow.

♂, *Abd.* 27, *hdw.* 29, *pt.* < 3 mm. ♀, 24, 30 < 3.

Widely distributed in tropical Africa, East and West, also recorded from Nossi Be and recently by Mr. Campion from Assumption Island, of the Aldabra Group in the Indian Ocean.

HELOTHEMIS (Karsch, 1890).

The single species representing this genus is a very close ally to *Trithemis*. The absence of the incomplete last ante-nodal cross-vein seems to be a regular character, and since great importance (evidently exaggerated in some cases) is given to the presence or absence of this vein, the genus may stand, though with doubtful rights.

Helothemis dorsalis (Rambur, 1842).

S. Afr. Mus.: 1 ♂, 1 ♀ (old specimens, no locality); 1 ♀, Boksburg, Transvaal; 1 ♂, Salisbury (24. xii. 1911). Brit. Mus.: 1 ♂, Cape; 1 ♂, Transvaal; 2 ♂, 1 ♀, Johannesburg (1903, H. Crawford-Cruger); 1 ♂, Boksburg, Johannesburg (C. H. Pead); 1 ♀, Willow Grange, Mooi River, Natal (i, ii. 1913, R. C. Wroughton). Mus. Stockholm: 2 ♂, Caffraria (J. Wahlberg). Coll. Selys: 1 ♂, 3 ♀, Cap de Bonne Esq. Coll. E. B. Williamson: 1 ♂, Salisbury (iii. 1900, Marshall). Coll. Ris.: 3 ♂, Botchabelo, 1200 m., Transvaal (17, 18, 19. ii. 1914, H. Junod).

♂. Labium black, sides yellowish; labrum, anteclypeus and frons anteriorly black; postclypeus and a narrow line at anterior suture of frons dark olivaceous. Frons above and vertex brilliant metallic violet. Thorax and abdomen wholly blackish, turning to violet-blue owing to a rather thin pruinosity. Legs black. Wings hyaline; small, deep golden-yellow spot at base of second pair, about half way to *Cuq* and two cells at membranule. Pterostigma blackish, in some

specimens very narrowly whitish at proximal end. Immature males similar to female, but black bands of abdomen broader, very gradually passing to mature colour; vestiges of thoracic pattern often visible in partly pruinose specimens.

♀. Labium yellowish, median lobe, and sometimes a narrow median line on side lobes black. Labium, face and frons yellow; broad basal black band on frons, extending anteriorly into furrow. Thorax and abdomen light greenish-yellow with black markings; cuneiform band narrower dorsally, on median suture; lines very close to humeral suture, on humeral suture, half way to metastigma, on metastigma, on second lateral suture, on metepimeron; these lines, except the sutural ones, mostly dorsally incomplete. Abdomen with broad, slightly sinuate mid-dorsal band, narrow lines on lateral and transverse carinae, broader on segments 7–9 and confluent with dorsal black. Wings slightly stained with greyish yellow throughout; deeper yellow but very diffuse spots at nodus and variable yellow basal spot on second pair to Anq_1, Cuq and end of membranule in specimen from Johannesburg. Legs black, with light yellow lines on external side of femora.

♂, *Abd.* 27, *hdw.* 29, *pt.* 3 mm. ♀, 25, 29, 3·5.

This is one of the characteristic *Libellulinae* of the South African fauna, though extending northward to British East Africa. It resembles strangely *Trithemis Distanti*, not only in colour but even in genital structure of male, though *H. dorsalis* has the wings comparatively more elongate than *T. Distanti* and their venation more close. Males may further be distinguished by their hamule being higher (especially the basal part) than in *Distanti*; females and immature males of *Distanti* show the black lines of thoracic sides with a distinct tendency to longitudinal fusion, common to almost all species of *Trithemis*; in *H. dorsalis* these lines are very sharply defined and there is no indication of longitudinal fusion. Kirby had described (1905) the genus as new under the name *Misthotus*, and the male from slightly different individuals as *M. ambiguus* and *M. Marshalli*. The descriptions of *Helothemis* (Karsch) and of the species *dorsalis* (Rambur) were made from the female. The highly dimorphic sexes were united under the older name by the writer.

TRITHEMIS (Brauer, 1868).

A genus of wide distribution in tropical Asia, tropical and subtropical Africa, the greater number of species African. Together with *Orthetrum* it is the dominant African genus of *Libellulinae* in number of species and of individuals.

Males.

1. Colour predominantly red . . . . . 2.
   Colour predominantly black, markings light yellowish . . 5.
2. Abdomen little widened at base, not sensibly contracted in third segment, triquetral and very gradually narrowed to apex . . . . 3.
   Abdomen little widened at base, contracted at third segment, very slender and slightly fusiform hindward. Pterostigma small, very dark ferruginous to almost black; neuration close, 11½-12½ *Anq*; veins red distally to pterostigma. Variable deep golden-yellow spot at base of both wings; smaller spots to Anq_1 and *Cuq* in front wing to Anq_1, *Cuq* or very little beyond and apex of membranule, or little more in hind wing; larger spots to Anq_2 and arculus in front wing to Anq_{2-3}, proximal or even distal end of *t* and anal angle in hind wing. Face dull ferruginous, frons above coppery red. Thorax reddish golden brown; black stripes on mesepimeron, at metastigma and at second lateral suture, dorsally incomplete and partially confluent to form a longitudinal stripe. Abdomen blood red; blackish lateral stripe at mid-height of segments 1–3, sides of segments 4–8 deep black, 9–10 wholly black. Legs black. *Abd.* 23, *hdw.* 25, *pt.* < 2 mm. to 26, 30, 2·5 . . . *T. arteriosa.*
3. Furrow of frons moderately deep; vertex broadly emarginate. Triangles of hind wings free, regularly but one *Cuq* in hind wings; pterostigma medium-sized . . . . . 4.
   Furrow of frons deep; vertex triangularly excised, two-pointed. Triangles of hind wings very often crossed, not rarely 2 *Cuq* in hind wings. Pterostigma very small; black, narrowly red at both ends on dorsal side, deep ferruginous on ventral side of wing. Base of both wings deep and brilliant golden yellow to about two cells beyond *t* in front wing, 3–4 cells beyond *t* in hind wing, part of *c* and *m* lighter in colour to almost hyaline. Neuration red to a little beyond level of nodus. Face olivaceous; frons scarlet red, narrowly yellowish at base and at sides. Thorax reddish golden brown dorsally, turning to olivaceous at the sides, with vestiges of black lines. Abdomen brilliant scarlet red, narrow black mid-dorsal line on segments 8–9. Legs brown, tibiae externally light ferruginous or red. *Abd.* 20, *hdw.* 23, *pt.* 1·5 mm. to 22, 26, 1·5.
   T. Kirbyi ardens.
4. Pterostigma blackish with a narrow ochreous line at anal margin. Venation yellowish red to nodus, blackish more distally. 10½ to 11½ *Anq*. Base of front wings light golden yellow to Anq_1 and *Cuq*, of hind wings deeper golden yellow to Anq_2, proximal side of *t* and anal angle. Face olivaceous; frons and vertex dull orange with no metallic colour, a narrow blackish line at base of frons. Thorax reddish golden brown, sides with vestiges of blackish lines. Abdomen dull blood red; lateral carinae very narrowly lined with black to segment 7, this black line broader on segment 8, and especially on 9 and 10; black mid-dorsal line on segments 8–9. Legs black. *Abd.* 24, *hdw.* 28, *pt.* 2·5 mm. *T. pluvialis.*
   Pterostigma ochreous to very light ferruginous between black veins. Venation bright red to pterostigma. 9½ to 10½ *Anq*. Variable golden-yellow brown spot at base of wings; in average specimens half way to

Anq$_1$ and *Cuq* in front wing to *Anq*$_2$, proximal side of *t* and anal angle in hind wing. Face and frons anteriorly reddish ochreous. Frons above and vertex brilliant metallic reddish violet. Thorax reddish brown, lighter at sides, with a pattern of confluent brown or blackish stripes as described for *arteriosa*. Abdomen dull blood red, sides of segments 1–3 yellowish, with an indistinct longitudinal blackish stripe; lateral carinae very narrowly black; broad mid dorsal black band on segments 8–9. Legs black, first and second femora brown. Mature specimens faintly violaceous by very slight bluish pruinosity. *Abd.* 22, *hdw.* 26, *pt.* 2·5 mm. to 24, 30, 2·5 . . . . . *T. annulata.*

5. Abdomen little widened at base, contracted at third segment, very slender and slightly fusiform hindward; yellow markings on abdomen persistent in mature specimens . . . . . 6.
Abdomen little widened at base, not sensibly contracted at third segment, triquetral and very gradually narrowed to apex. Wings hyaline, venation black; base of hind wings hyaline, or with a very small yellow spot, not beyond *Anq*$_1$ and *Cuq* and at most one cell at membranule. Pterostigma broad, black, in most specimens with a narrow light yellowish line at anal margin. 10½ to 13½ *Anq* Labium yellow with broad median black band. Labrum and postclypeus black; anteclypeus and anterior margin of frons olivaceous; frons above and vertex brilliant metallic violet blue Thorax and abdomen very dark brown to black, made faintly violaceous by thin bluish pruinosity. Legs black. *Abd.* 24, *hdw* 29, *pt.* 3 mm. to 26, 32, 3 . . . . . *T. Distanti.*

6. Frons above brilliant metallic blue, pure, or with a greenish shade. Labium yellow with broad median black band Labrum black with two yellow spots. Face and frons anteriorly light yellow. Thorax in mature specimens very densely light blue pruinose; in immature specimens with a pattern of black and light yellow similar to female. Abdomen black with light yellow markings; dorsal and lateral spots on segments 1 to 3; narrow lateral cuneiform spots on segments 4 to 7, gradually smaller hindward. Legs black. Wings hyaline, venation black; no basal yellow spot on posterior pair; but on hind wings (in all mature specimens) a large light yellow cloud between basal side of *t* and nodus in longitudinal, over the whole breadth of wing in transverse dimension. Pterostigma dark ferruginous to black, in most specimens with a narrow light yellowish line at posterior margin. 9½ to 10½ *Anq.* *Abd.* 25, *hdw.* 29, *pt.* 3 mm. . . . . *T. stictica.*
Frons above brilliant metallic pure violet. Labium whitish with broad median black band. Labrum and postclypeus blackish; anteclypeus and anterior margin of frons olivaceous. Thoracic dorsum blackish, made dull violaceous by pruinosity; sides olivaceous, with three broad black bands: on mesopimeron, across metastigma and behind second lateral suture; these bands dorsally incomplete and longitudinally confluent near dorsal end. Abdomen black with light ochreous markings; broad lateral and very small dorsal spots on segments 1 to 3; very narrow lateral lines on segments 4 to 7, incomplete and sometimes interrupted. Wings hyaline or very faintly greyish yellow; venation in

costal and proximal half brown in longitudinal, ochreous to whitish in cross-veins; base of second pair with a golden-yellow to light golden-brown spot; vestiges in *c*, *sc* and *m*, almost to *Cuq* in *cu*, to apex of membranule. Pterostigma light ochreous in dorsal, whitish in ventral side of wings, between thin black veins, smaller than in two preceding species. $8\frac{1}{2}$ to $9\frac{1}{2}$ *Anq*. *Abd.* 30, *hdw.* 30, *pt.* 2·5 mm. . *T. aureola.*

Females.

1. Frontal furrow moderately deep, vertex obtuse or very shallowly emarginate. Legs blackish, tibia concolorous . . . . . 2.
   Frontal furrow very deep, vertex two-pointed. Wings hyaline; golden-yellow basal spot in hind wings to *Anq* 1 and *Cuq*; small round yellow cloud between A_3 and anal angle; pterostigma very small, blackish and narrowly ochreous at both ends in dorsal, blackish with anal margin ochreous in ventral surface of wing. Venation ferruginous to nodal region, gradually darker more distally. $9\frac{1}{2}$–$10\frac{1}{2}$ *Anq*. Lips, face and frons whitish yellow, frons diffusely darker at base. Thoracic dorsum olivaceous, an indistinct cuneiform stripe at median suture and broad band at humeral suture ferruginous. Sides olivaceous; incomplete dark lines at humeral suture, on mesepimeron, at metastigma and on second lateral suture; these lines rather diffuse, the stigmatic one alone being distinct and blackish. Abdomen comparatively robust, very gradually narrowed to apex; dull ochreous brown; very narrow black lines on carinae; black mid-dorsal band on segments 8–9; in some specimens an almost complete narrow blackish line between lateral and mid-dorsal carinae on segments 3–9. Third femora black with narrow external ochreous line; second and first femora ochreous, black internally. *Abd.* 20, *hdw.* 23, *pt.* < 2 mm. to 23, 28, 2 . . . . . *T. Kirbyi ardens.*
2. Colour of abdomen predominantly light, ochreous to reddish brown . 3.
   Colour of abdomen predominantly black, light yellow lateral stripes 6.
3. A distinct mid-dorsal black line on abdominal segments 2–10, or, if there is no such line, lateral black margins also absent . . . . . 4.
   Mid-dorsal black line only on segments 2–3, sometimes 4, absent on segments 5–7; sides of segments 4–7 broadly black, this colour ascending almost to mid-dorsal line at terminal joint of each segment; 8 black with small ochreous latero-basal spots; 9–10 wholly black. Abdomen comparatively slender, though more robust than in corresponding male. Face, frons and vertex ochreous; narrow black basal line on frons. Thorax light golden brown dorsally; sides light greenish yellow, with the ordinary black lines of the genus rather narrow and not often confluent. Wings hyaline; basal spot golden yellow, predominantly small, only vestiges in front wing and not exceeding *Anq* 1, half way between *Cuq* and *t* and apex of membranule in hind wing; not rarely a light yellow cloud in region of nodus. Pterostigma conspicuously larger than in corresponding male, very dark ferruginous to blackish, often lighter at anal margin. Venation dark ferruginous to nodal region. $11\frac{1}{2}$–$12\frac{1}{2}$ *Anq*. *Abd.* 24, *hdw.* 28, *pt.* < 3 mm. . . . . *T. arteriosa.*

4. Pterostigma broad, bicolorous, black or very dark brown with anal margin light ochreous . . . . . 5.
   Petrostigma not distinctly widened, unicolorous, light ochreous to light ferruginous between dark veins. Face and frons whitish yellow; variable dark line at base of frons, sharply defined and black, or only faintly indicated. Thorax light golden or greyish brown dorsally, in very mature specimens sometimes slightly pruinose; more yellowish at the sides, with the usual dark bands, more or less confluent longitudinally; this pattern distinct and blackish in immature specimens, gradually fading to greyish shades and often indistinct in very mature and pruinose ones. Legs blackish brown, first and partially second femora ochreous brown. Abdomen comparatively robust, almost cylindrical; light ochreous brown; sides of segments 1–3 yellowish with blackish lateral band; narrow black lines at mid-dorsal, lateral and transverse carinae; broader black mid-dorsal band on segments 8–9. Wings, venation light reddish yellow to the same extent as the red colour in male (dark to almost blackish in immature specimens); yellow basal spot similar to corresponding male, but generally paler in colour. 9½ to 10½ *Anq*. *Abd*. 22, *hdw*. 28, *pt*. 3 *mm*. to 24, 30, 3 . . . *T. annutata*.
5. Wings with venation wholly black, except some whitish cross-veins in subcostal and adjacent species; in some specimens a small golden yellow basal spot in hind wing, at most to Anq_1, Cuq_1 and one or two cells at membranule; not rarely a light yellow cloud in nodal region; pterostigma deep black with light ochreous line at anal margin; *Anq* 10½ to 11½. Face greenish yellow, frons dull orange with broad shining black basal line. Thoracic dorsum dull yellowish; broad cuneiform, dorsally pointed blackish band on median suture; ventrally narrow, dorsally rather broad blackish band in front of humeral suture. Sides greenish yellow with the usual lines broad, blackish and conspicuously confluent in longitudinal direction. Abdomen comparatively robust, very gradually narrowed to end; light ochreous brown: black lines on mid-dorsal and lateral carinae broad, especially on posterior segments, confluent at terminal joints of segments 7–8; segment 9 black with ochreous anterolateral spot; 10 wholly black. *Abd*. 24, *hdw*. 31, *pt*. 3 < to 27, 33, 3 5 mm. *T. Distanti*.
   Wings with venation yellowish red to nodal region, blackish more distally; large golden-yellow spot on base, to Anq_1 and *Cuq* or slightly more in front wing; to Anq_2, basal side of *t* and anal angle in hind wing; pterostigma very dark ferruginous with light ferruginous narrow line at anal margin. Thoracic pattern similar to preceding species, but colours more like *T. annulata*, and the lateral bands reduced in size and much paler in colour, only the stigmatic line and parts of the sutural lines being black. Abdomen very much like preceding species in outline and elements of pattern; mid-dorsal black line a little narrower; lateral black band more reduced, especially on segments 4–6. *Abd*. 24, *hdw*. 30, *pt*. 3 mm. . . . . *T. pluvialis*.
6. Frons above metallic greenish blue, olivaceous anteriorly. Face light yellow; labrum yellow with median black line. Thoracic dorsum black with cuneiform light yellow antehumeral stripes and similar spots on

ante-alar sinus. Sides light yellow; the usual bands deep black and broadly confluent in longitudinal direction. Abdomen comparatively narrow, almost cylindrical; black with light yellow markings; lateral and dorsal bands interrupted by transverse black carinae on segments 1–3; lateral stripes almost for full length of segments 4–7, nearer to mid-dorsal than to lateral carinae; antero-lateral spots on segment 8. Wings hyaline, venation black; vestige of basal light yellow spot on hind wings; yellow cloud between *t*, nodus and anal margin similar to male, but lighter in colour. Pterostigma long, not distinctly widened, dark ferruginous, faint indication of lighter line at anal margin. *Anq* $9\frac{1}{2}$. $10\frac{1}{2}$. *Abd.* 22, *hdw.* 27, *pt.* > 3 mm. . . . . *T. stictica.*
Frons yellow, at base with broad black, slightly metallic blue band. Otherwise similar to corresponding male. (From older description, not compared for present table.) *Abd.* 27, *hdw.* 29, *pt.* < 3 mm. *T. aureola.*

Trithemis arteriosa (Burmeister, 1839).

S. Afr. Mus.: 3 ♂ (no locality); 1 ♂, Kafue River, S. Rhodesia; 1 ♂, 1 ♀, Victoria Falls (vii . 1911, L. Péringuey, and 1904, W. L. Sclater); 5 ♂, M'Fongosi, Zululand (iii, v, 1911, W. E. Jones); 3 ♂, Waterval, Transvaal (17 . ix, 15 . xii . 1899; 11 . x . 1900); 2 ♂, 2 ♀, Dunbrody, Blue Cliff (ii . 1912); 1 ♂, Umhlali, Natal (i . 1913, K. H. Barnard); Kaapmuiden, Transvaal (xi . 1908, Tucker); Otjituo, Ganb, Gibeon, and Otjiwarongo, S.W. Protectorate (i . 1920, Tucker). Mus. Stockholm: 4 ♂, 7 ♀, Zululand (15, 18 . ix, Trägardh). Coll. K. J. Morton: 1 ♀, Macequece (19 . ix . 1908, Miss Fountaine); 1 ♂, Umzinto, Natal (26 . iv . 1909, ead.). Coll. E. B. Williamson: 11 ♂, 10 ♀, Salisbury, Mashonaland (iv . 1899; i, ii, iii, x, xi . 1900; iii, v . 1905, Marshall); 2 ♂, 4 ♀, Natal (G. F. Leigh); 3 ♂, 1 ♀, Hilton Road, Natal (21, 24 . xii . 1909, *id*); 20 ♂, 1 ♀, Princetown, Natal (6, 8, 12, 21 . xii . 1908; 9, 19 . ii, 11, 17 . iii . 1909, *id.*). Coll. Ris: 1 ♂, Botchabelo, 1200 m., Transvaal (18 . ii . 1914, H. Junod).

This common species is known from the African continent throughout between Algeria and Natal, from Syria, the Canary Islands, Socotra and the Comoro Islands.

There is considerable variation in extent of the golden-yellow basal spot, not strictly depending on geographical distribution; but generally speaking it may be stated that forms with very large patch are more restricted to the inter-tropical parts of the continent, those with smaller patches being prevalent in the northern and southern limits of distribution, though even there specimens with large patches are not altogether absent. Various names have been proposed for these varieties, but it seems much better to relegate those names to synonomy.

Trithemis annulata (Palisot de Beauvais, 1805).

S. Afr. Mus: Kaapmuiden, Transvaal (xi . 1918, Tucker); 1 ♀, Lorenço Marques (28 . xi . 1911). Coll. Rts: 1 ♂, *ib.* (15 . xii . 1911). Coll. Sélys: 1 ♂, 2 ♀, Delagoa Bay.

The area of this species is nearly the same as of *arteriosa*, *i. e.* continental Africa between Algeria, Egypt and Delagoa Bay, Syria, Arabia and the Cape Verde Islands; it is recorded from Sicily and Sardinia (doubtfully from continental Italy), whereas *arteriosa* is not known to inhabit Europe; from Madagascar also we have seen *annulata* but not *arteriosa*. In South Africa it is evidently much less at home than *arteriosa*, and the small number of specimens here recorded may indicate its extreme southern limits.

Trithemis pluvialis (Förster, 1906).

Brit. Mus.: 1 ♀, Chirinda Forest, Gazaland, 4000 ft. (19 . x . 1905, Marshall). Coll. E. B. Williamson: 6 ♂, 4 ♀, Salisbury, Mashonaland (iv . 1900; iii, iv . 1905, *id.*).

Originally described from a single male specimen from Usambara; the description applies perfectly to our specimens. The species appears certainly distinct, having characters in common with *annulata* as well as with *Distanti*, as shown in our tables; the stature and outline of abdomen is much like *Distanti*. The form of genitalia in second segment of male differs from *annulata* (and *arteriosa*) by having the posterior margin of the basal piece of hamule distinctly angulate and the genital lobe considerably narrower, sickle-shaped, resembling the same organ of *T. Distanti*. None of our specimens is fully mature.

Trithemis Kirbyi ardens (Gerstacker, 1891).

S. Afr. Mus.: 1 ♂ (no locality); 1 ♀, Victoria Falls (1904, W. L. Sclater); 1 ♂, 1 ♀, Bulawayo (C. H. Pead); 1 ♀, Salisbury (23 . xii . 1911); 1 ♀, Waterval, Transvaal (15 . iv . 1900); 2 ♂, 1 ♀, M'Fongosi, Zululand (iii, x . 1911, W. E. Jones); Usakos, S.W. Protectorate (ii . 1920, Tucker). Coll. K. J. Morton: 1 ♂, Macequece (2 . x . 1908, Miss Fountaine). Coll. E. B. Williamson: 2 ♂, Natal (G. F. Leigh).

This brilliant and conspicuous species is known from the African continent south of the desert belt, although probably absent in the equatorial forest zone and evidently more adapted to desert regions. It is also recorded from Madagascar and the Comoro Islands. In the material under discussion only a form of female with almost hyaline

wings is known, as described in our table. From North Nigeria the writer has seen a series of andromorphous females with the wing base almost as brilliant golden yellow as in males; similar females are described from Choa by Förster. The first described specimens of *Trithemis Kirbyi* came from North-Western India and belong to a form with much paler-coloured wing bases.

Trithemis stictica (Burmeister, 1839).

S. Afr. Mus.: 1 ♂, Matopos (E. C. Chubb); 1 ♀, Latombo, Salisbury (3 . iii . 1912); 1 ♂, Kranspoort, Transvaal (21 . xii . 1906); 1 ♂ 1 ♀, White River, E. Transvaal (8 . xii . 1909; i . 1910, A. T. Cooke); 1 ♂, Lorenço Marques (15 . x . 1911). Brit. Mus.: 2 ♂, Salisbury (12 . xi . 1905, Marshall). Coll. K. J. Morton: 1 ♂, Wolhuterkop, Transvaal (i, xii . 1908, Miss Fountaine). Coll. E. B. Williamson: 5 ♂, Princetown, Natal (5, 12 . xii . 1908; 18 . ii, xii . 1909, G. F. Leigh). Coll. Ris: 1 ♂, Botchabelo, 1200 m., Transvaal (1914, H. Junod).

South African and East African, reaching northwards to Abyssinia; a few specimens are also known from western localities and from Madagascar. Adult males are perhaps the most graceful *Libelluline* dragonflies of the present fauna; the contrast of the very light and brilliant blue thorax, the black and yellow abdomen and the large yellow cloud in the hind wings is a most striking one. The description of the female in our table is made from the specimen from White River, which most certainly belongs to this species.

Trithemis aureola (Ris, 1912).

S. Afr. Mus.: 1 ♂, Inhambane (xii . 1912, K. H. Barnard). Coll. Sélys: 1 ♂, Delagoa Bay.

This species is very imperfectly known, though certainly distinct from its ally *stictica*. The writer has seen but a few more specimens, from Dakar and from Madagascar. In the paper on Schultze's voyage it was given Rambur's name *hova*. But further search demonstrated that this name belonged with much better right to a species of *Pseudomacromia*; a new name had therefore to be given to this *Trithemis*.

Trithemis Distanti (Kirby, 1898).

S. Afr. Mus.: 2 ♀, Waterval, Transvaal (16 . xi . 1899; 16 . xii . 1900); 5 ♂, 6 ♀, M'Fongosi, Zululand (ii, iii, iv, v, ix, x . 1911,

W. E. Jones); 1 ♂, Barkly West (xii . 1893, L. Péringuey); 3 ♂, 1 ♀, Dunbrody, Blue Cliff (ii . 1912). Brit. Mus.: 1 ♂, Salisbury (1904, Marshall); 1 ♀, Mazoe, 4700 ft., Mashonaland(27 . xii . 1905, *id.*); 1 ♂, 1 ♀, Willow Grange, Mooi River, Natal (21 . i . 1913, R. C. Wroughton). Coll. K. J. Morton: 2 ♂, 1 ♀, King Williamstown, 1 ♀, Stutterheim (2, 4, 16 . i . 1908, Miss Fountaine). Coll. E. B. Williamson, 6 ♂, 5 ♀, Salisbury (x . 1899; i, iii, x . 1900; iv . 1905; Marshall); 8 ♂, 3 ♀, Princetown, Natal (6, 8, 10, 12, 19, xii . 1908; 7, 19 . ii . 1909, G. F. Leigh); 1 ♂, 1 ♀, Hilton Road, Natal (19, 21 . xii . 1909, *id.*).

South African and East African, reaching northward to Abyssinia; also known from Madagascar. Specimens from equatorial West Africa have been considered as racially different by the writer, but they may perhaps be claimed as a distinct species when these forms are better known. *T. Distanti* is one of the characteristic species of the South African fauna; in dealing with *Helothemis dorsalis* we have mentioned its striking resemblance to that species.

PSEUDOMACROMIA (Kirby, 1889).

An African genus consisting of large species, some of them among the largest of *Libellulinae*. In structural and neural details evidently allied to *Trithemis*, which are only medium-sized species. Part of the species yellow and black or metallic green, by this colour system, large size and general stature resembling the *Corduline* genus *Macromia*. They are evidently strong flyers and not common species, and the genus is therefore very imperfectly known.

> In hind wing 4 to 5 rows of cells between A_3 and the wing's edge; 2 rows of cells between *Rs* and *Rspl* in most specimens. Tooth of tarsal claws small, shorter than point of claw. Male: Labium yellowish with broad median black band; face dark olivaceous to blackish; frons very dark metallic violet, narrowly lined with yellow anteriorly and at the sides. Thorax black with metallic green or blue reflections and yellow markings; broad, medially diffuse band in front of humeral suture; narrow incomplete line touching metastigma; two spots between this line and second lateral suture; ventral half of metepimeron. Legs black. Abdomen little widened at base; scarcely contracted at third segment; segments 4–10 almost parallel, triquetral, very gradually narrowed to end. Abdomen black with yellow markings, very light on segments 2–3, turning to ochreous posteriorly; lateral spot on segment 2; narrow basal ring and broad medio-lateral spot on 3–4; 5 8 oval medio-lateral spot and narrow line on mid-dorsal carina, this line sometimes fused to lateral spots; 9 10 black. Wings hyaline or very slightly stained with

yellow, especially along veins. Pterostigma black. Membranule whitish. Female very similar to male; metallic violet of frons reduced, sides and anterior margin broadly yellowish; yellow markings on abdomen more extended, lateral and dorsal elements almost generally confluent; not rarely a blackish spot at base of hind wings between membranule and A_3. ♂, *Abd.* 40, *hdw.* 45, *pt.* 3·5 mm. ♀, 43, 50, 3·5 . . *P. torrida.* In hind wing 3 to 4 (mostly 3) rows of cells between A_3 and the wing's edge; one row of cells between *Rs* and *Rspl*. Tooth of tarsal claws robust, longer than point of claw. Male: Labium light yellow, median lobe black. Labrum light yellow; face and frons anteriorly and laterally very light greenish yellow; frons above metallic blue. Thorax with dense whitish blue pruinosity. Legs dark ferruginous, lighter on first and second femora. Abdomen little widened at base in lateral, more so in dorso-ventral dimension; distinctly contracted at segments 3–4 and slightly fusiform posteriorly. Black; segments 1–3 dorsally whitish blue pruinose; sides of 1–3 light yellow, black at transverse carinae; sides of 4–8 with long and narrow lunulate ferruginous spots which almost touch both ends of each segment; 8 greyish blue pruinose dorsally; 9–10 wholly black. Wings hyaline, slightly stained with greyish yellow from *t* distally. Pterostigma ferruginous. Membranule greyish. Female similar to male; frons yellowish or orange with a basal metallic blue spot of variable extent. No pruinosity on thorax and abdomen; thorax dull ferruginous with coppery and bluish sheen and somewhat indistinct yellow markings: incomplete inferior line in front of metastigma, two spots on metepisternum as well as inferior half of metepimeron. Abdominal segments 1–3 ferruginous with transverse carinae rather broadly black; 4–9 with broad lateral ferruginous band shortly interrupted at joints. Apical part of wings variably stained with light golden yellow, mostly in front wing to nodus in longitudinal, to *Rspl* in transverse dimension, in hind wing to half way between nodus and pterostigma and over the entire breadth of wing. ♀, *Abd.* 35, *hdw.* 36, *pt.* 2·5 mm. to 38, 39, 2·5. ♀, 38, 39, 2·5 to 38, 40, 2·5 . *P. natalensis.*

Pseudomacromia torrida (Kirby, 1889).

S. Afr. Mus.: 1 ♀, M'Fongosi, Zululand (xii . 1911, Jones); 1 ♂, Ceres, Cape (Jan., R. Trimen). Coll. Sélys: 1 ♀, Natal. Coll. K. J. Morton: 1 ♂, Zoutpansberg, Transvaal.

Known from the whole African continent south of the desert belt, from the Canary Islands and the Islands of Comoro. Though not yet recorded from Mediterranean Africa, it has recently been found in Spain by Father Navás.

Pseudomacromia natalensis (R. Martin, 1900).

S. Afr. Mus.: 1 ♂, M'Fongosi, Zululand (iii . 1900, W. E. Jones). Brit. Mus.: 1 ♂, Zambesi (12 . ix . 1905); 2 ♂, 3 ♀, Chirinda

Forest, Gazaland, 3600–4000 ft. (3, 7, 8, 14, x . 1905, Marshall). Coll. K. J. Morton: 1 ♂, Macequece (2 . x . 1908, Miss Fountaine). Coll. R. Martin: 1 ♀, Natal. Coll. E. B. Williamson: 1 ♀, Hilton Road, 3800 ft., Natal (28, xii . 1909, G. F. Leigh). Mus. Tervueren: 2 ♂, Kapiri, Katanga (x, xi . 1912, Legros).

The male was described by Förster as *Zygonyx komatina* from Komatipoort, Transvaal. No other records are known to the writer. From what is known, this species is decidedly South African.

OLPOGASTRA (Karsch, 1895).

Allied to the preceding genus and restricted to tropical Africa and Madagascar; the small number of species is very imperfectly known.

Abdomen a little longer than hind wings, very much widened at base, extremely slender from segment 3 posteriorly. Teeth of tarsal claws very minute, even absent in some specimens. Male: Labium light yellow with median lobe black; labrum black; ante- and post-clypeus yellow with a black line at the suture between both pieces; frons above brilliant metallic blue with a ferruginous ground-colour showing through, narrowly yellow at anterior margin. Thorax brilliant metallic green with light yellow markings; incomplete line at median suture; ante-humeral lines to two-thirds height; transverse lines at ante-alar sinus; two round spots in front of humeral suture; two large elliptical spots on mesepimeron; ventral band and dorsal round spot on second lateral suture; large, roughly triangular anterior spot and two small round posterior spots on metepimeron; round spots on mesinfraepisternum and metinfraepisternum. Legs black, abdomen black with yellow markings; latero-ventral spot and dorsal ring on segment 2; complete narrow anterior ring on 3; segments 4–7 with small, dorsally interrupted basal ring, slightly elongate on 7. Genital lobe produced into a large contorted spine. Wings stained with greenish yellow from triangular region distally; second pair deeper yellow in the region between *t*, nodus and anal margin; apex narrowly and diffusely lined with brown; second pair with deep brown basal spot, vestige in *sc*, almost to *Cuq* in *cu* and one or two cells at membranule. Pterostigma dark brown; membranule black. 15½ *Aug*. Female very similar to male. ♂ ♀, *Abd*. 43, *hdw*. 42, *pt*. 2·5 mm. . . . . *O. lugubris*.

Abdomen distinctly shorter than hind wing, much widened at base, more robust posteriorly than in preceding species, and slightly fusiform. Teeth of tarsal claws of ordinary size, shorter than the point. Male; Labium and labrum ochreous; face and frons very light olivaceous; at base of frons a broad black band with metallic blue reflections. Vertex black at base, light olivaceous at summit. Thorax very dark brown with metallic green and blue sheen and rather dull ochreous markings; broad antehumeral band to two-thirds of the height; a ventral band and dorsal round spot in front of humeral suture; a sinuate line at metastigma;

metepisternum almost entirely ochreous; latero-ventral and indistinct dorsal spot on metepimeron. Very slight whitish pruinosity on entire thorax. Legs black. Abdomen black, with ochreous markings; latero-ventral spot on segment 2, this segment dull olivaceous or ferruginous dorsally; narrow ring at transverse carinae of 3; 4–7 triangular spots at middle of lateral carina corresponding to transverse ochreous bands on ventral surface; such band also on segment 8 and a vestige on 9; narrow light yellow line on mid-dorsal carina of segments 4 to 10. Genital lobe broadly trapezoid. Wings hyaline, faintly greyish yellow from triangular region distally. Dark brown spot at base of second pair; vestige in *sc*, half way to *Cuq* in *cu*, 1–2 cells at membranule. Pterostigma brownish black; membranule black. Female very similar to male. 12–13 *Anq.* ♂, *Abd.* 32, *hdw.* 39, *pt.* > 4 mm. ♀, 35, 38, 5.

O. Fuelleborni.

Olpogastra lugubris (Karsch, 1895).

S. Afr. Mus.: 1 ♂, Ovampoland.

Known by a small number of specimens from tropical Africa, East and West, reaching to Nubia. A most elegant and conspicuous insect.

Olpogastra fuelleborni (Grünberg, 1902).

S. Afr. Mus.: 2 ♂, M'Fongosi, Zululand (ii, iii. 1911, W. E. Jones); White River, Transvaal (Cooke); Kaapmuiden, Transvaal (xi. 1918, Tucker).

The type male from Nubia, female from Nyasaland and the specimens here recorded are all that is at present known of this species. A few specimens from the Belgian Congo belong to a subspecies differing in the larger size, more robust stature and some details in colour and pattern.

PANTALA (Hagen, 1861).

This and the two following genera have in common a particular structure of hind wings with exceptionally broad and also thin and flexible anal field. Corresponding to this structure we find in them a faculty of planing or sailing flight, which faculty is probably responsible for the excessively wide distribution of some members of this group. *Pantala* includes two species only, one cosmopolitan, the other one American.

Pantala flavescens (Fabricius, 1798).

S. Afr. Mus.: 1 ♀, Gwaai, S. Rhodesia (15. ii. 1912); 1 ♂, 1 ♀, Salisbury (17. xii. 1911); 1 ♂, Pietersburg, Zoutpansberg District,

Transvaal (15 . xii . 1902); 1 ♂, Waterval, Tv. (14 . x . 1900); 3 ♂, Barberton, Tv.; 2 ♂, M'Fongosi, Zululand (iii, x . 1911); 1 ♀, Lorenço Marques (28 . xi . 1911); Otjituo, Gaub, Tsintsabis, Namutoni, Otjiwarongo, Nuragas, and Gamies, S.W. Protectorate (i . 1919, Lightfoot, ii . 1921, Barnard, and i . 1920, Tucker). Coll. E. B Williamson: 12 ♂, 2 ♀, Salisbury (iv . 1899; x, xi, 1900; v . 1905, Marshall); 1 ♂, Princetown, Natal (14 . ii . 1909, G. F. Leigh); 4 ♂, 1 ♀, woodside off Umbilo Road, Congella, Natal (12–21 . x . 1904; 17 . i . 1905, *id.*).

♂. Lips ochreous. Face, frons and vertex light yellowish, often a light red diffuse spot in centre of face and inferior part of frons. Thoracic dorsum golden brown; sides pale whitish or bluish green with black dots in the sutures. Abdomen light yellowish to light yellowish red, carinae narrowly blackish; on mid-dorsal carinae of segments 8–10 rhomboid black spots; ventral surface whitish with a bluish or greenish shade on segments 1–4, ochreous posteriorly, each segment with somewhat diffuse, mostly interrupted, brown lateral stripes. Wings hyaline; a light golden-yellow spot of variable extent in base of anal field in hind wing; mostly between Cu_1, base of A_3, supplementary sector of A_3 and anal angle. Tips light brown in most specimens, broader in hind wing, maximally to about half way between distal end of pterostigma and apex of wing. Pterostigma light ferruginous. Membranule white.

Female very similar to male. Colour a trifle duller, sometimes with an olivaceous shade. Basal yellow spot of hind wings paler and more diffuse.

♂, ♀, *Abd.* 32, *hdw.* 39, *pt.* 2·5 mm. in front wing, 2 in hind wing.

An extremely common cosmopolitan species; chiefly inter-tropical, but recorded as far north as Kamtschatka, Massachusetts and Wisconsin; not yet observed in Europe or Mediterranean Africa, except Egypt; found on many oceanic islands and repeatedly observed on ships far from shore.

RHYOTHEMIS (Hagen, 1867).

A genus of many, often beautifully coloured species, most of them Asiatic, a few African and Australian, chiefly tropical, a small number of species also sub-tropical.

1. Both pairs of wings coloured at base at least to nodal region. Hind wings not contracted at apex of anal loop 2
   Front wings hyaline, fumose greyish in *sc* to Anq_1, in *cu* to Cuq; hind wings at base deep black with violet, cupreous and greenish metallic

sheen to about half way between distal angle of *t* and nodus; limits of black colour sharp, lacerate. Both wings faintly greyish yellow between triangular region and apex in very mature specimens. Anal margin of hind wings contracted at apex of anal loop, very broadly rounded proximally. Two rows of cells between *Rs Rspl.* Pterostigma very small, blackish to ferruginous. Body black, dull ferruginous on face, sides of thorax and of basal segments of abdomen; frons metallic violet or blue. Female shorter in body and with comparatively broader wings; otherwise the sexes very similar. ♂, *Abd.* 19, *hdw.* 27, *pt.* 1·5 mm. to 22, 30, 1·5. ♀, 16, 25, 1 to 19, 30 > 1 . . . . . *Rh. semihyalina.*

2. Colour on wings wholly black with metallic violet sheen. Two rows of cells between *Rs Rspl.* Black to middle of pterostigma in front wing, to distal end of pterostigma, and at anal margin narrowly to apex in hind wing; anal margin from anal angle to a little beyond M_4 narrowly hyaline in both wings; hyaline incomplete transverse bands at distal side of *t*, and distally from nodus; group of hyaline cells with black along the veins in anal field of hind wings at both sides of A_2; vestiges of 2 or 3 longitudinal subhyaline bands between proximal margin and A_3 in hind wing. Pterostigma black Body black; frons metallic blue, face dull olivaceous. Female similar, but with hyaline parts of wing pattern more extended. ♂, *Abd.* 18, *hdw.* 25, *pt.* 2 mm. ♀, 16, 23, 2 . . . . . *Rh. fenestrina.*

Wing bases light golden yellow, with an intricate pattern of blackish bands and spots distally to nodus in front wing, to one-third the distance between nodus and pterostigma in hind wing. One row of cells between *Rs-Rspl.* Pterostigma very small, greyish ochreous. Body black with metallic green reflections; a light yellow transverse line on suture of frons and postclypeus. Female very similar to male. ♂, *Abd.* 18, *hdw.* 23, *pt.* 1·5 mm. ♀, 16, 24, 1·5. . . . . *Rh. mariposa.*

Rhyothemis fenestrina (Rambur, 1842).

S. Afr. Mus.: 1 ♂, N. Ovampoland, Otiembora (20. xi–3. xii. 1887, A. W. Erikson).

A species from tropical Africa, West and East, evidently not a common one, and known by a limited number of specimens. The present male is similar to others from Sierra Leone and Nigeria.

Rhyothemis mariposa (Ris, 1913).

S. Afr. Mus. (and Coll. Ris): 3 ♂, Otiembora (xi. 1887, A. W. Erikson). Brit. Mus.: 1 ♀, N.E. Rhodesia, 4700 ft. (1904).

The specimens here recorded are all that is known of this most elegant small species.

Rhyothemis semi-hyalina (Desjardins, 1832).

S. Afr. Mus.: 1 ♂, 2 ♀, Lorenço Marques (30. ix, 29. xi, 12. xii. 1911); 1 ♂, Inhambane (xii. 1912, K. H. Barnard); 1 ♂, 1 ♀, Boksburg,

Transvaal; 1 ♀, Port Shepstone, Natal; St. Lucia Bay, Zululand (x. 1919, Bell-Marley). Brit. Mus.: 1 ♀, Pretoria. Coll. K. J. Morton: 1 ♂, Delagoa Bay (7. xi. 1907, Miss Fountaine). Coll. Ris: 2 ♂, 2 ♀, Delagoa Bay (12. xii. 1911); 1 ♂, Rikatla, Delagoa Bay (1914, H. Junod). Coll. E. B. Williamson: 1 ♀, woodside off Umbilo Road, Congella, Natal (G. F. Leigh).

Found in all parts of the African continent, in Syria and on many islands of the Indian Ocean; a closely-allied species occurs in Ceylon, South India, Malacca and Borneo. Various names have been given to individual varieties, sexually different specimens and stages of maturity. The writer's experience fully justifies the relegation of these names into synonomy.

TRAMEA (Hagen, 1861).

Similar to *Pantala* in size, outline and general aspect, but with important differences in neural and structural details. A moderate number of species, most of them intertropical in the Old World and America, some extremely wide-ranging and polymorphous, having given rise to a number of doubtfully valid names.

Base of hind wings with a broad, golden-yellow spot, to anal angle and distally to end of *t*, and a few cells in discoidal field. Within this yellow spot a broad, roughly semicircular dark band, very dark reddish brown, with reddish veins in male, black with yellow veins in female, constricted or interrupted between anal angle of *t* and A_2 in male, interrupted at same place in female. Venation reddish to nodus, blackish more distally; pterostigma light red; membranule white. Male: Face dull ochreous, frons bright red with broad basal band black with metallic blue reflection. Thorax golden brown with an olivaceous shade and some blackish dots at the sutures. Abdomen light red, very narrowly black at the joints; broad black dorsal spots on segments 8–10. Female: Frons orange with basal black band similar to male; olivaceous shade of thorax more distinct; abdomen reddish ochreous; black lines at joints distinctly broader than in male. Neuration darker. ♂, *Abd.* 31, *hdw.* 42, *pt.* > 2, 1·5 mm. ♀, 32, 42, 2·5, 2·5. . . . . *T. basilaris.*
Base of hind wings in male with a dark reddish-brown, red-veined spot; in *c*, *sc* and *m* about half way to Anq_1, in *cu* to *Cuq* or a little beyond; distal limit a straight transverse line to anal margin, vertically to *Cu*. In female the corresponding spot mostly smaller, not fully to anal margin, diffusely lined with golden yellow, indented at apex of membranule by a subhyaline spot. Venation red to slightly beyond nodus, gradually darker distally. Pterostigma red; membranule white. Male: Face dull ferruginous; frons brilliant metallic violet almost to anterior margin. Thorax rich golden brown with blackish, slightly metallic vestiges in the sutures. Abdomen red, part of carinae very narrowly

lined with black; broad black dorsal spots on segments 8–10. Female: Face dull ochreous; frons orange, superiorly about basal half black with metallic blue reflection. Thorax and abdomen lighter in colour than in male. ♂, *Abd.* 32, *hdw.* 40, *pt.* 2·5 < 2 mm. ♀, 30, 41, 2·5, 2 *T. limbata.*

Trамea basilaris (Palisot de Beauvais, 1805).

S. Afr. Mus.: 1 ♂, Lorenço Marques (J. da Costa); Grootfontein, Tsumeb, Sandup, Ondongua, S.W. Protectorate (i. 1920, Tucker, and ii. 1921, Barnard). Coll. E. B. Williamson: 1 ♂ ♀ *in cop.*, 3 ♂, Salisbury, Mashonaland (xi. 1900, Marshall). Coll. Sélys: 2 ♂, 3 ♀, "Afrique australe."

Known from intertropical Africa, East and West, and from some islands of the Indian Ocean in a form of little variability. A slightly different form from India and Ceylon.

Trамea limbata (Desjardins, 1832).

Coll. Sélys: 3 ♂, Delagoa Bay. Coll. K. J. Morton: 1 ♂, Natal.

T. limbata, in the wide application given to this name by the writer, means a species highly polymorphic in colour of wing base and of frons, but structurally homogeneous, ranging between Senegal in W. Africa and the islands of Samoa in the Pacific Ocean throughout the inter-tropical region. Forms from continental Africa were named *T. continentalis* by de Sélys, those from Delagoa Bay and Natal *T. limbata a*[2] by the writer.

UROTHEMIS (Brauer, 1868).

A genus of tropical African and Asiatic distribution, including a small number of forms. Similar in outline and facies to *Crocothemis*, but there is no real affinity to that genus; neural details and the genital structure of both sexes demonstrate close relations to the *Trамea* group.

♂. Thorax and abdomen wholly black, with dark greyish-blue pruinosity, not covering on abdomen a broad mid-dorsal black line, which is widened at terminal joint of each segment. Labium ochreous with indistinct median fuscous band; labrum black; anteclypeus light olivaceous; postclypeus and frons black, narrowly light yellow at sides. Wings hyaline, very lightly stained with yellowish, narrowly and diffusely brownish at tips. Base of hind wings with a deep blackish-brown spot of variable size, in most specimens in *c* and *sc* half way to *Anq*$_1$, vestige in *m*, in *cu* to *Cuq* or slightly beyond, to somewhat more than half way between apex of membranule and anal angle; limits of spot indented

by golden-brown lining of veinlets; small golden-brown vestige in base of front wing. Part of longitudinal veins and most cross-veins in costal field light yellow. Pterostigma very light yellow between black veins. Immature males similar in colour to females. ♀. Thorax greyish ochreous, sides pale yellow, some black dots at the sutures. Abdomen light ochreous, segments 1–2 dorsally blackish; 3–10 with broad median black band, widened at terminal joint of each segment. Labium and labrum whitish, face very light greenish, frons light yellow with black basal line. Wings similar to male, but with basal spot light yellow to deep golden yellow, with blackish, yellow-veined central irregularly semicircular band, which is mostly interrupted between anal angle of *t* and A_2. This basal, yellow and black spot very variable in extent, in some specimens not larger than that above described in the male, in others extending fully to distal end of *t* and anal angle. Yellow basal spot in front wing from vestiges to fully to Anq_2 and arculus. ♂, *Abd.* 25, *hdw.* 34, *pt.* 3 mm. ♀, 28, 36 < 4 . *U. Edwardsi.*

♂. Thorax reddish golden brown, abdomen red with narrow black mid-dorsal line on segments 4–7, broader on 8–9. Labium ochreous; labrum orange; face and frons dull red, a narrow black basal line on frons. Wings similar to preceding species; more diffusely greyish at tips; venation mostly red. Basal spot of hind wings generally considerably larger, deep reddish brown, with red veins, rather broad (1½ cells) golden-yellow margin and a diffuse central golden-yellow spot; mostly to Anq_2, distal end of *t*, and half way between apex of membranule and anal angle in hind wing; in front wing golden-yellow spot to Anq_1 and *Cuq*. Pterostigma light yellow between black veins; membranule dull ferruginous. ♀ similar to ♂. Colour of abdomen more reddish ochreous than red; dorsal black line generally a trifle larger. Basal spot of hind wings similar in size, but golden-yellow margins broader, and especially golden-yellow central spot lighter and much larger than in male. ♂, *Abd.* 27, *hdw.* 37, *pt.* 3·5 mm. ♀, 21, 37, 4 *U. assignata.*

Urothemis Edwardsi (Sélys, 1849).

S. Afr. Mus.: 1 ♀, Inhambane, and 1 ♀, Chinde (xii. 1912, K. H. Barnard). Coll. Sélys: 1 ♀, Delagoa Bay; 1 ♀, Natal. Coll. K. J. Morton: 1 ♀, Delagoa Bay (5. xi. 1907, Miss Fountaine).

Found in all parts of inter-tropical Africa. The type-specimen came from Algeria, but the species has not been found there again for more than seventy years. In the ♀ from Inhambane the basal spot in hind wings is exceptionally small and the yellow colour very light.

Urothemis assignata (Sélys, 1872).

Coll. Sélys: 1 ♂, Delagoa Bay; 1 ♀, Cap (very old specimen, sent by Drège). Brit. Mus.: 1 ♀, N.E. Rhodesia, Upper Luangwa River

(27. vii, 13. viii. 1910, S. A. Neave). Coll. Ris.: 1 ♀, Rikatla, Delagoa Bay (1914, H. Junod).

Widely distributed in inter-tropical Africa; a slightly modified form occurs in Madagascar.

TETHRIAMANTA (Kirby, 1889).

Distribution the same as *Urothemis*. Tiny little insects which may be called a minute edition of *Urothemis*.

Tethriamanta rezia (Kirby, 1889).

Coll. Sélys: 1 ♂, Delagoa Bay.

♂. Labium black, with sides narrowly yellowish. Labrum black with yellowish spot. Face yellowish red; frons and vertex red; narrow black basal line on frons. Thoracic dorsum reddish golden-brown, sides and ventral surface lighter, two blackish transverse bands on ventral sutures. Abdomen scarlet-red, narrow black lines at carinae; segments 3–10 with narrow, black mid-dorsal line, widened at terminal joint of each segment; ventral surface yellowish-red with small square, blackish spots at latero-posterior angle of each segment. Wings hyaline; golden-yellow basal spot in hind wing to $Anq_{1\text{-}2}$, *Cuq* or proximal side of *t*, half way between apex of membranule and anal angle or fully to anal angle; within this yellow spot mostly dark golden-brown stripes in *sc* to Anq_1 and *Cuq*, or in *cu* to *Cuq*; sometimes also a brown central spot in anal field. Base of front wing golden yellow to Anq_1 and *Cuq* or slightly more distally. Pterostigma very small, red; membranule blackish. Female very similar to male, but dark stripes in yellow basal spot absent.

♂, *Abd.* 18, *hdw.* 21, *pt.* 1·5 mm. ♀, 16, 20, 1·5.

Distribution almost exactly the same as in *Urothemis assignata*; but it seems a rare species, of which only a very small number of examples are to be found in our collections.

APPENDIX.

A number of species enumerated in the writer's compiled catalogue of South African Odonata (*vide* Introduction, p. 245) are not included in the present work, which is exclusively founded on actual specimens in the writer's hands. These species are registered as follows:

1. *Lestes tridens* (MacLachl., 1895), *l. c.*, p. 308, no. 6.—The description, made from one male from Delagoa Bay, does not apply to any species known to the writer.

2. *Lestes obscurus* (Kirby, 1898, 1905), *l. c.*, p. 308, no. 7.—Mr. Herbert Campion writes to me (9 . xii . 1913) that the specimens so described by Kirby are identical with *L. plagiatus*.

3. *Metacnemis angusta* (Sélys, 1863, 1886), *l. c.*, p. 310, no. 15.—Described from a single female, "Cap de Bonne Espérance, de l'ancienne collection Latreille."

4. *Argia concinna* (Ramb., 1842), *l. c.*, p. 310, no. 17.—This species is known from the original pair alone, said to be from "Cap" (de Bonne Espérance). I have seen the pair; it is similar in facies to its American congeners of the type *fissa*, *oculata*, etc. But the configuration of the apical border of the tenth segment of ♂ is peculiar, as

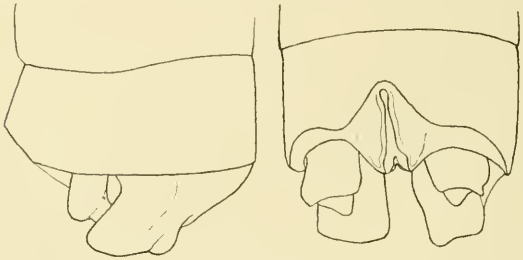

Fig. 77.—*Argia concinna*. ? Cape. Appendages, right side and dorsal view.

described and remarked upon by Sélys (1865) and shown by Hagen's figures (published by Calvert, 1902). None of the numerous species of *Argia* known to the writer is similar to *concinna* in this structure. The possibility, though perhaps not the probability, remains open that this species, though belonging to an otherwise strictly American genus, is really African.

5. *Enallagma obliteratum* (Sélys, 1876), *l. c.*, p. 314, no. 21.—This is almost certainly a colour variety of *E. glaucum* (see p. 326, *ante*).

6. *Pseudagrion Kersteni* (Gerstäcker, 1869), *l. c.*, p. 315, no. 26.—The specimens (1 ♀, 1 incomplete ♂) from South Africa under this name (*l. c.*, p. 316) are very probably *P. natalense* of the present paper (*ante*, p. 307).

7. *Pseudagrion Deckeni* (Gerstäcker, 1869), *l. c.*, p. 316, no. 27.—Karsch has decided (1893) for the identity of Selys' *P. praetextatum*

with *Deckeni*; but this identity is not certain. Karsch's own figure of a male superior appendage is not in favour of his view. I have therefore preferred the Sélysian name (*ante*, p. 305) for which the types could be examined. The question of synonymy opened by Karsch must be left for further investigation.

8. *Pseudagrion Hageni* (Karsch, 1893), *l. c.*, p. 317, no. 28.—No description exists of this species; it is only founded on a figure of a male superior appendage, drawn from an old specimen from the "Cape" mentioned by Sélys under *praetextatum*, not from the specimen but from a description by Hagen. I cannot locate this figure, unless it belongs to *P. angolense* of Sélys and of the present paper (*ante*, p. 302).

9. *Disparoneura glauca* (Sélys, 1860), *l. c.*, p. 318, no. 31.—The name of *Agrion glaucum* (Burmeister, 1839) had to be transferred from *Disparoneura* to *Enallagma*, and a new name substituted for the *Disparoneura*; as evidently the same species registered here as *D. mutata* had been described and figured under this name by Sélys, 1886, and by Calvert, 1895, the name *mutata* could be adopted for our specimens (*ante*, p. 293).

10. *Disparoneura frenulata* (Sélys, 1860), *l. c.*, p. 318, no. 32.—Described from specimens from the Cape. Our material contains but one species of *Disparoneura* from South Africa; accepting the name *mutata*, we suppose *frenulata* to be distinct; should it prove to be identical (the types must be at Cambridge, Massachusetts), the latter name would have priority.

11. *Ictinus pugnax* (Sélys, 1854), *l. c.*, p. 320, no. 38.—This species, recorded from "Port Natal" in the original description, is unknown to the writer.

12. *Anax dorsalis* (Burm., 1839), *l. c.*, p. 323, no. 40.—The writer has shown in an earlier paper ('Ann. Soc. Ent. Belg.,' lv, p. 323, 1911) that this name is very probably without foundation; the original description applies either to *A. imperator mauricianus*, or more probably to an erroneously identified American species—*A. junius*, Dry., ♀. Kirby's specimens named *dorsalis* are *A. speratus*; R. Martin's ♂ *dorsalis* is an erroneously identified American *A. longipes*, Hag.

13. *Aeschna dolabrata* (Karsch, 1899), *l. c.*, p. 325, no. 47.—The identity of this species with *A. minuscula* appears probable (*ante*, p. 364).

14. *Gynacantha bispina* (Ramb., 1842), *l. c.*, p. 325, no. 48.—The pair of *G. villosa* described and figured in the present paper (*ante*, p. 358) was formerly identified as *bispina*, an error that was afterwards rectified by comparison with Rambur's species in the Sélysian Collection.

15. *Brachythemis lacustris* (Kirby, 1889), *l. c.*, p. 336, no. 46.—Mr. Herbert Campion writes to me (19. xii. 1914) that the specimens from the Transvaal described under this name are not this species, but *Trithemis Kirbyi ardens*.

16. *Trithemis hora* (Ramb., 1842), *l. c.*, p. 339, no. 70.—Rambur's name had to be transferred to a species of *Pseudomacromia*, and was substituted in *Trithemis* by the new name *aureola* (*ante*, p. 427).

17. *Pseudomacromia komatina* (Forster, 1906), *l. c.*, p. 342, no. 76.—This name is evidently a synonym of *P. natalensis* (*ante*, p. 429).

Of the 17 species in the present list 3 are South African species not seen by the writer (1, 3, 11), 2 are of doubtful origin (4, 12—the latter also is a synonym), 12 are certainly or probably synonyms, or erroneously identified specimens (2, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17).

SYSTEMATIC ARRANGEMENT OF GENERA AND SPECIES.

I. Suborder ZYGOPTERA.

I. A. Family CALOPTERYGIDAE.

Gen. Libellago.
- caligata.

Gen. Phaon.
- iridipennis.

I. B. Family AGRIONIDAE.

I. Ba. Subfam. LESTINAE.

Gen. Lestes
- ictericus.
- ochraceus.
- Wahlbergi.
- virgatus.
- amicus.
- plagiatus.
- uncifer.

Gen. Chlorolestes.
- conspicua.
- Peringueyi.
- umbrata.
- fasciata.
- tessellata.
- longicauda.

I. Bc. Subfam. AGRIONINAE.

Gen. Allocnemis.
- leucosticta.

Gen. Chlorocnemis.
- Marshalli.

Gen. Disparoneura.
- mutata.

Gen. Metacnemis.
- valida.

Gen. Pseudagrion.
- furcigerum.
- caffrum.
- angolense.
- praetextatum.
- salisburyense.
- natalense.
- acaciae.
- massaicum.
- Sjostedti.

Gen. Ceriagrion.
- glabrum.
- suave.

Gen. Enallagma.
- subfurcatum.
- rotundipenne.
- nigridorsum.
- elongatum.
- glaucum.
- schultzei.
- fractum.
- sinuatum.
- subtile.

Gen. Ischnura.
senegalensis.
Gen. Agriocnemis.
exilis.

II. Suborder ANISOPTERA.
II. C. Family AESCHINIDAE.
II. Ca. Subfam. GOMPHINAE.
Gen. Podogomphus.
praetorius.
Gen. Mesogomphus.
Hageni.
elpidius.
cognatus.
Gen. Crenigomphus.
Hartmanni.
Gen. Onychogomphus.
supinus.
Gen. Ceratogomphus.
pictus.

II. Cb. Subfam. AESCHININAE.
Gen. Gynacantha.
villosa.
manderica.
Gen. Aeschna.
subpupillata.
minuscula.
Gen. Anaciaeschna.
triangulifera.
Gen. Anax.
speratus.
imperator mauricianus.
tristis.
georgius.
Gen. Hemianax.
ephippiger.

II. D. Family LIBELLULIDAE.
II. Da. Subfam. CORDULINAE.
Gen. Macromia.
picta.
thetis.
clymene.

II. Db. Subfam. LIBELLULINÆ.
Gen. Notiothemis.
Jonesi.
Gen. Orthetrum.
trinacria.
icteromelas.
caffrum.
chrysostigma.
Abbotti.
guineense.
brachiale.
stemmale capense.
farinosum.
Gen. Palpopleura.
lucia.
jucunda.
deceptor.
Gen. Chalcostephia.
coronata.
flavifrons.
Gen. Hemistigma.
albipuncta.
Gen. Porpax.
asperipes.
Gen. Acisoma.
panorpoides.
ascalaphoides.
Gen. Diplacodes.
exilis.
Lefebvrei.
Gen. Crocothemis.
divisa.
saxicolor.
sanguinolenta.
erythraea.
Gen. Bradinopyga.
cornuta.
Gen. Brachythemis.
leucosticta.
Gen. Sympetrum.
Fonscolombei.
Gen. Philonomon.
luminans.
Gen. Helothemis.
dorsalis.
Gen. Trithemis.
arteriosa.
annulata.
pluvialis.
Kirbyi ardens.
stictica.
aureola.
Distanti.

Gen. Pseudomacromia.
torrida.
natalensis.
Gen. Olpogastra.
lugubris.
Fuelleborni.
Gen. Pantala.
flavescens.
Gen. Rhythemis fenestrina.
mariposa.
semihyalina.
Gen. Tramea.
basilaris.
limbata.
Gen. Urothemis.
Edwardi.
assignata.
Gen. Tetheriamanta
rezia.

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Note on the Life-history of Chlorolestes conspicua.—By K. H. Barnard, M.A., F.L.S., Assistant Director.

Although this species is common near the mountain streams on Table Mountain and the Hottentots Holland Mountains, I have only once observed the method of oviposition, namely in one of the well-wooded kloofs in the latter mountains. The female was seen (March, 1919) puncturing the young green shoots of the trees (*Ilex capensis*) overhanging and about five feet above the stream.

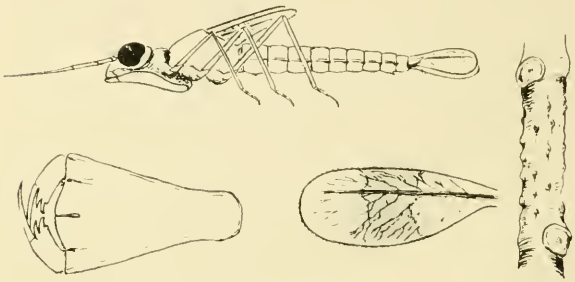
As a rule about five or six punctures are made at intervals of one-eighth of an inch or so along the twig, but without any great regularity. These punctures cause slight gall-like swellings, and the old ones are

observable for some little distance up the branches. Only a single egg is laid in each puncture.

In localities where there are no overhanging trees the eggs must be deposited in the stalks of rushes, small bushes, etc., but I have not yet succeeded in finding any in such situations.

The larva grows to a length of about 35 mm., and is brown or greeny-brown, more or less mottled with darker and lighter patches. The caudal gills have a broad transverse dark band across the middle.

The body is slender. Eyes very prominent. Pedicel of antenna slender and elongate. Labium extending back to bases of second pair of legs; mentum oblong, narrowing posteriorly, median lobe not very



Chlorolestes conspicua.
Larva, mask and caudal gill. Twig showing punctures for insertion of eggs. All enlarged.

prominent, bilobed with rather deep almost closed cleft; lateral lobes moderately slender, ending in two teeth, the inner longer than the outer, movable hook long and slender; no mental or lateral setae. Legs slender. Abdomen strongly keeled laterally. Caudal gills simple, broadly ovate, apically rounded, secondary tracheae oblique.

In habits the larva lives very openly and swims freely, preferring a clear stony or sandy bottom with not too much vegetation.

The similarity of the larva to that of *Synlestes* is apparent, and fully confirms the correctness of Ris' proposal (*supra*, p. 268), based on the wing structure of the imago, to remove *Chlorolestes* from the *Agrionidae* and to place it in the *Lestidae*.

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EXPLANATION OF PLATES V—XII.

PLATE V.

FIG.

1. *Hemianiax ephippiger.* Venation of *Anisoptera.* Lettering of veins in front wing, of spaces in hind wing. *C.* Costal. *Sc.* Subcostal. *R + M.* Common stalk of radial and medial. *Cu.* Common stalk of cubital. *A.* Anal. *R.* Radial. *Rs.* radial sector. *Rsa* Second branch of radial sector (in *Aeschninæ*). *Rspl.* Radial supplement. *B.* Bridge from base of radial sector to medial. M_{1-4}. Common stalks and branches of medial. *Mspl.* Medial supplement. Cu_1 and $_2$. Branches of cubitus. *Anq.* Antenodal cross-veins. *Pnq.* Postnodal cross-veins. *Arc.* Arculus. *Nod.* Nodus. *Pt.* Pterostigma. *c.* Costal. *sc.* Subcostal. *m.* Medial. *cu.* Cubito-anal. *t.* Triangle. *ht.* Supra-triangle. *al.* Divisions of anal loop. *df.* Discoidal field. *mbr.* Membranula. A_{1-3}. Branches of anal vein in hind wing. *obltr.* Oblique vein at distal end of bridge, bridge between ○ and ○.
2. *Metacnemis valida.* Venation of *Zygoptera.* Lettering as in fig. 1. A part of anal vein between petiole of wing and Cu_2. *Q.* Quadrangle.

PLATE VI.

FIG.

1. *Libellula fulva.* Nymph (European). Tracheation in nodal region: origin and crossing of Rs_1 and formation of bridge.
2. *Libellula fulva.* Nymph. Tracheation in triangular region: inflection of cubital fork (front wing).
3. *Libellula fulva.* Nymph. Tracheation in trangular region: inflection of cubital fork (hind wing).
4. *Calopteryx virgo.* Nymph (European). Tracheation: absence of radial crossing and inflection of cubital fork (left side).
5. *Ischnura elegans.* Nymph (European). Tracheation: reduced form of zygopterous venation (right side).
6. *Libellago caligata.* M'Fongosi. Upper ♂, lower ♀.
7. *Phaon iridipennis.* ♂. Natal.
8. *Lestes plagiatus.* ♀. M'Fongosi.

PLATE VII.

FIG.

1. *Chlorolestes conspicua.* ♂. Cape.
2. „ „ . ♀. Cape.
3. „ *peringueyi.* ♂. Ceres.
4. „ *fasciata.* ♂. Albert District.
5. „ *tessellata.* ♂. Cape.
6. „ *longicauda.* ♂. M'Fongosi.

FIG.
7. *Allocnemis leucosticta.* ♂. Barberton.
8. *Chlorocnemis marshalli.* ♂. Mazoe.
9. *Disparoneura mutata.* ♀. M'Fongosi.
10. *Metacnemis valida.* ♀. King Williamstown.

PLATE VIII.

FIG.
1. *Pseudagrion natalense.* ♂. M'Fongosi.
2. *Podogomphus praetorius.* ♂. M'Fongosi.
3. *Mesogomphus cognatus.* ♂. M'Fongosi.
4. *Crenigomphus hartmanni.* ♂. M'Fongosi.
5. *Onychogomphus supinus.* ♂. Barberton.
6. *Ceratogomphus pictus.* ♀. Waterval.
7. *Gynacantha manderica.* ♂. Salisbury.
8. *Aeschna subpupillata.* ♂. Stutterheim.
9. *Anaciaeschna triangulifera.* ♀. Harrar.
10. *Macromia picta.* ♂. Durban.

PLATE IX.

FIG.
1. *Podogomphus praetorius.* ♂. M'Fongosi. Thoracic pattern, diagrammatic.
2. *Mesogomphus hageni.* ♂. Waterval. Thoracic pattern, diagrammatic.
3. „ *elpidius.* ♂. M'Fongosi. Thoracic pattern, diagrammatic.
4. „ *cognatus.* ♂. M'Fongosi. Thoracic pattern, diagrammatic.
5. *Crenigomphus hartmanni.* ♂ M'Fongosi. Thoracic pattern, diagrammatic.
6. *Onychogomphus supinus.* ♂. Barberton. Thoracic pattern, diagrammatic.
7. *Ceratogomphus pictus.* ♂. Waterval Thoracic pattern, diagrammatic.

PLATE X.

FIG.
1. *Macromia picta.* ♀. Kranspoort.
2. *Macromia thetis.* ♀. Barberton.
3. „ *clymene.* ♂. Kapiri.
4. *Orthetrum stemmale capense.* ♂. M'Fongosi.
5. *Palpopleura lucia.* ♂. M'Fongosi.
6. „ „ ♀. Lorenço Marques. Type form.
7. „ „ ♂. M'Fongosi. var. *portia.*
8. „ „ ♀. M'Fongosi. Form corresponding to ♂ *portia.*
9. „ *jucunda.* ♂. M'Fongosi.
10 „ „ ♀. M'Fongosi.
11. *Hemistigma albipuncta.* ♂. Lorenço Marques.

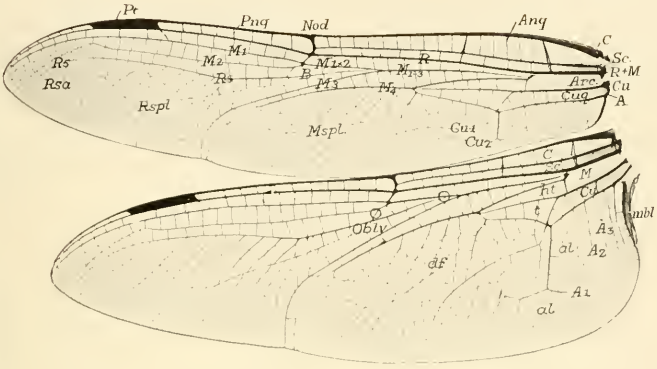
PLATE XI.

FIG.
1. *Hemistigma albipuncta.* ♀. Lorenço Marques.
2. *Acisoma panorpoides ascalaphoides.* ♂. Lorenço Marques.
3. *Crocothemis sanguinolenta.* ♂. M'Fongosi.
4. *Sympetrum fonscolombei.* ♂. Cape Town.
5. *Trithemis Distanti.* ♂. Dumbrody.
6. *Rhyothemis mariposa.* ♂. Otiembora.
7. „ *semihyalina.* ♂. Inhambane.
8. *Urothemis edwardsi.* ♀. Inhambane.

PLATE XII.

FIG.

1. *Lestes virens.* Nymph (European).
2. *Platycnemis pennipes.* Nymphs (European).
3. *Gomphus pulchellus.* Nymph (European).
4. *Anax imperator.* Nymph (European).
5. *Orthetrum cancellatum.* Nymph (European).
6. *Sympetrum striolatum.* Nymph (European).



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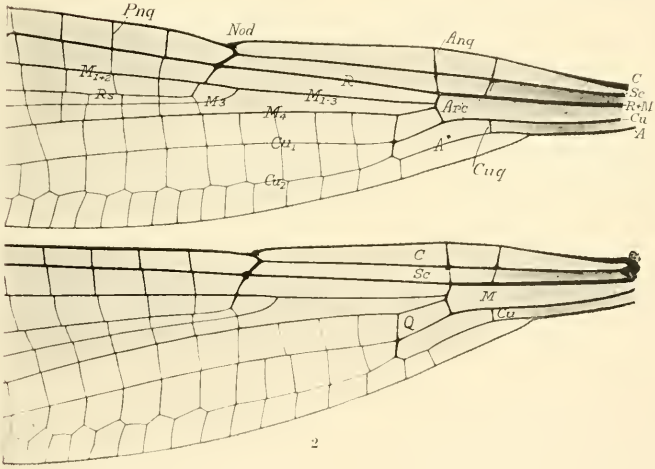

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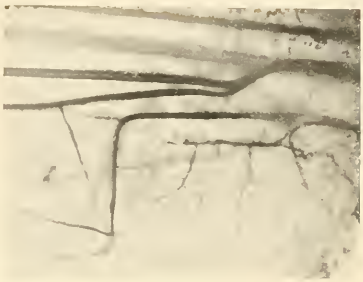

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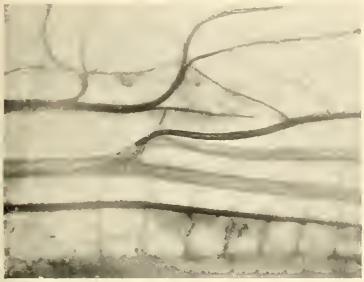

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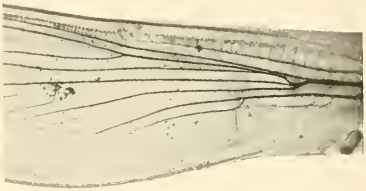

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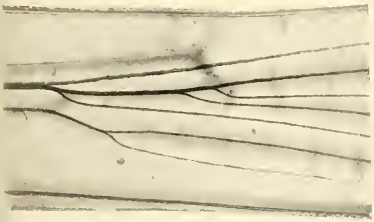

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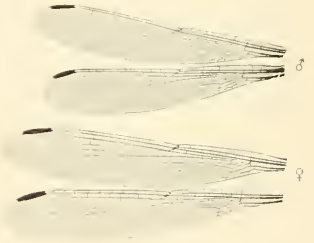

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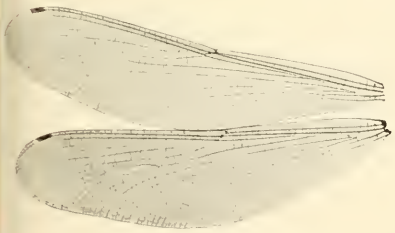

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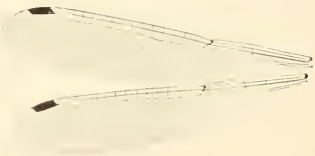

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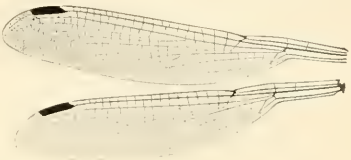

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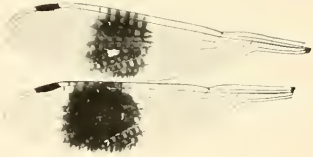

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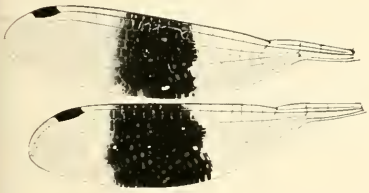

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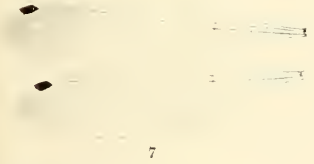

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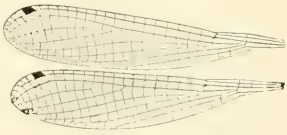

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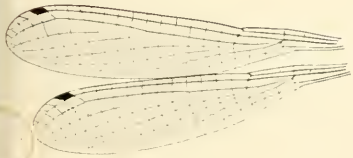

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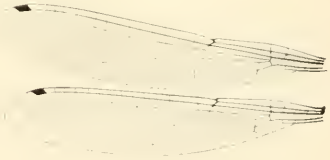

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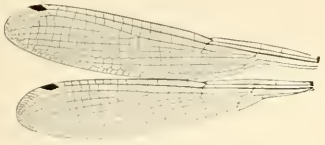

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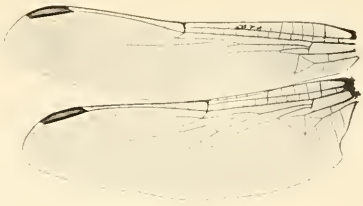

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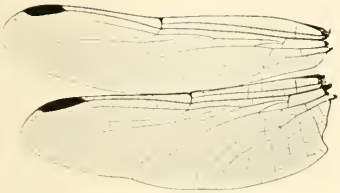

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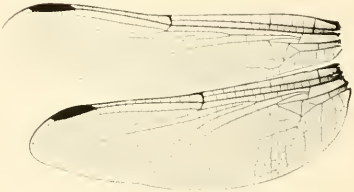

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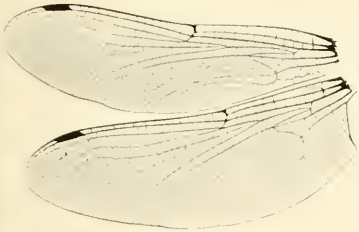

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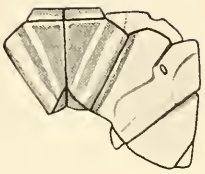

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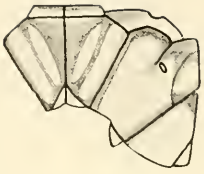

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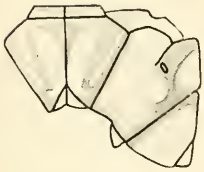

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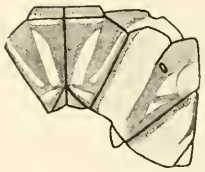

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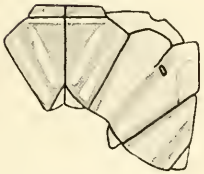

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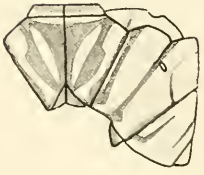

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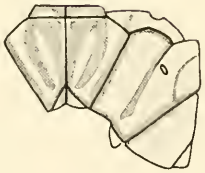

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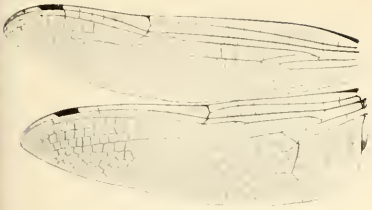

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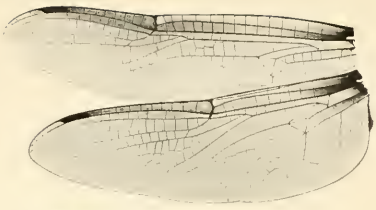

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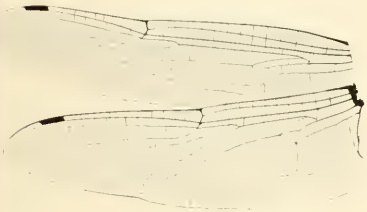

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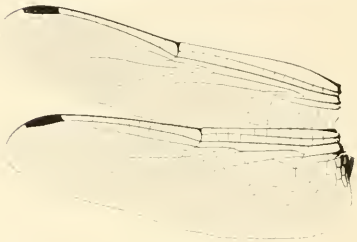

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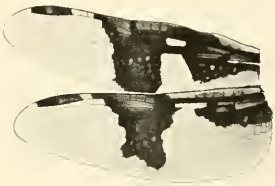

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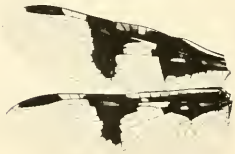

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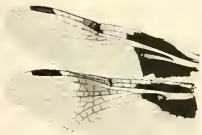

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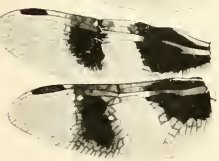

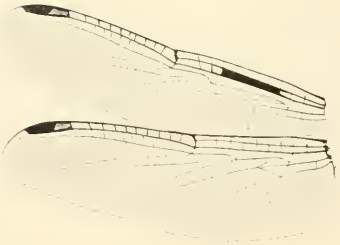

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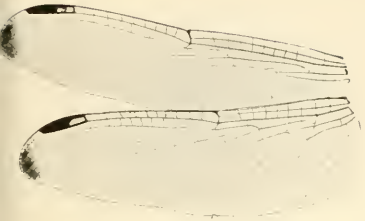

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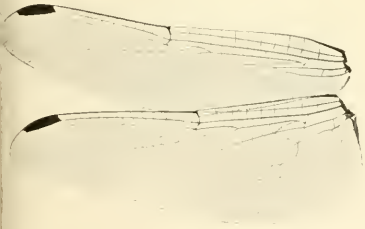

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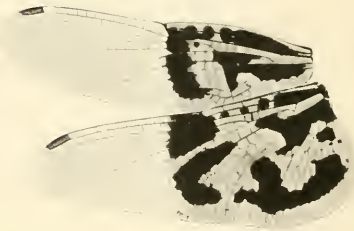

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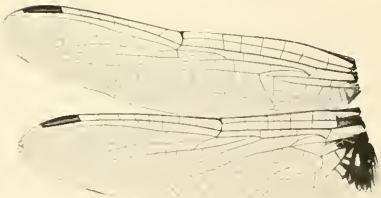

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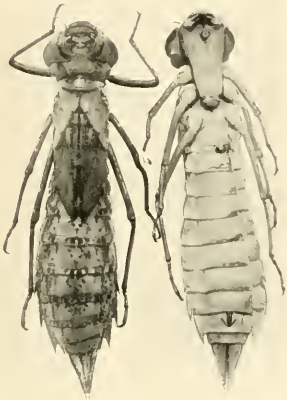

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