

ZYGOPTERA

+ introduction, index,
glossary, literature

THE DRAGONFLIES
of
SOUTHERN AFRICA

BY

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C O R R I G E N D A .

"THE DRAGONFLIES OF SOUTHERN AFRICA"
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E. C. G. Pinhey.

- Page ix, line 13, for "Gorduliidae" read "Corduliidae".
- " 40, " 15, for "recognisazle" read "recognizable".
- " 137, " 7 from bottom, for "Ichinogomphus" read "Ictinogomphus".
- " 156, to Caption Plate 11b add:
Ceratogomphus pictus :
394. Anal appendages, from left. 395. Same from above.
396. Accessory genitalia, from left. 397. Penis.
- " 186, lines 4 and 10 from bottom, for "Presba thetis" read "Phyllomacromia thetis".
Between lines 8 and 9 from bottom
add: 470. P. picta, from left.
471. P. clymene, from left (after Ris 1921).
- " 204, line 13 from bottom, for "prunosity" read "pruinosity".
- " 314, at top of page, delete "(Nat. Size)".
- " 318, at top of page, delete "(Nat. Size)".

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PREFACE

At the outset I must say that my interest in the African Odonata is largely due to the enthusiasm of a former colleague, Mr. J. A. Whellan. With this encouragement I have steadily progressed in the fascinating study of these insects and have become sufficiently familiar with them, I think, to attempt this work, the chief purpose of which is to set out the descriptions of the South African species in sufficient detail and with as many illustrations as possible, to infuse Entomologists in South Africa with the necessary enthusiasm to take up an entertaining study they might otherwise overlook. Collectors are generally scared off more by the tendency of dragonflies to lose their colours than by the rather complicated venation.

The late Dr. F. Ris (1908 and 1921) wrote accounts of the Southern African Odonata known at those times. These are excellent works on the subject and, quite apart from my own constant use of his papers, they have frequently been quoted by authorities elsewhere. As Barnard pointed out, however, in his useful paper of 1937, the venational notation as well as the classification of the Order has undergone very considerable revision. Apart from this a number of species have been added to local fauna, some recorded from other parts of Africa, others apparently quite new species and further facts have come to light on synonymy. I therefore consider the present work is justified, as an attempt to bring these alterations and additions up to date as far as I am able. It is intended to deal only with the winged state: Life histories are left for other workers. Dr. Barnard has performed a valuable service in this field in describing the nymphs of many of the Cape species.

For the publication I am indebted to the Council for Scientific and Industrial Research for supporting the project. My cordial thanks are extended to the Director and members of the Staff of the Transvaal Museum who have assisted in their various ways. I am exceedingly grateful to Lt.-Col. F. C. Fraser for the ever-willing and very considerable help he has afforded me. I also wish to thank those Institutes which have loaned or donated specimens for study: In particular the Zoological Departments of Witwatersrand, Pretoria and Rhodes Universities; the Director of the Port Elizabeth Museum and Snake Park; Mr. Whellan of the Division of Entomology, Salisbury; Dr. Hesse and the Director, Dr. Barnard, of the South African Museum, Cape Town. My gratitude is also extended to several amateur collectors who have sent many specimens to me.

I have made the descriptions and illustrations from specimens in the Transvaal Museum, except in a few cases where the only available specimens were received on loan and a few others which were not available at all, where I have had to take descriptions from literature. These instances are acknowledged in the appropriate places in the text.

References to some general literature is recorded at the end of the paper. Others, including those I was able to consult and also several papers which I have not seen, are entered under the titles to which they especially refer. I hope that there will be a minimum of errors in the recording of these references. Some of the literature, which was not in the Transvaal Museum library, was obtained by purchase or loan elsewhere, especially the South African Museum.

In conclusion I must apologise to more experienced Odonatists for any errors which may have slipped into the text or figures despite my efforts to avoid these "gremlins".

Pretoria, 1949.

E. C. G. PINHEY.

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INTRODUCTION

Odonata are insects that just fall within the category of beneficial insects. In their young or nymphal stages in the water as well as in their adult winged existence they are active predators on other small insects including mosquito larvæ or adults, but also perhaps at times feeding indiscriminately on other insects which may themselves be useful parasites or predators. When not actually benefiting Man directly in their activities they are at least harmless and, in very many cases, of definite aesthetic value on account of their grace of flight (particularly the Aeshnids) and beautiful colouring (*Chlorocypha caligata* is, I think, one of the most attractive of our entire insect fauna). However, in the past the general aspect of the larger Anisoptera have given rise to fanciful prejudices or superstitions and they have been known as "Horse stingers" in England or "Devil's Darning Needles" in America. The Zygoptera, on the other hand, because of their delicate appearance, have been known by the French name of Desmoiselles or Damsel flies. Even to-day members of the public are afraid of being stung if they handle a dragonfly, but, of course, it has no offensive weapon for this purpose.

THE DRAGONFLIES (ODONATA) OF SOUTHERN AFRICA

CHAPTER I.

STRUCTURE OF THE DRAGONFLY.

GENERAL DEFINITION: The Odonata are defined as prelaceous insects, having biting mouthparts. Compound eyes very large and prominent; the dorsum of the head provided always with 3 ocelli; antennae very short and filiform. Prothorax usually rather small or only of moderate size, always separated from the rest of the thorax (the synthorax, bearing the legs and wings) by a very flexible joint; Mesothorax and Metathorax fused as a powerful unit, the Synthorax, in which the sides and anterior portion are greatly elongated, so that the legs, attached to the smaller ventral portion, are placed in a forward position. The wings are hyaline, rounded at the apex and have a reticulate primitive venation nearer the condition found in the lower insect Orders, Neuroptera, etc. The abdomen is elongate, often very slender. Genitalia in the ♂ of unique form, consisting of anal claspers and appendages and a secondary group of organs on the second abdominal segment.

Development is hemimetabolous. The nymphs are aquatic, respire by rectal or caudal gills and seize their food by means of a prehensile modification of the labium.

DESCRIPTION: Dragonflies form a very distinct group and are easily separated from other insects. They have largely retained the primitive segmentation of the body as well as the reticulated wing venation. Kis in his paper of 1921 in the *Annals of the South African Museum* gives a brief but useful and very readable account of the structure. It is necessary, however, to go into rather more detail here on wing venation as the terminology has changed considerably in this respect, both through further light being thrown on the subject by more recent research and also by an attempt to bring the nomenclature into line with the modern conception of venation in other insect Orders. For further information on wing venation the student should refer to Tillyard's "Insects of Australia and New Zealand" (1926) and to Tillyard and Fraser's Revision of the Classification in the *Australian Zoologist*, Vol. IX, parts II to IV (1938-1940).

As an example of a local dragonfly showing general characters as well as many particular features such as auricles and foliations on the abdomen and an anal triangle on the hindwing I have sketched a figure of *Ictinogomphus ferox*.

Head. The head is large, concave posteriorly, attached to the thorax by two sclerites which allow very great mobility. The compound eyes are enormous and vision, for an insect, is very well developed, evidently the dominant sense. The antennae, bearing the sense organs of scent and hearing are very reduced and filiform consisting usually of 2 short or moderate basal segments and a longer tapering terminal segment. The mouthparts are of the usual biting type, with labium and labial palps, maxillary palps, mandibles and labrum. They show modifications in different families as shown in the diagrams of three examples (from Zygoptera; and Gomphidae and Libellulidae of the Anisoptera), each diagram showing the dorsal, ventral and anterior aspects of the head. The family modifications of mouthparts, eyes, wing-venation, etc., are described elsewhere under the respective families.

The eyes are each supported by a curved occiput, the latter linked posteriorly by an occipital plate, well defined in Zygoptera and Gomphidae but reduced to a small triangle in other Anisoptera. The rest of the dorsum of the head is occupied by the vertex and frons, but the sutures between occiput and vertex and between vertex and frons, are sometimes difficult to make out. The vertex (like the occiput) in higher Anisoptera is reduced, in this case to a raised portion just in front of the line of coincidence of the compound eyes. This

The Anal vein 1A in the forewing usually runs simply outwards parallel to Cu_2 , leaving 1 (or occasionally 2) rows between it and the posterior margin. In the hindwing of Zygoptera it is usually similar (except in cases where it is absent in both wings). In hindwing of Anisoptera it is more complex: the main vein usually runs from lower (anal) angle of the triangle, to the margin more or less parallel to Cu_2 ; but subsidiary veins A_1 to A_3 form an anal field and often enclose a somewhat circular or rather boot-shaped area known as the *Anal loop*, bounded on its outer edge by A_1 , inner edge by A_3 and often with a middle line or midrib (A_2). At the base of the wing there may be a triangular area against the membranule, known as the *anal triangle*.

The small *crossveins* of the wing need not be discussed in detail, but there are a few important ones. In the costal and subcostal spaces, below C and Sc respectively, there are crossveins, known as *Antenodals* between base and nodus, *postnodals* in costal space between nodus and pterostigma. In the more primitive species the antenodals are not coincident in costal and subcostal spaces, but they link up in the more advanced families. In the older groups, such as the Aeschnoidea, a few of the antenodals, called primaries, are thicker, the rest being thinner secondary antenodals; the primaries have disappeared in (more advanced) Libellulidae. Another important set of crossveins is that of the *Anal Crossing* veins (Ac), near base of wing, where 1A joins the cubital, before the discoidal cell. In primitive Anisoptera there are several of these Ac, but in higher forms they are reduced to 1 in each wing. In our Zygoptera the anal vein runs along the posterior margin in the basal part and leaves this margin at or shortly before Ac, with which it connects by the short vein A_1 (Ab). The base of the wing up to where A separates is called the *petiole*. Other crossveins of value in classification are found dividing the discoidal cells or the bridge space: These areas are then said to be "crossed"; but when there are no divisions in them they are "free".

The venational plan as outlined above is of primary importance for classification, particularly for determining the genera, and often for the species. This will be realized from the keys in the descriptive part.

PLATE 2.
WING VENATION.

14. *Pantala flavescens*, forewing and hindwing.
15. *Pseudagrion* sp., forewing (hindwing).
16. *Chlorocypha caligata*, forewing (hindwing).
17. *Anax tristis*, hindwing.
(A2. — midrib of anal loop.
Ac. — anal crossing.
A1. — anal loop
Arc. — arculus.
Ax. — antenodal crossvein.
B. — bridge.
C. — costa.
cos. — costal space.
D.C. — discoidal cell.
ht. — hypertriangle, supratriangle.
M. — median.
Mbl. — membranule.
o. — oblique vein.
P. Ax. — primary antenodal.
Pt. — pterostigma.
Px. — postnodal crossvein.
R. — radius.
S. Ax. — secondary antenodal.
Sc. — subcosta.
subcos. — subcostal space.
Sub. D.C. — subdiscoidal cell, subquadrate.)

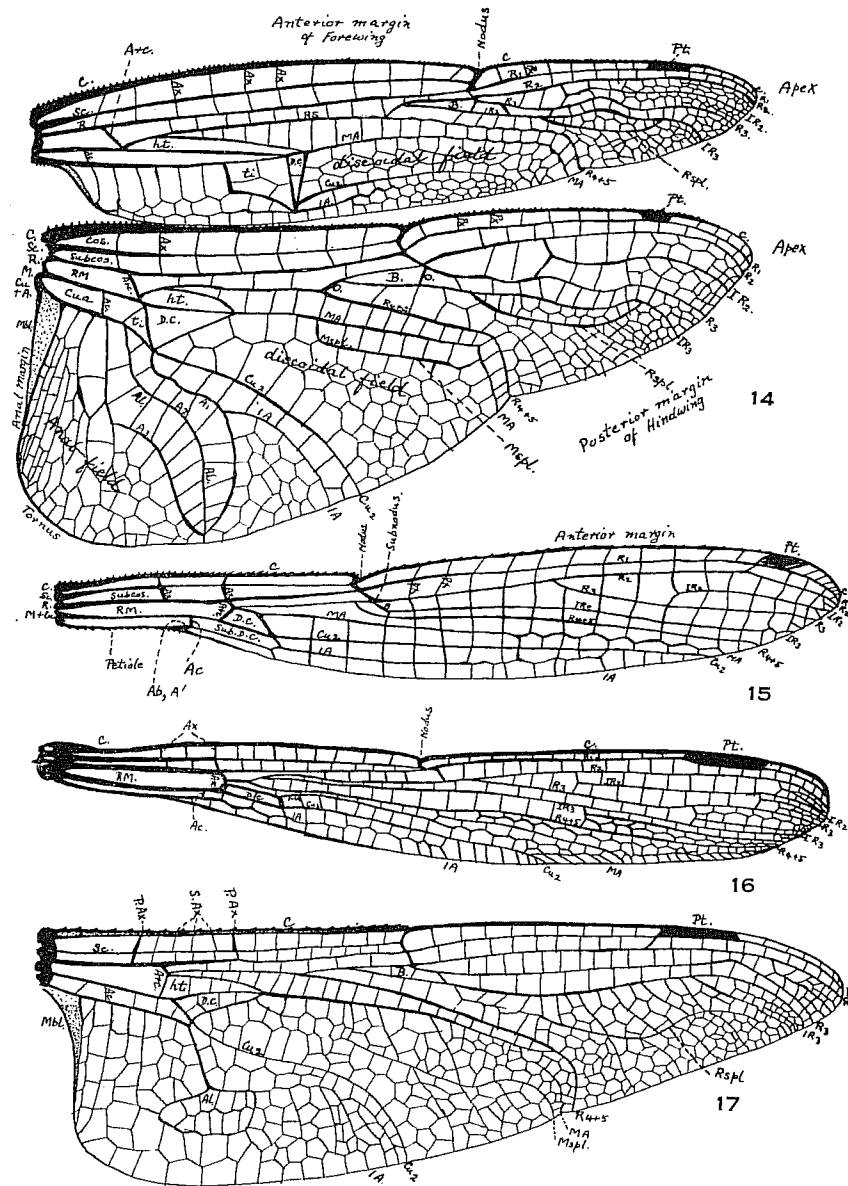


TABLE OF SOME PREVIOUS VENATIONAL SYSTEMS: The system described above has been traced by various workers, modified from time to time to afford as far as possible a natural concept of the plan derived by research on the correlations of nymphal wing rudiments and comparative study with adults, both fossil and living forms. The larger part of this work can be put down, I believe, to a handful of authorities including de Selys-Longchamps, Needham, Ris, Tillyard and Fraser. The present system is the revision by Tillyard 1926, and Tillyard and Fraser 1938-1940.

The references to the following brief extracts are:

- SÉLYS (?), 1902: *Ann. Soc. Ent. Belg.*
 NEEDHAM, 1903: *Proc. U.S. Nat. Mus.* 26, p. 703; 1917, *Entom. News* 28, p. 169.
 TILLYARD, 1917: *Biol. of Dragonflies.*
 FRASER, 1918: *J. Bomb. Nat. Hist. Soc.* 25, p. 460, et seq.
 RIS, 1921: *Ann. S. Afr. Mus.* XVII.
 TILLYARD, 1926: *Insects of Australia and New Zealand.*

TABLE OF VENATIONAL EQUIVALENTS

Designation of main branch of vein	Extracts from Selys	Needham	Tillyard 1917	Fraser 1918, simplified scheme	Ris 1921	Modern symbol Tillyard 1926	(Main branch) Ideal Notation
Costal vein	Costal	C	C	1st nerve, 1	C	C	CA
Subcostal	Subcostal	Sc.	Sc.	Intercostal	Sc.	Sc.	CP
Radius		R	R	2nd nerve, 2	R	R ₁	RA
Radius	Principal sector	M ₁	M ₁	3rd nerve, 3	M ₁	R ₂	—
Radius	—	M _{1a}	M _{1a}	—	M _{1a}	1 R ₂	—
Radius	Nodal sector	M ₂	M ₂	4	M ₂	R ₃	—
Radius	Subnodal sector	RS	MS	5	RS	1 R ₃	—
Radius		Rspl	Rspl	5a	Rspl	Rspl	—
Radius	Median sector	M ₃	M ₃	6	M ₃	R ₁₊₃	—
Media	Lower sector of areculus	M ₁	M ₁	7	M ₁	MA	MA
Media		Mspl	Mspl	7a	Mspl	MAspl	—
Cubital	Superior sector of triangle	Cu ₁	Cu ₁	8	Cu ₁	Cu ₂	CuP
Anal	Inferior sector of triangle	Cu ₂	Cu ₂	9	Cu ₂	1A	—
Radius + Median	Median	R+M	R+M	Subcostal	R+M	R ₁ +R ₃	—
Radial Sector	Upper sector of areculus	M ₁₊₃	M ₁₊₃	Sector of areculus	M ₁₊₃	R ₃	RP
Cubital			Cu+1A	—	Cu	Cu ₂ +1A	—
Anal rudiment			Ab	—	A*	A'	—
Anal crossing		Cuq	Ac	—	Cuq	Ac	—

The branches of the anal vein, A₁, A₂, etc., are names applied by Needham; the anal loop (al), bridge (B), bridge cross veins (Bcs or Bsq) are also due, I believe, to him. The subtriangle or subtrigone is generally designated ti or internal triangle, Selys' name for it; supratriangle is ht (hypertriangle).

Abdomen: Ten articulating segments are developed in Odonata, the first two and last two or three often reduced in size compared to the remainder. Each segment is strengthened by having a very broad dorsal plate or tergite which extends round the sides and part of the ventrum in a single piece (dorsal sclerite or tergite); the sternites (ventral sclerites) are very narrow flat plates connected to the tergites by membranous folds. The great flexibility of a dragonfly abdomen, largely due to this, is necessary for copulation. On the 10th abdominal segment there are processes which are generally considered to be rudiments of an 11th segment, the upper appendages or cerci being vestiges of the tergite (superior appendage of ♂, supra-anal tubercle of ♀); the lower appendages (inferior appendages of ♂, subanal plates of ♀) are thought to be part of the sternite.

Reproduction (which will be mentioned again under the subsequent chapter on habits) is complicated in dragonflies by a unique development in the ♂ which has the clasping organs (superior anal appendages) on the 10th segment and a subsidiary set of genital organs forming the copulatory mechanism on the ventrum of the 2nd and 3rd sternites.

♂ reproductive organs. The seminal vesicle opens on the 8th sternite via a pair of rather triangular plates. On the 10th segment are the two superior appendages (branched or unbranched) used for clasping the ♀ by head or prothorax; and paired or unpaired (and branched or unbranched) inferior appendages. On the ventrum of the second segment there is an organ in front, often hood-like, known as the *anterior lamina*; behind this, on either side, are one or two organs called hamuli; the outer hamulus on each side being often rather flattened and leaf-like in Zygoptera, usually less developed or absent in Anisoptera; the inner hamulus being small in Zygoptera, but well developed and provided with a hook in higher Anisoptera. At the distal end of the 2nd sternite or on the proximal end of the 3rd there is a rather flattened or rounded *genital lobe*. Lastly there is the penis, which at rest lies between these organs with its free end protected below the genital lobe, being drawn out from here during the second part of the copulatory process. These genital organs vary considerably in size and shape, not only in the families but among species. In Zygoptera and Aeshnidae the anal appendages of the 10th segment show important specific features; in Gomphidae both series of appendages (of 10th and 2-3rd) are of value for determination; in Libellulidae the secondary genitalia (2nd segment) are very important, but the anal appendages show little variation. The penis will generally show supplementary characters, but for most if not all of our known species there are sufficient characters in the other organs, in body markings, etc., for identification. It varies in shape and extent of chitinization.

♀ reproductive organs. The genital duct opens at the distal end of the 8th sternite. The gonapophyses are situated on the 8th and 9th sternites and there is no modification here of the basal segments of the abdomen. There are two main kinds of structure found in our Odonata. In Zygoptera and Aeshnidae there is a complicated ovipositor, provided with two pairs of elongate, tapering saws used for piercing the tissue of a plant for oviposition, one pair on the 8th sternite, the other on the 9th; these, when not in use, are covered by a pair of large valves, developed from the 9th segment, bearing at the distal end a rather short, slender process. In Gomphidae and Libellulidae there is no piercing ovipositor, the genital aperture on the 8th segment being usually covered merely by a small chitinous flap called the vulvar scale, simple or bifid; on the 9th sternite there is a pair of minute stylets. In some Zygoptera there is a spine at the distal end of the 8th sternite. Oviposition in Gomphids and Libellulids is merely random dispersal of eggs while the insect is in flight, whipping the surface of the water as she performs the process. The bursa copulatrix, opening via the genital duct, is within the 8th segment. It can be used for taxonomic study and, as Barnard shows, varies greatly in different families in development of

chitinized plates, spines and accessory sacculi. I have not, however, noticed very great differences specifically.

COPULATION. The ♂, often in single flight, or after clasping the ♀, charges the penis in the 2nd segment from the genital aperture on the 8th segment by curving the abdomen round. He seizes the ♀ with his legs, usually in flight, and then clasps her with his anal appendages by the prothorax (in Zygoptera) or head (in most Anisoptera). In this position the pair may rest on a twig for a time, with the ♀ hanging below the ♂ and then she will draw her abdomen up forwards below the arched body of the ♂ until her 8th segment is in contact with the base of his abdomen, where fertilization takes place. In many Anisoptera, however, particularly in *Pantala*, *Zygonyx* and *Trapezostigma* of our fauna, the connected pair fly in tandem rapidly up and down, keeping to the usual beat the ♂ may take when hawking for food on his own. Eventually they copulate, either during flight or after perching on a twig. *Zygonyx natalensis* may fly in tandem over waterfalls for long periods.

TECHNIQUE FOR EXAMINATION OF GENITALIA: Odonata are very convenient for the study of genital features, despite the complexity of the male appendages, since these organs can be readily examined in situ and generally without any manipulation. The terminal appendages of either sex are fully exposed to view, except in a few instances such as in males of the genus *Enallagma* where it is either necessary to remove the appendages of one side or to cut away one side of the 10th abdominal segment in order to see the basal portions as they are partly hidden (cryptic). The accessory genitalia of the male are also easily seen in ventral or lateral views. A little manipulation (in fresh relaxed specimens) with a needle or pin will expose the apical part of the penis and it is often possible to see nearly the whole structure without any dissection. Occasionally it is necessary to cut away the hamule and lobe of one side. The penis is well chitinized except for lateral and terminal processes (when present) in Anisoptera, but the apical part is membranous in Zygoptera. In the latter suborder the free end lies under the sheath behind the posterior lobes. The Anisopteran penis is in a more anterior position, between the hamules. In some Anisoptera, particularly the lower Libellulids, the Corduliids and Gomphids, there are tentacles, subapical or terminal. These are often paired, when present, and each fits into the hollow inner surface of the penial sheath (in Gomphidae and Corduliidae). These processes are extremely long in Corduliidae (at least in our local species). The female genital organs show externally a characteristically shaped vulva or vulvar scale, especially in Gomphidae and Libelluloidea. It would appear, in fact, that the only genital feature in Odonata which has to be removed and specially treated for examination is the bursa copulatrix of the female, within the 8th abdominal segment. In the present state of knowledge of our Odonata it does not seem necessary to make use of this organ and spoil the end of the abdomen. If a comparative study is to be made of the bursa it can be prepared in the usual way: The end of the abdomen is severed between 7th and 8th segments; the 10th can be cut off from this section and mounted on a card below the insect; 8th and 9th are soaked in cold 10% potash for about a day or gently warmed in this solution for a few minutes; then the two segments are parted, the bursa removed, washed in water or dilute acetic acid; the bursa can be stained with fuchsin; it is dehydrated with alcohol, cleared with clove oil and xylol, and mounted in Canada balsam on a slide.

MEASUREMENTS: The length of the abdomen and of the hindwing (the forewing might also do), given in millimetres, is now considered essential to descriptions of dragonflies. Often the limits of variation of these measurements is small, but sometimes there are quite considerable differences between dwarf examples and normal or large individuals. The ratio of abdomen and hindwing, however, is generally constant and in this paper I include this ratio for the male sex of each species described. Measurements formerly given were of total body length and of wing expanse, but these are now abandoned in favour of abdomen and hindwing. The antennal-costa ratio used by Lepidopterists is impracticable here, because of the reduced size and comparative unimportance of the antenna.

N.B. — It should be noted here that in all abdomen lengths and ratios in this paper the anal appendages are omitted, unless otherwise stated.

VARIATION: Odonata in general show very marked sexual dimorphism. The males usually develop bright colours on body or wings when mature, while immature males and females are more similar in colour, paler or duller. When pruinose blue is developed this is generally confined to the ♂, but the ♀ may have it to a lesser extent. In Gomphids, Corduliids and some Aeshnids the colour is very similar in both sexes. Where strong dimorphism is shown it is usually the ♀ which is coloured for protection in its natural surroundings while the male flaunts gay colours to attract the ♀. In a few cases, however, it would appear that the ♂ is camouflaged: The blackened wings of ♂ *Tetrathemis pollenii* suggest a protective colour as he flies about his shaded haunts; the wing-patterns of *Paltoptera lucia*, said to be mimetic of Hymenoptera, show more resemblance to some Sphegids in the black markings of the ♂ rather than the paler pattern of the ♀. In a few instances in our fauna there is polymorphism — this is the case in *Agriocnemis exilis* and *Ischnura senegalensis*. *Enallagma glaucum* shows variation more in the male sex than in the female, sometimes tending to melanism. There seems to be no definite seasonal dimorphism in our species, although dry season *Prithemis kirbyi ardens* seem to show deficiency in mature coloration in the Pretoria district. Probably most of our species have only one brood in the year, but a few of the smallest species may have more broods.

CHAPTER 2

HABITS AND LIFE CYCLE

HABITS: Although it is true to say that most species of dragonflies are to be seen flying in the neighbourhood of the water in which they breed there are some species of Anisoptera, such as some *Macromia*, *Oligoneura* and the females especially of many other genera which are more often found well away from water, among trees. The females of these genera rarely seem to visit water except to lay eggs, and they may perform this with trepidation, easily scared away. The Zygoptera, however, are generally in close proximity to their breeding haunts, the females flying openly amongst the males or in the grass and other foliage on the banks. Here again, there are exceptions, for females, for instance, of *Pseudagrion massaicum* appear to hide amongst trees or bushes, except when mating and ovipositing. Members of the genus *Lestes*, especially *L. ictericus*, are often found at a long distance from their aquatic habitat. I have particularly noticed both sexes on and around the tops of hills at Pretoria in the cold months of the dry season. Most of our species are diurnal, in fact, normally flying only in bright sunshine. A few, such as *Tholymis* and *Gynacantha* are crepuscular.

The males of many Anisoptera seem to select a favourite area to search for their food, which consists of small flying insects, and to wait for the appearance of a female. An individual of some species, such as the *Trithemis* and *Orthetrum* genera, will rest on a twig and make short excursionary flights to chase away a rival of its own species or some other dragonflies, or to seize its prey; and then it will return frequently to the same twig or it will hesitate and then, perhaps, select another perch. The more powerful species such as *Pantala*, *Trapezostigma* and the *Aeshnids* fly up and down a stream or round a pool hawking for food or looking for a mate. *Gomphids* generally rest on stones, sand or mud, taking short flights, keeping low over the water. The large and powerful *Ictinogomphus ferox* prefers resting on reeds, but may keep on the wing for long periods. The *Coenagrionidae* seem to fly merely haphazardly from one perch (a grass stem, reed or twig) to another. *Pseudagrion massaicum*, *Ps. nigerrimum* and some of the *Enallagma* fly low over the surface of the water, frequently settling on twigs just showing through the water or on water lily leaves. *Ps. pseudomassaicum* flies over fast running water. *Chlorocypha* settle on twigs or stones like Anisoptera.

DISTRIBUTION: There are other examples which could be mentioned to illustrate the diversity of flying habits, but they are mentioned under the various species. A brief account of the range of habitat and distribution must be given. Many species like open stagnant pools, pans or swamps. These include the genera *Acisoma*, *Diplacodes*, *Trapezostigma*, *Urothemis*, *Enallagma*, many *Lestes* and *Agriocnemis*. Others like flowing streams, especially the *Gomphids*. *Zygonyx* hovers over waterfalls. Some will only be found in the diffuse light of pools or streams well shaded with trees: *Tetrathemis polleni*, *Notiothemis*, *Trithemis basilineata* and *Pseudagrion angolense*. Others again are not particular, but they are generally in the open—most *Trithemis* and *Orthetrum*. Despite the preference of several species for diffuse light or shade, dragonflies are essentially lovers of sunshine, and it is not much use seeking them on dull days, except in their retreats among bushes and trees. Many species will vanish rapidly on a sunny day if the sun is obscured by cloud, but others such as the *Lestes* may keep flying once they have left their nocturnal resting place. Temperature also has a marked effect on distribution, many of the higher Libellulids, such as *Trapezostigma limbata*, *Urothemis*, *Atoconura* and *Tetrathemis* favour hot low-velld; *Chlorolestes* prefer more temperate regions or mountain forests; while others can be found almost anywhere. Many species may be found on the wing throughout the year in Southern Africa, but I

find that the peak months for number of species are November to January, at the start of and early in the rainy season. Later in the wet season when rivers are in flood they disappear from these haunts. Fast-flowing water will only attract a few such as *Zygonyx*. Thus, unlike vegetarian insects, the dragonflies are not limited to any marked extent by flora, but on the salinity of the water and strength of its currents, and to a great extent on temperature. On account of their strong flight it is therefore not surprising that most of our Anisoptera are widely distributed in Africa. The migratory tendency has resulted in some species being found in other Continents as well, for instance *Pantala flavescens*, *Trapezostigma*, *Tholymis tillarga*, *Anax imperator* and *Hemianax cphippiger*. It is rather more to be wondered at that some of the Zygoptera are so widely spread, many *Pseudagrion*, *Enallagma* and the small *Agriocnemis* included. It is thought that the smallest ones may be carried by air-currents. The flight of *Agriocnemis* is certainly very feeble. At the other end of the scale the strength of flight of an *Anax tristis*, a *Hemianax cphippiger* or a *Trapezostigma basilaris* is really remarkable. Their acrobatic display, even when feeding on the wing or paired and flying in tandem, is a marvel to watch. They can hover, dart forwards or backwards, or fly up rapidly at a steep angle. I have seen *cphippiger* perform a rapid "loop" while hovering and without shifting appreciably during the somersault.

MATING: Usually in pairing the male "pounces" on the female, grabbing her with his legs, while she is in flight, at rest or, even when egg-laying. If he has a satisfactory grip he will bring his anal appendages up under his body and catch hold of the female with these by her head (Anisoptera) or prothorax (Zygoptera), releasing his leg-hold. The two will then fly in tandem for a long period in the case of some of the strong-flying Anisoptera, carrying out fertilization during flight; or in others settle on a twig, the female suspended below the male. Previous to this the male will have charged the penis on his second abdominal segment. The female, by curving her abdomen, will bring her genital aperture below the base of the abdomen of the male, where fertilization takes place. In some cases the female evidently refuses to mate and the male is rebuffed as soon as he tries to seize her with his legs. In one remarkable case, that of the beautiful little *Chlorocypha calidula*, there is an elegant courtship, comparable to the elaborate display found among birds, and the male seems to show some respect for the female. I have described this briefly under the species in question.

LIFE CYCLE: In this paper I do not propose to deal with any specific life cycles. It would take a number of years to work out even perhaps half the species adequately. I can only briefly mention the subject here from a general aspect and would refer the reader to the useful contributions on the nymphs of some of our species by Barnard (1937, 1940) and to descriptions by workers in other countries.

When ovipositing, the female *Gomphids* and *Libellulids* fly over some calm, still pool and whip the surface with their abdomen, releasing an egg at each stroke. *Zygoptera* and *Aeshnidae* settle on plants, pierce the outer tissue with their saw-like ovipositor and lay their eggs. Usually they rest on a twig or leaf floating on the water and dip their abdomen down under the water until they reach a stem with their ovipositor. *Zygoptera* females, during this process, usually have the male still attached to their prothorax by his anal appendages, standing vertically above her in this position, the female being the dominant partner here, as she selects a water plant on which to settle before thrusting her abdomen into the water. While thus attached I have seen the male feverishly but ineffectively vibrating his wings, but unable to raise the female until she is ready to move. Some female *Libellulids* may be even more timid than usual during egg-laying, hurry brusquely through the job and are easily frightened away.

The eggs, at least of the *Libellulids*, are generally yellow in colour, elongate or rather spherical. A female may be capable of producing a few hundred eggs. This appeared to be the case in a ♀ *Trapezostigma limbata* I caught. The young larvae or nymphs (naiads) which emerge from the eggs are of characteristic shape in the main groups. They feed on insects and other small aquatic Arthropods, the largest nymphs (some *Aeshnids*) being said

to attack small fish. The prey is seized by a pair of extensible forceps below the head known as the mask, a modification of the labium. This is a hinged structure which can be withdrawn under the head. Respiration is effected by gills. The nymphs undergo several moults before attaining the adult state, which they eventually reach by the more primitive method of gradual metamorphosis, not assuming any intermediate resting state or pupa. The later nymphal instars show wing rudiments, larger after each moult, until the penultimate ecdysis, soon after which the nymph climbs a reed or twig in or near the water, splits down the back and the adult emerges. The newly emerged adult is very soft-bodied, with compact wings which take up to about an hour to expand to full-size, soft and shimmering; the body colour usually rather yellowish or whitish at first or pale green in some Gomphids, the wings often yellower than in the fully mature state. This general individual remains in a weak, rather unprotected state for a longish period, not drying quickly as in Lepidoptera. After many hours the wings and body begin to harden and develop the maturer coloration. In many cases, especially in the males, these juveniles go a stage further in maturity, excreting a bluish or whitish waxy coating or pruinosity; this after a number of days. In some genera it is often of assistance in identification if the rather immature, juvenile males can be procured, as pruinosity may mask the true markings. A general individual, however, is too soft to be of much benefit, and the eyes, thorax and abdomen collapse. The adult may live for a matter of weeks or months and certain species, such as *Synpsectra fusca* are known to hibernate in the winter of temperate climates. Species of Zygoptera are known to be capable of breeding in the small pools of water on some large terrestrial lily leaves.

NYPHIS: TENTATIVE GENERAL KEY TO FAMILIES AND SOME GENERA OF SOUTHERN AFRICAN ODNATA.

(extr. Brues and Melander, 1932, modified ex Barnard, 1937).

- 1 — Body slender, bearing 3 (or 2) long tracheal gills at tip of abdomen; these gills usually leaf-like, sometimes triquetral. Mask flat Suborder Zygoptera 2
- Body stout, robust; abdomen without terminal tracheal gills; the caudal gills concealed in an enlargement of the rectum. Tip of abdomen bearing 3(5) spine-like or triangular processes Suborder Anisoptera 9
- 2 — Mask bearing setae—at least 2 pairs, on mentum or lateral lobes 3
- Mask without setae either on mentum or on lateral lobes 6
- 3 — Median lobe of mask excised; lateral lobes deeply cleft; legs long. Caudal gills (lamellate) with secondary tracheae lying at right angles to the gill axis . . Fam. *Lestidae: Lestes* Leach. 4
- Median lobe of mask projecting, not excised; legs short or of moderate length 4
- 4 — Caudal gills triquetral Fam. *Platycnemididae: Altoenemis* Sélys 5
- Caudal gills lamellate Fam. *Coenagrionidae* 5
- 5 — Gills nodate, elongate. 1 seta on mentum, 3 on lateral lobe *Pseudagrion* Sélys
- Gills subnodate or simple. 4-5 setae on mentum, 6 on lateral lobe *Eusallagma* Charp. and *Ischnura* Charp.
- 6 — First joint of antenna greatly lengthened as long as or longer than the distal ones together 7
- First joint of antenna not noticeably lengthened. Gills constricted, sac-like or lamellar. 1 seta on mentum, 3 on lateral lobe Fam. *Protonoceridae: Elatoneura* Cowley
- 7 — 3 caudal gills 8
- Only 2 caudal gills, triquetral Fam. *Chlorocyphidae: Chlorocypha* Fraser
- 8 — Median caudal gills flat, much shorter than the lateral ones; the lateral ones triquetral Fam. *Agriidae: Phaon* Sélys
- Caudal gills all the same size and shape, lamellate, broadly oval Fam. *Synlestidae: Chlorolestes* Sélys
- 9 — Antennae 7-jointed. All tarsi 3-jointed 11

- Antennae 4-jointed (4th often minute). Mask with flat median lobe; distal margin of mentum not cleft. Tarsi of forelegs and mid-legs 2-jointed Fam. *Gomphidae* 10
- 10 — Legs short. Abdomen relatively narrow without dorsal keel *Paragomphus* Cowley
- Legs long. Abdomen relatively broad, with dorsal keel *Ceratogomphus* Sélys
- 11 — Mask spoon-shaped, with broad lateral lobes. Setae usually numerous 13
- Mask flat, median lobe cleft. Normally without setae on the labium. Lateral lobes of labium with a long moveable hook Fam. *Aeshnidae* 12
- 12 — Eyes large, hemispherical. Mask not extending beyond mid coxae *Aeshna* Fab.
- Eyes very large, flattened dorsally. Mask extending to hind coxae *Anax* Leach
- 13 — Teeth along inner margin of lateral lobes of labium deep or moderate, the dentition always clearly marked; legs usually long, hindfemora longer than width of head. Setae on labium very stout Fam. *Corduliidae* 14
- Teeth on inner margin of lateral lobes of labium normally reduced to crenulations or obsolete (exceptions include *Pantala*, which has a very enlarged mask, and subfamily *Tetraetheminae*; *Pantala* has strong spines on abd. 8-9) Fam. *Libellulidae* 15
- 14 — Body flattened, abdomen broadly oval. Eyes very prominent. Abdomen 8-9 with short acute posterior spines *Phyllomacromia* Sélys
- Body not flattened, abdomen elongate oval. Abdomen 8-9 without strong lateral spines *Presba* Barnard.
- 15 — Distal margin of labium with long teeth. Abdomen 8-9 with strong lateral spines *Pantala* Hagen
- Distal margin of labium without teeth or only slight prominences 16
- 16 — Eyes small. Lateral margins of head behind eyes parallel. Legs short. Body strongly setose, opaque *Oethetrum* Newman
- Eyes prominent. Lateral margins behind eyes convergent. Legs moderately long. Body sparsely setose or nearly glabrous, more or less mottled and semitransparent 17
- 17 — Abdomen without dorsal keel *Crocothemis* Brauer
- Abdomen with medio-dorsal keel, and with medium dorsal teeth 18
- 18 — Segments 8-9 ending in small points. Medio-dorsal teeth large *Trithemis* Brauer
- Segments 8-9 ending in strong spines. Medio-dorsal teeth small 19
- 19 — Length of body about 14-16 mm. *Sympetrum* Newman, etc.
- Length of body about 24-26 mm. *Zygonyx* Hagen

CHAPTER 3

COLLECTION AND PRESERVATION

COLLECTION: An ordinary butterfly net can be used for collecting dragonflies, but one of strong material is advisable, since it is sometimes necessary to sweep the water in collecting. This is unavoidable with species (like *Pseudagrion massaicum*) which fly low over the surface, or those settling on water lily leaves (*Aeisoma*) and females of most species when egg-laying. The bag of the net could be made of organdie, silk voile, bolting silk or strong muslin. Extension rods for the stick are essential for collecting species of *Oligostris* or others up in the trees or for dragonflies flying or resting at some distance from the edge of water. Waders or gumboots are useful in shallow water, particularly in warmer parts of the country, where paddling without such protection might lead to an infection by larvae (cercariae) of the parasitic Bilharzia worms.

A cyanide bottle seems the most satisfactory agent for killing Odonata. The acetic ether (ethyl acetate) used by some entomologists for other insects seems to have a peculiar effect on dragonflies, tending to produce a pink flush where the specimen was green or yellow: I have seen *Orthetrum chrysostigma* ♂ after this treatment having a pink face and a pink thoracic bloom showed through the blue pruinosity; pink patches appeared on sides of thorax in certain *Trithemis*; the sides of the abdomen in *Chlorolestes fasciata*, *Enallagma* spp. and *Pseudagrion* spp. showed a similar result.

Fresh specimens of dragonflies are very easy to set, whether large or small, for the wings fall readily into the correct horizontal position. Owing to the oblique lengthening of the thorax the wing bases are in an oblique plane at right angles to this thoracic elongation. Thus, in order to set the wings absolutely level, without the bases being twisted, it is necessary to set the insect with the body pointing downwards, head below the thorax, in a "dive-bombing" attitude. This is not to say that the thoracic pin is pushed through at an abnormal angle: As in Lepidoptera the pin should enter the thorax between the wings and emerge below between the legs; if this is done with a dragonfly the body axis is automatically dipped. When unset specimens have to be relaxed, they should not be allowed to get too moist, or segments of the abdomen may separate. On the setting-board the abdomen usually has to be pressed down.

In the arrangement of dragonflies in cabinets or store-boxes it is usually advisable to stagger the rows of specimens if series are kept, and place alternate specimens with wings overlapping the abdomen of the one in front. Otherwise these insects take up an amount of space disproportionate to the number of species.

PRESERVATION OF COLOUR IN DRAGONFLIES

The tendency of dragonflies to lose their body colours more by rapid decomposition than by fading has led to several attempts to remedy this and quite often has caused collectors to abandon the group after a brief study.

It should be pointed out, however, that many species do not appreciably lose their colours and that for others it is merely a question of taking sufficient trouble to prevent decomposition. As I consider this of some importance I will discuss the problem at some length.

Kemp ("Entomologist," 1903, p. 34) found that pinning the smaller dragonflies of the group Zygoptera on to a piece of cork and leaving this immersed in alcohol for about a month, preserved the colours of certain species remarkably well. I have noticed myself that this is the case for instance in *Pseudagrion massaicum*, which remained as brilliant as its fresh condition. It is remarked by Kemp that when the specimens are removed the liquid should not be allowed to dry on the wings because of a tendency to cloudiness, but it should

be drawn off with blotting paper. In the case of Anisoptera the alcohol does not penetrate quickly enough to stop decomposition. I have tried this method with Zygoptera with some success even if the specimens are only immersed in alcohol (70-90%) for about 24 hours or so. There is a tendency to shrinkage if the higher percentages of alcohol are used. With Anisoptera I have tried slitting the abdomen and making a small hole in the thoracic ventrum to induce the alcohol to penetrate quickly, but with only inadequate success. Formalin, a rapid preservative for many insects and recommended for preserving Orthoptera, should not be used for Odonata, unless very dilute or mixed with some other liquid. By itself it appears to be one of the quickest and surest ways of decolourizing dragonflies. Stefanelli found it a help to treat some species drastically with concentrated sulphuric acid. Williamson (1901, Ent. News, Philad., p. 131) used 95% alcohol or acetone followed by benzene with success in the case of a species of *Enallagma*. I have tried both these with other dragonflies, and although I find alcohol of some value in this connection, the other mixture (alcohol and benzene) was unsatisfactory. In fact, with the pruinose blue *Pseudagrion salisburyense* the acetone-benzene treatment successfully removed all pruinosity, confirming, incidentally, that this is of a fatty nature. Again, if blue pruinose species are dried at too high a temperature, the pruinosity disappears, leaving a shiny black surface.

Tillyard, 1917, explained that as the decomposition is largely due to the intestinal contents the colour preservation may be assisted if the collector starves the dragonfly to death and then dries it rapidly (on the setting-board) by the application of heat. It may be stated that starving alone does little to assist unless the specimens are quickly dried. The more humane method is that used for larger insects of other orders, killing the specimen in the usual way, cleaning out the abdomen and, if necessary, stuffing it with cottonwool or some other material. The cleaning must be done carefully to avoid scratching the colouring matter off the inner surface of the abdominal wall. Where this colour has been removed it can be replaced with oil point or watercolour mixed with soap or oil. It is, however, a delicate operation, not to be attempted except with the large species (some experts who preserve Lepidopterous larvae by the blowing method have been able to perform this task with great precision). One of the minor difficulties is to match the exact original colour.

Perhaps a few general hints on our Odonata regarding the preservation of colour may be of some use to beginners.

1. Do not let dragonflies get too moist by leaving in a relaxing tin or jar for longer than necessary to soften the wing-muscles just enough for setting. Papered specimens also sometimes get moist and decompose rapidly, especially if placed, before they are dry, in an air-tight container. Dragonflies, being very active and carnivorous, have fuller intestinal contents than adult Lepidoptera.
2. Some colours show little or no tendency to disappear. These include the metallic green or blue found frequently on head, thorax or abdomen, in *Chlorolestes*, a few *Lestes*, many Coenagruids, *Macromia* and *Zygonyx*; also pruinose blue colour (chiefly in ♂♂) will remain permanent (unless the specimen becomes excessively damp) in the cases of *Chlorolestes umbrata*, *Lestes plagiatus*, *Metacnemis valida*, *Elatoncura glauca*, *Pseudagrion kerstenii*, *P. salisburyense* and a few other Coenagruids, *Orthetrum*, the blue species of *Trithemis*, and certain other Libellulids. Again, colours on the wings will not alter.
3. Red or orange body colour may fade a little, but generally remains fairly satisfactory. This is the case as a rule in *Ceragrion*, *Chlorocypha luminosa*, *Trithemis arteriosa*, *T. kirbyi ardens* and generally *Crocothemis*. If they are rapidly dried in the sun, in front of a stove or in an incubator this will generally ensure better preservation.
4. The greens or yellows of Gomphids and others show the same tendency and this can be largely checked by rapid drying. This also applies to the light sky blue colours of some species, e.g. the abdomen of *Chlorocypha caligata*: Its red leg colour is also well

preserved in this way. The light blue of *Enallagma* I find more difficult. Sometimes rapid drying assists, sometimes it may hasten the disappearance of this colour. A surer method is to immerse species of this genus and similarly coloured *Pseudagrion* in 70% alcohol for at least a few days, dry them partly with blotting paper and immediately set them.

5. The Aeshnids and certain of the largest Libellulids, such as *Urothemis assignata*, require to have the abdomen well cleaned out and then dried quickly. Drying without emptying the abdomen is generally useless for these, and they will soon turn a monotonous brown. One method is to slit the ventrum of the abdomen from distal end of 3rd segment to 7th segment (in order not to injure genitalia in the ♂: up to the 1st segment in ♀ can be done), remove the contents with a hook or fine tweezers and replace with a thin roll of cotton wool. It is often necessary to insert a fine piece of wire or a pin through abdomen to thorax for support. Some collectors introduce the pin from the thoracic end, pushing through between the bases of the legs and down the abdomen. Another method, which I myself use and find quite satisfactory, although it may appear somewhat drastic, is as follows: carefully sever the abdomen from the thorax at the base. Insert a fine green twig or grass stem of suitable size through the severed end of the abdomen, pushing it gently right through, without scraping the walls, until it can be drawn out at the anus, pulling more rapidly as it first appears from this end in order to draw the body contents out. If the abdomen does not yet appear clean the twig can be drawn through again after removing the first viscera. The thorax may be cleaned inside with fine forceps, but generally this is not necessary in the process. The insect is then pinned and set, leaving the abdomen free, but supported somewhere on the board between pins, and it is then dried in front of a stove or in the sun (with suitable provision to prevent ants attacking the corpse—e.g., sprinkle naphthalene round the board). When dry (a matter of a few hours) the abdomen is fixed to the thorax with gum or secotine. This method I generally find highly satisfactory for these larger insects: but they must be cleaned out as soon as they are dead, not left overnight to start decay. This is particularly important with the large blue Aeshnid, *Anax imperator*. It is advisable before fixing the abdomen to use a pin inserted through abdomen and passing forwards into the thorax.

With the larger species, for instance the Aeshnids, I usually extract the contents of the first two segments (after severing the abdomen), before passing a grass stem through. Forceps or a bent pin can be used, and it is sometimes possible to draw out most of the abdominal contents in this way. In the case of specimens to be prepared and not immediately set I sever and clean the abdomen in the same way, leaving it loose in the paper with the rest of the insect. If thoroughly cleaned the larger species usually do not require to be dried with heat in these papers, but merely left to dry at atmospheric temperature.

As a final remark in this chapter I would like to mention the tendency in many dried Odonata to develop a pale yellowish or whitish "antehumeral band" which is usually incomplete at upper end and situated near median suture. I find this sometimes in brown-coloured Zygoptera, such as *Lestes pallidus ictericus* and others. It is misleading in that this form of decomposition assumes the appearance of an antehumeral stripe which should not be there.

CHAPTER 4

CLASSIFICATION OF THE ODONATA

Living species of dragonflies found to-day belong to the *Odonata* (Fabricius 1792). They were at one time included as part of Linné's *Neuroptera* (1758); and the names *Subulicornia* (Latreille, pars), *Pseudoneuroptera* and *Paraneuroptera* (Shiple 1904) have also been used to cover the group. There is also, however, a wealth of fossil material, collected in rocks of different ages dating back to the Carboniferous era. Some of these fossils, because of their very much more archaic venation than modern Odonata, have been separated into other orders, such as Protodonata and Protozygoptera, which are considered ancestral to the modern groups. The fossil orders and the fossil true Odonata do not concern us here, but a general survey of these primitive groups and of the classification of the modern families can be found in Tillyard and Fraser's papers of 1938-1940 (*Australian Zoologist* IX., pts. II-IV).

Despite the evolutionary changes which have resulted in the present conception of the dragonflies falling into several Orders, there are still existing to-day many species of true Odonata with somewhat primitive, archaic venation. Before proceeding with an outline of the classification it will be well to consider here what features are generally stated to be primitive in existing species of dragonflies. According to Fraser it appears that the fossil Order Protodonata gave rise to the Order Protozygoptera, and from this arose part of the Order Odonata, suborder Zygoptera and suborder Anisozygoptera (the latter mainly a fossil group with a single living genus in East Asia); and the Anisoptera in turn appeared through the Anisozygoptera. Zygoptera seem to show more ancestral wing structure than Anisoptera. Some of the more archaic features of existing species may be summarised under a few headings:

PRIMITIVE FEATURES:

1. *Cells mainly quadrilateral in shape.* Particularly in Protoneuridae and Platynemididae of our fauna. In the Coenagruidae there is an advance through increased zig-zagging of the main veins resulting in 5-sided cells. In Anisoptera the cells, bordered by long veins, tend to be quadrangular or pentagonal, but others may be pentagonal or hexagonal.
2. *Larger number of long veins.* In *Lestes* and *Chlorolestes* there are subsidiary longitudinal veins, which are absent in Coenagruidae, etc.
3. *Arculus distal in position.* At or beyond 2nd AN. This is the case in nearly all our Zygoptera as well as in many Gomphidae, some Aeshnidae and lower Libellulidae (*Tetra-themis*, *Notiothemis*, most *Orthetrum*, etc.).
4. *Discoidal cell in the form of a quadrilateral.* This, in our fauna, is only in the Zygoptera, except for the archaic Libellulid genus *Tetra-themis*.
5. *Bridge with accessory veins.* In the Anisoptera this is found in Aeshnoidea; in Libellulids the bridge is free, except in *Palpopleura* and *Tetra-themis*.
6. *Hindwing with more than 1 Ac.* It is not clear to me whether this is a primitive feature or a specialized secondary character in our Odonata, for most of our Zygoptera only have 1 Ac in each wing; Aeshnoidea and a few primitive Libellulids (e.g. *Atoc-neura*, *Porpax*) have more than 1 Ac in hindwing.
7. *No radial supplement Rspl.* This is a vein developed from the inferior branch of the 3rd Radial (1R₃), the intervening space between 1R₃ and Rspl containing 1 or more rows of cells. This Rspl is developed to a greater or lesser extent in Anisoptera, but not in Zygoptera.

8. The tendency to black (or metallic greenish black) and yellow, or black and green body colours is perhaps a primitive character, but it is also apparently a secondary development in shade-loving species. In our fauna these colours are especially developed in *Chlorolestes*, *Ellatoneura*, certain *Pseudagrion* (especially *P. angolense*), among Zygoptera; Gomphids, *Anax tristis*, Corduliids, *Notiothemis* and *Oligogastra* among the Anisoptera. All these, except the Gomphids (our most primitive Anisopterans), are woodland, shade-loving species. A remarkable exception is the ♂ *Diplacodes lefeberci* (an Anisopteran) which, when fully mature, has an entirely black body and yet it is not at all primitive in venation, and, far from being a shade-lover, it desports itself over open pools. I have found no explanation for this. The rather black-bodied *Brachythemis leucosticta*, with dark bars across the wings, is another exception. Here, however, an explanation can be suggested: It flies low over dark, bare, muddy banks of pools, and the dark markings act as camouflage.

A preliminary outline of the classification, with a systematic list and simplified keys to our known genera, may be of use to students. The detailed classification will follow later, with descriptions and fuller keys, covering slightly more than is at present known to occur here.

OUTLINE OF CLASSIFICATION: The Odonata is first divided into two large Suborders, Zygoptera (delicate, equal-winged species) and Anisoptera (robust, with unequal wings). Each is separated into two superfamilies: Zygoptera into Coenagrionidea and Agrionidea (depending on number of antennal crossveins and other characters); Anisoptera into Aeshnoidea and Libelluloidea (especially on shape of discoidal cell and confluence of antenodal crossveins). These groups are again divided into families: Coenagrionidea into Synlestidae, Lestidae, Protoneuridae, Platycnemididae and Coenagrionidae (on shape of discoidal cell, tide, Lestidae, Protoneuridae, Platycnemididae and Coenagrionidae); Agrionidea into Agrionidae and Chlorocyphidae (on facial development of veins Cu₂ and 1A); Aeshnoidea into Gomphidae and Aeshmidae (on the development, shape of abdomen, etc.); Libelluloidea into Corduliidae and Libellulidae (chiefly on characters of the eyes); Libelluloidea into Corduliidae and Libellulidae (chiefly on characters of the males). The families in turn are split into subfamilies, but for convenience in working down a species it is easier to use keys from families direct to genera: depending primarily on wing venation, but frequently supplemented by characters of body and legs. Of the families quoted above only the Coenagrionidae and Libellulidae are of any size in our fauna, the others including only from one to about a dozen species.

These families were formerly considered a lower rank and the groups in general have undergone a change since Ris' papers. Papers (mentioned above) by Tillyard and Fraser should be consulted for an explanation of these changes.

SYSTEMATIC LIST OF KNOWN SPECIES IN SOUTHERN AFRICA: The following list I have compiled from records I have been able to obtain from various sources, omitting definite synonyms and species very doubtfully recorded.

ODONATA

Suborder ZYGOPTERA
Superfam. COENAGRIONIDEA
Fam. SYNLESTIDAE
Subfam. Synlestinae
Chlorolestes Selys
Subg. *Chlorolestes*
C. conspicua Selys
C. umbrata Selys
Subg. *Euchlorolestes*
C. fasciata Burm.
C. tessellata Burm.
C. longicauda Burm.

C. elegans Pinh.
Eochlorolestes Barnard
E. ferengueyi Ris
E. nylephtha Barnard
Fam. LESTIDAE
Subfam. Lestinae
Lestes Leach
L. pallidus Ramb.
f. ictericus Gerst.
f. ochraceus Selys
L. zahlbergi Ris
L. niger Martin

L. tridens McL.
L. virgatus Burm.
L. plagiatus Burm.
L. unceifer Karsch
Fam. PROTONEURIDAE
Ellatoneura Cowley
E. fraxinata Hagen
E. glauca Selys
Chloronemis Selys
C. marshalli Ris
Fam. PLATYCNEMIDIDAE
Platycnemis Selys
Pl. valida Selys
Allocnemis Selys
A. leucosticta Selys
Fam. COENAGRIONIDEA
Subfam. Coenagrioninae
Ceragrion Selys
C. glabrum Burm.
C. sauzi Ris
C. corallinum Champion
Pseudagrion Selys
P. acacie Först.
P. angolense Selys
P. assgani Pinh.
P. cafferum Burm.
P. citricola Barnard
P. fuscigerum Ramb.
P. gigas Ris
P. glaucescens Selys
P. inconspicuum Ris
P. kersteni Gerst.
P. makabusiensis Pinh.
P. massaicum Sjöst.
P. pseudomassaicum sp. nov.
P. natalense Ris
P. nigerrimum Pinh.
P. nubicum Selys
P. salisburyense Ris
P. sjöstedti Först.
Acagrion Selys
A. attenuatum Fraser
Ischnura Charp.
I. senegalensis Ramb.
Enallagma Charp.
E. elongatum Martin
E. glaucum Burm.
E. nigridorsum Selys
E. rotundipenne Ris
E. sapphirina Pinh.
E. sinuatum Ris
E. subfurcatum Selys
E. subtile Ris
Agriocnemis Selys

A. exilis Selys
A. polychromaticum Barnard
Superfam. AGRIONIDEA
Fam. AGRIONIDAE
Phaon Selys
P. iridipennis Burm.
Fam. CHLOROCYPHIDAE
Chlorocypha Fraser
C. caligata Selys
C. dispar subsp. *humiosa* Karsch
C. fitzsimonsi Pinh.
Suborder ANISOPTERA
Superfam. AESHNOIDEA
Fam. GOMPHIDAE
Subfam. Ictinogomphinae
Ictinogomphus Cowley
I. ferax Ramb.
Diastatomma (Charp.) Burm.
Subfam. Gomphinae
Ictinogomphus Martin
I. africanus Fraser
Notogomphus Selys
N. pratorius Selys
N. sp.
Paragomphus Cowley
P. cognatus Ramb.
P. sabicus Pinh.
P. elpidius Ris
P. hageni Selys
Onychogomphus Selys
O. supinus Selys
Crenigomphus Selys
C. hartmanni Först.
Ceratogomphus Selys
C. pictus Selys
Fam. AESHNIDAE
Subfam. Aeshninae
Aeshna Fab.
A. ellioti Kirby
A. minuscula McL.
A. rileyi Calvert
Anaëteschna Selys
A. triangulifera McL.
Anax Leach
A. imperator subsp. *mauricianus* Ramb.
A. speratus Hagen
A. tristis Hagen
Hemianax Selys
H. ephippiger Burm.
Gynacantha Ramb.
G. manderica Grünb.
G. villosa Grünb.
Superfam. LIBELLULOIDEA

Fam. CORDULIIDÆ
 Subfam. Gomphomacromiinae
Presba Barnard
P. venator Barnard
P. piscator Barnard
 Subfam. Epophthalmiinae
Phyllomacromia Selys
P. picta Selys
P. reginae le Roi
P. sophia Selys
P. thetis Ris
P. tropicalis Selys
 Fam. LIBELLULIDÆ
 Subfam. Tetratheminae
Tetrathemis Brauer
T. pollenii Selys
Notiothemis Ris
N. jonesi Ris
 Subfam. Libellulinae
Orthetrum Newman
O. abboti Calvert
O. brachiale Beauv.
O. cafferum Burm.
O. chrysostigma Burm.
O. farinosum Först.
O. guineense Ris
O. icteromelas Ris
O. rubens Brnd.
O. stemmale subsp. *capense* Calvert
O. stemmale subsp. *kalai* Longf.
O. trinacria Selys
 Subfam. Diastatopidinae
Palpopleura Ramb.
P. deceptor Calvert
P. jucunda Ramb.
P. lucia f. *lucia* Drury
P. lucia f. *portia* Ramb.
 Subfam. Brachydiplacinae
Chalcostephia Kirby
C. coronata subsp. *flavifrons* Kirby
Hemistigma Kirby
H. albipuncta Ramb.
Porpax Karsch
P. asperipes Karsch
Atocnecura Karsch
A. biordinata Karsch
Acisoma Kirby
A. panorpoides subsp. *ascalaphoides* Ramb.
Diplacodes Kirby
D. exilis Ris
D. lefebvrei Ramb.
Crocathemis Brauer

C. divisa Baum.
C. erythraca Brullé
C. sanguinolenta Burm.
C. saxicolor Ris
Bradynopyga Kirby
B. cornuta Ris
Brachythemis Brauer
B. lacustris Kirby
B. leucosticta Burm.
Philonomon Först.
P. luminans Karsch
Sympetrum Newman
S. fonscolombi Selys
 Subfam. Tritheminae
Trithemis Brauer
T. annulata Beauv.
T. arteriosa Burm.
T. aureola Ris
T. basitincta Ris
T. kirbyi Selys subsp. *ardens* Gerst.
T. donaldsoni subsp. *donaldsoni* Calvert
T. phueialis Först.
T. monardi Ris
T. risi Longf.
T. siccica Burm.
T. wevereri Ris
T. dorsalis Ramb.
 Subfam. Onychotheminae
Zygonyx Hagen
Z. natalensis Martin
Z. torrida Kirby
Olpogastra Karsch
O. fuellborni subsp. *fuellborni* Grünb.
O. lugubris Karsch
 Subfam. Rhyotheminae
Rhyothemis Hagen
R. fenestrata Ramb.
R. mariposa Ris
R. semihyalina Desj.
 Subfam. Zygommatinae
Tholymis Hagen
T. tillarga Fab.
Pantala Hagen
P. flavescens F.
Trapezostigma Hagen
T. basilaris Beauv.
T. limbata Desj.
Urothemis Brauer
U. assignata Selys
U. edwardsi Selys
Aethriamanta Kirby
A. rezia Kirby

A few other species of doubtful source have been recorded from this fauna. These are:

Fam. COENAGRIIDÆ	Fam. AESHNIDÆ
Subfam. Argiinae	Subfam. Aeshninae
<i>Argia</i> Ramb.	<i>Anax georgius</i> Selys
<i>A. concinna</i> Ramb.	Fam. LIBELLULIDÆ
Fam. GOMPHIDÆ	Subfam. Brachydiplacinae
Subfam. Gomphinae	* <i>Bradynopyga subcancellata</i> Martin
* <i>Notogomphus stuhlmanni</i> Karsch	

"*Lestes*" *lucelia* Drury was obviously wrongly recorded from the Cape. It is a tropical American species of the family Pseudostigmatidae.

SIMPLIFIED AND ABBREVIATED KEYS TO KNOWN SOUTHERN AFRICAN GENERA ONLY.

(Detailed keys are to be found in their respective places in the subsequent chapters on DESCRIPTION OF SPECIES. Specific keys are included under the genera.)

Order Odonata.

- 1 -- Forewing and hindwing always very similar in shape and structure; discoidal cell always a quadrilateral Suborder *Zygoptera* .. A
 -- Forewing and hindwing dissimilar; discoidal cell very rarely quadrilateral (only in *Tetrathemis* Suborder *Anisoptera* .. B

A. Suborder Zygoptera.

- 1 -- 5 or more antenodal crossveins Superfam. *Agrioidea* .. Aa
 -- 2 antenodals Superfam. *Coenagrioidea* .. Ab

Aa. Superfam. Agrioidea.

- 1 -- Wings petiolate; discoidal cell with 1 crossvein; pterostigma long and narrow; epistome enlarged and face snout-like; 2 primary Ax present Fam. *Chlorocyphidae*, genus *Chlorocypha* Fraser
 -- Wings not petiolate; discoidal cell with several crossveins; pterostigma small or absent; epistome not enlarged; no primary Ax present Fam. *Agridae* our only species *Phaon iridipennis* Burm.

Ab. Superfam. Coenagrioidea.

- 1 -- Cu_2 strongly arched forwards just after leaving discoidal cell; pterostigma long Fam. *Syolestidae* .. Ab1
 -- Cu_2 not abruptly arched just after discoidal cell 2
 2 -- $R_{1,5}$ and $1R_2$ rising nearer arcus than subnodus; pterostigma 2 or more cells long Fam. *Lestidae*, genus *Lestes* Leach
 -- $R_{1,5}$ and $1R_2$ rising nearer subnodus than arcus; pterostigma only less than 2 cells long 3
 3 -- 1A absent or not more than 1 cell long Fam. *Protoneuridae* .. Ab2
 -- 1A normally developed 4
 4 -- Discoidal cell practically rectangular Fam. *Platycnemididae* .. Ab3
 -- Discoidal cell with distal angle very acute Fam. *Coenagriidae* .. Ab4

Ab.1. Fam. Syolestidae.

- 1 -- $R_{1,5}$ rising at subnodus *Chlorolestes* Selys
 -- $R_{1,5}$ rising before subnodus *Echlorolestes* Brnd.

* I am not sure whether these are considered good species or synonyms of others in this list.

Ab.2. Fam. *Protoncuridae*.

- 1 — 1A absent *Elatoneura* Cowley
 — 1A developed, 1 cell long *Chlorocnemis marshalli* Ris

Ab.3. Fam. *Platycnemididae*.

- 1 — 4 antenodal cells between MA and CU₂; pterostigma dark *Metaenemis valida* Selys
 — 2 cells between MA and CU₂; pterostigma pale yellow *Alloenemis leucosticta* Karsch

Ab.4. Fam. *Cocnagriidae*.

- 1 — Origin of A' at Ac or not more proximal than length of Ac 2
 — Origin of A' more proximal than length of Ac 4
 2 — Ac nearer 1st than 2nd Ax; body reddish; frons with crest; no postocular spots *Ceriatrion* Selys
 — Ac midway between 1st and 2nd Ax; usually with p.o. spots 3
 3 — Forewing with 14-15 px; R₄₊₅ rising distinctively before subnodus; ♀ without vulvar scale; abdomen moderate length *Pseudagrion* Selys
 — Forewing with 9-12 px; R₄₊₅ almost at subnodus; ♀ with vulvar scale; abdomen extremely long *Aciagrion attenuatum* Fraser
 4 — Arculus far distal to 2nd Ax; very small species, abdomen less than 20 mm. long *Agriocnemis* Selys
 — Arculus practically at 2nd Ax; abdomen nearly always over 20 mm. long 5
 5 — R₃ in forewing rising at 5th or 6th px; pterostigma in ♂ similar in each wing *Enallagma* Charp.
 — R₃ in forewing rising at 4th px; pterostigma bicoloured in forewing of ♂, unicoloured in hindwing *Ichnura senegalensis* Ramb.

B. Suborder *Anisoptera*.

- 1 — Antenodal crossveins not coincident in costal and subcostal spaces; discoidal cells very similar in both wings and well distal to arculus in both Superfam. *Aeshnoidea* .. Ba
 — Antenodals mainly coincident in costal and subcostal spaces; discoidal cells very dissimilar in forewing and hindwing Superfam. *Libelluloidea* .. Bb

Ba. Superfam. *Aeshnoidea*.

- 1 — Eyes widely separated Fam. *Gomphidae* .. Ba1
 — Eyes in contact Fam. *Aeshnidae* .. Ba2

Bb. Superfam. *Libelluloidea*.

- 1 — Primary antenodals present, but poorly developed; ♂ with anal margin of wing angulated; with auricles and tibial keels Fam. *Corduliidae* .. Bb1
 — No primaries; hindwing always rounded along anal margin; no auricles or tibial keels Fam. *Libellulidae* .. Bb2

Ba.1. Fam. *Gomphidae*.

- 1 — Discoidal cells crossed; very large insects (abd. over 50 mm.) *Ictinogomphus ferox* Ramb. 2
 — Discoidal cells free. Abdomen less than 40 mm.
 2 — Tornus of hindwing with 5 small and 1 large spine; both wings narrow; small species, hindwing less than 24 mm. *Lestrogomphus africanus* Fraser
 — Tornus without these spines; hindwing broad at base compared to forewing; hindwing over 24 mm. 3
 3 — Hindlegs very long, hindfemora reaching almost to base of abd. segment 3 *Notogomphus* Selys
 — Legs short, hindfemora not reaching beyond joint between thorax and abdomen 4
 4 — Hindwing without distinct anal loop 5
 — Hindwing with distinct anal loop of at least 2 cells 6

- 5 — Pterostigma large; abdomen 3-7 robust in ♂; superior appendages scarcely larger than segment 10 *Crenigomphus hartmanni* Först
 — Pterostigma moderate; abd. 3-7 very slender in ♂; sup. append. much longer than 10th segm. *Paragomphus* Cowley
 6 — Anal loop 2-celled; segments 8-9 foliate; anal appendages much longer than 10 segment *Oncyhogomphus supinus* Selys
 — Anal loop more than 2-celled; only segment 8 foliate; anal append. much shorter than 10 *Ceratogomphus pictus* Selys

Ba.2. Fam. *Aeshnidae*.

- 1 — IR₁ forked proximally to pterostigma; 2 or more rows between the forks. Hindwing of ♂ excavate along anal margin 2
 — IR₁ forked beyond middle of pterostigma; only 2 rows between the forks. Hindwing rounded at anal margin 4
 2 — Frons broader than one-third total transverse diameter of head and eyes; eyes moderately large, in contact for no more than the dorsal length of the frons 3
 — Frons narrower than one-third diameter of head; eyes very large, in contact for about twice the dorsal length of the frons *Gynacantha* Ramb.
 3 — End of R₃ only gradually curved below pterostigma; anal margin in ♂ excavate
 — End of R₃ abruptly curved (as in *Aaax*); anal margin straight *Aeshna* Fabr.
 — End of R₃ abruptly curved (as in *Aaax*); anal margin straight *Aaax* Leach
 4 — 1A in hindwing scarcely deviating from being parallel to CU₂ *Aaax* Leach
 — 1A forming a large circuit before running parallel to CU₂ *Heclaxax epipipiger* Burn.

Bb.1. Fam. *Corduliidae*.

- 1 — Anal loop 2 cells wide, elongate *Presba* Barnard
 — Anal loop 3 cells wide, short *Phyllomacromia* Selys

Bb.2. Fam. *Libellulidae*.

- 1 — Discoidal cell in forewing short, almost equilateral triangle in shape or quadrangular; arculus always at or distal to 2nd Ax 2
 — Discoidal cell always a triangle and longer in transverse direction 3
 2 — Discoidal cell quadrangular (costal edge broken) *Tetrathemis* Brauer
 — Discoidal cell triangular (costal edge straight) *Notiothemis jonesi* Ris
 3 — Arculus at or distal to 2nd Ax 4
 — Arculus proximal to 2nd Ax 6
 4 — Hindwing with 2 or more Ac; discoidal field of 2 rows 5
 — Hindwing with 1Ac; discoidal field of 3-5 rows *Orthetrum* Newman
 5 — Last Ax in forewing complete *Atocnema biordinata* Karsch
 — Last Ax in forewing incomplete *Porpax asperipes* Karsch
 6 — Costa bent at a point midway between base and nodus; wings marked with black *Palpopleura* Ramb.
 — Costa gradually curved, without bend 7
 7 — Discoidal field distinctly widening before level of nodus 8
 — Discoidal field between parallel or convergent veins 14
 8 — Last Ax in forewing complete; more than 10 Ax present; discoidal field of 3 rows *Orthetrum* Newman
 — Last Ax in forewing incomplete (rarely complete in some species of *Acisoma*, but then there are only 6₁-7₁ Ax) 9
 9 — Abdomen segments 1-5 very swollen; only 6₁-7₁ Ax in forewing *Acisoma panorpoides ascalaphoides* Ramb.
 — Abd. not greatly swollen at base; 8 or more Ax in forewing 10
 10 — Discoidal field starts with 2 rows; discoidal cell in forewing free 11
 — Discoidal field starts 3-4 rows; discoidal cell in forewing crossed 12

- 11 — Proximal edge of discoidal cell in hindwing at arculus; forewing with 6½-7½ Ax *Diplacodes* Kirby
 — Proximal edge of discoidal cell in hindwing distal to arculus; forewing with 8½-10½ Ax *Chalcostephia coronata flavifrons* Kirby
- 12 — Pterostigma bicolorous; discoidal field usually of 2 rows (may be 3 cells at discoidal cell) *Hemistigma albipuncta* Ramb.
 — Pterostigma unicolorous; discoidal field usually of 3 rows 13
- 13 — R₃ strongly bisinuate; Cu₂ moderately curved *Bradinozyga coronata* Ris
 — R₃ only moderately bisinuate, but Cu₂ strongly arched *Crocothemis* Brauer
- 14 — Forewing with less than 8 Ax 15
 — Forewing with more than 8 Ax 19
- 15 — Last Ax in forewing incomplete 16
 — Last Ax in forewing complete 18
- 16 — Hindlobe of prothorax small; abdomen short and robust; wings with large coloured bands *Brachythemis* Brauer
 — Hindlobe of prothorax enlarged; no more than a trace of amber at base of wings 17
- 17 — Discoidal cell in forewing crossed; Cu₂ in hindwing starts at anal angle of discoidal cell *Sympetrum fonscolombi* Sélys
 — Disc. cell in forewing free; Cu₂ in hw. does not start from anal angle, but separately from it *Philanomon luminans* Karsch
- 18 — Large species; forewing with 7 Ax *Urothemis* Brauer
 — Small species; forewing with 6 Ax *Aethriamanta rezia* Kirby
- 19 — Discoidal cell in forewing and hindwing almost on same level (not more than 2 cells apart) 20
 — Discoidal cell in forewing about 3 or more cells distal to level of this cell in hindwing 23
- 20 — Hindwing with clearly defined anal loop, closed before margin of wing 21
 — Hindwing with anal loop less clear, open at posterior margin of wing; anal field very broad *Tholymis tillarga* Fab.
- 21 — Anal loop shortish, with external angle about 2 cells beyond distal angle of discoidal cell. Maximum size, abd. 30, hw. 34 *Tritthemis* Brauer
 — Anal loop long, ext. angle 3-4 cells beyond distal angle of discoidal cell. Minimum size, abd. 32, hw. 37 22
- 22 — Tibial spines fine; pterostigma shortish; R₃ deeply bisinuate *Zygonyx* Hagen
 — Tibial spines robust; pterostigma elongate; R₃ very deeply bisinuate *Oipogonista* Karsch
- 23 — Pterostigma of similar size in forewing and hindwing; large blackish arens on wings *Rhyothemis* Hagen
 — Pterostigma in forewing much longer than in hindwing; wings hyaline or only with smallish brown basal patch 24
- 24 — Hindwing with merely a trace of yellow, no brown; R₃ deeply bisinuate *Pantala flavescens* Fabr.
 — Hindwing with brown or brown yellow basal patch; R₃ almost straight *Trapezostigma* Hagen

CHAPTER 5

Suborder ZYGOPTERA Auct

Agrionida Leach 1815, Brewster's Edinb. Encycl. ix.

Agrionidae Stephens 1823.

Zygoptera Sélys 1854, Monogr. Calopt. Munz 1919, Mem. Amer. Ent. Soc. 3 (Keys). Kennedy 1920, Ohio J. Sci., xxi: 1, p. 19 (on classification). Ris 1921, Ann. S. Afr. Mus., xviii., p. 260. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 71. Tillyard and Fraser 1938, Austral. Zool., ix.: iv., p. 146.

Calopterygida Karsch 1894.

Caudibranchiata Grünberg 1903, Ergebn. Nyassa, Zool. Jahrb., 6, p. 695.

INTRODUCTION: Easily distinguished from the Anisoptera by their general appearance, with wings of similar shape, and petioled at the base. All the species in Southern Africa have long, slender abdomens, except *Chlorocypha*, usually with narrow wings and of rather fragile build.

DESCRIPTION: Insects of delicate build. Eyes far apart. Forewing and hindwing very similar in shape and venation; wings usually narrow and petiolate. In most of our species there are only 2 antenodal crossveins; pterostigma generally rhomboidal, sometimes a narrow rectangle. Discoidal cell a quadrilateral, crossed or free, and situated on the arculus; never with a supra-triangle. Wings usually held together over the back when in repose; but the Lestids usually hold them nearly horizontal when at rest.

REMARKS: So far we have fewer species and genera recorded of this suborder in Southern Africa than of Anisoptera, but this is partly due to their smaller size and the tendency to overlook them. A few new species were described in my earlier paper and there is no doubt that if this suborder is collected in future here as thoroughly as the Anisoptera, particularly the Libellulidae, have been in the past, more new species or at least species hitherto unrecorded here will be added to this group.

KEY: The Zygoptera of the Ethiopian region fall into 2 superfamilies:—

- 1 — Arculus nearer to base of wing than to nodus (usually much nearer). Always 5 or more antenodal crossveins; discoidal cell nearly always crosses Superfam. *Agrionidae*.
 — Arculus nearer nodus or halfway between base and nodus. Only 2 antenodals in Southern African genera (3-5 in a few others from Madagascar, etc.); discoidal cell scarcely ever crossed (never in our genera) Superfam. *Coenagrioidae*.

Superfamily COENAGRIOIDEA Tillyard (emend.)

Coenagrioidae Tillyard et Fraser 1938, Austral. Zool. ix.: ii., p. 152.

INTRODUCTION: Really separated from Agrionidae, the only other Zygopterous Superfamily in the Ethiopian region, by having only 2 Ax in each wing.

DESCRIPTION: Each wing with only 2 Ax (except in a few genera not occurring in Southern Africa where there are additional incomplete antenodals). Pterostigma usually well developed. Discoidal cell usually complete and free; 1R₂ and R₁₊₂ arise in nodal region.

REMARKS: This Superfamily contains a number of families, and in Southern Africa all except 3 species of the Zygoptera.

KEY TO AFRICAN FAMILIES

- 1 — Cu₂ strongly arched forwards just after leaving discoidal cell. Pterostigma long (2 or more cells in length); with supplementary short sectors present. Tibial spines long. Superior appendages of ♂ forcipate *SYNLESTIDÆ*
 — Cu₂ not abruptly arched just after the discoidal cell 2

- 2 — $R_{1,5}$ and $1R_3$ both rising far proximal to subnodus, nearer arculus. Other features as for *Synlestidae* above *LESTIDÆ* 3
 — $R_{1,5}$ and $1R_3$ rising nearer subnodus than arculus 3
 3 — With supplementary sectors developed in distal third of wing *MEGAPODAGRIIDÆ*
 (No Southern African genera.) 4
 — No supplementary sectors (merely a few divided cells near apex) 4
 4 — 1A absent or very reduced (not more than about 1 cell long); Cu_2 normal or reduced *PROTONEURIDÆ* 5
 — Cu_2 and 1A normally developed 5
 5 — Discoidal cell practically rectangular; main veins straight with very little zig-zagging except 1A and distal end of MA) *PLATYCNEMIDIDÆ*
 — Discoidal cell with distal angle very acute; distal part of $1R_3$ and MA, as well as 1A zig-zagged *COENAGRIIDÆ*
- NYPHS: Refer Barnard 1937, p. 202, under Agrionide.

Family MEGAPODAGRIIDÆ

The only Ethiopian genera are from tropical Africa and particularly Madagascar.

Family SYNLESTIDÆ Tillyard 1926

- Lestina* et *Synlestina*: Tillyard 1917, Biol. Dragonflies, p. 277.
Lestina: Ris (pars) 1921, Ann. S. Afr. Mus., xviii, p. 267.
Synlestidae: Tillyard 1926, Insects of Australia and New Zealand, p. 78. Fraser 1933, Fauna Br. Ind. Odonata 1, p. 19. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 188. Tillyard et Fraser 1938, Austral. Zool. ix: ii, p. 154. Lieftinck 1939, Treubia 17, p. 60.

INTRODUCTION: A group of large Lestid-like species separated from true Lestids chiefly in the primitive arching of Cu_2 just after leaving the discoidal cell.

DESCRIPTION: Nodus at $\frac{1}{4}$ or $\frac{1}{3}$ of wing-length from base; discoidal cell with distal angle usually acute; Cu_2 strongly arched forwards just after leaving this cell. Pterostigma rhomboidal or rectangular with posterior edge convex. Usually with supplementary sectors. Superior appendages of ♂ always forcipate. Tibial spines long.

REMARKS: A comparatively small family represented by a few genera in Australia, Asia, Africa and America. The sub-family *Synlestina* Tillyard contains the African genera *Chlorolestes* Selys and *Eechlorolestes* Brnd. confined to Southern Africa, and their only close relative *Synlestes* Selys of Australia. In *Chlorolestes* $R_{1,5}$ rises as the subnodus, in *Eechlorolestes* it rises more proximally.

NYPHS: Refer Barnard 1937, p. 189.

CHLORESTES Selys

- Chlorolestes* Selys 1862, Synops. des Agrionines, Deux. Legion (2) 13 No. 4 (2) 14, p. 33. Ris 1921, Ann. S. Afr. Mus., xviii, p. 278. Fraser 1933, Fauna Br. Ind. Odonata 1, p. 19. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 189.
Eechlorolestes Kennedy (for *fasciata* group) 1920, Ohio J. Sc., xxi, p. 84 (genotype *Chl. fasciata* Burm.). Genotype *Chlorolestes conspicua* Selys (1862).

INTRODUCTION: This genus, among Southern African Zygoptera, is generally easily recognised by its large pterostigma; comparatively large size; metallic coloration; and the venation. The banded forms of the ♂ are very striking. It is related to the Australian genera *Synlestes* and *Chorismagrion*.

DESCRIPTION: Wings petiolate to level of discoidal cell: i.e. anal vein leaves margin distally to Ac. $1R_3$ and $R_{1,5}$ arise nearer level of nodus than to arculus; MA abruptly curved upwards as it leaves discoidal cell; longitudinal veins curved downwards in apical region. Superior anal appendages of ♂ forcipate. Posterior hamules well developed.

This genus differs from *Eechlorolestes* Barnard in having $R_{1,5}$ arising at subnodus; superior appendages of ♂ without a basal tooth and without lobes on inner margin; penis with a distal hook; accessory sac of bursa in ♀ with bifurcate sacculae (vide Barnard). It would appear that the characters mentioned here are sufficient to separate *Eechlorolestes* from *Chlorolestes*, although for comparative purposes Barnard preferred subgeneric rank for the former. I am inclined to leave *Eechlorolestes*, however, as a subgenus here for, as Barnard points out, it differs less strikingly from *Chlorolestes* sensu stricto.

Regarding the terminal ring of spines on the 9th abdominal segment see Remarks under genus *Lestes*.

REMARKS: All the members of this genus and *Eechlorolestes* are described from the Cape Province, Transvaal or Natal; and only *elegans* has been recorded any further north — that is in S. Rhodesia. It is, in fact, the one truly Southern African, and particularly Cape Province genus, and in this respect it may be compared to the genus *Phasis* Illm. and its relatives (Lepidoptera - Lycaenide).

A new species, *elegans*, nearly as large as *conspicua*, has been found in the Transvaal Museum collection. These insects like mountain forests.

KEY TO SPECIES (partly after Barnard).

- 1 — Inferior appendage unbranched. Pterostigma normally unicolorous. Distal hook of penis apically acute s.g. *Chlorolestes* sensu stricto 2
 — Inferior appendage bifid (branches equal or unequal). Pterostigma normally bicolorous. Distal hook of penis with spatulate apex. Ac distal to 1st Ax s.g. *Eechlorolestes* Kennedy 3
 2 — Larger species (Abd. over 46, hw. over 40 mm.). Wings not banded. Yellow stripe on mesepisternum entirely dorsal to humeral suture. Veins R_3-1R_3 and $R_{1,5}-MA$ evenly diverging *C. conspicua* Selys
 — Smaller species (abd. under 40, hw. under 30 mm.). Wings banded when fully mature. Yellow stripe crosses humeral suture. Veins R_3-1R_3 and $R_{1,5}-MA$ subparallel, except near apical margin *C. umbrata* Selys
 3 — Inferior appendage with enlarged outer branch, but the inner, upcurved branch reduced almost to spinous structure. Yellow humeral stripe runs along both sides of this suture. No distinct stripe on 2nd lateral suture. Abd. over 40 mm., hw. at least 29 mm. *C. elegans* Pinh.
 — Inferior appendage with equally developed curved branches (rather forcipate). Yellow humeral stripe distinctly crosses humeral suture at its dorsal end 4
 4 — A distinct green or pruinose stripe on second lateral suture. Body markings brilliant metallic green generally. Abd. 32-39 mm. (usually under 35), hw. 25-28 mm. *C. fasciata* Burm.
 — Second lateral suture only irregularly clouded if marked at all. Body metallic colour duller. Abd. 40-43 in ♂, 37-39 in ♀, hw. 28-31 mm. 5
 5 — Wings narrow with subfalcate apices *longicauda* Burm.
 — Wings broad with broadly rounded apices *tessellata* Burm.

NYPHS: Refer Barnard 1937, p. 189.

CHLORESTES CONSPICUA Selys

(Thorax, ♂ accessory genitalia . . Pl. 3a; ♀ append. . . Pl. 3b; venation . . Pl. 29.)

- Chlorolestes conspicua* Selys 1862, Synops. des Agrionines, 2nd legion, 2: (13, p. 32, No. 4; and Bull. Ac. R. Belg. 2: 14, p. 34 (described from Cape Province). Kennedy, 1920, Ohio J. Sci., xxi: 1f.10-11 (penis). Ris 1921, Ann. S. Afr. Mus., xviii, p. 280, pl. 7, ff. 1-2. Barnard 1921, 1d. loc. p. 445 (life cycle) and 1937, loc. cit., xxxii, pp. 192-194.
Agrion longicaudum Burmeister (pars) 1839, Handb. Entom. II, p. 823.

INTRODUCTION: A very large species characterized by venation showing 2 rows of cells between $1R_3$ and $R_{1,5}$; pterostigma unicolorous reddish-brown; inferior appendages of ♂ not bifid. The wings apparently do not develop bands.

DESCRIPTION: ♂. Labium, genae and occiput yellow or yellow-ochre. Labrum black; anteclypeus pale yellow; postclypeus brown; frons and vertex metallic green or blue-green; an ochreous or reddish-ochreous band behind the ocelli. Prothorax red-brown with metallic green sheen; a lateral round yellow spot.

Synthorax dark reddish brown; mesepisternum mainly with metallic green sheen; a short yellow-ochre stripe above the humeral suture, incomplete at either end; mesepimeron also metallic green; metepisternum chrome yellow, suffused above second lateral suture with a brown stripe which also extends on to metepimeron and may have a metallic green sheen; rest of metepimeron and ventral plate pale yellow to whitish, developing a white pruinosity. Femora ochreous brown, darker distally, rest of legs dark brown. Wings hyaline. Pterostigma light reddish between dark brown veins.

Venation as in key.

Abdomen rather slender; dark reddish-brown, blackish towards ends of each segment; metallic green, except the end segments. Sides of 1-3 ochreous and a basal ring of this colour on 2-5 or 6. A thin white pruinosity on sides of 1, dorsum of 9-10. Anal appendages blackish.

Accessory genitalia: Hamules and penis well chitinized; distal hook pointed apically. ♀. Very similar, but metallic green areas reduced; head markings duller.

Abd. ♂ 47-53, ♀ 41-49. Hw. 32-37. Pl. about 3 mm. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Known only from south-west portion of the Cape Province as far east as Robinson Pass.

In Transvaal Museum collection: Cape Province --- Bosch Kloof, Worcester, Jan., 1933 (H. G. Wood).

REMARKS: Barnard says this species is common in the S.W. Cape area.

LIFE CYCLE: Refer Barnard 1921, p. 445, and 1937, p. 193.

CHLOROLESTES UMBRATA Sélys

(Thorax, ♂ access. genit. .. Pl. 3a ♂ anal append. .. Pl. 3b.)

Chlorolestes umbrata Sélys 1862, Synops. des Agrionines, 2nd Legion, 2t 13, p. 4; and 1862, Bull. Soc. R. Belg. 2: 14, p. 37 (described from Cape Province). Ris 1921, Ann. S. Afr. Mus., xviii, p. 283. Barnard 1937, Ann. S. Afr. Mus., xxxii, pp. 194-196.

INTRODUCTION: The smallest Synlestid in Africa. It is easily determined by venation, particularly in having only one row of cells between $1R_2$ and R_3 (in all others there are two

PLATE 3a.

CHLOROLESTES: THORAX AND MALE GENITALIA.

Thoracic Pattern of:—

18. *fasciata*. 19. *longicauda-tessellata*. 20. *elegans*. 21. *perengueyi*. 22. *umbrata*.
23. *nylephtha*. 24. *conspicua*.

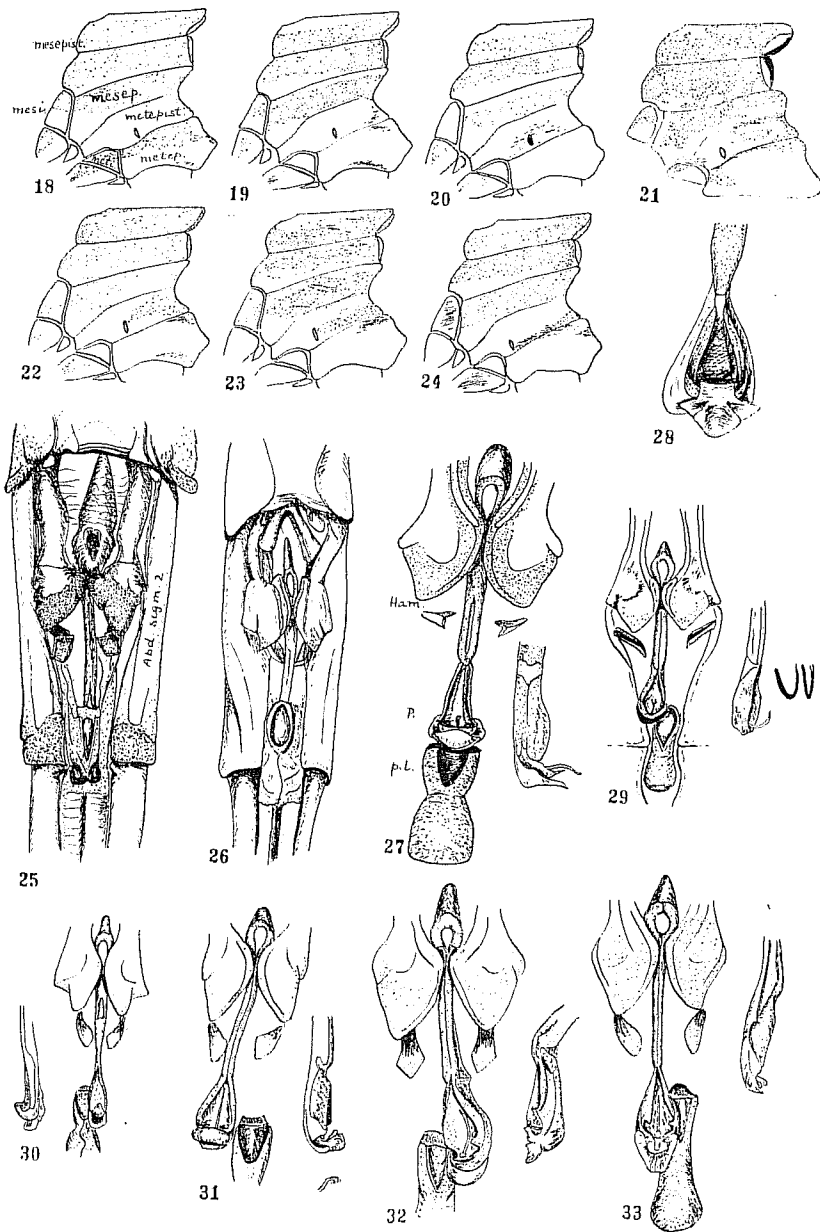
Second Segment, Male, with Appendages (ventral view):—

25. *longicauda* (Mariéps). 26. *nylephtha*.

Appendages and Penis:—

27. *conspicua*, genitalia and penis from right.
28. *perengueyi*, penis.
29. *umbrata*, genitalia, penis from right and distal process of penis.
30. *nylephtha*, genitalia and penis from left.
31. *fasciata*, genitalia and penis from right.
32. *longicauda* (Mariéps), genitalia and penis from left.
33. *elegans*, genitalia and penis from right.
(Ham.—hamules. P.—penis. p.l.—penal sheath. Other lettering as on pl. 1.)

(In figs. 18-24 speckled zones metallic green, shaded areas brownish, remainder yellow to whitish; in the other figures dotted areas are thickened chitin.)



to three rows in this area below the pterostigma). The inferior anal appendage is not bifid. The wings in the male gradually develop white and brown bands, and its thorax develops a pale blue pruinosity on the dorsum.

DESCRIPTION: Immature ♂. Labium ochreous. Labrum glossy black; occiput bronze-black; gena ochreous or pale yellow; anteclypeus dark reddish-brown. Frons and dorsum of head anterior to the ocelli and at bases of eyes bright metallic green or blue-green.

Prothorax bronze-brown to blackish, with slight green reflection, with broad yellow band on either side. Synthorax darker bronze-brown, with faint green reflection; a pale yellow stripe above humeral suture, crossing to form a spot at the upper end (near base of forewing) below this suture. Antelar sinus with green reflection. Mesepimeron and metepisternum brown; a broad yellow incomplete band above second lateral suture, but sometimes not well developed. Metepimeron and ventral plate pale, showing brown patches near their common suture and traces of yellow.

White pruinosity starts to develop early on ventrum of thorax, a small interalar dot between hindwings, traces on first abdominal segment and on dorsum of 9-10.

Legs brown and ochreous brown.

Pterostigma unicolorous, light red-brown (darkening a little in mature specimens), between dark brown veins. Bands on the wings develop first as a very faint whitish bloom in the proximal half; the brown starting to develop slightly later as an indeterminate light cloud distally.

In fully mature males the white band extends from about the distal end of the discoidal cell to 6th or 8th Px, the brown from thence to proximal end of pterostigma (in forewing) or even farther in hindwing.

Abdomen metallic bronze with some green reflection. Slight ochreous transverse rings at bases of 3-7; 9-10 duller, developing a whitish pruinosity above; anal appendages blackish. Inferior appendage with an upturned claw, not bifurcate.

In mature ♂ the entire dorsum of the thorax develops a fine pale whitish blue pruinosity; and white traces may develop on the dorsum of abdomen 8. The wings are strongly banded, as described above.

Accessory genitalia: Hamules not very heavily sclerotized; posterior hamules with acute apex; hook of penis terminally bifurcate with acute apices. Posterior lobes short.

♀. Like immature male, but duller.

Abd. ♂ 34-39; ♀ 31-32; hw. ♂ 22-25, ♀ 21-23. Pterostigma 1.8 to 2 mm. Abd./hw. ratio (♂) about 1.6.

DISTRIBUTION: Only recorded from Cape Province.

Southern Africa. In Transvaal Museum collection: Cape Province — Blaauwkrantz, Feb., 1941; Du Toits Kloof, Apr., 1934 (C. Thorne); Groot River, Feb., 1941.

Barnard records several localities from Cape Town area eastwards to Coldstream, and northwards to Worcester districts.

In Pretoria University: Knysna, Jan., 1892 (Newdigate).

REMARKS: A local species.

NYMPH: Refer Barnard 1937, p. 195.

CHLOROLESTES FASCIATA Burmeister

(Thorax, ♂ access. genit. .. Pl. 3a; ♂ anal append. .. Pl. 3b; ♀ append. .. Pl. 5a; entire insect .. Pl. 20; venation .. Pl. 20.)

Agrion fasciatum Burmeister 1839, *Handb. Entomol.* II, Berlin, p. 822, No. 24 (Type loc. Port Natal-Durban; 2 ♂♂).

Chlorolestes fasciata Sélys 1862, *Synops. des Agrionines* II, *Bull. Ac. R. Belg.* 2: 14, p. 36. Ris 1921, *Ann. S. Afr. Mus.*, xviii, p. 284, f. 17, pl. VII, f. 4. Barnard 1937, *Ann. S. Afr. Mus.*, xxxii, pp. 196-197, ff. 8, 9.

Euchlorolestes fasciata Kennedy 1920, *Ohio J. Sci.*, xxi, p. 84.

INTRODUCTION: Both sexes of adult with the dorsum bright metallic green; pterostigma bicolorous, distally pale yellow to orange, the smaller proximal portion dark brown. Wings hyaline or in some males banded. In the series at the Transvaal Museum all except one of the males with hyaline wings seem to be more immature, with the pale body markings bright yellow and the pterostigma distally pale yellow. The banded males (and one unbanded) in this collection are mature, with body markings and pterostigma darker.

DESCRIPTION: ♂. Labium and face yellow; labrum, dorsum of frons and head metallic green; base of antennae yellow, remainder greenish-black. Thoracic dorsum green; prothorax with lateral yellow band; synthorax with yellow humeral line, which may be very narrow or moderately broad, tending to be incomplete at upper end. Mesepimeron green; remainder of side mainly yellow, with an incomplete green band in upper half of metepimeron along the second lateral suture, this band becoming clouded with white pruinosity. In one male from Stellenbosch this metepimeral band is only vestigial.

Femora yellow, metallic green outwardly; tibiae yellow-brown, brown externally, tarsi dark brown.

Wings of banded male opalescent white from about nodus and quadrilateral to about 5th or 6th Px, then brown for the same distance or greater, in hindwing sometimes reaching proximal end of pterostigma. Pterostigma normally pale yellow with small brown proximal portion; in one hyaline ♂ almost uniform dark brown.

Abdomen metallic green above, a narrow yellow intersegmental ring on the anterior segments, which are also yellow lateroventrally; last 5 or 6 segments with coppery tinge; 8-10 in mature banded specimens tending to white pruinosity above.

Anal appendages black. Superior appendages without basal tooth, inferior appendages bifid.

Accessory genitalia: Hamules not heavily sclerotized; posterior hamules rather narrow. Hook of penis curved at tip forming a disc-shaped apical portion.

♀. Similar in markings. Wings never banded.

Abd. ♂ 32-39 (without appendages), ♀ 32-36. Hw. 25-28, pt. 2-2.5. Very large specimens from Cala; abd. ♂ 42, ♀ 40. Hw. ♂ 31, ♀ 32. Abd./wing ratio (♂) about 1.4.

DISTRIBUTION: Only found so far in the Union of South Africa.

Southern Africa: Transvaal Museum collection: Cape Province — Stellenbosch, December, 1925; Saamloop, E. Griqualand, March, 1932; Cala, December, 1948 (D. A. Swane-poel). Natal — Mahai R. (5000'), May, 1931 (Bell-Marley. Several spec.); Tugela R. (5500'), May, 1931; Mont-aux-Sources, May, 1938. Transvaal — Woodbush Village, April, 1915, December, 1907; Waterval Boven, April, 1907; Rustenburg, October, 1948 (Capener).

(Months recorded for hyaline males — April, October, December; for banded males — March, April, May.)

Other records (Ris): Cape Province — Prince Albert district, April, 1884; Burghersdorp, 1883. Natal — Estcourt, Jan. - March, 1913; Dargle, February, 1909; Zululand, 1897. Rhodes University Collection: Moltene (Jan., 1948) and Port Elizabeth (July, 1948), in Cape Province.

REMARKS: I have no information on habits or life cycle, except that it is a fairly local South African species. I am inclined to think that the wings of all males would become banded at full maturity, although they may be mature for mating in the hyaline stage. This would be a similar process to that of *Tetrathemis pollenii*.

CHLOROlestes TESSELLATA Burmeister

et *C. LONGICAUDA* Burmeister

(Thorax, ♂ access. genit.—Pl. 3a; ♂ anal append.—Pl. 3b; ♀ append. bursa—Pl. 5a; entire insect—Pl. 21.)

Agrion tessellatum Burmeister 1839, Handb. der Entomol. II, Berlin, p. 822, No. 25 (Type loc. Durban, ♂).*Chlorolestes tessellata* Selys 1862, Synops. des Agrionines, II, p. 33; Bull. Ac. R. Belg. 2: 14, p. 35. Ris 1921, Ann. S. Afr. Mus., xviii, p. 286, pl. vii, f. 5. Barnard 1937, Ann. S. Afr. Mus., xxxii, pp. 197-199, f. 9.*Euchlorolestes tessellata* Kennedy 1920, Ohio J. Sci. 21: 1, f. 12-13.*Agrion longicaudum* Burmeister, l.c., p. 823, No. 26 (Type loc. Durban, ♂, ♀).*Chlorolestes longicauda* Selys, l.c., pp. 33 and 35. Ris, l.c., p. 287, f. 18, pl. vii, f. 6. Barnard, l.c., p. 199.

INTRODUCTION: Larger species than *fasciata*, with duller green metallic colour. Each member of the *fasciata* group appears to produce mature males which are banded or hyaline; but the distinction is not subspecific, as both occur in the same localities. Further study in the field may decide whether they are of seasonal appearance, but at present they must be placed merely as forms. At Marieps Mt. both forms have been taken in April; but this may indicate overlapping generations or, as they were taken in different years, abnormal season. As in the case of *fasciata*, however, I am inclined to think that banding is a normal tendency of the male with age.

I include both *tessellata* and *longicauda* together here. Both have, I find, banded males, but according to Fraser the difference lies in wing shape—in *tessellata*, of wing-length 31.5 mm. the widest part of the wing is 7.5 mm. and the apex is rounded; in *longicauda* of same wing-length the widest part is 6 mm. and the apex subfalcate. I quote Fraser's figures here (in correspondence, Jan., 1949), for although we have long series of *longicauda* I have seen only a few of the broader winged *tessellata*, including a banded specimen from Zululand, another from Grahamstown (Apr., 1895; lent by South African Museum) and a hyaline male taken by Dr. Newton at N'Kandla, Zululand (Jan., 1949). Apart from wing-shape, I could detect no difference (genitalia or otherwise) in these and *longicauda*, except size. If they are conspecific *tessellata* has priority.

DESCRIPTION: *C. longicauda*: Banded ♂ from Cape Province: Labium yellowish-brown. Labrum metallic green; anteclypeus and genæ yellow; postclypeus dull brown. Dorsum of head black, with metallic green sheen between ocelli and at bases of eyes. Prothorax black with green sheen, with broad ochreous lateral and anterior bands.

Synthorax dark metallic green above; an oblique brownish-ochreous humeral stripe crossing from mesepisternum to mesepimeron towards upper ("posterior") end of humeral suture. Mesepimeron dark metallic green; on its lower part ochreous to brown; rest of sides and ventrum of thorax yellowish, dusted with white pruinose. In immature specimens the yellowish markings are brighter; more ochreous to brownish in old specimens. In older specimens a pruinose bluish spot between the wings.

Legs ochreous and dark brown; on femora with metallic lustre.

Wings of mature ♂ (banded): white pruinose from distal end of discoidal cell to about 6th to 8th postnodal crossvein, brown from thence for a further 7-8 postnodals; immature

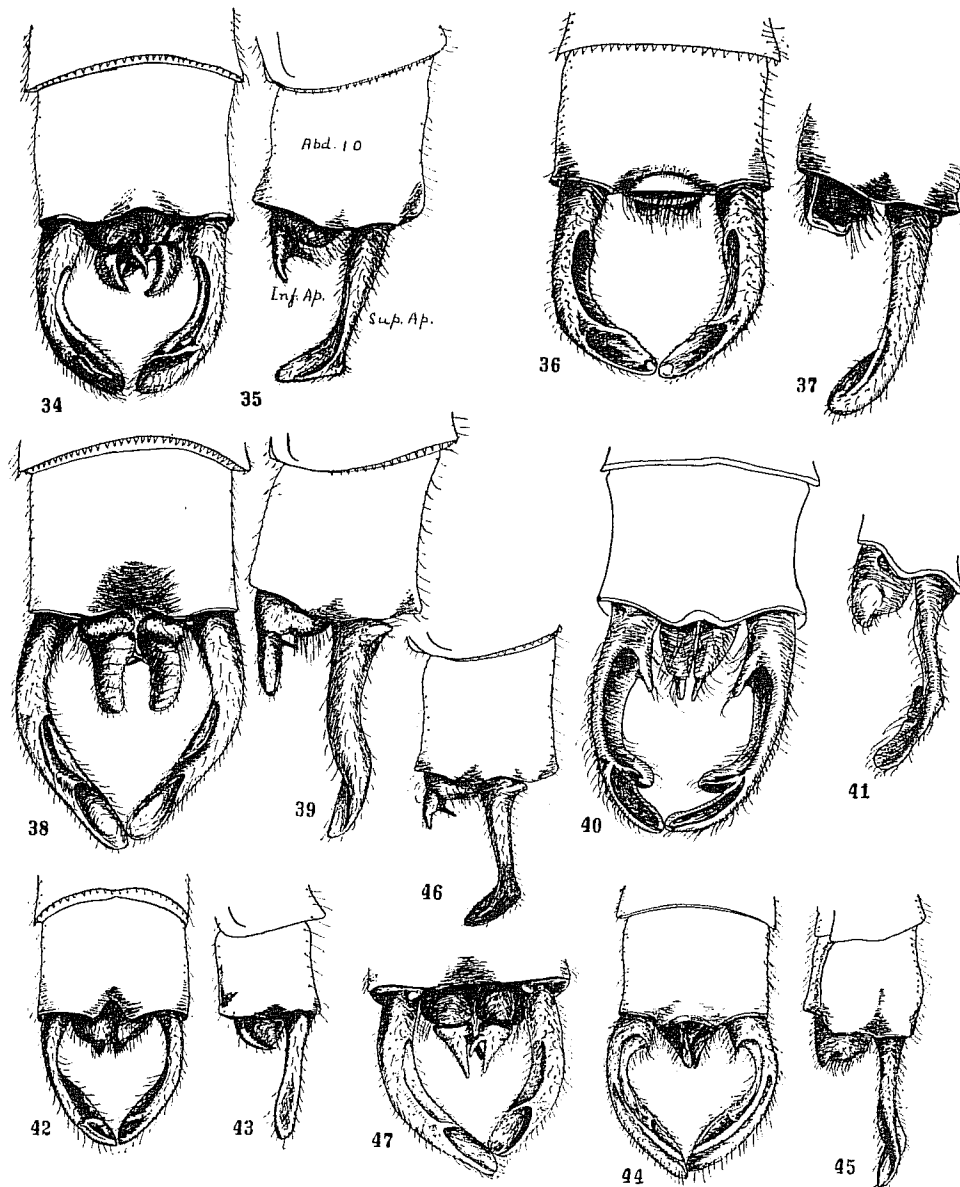
PLATE 3b.

CHLOROlestes: MALE, ANAL APPENDAGES.

Dorsal and Lateral Views:—

34-35. *longicauda*. 36-37. *conspicua*. 38-39. *elegans*. 40-41. *perengueyi*.
42-43. *umbrata*. 44-45. *nylaphtha*. 46-47. *fasciata*.

(Inf. App.—Inferior appendage. Sup. App.—Superior appendage.)



♂♂ showing these areas narrow, gradually developing with age. Pterostigma bicolorous black in proximal half, reddish distally.

Abdomen slender; brown to black, with green reflection on 1 to 5 or 6; 7 or 8 to 10 and anal appendages black; a black terminal band on 3-7; 8-10 whitish pruinose dorsally in older specimens.

Unbanded ♂♂ from some localities similar in coloration, size and form of appendages, and some are evidently mature. The wings are hyaline; the distal end of the pterostigma is pale yellow in immature specimens, reddish in older ones.

♀ very similar in markings. Abdomen shorter and broader.

Banded ♂ from Transvaal: generally a larger insect; body rather more robust. Labrum metallic blue; metallic colour on dorsum of head also bluer. Prothorax duller. Metallic green of abdomen duller. In hyaline males from same locality the distal pale colour of the pterostigma changes from pale yellow to reddish and finally, in old specimens, almost disappears, pterostigma mainly black. No bluish spot between the wings in any specimens.

Anal appendages as in the Cape series.

Accessory genitalia: similar to *fasciata*, but hamules heavily sclerotized in Transvaal series, rather less so in Cape series; posterior hamules broader terminally.

DIMENSIONS: Cape series: Abd. ♂ 40-43; ♀ 37-39. Hw. ♂ 28-29; ♀ 28-31. Pterostigma 2 mm. Abd./h.wing ratio (♂) about 1.4. Transvaal series: Abd. ♂ 41-47; ♀ 39-46. Hw. ♂ 29-33; ♀ 31-35. Pterostigma 2-2.2 mm. Abd./h.wing ratio (♂) about 1.4.

Barnard also gives smaller dimensions for Cape than for Transvaal and Natal specimens: Cape: Abd. ♂ 35-39; ♀ 38; hw. ♂ 27-28, ♀ 31. Transvaal and Natal: Abd. ♂ 43-45, ♀ 38-45; hw. ♂ 29-34, ♀ 33-35.

C. tessellata: See under Introduction above and the footnote below.

DISTRIBUTION: Union of South Africa. Transvaal Museum collection: Cape Province—Van Staden, Jan., 1941 (series of banded and unbanded); Groot R., Feb., 1941; Elands R., March, 1939. *Natal—Eshowe, March, 1938 (very large but damaged specimens). Transvaal—Marieps Mt., April, 1932 (banded), April, 1948 (unbanded) (series).

Other records: In Pretoria University—Barberton. In Rhodes University—Keurbooms R. (June, 1948), banded. Port Elizabeth (July, 1948), unbanded.

REMARKS: More widely distributed than its relatives here. As I remarked above, I believe the banded form of the male may prove with further research to be a general tendency of this species. I also think *tessellata* and *longicauda* are forms of the same species, differing in wing-shape. The former, occurring in Natal and near the coast of the Eastern Cape Province, might be the typical form or subspecies; *longicauda* extending from more western localities in the Cape Province northwards and eastwards into the Transvaal. These zones are separated climatically and geographically.

NYMPH: Refer to Barnard 1937, p. 199.

CHLOROLESTES ELEGANS Pinh.

(Thorax, ♂ acc. genit.—Pl. 3a; ♂ anal append.—Pl. 3b; ♀ append.—Pl. 5a; entire insect—Pl. 20, 21.)

Chlorolestes elegans Pinhey, 1950, Ann. Transv. Mus., xxi., p. 260, figs. 1-4.

INTRODUCTION: A very large species, in general appearance like *longicauda*, but with inferior appendages markedly different, the outer branch of each broad and straight, the inner

* The ♂ of this very large pair has broader wings with more rounded apices—apparently true *tessellata*. Terminal segments of abdomen lost. As mentioned previously, Dr. Newton has taken hyaline ♂♂ at N'Kandla, Zululand. These are very large, abd. 50 mm., wings broad, pterostigma quite black and wings smoky; they appear to be *tessellata*, but mature and not banded. The specimen sent to me was taken on 22nd Jan., 1949.

one reduced to a small upwardly-projecting spine-like process. Pterostigma of mature ♂ rather uniform dark brown. Pale humeral stripe continuous along both sides of this suture.

DESCRIPTION: Unbanded mature ♂. Very like a large *longicauda*. Labrum metallic green; dorsum of head marked with metallic green and blue-green. Humeral yellowish stripe on thorax entirely or almost entirely on both sides of the suture. Other features as in that species. Pterostigma in all the male Transvaal specimens blackish-brown with merely a faint indication of reddish in outer part, not distinctly bicolorous; evidently they are very mature specimens, and have developed whitish pruinosity on dorsum of abdomen 9-10. No blue spot in interalary spaces.

Mature banded ♂ very similar in body markings; bands on wings as in *longicauda*.

Accessory genitalia of male: Hamules heavily sclerotized; posterior hamules shaped more like *fasciata* than *tessellata*.

♀. Very similar. The only specimen in the collection is slightly less mature than the males and has the outer two-thirds of pterostigma pale yellow brown, up to the brown distal crossvein.

Abd. ♂ 46-47.5, ♀ 44; hw. ♂ 31.5-34, ♀ 35; Pl. 2 mm. Abd./hw. ratio 1.4-1.5.

A hyaline male specimen from Penhalonga in the National Museum, Bulawayo, is evidently a smallish specimen of this species, pterostigma small, blackish-brown. Abd. 46.5, hw. 29, pt. 1.5 mm.

DISTRIBUTION: So far only found in the Transvaal and Southern Rhodesia. Transvaal Museum collection: 4 ♂♂ (1 banded), 1 ♀. Transvaal—Woodbush Village, Dec., 1907; Entabeni, Nov., 1931. Other records: National Museum, Bulawayo. Southern Rhodesia—Penhalonga, 21st Oct., 1943.

REMARKS: This large species is the most northerly one known of the genus.

MATERIAL: Holotype ♂, Allotype ♀; 1 paratype ♂ banded, 1 paratype ♂ unbanded in Transvaal Museum.

ECCHLOROLESTES Barnard

Chlorolestes Selys (pars) 1862, Synops. Agrion Deux. Légion (2)14, p. 33.

Ecchlolestes Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 190.

Genotype (by priority ruling) *Chlorolestes perengueyi* Ris 1921.

INTRODUCTION: The position of *Ecchlolestes*, which Barnard preferred to consider as a subspecies, is briefly discussed under *Chlorolestes*.

DESCRIPTION: This group differs from *Chlorolestes* in having R_{4+5} arising proximally to subnodus; the two pairs of veins R_3 and $1R_3$, R_{4+5} and MA subparallel for most of their length until near the apical margin. Superior appendage of ♂ with a basal tooth; inferior appendage not bifid. Penis without distal hook. Accessory sac of ♀ bursa without a saccule (vide Barnard).

REMARKS: See under *Chlorolestes*.

KEY TO SPECIES (after Barnard).

- 1 — Superior appendage ♂ with distinct distal lobe on inner margin; anteclypeus pale cream; no spot on metanotum *E. perengueyi* Ris
 — Superior appendage ♂ without distal lobe, merely thickened; anteclypeus metallic green; a blue spot on metanotum *E. nyleptha* Barnard

ECCHLOROLESTES PERENGUEYI Ris

(Thorax, penis—Pl. 3a; ♂ anal append.—Pl. 3b.)

Chlorolestes perengueyi Ris 1921, Ann. S. Afr. Mus. xviii., p. 282, f. 16; pl. vii., f. 3 (2 ♂♂, Ceres, Cape Prov.). Barnard 1937, id. loc. xxxii., p. 199 (♂ and ♀).

INTRODUCTION: This species is characterised by its metallic thorax, marked with 3 pale

spots along humeral suture. In venation and genitalia it is near *nylephtha*. Superior appendage on inner edge with sub-basal tooth and subapical lobe.

As we have no specimens in the Transvaal Museum I give descriptions from Ris and Barnard.

DESCRIPTION: ♂. Labium, genae and anteclypeus cream or very pale yellowish brown; occiput black, on ventrum with metallic green sheen. Labrum, postclypeus, frons and vertex metallic green. Prothorax green with copper or bronze sheen, narrowly edged with pale brownish and with two round pale yellowish spots anteriorly. Synthorax greenish-black with copper or bronze sheen; very narrow pale medial line; 3 pale yellowish spots above humeral suture, one at dorsal end, one in middle and the last at ventral third. The metallic colour of the dorsum descends laterally on mesepimeron, but ends irregularly at a pale yellowish band above first lateral suture. Metepisternum pale yellowish with a small brown patch dorsal to the metastigma more or less confluent with a dark line along upper half of first lateral suture; metepimeron pale yellow with narrow dark line on second lateral suture, a dark spot below dorsal end of this suture and another dark patch below ventral end. Ventrums whitish to white pruinose, partly edged with dark lines.

Legs reddish brown, with black outer lines on femora and inner surfaces of tibiae; tarsi black.

Wings hyaline, not banded; pterostigma dark brown. A' rises as proximal end of discoidal cell; R₁₊₂ proximal to subnodus. Abdomen 1 pale yellowish, blackish above, with white pruinosity; 2 bronze-green, with narrow yellowish basal ring, at sides pale yellowish, this ascending in middle; 3-6 pale yellowish, with on each segment a dark bronze green dorsal band, broad anteriorly tapering in middle, more or less joined to a broad distal transverse band; 7 black with narrow pale basal ring, interrupted dorsally; 8-10 black; 9-10 and sometimes distal end of 8 with bluish-white pruinosity. Anal appendages black; superior on inner margin with sub-basal tooth and subapical lobe; inferior appendage unbranched.

Accessory genitalia: Posterior hamules narrowing apically. Penis without distal hook.

♀. Apparently very similar to ♂. The only differences mentioned in Barnard's description are that the head above is duller; pterostigma paler.

♂, ♀ abd. 38-39. Hw. 27-29. Pt. < 2 mm. Abd./hw. ratio (♂) 1-4.

DISTRIBUTION: Known only from the south-western Cape Province. Barnard gives several localities in the neighbourhood of Ceres, Goudini, Stellenbosch, Rawsonville, Worcester, etc.

HABITS: Unlike other Chlorolestids, Barnard says this species inhabits open streams, ♂♂ settling flat on rocks, rarely on bushes, ♀♀ more often on bushes.

NYMPH: Refer Barnard 1937, p. 200.

ECCHLORESTES NYLEPHTHA Barnard

(Thorax, ♂ acc. genit.—Pl. 3a; ♂ anal append.—Pl. 3b; entire insect—Pl. 21; Venation—Pl. 29.)

Chlorolestes (s.g. *Ecchlorolestes*) *nylephtha* Barnard 1937, Ann. S. Afr. Mus., xxxii, pp. 201-202. (Described from Cape Province.)

INTRODUCTION: Named, as Barnard says, after the well-known character created by Rider Haggard, this species is characterized by its long, very slender body; the broad orange pterostigma; the unbranched inferior anal appendages; and the proximal position of R₁₊₂. In the mature ♂ there is a bluish pruinose interalar spot between the hindwings and another on the pronotum. The wings do not appear to develop bands.

DESCRIPTION: Immature ♂. Labium pale ochreous; genae whitish ochreous; face and frons brilliant metallic green; head above blackish, with also a brilliant green in anterior half, coppery in the depressions.

Prothorax brown to bronze-brown, early developing a pale bluish pruinose spot on anterior lobe.

Synthorax bronze-brown on mesepisternum and mesepimeron, with slight green sheen (more pronounced near median carina). A yellow stripe above humeral suture, crossing this at upper end to form mesepimeral spot below forewing costa. An irregular yellow stripe running well above the second lateral suture. Ventrums pale yellowish. Legs brown.

Wings hyaline. Pterostigma short and broad, light reddish between brown veins.

Abdomen bronze-blackish above, with pale rings at bases of segments 3-7. Dorsum of 1-2 metallic green.

Anal appendages black. Inferior appendages not bifid.

In mature ♂ there is a bluish pruinose interalar spot and traces of whitish pruinosity on 9-10. Pterostigma darker.

Accessory genitalia: Hamules not heavily sclerotized; posterior hamules rather narrow. Penis without distal hook.

♀. Very similar but duller. The face and head above are glossy black, with faint green sheen, in parts where the male is brilliant green. Pterostigma slightly paler reddish (in Transvaal Museum specimens); no pruinose bluish markings in these specimens.

Abd. ♂ 44-48, ♀ 40-42; hw. 27-30. Pt. ♂ < 2, ♀ 2 mm. Abd./hw. ratio (♂) 1-6.

DISTRIBUTION: Only found in the Cape.

Southern Africa. Transvaal Museum Collection: Cape Province — Jonkersberg (George), Nov., 1940 (Van Son); Karreedaw Pass, Dec., 1947.

Other localities (Barnard): Robinson Pass, Feb., 1932; Lemoenshoek, Nov., 1927. Other months given for the George district are January and April.

NYMPH: Refer Barnard 1937, p. 202.

Family LESTIDÆ Auctt.

Lestine Calvert (pars) 1901, Ent. Mon. Mag. 38, p. 29.

Lestine et *Synlestine* Tillyard 1917, Biol. Dragonflies, p. 276.

Lestine Ris (pars) 1921, Ann. S. Afr. Mus., xviii, p. 267.

Lestine Fraser 1933, Fauna Br. Ind. Odonata 1, p. 18. Schouteden 1934, Ann. Mus. Congo Belge (3) 2: 3(1), p. 77.

Lestidae Tillyard et Fraser 1938, Austral. Zool. ix: II, p. 156. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 187.

INTRODUCTION: Separated from *Synlestidae* by the shape of vein Cu₂.

DESCRIPTION: Nodus at about one-fourth to one-third wing length from base; discoidal cell generally with distal angle acute (subfam. *Lestinae*); 1 R₂ and R₁₊₂ rise very much nearer arculus than nodus; Cu₂ straight after leaving discoidal cell. Shortly after the start of R₂ (from R₂) a characteristic oblique vein descends to 1 R₂. Several supplementary sectors present and these as well as 1 R₂ tend to be zig-zagged. Pterostigma rectangular, usually elongate. Superior appendages of ♂ forcipate. Tibial spines long.

REMARKS: A family with representatives all over the world. *Lestes* occurs in the Ethiopian region as well as in other continents; and *Symplocma* in North Africa. These are in the subfamily *Lestinae* Auctt.

Lestes is the only genus in our subregion.

NYMPH: Refer Barnard 1937, p. 187.

LESTES Leach

Lestes Leach 1815, Brewster's Edinb. Encycl. (9)1, p. 137. R. Martin 1910, "Les Lestes d'Afrique," Ann. Soc. Ent. France, 79, p. 82 (with key to Afr. spp.). Ris 1921, Ann. S. Afr. Mus., xviii, p. 268. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 77. Cowley 1934, Entomologist 67, No. 866, p. 204 (on synonymy). Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 187. Schmidt 1938, Senckenb. Akad. Wiss. Wien. 147 Abh. 1, p. 136 (Key to species). Needham 1941, J. Afr. Univ. P. R. Rio Piedras 25 No. 3, p. 8 (Key to some nymphs).

Genotype *Agrion barbara* F. appears to be the genotype according to Hagen 1848, Stettin Ent. Zeit. 9, p. 147. Fraser tells me, however, that Kirby gave *sponsa* as genotype in his Catalogue, 1890, p. 160.

Synonymy:

Puella Brullé 1832, Exp. Moreé 3(1), Anim. Artic., p. 104 (genotype *Agrion barbara* F.).
Anapetes Charpentier 1840, Libellul. Europ. 18. (genotype *Agrion forcipula* Charp.).

**Africolestes* Kennedy 1920, Ohio. J. Sci. xxi., p. 84 (genotype *Agrion virgatum* Burm.).

INTRODUCTION: The species of this genus are easily recognisable in the field by their long pterostigma, long slender abdomen and large, normally forcipate superior appendages in the ♂. They are smaller than most of the members of *Chlorolestes*, and differ venationally in having Cu_2 not strongly arched just after leaving the discoidal cell.

DESCRIPTION: Arculus halfway between nodus and base of wing, pterostigma elongate, covering 2 or more cells; Cu_2 not markedly arched just after leaving discoidal cell; R_{4+5} and $I R_3$ arising well proximal to subnodus, $I R_3$ usually halfway between arculus and subnodus and usually nearer the arculus. Supplementary sectors present between $I R_3$, R_{4+5} and MA. Anal vein leaves margin at Ac. Abdomen slender. Superior appendages of ♂ large and usually forcipate.

REMARKS: An almost cosmopolitan genus, with a large number of species described from Africa. However, the validity of some of these is questionable, owing to the considerable variation shown locally by some which has led to multiplication of specific names. Fraser considers *ictericus* and *ochraceus* races of *pallidus* Ramb. As they may occur in the same area I think they must be colour forms, not races, and that with *wahlbergi* they constitute part of a Formenkreis group with the latter species on the brink of separation. I do not at any rate find that they can be conveniently distinguished by genital features.

In trying to assess further characteristics regarding possible use in keys, I have examined the terminal spines on the 9th abdominal segment. These I find are, as in *Chlorolestes*, variable in individuals, in size, number and spacing. They appear to be relatively fewer and further apart than in *Chlorolestes*. I have also made counts of the spines on the ♂ superior appendages in *Lestes* and they also vary, in a single species, both in number (whether or not from the same locality) and in position, whether grouped singly, in pairs or threes, *L. plagiatus* has in our series 5-9 laterally in apical half; in *L. unciifer* 3 subterminal spines at the angle where the appendages curve down; in the *ictericus-wahlbergi* group about 6-8 laterally in outer half; in *L. virgatus* about 7-9 scattered around terminal half, laterally and dorsally.

It may be remarked here that "*Lestes*" *lucretia* (Drury) (*Libellula lucretia* Drury 1837, Ill. Exot. Ent. II, p. 97, pl. xviii, f. 1), described from "Cape of Good Hope" is actually a tropical American member of the Family Pseudostigmatidae, genus *Mecistogaster* Ramb. and wrongly located in Drury's description. It is certainly unfortunate that this is so and that this gigantic Zygopteran (with an abdomen about $5\frac{1}{2}$ inches long, over 130 mm.) does not occur in our territory!

* Like Barnard I find that in our series of *virgatus* both sectors of the arculus originate high up, and I leave *Africolestes* in synonymy.

KEY TO GENUS LESTES. (Refer Pl. 4a, 4b.)

- 1 — Dorsum of thorax mainly bright metallic green or with bright metallic green regular stripes or else spots 2
- Thorax without metallic green sheen; occasionally with merely a slight dull greenish colour (in *tridens*, but in this case on a very irregular blackish dorsal band and on several lateral spots). Tenth abdominal segment rounded above, not keeled; superior appendage of ♂ always forcipate 5
- 2 — Tenth abdominal segment with a median dorsal keel. Pterostigma dark, rather narrow, parallel-sided. Superior appendages of ♂ extending further than length of 10th abdominal segment, curved downwards strongly in distal half 3
- Tenth abdominal segment rounded above, without median keel. Pterostigma pale, between brown veins, broad, posterior edge convex. Superior appendages of ♂ not or scarcely extending farther than length of 10th segment, not curved downwards, but forcipate, curved inwards to meet at their tips 4
- 3 — Thoracic dorsum mainly metallic green in ♂. A slender species. Superior appendages of ♂ bent down sharply, almost at a right angle, in distal third. Thoracic dorsum of ♀ mainly brown with separate green spots in a row on either side of median suture and a row at humeral suture. *L. unciifer* Karsch
- Thoracic dorsum of both sexes with metallic green antehumeral stripe about half or less than half the width of each mesepisternum; in adult ♂ the thorax largely pruinose. A large, robust species. Superior appendage of ♂ curved down rather gradually *L. plagiatus* Burm.
- 4 — Rather smaller species, abd. 35, hw. 25-27, pt. usually over 2 mm. Wings yellowish, deeper yellow at apex. Superior appendage of ♂ with sub-basal tooth and a distal ridge on inner margin *L. amicus* Martin (not recorded here)
- Slightly larger species, abd. 36-39, hw. 25-29, pt. shorter, 2 mm. Wings hyaline or uniformly yellowish. Superior appendage of ♂ with sub-basal tooth, but with two other more distal teeth instead of a ridge *L. virgatus* Burm.
- 5 — Thorax of ♂ largely black; dorsum yellowish or black with pale (greenish, bluish or yellowish) antehumeral stripes; sides black with incomplete yellowish or greenish stripe above 2nd lateral suture and above suture between metepimeron and metasternum. Thorax of ♀ greenish with very narrow, incomplete black sutural lines. Pterostigma either plain dark brown, or brown in proximal half, whitish in distal half. Hw. 19-22 mm. *L. wahlbergi* Ris
- Thorax yellowish, greenish or brownish in ♂ or ♀, not mainly black nor with narrow black sutural lines 6
- 6 — Thorax and abdomen above more or less uniform light brown or light reddish brown. Pterostigma uniform pale yellow. Abdomen 29-34, hw. 19-23, pt. 1.5 mm. *L. pallidus ictericus* Gerst.
- Thorax and abdomen darker. Pterostigma dark brown or else bicoloured 7
- 7 — Dark, thoracic markings irregular: a broad 3-lobed median dorsal band; several small separate dots on sides of thorax. Superior appendage of ♂ with 3 strongly developed teeth on inner margin; inferior appendage short with curved terminal process *L. tridens* McL.
- Thoracic dorsum with straight-edged antehumeral stripes or more uniformly coloured 8
- 8 — Thorax dull green above; at sides whitish with several very large black spots. Very small species, abd. 27.5 mm. Superior appendage of ♂ with two teeth on inner margin *L. niger* Martin
- Thorax yellowish, greenish or brownish above, with interrupted blackish lines; a distinct black spot at ventro-anterior angle of metepimeron. Larger species, abd. over 30 mm. Superior appendage very like *ictericus*; with sub-basal tooth only *L. pallidus ochraceus* Selys

NYPHHS OF LESTES: Refer Ris 1921, pl. xii, f. 1; Needham 1941.

LESTES AMICUS Martin

(Refer Pl. 4a, fig. 53.)

Lestes amicus Martin 1910, Ann. Soc. Ent. France 79, p. 91. Ris 1921, Ann. S. Afr. Mus., xviii, p. 25, fig. 12.

INTRODUCTION: Not yet recorded from Southern Africa, but known from Belgian Congo and Northern Rhodesia. Very like *virgatus*, but somewhat smaller; apex of wings deeper

yellowish; pterostigma longer and uniform pale colour. Superior appendages of ♂ with sub-basal tooth and a distal ridge on inner margin, whereas in *virgatus* there are 3 teeth on inner margin.

DESCRIPTION: ♂. (ex Ris). "Labium whitish. Occiput yellowish, a black spot on each side of 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." Pterostigma entirely yellow. Wings tinted with yellowish, this colour deepened to golden in apical portion.

♀. (Belgian Congo). Very like ♂, and like *virgatus*, but smaller and with outer part of wings deep yellow as in ♂ *amicus*. Sides of 8-10 and valves ferruginous.

Abd. ♂, ♀ 35. Hw. ♂ 25, ♀ 27, pt. ♂ 2, ♀ 2.5 mm. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: Portuguese E. Africa, N. Rhodesia, Angola, Belgian Congo, all north of the Zambezi - Kunene River line.

Not recorded in our area.

LESTES PALLIDUS f. ICTERICUS Gerst.

(♂ Acc. genit. refer Pl. 4a; ♂ anal append. —Pl. 4b; ♀ genit. —Pl. 5a.)

Lestes icterica Gerstäcker 1869, Arch. f. Naturgesch. 35:1, p. 222, nr. 83. (Type locality Mombasa, Kenya, ♂, 1862.)

Lestes ictericus Martin 1910, Ann. Soc. Ent. France, 79, pp. 83-93. Ris 1908, in Schultze's Forschungsreise, p. 309, nr. 8 (Kalahari); and 1921, Ann. S. Afr. Mus., xviii, p. 270, f. 8. (Fraser considers this may be a race of *pallidus* Ramb., which is actually mentioned in Gerstäcker's original description of *ictericus*.)

Lestes pallida Rambur 1842, Roret's Suite à Buffon, Névropt., p. 262 (Senegal).

Lestes pallidus Martin 1910, Ann. Soc. Ent. France 79, p. 92.

PLATE 4a.

LESTES: THORAX AND MALE GENITALIA.

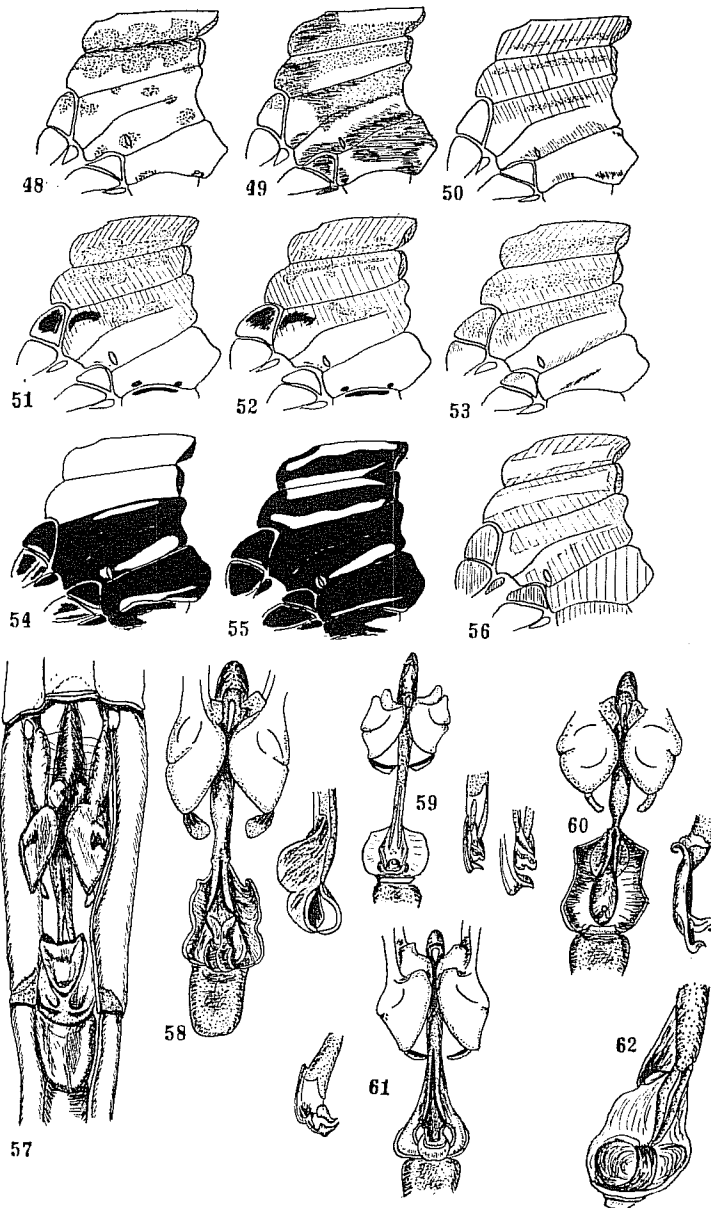
Thoracic Pattern of:—

48. *tridens*. 49. *plagiatus* (mature male). 50. *plagiatus* (female and immature male). 51-52. *uncifer* (female). 53. *virgatus fanicus* is similar.
54. *wahlbergi* (amicus is similar) 54. *wahlbergi* 55. *wahlbergi*
54-55. *wahlbergi*. 56. *ochraceus*.

Appendages:—

57. *plagiatus*, second segment (ventral view).
58. *plagiatus*, genitalia and penis from right.
59. *wahlbergi*, genitalia and penis from right (*ictericus* and *ochraceus* similar).
60. *virgatus*, genitalia and penis from right.
61. *uncifer*, genitalia and penis from right.
62. *tridens*, penis.

(In figs. 48-56, dotted areas are metallic green, shaded areas brown to black; in other figures dotted areas are thickened chitin.)



INTRODUCTION: Readily distinguished from other species of the genus in Southern Africa by the rather uniform pale brown colour of the dorsum of the head, thorax, abdomen, and pterostigma; but some of the more western specimens have a reddish thorax.

DESCRIPTION: ♂. Labium and genæ whitish-yellow, labrum slightly darker; rest of face, dorsum of thorax and abdomen light ferruginous. The synthorax may, however, be ochreous brown or greenish ochreous, and there may be darker markings on head and thorax. Those on synthorax consisting of 2 bands on mesepisternum, one at median carina, the other above the humeral suture. In some specimens from Bechuanaland and South West Africa the dorsum of the head is very dark reddish-brown, of the thorax rather lighter reddish-brown. Sides of thorax pale yellowish; an incomplete diffuse brown band above the second lateral suture; a brown spot at the anterior ventral angle of the metepimeron, as stated in Ris. The ventrum and interalar spaces may be frosted with white pruinose. Legs pale yellow with dark brown stripes. Pterostigma ochreous, edged costally and posteriorly by brown veins. Venation brown.

Abdomen pale ochreous brown; segments 2-7 with transverse dark brown crescentic mark near distal ends; 9-10 with blackish median carina. Ventrums of 8-10 sometimes white pruinose.

Anal appendages incurved yellowish, superior black at tips; inferior appendages lobed at apex; this terminal portion may be directed backwards or it may be slightly upturned more like Ris' diagram of *wahlbergi*.

Accessory genitalia: Hamules small, very little chitinization; posterior hamules narrow, truncate. Distal concavity of penis with short inner fold; sclerotic portion of apical part of stem reduced laterally.

♀ very similar to ♂.

Abd. ♂ 30-34, ♀ 29-32. Hw. 19-23. Pt. 1.5 mm. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Recorded from Union of South Africa, South West Africa, Southern Rhodesia, Bechuanaland, Kenya, Sudan, Dakar, Zanzibar. *Lestes pallidus* was described from Senegal.

Southern Africa. Transvaal Museum Collection: South West Africa — Oshikango, June-July, 1948 (Koch). South Angola — Lagoa, May, 1948 (Koch). Bechuanaland — Tsotsorogo Pan, June-July, 1930 (Van Son, short series); Metsimaklaba, March, 1930. Transvaal — Pretoria, June, 1907, April-May-Aug., 1948 (Series); Rustenburg, Oct., 1948 (Capener). S. Rhodesia — Salisbury, Dec., 1947. Other records: S.W. Africa — Klein Waterberg, Feb., 1913.

REMARKS: This species is locally common — for instance in Pretoria district. It may be found among reeds or grass near water, females usually more abundant in the grass; or at some distance from water, even on hilltops, where it may often be seen in winter months.

A single ♂ I saw near Hudley, Zululand, December, 1948, appeared to be a very large specimen of this. Unfortunately it escaped from my net and flew over an entanglement of bushes.

LESTES PALLIDUS f. OCHRACEUS Séys

(Thorax, ♂ acc. genit. — Pl. 4a; ♀ anal append. — Pl. 4b; ♀ genit. refer. — Pl. 5a.)

Lestes ochraceus Séys 1862, Synops. Agrionin, 2nd Légion 2: 13, No. 4. Martin 1910, Ann. Soc. Ent. France 79, pp. 86, 92. Campion 1913, Trans. Linn. Soc., Lond., 15, p. 441. Ris 1921, Ann. S. Afr. Mus., xviii., p. 271.

INTRODUCTION: Close to *ictericus*. Greener on thorax (in life) when mature, this changing to yellowish with green bands a few days after death. Pterostigma paler in outer part.

DESCRIPTION: Adult ♂. Colours in life: Labium whitish ochreous; face, frons and head olivaceous, paler olive on labrum and genæ. Eyes deep blue above, paler at sides, ventrally brown.

Prothorax brown, showing some whitish pruinosity at sides.

Synthorax entirely olive-green above, as well as mesepimeron; rest of sides more yellow green, turning pale yellow ventrally; a yellowish stripe above 1st lateral suture. White pruinosity develops at wing bases and in interalary spaces, on ventrum and metepimeron.

In older specimens the white invades the mesepimeron, firstly along the yellowish stripe. Sometimes a dark brown spot at anterior ventral angle of metepimeron.

Legs yellowish, faintly lined with brown. Venation brown.

Pterostigma light brown, fading to ochreous in distal quarter; between brown veins.

Abdomen olivaceous brown, slightly darker on terminal segments. A more or less crescentic dark mark (as in *ictericus*), divided by the medial carina, near distal ends of 2-8. 1-2 yellowish-green laterally. White pruinosity covering 9-10, and a trace on 1. Anal appendages brown; similar otherwise to *ictericus*.

Colours of pinned specimen after drying out: Face and head above become olivaceous-brown; eyes dark brown.

Synthorax above develops a very broad yellow band on the mesepisternum: this band is more than one-third the width of the mesepisternum and is situated nearer to the median carina than to the humeral suture; it broadens at the upper end, but does not quite reach the humeral suture.

Accessory genitalia similar to *ictericus*.

♀. Similar to ♂ in markings.

Two ♂ specimens from Salisbury, S. Rhodesia, may be older examples of this species, but they are darker, blue-green on thorax; pterostigma almost uniform darkish brown.

Abd. ♂ 31-35, ♀ 30-32. Hw. 21-23. Pt. 1.5. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Recorded from Cape to Sudan; Madagascar; Seychelles; Aldabra Isles.

Southern Africa. Transvaal Museum Collection: Transvaal — Pretoria, Nov., 1921, Sept., 1948 (Series). ? S. Rhodesia — Salisbury, Dec., 1947 (2 ♂♂ Pinhey).

REMARKS: The Pretoria specimens are common over small pools in sandy waste lands.

LESTES NIGER Martin

Lestes niger Martin 1910, Ann. Soc. Ent. France 79, p. 88, No. 3 (♂, Delagon Bay).

INTRODUCTION: Related to *ochraceus* and *tridens* but smaller: two teeth on inner edge of superior appendage; thorax with straight lines.

No specimens in Transvaal Museum, so I quote from Martin (modified in my own terms):

DESCRIPTION: ♂. Lips and epistome testaceous yellow; head above black, posteriorly yellowish. Prothorax deep brown, sides clearer. Dorsum of synthorax deep metallic green with a very fine median dorsal yellow line, a yellow line separating it from prothorax, narrow yellow humeral lines. Below the humeral suture a broad blackish band, covered anteriorly with yellow; rest of sides whitish with 3 large black spots; ventrum with a dirty yellowish grey. Legs yellow lined with black. Wings lightly tinted with yellowish; pterostigma short, brown, rectangular, a little pointed on inner edge, with a fine clear line at its external edge; 10-11 px. Abdomen black above; sides of 1-2 yellow; 6 with narrow basal yellow ring, two lateral anteterminal yellow spots and a yellow terminal ring scarcely discernible; 7 with

yellow basal ring and two lateral spots; 8-10 enlarged, 10 with a pronounced median excision. Superior appendages longer than 10, brownish yellow, blackish at apex, regularly incurved, with strong, pointed basal tooth, followed by another pointed one; inferior appendages short, stout, blackish.

♀. Unknown.

♂ Abd. 27.5, hw. 19, pt. 1 mm.

DISTRIBUTION: Only recorded from Delagoa Bay.

REMARKS: Fraser tells me the type is lost.

LESTES PLAGIATUS Burmeister

(Thorax, ♂ acc. genit.—Pl. 4a; ♂ anal append.—Pl. 4b; ♀ genit.—Pl. 5a; venation—Pl. 29.)

Agrion plagiatum Burmeister 1839, Handb. der Entomol. II, p. 824, No. 29. (Type loc. Durban, ♂, ♀.)

Lestes forceps Rambur 1842, Névropt., p. 245.

Lestes plagiata Sélys 1862, Synops. des Agrionines II, p. 40 (Durban).

Lestes plagiatus Ris 1908, in Schultze's Forschungsreise, p. 307, No. 4. Martin 1910, Ann. Soc. Ent., France, 79. Ris 1921, Ann. S. Afr. Mus., xviii, p. 276, f. 13, pl. vi, f. 8. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 188. Ris 1921, loc. cit., p. 438, quotes Herbert Campion as stating that Kirby's *obscurus* is a synonym of *plagiatus*:

Lestes obscurus Kirby 1898, Ann. Mag. Nat. Hist. (7) 2, p. 245 (♂ descr. from Barberton, Transvaal); and 1905, loc. cit. (7) 15, p. 191 (Mashonaland). Martin 1910, Ann. Soc. Ent., France, 79.

INTRODUCTION: This is a large species, readily distinguished by the superior anal appendages, which are not so markedly incurved as in other Ethiopian species, except in *uncifer*. In *plagiatus*, and more so in *uncifer*, these organs are down-curved and there is a well-developed median carina on the dorsum of the 10th segment.

DESCRIPTION: Mature ♂. Labium whitish ochreous. Labrum, genae and anteclypeus olivaceous; frons and head above black. Eyes dark blue in life, change to brown.

Dorsum of prothorax and synthorax black. Thorax, abdomen, segm. 1 and 10 dusted with whitish pruinose. Synthorax with very narrow whitish or yellowish median line; the mesepisternum largely metallic green, an incomplete olive band above humeral suture.

Legs yellowish and black. Pterostigma dark brown; venation blackish. Dorsum of abdomen metallic green, sides and ventrum yellowish.

Anal appendages black.

Immature males are marked like the females. A later stage, but not yet pruinose, has the synthorax ferruginous with broad metallic green bands on the mesepisternum, and on the mesepimeron below the humeral suture. Pterostigma ferruginous.

Accessory genitalia: Posterior hamules broad. Apical lobe of penis with a curved membrane over the distal dorsal cavity, this membrane in ventral view looking rather like an empty cotton reel.

♀. Labrum light ferruginous, frons and dorsum of head dark ferruginous. Prothorax and synthorax ferruginous; a narrow incomplete metallic green band on mesepisternum nearer median than humeral suture; an incomplete similar stripe below humeral suture. These two bands becoming dark brown in very mature specimens. A whitish pruinosity may develop over the thorax, but to a lesser extent than in the male.

Pterostigma ferruginous, darker in old specimens.

Markings in other respects very similar to the male. Abd. ♂ 33-37 (without appendages), ♀ 34-36. Hw. ♂ 24.5-27.5, ♀ 26-28. Pt. 1.5 mm. Ris mentions a small ♀ with abdomen only 31 mm.; his measurements of the hindwing in ♀♀ up to 38 would appear to be a misprint for 28.

Abd./hw. ratio (♂) about 1.4.

DISTRIBUTION: Recorded from the Union of S. Africa, S. Rhodesia (Mashonaland and Matabeleland), E. Africa, Belgian Congo and Angola.

Southern Africa. Transvaal Museum Collection: Cape Province—Groot River, Feb., 1941. Natal—Hudley, Nov.-Dec., 1948. Transvaal—Saltpan, Pretoria dist., Feb., 1929; Woodbush Village, April, 1915. Portuguese East Africa—Magude, October, 1918; Villa Pery, Feb., 1948. S. Rhodesia—Salisbury, Nov.-Dec., 1947, Jan.-March, 1948 (Pinhey) (series); Inyagui River—Mtoko Road, Nov., 1947; Umtali, Jan., 1948.

Other records: Cape Province—East London, 1885; Knysna, Jan., 1936. Natal—Dumbrody, March, 1912; M'fongosi; Princeton, Dec., 1908. Transvaal—Waterval, Nov., 1899; Acornhoek, Dec., 1918; Botchabelo, Feb., 1914. S. Rhodesia—Matopos, Bulawayo dist., Feb., 1911; Sanyati/Zambesi R., May, 1912; Mazoe, Dec., 1905; Umtali, July-Dec., 1947; Umvumvumu R., Melsetter, Sept., Oct., 1947. Portuguese E. Africa—Ingamane Forest, Oct., 1947. Rhodes University: Grahamstown (Cape Province).

REMARKS: Settles on reeds, etc., near or at water's edge of shaded or open streams and quiet pools: Like other *Lestes* the wings are held outwards but lifted from the horizontal; end of abdomen often slightly curled upwards.

LESTES TRIDENS McL.

(Thorax, penis—Pl. 4a; anal app.—Pl. 4b; ♀ genit.—Pl. 5a.)

Lestes tridens MacLachlan 1895, Ann. Mag. Nat. Hist. 6, xvi, p. 24, No. 6 (1 ♂, Delagoa Bay). Sjöstedt 1917, Ark. f. Zool 11: 14, p. 24 (1 ♀, Belg. Congo). Martin 1910, Ann. Soc. Ent., France, 79, p. 85. Ris 1921, Ann. S. Afr. Mus., xviii, p. 438 (species not known to Ris).

INTRODUCTION: Readily distinguished by the brown dots on the thorax in both sexes. Superior anal appendages of ♂ with strong sub-basal tooth; inferior appendages very reduced.

DESCRIPTION: Mature ♂. Eyes, in life, blue, pale to whitish below, deep blue above. Labium whitish ochreous. Occiput below white pruinose. Labrum, genae and occiput in front coeruleous, the first with broad black median basal spot, rather in shape of hemisphere; rest of head above black, except for diffuse reddish-brown zone just lateral to the ocellar group. Thorax grey above (on synthorax also on sides down to first lateral suture), laterally and ventrally whitish, covered with white pruinosity, except for some blackish spots, with green or bronze reflection; the effect of white on grey being an apparent grey blue or violet blue on dorsum. The dark spots are as follows: a broad irregular median dorsal band expanded at 3 places—rounded anterior and posterior swellings and a short square-cut bar from the middle; this band extended forwards on to prothorax, where it is partly divided by some of the white pruinosity. A spot at side of prothorax and another on 1st coxa. A very narrow humeral line; a spot near dorsal end of this suture. On sides of synthorax a spot on mesinfraepisternum, 2 or 3 spots and a short oblique bar on mesepimeron; a spot at dorsal third of 1st suture; a spot near each end of metepisternum; two spots above and below ventral suture of metepimeron; on ventrum a central spot.

Legs yellow green with bronze black external line. Wings hyaline, faintly stained yellowish, becoming more stained with age. Venation black. Pterostigma dark ochreous between blackish veins.

Abdomen yellow green (ochreous after death), partly ochreous with broad black dorsal band (slightly bronzed) reminiscent of many Coenagrionids. White pruinosity on most of 1; a slightly oblique white ring near posterior end of 9, a white anterior ring on 10 and also white in the terminal dorsal excavation; often a narrow vertical white line in middle of side of 8; ventrum largely white pruinose; the dorsal dark band: continuous on 1; on 2-7, constricted at anterior and posterior ends, and shortly before posterior end distended as a rounded spot. 8-10 black entirely, except for the pruinosity. Superior appendage black at each end, rather ferruginous in middle portion; forcipate; on inner edge 3 strong teeth, one near base, one at one-third, one at two-thirds. Inferior appendage very reduced in size.

♀. Very similar in markings, differing as follows: Labrum and frons dull olive (brownish after death), epistome brown. Vertex above ferruginous; with black between the ocelli; large black spot near each eye. Prothorax yellow-green above with dark brown dorso-lateral spot; sides white pruinose, with brown spot. Synthorax markings and pruinosity as in ♂, but the dorsal irregular greenish-black band is divided by a median ferruginous stripe.

Abdomen with less pruinosity: only partial on 1, mere traces on terminal segments. Dorsal band very similar, but on 9 reduced to a broad dorsal anterior triangle covering about half, the other half of the segment yellow-green. Cerci pale yellow.

Abd. ♂ 28-31. ♀ 27-30. Hw. ♂ 19-22. ♀ 20-22. Pt. about 1 mm., covering 2 cells. Abd./hw. ratio (♂) 1-4.

DISTRIBUTION: Natal, Portuguese E. Africa and Belgian Congo.

Transvaal Museum Collection: Natal—long series Hudley, Zululand, end of Nov., 1948 (Pinhey).

REMARKS: Abundant in small stagnant pool in Zululand; a few also found near a large pan.

LESTES UNCIFER Karsch.

(Thorax, ♂ acc. genit.—Pl. 4a; anal append.—Pl. 4b; ♀ genit.—refer Pl. 5a.)

Lestes uncifer Karsch 1899, Odonaten, Ent. Nachr. 25, p. 381 (described from South Africa). Martin 1910, Ann. Soc. Ent., France, 79, pp. 84, 90. Ris 1921, Ann. S. Afr. Mus., xviii, p. 278.

INTRODUCTION: Smaller than *plagiatus*, but like that species, with the superior appendage curved downwards, in the present species more or less at a right angle.

DESCRIPTION: Mature ♂, but not fully pruinose. Labium whitish straw-coloured. Labrum, genae and clypeus olivaceous (coeruleous in life); head and frons above dull blackish; eyes (in life) dark blue above, deep blue laterally, yellow-green below; becoming brown in pinned specimens. Prothorax black above, olivaceous laterally. Synthorax dorsally blackish brown, most of each mesepisternum metallic green; sides pale olivaceous, frosted with white pruinosity. Interalary space white pruinose. Ventrums pruinose white with an elongate brown spot near the metastigma, 2 smaller marks on the metepimeron. Legs pale yellowish, striped with brown.

Pterostigma narrowish, brown. Venation light brown. Abdomen dorsally dark brown with green reflection; 1 and 10 in maturer specimen white pruinose. Laterally the anterior segments whitish green, becoming yellowish, this paler colour passing up dorsally at the base of segments 3-6; 7-8 mainly blackish, 9-10 blackish. In a more mature ♂ the thorax and abdomen are more bronze-black. In one specimen 3 faint reddish spots can be made out on the mesepisternum of the thorax; an irregular anterior spot extending almost to the median carina; an elongate median spot well separated from this ridge; and an irregular posterior spot extending to the carina.

Anal appendages dark brown.

Accessory genitalia: Hamules only lightly chitinized; posterior hamules narrow and rather tapering; distal penial depression with a short inner fold.

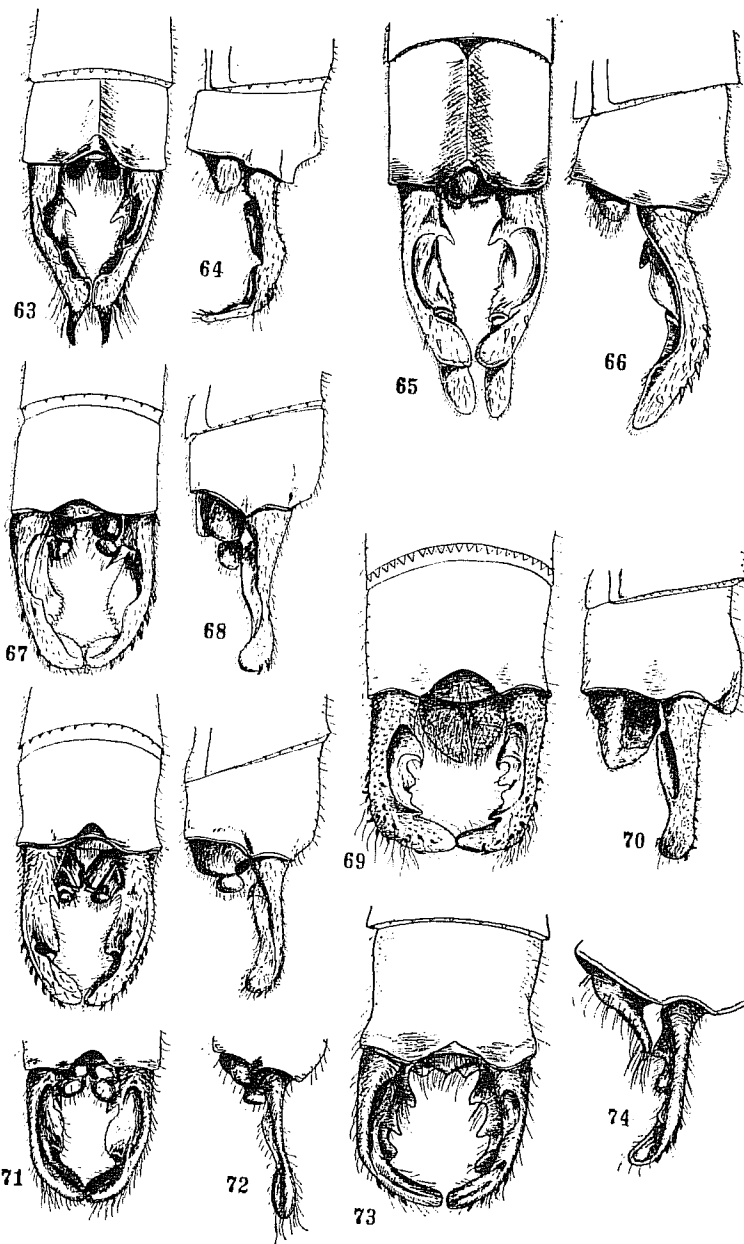
The specimen described by Ris differs in several respects, particularly in having the black areas much less extensive on the thorax and the dorsal band on abdomen 2-6 much narrower. The inferior anal appendage is bent and tapering instead of broad and blunt as in the specimens I have described above.

PLATE 4b.

LESTES: MALE ANAL APPENDAGES.

Dorsal and Lateral Views:—

63-64. *uncifer*. 65-66. *plagiatus*. 67-68. *ochraceus*. 69-70. *virgatus*.
71-72. *wahlbergi*. 73-74. *tridens*.



♀. Labrum orange-ochreous, genae olivaceous; vertex, clypeus and frons light orange brown, with dark reddish-brown markings, turning blackish in pinned examples: on the post-clypeus running along the anterior border and extending back medially; on frons and vertex surrounding the ocelli and with branches to the eyes. Eyes, in life, brown above, very pale yellow below. Prothorax yellowish-brown. Synthorax light ferruginous, deeper in colour on either side of the median carina and extending irregularly over the mesepisternum, and a thin deep line above the humeral suture; a large dark red-brown patch on mesinfraepisternum extending on to the mesepimeron. On mesepisternum and mesepimeron there are irregular metallic green or blue-green marks which vary individually in different specimens: those on the mesepisternum may consist of a narrow complete or incomplete band dilated at either end, and two separate spots, one in the middle and one at the posterior end of this plate; or the band may taper posteriorly and have the median spot and sometimes the other spot joined to it. The patch on the mesepimeron may be hatchet-shaped, comma-shaped, free or joined to the reddish patch of the mesinfraepisternum; or the green patch may be in the form of two or three separate spots, one elongate and larger than the others. The patches are not necessarily the same on either side even in one individual.

Thorax laterally pale olivaceous yellow, thinly white pruinose ventrally. Abdomen yellowish, changing to ferruginous on dorsum; 2-9 with broad green band, interrupted finely at the joints and incomplete on 9; this band expanded distally on segments 3-8. Pterostigma shorter and paler than in ♂.

Appendages light ferruginous.

Ris' description is very different, and the female he described was more like the corresponding male.

Measurements of the specimens I have described: Abdomen ♂ 30-31.5 (without appendages), ♀ 28-29. Hw. ♂ 20-21, ♀ 21-23. Pt. ♂ 1.5, ♀ 1.2-1.3. Abd./hw. ratio (♂) about 1.5. Measurements given by Ris: Abd. ♂ 39, ♀ 34. Hw. ♂ 25, ♀ 24. Pt. 1 mm.

DISTRIBUTION: *L. uncifer* is recorded from Union of South Africa, Portuguese East Africa and Belgian Congo.

Transvaal Museum Collection: S. Rhodesia—a short series collected at Rusape, Feb., 1948 (Pinhey).

Other records: Ris mentions 1 ♂ from Lourenço Marques, Dec., 1911.

REMARKS: The Rusape specimens were flying actively among reeds around an open pool.

LESTES VIRGATUS Burmeister

(Thorax, acc. genit.—Pl. 4a; anal append.—Pl. 4b; entire insect—Pl. 20.)

Agrion virgatum Burmeister 1839, Handb. der Entomol. II, Berlin, p. 824, No. 30 (Type locality Durban, ♂, ♀).

Lestes virgata Sélys 1862, Synops. des Agrionines II, p. 39 (Durban).

Lestes virgatus Martin 1910, Ann. Soc. Ent., France, 79. Ris 1921, Ann. S. Afr. Mus., xviii, p. 274, f. 11. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 187-188.

Africalestes virgatus Kennedy 1920, Ohio. J. Sci. 21, p. 84.

INTRODUCTION: About the size of *Lestes plagiatas*, but with the superior anal appendages curved inwards to meet at their apices and not distinctly sloping downwards; pterostigma markedly convex in the middle. On the inner edge of the superior appendage there is a stout tooth sloping upwards shortly before the apex.

DESCRIPTION: Immature ♂. Labium whitish yellow; face and dorsum of head yellowish brown, frons anteriorly ferruginous. Dorsum of head with metallic green patches around the ocelli and at the bases of the compound eyes. Thorax and abdomen light ferruginous

with metallic green markings, laterally and ventrally pale yellowish. The green markings consist of an irregular patch on the prothorax; mesepisternum with a broad band down the centre of this plate; a short broad band on the mesepimeron; a broad green band covering the dorsum of the abdomen, except for a pale yellow ring at the base of the segments 2-5 and a narrow mid-dorsal line on these segments. Femora and tibiae yellowish and brown, tarsi blackish. Pterostigma whitish-brown, between brown veins. Venation brown. Wings yellowish.

Mature ♂. Labrum yellow-green, emerald or light olive green; dorsum of head blackish brown with green reflection near base of eyes; with or without this metallic green around and between the ocelli. Synthorax with an incomplete brownish band at second lateral suture; a bluish-white interalar pruinosity. Abdomen darker, especially the posterior segments which become dull blackish. Pterostigma purplish-brown, paler in centre. Otherwise as in immature ♂. The wings are yellowish usually, but in very mature specimens hyaline, with black venation. The pterostigma may eventually become almost completely black. White pruinosity develops between the wings, on ventrum of thorax, at base of abdomen 1, the whole of 9 and 10 and sometimes on distal end of 8.

Anal appendages brown; incurved as in *ictericus* group, but stouter and having three teeth on inner edge of each superior appendage.

Accessory genitalia: Anterior hamules rather short and broad; posterior hamules narrow, blunt apically. Distal concavity of penis with an inner curved fold, tapering to apex.

♀. Similar to the immature ♂.

Abd. ♂ 36-39 (without appendages), ♀ 38. Hw. 25-29. Pt. 2 mm. Abd./Hwing ratio (♂) about 1.33.

DISTRIBUTION: Recorded from Union of South Africa, East Africa, Belgian Congo.

Southern Africa. Transvaal Museum Collection: Natal—Sarnia, Jan., 1912; Hudley, Dec., 1948 (Pinhey). Transvaal—Moorddrift, October, 1907; Pretoria, March, 1910. S. Rhodesia—Mt. Selinda, Feb., 1948 (Whellan).

Other records: Cape Province—Kingwilliamstown, April, 1894. Natal—Dunbrody, June, 1912; Durban, Dec., 1907; Prinetown, Feb., 1910. S. Rhodesia—Matopo Dam, Bulawayo, Feb., 1911; Zambesi-Sanyati R., May, 1912; Salisbury, April, 1900, April, 1904, March-May, 1905; Chirinda Forest, Oct., 1905; Mangesi R., October, 1905. In Rhodes University Collection: Barkly East, April, 1948 (W. Frost).

REMARKS: This seems to be mainly confined locally to certain forests or woodlands, but in Zululand I have found it at the coast, among reeds near a pool.

LESTES WAHLBERGI Ris

(Thorax, acc. genit.—Pl. 4a; anal append.—Pl. 4b; ♀ genit.—Pl. 5a.)

Lestes wahlbergi Ris 1921, Ann. S. Afr. Mus., xviii, pp. 272-273, f. 10 (Type locality Cafraria, 1 ♂).

INTRODUCTION: Specimens in the Transvaal Museum which I have allocated to this species agree in genitalia with Ris' description. Our series, however, shows three stages of development and it is only in the oldest of these that the description of the markings agrees, except for minor differences.

The anal appendages of this species are like *ictericus*, but with the terminal lobe of the inferiors normally upturned. It is about the size of *ictericus*; the pterostigma is narrow, brown or dark brown, in some specimens showing a pale distal area. Thorax black, with pale markings of variable extent. Apart from changes during growth it would appear there are some colour variations.

DESCRIPTION: Stage (a). Immature ♂ (or colour form) (but not teneral). Very distinctly marked. Labium, genae and occiput whitish ochreous. Face pale ochreous; ante-

clypeus browner; postclypeus and frons above with broad dark brown transverse band. Head above ochreous in front, dull black behind the ocelli, posterior margin ochreous. Eyes brown.

Prothorax dull black; on anterior lobe and laterally whitish pruinose (evidently pruinosity commences early on). Entire mesepisterna pale ochreous, except a black transverse band across anterior end; antealar sinus blackish. Entire side of thorax dull black except for three short glossy pale ochreous streaks: a very short one just below humeral suture; a broader bar above 2nd lateral suture in upper two-thirds of metepisternum, and the metastigma also ochreous; a bar of about same size along and above latero-ventral edge of metepimeron. Ventrum black anteriorly and laterally; the remaining triangular portion greenish-white with diffuse brown spot anteriorly. Wing-bases and interalar sinuses white pruinose.

Legs pale ochreous, with narrow dark lines externally on femora and internally on tibiae; spines and ungues black; coxae with brown spots.

Wings clear hyaline. Venation light brown. Pterostigma whitish yellow, most of the proximal two-thirds occupied by a large elongate brown patch; bounded by brown veins, except on distal end, which has an ochreous crossvein.

Abdomen 1-7 whitish-ochreous becoming pale pinkish on 6-7; dorsally with broad dark brown band on these segments, incompletely interrupted at ends of segments; this band expanding somewhat in distal part of each segment; on 2-5 in lateral view, it may be seen that a bluish-grey area extends downwards slightly from the dorsal brown band, especially on 2 and base of 3. Segment 1 with two lateral spots, a large anterior one and a small posterior one. On 7 the dorsal band expands considerably at posterior end to meet a black mark at the side; this lateral mark continuing forward more ventrally as an indefinite black line. 8-10 black entirely.

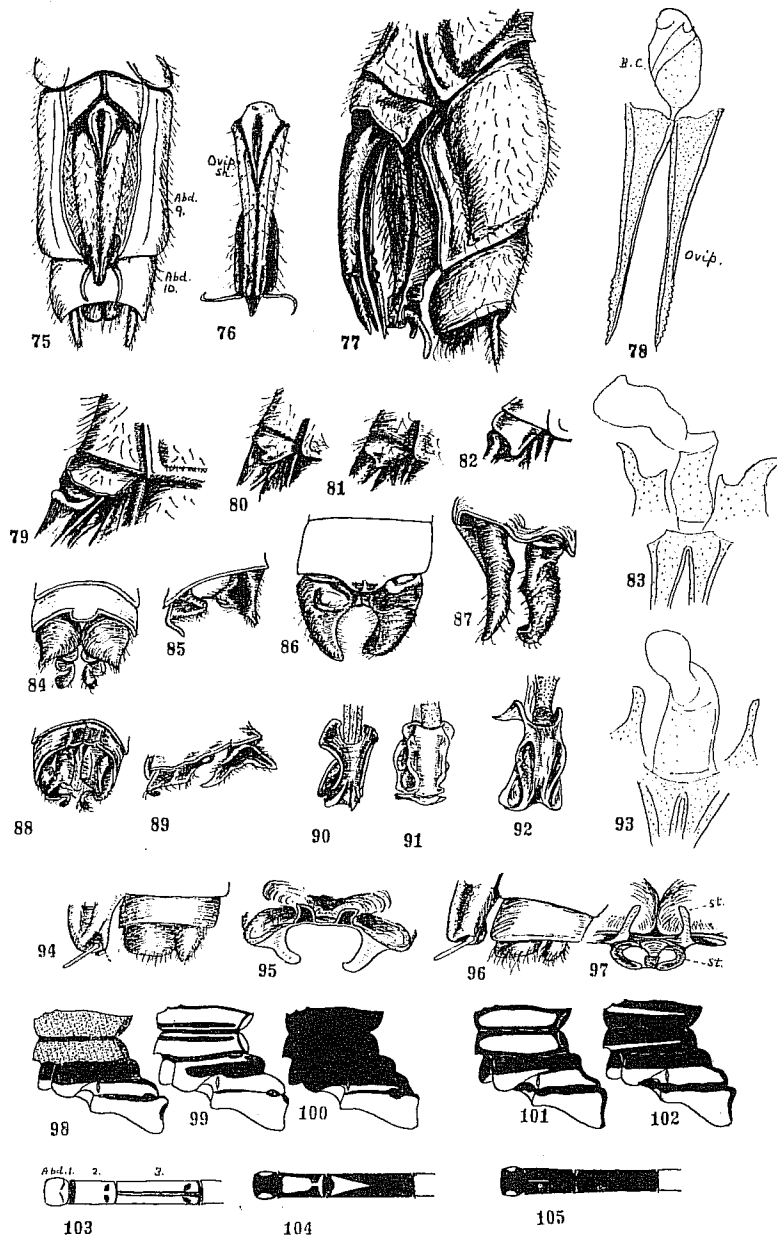
Superior anal appendages brownish, on the incurved terminal portions black.

Stage (b). Maturer ♂ with irregular dorsal bands on thorax. Labium and occiput creamy white; labrum and gena pale blue-green or as in (a). Anteclypeus olivaceous. Postclypeus and frons above dark red-brown to wholly black. Head above olivaceous in front, black otherwise, except the thin ochreous posterior edge; or else wholly black. Eyes blue in life; turning brown.

PLATE 5a.

CHLOROLESTES, LESTES:— FEMALE GENITALIA; ELATTONEURA,
CHLOROCNEMIS.

75. *Chlorolestes longicauda*, female genitalia and terminal appendages (*fasciata* very similar). Ventral view.
76. *C. elegans*, ovipositor sheath.
77. *C. fasciata*, lateral view of end segments of female, showing ovipositor, sheath and vulvar scale (*longicauda*, *nylophtha* and *elegans* very similar).
78. *C. longicauda*, bursa copulatrix and part of ovipositor.
79-82. Vulvar scale (in situ from left) of *Lestes plagiatus* (*uncifer* similar), *ictericus* (and *ochraceus*), *vonbergi* and *tridens* respectively.
83. *Lestes plagiatus*, bursa copulatrix.
84-85. *Elattooneura glauca*, male anal appendages, seen from above and from left side.
86-87. *Chlorocnemis marshalli* (same).
88-89. *Elattooneura fraenulata* (same).
90-92. Penis of *fraenulata*, *glauca* and *marshalli*, respectively.
93. *E. glauca*, bursa of female.
94-95. *C. marshalli*, female, anal appendages from left and hindlobe of prothorax from above.
96-97. *E. glauca* (same).
98-102. Thoracic pattern of *glauca* male (speckled area pruinose blue); *glauca* female; *fraenulata*, male; *marshalli*, male; *marshalli*, female. In that order.
103-105. Pattern of abdominal segments 1 to 3 from above: *glauca*, female, and *marshalli*, and female, respectively.



Prothorax as in (a), or with more pruinosity.

Mesepisterna now olivaceous, with the blackish end sending back a thin irregular blackish line (nearer median carina than humeral suture), to end at antearlar sinus; sides and ventrum as in (a); but the black areas of the synthorax are well dusted with white pruinosity. In other specimens the irregular black band on dorsum is broader. Pruinose at wingbases and interalar spaces. Median carina olivaceous, becoming black in one example. On ventrum the pale triangle later becomes divided by a black median band.

Legs as in (a), but the coxæ largely white pruinose. Wings smoky yellowish. Pterostigma showing stages from that of (a) to almost uniform dark brown.

Abdomen laterally whitish on 2, pale bluish green on 3-7, more pinkish on 7; broad dark band dorsally as in (a); 7-10 as in (a).

1 at sides whitish, with or without a brown bar [equivalent to the two spots in (a), now joined up]. Anal appendages blackish.

In life, the olivaceous areas were evidently blue, as Dr. Koch who caught the specimens states the general effect was of a blue species.

Stage (c). Maturer ♂ with rather regular bars on dorsum of thorax. Very similar to (b), but the thoracic black bands broader and straighter at the edges; the dorsal olivaceous bands are shorter and of the same width as the black. In one of these specimens the wings are clearer, scarcely smoky and there is very little pruinosity on the synthorax, which consequently appears much blacker on the sides, as in (a).

There is thus in these series a transition from one stage to another; but darkening and pruinosity of the body and smokiness of the wings, evidently do not develop necessarily in any definite order. Stage (a) may, as suggested above, be a distinct colour form.

The abdomen-wing ratio is also not quite constant: in (a) and one specimen of (c) the dimensions are abdomen 30-31, hindwing about 20, giving a ratio of 1.5. In the rest the abdomen is 32-35, hindwing 20-22, ratio 1.6. Accessory genitalia: as in *ictericus*.

The ♂ described by Ris appears to be near stage (c), but on the thorax the pale bands are light reddish-brown instead of olivaceous as in our series. In other respects it fits into the composite picture of the descriptions above fairly well, except in dimensions which are given as abdomen 31, hindwing 18, with the ratio, therefore, 1.7. If the 31 included anal appendages the ratio would reduce to 1.6.

It appears to me that, allowing for the remarkable variation in our series both in markings and dimensions, it is reasonable to assume that they belong to the species *cahlbergi*. Whether the male described under (a) is merely a normal juvenile or a specialized desert colour form it is difficult to say without further material.

♀. The only specimen we have would fit into the (b) or (c) stage, but the black markings are much reduced. Frons and postclypeus above olivaceous with trace of black bar. Head pale olivaceous in front, black behind. Prothorax reddish-brown.

Synthorax olivaceous above and at sides; narrow black incomplete sutural lines; on dorsum a broad pale yellow antehumeral band (but this may be staining after death). Otherwise as in ♂ of (b) or (c). Wings smoky; pterostigma dark brown.

Abd. ♂ 30-35, ♀ 28.5. Hindwing 19-22. Pterostigma 1 to > 1. Abd./hw. ratio (♂) 1.5-1.6.

DISTRIBUTION: Ris' ♂ was described from Caffraria.

Southern Africa. In Transvaal Museum Collection: S.W. Africa—Ochikango, June, 1948, collected by Dr. Koch.

REMARKS: The blacker specimens were all taken by Dr. Koch flying over a lake about 50 miles north of Oshikango.

Family PROTONEURIDÆ Tillyard

Protoneurina Jac. et Bianchi 1905. Tillyard 1917, Biol. Dragonflies, p. 279. Fraser 1933, Fauna Br. Ind. Odonata I, p. 209. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 205.

Agrionine Ris (pars) 1921, Ann. S. Afr. Mus., xviii, p. 288.

Protoneuridae Tillyard 1926, Insects of Australia and N. Zealand, p. 76. Tillyard et Fraser 1938, Austral. Zool., IX: II, p. 163. Fraser 1938, Proc. R. ent. Soc., Lond. (A) 13, p. 64.

INTRODUCTION: Characterized by the rectangular discoidal cell; and 1A considerably reduced or absent.

DESCRIPTION: Nodus at about one-third winglength from base. Discoidal cell a narrow rectangle; Ac usually between 1st and 2nd Ax; Cu₂ normal or reduced; 1A very reduced or absent. Pterostigma always short, $\frac{1}{2}$ to $1\frac{1}{2}$ cells long. I R₃ usually rises at subnodus and R₄₊₅ just proximal to this level. Main veins usually straight, not zig-zagged, except MA. Wings generally narrow.

REMARKS: Represented by several genera in America and Australia, but only very few in Africa, of which two occur in Southern Africa.

KEY TO SOUTHERN AFRICAN GENERA.

- 1 — 1A developed but only 1 cell long; usually more than 16 px; A' originates at Ac; R₄₊₅ at subnodus. Abdomen very long and slender *Chlorocnemis* Sélys
— 1A absent; usually less than 16 px; A' originates slightly proximal to Ac; I R₃ at subnodus, but R₄₊₅ one cell proximal *Elatoneura* Cowley
NYMPHS: Refer Barnard 1937, p. 205.

ELATONEURA Cowley

Disparoneura Sélys 1886 (non 1860), Revn. Synops. Agrion., p. 160. Ris 1921, Ann. S. Afr. Mus., xviii, pp. 286, 293, 439. Fraser 1933 (pars), Fauna Br. India I, p. 228. Schouteden 1934, Ann. Mus. Congo Belge (3) 2: 3(1), p. 78.

Elatoneura Cowley 1935, Entom. Mon. Mag., 71, p. 14 (nom. nov. for *Disparoneura* Sélys 1886); id. 1936, Ann. Mag. Nat. Hist. (10) 17, pp. 511, 523 (key to related genera). Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 205.

Genotype *DISPARONEURA GLAUCA* Sélys.

INTRODUCTION: This genus, in Africa, is related to *Chlorocnemis* Sélys, *Isomecane* Cowley, *Prodasineura* Cowley and *Notoneura* Tillyard. Cowley, a year after proposing *Elatoneura* for part of *Disparoneura*, gave a key to these genera (1936). However, in Southern Africa, *Chlorocnemis marshalli* Ris is the only other member of this family and our two species of *Elatoneura* differ not only in venation but also in their much smaller size. The blue thoracic markings of *marshalli* are like those of *E. glauca*.

DESCRIPTION: Protoneurids with 1A absent; A' ending at level of distal side of discoidal cell.

Cu₂ ending at about 2nd or 3rd px; I R₃ starting at subnodus, R₄₊₅ about 1 cell distal to this.

Southern African species small, abdomen not more than 32 mm. long.

REMARKS: One of the local species is widespread and very common; the other is apparently scarce or confined to certain localities in the Cape Province.

There are a number of African, as well as Asiatic species.

KEY TO SPECIES.

- 1 — Body of ♂ mainly black, ♀ almost as dark; thorax dark with metallic green or bronze sheen; pterostigma light brown. Superior appendage ♂ with only 1 downwardly projecting tooth; ♀ with posterior pair of prothoracic stylets somewhat erect, at an angle of 45° with the anterior pair *E. freudata* (Hagen, Sélys)

— Body paler; thorax of ♂ pale blue; pterostigma darker. Superior appendage ♂ with 2 downwardly projecting teeth; ♀ with posterior pair of stylets more horizontal *E. glauca* (Selys)

NYMPH: Refer Barnard 1937, p. 205.

ELATTONEURA FRAENULATA Hagen, Selys

(Thorax, anal append. and acc. genit. ♂ — Pl. 5a.)

Disparoneura fraenulata Hagen, in Selys 1860, Bull. Acad. R. Belg. 2 t 10, pp. 17, 318, No. 32. (Type locality ♂ Cape of Good Hope). Ris 1908, in Schultze's Forschungsreise I, p. 318, nr. 32.

Disparoneura fraenulata Ris, 1921, Ann. S. Afr. Mus., xviii., p. 439.

Elattoneura fraenulata Cowley 1936, Ann. Mag. Nat. Hist. (10)17, p. 518. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 206, f. 12.

INTRODUCTION: This species differs from *glauca* in its blacker colouring; superior appendages with only a single ventral tooth; posterior stylets of ♀ less horizontal. The differences are well set out by Barnard.

DESCRIPTION: ♂. Lips dark ferruginous; rest of head black; a trace of white pruinosity on ventrum of occiput. Barnard also mentions a trace of pruinosity on vertex behind the frontal suture. Entire dorsum of thorax black with faint indication of greenish sheen; this black changing below middle of metepisternum to dark ferruginous and on metepimeron and ventrum more ochreous; second lateral suture with narrow dark brown line; sides and ventrum lightly dusted with white pruinosity. Legs dark brown. Pterostigma ochreous brown in centre, edged with whitish ochreous; between brown veins. Slight indication of blue pruinosity at wing roots.

Abdomen dark brown to black above, with slight metallic green sheen; ferruginous at sides. Abdomen 1 with faint dusting of white pruinosity. Anal appendages dark brown; large ventral tooth on superiors ferruginous.

Accessory genitalia: penis fig. 90.

♂ Abd. 26. Hw. 17. Abd./hw. ratio (♂) about 1.5.

♀. We have at yet no specimen. Barnard says "almost as dark as ♂; a faint indication of a dark brown stripe just above the humeral suture, and a short ochreous streak midway just below; the dark bronzy green not extending to the metepisternum, which nevertheless has a more or less extensive smoky suffusion". Of the prothorax he says that the posterior pair of stylets are less horizontal than in *mutata* (*glauca*), at an angle of 45° with anterior pair. Apparently through a printing error, Barnard's measurements are not included.

DISTRIBUTION: Cape Province. Possibly also in Belgian Congo (vide Schouteden 1934, *Disparoneura fraenulata*).

Southern Africa. Transvaal Museum Collection: Cape Province—Ceres, Feb., 1921. Barnard records several localities in the S.W. Cape area.

REMARKS: Evidently a very local species, unlike *glauca*.

NYMPH: Refer Barnard 1937, p. 207.

ELATTONEURA GLAUCA Selys (Genotype)

(Thorax, abdomen, anal append. and acc. genit.; bursa — Pl. 5a; venation — Pl. 29.)

Disparoneura glauca Selys 1860, Bull. Ac. R. Belg., t. 10, p. 318, no. 31.

Disparoneura mutata Selys 1866, Révision Synops. Agrion., Mem. Cour. Acad. R. Belg., 38, p. 164 (♂, ♀ Maglia, W. Afr.). Calvert 1895, Proc. U.S. Nat. Mus., xviii., p. 141, f. 15 (♂ append.) (Zanzibar). Ris 1908, in Schultze's Forschungsreise I, p. 318 (non-*glauca* Ris, nr. 31). id. 1921, Ann. S. Afr. Mus., xviii., pp. 293, 439; f. 21; pl. vii., f. 9.

Elattoneura glauca Cowley 1935, Ent. Mon. Mag. lxxi., p. 14. id. 1936, Ann. Mag. Nat. Hist. (10)17, p. 518.

Elattoneura mutata Barnard 1937, Ann. S. Afr. Mus. xxxii., p. 206.

INTRODUCTION: Ris, 1908 and 1921, thought *glauca* a homonym of *Enallagma* (*Agrion*) *glauca* (Burm.), but Cowley, 1935 and 1936, disproved this and used *glauca* Selys as his genotype for *Elattoneura*, with *mutata* in synonymy. Selys, in describing *mutata*, had showed that he thought this might really be only a race of *glauca*.

This is a paler species than *fraenulata*; ♂ with light blue on head and thoracic dorsum; superior appendages with two ventral teeth; ♀ with posterior pair of prothoracic stylets more horizontal.

DESCRIPTION: Mature ♂. Labium and occiput dark ferruginous to black; anterior margin of labrum and whole antevlypeus dark ferruginous; rest of face and head above black; a rather dense pale blue pruinosity on occiput above, on vertex to a line shortly behind the antennae, and (developing later) on postclypeus. Postocular spots very narrow, joined across back of head; whitish ochreous. Eyes blue, capped above with dark brown. Prothorax black, developing pale blue pruinosity at sides; posterior margin evenly curved, not erect.

Synthorax above and in upper part of sides black with green metallic sheen (seen best in non-pruinose specimens); the dorsum covered with pale blue pruinosity almost to humeral suture, except for a fine median carina remaining black. At sides the greenish black descends as far as metastigma where there is a complete pale pinkish or ochreous stripe; a very broad black band below this with its median line following the second lateral suture. Lower part of metepimeron and the ventrum very pale pinkish-ochreous or pale ochreous. Pruinosity only appears on the sides very thinly and is mainly evident on the pale parts.

Legs blackish externally, ochreous on inner surfaces; femora developing whitish pruinosity; distal femoral spines long, up to about twice the distance between successive spines; proximal tibial spines still longer. Clawhooks small subapical.

Wings hyaline. Pterostigma in immature ♂ light ochreous-brown, paler at margins, between dark brown veins; in mature ♂ very dark brown. Anal vein variable in form.

Abdomen very slender; in immature ♂, 1-6 ferruginous (1-2 paler at sides), 3-6 becoming black at posterior ends; 8-10 black; 3-6 with white annulus at proximal end, broken on dorsum; 2 above with narrow white dorsal carina; 3-6 with extremely narrow white line.

Pale blue pruinosity developing first on sides of 2. In mature ♂ the abdomen is darker above, though remaining paler ventrally; blue pruinosity on dorsum of 1-2 and 8; eventually also on 9-10. Appendages blackish; superiors each with 2 ventral teeth.

General and very immature ♂♂ more like ♀ in coloration. Accessory genitalia: Penis fig. 91.

Mature ♀. Labium and occiput light ochreous. Labrum, gena, frons and a transverse band across vertex in ocellar region orange-ochreous to brownish ochreous; labrum with dark brown median-basal dot; epistome light brown. A complete transverse black band in front of the antennae, and continuing across the eyes as a brown impression. Back of head black; postocular spots as in ♂. Prothorax reddish ochreous with two short black dorsal longitudinal bars; at sides a curved black line; posterior lobe with 2 pairs of stylets, the median ones blackish, procumbent and convergent; lateral ones reddish, nearly vertical, longer and narrower, somewhat divergent.

Synthorax pinkish brown with black lines: narrow median line; a fairly narrow ante-humeral line very close to this median carina; a band at humeral suture, confluent at each end with broad black band in upper part of mesepimeron; a rather narrow black line at second lateral suture; below this the thorax is whitish ochreous, not pinkish, and lightly dusted with white pruinosity.

Legs pale pinkish ochreous; outer surfaces of femora and tarsi dark brown to blackish.

Pterostigma as in immature ♂, paler than in mature ♂.

Abdomen pale pinkish ochreous, paler still at sides of 1-2; marked above with dark ferruginous or blackish, but with very narrow whitish median line as in ♂: 2 with broad dorsal blackish band, incomplete terminally, constricted just behind middle of segment, then widening in posterior half as a crescentic transverse band; 3-6 with broad band narrowed at proximal end of each segment where there is an incomplete white ring as in ♂, broadening to a lobe just before posterior end and not continuing to the joint. The dark colour spreads round the terminal segments, but the median pale carina broadens at distal end of 7, continues as a broad dorsal pale band on 8-9 and covers the whole of 10 except a blackish lateral line along posterior edge: This expanded pale portion is generally very pale ochreous or deeper ochreous; occasionally, however, it is bluish-white.

Valves on 9th sternite black, not quite reaching end of abdomen.

In immature ♀♀ the abdomen is whitish pink above with brown marks at each end of segments 1-6; or it may be almost wholly whitish, except the terminal segments.

Abd. ♂ 26-28, ♀ 29-32, hw. ♂, ♀ 18-20. Abd./hw. ratio (♂) about 1.5, but varying in individuals from 1.4 to 1.6.

DISTRIBUTION: Cape Province to Belgian Congo and West Africa.

Southern Africa: Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal, S. Rhodesia.

Also recorded from localities in Portuguese E. Africa.

REMARKS: Locally common and gregarious on banks of streams, particularly in shade of trees. Dr. A. H. Newton, of Nqutu, Zululand, told me in a letter dated 13th January, 1948, that he had found a ♂ *Elatonocura mutata* (i.e. *glauca*) in tandem with a ♀ *Allocnemis leucosticta*. This very interesting observation seems to emphasize the importance of the pale yellow or whitish dorsal marks on the terminal abdominal segments of females of both these species: It would appear that this is an identification mark for the male and that it is possible for him to make a mistake!

CHLOROCNEMIS Sélvs

Chlorocnemis Sélvs 1863, Synops. des Agrion. 4th Légion, Bull. Acad. R. Belg. (2)16: 8, p. 175. Ris 1921, Ann. S. Afr. Mus., xviii., p. 291. Schouteden 1934, Ann. Mus., Congo Belge (3)2, (3)1, p. 79. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 470.

Genotype *CHLOROCNEMIS ELONGATA* (Hagen) Sélvs (1863) (W. Afr.).

INTRODUCTION: Recognized by its very elongate slender body; blue thoracic patches; and venation.

DESCRIPTION: Discoidal cell rectangular; anal vein leaves hindmargin at Ac; 1A short, extending about 1-2 cells beyond discoidal cell. R_{1+2} arising at subnodus; 1 R_3 more distally. Abdomen very long and slender. Tibial spines long.

REMARKS: A small tropical African genus with one very local species recorded south of the Zambezi.

CHLOROCNEMIS MARSHALLI Ris

(Thorax, abdomen, acc. genit., anal append.—Pl. 5a; entire insect—Pl. 20; Venation—Pl. 29.)

Chlorocnemis marshalli Ris 1921, Ann. S. Afr. Mus., xviii., p. 291, f. 20; pl. vii., f. 8 (Type locality ♂ Mazoe). Fraser 1928, Trans. Ent. Soc., Lond., 76, p. 128 (♀, Nyasaland).

INTRODUCTION: The only other relatives known so far in Southern Africa are the two species of *Elatonocura* which differ from *C. marshalli* in venation and in being much smaller, with the abdomen slender but not so attenuated.

DESCRIPTION: ♂. Labium whitish, with black anterior projection, this black portion slightly pale blue green posteriorly. Occiput, frons, genae and epistome jet black; labrum and vertex of head bright coeruleous blue. (In preserved specimens the pale greenish-blue colour may turn dull pale blue or green). Prothorax black, with coeruleous along anterior, posterior and lateral margins and dorso-lateral spot.

Synthorax black above, white on ventrum, with complete coeruleous bands: covering most of the mesepisterna except the median dorsal line; and covering the metepisternum and metepimeron except a broad black band on both sides of second lateral suture. Legs long and slender, with very long fine spines; legs black, femora lined inside, partly or completely with pale coeruleous. Wings light greenish yellow. Pterostigma small, almost square; black.

Abdomen very long and slender; black with coeruleous markings: 1 with whitish blue lateral spot or band; 2 with broad coeruleous dorsal band, interrupted before its distal end by a black transverse band which is incomplete dorsally; 2 at sides with a ventro-lateral whitish blue band connected upwards at posterior end to dorsal blue band. 3 dorsally with broad coeruleous band tapering to a point at the middle of the segment, the rest of it being black; or this dorsal triangle continuing to end as an extremely fine dorsal line. 4-7 with small basal triangle, also tapering posteriorly on 4 but ending more abruptly on 5-7. 8-10 entirely light blue or violet blue above, black at sides.

Anal appendages black.

Accessory genitalia: Penis fig. 92.

♀. Labium whitish ochreous, black anteriorly. Face and head black except: Labrum pale olivaceous in front; anteclypeus ferruginous; a light olive transverse band along front of vertex, crossing occiput to the eyes. Eyes greenish but with a black horizontal ring about mid-height. Prothorax mainly black. Synthorax black with very narrow olive ante-humeral line; sides whitish green, with black band along second lateral suture as in ♂, and below this, on metepimeron, a grey streak. Ventrums ochreous. Legs as in ♂, but pale lines ochreous instead of coeruleous. Wings not so deeply greenish-yellow. Pterostigma as in ♂. Abdomen mainly black; 1-2 with broad whitish ochreous or greenish-white lateral bands; a much narrower, discontinuous ventro-lateral line on 3-8; 3 narrowly whitish laterally at proximal end; 4 with a very small whitish lateral dot at proximal end; 2 above with narrow cream dorsal line in proximal half; 8 with a yellowish-white transverse dorsal band in distal half; 9 with whitish ring at proximal end. Cerci black.

Abd. ♂ 37-41, ♀ 36-38, hw. ♂ 23-25, ♀ 24-25. Abd./hw. ratio (♂) about 1.6.

DISTRIBUTION: Recorded from Southern Rhodesia and Nyasaland.

Southern Africa: Transvaal Museum Collection: S. Rhodesia—Mt. Selinda, Dec., 1935 (van Son) and Feb., 1948 (Whellan).

Also recorded in S. Rhodesia from Mazoe (Feb., 1905); Untali (see Ris); Inyanga (Feb., 1940) and Penhalanga (Oct., 1943) (in Nat. Mus., Bulawayo).

REMARKS: A very local subtropical species occurring at moderately high altitudes.

Family PLATYCNEMIDIDÆ Tillyard et Fraser 1938.

Platycnemididinae Jac. et Bianchi 1905.

Platycnemis Tillyard 1917, Biol. Dragonflies, p. 279. Fraser 1929, J. Bomb. Nat. Hist. Soc., 33, p. 835.

Agrionidae Ris (pars) 1921, Ann. S. Afr. Mus., xviii., p. 288.

Platycnemididae Fraser 1933, Fauna Br. Ind. Odonata I, p. 150. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 202. Tillyard et Fraser 1938, Austral. Zool. IX: II, p. 164. Fraser 1938, Proc. R. ent. Soc., Lond. (A)13, p. 64. Cowley 1940, Proc. R. ent. Soc., Lond. (B)9: 10, p. 172.

INTRODUCTION: Discoidal cell rectangular or with the distal angle not very acute; 1A fairly well developed, reaching to about the level of 4th to 8th px.

DESCRIPTION: Nodus at about one-third winglength from base. Wings moderately broad; most of the cells in the form of quadrilaterals, as there is very little zig-zagging of the main veins (except 1A, part of MA and sometimes part of IR_3). Pterostigma small. IR_3 and R_{4+5} rise very close together at or near subnodus. Discoidal cell short and rectangular or elongate but the distal angle not very acute (anterior edge only slightly shorter than posterior edge). Cu_2 and 1A well developed.

REMARKS: The family is principally found in palaearctic and ethiopian regions.

KEY TO SOUTHERN AFRICAN GENERA.

- 1 — Origin of A' well proximal to Ac; IR_3 rising at subnodus *Metacnemis* Selys
— Origin of A' at Ac or very slightly proximal (less than length of Ac); IR_3 rising beyond subnodus *Atacnemis* Selys

NYMPHS: Refer Barnard 1937, p. 203.

METACNEMIS Selys

Metacnemis Selys 1863, Bull. Acad. R. Belg. (2)16, No. 8, p. 160. Ris 1921, Ann. S. Afr. Mus., xviii, p. 296. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 471.

Mesocnemis Karsch 1891, Ent. Nachr. 17, p. 66 (genotype *M. singularis* Karsch). Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 79. Longfield, loc. cit.

Genotype *METACNEMIS VALIDA* Selys (1863).

INTRODUCTION: As I have explained under the following species I am inclined to the view that *Mesocnemis singularis* Karsch would seem to be a synonym of *Metacnemis valida* Selys, through similarities in description and variability in position of the arculus. If my assumption is correct then *Mesocnemis* would fall and the abnormal position of the arculus, about midway between 1st and 2nd Ax, instead of at Ax as in other *Metacnemis* would be a peculiar aberrant feature of this particular species.

The insect I have allotted to this species is a robust Zygopteran with very broad head and, in the ♂, an almost entirely pale blue pruinose body; in the ♀ light brown.

It is said to be somewhat like the genus *Argia* in appearance.

DESCRIPTION: Head broad. Discoidal cell not such a regular rectangular as in the Protoneurid genera, but with lower distal angle rather acute. Arculus varying from about midway between 1st and 2nd Ax (*Mesocnemis*) to near or at 2nd Ax (*Metacnemis* position). IR_3 arises at subnodus, R_{4+5} proximal to this level; anal vein leaves margin far proximal to Ac (about 3 times the length of Ac); 1A ending about level of nodus; 1st and 2nd Ax rather close together and converging backwards. Pterostigma small. Tibial spines very long.

REMARKS: See under the following species.

METACNEMIS VALIDA Selys

(Thorax, abd., anal append., acc. genit. — Pl. 5b; entire insect — Pl. 20; venation — Pl. 29.)

Metacnemis valida Selys 1863, Synops. Agrionines, p. 17; Bull. Acad. R. Belg. 2: 16, p. 8 (♂ Cape of Good Hope). Ris 1908, in Schultz's Forschungsreise I, p. 310, nr. 14; also 1921, Ann. S. Afr. Mus., xviii, p. 296, pl. vil, f. 10 (♀ Kingwilliamstown).

Mesocnemis singularis Karsch 1891, Ent. Nachr. 17, p. 67 (West Africa). Longfield 1936, Trans. R. ent. Soc., Lond., 85, p. 471.

Metacnemis pruinosa Fraser 1928, Trans. Ent. Soc., Lond., 76, p. 129 (♂, ♀ Uganda).

A further possible synonym, but I have not seen the description:—

Metacnemis angusta Selys 1863, Bull. Acad. R. Belg. 2: 16, p. 310, no. 15 (♀ Cape of Good Hope).

Metacnemis angusta Ris. 1921, l.c., p. 438.

INTRODUCTION: A broad-winged, robust insect. The mature ♂ develops a dense whitish blue pruinosity on the body. In each wing 4 antenodal cellules between MA and Cu_2 .

The position of the arculus in relation to the 2nd Ax, the character separating *Metacnemis* and *Mesocnemis*, is variable: Usually the arculus is placed well before 2nd Ax, but nearer to it than to 1st Ax; sometimes halfway between them; occasionally very close to or even at 2nd Ax. The description of the ♀ in Ris (1921) agrees with our specimens; and Fraser's *pruinosa* (which Longfield says is a synonym of *singularis*) fits the males and females of our series very well, except that his ♀ was of slightly smaller dimensions.

I have, therefore, taken the view that *singularis* Karsch (= *pruinosa* Fraser) is a synonym of *valida* Selys. If my assumption is correct, then judging from our series and from records in East and West Africa *valida* normally has the arculus well proximal to the 2nd Ax, in which case Ris' figure of the wings of ♀ *valida* is from an abnormal specimen. This species would then fall to *Mesocnemis* Karsch but, because of the variability of the exclusive character in this genus, the proximal position of the arculus, this genus would be redundant and would be a synonym of *Metacnemis* Selys.

DESCRIPTION: Pruinos ♂. Eyes, in life deep blue above, pale below. Face, in life, pale greenish or bluish changing to ochreous or brownish. Labium broad, median lobe with small anterior notch and fine median longitudinal suture; ochreous. Occiput, gena, epistome, frons and vertex light ferruginous; labrum light ochreous. Face bearing rather long fine hair. Entire head, except the eyes, labrum, gena and anterior portion of occiput, densely coated with whitish-blue pruinosity. Entire dorsum of thorax and abdomen coated more or less with whitish-blue pruinosity, denser on thorax, abdomen 1-2 and 8-10, than on intervening abdominal segments. Prothorax broad, with large dorso-lateral convex inflations meeting at a central groove. Synthorax laterally with the pruinoscence thinner, a pinkish ochreous ground-colour visible. Abdomen mainly black above, under the pruinosity. Femora ochreous, becoming dark brown externally; rest of legs blackish. Legs long and robust with long femoral and tibial spines; lightly pruinose. Anal appendages blackish.

Wings hyaline or very faintly greenish. Pterostigma light brown between blackish veins. Younger ♂: Rather teneral yet almost as well covered with blue pruinosity as in mature ♂, so that this bloom must commence exceptionally early in ♂♂ of this species. The following markings can be made out:

Synthorax with narrow black line at median dorsal suture, at humeral suture and at 2nd lateral suture; at dorsal ends these last two sutures a depression filled with blackish. Abdomen 1 with deep dorsal furrow bordered latero-dorsally by blackish pyramidal prominences. Distal end of 2-7 with narrow black terminal ring and shortly before this another more suffused annulus. As stated above pruinosity is well developed on this young ♂, but on abdomen 8 it is confined to a slight lateral dusting and 9-10 only on ventrum; whereas in the maturer ♂ these three segments are very densely coated. 8-10 are ferruginous, shaded with brown; 8-9 with small round dark brown dorso-lateral spot. Pterostigma pale ochreous suffused with greyish.*

Accessory genitalia: Penis, fig. 119.

♀. Very similar to ♂, but lacking the pale blue pruinoscence, except for a thin coating on legs and on ventrum of thorax; so that the body markings are clear. Head orange-brown anteriorly to ferruginous on dorsum. Thorax light ferruginous, paler at sides. The shape of the prothorax is described in some detail by Ris (1921) (in the ♂ it is very similar); a black posterior transverse line. Synthorax with black markings as described for the young ♂. Abdomen light ferruginous; pyramids on dorsum of 1 black; terminal rings as in ♂; subterminal rings seen to consist in ♀ of a transversely pyriform spot on either side of the mid-dorsal carina; spots on 8-9 as in ♂, but longitudinally elongate on 9. Valves reaching

* Mr. Whellan tells me that in a series of 14 specimens in the Department of Agriculture, Salisbury, the arculus is constant in position, between 1st and 2nd Ax.

to end of abdomen. Ris mentions a narrow diffuse dark mid-dorsal line on 2-7, but this is not apparent on our specimens.

Abd. ♂ 33-34, ♀ 30-32. Hw. of ♂ 26-27, ♀ 27-30. Abd./hw. ratio (♂) 1.3.

DISTRIBUTION: Natal to Uganda and W. Africa.

Southern Africa. Transvaal Museum Collection: S. Rhodesia—Sinoia, Nov., 1947 (series) and Inyagui R., Mtoko Rd., Nov., 1947 (Pinhey); Changadzi R., Jan., 1938 (van Son).

Other records: Cape—Kingwilliamstown (♀, Jan., 1908). S. Rhodesia—Victoria Falls.

REMARKS: This very local species settles on rocks and flies in the manner of Chlorocyphid. It is to be found over fast-flowing waters of rivers in rocky localities.

ALLOCNEMIS* Selys

Allocnemis Selys 1863, Synops. Agrion. 4th Légion, Bull. Acad. R. Belg. (2)16, p. 173. Ris 1921, Ann. S. Afr. Mus., xviii, p. 289. Schouteden 1934, Ann. Mus. Congo Belge (3)2:3(1), p. 79. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 203.

INTRODUCTION: *Allocnemis* is considered to differ from *Stenoenemis*, a close relative, in having the origin of A' at Ac or very slightly proximal, instead of being well proximal as in *Stenoenemis*; and IR₂ usually rises beyond subnodus instead of at it. In our *leucosticta* A' starts at Ac and IR₂ just after subnodus.

The genus is near *Chlorocnemis*, and also has yellow wings; but smaller, the body not so attenuated; anal vein much more developed.

DESCRIPTION: Slender-bodied, blackish insects, usually with yellowish or distinctly yellow wings; small rhombic pterostigma; anal vein fairly well developed; A' rising at or just before Ac; discoidal cell rectangular; R₁₊₂ rising at subnodus, IR₂ slightly distal. Tibial spines long.

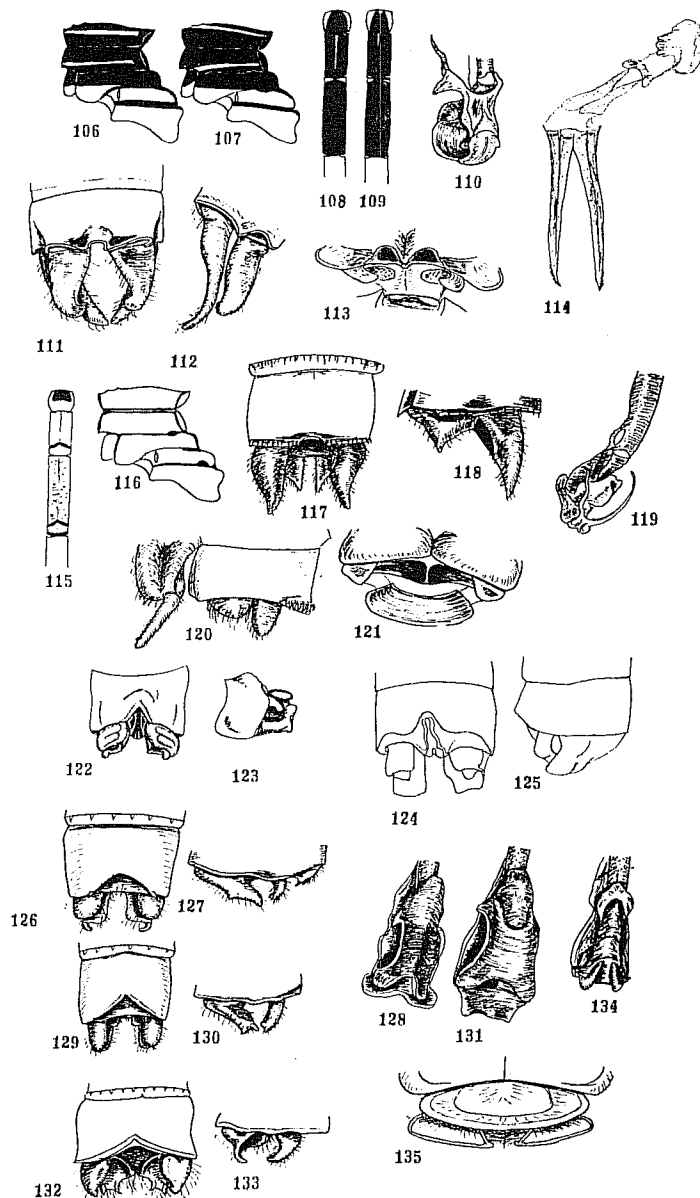
* Fraser informs me (Jan., 1949) that Cowley considers our species, *leucosticta*, should be *Stenoenemis*, not *Allocnemis*.—

Stenoenemis Karsch 1899, Ent. Nachr. 25, p. 166. Genotype *Stenoenemis pachystigma* Karsch (1899, W. Afr.).

PLATE 5b.

ALLOCNEMIS, METACNEMIS, ARGIA, CERIAGRION.

- 106-107. *Allocnemis leucosticta*, thorax of male, female.
 108-109. Same, abdomen 1 to 3 of male and female.
 110. Same, penis.
 111-112. Same, male anal appendages from above and left side.
 113. Same, female, hindlobe of prothorax.
 114. Same, bursa copulatrix.
 115. *Metaenemis valida*, abdomen 1 to 3 of female.
 116. Same, thorax of female.
 117-118. Same, anal appendages of male.
 119. Same, penis.
 120. Same, female, end of abdomen.
 121. Same, female, prothorax.
 122-123. *Argia concinna*, anal appendages of male, above and left side (after Hagen 1864, in Calvert 1902).
 124-125. Same, above and right side (after Ris 1921).
 126-127. *Ceriagrion glabrum*, anal appendages of male.
 128. Same, penis.
 129-130. *C. suave*, anal appendages.
 131. Same, penis.
 132-133. *C. corallinum*, anal appendages.
 134. Same, penis.
 135. *C. glabrum*, female hindlobe of prothorax.



REMARKS: Only 2 or 3 species are known in Africa, one of them from Southern Africa. In the Transvaal Museum a single large ♀ (from Marieps Mt.) may represent another species, but not having more material I have left it under *leucosticta*.

NYMPHS: Refer Barnard 1937, p. 204.

ALLOCNEMIS LEUCOSTICTA* Selys

(Thorax, abd., ♂ genit., bursa—Pl. 15b; entire insect—Pl. 20; venation—Pl. 29.)

Allocnemis leucosticta Selys 1883, Synops. des Agrionines, 4th Légion, 2 t 16, pp. ? 8, 30 (Type locality ♂, ♀ Cape of Good Hope); id. 1886, Révis. Synops. Agr., p. 140 (Transvaal). Ris 1908, in Schultze's Forschungsreise, 1, p. 310, nr. 16; id. 1921, Ann. S. Afr. Mus., xviii, p. 289, f. 19, pl. vii, f. 7. Barnard 1937, loc. id. xxxii, p. 203.

INTRODUCTION: Easily recognized by its very yellowish wings, large pale pterostigma, generally dark body and the yellow dorsal marks at tip of abdomen in both sexes. It is much larger than *Elattoncira glauca* which, in the female, also has the yellowish marks at the end of the abdomen.

DESCRIPTION: Mature ♂. Pale colours in life: labium whitish; eyes, rest of face and the legs sky blue; thoracic stripes very pale green; dorsum of 9-10 and the appendages bright orange. Labium whitish-ochreous, anterior apex black.

Occiput black. Labrum light green, along free anterior margin pale ochreous; Ris says there is sometimes a small black basal spot, but this does not appear in our male specimens. Genæ greenish with across the base a black transverse band which, in many specimens, but not all, continues across the eyes. Anteclypeus dark ferruginous, postclypeus black. Head above black, with pale green transverse band on the frons in front of the antennal level. Anterior ocellus and sometimes the small depression just in front of it ferruginous.

Prothorax black above; a pale transverse ochreous bar on anterior lobe; posterior lobe raised, its hindmargin evenly curved; sides of prothorax pale ochreous. Synthorax black above, with straight, narrow yellowish or pale greenish antehumeral stripe near humeral suture. Sides black at least down to dorsal end of first lateral suture and almost or quite to rest of this suture; rest of sides whitish-yellow tinged with greenish, except a narrow black line on second lateral suture. Legs black outside, on inside whitish-blue or whitish-yellow; spines very long, about three times length of distance between each. Claw-teeth small, subapical. Wings more or less deeply greenish-yellow (paler in immature specimens). Pterostigma rhomboid or parallelogram in shape, very variable in size; opaque creamy white or pale yellow between dark brown veins; ventrally whiter; in some specimens on upper surface slightly stained with brown round the edges against the boundary-veins. In old specimens veins are densely stained. A large mature ♀ from Marieps Mt., Transvaal, apparently also this species, has hyaline wings. Abdomen slender, black; sides of 1-2 whitish-ochreous or whitish-green; sides of 3-8 with latero-ventral whitish line, incomplete at end of each segment, that on 8 deeper in colour and broader. 3 with a narrow pale yellow dorsal line on proximal two-thirds; 3-7 with narrow whitish basal ring, broken dorsally. On dorsum of terminal segments a bright pale yellow or ochreous (bright orange in life) band, starting at distal end of 8 and covering dorsum of 9-10.

Superior appendages pale yellow ochreous; inferiors larger than superiors, pale orange with black apices.

Accessory genitalia: (Barnard) Posterior hamules well developed. Penis without distal hook, but with the membranous apex strongly developed and bifid. Refer fig. 110 here.

Homöochromatic ♀. Very similar to ♂. Labrum with black spot at base, or a broad black band, sometimes excavate medially in front. Pale colours of body as in ♂ or sometimes deeper ochreous. Black line on second lateral suture usually as well developed as in ♂.

* See footnote under genus *Allocnemis*.

Wings and pterostigma vary in tint as in ♂. Whitish basal rings on abdomen narrower. Dorsal patch on 8-10 startling in proximal half of 8; deep ochreous or even reddish-ochreous (orange in life). Valves on 9th sternite extending beyond tip of abdomen.

Heterochromatic ♀. Occasionally a ♀ may be found with the dorsal patch on 8-10 blue instead of orange.

Abd. ♂ 32-37, ♀ 31-33; hw. ♂ 21-25, ♀ 23-25. Pl. (costal edge) less than 1-1.5 mm. Abd./hw. ratio (♂) 1.5.

One very large ♀ mentioned above with hyaline wings (Marieps Mt., Tvl., Oct., 1948, Swanepoel) measures abd. 36, hw. 27.5.

DISTRIBUTION: At present known only from the Union of South Africa.

Transvaal Museum Collection: Series from Balgowan (Pemington); Hudley (Zululand, Pinhey); Van Stadens, Kokstad, and Groot River (Cape Province); Marieps Mt., Barberton, Woodbush and Kastrol Nek (Transvaal).

Also recorded from M'Fongosi, Estcourt and Princetown (Natal).

REMARKS: Found in moist, shady parts of woods and ravines.

NYMPHS: Refer Barnard 1937, p. 204.

Family COENAGRIIDÆ Tillyard 1926

Coenagrionina Muttikowski 1910, Catal. Odon. N. Amer., Bull. Mus. Milwaukee, 1(1).

Agrionina Tillyard 1917, Biol. Dragonflies, pp. 277, 279. Ris 1921, Ann. S. Afr. Mus., xviii, pp. 266, 288.

Coenagriidae Tillyard 1926, Insects of Australia and New Zealand, p. 76. Fraser (pars) 1929, J. Bomb. Nat. Hist. Soc., 33, p. 834. Fraser (pars) 1933, Fauna Br. Ind. Odonata, 1, pp. 18, 272. Barnard 1937, Ann. S. Afr. Mus., xxxii, pp. 202, 208. Tillyard et Fraser 1938, Austral. Zool. IX: II, p. 165.

Agrionidae Schouteden (pars) 1934, Ann. Mus., Congo Belge (3) 2: (3) 1, p. 77.

INTRODUCTION: Discoidal cell with distal angle acute; Cu₂ and 1A well developed. This is a very homogeneous group and the characters used for separating the genera are scarcely of generic significance, often monosexual. In some cases a species is allotted to a certain genus more on general facies than on clear-cut distinctions.

DESCRIPTION: Nodus at about one-third wing length from base; cells mostly quadrilateral as there is very little zig-zagging of the main veins, except 1A, distal part of MA, and sometimes terminal part of IR₂. Discoidal cell with distal angle acute, the anterior edge little more than half the posterior edge. Cu₂ and 1A always well developed; IR₂ arises at subnodus, R₁₊₂ slightly proximal. Pterostigma short, usually rhomboidal. Superior appendages of ♂ variable, but never forcipate.

REMARKS: This is the largest family of the Zygoptera, distributed widely and in Southern Africa containing a number of genera, including *Pseudagrion* and *Enallagma*, whose species are not always easy to separate. It is divided into two subfamilies, probably only the second one being found here:

Subfamily Argiinae.

A' commencing well before Ac, considerably further than the length of Ac; discoidal cell widened distally. Tibial spines long (about twice as long as the intervening spaces).

The only record from Southern Africa is in the genus *Argia* Rambur, of which the species *A. concinna* Ramb. is dubiously recorded from the Cape.

Subfamily Coenagriinae.

A' starting at Ac or not very much more than the length of Ac before this level; discoidal cell not widened distally, i.e. upper and lower edges remaining parallel, although the

distal edge is always longer than the proximal. Tibial spines not or scarcely longer than the intervening space.

KEY TO SOUTHERN AFRICAN GENERA (subfamily Coenagrioninae).

- 1 — Origin of A' at Ac or only slightly proximal (not more than the length of Ac before it). Arculus at or near 2nd Ax; pterostigma similar in forewing and hindwing 2
— Origin of A' well before Ac (more than the length of Ac) 5
- 2 — Ac normally at level distinctly nearer 1st Ax than to 2nd Ax. Body colour yellowish, orange or reddish; no postocular spots; frons with a transverse crest. Inferior tooth (clawhook) of tarsal claw well developed. Superior appendages of ♂ not bifurcate. Prothorax of ♀ without stylets. ♀ without vulvar scale on 8th sternite . . . *Ceragrion* Selys
— Ac practically midway between 1st and 2nd Ax or nearer 2nd. Usually with postocular spots; frons without a crest normally; ♀ usually with prothoracic stylets; superior appendages of ♂ usually bifurcate 3
- 3 — ♀ without vulvar scale on 8th sternite; with 14-15 px. Colour of body variable, blue, green or red, marked with black. R_{1,5} rising distinctly before subnodus, IR₂ rising at 8th-10th px. Pterostigma of same shape in each wing *Pseudagrion* Selys
— ♀ with vulvar scale; mostly with fewer px. IR₂ usually rising at about 7th-8th px 4
- 4 — Pterostigma of same shape in each wing. R_{1,5} rising distinctly before subnodus; forewing with 12-15 px; colour of body yellowish, greenish or bluish, with black markings *Mombagrion* Sjöst.
— Pterostigma narrower in hindwing than in forewing in ♂ at least. R_{1,5} rising almost at subnodus; forewing with 9-12 px; colour black, blue and dark green. Apex of wing rather pointed. Abdomen may be very long and slender *Aciagrion* Selys
- 5 — Arculus far distal to 2nd Ax; ♀ without vulvar spine. Very small species (abdomen less than 20 mm. long); legs short. Pterostigma very small, covering less than 1 cell. 1A reaching only to 2nd px. Only 5-9 px. ♀ tending to be polychromatic. 10th segment of ♂ not raised dorsally *Aptocnemis* Selys
— Arculus practically at 2nd Ax. ♀ usually with vulvar spine. Larger species as a rule (abdomen more than 20 mm. long). Pterostigma normal (1 cell's length). 1A reaching further 6
- 6 — R₃ in forewing rising at 5th or 6th px, in hindwing at 4th or 5th px; 10th segment of ♂ only slightly or not at all raised at posterior margin; pterostigma in ♂ similar in forewing and hindwing. ♀ not polychromatic *Enallagma* Charp.
— R₃ in forewing usually at 4th, in hindwing at 3rd px; 10th segment of ♂ raised posteriorly as a strong bifid dorsal process; pterostigma of ♂ dissimilar in forewing and hindwing (in forewing blackish proximally, pale blue or white in distal half). ♀ polychromatic *Ischnura* Charp.

NYMPHS: Refer Barnard 1937, p. 208 (Agrioninae).

ARGIA Rambur

Argia Rambur 1842, Roret's Suite à Buffon, Névropt., p. 254. Culvert 1902, Bull. Mus. Harvard, 39, No. 4, p. 103, pls. 1-2 (list of spp.; figs. by Hagen 1865).

Genotype *AGRION FUMIPENNE* Burm. (1839).

INTRODUCTION: *Argia concinna* Rambur has been stated to have been taken and described from the Cape. The genus is, however, an American one and it has been suspected that the locality was incorrect. However, for the sake of completeness I include some remarks on the genus.

DESCRIPTION: Head broad; tibial spines very long, about twice as long as the intervening spaces; tarsal claws with terminal hooks unequal. Discoidal cell with lower distal angle somewhat acute; its proximal edge in forewing usually longer than anterior edge; distal edge distinctly longer than proximal. A' starts well proximal to Ac; 1A long,

* *Mombagrion* Sjöst. has not yet been recorded in Southern Africa, but it contains two species, one of which, *congoense* Sjöst., occurs in the Belgian Congo and may perhaps be found further south.

extending to level of about 10th-12th px; 1 row of postanal cells. Arculus at 2nd Ax; 14 or more px in forewing. 3-7 antenodal cells between MA and Cu₂; R₅ rises at about 8th px. Ac midway between 1st and 2nd Ax.

REMARKS: Of this American genus one species is said to have been found at the Cape: only the type ♂ and ♀ are known and, as stated above, the original locality said to be Cape, is questioned. Anal appendages—see Pl. 5b.

ARGIA CONCINNA Rambur

Argion concinnum Rambur 1842, loc. cit., pp. 270, 310, No. 17 (♂, ♀ from Cape).

Argia concinna Selys 1865, Bull. Acad. R. Belg., 2, 20, p. 391 (♂, ♀). Culvert 1902, Bull. Mus. Comp. Zool. Harvard, Camb., Mass., 39, pl. 4, pp. 103-120, pls. 1-2 (illustr. by Hagen 1865). Ris 1921, Ann. S. Afr. Mus., xviii., p. 438 (fig. genit.). Gloyd, 1941, Bull. Chicago Acad. Sci. (6)6, p. 130.

REMARKS: This is said to be a true *Argia* and probably wrongly located as a species from the Cape. Gloyd (1941) says that Dr. Erich Schmidt compared the damaged type ♂ in the Selys collection at Bruxelles with 2 ♂♂ (Williamson collection) from Dominica (West Indies) and thought they were conspecific.

CERAGRION Selys

Ceragrion Selys 1876, Bull. Acad. R. Belg. (2)41, p. 1235; (2)42, p. 525. Selys 1877, C. R. Ent. Belg., xix., p. 235. Ris 1921, Ann. S. Afr. Mus., xviii., pp. 267, 314. Fraser 1933, Fauna Br. Ind. Odonata I, p. 313. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 81. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 217. Fraser 1941, Proc. R. ent. Soc., Lond., 10: 4, p. 62 (key to African spp.).

INTRODUCTION: The Southern African species are easily recognized by their size and their generally reddish colour.

DESCRIPTION: Body reddish; no postocular spots. Anal vein leaves posterior margin very close to or at Ac. Frons with a transverse ridge. Tibial spines short. ♂ with superior appendages not bifurcate. ♀ without vulvar spine on 8th sternite and without prothoracic stylets.

REMARKS: As stated above, these insects are generally easily recognized by their size and colouring. Several species are recorded in Africa and the genus is also found in Asia. Three species are found in Southern Africa, the second one I took only recently in Southern Rhodesia: Ris had predicted its occurrence there. The third is *corallinum*.

KEY TO SPECIES.

- 1 — A' starting distinctly proximally to Ac; thorax green in ♂ and ♀, abd. 26-27 mm. *corallinum* Campion
- A' starting at Ac; thorax red in ♂, green only in ♀. Abd. 29 or over 2
- 2 — Abdomen orange to orange red in ♂; 10th segment with one or more spines on either side of the apical notch; superior appendages definitely shorter than inferior. Wings rather uniformly yellowish. Abdomen ♂ about 29-33 mm. long *C. glabrum* Burm.
- Abdomen more pinkish red; no spines on notch of 10th segment; superior appendages as long as or longer than the inferior appendages. Wings more yellowish anteriorly than posteriorly. Abdomen ♂ longer and narrower, about 33-36 mm. long *C. suave* Ris

CERAGRION CORALLINUM Campion

(Anal append.—Pl. 5b; entire insect—Pl. 20.)

Ceragrion corallinum Campion 1914, Ann. Mag. Nat. Hist., 14, p. 279 (W. Afr.). Fraser 1941, Proc. R. ent. Soc., Lond. (B)10: 3, p. 38.

INTRODUCTION: *C. corallinum* differs from *glabrum* and *suave* in having a dark green thoracic dorsum; A' starts distinctly proximal to Ac instead of at Ac, at least in forewing. A specimen loaned by Mr. Whellan from Salisbury appears to agree with this species.

DESCRIPTION: ♂. Labium pale yellow; labrum, anteclypeus, frons in front greenish yellow; genæ pale green; postclypeus, back of frons, top of head red-brown. Synthorax with narrow dark green or brown on median carina, broad yellow median stripe on either side of this and a broader dark green antehumeral stripe; sides pale green. Wings hyaline; with black veins. Arculus a little distal to 2nd Ax; A' starting proximal to Ac at least in forewing. Forewing with 11-12 px. Pterostigma greenish-brown, edged with black. Dorsum of abdomen light red. Apical excision on 10th segment U-shaped, shallow.

Anal appendages reddish. Superiors shorter than inferiors, stout, incurved and curving down. Inferiors shorter than 10, broad laterally, curving gently upwards and backwards, ending in an acute upper point and shorter lower blunt point. Penis, fig. 134.

♀. (after Champion) Head as in ♂. Prothorax dark brown. Synthoracic dorsum greenish gold with narrow dark green median dorsal line, and a similar humeral line; rest of thorax and the legs as in ♂. Arculus at 2nd Ax. Forewing with 11 px, hindwing with 10-11 px. Abdomen yellow brown.

Abd. ♂ 26-27; ♀ (segments 1-5 were 16 mm., the rest were lost). Hw. ♂ 17-20, ♀ 18 mm. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Belgian Congo; Sierra Leone; S. Rhodesia.

Southern Africa. S. Rhodesia — ♂ Chibudzana R., Melssetter, 16/11/48 (Whellan).

CERIAGRION GLABRUM Burm.

(♂ genit., ♀ prothorax — Pl. 5b; venation — Pl. 29.)

Agrion glabrum Burmeister 1839, Handb. der Entomol. II., Berlin, p. 821, nr. 18 (Vorgebirge der G.H.).

Agrion cerinum Rambur 1842, Hist. Nat. Névropt., p. 279 (pars) (Sénégal).

Agrion ferrugineum Rambur, l.c., p. 280, nr. 29 (Madagascar).

? *Brachybasis rhomboidalis* Paillet de Beauvais 1809, Ins. Afr. Amer., p. 85, Neur., pl. vii, f. 1.

Brachybasis glabra Sélys 1869, Ann. Soc. Ent. Belg., xii., p. 95 (Seychelles).

Brachybasis rhomboidalis (Paillet de Beauvais) Kirby 1890, Catalogue, p. 187; 1898, Ann. Mag. Hist., p. 245 (Nyasal., Delagoa B., Durban).

Ceriagrion glabrum Sélys 1876, Synops. Agrionines, p. 237; and Bull. Acad. R. Belg. (2)42, p. 527. Tillyard 1906, Proc. Linn. Soc., 31, p. 191 (Australia). Ris 1908, in Schultze's Forschungsreise I., p. 317, nr. 30; id. 1921, Ann. S. Afr. Mus., xviii., p. 314, f. 31. Andres 1928, Mem. Soc. R. Ent. Egypte, p. 25, pl. iii, f. 4. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 217.

INTRODUCTION: Only differs slightly in appearance from *suave*: abdomen rather more robust and shorter; more orange in colour; 10th abdominal segment in ♂ with stout spines along the sides of the terminal notch; superior appendages shorter than inferiors. Pterostigma in ♂ ochreous.

DESCRIPTION: Mature ♂. Eyes, in life, light yellowish-green. Labrum and occiput whitish or pale ochreous. Labrum orange yellow; genæ lemon yellow; epistome and frons orange ochre to orange brown. Vertex ferruginous, slightly paling in front. Entire thoracic dorsum ferruginous; a minute black dot at antero-ventral end and usually discernible; sides yellow (greenish-yellow usually in life) becoming paler ventrally. A small black spot just above dorsal end of humeral and of second lateral sutures. Legs orange yellow with black spines. Wings faintly tinged with greenish, becoming in fully mature specimens markedly stained with greenish-yellow; pterostigma light ochreous, between brown veins.

Abdomen bright orange red to about 6th or 7th segment, then brownish; sides of 1-2 and ventrum of most of the remainder yellow. Anal appendages brown. Superiors markedly shorter than inferiors. Apex of abdomen 10 with 1-5 stout blackish spines along each margin of the dorsal notch. Accessory genitalia: Penis fig. 128.

Teneral ♂ with all the orange and yellow parts much paler; traces of narrow brown antehumeral lines on mesepisterna. Wings hyaline.

♀. Labium whitish ochreous; occiput whitish ochreous to pale yellow with greenish tint. Labrum whitish ochreous to very light yellow, with minute black lateral dot at base. Anteclypeus, genæ and frons in front pale greenish-yellow. Postclypeus light brown; frons above similar or shading to ferruginous, the latter colour covering the vertex. Prothorax and synthorax above light ferruginous or yellow-brown, the latter developing a rather indefinite broad brassy metallic antehumeral band close to median suture, this band slightly delineated (in puffed examples) by greyish edging. Black anterior dot at collar as in ♂. Sides of thorax pale yellow or greenish-yellow, whitish below; a pale green diffuse band on metepimeron; black sutural spots as in ♂. Ventrums in old specimens white pruinose. Legs more pale ochreous than in ♂. Wing-tinting not generally so strongly developed. Pterostigma pale greenish ochreous. Abdomen slightly more robust; dorsum olivaceous brown, except on 1 which usually only has two short dorsal brown bars; 1-3 or 4 distally above with incomplete ochreous ring, edged in front with brown. Sides of 1-2 greenish-yellow; ventrum pale ochreous. Valves extending to end of 10.

Occasionally the ♀ may be more orange in colour, approaching the ♂ colouring.

Abd. ♂ 29-33, ♀ 30-35, hw. ♂ 19-22, ♀ 20-23. Abd./hw. ratio (♂) 1.5, ♀ 1.4.

DISTRIBUTION: Distributed throughout Africa; Madagascar, Zanzibar and Seychelles. Also said to occur in Australia (c.f. Tillyard 1906).

Southern Africa. Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal, S. Rhodesia and Portuguese E. Africa.

Also recorded from S.W. Africa.

REMARKS: A common species in streams and pools well supplied with reeds, etc., on which it likes to rest.

CERIAGRION SUAVE Ris

(Anal append., penis — Pl. 5b.)

Ceriagrion suave Ris 1921, Ann. S. Afr. Mus., xviii., p. 316, f. 32 (Type locality ♂ ♂ Katanga, B. Congo). Schouteden 1934, Ann. Musée Congo Belge, (3)2: (3)1, p. 82.

INTRODUCTION: Very similar to and easily confused with *glabrum*; abdomen longer and more slender; redder in colour. Superior appendages not shorter than the inferiors; apical notch of 10 abdominal segment not spinous. Pterostigma in ♂ light red.

DESCRIPTION: ♂. Labium whitish ochreous. Labrum deep yellow. Genæ and occiput pale yellow or greenish-yellow; similarly the frons in front, or brownish ochreous. Anteclypeus light reddish brown; postclypeus, frons above and vertex darker ferruginous. Thoracic dorsum ferruginous, sometimes showing a brassy-metallic antehumeral band (as described in ♀ of *glabrum*). Sides orange to yellowish, ventrally whiter; with green stripe or suffusion on metepimeron; a brown spot at dorsal end of second lateral suture. Ventrums slightly whitish pruinose. Legs pale ochreous with black spines. Wings becoming less heavily yellowish than in *glabrum* and more strongly developed along costal margin than posteriorly. Pterostigma light red, between brown veins.

Abdomen longer and more slender than in *glabrum*; pinkish red to blood red; last 4 or 5 segments red or brownish red, in preserved specimens. Narrow dark brown inter-segmental rings rather more distinct than in *glabrum*. 1-2 at sides, and ventrum of abdomen yellow. Terminal excision on dorsum of 10 without spines. Anal appendages brown; superiors quite as long as inferiors.

Accessory genitalia: Penis fig. 131.

?♀. A ♀ *Ceriagrion* in Transvaal Museum from Natal very probably belongs to this species rather than to *glabrum*: In this specimen the wings are hyaline; the pterostigma appears to be very slightly more ochreous. Abdomen slightly more elongate. Valves not quite reaching end of 10th segment. Otherwise similar to *glabrum*.

♂ Abd. 33-36; hw. 21-22.5. Abd./hw. ratio 1.6.
 ♀ (ex Natal) abd. 36; hw. 24. Abd./hw. ratio 1.5.

DISTRIBUTION: ? Natal; S. Rhodesia; Angola; Belgian Congo.
 Southern Africa. Transvaal Museum Collection: ? Natal—♀ Kosi Bay, July, 1948
 (Pemington). S. Rhodesia—2 ♂♂ Salisbury, Dec., 1947 (Pinhey).

REMARKS: Found in similar habitats, but possibly more confined to the warmer areas than *glabrum*. Very easily overlooked, but of the large number of ♂♂ *Ceriatgrion* I have hitherto examined from Southern Africa only the two mentioned above were *sure*, so that it can be considered a scarcer insect. We have several *glabrum* from exactly the same collecting locality near Salisbury (a stream off Hunyani R., 12 miles out).

PSEUDAGRION Sélys.

Pseudagrion Sélys 1876, Bull. Acad. R. Belg. (2)42, nos. 2-3, p. 490; id. 1877, C.-R. Ent. Belg., xix., p. 200. Ris 1921, Ann. S. Afr. Mus., xviii, pp. 266, 297. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 80. Fraser 1933, Fauna Br. Ind., Odonata, I, p. 274. Ris et Schmidt 1936, Abh. Senckenb. Naturforsch. Gesell., Frankfurt, 433, pp. 1-68. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 472. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 208.

Genotype *AGRION CAFFRUM* Burm. (1839).

INTRODUCTION: In appearance like *Enallagma*, but generally larger; A' usually shorter than Ac; anal appendages of ♂ exposed and generally fairly large (in *Enallagma* they are usually cryptic, being partly hidden by the 10th abdominal segment); ♀ without vulvar spine on 8th segment.

DESCRIPTION: Mostly blue or red and black species. Frons without transverse ridge; postocular spots present (in adults of a few species they become obliterated). Prothorax of ♀ usually with characteristic stylets attached to posterior edge. A' commencing at Ac or slightly proximal; rarely as far proximal as the length of Ac; 1A reaching about 7th-8th px; IR₂ arises at about 10th px, R₁₊₂ distinctly before the subnodus; forewing with about 14-15 px. Abdomen slender, fairly short or of moderate length. Anal appendages of ♂ well developed; superiors usually bifurcate and extending horizontally. Posterior hamules small, conical; penis with well developed apical hook, usually bilobed. ♀ without vulvar spine on 8th sternite.

REMARKS: The genus is moderately large and distributed through Africa, Asia and Australasia. About 40 species are known at present in Africa, including a few new species in a recent paper; and almost half these have been found in Southern Africa. This again is more than double the number described by Ris in his 1921 paper.

The species are often difficult to determine. Separate keys are necessary for the two sexes. In the case of the ♂♂ the most useful characters are the anal appendages; but markings on head, the shape of the postocular spots, shape of the prothorax, development of antehumeral bands, shape of the pterostigma and markings on the 2nd abdominal segment are all important. In the ♀♀ some of these characters are also used and, in particular, the prothoracic stylets.

On the characters shown by the penis it seems that the development of the lateral lobes (figs. 176-193) suggest four groups:—

- angolense*, *caffrum*, *furcigerum*, *makabusiensis*.
- citricola*, *salisburyense*.
- acacia*, *assegaii*, *glaucescens*, *nubicum*, *pseudomassaicum*.
- inconspicuum*, *kersteni*, *massaicum*, *natalense*, *nigerrimum* and perhaps *sjöstedti* (Chirundu example).

KEY TO PSEUDAGRION.

- ♂♂
- 1 — Adult without pale postocular spots. Anal appendages rather of the "kersteni" form. Thoracic dorsum blackish, without or with only very narrow antehumeral stripes 2
 — Adult with pale postocular spots 4
 - 2 — Body with strong metallic reflection on dorsum with no dorsal pruinosity on head or thorax. Pterostigma bright pale reddish or reddish orange. Labrum and frons bright orange. Superior appendages with sub-basal truncate tooth on inner edge. (Fig. 174-175.) Smallish species, abdomen 25-26, hindwing 19-20 *P. caffrum* Burm.
 — Body rather dull blackish or shiny black, masked with bluish pruinosity on head, thorax and abdomen. Pterostigma dark reddish or brown. Labrum and frons greenish or brownish in front. With or without sub-basal tooth 3
 - 3 — Larger, more robust species, abdomen about 29-30 mm., hw. over 20 mm. Synthorax with narrow pale antehumeral lines. Sides of thorax mainly pale below first lateral suture, with short black bar on upper part of second suture. Superior appendages robust, with sub-basal tooth on inner edge. Fig. 140-141. *P. furcigerum* Ramb.
 — Smaller species, less robust, abdomen about 27 mm., hw. about 19 mm. Synthorax uniformly black (with bluish pruinosity when mature) entirely on dorsum and down sides to or below second lateral suture. Superior appendages less robust, without any sub-basal tooth. Fig. 142, 143 *P. inconspicuum* Ris
 - 4 — Synthoracic dorsum all black or mainly black with pale antehumeral lines 5
 — Synthoracic dorsum mainly pale-reddish, bluish or greenish, with narrow or narrowish black lines on sutures 14
 - 5 — Face, dorsum of head, thorax and abdomen almost entirely black. Abdomen 8-9 partly blue. Whitish pruinosity of dorsum confined to interalar spaces and abdomen 1. Superior appendage not bifid, much shorter than inferior. Fig. 163-165 *P. nigerrimum* Pinh.
 — With pale antehumeral stripes always in immature ♂; in mature ♂ of *natalense*, *citricola* and *salisburyense* these are obliterated by a thin pruinosity spreading over the thorax, but not only confined to certain areas. Superior appendage bifid, longer than inferiors 6
 - 6 — Mature adults extensively bluish pruinose on thorax and abdomen, often sufficiently to mask any antehumeral stripes, although these may become whitish pruinose (in *kersteni*)
 — Mature adults without pruinosity or only patches at interalary spaces and at each end of abdomen (but the pale colours of the body are often blue) 10
 - 7 — Labrum deep black. Pterostigma of adult dark brown to blackish. Broad antehumeral stripes, blue pruinose in adult. Superior appendage deeply and widely forked, the lower branch angled at start (sideview) and reaching further than upper branch. Fig. 136-137. Abdomen 30-32, hw. 20-23 mm. *P. kersteni* Gerst.
 — Labrum greenish, yellowish or orange. Pterostigma ochreous brown or reddish. Antehumeral bands usually only visible in immature examples, very narrow; at maturity they are hidden by blue pruinosity. Superior appendage only narrowly forked, the lower branch not distinctly angled at start 8
 - 8 — Larger species, abd. 30-32, hw. 23-24 mm. Antehumeral stripes may show in fully mature adult as very narrow greenish lines. Side of thorax (in fresh examples) bright green. Pterostigma pale reddish brown. In sideview the lower branch of the superior appendage is seen to be far narrower than upper branch and projects obliquely upwards. Fig. 138-139. *P. natalense* Ris
 — Smaller species, abd. 26-30, hw. 18-21 mm. Thoracic dorsum of adult dark pruinose blue. Sides of thorax yellow ochreous or pinkish ochreous, developing white pruinosity. Pterostigma ochreous brown or reddish. Superior appendage not as above 9
 - 9 — Labrum and face in front bright orange. Pterostigma reddish; lower branch of superior appendage extending distinctly further than upper branch. Fig. 144-145 *P. citricola* Brnd.
 — Labrum and face mainly greenish or ochreous. Pterostigma ochreous brown; lower branch of superior appendage not extending beyond end of upper branch. Fig. 146-147. *P. salisburyense* Ris
 - 10 — Antehumeral stripes very narrow, considerably narrower than the black of the mesepisternum, greenish or orange. Superior appendage deeply and broadly forked 11
 — Antehumeral band broad, nearly or quite as broad as the black on one side of the median line, green, blue or yellowish. Superior appendage not forked or only shallowly so 12
 - 11 — Smaller species, abd. less than 30 mm., hw. 20 mm. Labrum and epistome dark ferruginous to blackish. Head above black. Pterostigma blackish. Upper and lower branches of superior appendage about equally broad (in side view); two teeth on their inner margin. Fig. 168-169 *P. makabusiensis* Pinh.

- Larger species (generally, but dwarf's occur), abdomen usually over 30 mm., hw. 21-25 mm. Face largely orange or reddish orange, head above black and orange. Pterostigma reddish. Lower branch of superior appendage much thicker than the upper branch. Fig. 156-158. *P. angolense* Selys
- 12 — Very large robust species, abd. about 38 mm., hw. 28-30 mm. Pterostigma ochreous or greenish. Superior appendage robust, shallowly forked, the lower branch slightly longer than the upper. Face of mature ♂ partly bright orange. Fig. 172-173 *P. gigas* Ris
- Much smaller species, abd. 24-26, hw. 18-19 mm. Superior appendage short or long, at most only slightly bifid at apex. Face blue or green 13
- 13 — Abdomen 2 above with black "U", joined by stalk to distal end of segment. Pterostigma light violet grey. Superior appendage almost as long as segment 10, longer than the inferior and slightly bifid at apex. Fig. 154-155 *P. nubicum* Selys
- Abdomen 2 above with a blackish median stripe narrow for two-thirds of segment, gradually widened in distal half, contracted just before distal end of segment. Pterostigma ochreous or light brownish ochreous. Anal appendages very short, superior less than one-third as long as the 10th segment, not bifid. Fig. 159-160 *P. assegaai* Pinh.
- 14 — The pale colour on head and thorax blue or greenish. Humeral stripe not enlarged near upper end, but with separate black spot above this stripe here. Postocular spots very large, green, not edged with black. Pterostigma reddish. A largish species with slender abdomen, 31 mm., hw. 23. Superior appendage (sideview) broad, rather deeply divided into two equal branches. Fig. 170-171 *P. glaucescens* Selys
- The pale colour of head and thorax red or reddish; humeral black line enlarged as a somewhat rounded black spot near upper end. Superior appendage not bifid 15
- 15 — Large species, abd. 30-35, hw. 22.5 mm. Black median thoracic line narrowish, humeral line narrow or broadish. Postocular spots broadly bordered with black, anteriorly and posteriorly. Abdomen 2 broadly blackish dorsally. Superior appendage very short and blunt. Fig. 166-167 *P. sjöstedti* Först.
- Smaller species, abd. not more than 32 mm. Black thoracic lines variable. Dorsum of abd. 2 not uniformly black with a pale central area 16
- 16 — Black thoracic lines very narrow. Head mainly red above; postocular spots not distinctly marked off with black border merging into occiput. Abd. 2 blue with narrow black rather U-shaped mark. Inferior appendage tapering. Fig. 152-153 *P. uticivae* Först.
- Black lines on thorax broadish. Abd. 2 mainly black with small pale dorsal central area. Inferior appendage hatchet-shaped 17
- 17 — Larger species, abd. 31-32, hw. 21-22 mm. Thorax not bright red, always developing a blue pruinosity, thin at first, eventually quite masking the reddish. Pterostigma reddish violet. Abd. 2 with dorsal pale spot rather heart-shaped, sometimes divided. Superior appendage distinctly longer than inferior. Fig. 150-151. Forewing with 11-12 px. *P. pseudomassaticum* sp. nov.
- Smaller species, abdomen 26-28, hindwing 18-19 mm. Thorax bright red, not coated with blue pruinosity (at most the pruinosity only developing between the wing-bases). Pterostigma reddish ochreous. Abd. 2 with dorsal pale spot a divided ellipse. Superior appendage not larger than inferior. Fig. 148-149. Forewing with 10-11 px. *P. massaticum* Sjöst.
- ♀♀*
- 1 — Prothoracic stylets not developed or vestigial, mere swellings on posterior lobe of prothorax. Black humeral lines on thorax narrow, irregular 2
- Prothoracic stylets developed, at least longer than broad. Humeral marking usually fairly regular and broad, but not in some species 4
- 2 — Small species abd. 26-28, hw. 20-21 mm. Posterior lobe of prothorax broadish, convex. Sural black thoracic lines fairly broad, that on median suture about 1 mm. wide. Postocular spots broadly edged with black posteriorly. Abdomen 2 with broad dorsal band, expanding to a broad triangle before distal end. Cerci rather narrow cones. Pterostigma ochreous brown. Forewing with 10-11 px *P. massaticum* Sjöst.
- Larger species, abd. about 30-32 (sometimes 29), hw. 22-24 mm. Sural black on thorax narrow. Postocular spots narrowly and incompletely bordered posteriorly 3

* Two species are omitted in the key to females as we have no specimens: *glaucescens* and *inconspicuum*; also we have no female *citricola*, so that I fit this species in as well as I can from Barnard (1937). It is not at all easy to make a satisfactory key and that here must be used with caution. For collectors in Southern Africa it is generally easy to obtain pairs in cop and the male of the pair is more readily determined, especially by genitalia.

- 3 — Dorsal band on abdomen 2 narrow in proximal half, expanding to a narrow transverse triangle before distal end. Humeral black on thorax almost broken before the rounded spot at upper end. Posterior lobe of prothorax broadly trapezoidal, the hindmargin almost straight. Pterostigma pale, yellow ochre. Cerci narrowly conical. Forewing with 11-12 px *P. pseudomassaticum* sp. nov.
- Dorsal band on 2 broad, with broad triangle in distal half. Humeral sural black narrow but mainly of continuous breadth until the upper spot. Posterior lobe of prothorax a narrow triangle. Pterostigma brownish or greyish ochreous. Cerci broadly conical *P. nigerrimum* Pinh.
- 4 — Prothoracic stylets very short not more than about twice as long as broad, not more than one-fourth length of prothorax 5
- Prothoracic stylets longer, nearly or quite three times as long as broad, at least one-third length of prothorax 8
- 5 — Very large robust species, abdomen over 36 mm. long. Prothoracic stylet orange, very short, scarcely longer than broad. Black of thoracic dorsum occupying about half the mesepisternum. Blackish band on abdomen very broad, no pale colour visible above, except segmental rings. Pterostigma ochreous *P. gigas* Ris
- Abdomen less than 30 mm. long 6
- 6 — Black band at humeral suture very broad, especially below this suture. Prothoracic stylet triangular in shape, about twice as long as broad; broad at base. Abdomen with broad black dorsal band. Pterostigma ochreous brown. Adult largely pruinose blue on thorax and abdomen *P. fuscigerum* Ramb.
- Humeral suture without any black or with the black very narrow. Abdomen with a narrow or very narrow black dorsal band, not nearly covering the pale ground colour when seen from above. Adult only developing very little pruinosity 7
- 7 — Prothoracic stylet about twice as long as broad, rather erect, ochreous. Humeral black reduced to an incomplete narrow line. Black band on abdomen 2 about one-fourth width of the portion visible from above. Pterostigma very pale whitish-yellow *P. assegaai* Pinh.
- Prothoracic stylet very short, broad, scarcely longer than broad. Humeral black a complete band, shaped rather as in *massaticum*. Black band on abdomen 2 almost linear in dimensions. Pterostigma ochreous *P. acaciae* Först.
- 8 — Black dorsal markings on thorax reduced to narrow lines on sutures as in *acaciae*, etc. Posterior lobe of prothorax semicircular. Abdominal black consisting of broadish lanceolate markings on dorsum. Abdomen about 32 mm. long *P. glaucescens* Selys and *P. sjöstedti* Först.
- Black on thorax moderately broad, at least that on median suture. Black dorsal band of abdomen, on 3-6 covering this area when viewed from above except for pale rings at ends of segments 9
- 9 — Larger species, abd. generally over 31 mm. 10
- Smaller species, abd. rarely over 30 mm. 12
- 10 — Pale antehumeral band on thorax considerably wider than the black on one side of the median suture. Pterostigma elongate, posterior edge three-fourths length of costal edge. Prothoracic stylets ochreous with black tips *P. kersteni* Gerst.
- Pale antehumeral band on thorax, narrow, distinctly narrower than either the median or the humeral black on mesepisternum 11
- 11 — Prothoracic stylets pale orange. Pterostigma rhomboidal, costal and posterior margins of equal length *P. natalense* Ris
- Prothoracic stylet orange with dark apex. Pterostigma more elongate, costal edge distinctly longer than posterior edge *P. angolense* Selys
- 12 — Pale antehumeral band on thorax very broad, more than twice as broad as the median black on one side of the median line. Humeral black line very irregular in outline, the black only descending short distance on metepimeron. Hindlobe of prothorax produced in middle as 3 equal semicircular arches. Stylets pale with dark apices. General colour of body blue-green *P. nubicum* Selys
- Pale antehumeral band narrower, not or little broader than the median black on mesepisternum. Humeral black not very irregular in outline (merely evenly narrowing or broadening), the black descending halfway or more down mesepimeron 13
- 13 — Pale antehumeral band moderately broad, occupying about half the mesepisternum 14
- Pale antehumeral band narrower, less than half width of mesepisternum. Abdomen about 27-28 mm. 15
- 14 — Pterostigma reddish. Abdomen 25-26 mm. *P. caffrum* Burm.
- Pterostigma pale brown. Abdomen 27-28 mm. *P. citricola* Brnd.

- 15 — Mesepimeron mainly blackish, except for a narrow pale line above 1st lateral suture. 1st and 2nd lateral sutures with distinct black lines in upper half. Costal edge of pterostigma much longer than posterior edge *P. malakusensis* Plah.
 — Mesepimeron mainly pale, the black confined more or less to the upper (anterior) half. 2nd lateral suture only with a black spot at upper end; 1st suture with a line. Pterostigma long, but almost a parallelogram in shape *P. salisburyense* Ris
 NYMPHS: Refer Barnard 1937, p. 209.

PSEUDAGRION ACACIÆ Förster.

(♂ genit. — Pl. 6a-6b; thorax, abd. — Pl. 7a.)

Pseudagrion acaciæ Förster 1906, Jahresh. Mannheim Ver. Naturk., 71-72, p. 56 (Type locality ♂, ♀ Komatiport). Ris 1908, in Schultze's Forschungsreise I, p. 317, nr. 29; Id. 1921, Ann. S. Afr. Mus., xviii, p. 308, f. 28. Andres 1928, Mem. Soc. R. Ent. Egypte, p. 22, pl. 1, f. 2 (abd.). Ris 1936, Abh. Senck. nat. Ges., 433, p. 53. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 209, f. 13e (penis).

INTRODUCTION: A small species with red head and thorax, near *massaicum*, but with rather narrower black lines on thorax; second abdominal segment with a U-shaped mark; anal appendages differently formed. It is smaller than *sjustedti*.

DESCRIPTION: Mature ♂. Eyes reddish in life. Labrum whitish ochreous; occiput pale ochreous below darkening above to olive-brown to bluish-green, with only faintly marked pale postocular spots. Face, frons, vertex, ocelli and basal segment of antenna brick red, but labrum and gene brighter, more vermilion. Postocular spots large, pale green, merging with the greenish ground-colour of the occiput or only slightly edged with black. Traces of black markings on vertex, particularly a transverse line demarcating vertex and occipital plate; the other traces being part of a transverse line in ocellar region. Prothorax with posterior edge raised in a flattish arc; reddish, with black transverse markings. Mesepisterna orange red, shaded with violaceous in lateral halves and posteriorly; a complete narrow median line; a slightly broader humeral line, almost broken in upper third, above this break the black spreading on to mesepisternum, below it spreading on to mesepimeron. Sides of thorax yellowish-green on mesepimeron, paler below, but becoming here and there ventrally covered with white pruinosity, which is also at interalar spaces and wing bases. Very short black lines or dots at upper ends of lateral sutures. Femora blackish, with white pruinosity; tibiae and tarsi ochreous-brown. Wings hyaline; pterostigma violaceous-brown, rhomboid; A' almost as long as Ac.

Abdomen 1-7 olive green with black markings; 1-2, 8-10 and rest of abdomen ventrally dusted lightly with whitish pruinosity. The black markings are: 1 with dorsal spot; 2 with a rather U-shaped dorsal mark and a very narrow terminal ring; 3-7 with mid-dorsal band, not reaching anterior end of segment and expanding distally as a spot or transverse band. 8-10 mainly black.

Anal appendages reddish brown; inferiors in side view like an upturned tooth.

Accessory genitalia: Penis fig. 183.

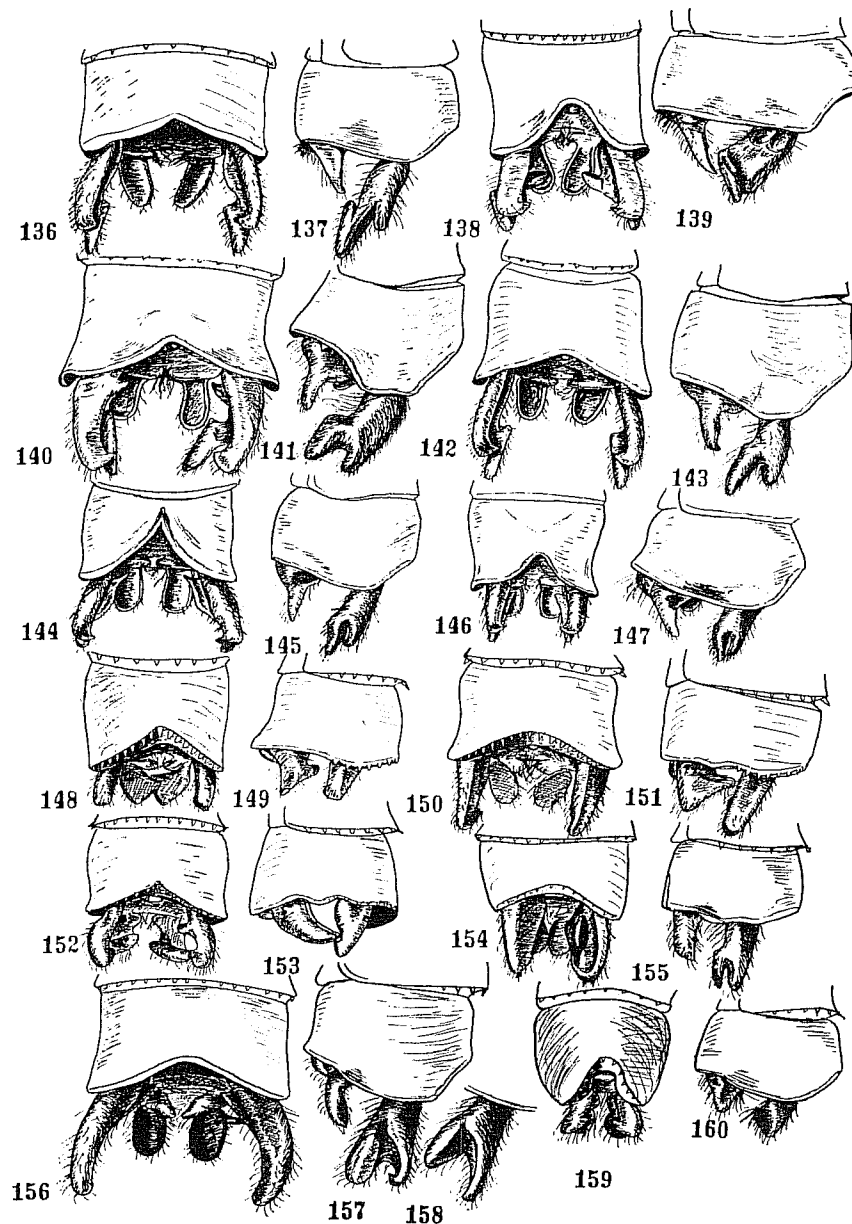
♀. Face orange ochreous, more olivaceous brown on frons and epistome. Posterior lobe of prothorax rather broad, erect (higher than in ♂); stylets short and broad, blunt, not

PLATE 6a.

PSEUDAGRION: ANAL APPENDAGES OF MALES.

(Seen from above and left side.)

136-137. *kersteni*. 138-139. *natalense*. 140-141. *fulvigerum*.
 142-143. *inconspicuum*. 144-145. *citricola*. 146-147. *salisburyense*.
 148-149. *massaicum*. 150-151. *pseudomassaicum*. 152-153. *acaciæ*.
 154-155. *nubicum*. 156-158. *angolense*. 159-160. *assegati*.



quite bent down on to the pronotum. Synthorax light ochreous with brassy sheen, paler laterally; black markings as in ♂, but more reduced. Abdomen comparatively robust, dull ochreous to light ferruginous; 2-6 with a very narrow, partially interrupted median dorsal black line and a small posterior spot on each; 7 with complete mid-dorsal band, enlarged posteriorly; 8 with basal spot on dorsum, with a fine dorsal line ending in a terminal ring; 9 with complete dorsal band; 10 with two basal dots. Pterostigma light brownish ochreous between brown veins.

Abd. ♂ 27-30, ♀ 28-29, hw. ♂ 17-20, ♀ 21. Abd./hw. ratio (♂) 1.5.

DISTRIBUTION: Natal to Egypt; Palestine.

Southern Africa. Transvaal Museum Collection: S. Rhodesia — Chirundu Bridge, Dec., 1947 (Whellan). Portuguese E. Afrika — Ingamanhê Forest, Sept., 1947 (Pinhey).

Also recorded from Zululand (M'Fongosi 1911 and 1925); Transvaal (Komatipoort); S. Rhodesia (Victoria Falls); also seen Umhlatuzi R., Natal, Dec., 1948 (Pinhey).

REMARKS: In Southern Africa this can be said to be a local species in subtropical lowveld. It flies along margins of rivers.

PSEUDAGRION ANGOLENSE Selys

(♂ genit. — Pl. 6a, 6b; thorax — Pl. 7a; ♀ prothorax — Pl. 7b.)

Pseudagrion angolense Selys 1876, Bull. Acad. Belg. (2)42, p. 493 (♂ Angola); id. 1877, C.R. Ent. Belg., xix, p. 203. Ris 1921, Ann. S. Afr. Mus., xviii, pp. 302, 439, f. 24; id. 1936, Abh. Senckenb. Naturf. Ges. 433, p. 39, nr. 16, ff. 19-20. Longfield 1936, Trans. R. Ent. Soc., Lond., 85: 20, p. 472. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 209, f. 13g (penis).

Pseudagrion hageni Karsch 1893, Berlin. Ent. Zeitschr., 38, p. 317, nr. 28, fig. 8 (♂ append.).

Pseudagrion prutezatum Hagen 1893, id. loc. (non Selys).

INTRODUCTION: This species is quite distinct from all hitherto known *Pseudagrion* south of the Zambezi, although further north it has several close allies. From other southern species it stands out by its general blackish head and thorax (not largely pale as in others), with orange markings; and the lack of pruinosity, except at interalary spaces.

DESCRIPTION: ♂. Eyes in life, orange to yellowish. Labium and occiput orange-ochreous; labrum deep orange with black basal dots, one in middle and two lateral; genæ and anteclypeus orange; postclypeus black. Frons and base of antennæ broadly orange, vertex and antennal joints 2-3 bright orange. Vertex and occipital plate, black; post-ocular spots orange, transversely elliptical and joined across occiput.

Prothorax black; orange markings: anterior margin and sides, as well as a median dorsal twin pair of small spots, a latero-dorsal spot and a short lateral line on posterior margin: but the orange markings are variable, in some cases almost obsolete, except the orange anterior margin. Synthorax above black with slight greenish lustre; a narrow complete pale greenish to greenish-orange antehumeral stripe near humeral suture, slightly broadening at anteroventral end; sometimes incomplete at dorsal end. Sides mainly black to second lateral suture, but with light olive green to yellow-green on lower half of the mesepimeron, part of the ventral end of metepisternum and a short tapering streak or triangular spot in upper half of metepisternum; metepimeron olive green to yellowish below, invaded slightly below upper end of second lateral suture by black. Metepimeron and metasterna develop very thin dusting of white pruinosity. Interalary spaces in old specimens bluish pruinosity. Legs ochreous, femora black externally.

Wings hyaline; very faintly greenish-tinged in old specimens. Pterostigma light red to reddish brown, between black veins. Abdomen very slender; 1-7 black with dark metallic green or blue-green sheen, 8-9 with violet blue on dorsum, except at distal ends; 10 black, 1-7 pale ochreous at sides. 1 above, in old specimens, blue pruinosity. Anal appendages black.

Dr. Newton's dwarf Zululand specimens, mentioned below, differ in having a slight reduction of black markings on sides of thorax.

Accessory genitalia: Penis fig. 181.

♀. Rather similar to ♂, but in life the pale markings are greenish; in preserved specimens this green tends to disappear. Markings on head as in ♂, but paler, more yellowish or yellowish-orange. Postocular spots pale greenish orange. Prothorax as in ♂; in some specimens with an orange median line on posterior lobe. Stylets pale orange, procumbent. Synthorax above much as in ♂, with broader more pale greenish orange or pale green antehumeral stripes; occasionally the median carina finely orange in ventral end. Sides paler than in ♂: Mesepimeron only blackish in upper half; a black line over top of mesinfraepisternum; rest of sides pale greenish blue, metepisternum more greenish ochreous to ochreous; a short black line in upper third or half of first lateral suture and a black spot near dorsal end of second suture or sometimes along two-thirds of this; more ventrally the sides become pale yellow or whitish. Legs as in ♂ or paler. Pterostigma greenish ochreous. Abdomen above black with metallic green sheen; a narrow creamy-yellow basal ring on each segment, usually broken mid-dorsally on 2-4; 8 light blue or pale violet blue on distal third; the same colour covering 9, except for a dorso-lateral spot at base; and covering 10 entirely. Sides of abdomen (more narrowly and ventrally on 8-10) pale ochreous. Valves pale yellowish, reaching end of abdomen.

Abd. ♂ 31-38, ♀ 31-40. Hw. ♂ 21-25, ♀ 22-28. Abd./hw. ratio (♂) 1.5. Dwarfs taken in Zululand have abd. about 25 mm. long, hw. 19 mm.

DISTRIBUTION: Cape Province to Uganda and W. Africa.

Southern Africa. Transvaal Museum Collection: Series from Cape Province (Van Stadens), S. Rhodesia (Salisbury and Mazoe) and Portuguese E. Africa (Vila Pery); Natal (Hudley), Transvaal (Pretoria).

REMARKS: Our Van Stadens and Vila Pery specimens are smaller than the average Salisbury ones — and would seem to indicate that there is some correlation between size and altitude, the Salisbury localities being at about 4,000', the others in low veld. Dr. Newton has taken very small examples at Nqutu, Zululand, Jan., 1949. The species is locally common in damp shaded localities: in woodlands amongst long grass near streams or pools. On the wing throughout the year in such places.

PSEUDAGRION CAFFRUM Burm.

(Anal append., penis — Pl. 6b; ♀ prothorax — Pl. 7b.)

Agriion cafferum Burmeister 1839, Handb. der Entom. II, p. 821, nr. 20 (♂ ♂ Port Natal — Durban).

Agriion palliatum (Klug, Hagen, Mss.) Selys 1876 (♂).

Pseudagrion furcigerum Karsch 1893, Berlin Ent. Zeitschr., p. 38, f. 10.

Pseudagrion cafferum Ris 1921, Ann. S. Afr. Mus., xviii, p. 301, f. 23; id. 1936, Abh. Senckenb., 433, p. 16, f. 3. Calvert 1898, Trans. Amer. Ent. Soc., xxv, p. 42 (description).

? *Pseudagrion cafferum* Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 210.

INTRODUCTION: A smallish species, the ♂ with shiny black head, orange face, metallic greenish black thoracic dorsum; reddish pterostigma. No postocular spots. Superior appendages like *kersteni*, but with sub-basal tooth. It seems to me from our material that Barnard's series of *cafferum* were really *furcigerum*: I certainly consider them distinct species, not in synonymy as he supposed.

DESCRIPTION (living colours): Mature ♂. Labium bright sulphur yellow (may be paler after death); occiput below green, in front orange (paler after death); face and frons bright orange; a narrow black basal line or 3 dots on labrum; postclypeus very broadly black from base outwards. Rest of head above black with slight metallic greenish sheen;

no pale postocular spots. Dorsum of prothorax and synthorax black with metallic green or bronze sheen; sides of prothorax ochreous. On synthorax the metallic green descends below the humeral suture, about halfway to 1st lateral suture. Rest of sides greenish ochreous or ochreous; a short black line at dorsal end of 1st suture, joined upwards at proximal end to the dorsal metallic green; a black spot at dorsal end of 2nd suture. Sides of prothorax and synthorax very thinly white pruinose. Legs sulphur yellow; femora on outside and tibiae anteriorly metallic greenish black; very slight white pruinosity on femora. Pterostigma reddish, carmine or reddish orange. Dorsum of abdomen with continuous broad steely blue band, covered with thin blue pruinosity in older specimens; sides and ventrum of 1-5 pale canary yellow, remainder bluish to pinkish. Superior appendages shaped rather like in *kersteni*, but on inner edge with sub-basal tooth. Very slight whitish pruinosity on side of 1. Penis fig. 187.

In Ris' description (1921) the pale colours are given as more greenish. Teneral ♂ similar, but appearing, if anything, brighter as there is no pruinosity; with very slender orange postocular spots, cuneiform, not quite joined to an orange line along occipital plate.

♀. Labium pale ochreous. Occiput greenish yellow below; labrum, genae and front of occiput canary yellow; rest of face orange, not quite as bright as in ♂; labrum at base with 3 black dots, one in middle, one at each extreme end. Postclypeus almost as broadly black above as in ♂, frons with black median basal spot; vertex black with pyriform orange postocular spots, connected rather broadly by an orange bar across back of occiput. Prothorax greenish-black above, bordered with orange, laterally mainly orange, and with a median dorsal paired orange spot; stylets long and slender, depressed, orange. Posterior lobe moderately convex; synthorax above mainly orange; a metallic green black median band on either side of narrow orange dorsal line, each band about one-third width of each mesepisternum; a rather narrow continuous black humeral band; sides bright greenish yellow; a small black spot at dorsal end of 2nd lateral suture. Very slight white pruinosity on lower sides and on ventrum. Legs yellow, with thin, discontinuous blue-black outer line on each femur and tibia. Pterostigma orange-brown to orange. Abdomen 1-5 or 1-6 bright pale green, terminal segments yellowish; on dorsum a broad black band with brilliant green metallic sheen, this band constricted at joints.

Immature ♀ very similar. In an old female, abd. 1-3 and 8-10 are thinly pruinose; head black above without any postocular spots; abdomen green laterally as in less mature ♀.

Abd. ♂ 25-26, ♀ 25.5-26.5; hw. ♂ 19-20, ♀ 20-21. Abd./hw. ratio (♂) 1.3.

DISTRIBUTION: A Natal species. Transvaal Museum Collection: Natal — Balgowan, Dec., 1948 (K. Pennington).

Other records (Ris) — Mooi Rivier (Natal), Jan.-Feb., 1913 (R. C. Wroughton). Ngutu (Zululand) (Newton).

REMARKS: When fresh this is a very strikingly coloured insect, particularly the ♂.

PLATE 6h.

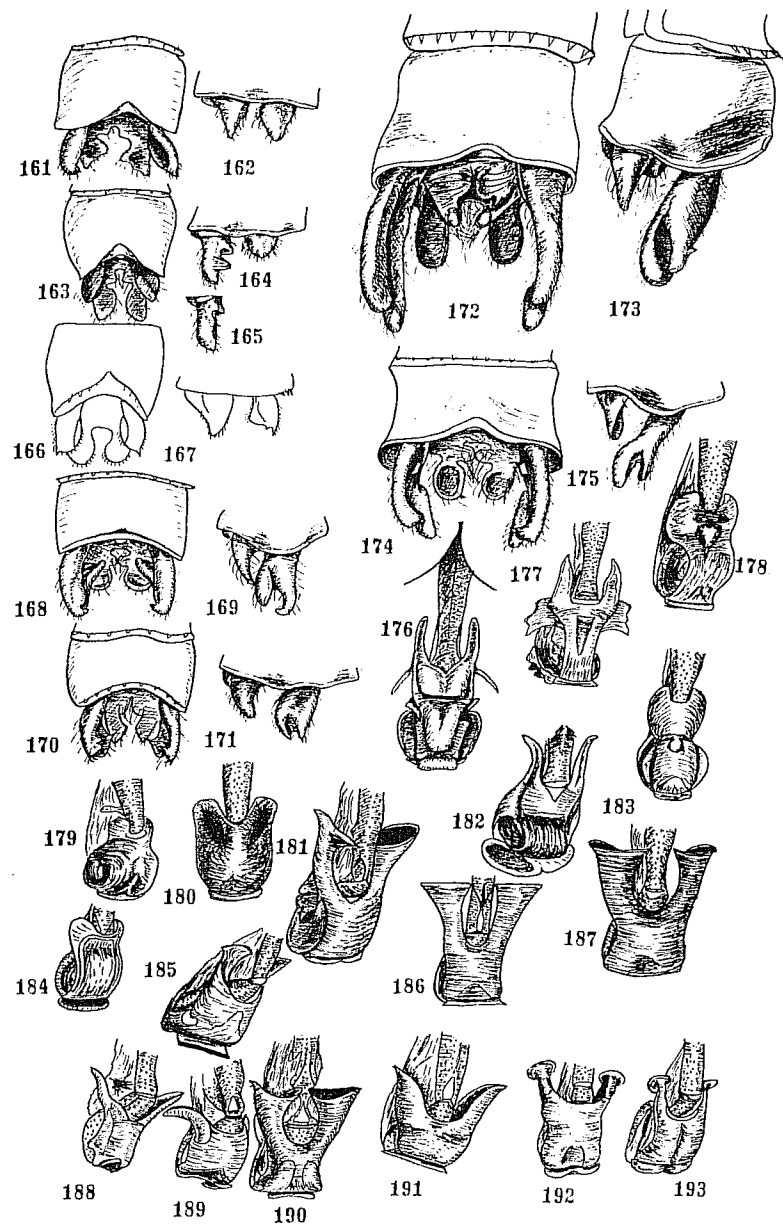
PSEUDAGRION: ANAL APPENDAGES AND PENIS.

Anal Appendages:—

161-162. ♀ *sjöstedti* (Chirundu, Zabbezi). 163-165. *nigerrimum*.
166-167. *sjöstedti* (after Ris). 168-169. *makabustensis*.
170-171. *glaucescens* (Chirundu). 172-173. *gigas*. 174-175. *caffrum*.

Penis:—

176. ♀ *sjöstedti* (Chirundu). 177. *massaicum*. 178. *pseudomassaicum*.
179. *subicum*. 180. *assegaii*. 181. *angolense*. 182. *nigerrimum*.
183. *acacia* (Chirundu). 184. *glaucescens* (Chirundu). 185. *gigas*.
186. *makabustensis*. 187. *caffrum*. 188. *kersteni*. 189. *natalense*.
190. *furcigerum*. 191. *inconspicuum*. 192. *citricola*. 193. *salisburyense*.



PSEUDAGRION INCONSPICUUM Ris.

(♂ genit. —Pl. 6a, 6b.)

Pseudagrion inconspicuum Ris 1931, *Révue Suisse Zool.*, p. 98, fig. 1 (2 ♂♂ St. Amaro, Angola). Longfield 1945, *Arqu. Mus. Bocage*, 16, p. 28 (in list only; ♂♂, ♀♀ from several localities in Angola).

INTRODUCTION: Rather like *salisburyense* in appearance and like *kersteni* in anal appendages, but differing from both these in having the back of the head quite black in adult, without postocular spots.

DESCRIPTION: Mature non-pruinose ♂. (Perhaps the pruinosity may have been removed by heating too strongly when it was set.) Labium and occiput below ochreous; occiput in front pale green; labrum and anteclypeus blackish brown; rest of face and head (except the eyes) black. No postocular spots (present in immature ♂ apparently). The labrum shiny black or blackish brown.

Prothorax above black, at sides narrowly ochreous. Synthorax dull black above and at sides to 2nd lateral suture, and spreading over on to metepimeron at dorsal end. Metinfraepisternum and rest of metepimeron and ventrum light olivaceous to ochreous. Legs shiny black. Pterostigma dark ferruginous, edged with slightly paler narrow line; between black veins. R_3 rising just before 6th px in forewing. Abdomen entirely black above and at sides; on proximal segments with blue sheen, middle segments green sheen, terminal segments violet or bronze. Ventrum ochreous. Anal appendages blackish-ferruginous; superiors shaped very like *kersteni*. Penis, fig. 191.

Pruinose ♂. Differs from the non-pruinose ♂ as follows: Labium black, more ochreous in the middle; maxillary palps ochreous; occiput in front and genae dark olive; labrum and epistome greenish black; rest of head black (no postocular spots) except a pale ochreous triangular area on postero-ventral surface of occiput, and a thin white pruinosity on postclypeus, frons and part of vertex anterior to the ocelli (ending in a sinuous post-antennal line). Thorax marked as in the non-pruinose ♂, but coated thinly with white pruinosity and with a metallic green sheen showing through on the black areas. Legs black, rather ochreous interiorly; coxæ and femora thinly whitish pruinose. Pterostigma more blackish ferruginous; R_3 as in the non-pruinose ♂. Abdomen coated with white pruinosity on 1-7, more densely on basal segments, thinly on posterior ones. Anal appendages as above.

♀. I have seen no specimens, but this sex is known from Angola (1932).

♂ Abd. 24.5-27; hw. 18-20; abd./hw. ratio (♂) about 1.35.

DISTRIBUTION: Angola. Cape Province.

Transvaal Museum Collection: Cape Province — Ceres, at 1,500 ft. (R. E. Turner), Oct. or Nov., 1920; Clanwilliam, Nov., 1948 (G. van Son).

PSEUDAGRION CITRICOLA Barnard

(♂ genit. —Pl. 6a, 6b.)

Pseudagrion citricola Barnard 1937, *Ann. S. Afr. Mus.*, xxxii, p. 212, ff. 13, 14 (Type locality ♂ ♀, Kridouw Krans, Cape Province).

INTRODUCTION: A non-pruinose specimen in the Transvaal Museum resembles this species, but it has no locality label. Several pruinose male specimens from the Cape also fit this species. The species is very close to *salisburyense* Ris in genitalia, but it has an orange-yellow face. Barnard says his *criticola* ♂ resembles *salisburyense* and the ♀ is like *kersteni*: But then the ♀♀ of these species are extremely similar in markings and prothoracic stylets.

DESCRIPTION: Not fully mature non-pruinose ♂. Labium and occiput below pale orange ochreous; occiput in front, genae, labrum and epistome orange; postclypeus at base and entire dorsum of head black with metallic green and blue-green sheen, but with small pyri-

form orange postocular spots. Prothorax and synthorax entirely black above with green metallic sheen; the former ochreous laterally; on the latter the dark area descends the sides to about the 1st lateral suture, overlapping this at dorsal end; rest of sides and ventrum ochreous (stained with grey on one side of the body) except for a broad black band on dorsal two-thirds of 2nd lateral suture. Legs black externally, ochreous internally. Pterostigma reddish ochreous. R_3 starts at 5th px in forewing, at 4th in hindwing. Abdomen black with bright blue, blue-green and green sheens; this relieved by very narrow pale ochreous ring at proximal ends of 1-7; dorsum of 8-9 and extreme distal end of 7 violet; 10 greenish black; appendages blackish. In side view the appendages are very like *salisburyense* with the bifurcation of the superiors slightly more pronounced and the lower branch more elongate. Ventrum of abdomen pale ochreous. Barnard says that pruinosity covers 8-9 and three-fourths of 7. The only marked differences between our specimen and that described by Barnard is in the lack of pruinosity and the postocular spots being orange instead of dull blue.

Accessory genitalia: Penis, fig. 192, very like *Salisburyense*.

Mature pruinose ♂. Differs from our non-pruinose ♂ as follows: Labium, occiput, genae, epistome deep chrome yellow; postclypeus with narrow basal line which is black with green or brassy sheen, this metallic colour spreading over the whole frons and vertex as in the black ♂; but the postocular spots smaller, round and pale blue or pale green. All the thorax and most of the abdomen to about the base of the 7th segment thinly coated with whitish or bluish-white pruinosity, denser on abdomen 1-2 than elsewhere. Thorax above (apart from pruinosity) as in the non-pruinose specimen; at sides the metallic black descends to about the 1st lateral suture and then from near dorsal end of this suture a broad oblique metallic stripe descends to metastigma; a broad dark band on 2nd suture; in older specimens entire sides blue pruinose to 2nd lateral suture. Rest of sides pale canary yellow, becoming more ochreous ventrally. Legs black externally, but pale yellow internally. Pterostigma ferruginous, paler at edges, between blackish veins. R_3 starts at 5th-6th in forewing and 5th in hindwing. Abdomen very similar to the non-pruinose specimen; blue pruinosity progressively thinner posteriorly; very little on terminal segments. Anal appendages as in the non-pruinose ♂.

General ♀ (from Barnard's description). Differs from ♂ as follows: postocular spots orange-brown (similar to our ♂), connected by an orange-brown line; frons also this colour. Prothorax black with dorsal and lateral orange marks; stylets orange, and described "as in *kersteni*". Synthorax orange; with black antehumeral stripe close to narrow median orange line; below humeral suture a black band equal to half the width of the mesepimeron. Legs ochreous; narrow black external lines on femora and tibiae. Pterostigma pale brown. Abdomen apparently as in ♂, with pale patches on 8-9, and whole of 10 pale.

A rather more mature ♀ is described as being darker, with the orange markings on head and thorax olivaceous; sides of thorax greyish. A still more mature ♀ is darker and much more like the ♂: postocular spots small, disconnected; prothorax and stylets and synthorax entirely black dorsally; pale patches on abdomen more or less pruinose.

♂ Abd. 26-29, hw. 18.5-20. Abd./hw. (♂) ratio about 1.3. Barnard's measurements: Abd. ♂ 26-27, ♀ 27-28. Hw. ♂ 20, ♀ 20-21.

DISTRIBUTION: Only recorded from Cape Province: Kridouw Krans, Olifants River (Barnard, Sept., 1931).

Transvaal Museum Collection: 1 ♂ (no data). Cape Province — Clanwilliam, Nov., 1948 (Van Son); Butterworth, Dec., 1948 (D. A. Swanepoel); Albany and Grahamstown, March and Sept., 1948 (ex Rhodes Univ. Collection).

In Rhodes University Collection: Albany, Apr., 1948 (R. Prosser).

REMARKS: Apparently a very local species. The genitalia are very like *spernatum* Sclys.

PSEUDAGRION ASSEGAI Pinh.

(♂ genit.—Pl. 6a, 6b; thorax, abd.—Pl. 7a; ♀ prothorax—Pl. 7b.)

Pseudagrion assegai Pinhey 1950, Ann. Transv. Mus., xxi, p. 261, figs. 5-10.

INTRODUCTION: Very similar in size and habits to *nubicum*. The ♂♂ are also very much alike in colour (coeruleous blue) and markings, but the dorsum of the 2nd abdominal segment has a rather spear-shaped spot instead of a U; and the superior anal appendage is much shorter. The ♀ of this species differs in its colour, which is light brown, and the shorter prothoracic stylets. Black humeral line narrower than in *nubicum*. The male is closely related to *sudanicum* Sélys, but the latter has a U-shaped black dorsal mark on abdomen 2 as in *nubicum*.

DESCRIPTION: Mature ♂. Eyes in life pale blue above and at sides, pink on ventrum. Labium whitish. Occiput whitish-green. Genae, labrum and epistome sky blue (turning green in some pinned examples); frons greenish-blue (turning olive-green); with black markings: a small median and two lateral spots at base of labrum; most of postclypeus black, almost at margins; frons above with short black basal band connected vertically at the anterior ocellus to the vertex, which is black. Post-ocular spots pale blue-green, pyriform, isolated. A narrow pale green line along posterior edge of occipital plate. Prothorax black; edged narrowly at the back and more widely anteriorly, and entire sides pale blue-green; also a large pale blue-green dorso-lateral spot; posterior lobe slightly raised, broadly rounded along its free margin.

Synthorax black on dorsum to humeral line, with broad pale blue-green antehumeral bands (sky blue in life), nearer humeral than medial suture; this band slightly excavate externally at dorsal end, and in width equal to about half the entire mesepisternal breadth. Sides sky blue to light blue-green; the black from dorsum usually slightly overlapping the humeral suture on to mesepimeron; a black spot at dorsal end of second lateral suture and sometimes another at dorsal end of first suture; usually a small round black spot on metepisternum just below middle of first suture and in one of our specimens another such spot on metepimeron approximately in centre of this plate. Legs ochreous; femora and tibiae with black external line. Pterostigma ochreous or light brownish-ochreous.

Abdomen 1-2, 8-10 light sky blue in life, 3-7 pale greenish-blue; in pinned examples all segments may be the latter colour. 1 above with broad black basal spot; 2 with metallic green-black median band, narrow at proximal end, gradually widening to two-thirds length of segment then suddenly contracting and ending in a black distal annulus. 3-6 with broad black, green or bronze-reflecting band, narrowed at distal end, inflated after a brief constriction before distal end of each segment; 7 with more uniform broad green-black band, continuous or ending abruptly before end of segment where there is a blue transverse band. 8-10 entirely sky blue, except for a basal black triangle (or complete band) on dorsum of 10. Anal appendages blackish, very short; superiors only little more than a quarter as long as segment 10.

Accessory genitalia: Penis fig. 180.

Mature ♀. General colour light ochreous-brown. Labium and occiput whitish-ochreous. Face and head light ochreous with black markings as follows: very narrow basal line on labrum; a median and two lateral spots at base of postclypeus; a short crescent at base of frons above; a small spot on either side of anterior ocellus; a continuous transverse band just behind the posterior ocelli. Postocular spots olivaceous, not very distinctly marked off from the back of the head, which is orange-ochreous. Prothorax ochreous; lateral medial lobes very rounded; posterior lobe with an even margin slightly angled mid-dorsally, but not divided into the 3 lobes often found in *Pseudagrion* ♀♀; stylets ochreous, slightly raised, short, about twice as long as broad; a short black bar between them; a small black central spot in the hollow between the latero-medial lobes. In some examples the two black markings on prothorax are more extensive and almost link up.

Synthorax light orange or ochreous-brown, at sides more greenish, ventrally more yellowish; with reduced black markings (having a green sheen): a mid-dorsal band, slightly contracting at its lower end; this band in its total (double) width not broader than $\frac{1}{2}$ - $\frac{2}{3}$ of each mesepisternum; a black spot at upper end of humeral suture and again at second lateral suture; or with a fine interrupted line along humeral suture; usually a faint brown spot on metepisternum just below middle of second lateral suture. Legs pale ochreous; foreleg with short black exterior line on exterior of femur and a more complete line on inner surface of tibia. Pterostigma whitish-ochreous.

Abdomen orange-ochreous or light ochreous-brown; a narrow black annulus at end of each segment. Dorsum marked with black, having a green sheen: with narrow, broken basal bar and a very fine transverse mid-dorsal line; 2-7 with the band very much as in the ♂; 8 with broad band almost to distal end; 9 with broad band in proximal two-thirds. 10 without any dorsal marking. Cerci and valves of the ground-colour.

Abd. ♂ 25-26, ♀ 25-26. Hw. ♂ 18-19, ♀ 18-20. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: Transvaal and S. Rhodesia.

Southern Africa. Transvaal Museum Collection: Transvaal—Moorddrift, Oct., 1909 (Swierstra); Nile R., Potgietersrust, Oct., 1948 (D. Brown). S. Rhodesia—Salisbury, Dec., 1947-Jan., 1948 (Pinhey).

REMARKS: Found in same habitats as *nubicum*.

MATERIAL: Holotype, allotype, 2 ♂ and 1 ♀ paratypes in Transvaal Museum.

PSEUDAGRION FURCIGERUM Ramb.

(♂ genit.—Pl. 6a, 6b; ♀ prothorax—Pl. 7b.)

Agria furcigerum Rambur 1842, Hist. Nat., Névropt., p. 261 (♂, Cape).

Pseudagrion furcigerum Sélys 1876, Bull. Acad. r. Belg. (2)42, p. 496. Ris 1908, in Schultze's Forsch., Jenaische Denkschr. 13, p. 315; id. 1921, Ann. S. Afr. Mus., xviii, p. 300, f.22; id. 1936, Abh. Senckenb. Nat. Ges., 433, p. 17, nr. 2.

Pseudagrion caffrum Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 210, 212.

INTRODUCTION: Exceedingly like *kersteni* Gerst. in colour, markings, size and genitalia: Darker, with narrower antehumeral bands; no true postocular spots when mature, but occasionally traces of white pruinose dots; anal appendages more strongly built and bearing a blunt tooth on inner margin of superiors near base. As I remarked above under *caffrum* I consider this species very distinct and is evidently what Barnard took for *caffrum*.

DESCRIPTION: Mature ♂. Labium pale ochreous; occiput pale yellow or greenish below, thinly dusted with white pruinose; above quite black. Labrum, anteclypeus and genae olive; labrum with very narrow basal line or 3 black basal dots; rest of face and head above black, without postocular spots; in old specimens occasionally with very small white pruinose rounded spot in the normal position of a postocular spot; thin white dusting at base of postclypeus, on frons, on one or two very small patches on back of head. Prothorax and synthorax black above with green or bronze metallic sheen; laterally pale ochreous or olivaceous; prothorax at sides and anterior margin white pruinose. Synthorax with pale bluish-white antehumeral stripes similar to *kersteni*, but rather narrower; pruinose blue spots on interalar spaces; at sides the greenish-black descends to, and slightly overlaps, the 1st lateral suture; and a broad black band at upper two-thirds of 2nd suture, more on metepisternum than on metepimeron. Sides, except on black regions, and ventrum white pruinose. Legs dark ochreous or ferruginous; femora outside (and tibiae more narrowly) black and thinly white pruinose. Pterostigma ferruginous between dark brown veins.

Abdomen robust; black above with metallic green sheen; sides ochreous or greenish; the whole surface rather densely white pruinose, except narrow terminal black rings on each segment.

Superior appendages stout; black; deeply forked, the lower branch starting at an angle and extending further than upper one; a tooth (blunt, rounded or acute) on inner margin near base. Inferiors small; ochreous, with brown tip.

Accessory genitalia: Penis, fig. 190.

Immature ♂. Similar but without pruinosity and therefore darker in appearance. Barnard says the teneral ♂ has postocular spots. Abdomen 8-9 with blue dorsal band. Pterostigma paler brown in very immature individuals.

Mature ♀. Very similar to mature ♂. Whitish-blue pruinose antehumeral bands duller and much broader, occupying three-fourths of each mesepisternum. Black at humeral line narrower, extending down mesepimeron halfway to 1st suture; narrower black line at 2nd suture. Black on outside of legs reduced to narrow lines. Pterostigma lighter ferruginous. Abdomen 8-10 with pale green or blue-green dorsal patches. The whole body rather thickly dusted with white pruinosity. Prothorax trilobed, the median lobe very large, rounded, somewhat procumbent. Stylets dark, short, tapering, procumbent.

Abd. ♂ 25-29, ♀ 25-28.5. Hw. ♂ 19-22, ♀ 20-23. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: Cape Province.

Transvaal Museum Collection: Cape Province—Schuster's Kraal, Oct., 1948, and Silvermine Valley, Dec., 1948 (C. G. C. Diekson).

Other records: Type ♂ from Cape (vide Ris). Barnard—Common on mountains and lowlands of south-western Cape Province.

NYMPH: Refer Barnard 1937, p. 211 (under *caffrum*).

PSEUDAGRION GIGAS Ris

(♂ genitalia—Pl. 6b; thorax and abdomen—Pl. 7a; ♀ prothorax—Pl. 7b.)

Pseudagrion gigas Ris 1936, Abh. Senck. naturf. Ges., 433, p. 33, nr. 12, f. 15 (♂♂, Sikasso, Guinea).

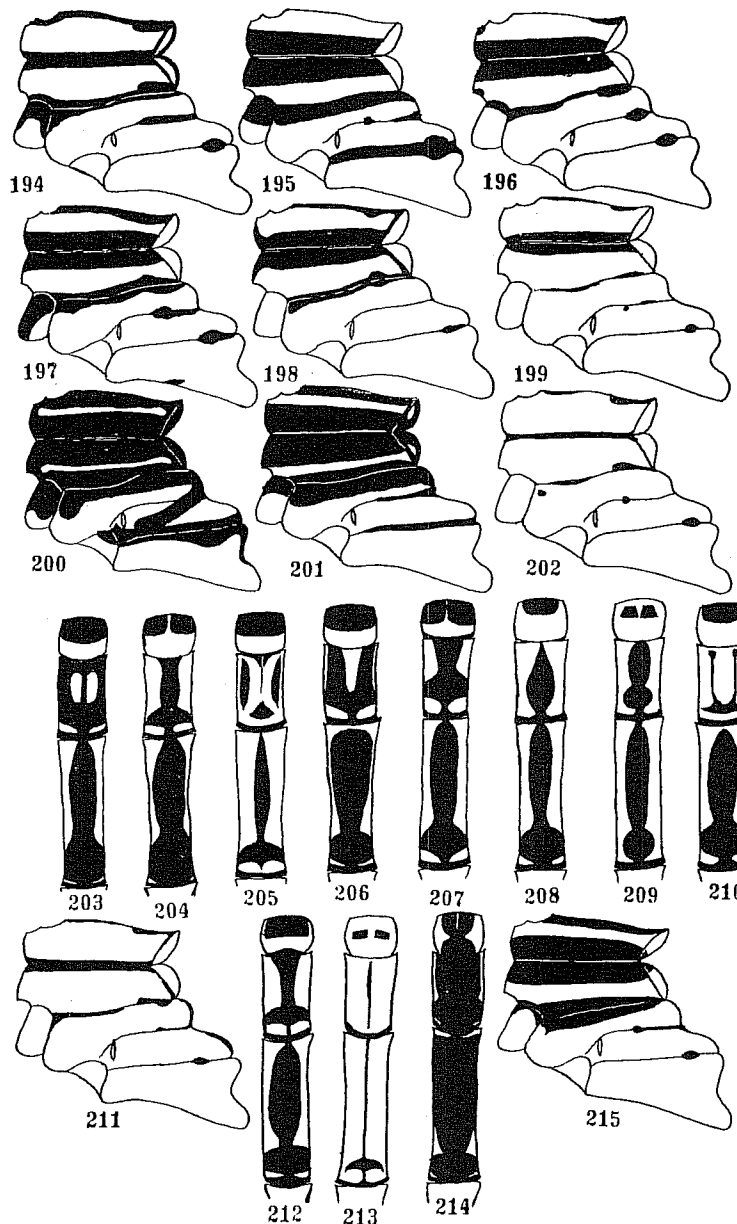
INTRODUCTION: Related to *angolense*, but larger; antehumeral stripes broader; superior appendages only very shallowly excised, not distinctly bifurcating. Postocular spots more pear-shaped (pyriform) than in *angolense*. Our specimens agree fairly well with Ris' description.

DESCRIPTION: Immature ♂. Labium whitish-ochreous, gena and most of frons pale, rather pinkish-ochreous; labrum and epistome dull yellowish-ochreous, the labrum with minute black basal dot at lateral angles, the postclypeus with very broad black basal band, shallowly excised anteriorly in middle. Vertex black with metallic green sheen; postocular spots roundish pyriform, pale pinkish-ochreous; a short transverse bar of same colour on back of occipital plate, but not connecting up to the postocular spots. Occiput pale pinkish-ochreous. Thorax dorsally black with metallic green sheen, marked dorsally, laterally and

PLATE 7a.

PSEUDAGRION: THORAX AND ABDOMINAL SEGMENTS 1 TO 3.

194. *massaicum*, male and female (*acacie* similar).
 195. *kersteni*, juvenile male. 196. *kersteni*, female.
 197. *nubicum*, male (female very similar). 198. *assegaili*, male.
 199. *assegaili*, female. 200. *angolense*, male. 201. *salisburyense*, female and juvenile male.
 202. *glaucescens*, male.
 203. *massaicum*, male. 204. *massaicum*, female. 205. *acacie*, male.
 206. *nubicum*, male. 207. *nubicum*, female. 208. *assegaili*, male.
 209. *assegaili*, female. 210. *glaucescens*, male.
 211. *nigerrimum*, female. 212. *nigerrimum*, female.
 213. *acacie*, female. 214. *gigas*, male. 215. *gigas*, male.



ventrally with pale pinkish-ochreous as follows: Prothorax along anterior margin, narrowly in posterior edge, at sides, 2 small elongate spots on either side of median line and a large dorso-lateral oval spot. On synthorax a very narrow pale median line; a complete broad, parallel-sided antehumeral stripe, slightly widened at ventral end, placed a little nearer humeral than median suture; almost entire sides pinkish, turning creamy-white ventrally, with very narrow greenish-black streak in upper half of 1st lateral suture and an elongate spot at dorsal end of 2nd lateral suture. Legs pale creamy-yellow, with narrow blackish external line and black spines. Venation brown, pterostigma pale olivaceous, wings very faintly tinted greenish. Anal vein leaving margin before Ac by nearly its length in forewing; a shorter length or at Ac in hindwing. Abdomen 1-7 above black with metallic green sheen, with pale pinkish terminal ring on each segment, finely broken mid-dorsally, 1-3 at sides pale pinkish, distal end of 3-7 pale yellow to pale ochreous; 8 at base black, the rest of 8 and whole of 9 pinkish-maroon; 10 blackish above, pinkish-ochreous at sides. Superior appendages black, inferiors ochreous. Superiors only very shallowly bifid, the lower branch slightly the longer.

Mature ♂. Pale colours in life; entire face in front and ventral two-thirds of eye chrome yellow; occiput postventrally greenish-yellow; eye above dark brown. Frons greenish-yellow; postocular spots coeruleous; a short green transverse line on occipital plate. All pale areas of thorax, coxae, anterior surfaces of femora, sides of abdomen 1-3 bright grass green; rest of sides of abdomen pale blue-green, ventrum of 10 yellow-green. In the more mature specimens traces of violet dorsal spots on 8-9. Pterostigma reddish-brown.

Non-pruinose but mature ♀. Marked very similarly, differing as follows: Labrum yellow-green; gene and occiput bright yellow; postclypeus mainly black. Frons yellowish in front. Vertex and prothorax as in ♂, but pale markings olivaceous. Stylets very short, orange. Antehumeral band still broader covering more than half of each mesepisternum; pale olivaceous; a very narrow median dorsal line of same colour; sides of thorax yellowish-green in upper part, yellow to white ventrally. Pterostigma very light red.

Abdomen broader, more robust; entire dorsum with dense metallic-green sheen, except narrow pale terminal rings; sides yellow.

Pruinose ♀. Darker. Labrum deeper green; anteclypeus olive; frons brown, at sides greenish; occiput pale ochreous. Thorax and abdomen very similar, but developing white pruinosity on sides and ventrum of former and over the whole of abdomen 1. The postocular spots joined by the pale occipital line.

Abd. ♂ 38, ♀ 37-39. Hw ♂ 28-30. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: So far recorded only from S. Rhodesia, Portuguese E. Africa and Spanish Guinea.

Southern Africa. Transvaal Museum Collection: S. Rhodesia—Umvumvumu R., Melssetter, Oct., 1947 (Pinhey). Portuguese East Africa—Ingamanhê Forest, Sept. 1947 (Pinhey).

REMARKS: Collected in long grass near strongly flowing rivers.

PSEUDAGRION GLAUDESCENS Sélvs

(♂ genitalia—Pl. 6b; thorax and abdomen—Pl. 7a.)

Pseudagrion glaucescens Sélvs 1876, Bull. Acad. Belg. (2)42, p. 498 (♂, ♀); and 1877, C. R. Ent. Belg., xix, p. 208 (♂ ♀, Sierra Leone). Ris 1936, Abh. Senck. nat. Ges., 433, p. 61. Longfield 1936, Trans. R. ent. Soc., Lond., 85:20, p. 473.

Pseudagrion zumbense Návás 1917, Broteria Sér. zool., 15, p. 72, ff. 1-2 (♂, ♀, Zumbo, Port. E. Afr.).

INTRODUCTION: A pale blue-green species with long slender abdomen; postocular spots very large, green. Very little black marking. Superior appendage deeply forked.

DESCRIPTION: ♂. Colours in life (Mombasa specimens): Eye light green to grass green; labium whitish; rest of face light bluish-green, darkening on frons; postocular spots

large, pale cobalt. Thorax in front and most of abdomen dorsally bronze green; thoracic sides, sides of 2, whole of 8 and 9, sides of 10 pale cobalt.

Pinned specimens: Labrum whitish-ochreous. Occiput ochreous suffused with dark greenish; with very large green postocular spots not edged with black. Labrum pale ochreous. Epistome and frons pale olivaceous; frons with black lateral basal spot and short median basal transverse bar. Vertex brownish-ochreous with broad black posterior transverse band across the ocelli, divided laterally by a reddish spot outside the posterior ocelli.

Prothorax dull green, partly ochreous on posterior lobe, the latter with black line along free margin; a black anterior transverse ring, incomplete dorsally; two latero-posterior spots, joined to the marginal line of posterior lobe.

Mesepisterna bronzed olive-green, with very fine black median-line near which on either side there is (in preserved specimens) a yellowish dorsal band, not reaching antealar sinus. A very narrow discontinuous black humeral line and above its upper end a black pear-shaped spot on mesepisternum. Sides and ventrum mainly greenish-white, but metepisternum and postero-ventral part of metepimeron emerald green. Wingbases and interalar spaces emerald.

Legs ochreous; femora with black external line.

Wings hyaline; pterostigma rhomboid with curved borders; pinkish-red.

Abdomen very slender. 1-2, base of 3, 8-10 (except median dorsal black band on 10) coeruleous; other segments olive-green to bronze-green (more grass-green in life). Black markings: 1 with broad basal spot on dorsum; 2 with dorsal U-shaped mark and a narrow terminal ring; 3-7 with broad bronze-black band, on each segment tapering anteriorly and reaching proximal end only as a very narrow line, but expanding distally as a rounded spot.

Anal appendages black; superiors deeply forked.

♀ in life (Mombasa): Labium white, anteclypeus emerald, rest of face and frons olive green. Eye pale greenish-yellow, darker on top. Head above olive brown. Postocular spots emerald behind, olive anteriorly. Thoracic dorsum olive, sides emerald. Abdomen 9-10 and a postlateral spot on 8 coeruleous. Most of abdomen dorsally with bronze-green band expanding posteriorly on each segment as in ♀♀ of other species. Prothoracic stylets about one-third length of prothorax, brownish-orange with black tips.

♂. Abd. 31, hw. 23. Abd./hw. ratio about 1.3-1.4. Kenya specimens, ♂ abd. 33, hw. 23. ♀ abd. 31, hw. 23.

DISTRIBUTION: S. Rhodesia and Portuguese E. Afr., Kenya, Belgian Congo and Sierra Leone.

Southern Africa. Transvaal Museum Collection: S. Rhodesia—Chirundu Bridge, Dec., 1947 (Whellan).

REMARKS: Evidently a tropical species. In Kenya I have found it on a narrow fast-flowing, reedy stream.

PSEUDAGRION KERSTENI Gerst.

(♂ genit.—Pl. 6a, 6b; thorax—Pl. 7a; ♀ prothorax, bursa—Pl. 7b.)

Agrion kersteni Gerstäcker 1869, Archiv. f. Naturg., 35:1, p. 222, nr. 86 (Type loc. ♂, ♀, Mbaramu (Zanzibar); id. 1873, in Von der Deckens Reisen in Ostafrika, 3, p. 53 (♀, Mbaramu; ♂ ♂, Cape).

Agrion deckeni Gerstäcker 1869, l.c., nr. 87 (♂, Mbaramu); id. 1873, l.c., p. 54 (♂).

Pseudagrion pretaxatum Sélvs 1876, Bull. Acad. R. Belg. (2)41:2-3, p. 204; l.c. (2)42, p. 494 (♂, ♀ Zanzibar, etc.). Ris 1921, Ann. S. Afr. Mus., xviii, p. 303, f. 25. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 81.

Pseudagrion furelgerum Sélvs 1876, Bull. Acad. R. Belg. (2)42, p. 497 (♀).

Agrion palliatum (Klug, Hagen MSS.) Sélvs, l.c., p. 497 (♀).

Pseudagrion pretaxatum r. *syriacum* Sélvs 1887, Ann. Soc. ent. Belg., 31, p. 47 (♂ ♂, ♀, Beirut).

Coenagrion kersteni Kirby 1890, Catal., p. 151.

Pseudagrion syriacum Kirby l.c., p. 153.

Pseudagrion deckeni Karsch 1893, Berlin. Ent. Zeitschr., 38, p. 39. Ris 1908, in Schultze's Forschungsreise, Jena. Denschr., 13, p. 216, nr. 27 (*P. kersteni* Ris 1908, however, is a synonym of *spernatum* Sélys).

Pseudagrion erythreum Förster ? 1906, Jahrb. Mannheim Ver. Nat., 71-72 (nom. nud.).

Pseudagrion killimandjaricum Sjöstedt 1909, Killimandjaro-Meru Exped., p. 47, pl. 2f. 18 (♂ append.), p. 40, f. 2 (♂ ♀, Killimandjaro).

Pseudagrion kersteni Ris 1936, Abh. Senck. nat. Ges., p. 18, ff. 2a, 5. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 213.

Pseudagrion kersteni var. *draconis* Barnard, l.c., p. 213, f. 13 (penis), f. 14 (anal append.) — Cape.

INTRODUCTION: Rather close to *salisburyense*, but slightly larger. The mature ♂ is very easy to distinguish by its black thorax and broad pale blue pruinose antehumeral stripes; and the superior appendages in sideview are quite distinct, for the lower branch of the apical fork juts out prominently both in ventral and in posterior direction. The ♀♀ are much more difficult to distinguish from that sex in *salisburyense*, but in the field, where they frequently occur in the same locality, it is fairly easy to find pairs in copula.

Gerstaecker pointed out there was little difference between the *deckeni* and *kersteni* he described in 1869; the former, having a darker pterostigma, may perhaps have been a more mature example.

DESCRIPTION: Mature pruinose ♂. Eyes, in life, brown above, pale green below. Labium and occiput below pale ochreous; labrum, epistomic glossy blackish-brown to black; genae pale green; frons and vertex black, the whole area in front of the lateral ocelli rather densely whitish pruinose; postocular spots very small, pale green, rounded.

Prothorax black, marked rather thickly with white pruinose. Synthorax black above; with or more usually without a very thin whitish-blue pruinose median line; a broad continuous bluish antehumeral band, touching humeral suture and equal in breadth to about half of each mesepisternum. At sides the mesepimeron is black in the more dorsal half of its length, the rest of sides and ventrum greenish to pinkish-ochreous marked with black on sutures; usually a small spot at dorsal end of first lateral suture; a broad continuous band on 2nd suture. Sides, ventrum and between wing bases rather densely white pruinose. Legs black; tibiae at proximal ends, and the tarsi ferruginous; femora thinly whitish pruinose. Pterostigma blackish-brown.

Abdomen blackish-brown, with black distal ring on most segments; at proximal ends of middle segments usually a slight indication of a pale greenish or reddish-ochreous ring, severed dorsally; latero-ventrally the segments also of this pale colour; the dorsum of the abdomen thinly or thickly dusted with white pruinose (especially segments 1, 8-9). Sides of 1 and 10 more broadly pale than the other segments. Sometimes the pruinosity on dorsum of 6-7 takes the form of a pair of small twin spots near distal end. Anal appendages pinkish-ochreous or reddish-brown; superiors with black tips. The superior has a prominent ventral branch, starting at an angle and extending posteriorly well beyond the end of the upper branch.

A mature, in fact evidently old ♂ from the Cape, is very black, with the white pruinosity on the body irregularly scattered, without the usual thoracic markings.

Immature ♂. Only a trace of pruinosity (showing where it starts): a thin blue dusting on postclypeus, frons and anterior part of vertex; very thin white sprinkling on femora. Head above and dark parts of thorax and abdomen black with metallic-green sheen. Postocular spots, antehumeral stripes, sides of thorax and abdomen pale pinkish-ochreous; prothorax green-black above, with pinkish at sides, anterior and lateral margin and dorso-lateral spot. Two separated black spots near dorsal end of 1st lateral suture; discontinuous black line on upper two-thirds of 2nd suture. Abd. 1-7 and 10 black above with green, blue or blue-green sheens; narrow basal yellow rings; 8-9 blue or violet blue. var. *draconis* Barnard:

This is said to differ (viz. Barnard) in having the blue patches of 8-9 (which are later obscured by white pruinosity) constricted in the middle of these segments; and the penis having "no spines on lower margin of stem, but with minute denticles on the membranous portion, and the apical lobe with wider excision".

♀. Greenish-brown or ochreous with greenish-black markings, these dark markings of lesser extent than in ♂. Labium and occiput as in ♂. Face and frons orange-ochreous, olivaceous brown or light ferruginous, paler at sides; labrum at base with 3 small black dots, one central the other lateral; postclypeus and frons each with small black basal dot; or the postclypeus above entirely green-black in older specimens. Head above black behind a level just in front of the anterior ocellus, except for a small pale spot just in front of each lateral ocellus. Postocular spots large, oval, green; connected via an orange line across the back of the occipital plate.

Prothorax orange-ochreous or greenish-ochreous; with very broad black median band, enclosing in the centre two small twin oval pale spots and on posterior margin a small triangular median spot; dorso-laterally with small black spot on middle lobe and another on posterior lobe; stylets about 3 times as long as broad, ochreous with black tips. In an older specimen the pale areas are rather darker; the central pale spots are red and much larger, spreading outwards so that the black area is considerably reduced: a broad black posterior median patch, an anterior black triangle and an elongate dorso-lateral black spot. Synthorax with rather similar pattern to the ♂; the dark areas black with green reflection; the very narrow pale median stripe normally present; the pale areas greenish to reddish-ochreous, sides more yellowish-green to pale yellowish; antehumeral stripe broader, equal in breadth to almost two-thirds of each mesepisternum (broader than in *salisburyense*); the greenish-black humeral line very narrow, not fully continued to ventral end, and only about one-fourth as broad as the mesepimeron; at dorsal end this line spreading slightly on the mesepisternum. Black lateral markings reduced to a black spot at dorsal end of each of the two sutures. Very slight white pruinosity on sutures. Legs ochreous; femora with narrow black external line.

Pterostigma elongate, pale greyish-ochreous.

Abdomen with black band along dorsum of 1-7, but not spreading laterally as in ♂; this black having a green, or on posterior segments a brassy, blue or violet sheen; the band severed at distal end of 1 and almost severed at proximal ends of 3-7 by narrow yellow or pale green ring; the dark band, as in several other species, slightly expanded into a spot shortly before distal ends of 2-7. Sides of all segments greenish or yellowish. 8 mainly black, a dull bluish or blackish-green distal dorsal spot; 9 light blue, dull violet or olivaceous with black latero-dorsal spot; 10 all light blue or olivaceous. Cerci blackish.

The ♀ of var. *draconis* appears to agree with normal ♀ *kersteni*.

Abd. ♂ 30-32, ♀ 30-32. Hw. ♂ 20.5-23, ♀ 22-24. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: This species is recorded from most parts of the Ethiopian region; Zanzibar.

Southern Africa. Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal and S. Rhodesia.

Also recorded: Portuguese E. Africa.

REMARKS: One of the commonest Zygoptera in Southern Africa. It frequents streams or pools and may be found very often in company with *P. salisburyense*: The females of these are difficult to distinguish, as has been stated above.

PSEUDAGRION MAKABUSIENSIS Pinh.

(♂ genit. — Pl. 6b.)

Pseudagrion makabusiensis Pinhey 1950, Ann. Transv. Mus., xxi, p. 263, figs. 11-12.

INTRODUCTION: A rather dark species about the size of *salisburyense* and related to

melanicterum Sélys. Head and thorax blackish; narrow green antehumeral stripes. Pterostigma blackish. Abdomen mainly metallic-green; 8-10 dark blue or violet blue. Superior appendages almost as long as 10, widely forked; toothed.

DESCRIPTION: Mature ♂ (Makabusi R.). Labium and occiput whitish-ochreous, the latter dusted with white pruinose. Labrum, genae and epistome glossy bronze-black; frons and vertex in front lilac brown; rest of head above dull black, with only very slight green sheen; postocular spots elongate oval, pale ochreous (bluish in life), connected to or separate from a narrow line across back of occipital plate. Prothorax black, with metallic-green sheen; a narrow greenish-ochreous transverse line just behind the anterior margin, and two small lateral spots of this colour. Postnotal border slightly erect, scarcely trilobed.

Synthorax above bronze and greenish-black; very narrow straight pale green (very pale pinkish-ochreous in some pinned examples) antehumeral lines in lateral half of mesepisternum, these lines not quite reaching anterior border. Sides and ventrum mainly greenish-yellow to ochreous, the mesepimeron in dorso-anterior half invaded by the greenish-black of the dorsum and at dorsal end of mesepimeron this dark colour descends and travels halfway down first lateral suture; a broad black band on second lateral suture. Sides and ventrum coated with white pruinose.

Legs black, lightly dusted with white. Wings hyaline; pterostigma blackish-brown to black.

Abdomen dorsally with a very broad black band with bright green or (more distally) bronze sheen on 1-7 (narrower on 2), this band severed on distal end of 1 and basal end of 2 by narrow pale ring, and almost severed at proximal ends of 3-6 by narrow pale, basal rings except for a very narrow dorsal continuation of the green band. 8-10 and distal end of 7 dark blue or violet blue. Sides and ventrum pale green to ochreous, this pale colour broader on proximal than on distal segments, as the dorsal band extends further down on posterior segments. 1 all round, 2 at sides and also, to a lesser extent 3, dusted lightly with white pruinose.

Appendages blackish-brown; superiors deeply and broadly forked at apex, the upper branch curled down; inferiors narrow (in sideview) directed obliquely upwards.

In side view rather like *angolense*; in dorsal view the superior appendage is seen to bear two teeth on inner margin, one of them very large.

Variety A.

♂. *Hunyani R.* Differs mainly on side of synthorax; black band on second lateral suture still broader; that on first lateral suture extends (as above) halfway along this suture and then curves down obliquely to meet the second suture slightly beyond its midpoint. Postocular spots slightly broader, not joined to line on occipital plate.

Variety B.

♂. *Goromonzi.* Differs from typical form: Labrum and epistome ferruginous; labrum with 3 small black basal dots; postclypeus with very narrow black basal line; genae, frons and front of vertex light ferruginous. Postocular spots not joined to occipital line. Pterostigma dark brown. The blue-violet areas on abdomen 7-10 are replaced by light ferruginous on 7-9; 10 all black.

This is possibly a rather younger stage, although fairly densely whitish on thorax and legs.

A teneral ♂ from Goromonzi is similar to this variety B, but with the face paler ferruginous; postocular spots connected. In life the face was violaceous; eye brown above, pale yellowish-green below; postocular spots bright blue. Antehumerals green; thorax whitish-green at sides. Pterostigma olivaceous. The only ♀ I have seen is a very teneral example not serviceable as an allotype.

Teneral ♀ (Goromonzi). Labium, occiput, face and frons pale ochreous; 3 dark brown spots at base of labrum (1 medial and 2 lateral: postclypeus with very broad dark brown basal band. Vertex black, very slightly greenish; postocular spots as in ♂; pale green; connected by occipital line. Prothorax greenish-black above, with lateral ochreous spot and ochreous anterior transverse line; sides ochreous. Posterior lobe yellowish laterally; gently rounded, slightly raised. Stylets yellowish, about 3 times as long as broad. Synthorax marked as in typical ♂; the pale areas ochreous, the antehumeral line slightly broader than in ♂. Legs pale ochreous, with narrow dark exterior line on femora. Pterostigma pale greyish-ochreous. Abdomen similar to ♂, but the dorsal green band continuous (except for pale basal rings) almost to end of 7; extreme distal end of 7, and 8-10, red on dorsum except for a narrow black terminal ring. Valves yellowish.

♂. ♀ Abd. 28-29.5, hw. 20. Abd./hw. ratio (♂) 1.5.

DISTRIBUTION: Southern Rhodesia: Salisbury (Makabusi R., near Hunyani R.) and Goromonzi, Dec., 1947-Jan., 1948 (Pinhey).

REMARKS: Found very locally on rushes or grasses in very sluggish parts of streams. The ♀ requires description for a mature specimen.

MATERIAL: Holotype ♂ and 6 paratype ♂♂ in Transvaal Museum.

PSEUDAGRION MASSAICUM Sjöstedt.

(♂ genitalia — Pl. 6a, 6b; thorax, abdomen — Pl. 7a; ♀ prothorax — Pl. 7b.)

Pseudagrion punctum massaicum Sjöstedt 1909, Wiss. Ergebn. schwed. Zool. Exped. Kilimandjaro-Meru, Odonata 2, p. 48. (♂, ♀ Kilimandjaro).

Pseudagrion massaicum Ris 1915, Ent. Mittell. 4, p. 141 (♀, Anjouan); id. 1921, Ann. S. Afr. Mus., xviii., p. 310, f. 29; id. 1936, Abh. Senck. nat. Ges., 433, p. 60, f. 26. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 473.

Pseudagrion massaicum var. *cognatum* Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 215, ff. 13 (penis), 15 (genit.); and 1940, l.c., p. 659.

INTRODUCTION: Closely related to *sjöstedti*, *pseudomassaicum* and *acacia*, but otherwise the ♂ is distinct from recorded Southern African species by the red head and thorax and bluish abdomen. It is the smallest of this group of red-headed species. The ♀ has a brassy-metallic thorax.

Ae variable in position, usually much nearer 1st than 2nd Ax, but sometimes almost halfway between. Forewing with 10-11 px, hindwing 8-9 px. Pterostigma covers almost one radial cell. Anal appendages of ♂ as in Ris 1921, but not as in Ris 1936.

DESCRIPTION: Mature ♂. Labium light reddish-ochreous. Occiput of similar colour mainly, but black on dorso-posterior portion; on ventrum marked with whitish-pruinose. Face and head above dark maroon or dark brick red (labrum scarcely paler); narrow black basal line on labrum and postclypeus, and a shorter one at base of frons; head black from a level just behind the anterior ocellus, but leaving a small red spot in front of each of these; and the postocular spots, in the black portion of the occiput, rather large, pyriform, red, almost or quite connected to a narrow red line across the hindmargin of the occipital plate.

Prothorax black above, red at sides; on the black dorsum edged in front by a red line, a narrow one on posterior border; a twin pair of small mid-dorsal red spots and a latero-dorsal red spot.

Synthorax dark orange-red; with rather broad complete black median band; a fairly broad black humeral band, tapering slightly up towards dorsal end, but in dorsal one-third enlarging on mesepisternum as an elongate spot. Sides greenish or yellow or reddish-yellow or metallic-brassy sheen; becoming ochreous and paler ventrally. A short narrow black line on upper half of first lateral suture; an elongate black spot at dorsal end of second suture. Lower part of sides and the ventrum coated with white pruinose. Tibiae and tarsi mainly ochreous, blackish internally; femora black, thinly dusted with white. Pterostigma elongate,

reddish-ochreous, between brown veins. Anal vein starts almost or quite as far proximal to Ac as the length of Ac.

Abdomen rather short and robust. A very broad black dorsal band with bronze or green-metallic sheen on 1-7; on 2 with pale ring at distal end, severed narrowly by the dorsal band; the rest of dorsum of 2 with the greenish-black band very broad, leaving in its centre a pair of small elliptical pale green spots; or occasionally the greenish-black forming a broad-limbed "U" open anteriorly, joined posteriorly to the distal end of the segment. 3-5 with incomplete pale yellowish-green basal ring, severed mid-dorsally; the greenish-black band expanding at distal ends, but usually enclosing a small lateral distal pale spot; sides 1-5 pale greenish-yellow. 6 with pale broken anterior ring, but the rest of 6 and the whole of 7 entirely green or bronze black; 8-9 dark sky blue to violet blue; 10 black (or blue mid-dorsally). Anal appendages black. Inferiors broad and rather hatchet-shaped; inferiors as long as superiors (agreeing with Ris 1921; but in Ris' figure of 1936 the superior appendages are longer).

♀. Rather similarly marked, but duller and paler, with the black somewhat reduced. Labium and occiput pale ochreous, the latter black postdorsally. Labrum and genae orange with 3 black basal dots; rest of face and frons dull ferruginous or reddish-ochreous; narrow black basal lines on postclypeus and frons; black transverse band on vertex as in ♂; postocular spots red, shaped as in ♂; free or joined to narrow olive postoccipital line. Prothorax black, with olivaceous or greenish markings arranged like the red ones in the ♂, but these pale areas larger; stylets only vestigial lumps on posterior lobe, this lobe broad and erect.

Synthorax olivaceous or olive brown, often with rather metallic-brassy sheen on dorsum and paler greenish down to 1st lateral suture, duller more ventro-laterally; black markings on thorax as in ♂. Sometimes the brassy sheen on the dorsum is confined to a broadish band on either side of the black mid-dorsal band. Metepimeron often pale coeruleous. Lower part of sides and the ventrum whitish.

Legs ochreous; femora black externally, lightly dusted with white. Pterostigma ochreous-brown, between black veins.

Abdomen with broad metallic band much as in ♂, on 1-10; sides olivaceous or reddish-ochreous; the dorsal band may be as broad as in ♂ or it may be reduced to a very narrow mid-dorsal stripe, shaped, however, as in ♂ on 3-7; on 2 it may be in those with broad band similar to the markings on 3-6, forming a broad spot before distal end; or where the dorsal band is narrow it is a more lanceolate stripe; 8 and basal part of 9 with this metallic band, joined narrowly to distal end of 9; rest of 9, 10 pale olivaceous, pale bluish, or ochreous, 10 with black dorsal band. Valves ending well before end of 10.

var. cogmanni Barnard: Said to differ in the penis of the ♂ "without lateral spines on stem, the apical hook elongate, with 2 short proximal and 2 elongate distal lobes, and short lateral alate projections". Also said to differ in abdominal pattern of 1-3 in ♀. This is variable in our series of *massaicum*.

Abd. ♂ 26-28, ♀ 26-28, hw. ♂ 18-19, ♀ 20-21. Abd./hw. ratio (♂) about 1.4.

DISTRIBUTION: Cape Province to Kenya, Uganda, Belgian Congo and Angola.

Southern Africa. Transvaal Museum Collection: Series from Natal, Transvaal and S. Rhodesia.

Also recorded from Portuguese E. Africa. *var. cogmanni* from Montagu, Cape Province, Jan., Nov., 1935 (vide Barnard, p. 217).

REMARKS: Locally common over streams, pools or even broad rivers, flying strongly and low over the water; settling on leaves of water lilies, on twigs, rushes, etc.; rather swift for a Coenagrionid and often not easy to net, as it is shy.

PSEUDAGRION PSEUDOMASSAICUM sp. nov.

(♂ genitalia—Pl. 6a, 6b; ♀ prothorax—Pl. 7b.)

INTRODUCTION: Very like *massaicum*, but with longer abdomen; thorax of ♂ not as red and at maturity becomes pruinose blue. Pterostigma covering less than 1 radial cell. Forewing with 11-12 px, hindwing 9-10 px. Ac variable in position, halfway between 1st and 2nd Ax or nearer 1st. The anal appendages of the ♂ resemble the figure of *massaicum* in Ris 1936, but not Ris 1921.

DESCRIPTION: Mature, pruinose ♂. Eyes in life bright red; dull blue ventrally. Back of occiput with black spots. Labium reddish-ochreous, thinly dusted with white pruinose; face and frons as in *massaicum*; a white pruinose line along fronto-clypeal suture: Postocular spots red, narrowish, cuneiform. Prothorax blackish-blue above, with very faint indication of red below the pruinosity, and slightly dusted with white above and at sides.

Synthorax above dark violet blue pruinose with faint indication of a light reddish underlying ground-colour and of black stripes, broader and more uniform than in *massaicum*. Sides pinkish-olivaceous on mesepimeron, becoming paler more ventrally; sides and ventrum rather densely pruinose, so that no black markings are discernible. Femora black, with white pruinosity; tibiae and tarsi light ferruginous. Pterostigma reddish-violet.

Abdomen more elongate than in *massaicum*, marked very similarly, but the entire dorsum marked with black or greenish-black from 1-10; these markings similar on most segments to *massaicum*, with pale anterior rings; that on 2 being a very broad greenish-black band enclosing in centre a rather heart-shaped reddish spot (larger than in *massaicum* and undivided) and at posterior end the band narrowing abruptly and joined to distal end by a short narrow stalk (as in *massaicum*). 7-9 and anal appendages black above; 8-9 dusted with white pruinose and appearing violet blue if not examined with a lens. 10 with narrow black dorsal line.

Anal appendages very similar to *massaicum* (Ris 1921), but the superiors distinctly longer than the inferiors (like *massaicum* Ris 1936).

Less mature ♂ (not fully pruinose). Eyes as in pruinose stage. Back of occiput not showing the black spots. Labrum and genae orange (redder in life) anteclypeus ferruginous; rest of face and frons brick red; three black basal dots (one median and two lateral) on labrum and postclypeus; a short black basal line on frons (as in *massaicum*); scant white pruinosity on postclypeus and on frons in front. Vertex above black; a red spot in front of each posterior ocellus; large pyriform green postocular spots, broadly bordered with black, and connected by narrow greenish line on hindmargin of occipital plate. Prothorax black; edged all round with dull reddish blue, or on posterior margin this pale line broken on either side of a small median spot; in middle of prothorax a small twin pair of reddish-blue spots and a dorso-lateral spot. Synthorax above light pinkish red dusted over very lightly with pruinosity to give a violet effect; black median and humeral bands as in *massaicum*; sides pale yellow or greenish-yellow; narrow black line just below dorsal two-fifths of 1st suture, a small black spot at dorsal end of second suture; sides, interalar spaces and ventrum thinly white pruinose. Legs as in pruinose ♂. Pterostigma a little paler, more reddish-ochreous. Abdomen as above; the heart-shaped pale area in middle of 2 above may be divided by a narrow black medial line. Sides of 1 to base of 3, and whole of 8-9 thinly bluish-white pruinose. A younger ♂ shows traces of pruinosity only on front of frons, on ventrum of thorax and on legs; the thoracic dorsum is dull plum-coloured (almost maroon).

♀. Duller and paler than ♂. Labrum and genae pale yellow, the former at base with three small brown dots; epistome dull orange; rest of face and head above light ferruginous; a black dot on either side of anterior ocellus; a narrow black transverse band across the head over and slightly behind the posterior ocelli. Postocular spots as in ♂, but duller, and only narrowly bordered behind by an incomplete black line. Prothorax light ferruginous;

a narrow black transverse line in posterior half just in front of rather broad hindlobe; posterior margin of this lobe somewhat raised, *straight*, at lateral edges rounded. Stylets, as in *massaicum*, reduced to mere lumps on this lobe. Synthorax pale ferruginous above, pale greenish-yellow at sides; black markings reduced—narrow median line; incomplete humeral line (shaped as in ♂); (a tendency in preserved specimens to form a straight narrow yellow band, due to staining, on either side of the black median line and incomplete at dorsal end). Black sutural markings at sides reduced almost to traces. Thin white pruinosity on sides and ventrum. Legs ochreous; with narrow black external line in distal half of femur. Pterostigma yellow ochre. Abdomen pale ferruginous; at sides of basal segments greenish or yellow-green. On dorsum a bronze-black band shaped as in ♂ (except on 2), but much narrower on segments 3-5; 8-10 almost wholly black; 2 above with a narrow median dorsal band; expanding into a triangle in distal half, then joined by narrow stalk to a terminal ring. Valves distinctly short, ending well before end of abdomen.

Abd. ♂ 31-32, ♀ 30-32. Hw. ♂ 21-22, ♀ 22-24. Abd./hw. ratio (♂) 1.5.

DISTRIBUTION: Southern Africa. Transvaal Museum Collection: Natal—Umhlatuzi R., Dec., 1948 (Pinhey). Transvaal—no locality label. S. Rhodesia—Salisbury, Dec., 1947; Mazoe, Jan., 1948; Sinoia, March, 1948, and Inyagui R.-Mtoko Rd., Dec., 1947 (all Pinhey). Portuguese E. Africa—Masica R., Feb., 1948; Ingamanhé Forest, Sept., 1947 (Pinhey).

REMARKS: This somewhat local species is found flying over rather fast-flowing rivers or broad streams, not over still pools as *massaicum* generally does. I have seen it flying among reeds growing at edges of rapids. Like *massaicum* and *nigerrimum* it has rather a strong flight for a Coenagriid.

PSEUDAGRION NATALENSE Ris

(♂ genitalia—Pl. 6a, 6b.)

Pseudagrion natalense Ris 1921, Ann. S. Afr. Mus., xviii, p. 307, f. 27, Pl. viii, f. 1 (♂, ♀ South Africa; id. 1936, Abh. Senckenb. Naturfor. Ges., 433, p. 32, f. 14.

INTRODUCTION: Larger than *salisburyense*, which it superficially resembles, but at once recognized by the distinct formation of the superior appendages, especially if viewed laterally.

DESCRIPTION: Mature ♂. Eyes, in life, black above, green below. Labium and occiput whitish-ochreous to ochreous. Labrum and genae olivaceous, the former with black basal spot in centre and another at each lateral angle (in life the labrum is more pale bluish-green). Anteclypeus olivaceous; postclypeus, frons and vertex black, the last two in older specimens becoming coated with bluish-white pruinosity. Postocular spots light green.

Prothorax black, with bluish pruinosity; latero-ventrally ochreous. Synthorax bronze-black, with thin pruinose dusting. A very narrow green antehumeral line (or ochreous usually in preserved specimens), nearer humeral than medial suture; at sides greenish-black from humeral suture almost to first lateral suture; rest of sides and ventrum pale greenish (bright green in life) to pale ochreous, with short metallic-black line in upper half of first lateral suture and another stripe, incomplete at ventral end, on second lateral suture. Legs black externally, ochreous on inner surfaces; femora slightly pruinose. Pterostigma very light reddish-brown. Wings tinged yellowish in old specimens. Anal vein leaves margin almost at Ac.

Abdomen bronze-black, covered with bluish pruinosity, which becomes whitish in older specimens (as whitish as in *kersteni*). Superior appendages ochreous, dorsally black; inferiors paler ochreous.

Immature ♂. Pale colours of face, lower half of eye and sides of thorax pale emerald; a horizontal dark brown band round the eye; postocular spots sky blue; thoracic dorsum with

two pale posterior dots; abdomen shiny blue; 8-9 with incomplete broad pale blue dorsal band, that on 8 excavate laterally before its end.

♀. Larger than *kersteni* and *salisburyense*. Labrum and postclypeus orange; anteclypeus light reddish-brown; frons black. Vertex in front light green or olive, black posteriorly; occiput black. Postocular spots pale green, more elongate than in ♂.

Prothorax black with light green median line and lateral spot; posterior lobe almost semicircular; stylets narrow, pale ochreous or olivaceous, half length of prothorax, darkened at apices.

Synthorax bronze-black; a broad pale green to pale ochreous antehumeral band halfway between humeral and medial sutures, and occupying about one-third or more of width of each mesepisternum. Mesepimeron black until halfway to first lateral suture; the rest of sides very pale green, ochreous at ventral end; a short black line in upper half of first lateral suture and an elongate black spot at dorsal end of second lateral suture. Legs ochreous with black lines.

Pterostigma more ochreous than reddish.

Abdomen black with metallic-green sheen. Dorsum of 8-10 with dull blue-green or olive patch, on 8 as a posterior band, on 9 entirely except a latero-dorsal black spot, and on 10 entirely blue-green.

Old specimens show slight bluish pruinosity on dorsum of abdomen 1, at wingbases and interalar spaces. Immature ♀, in life: face, sides of thorax, abdomen and antehumeral stripes, pale greenish-yellow to whitish. Eyes below pale green. Postocular spots pale blue, free or joined across occiput. Wings yellow-tinged. Abdomen 8-10 pale cobalt blue above.

Abd. ♂ 30-32, ♀ 35; hw. ♂ 23-24, ♀ 26-26.5. Abd./hw. ratio (♂) about 1.3.

DISTRIBUTION: Cape Province to Belgian Congo.

Southern Africa. Transvaal Museum Collection: Natal—Balgowan, Feb., 1949 (Pennington). Transvaal—Woodbush, Dec., 1907 (Swierstra); Sterkfontein (Pinhey). Southern Rhodesia—Salisbury, Jan., 1948 (Pinhey); Umtali, Dec., 1947 (Pinhey).

Also recorded from Stutterheim (Cape Province); M'Fongosi and Willow Grange (in Natal).

REMARKS: Personally I have found this to be a local species occurring amongst *salisburyense*, *kersteni* and *angolense* on banks of streams amongst grasses and reeds, in shade or open. Younger males resemble *salisburyense*, the larger *kersteni*, but it is larger than either species and much more green on the thorax.

PSEUDAGRION NIGERRIMUM Pinh.

(♂ genit.—Pl. 6b; thorax, abdomen—Pl. 7a; ♀ prothorax—Pl. 7b.)

Pseudagrion nigerrimum Pinhey 1950, Ann. Transv. Mus., xxi, p. 265, figs. 13-17.

INTRODUCTION: The male is readily distinguished from other *Pseudagrion* by the very black colouring all over its body and, in life, having the lower half of the eye bright red. The ♀ is rather like a large specimen of ♀ *mubicum* or *assegaii*; orange-brown, with rather brassy sheen in the less mature examples; stylets reduced to mere lumps on the postnotal margin.

DESCRIPTION: Mature ♂ (Shawanoya). Head, thorax and most of abdomen above black, the latter with metallic sheens. Occiput and genae very glossy black in front, the occiput ventrally pale ochreous dusted with white. Eyes in life black above, scarlet in ventral half. Labium brownish-ochreous to ferruginous, dusted with white. Thorax with rather long hair. Posterior margin of prothorax almost straight, somewhat erect, curved laterally. The black of the dorsum spreads down the sides to about first lateral suture, except

at dorsal end of mesepimeron, which is olive or olivaceous; a broad black band in upper half of first lateral suture below this olive area. Rest of sides pale olivaceous with continuous black line on second lateral suture. Metepimeron, ventrum of thorax, sides of prothorax, interalary spaces and wing origins coated with dense whitish pruinosity. Legs black, femora dusted with white pruinose. Anal vein rises well proximal to Ac, by more than the length of Ac. Pterostigma dark grey, between black veins.

Abdomen 1-2 black; 1 and dorsum of 2 at base dusted with white pruinose; rest of 2 metallic-green above, except for a narrow yellow annulus at distal end, which is divided mid-dorsally by the metallic green. 3-6 with very broad black dorsal band, reflecting metallic green; this band almost severed at proximal ends by a pale green ring (incomplete mid-dorsally), at distal end spreading down sides except for a small lateral distal yellowish spot on 3-5; a black terminal ring; rest of sides of 3-6 yellow-green to pale olivaceous. 7 wholly black except for rather paler lateral spot at proximal end. 8 light blue in basal two-thirds, 9 in basal half, the rest of 8-10 black. Anal appendages olive brown, black at tips; superiors very short.

In another specimen (Umtali) the sides of the thorax and abdomen are darker, almost ferruginous. The wings are rather smoky, the pterostigma blackish-grey. In another still older specimen, all the pale markings are still darker, the white pruinosity more extensive on sides of thorax; the wings are still more smoky, and the pterostigma black.

Non-pruinose ♂ (Salisbury): Almost as black as the mature specimens; thorax at humeral angles slightly glossy, at sides pale greenish, becoming pinkish more ventrally; pale parts of abdomen pinkish-ochreous or pinkish-brown. Pruinosity starts at leg bases, ventrum of thorax and between the wings.

♀ (Shawanoya). Pale brownish greener in life). Labium and occiput pale ochreous or pale orange, the latter lightly dusted with whitish. Labrum, anteclypeus and gena pale orange, pale orange-ochreous or pinkish-ochreous; labrum with minute black dot in centre at base; postclypeus, frons and vertex to a level of lateral ocelli ochreous-brown; a black spot on either side of anterior ocellus; just behind this a narrow black transverse line runs across the head, starting at base of each eye it runs in towards lateral ocellus, turns back a little and continues behind these ocelli. This black line forms an anterior edge to a rather large postocular green (olive) spot, behind its posterior border a black elongate spot or fine line; the spot may be slightly invaded with pale orange of the occiput. A very short black line marks the lateral boundary of the occipital plate. Prothorax orange brown, with very narrow black posterior transverse line; and a black spot on mesonotum in front of the lateral lobes; posterior margin trilobed, erect; stylets vestigial, mere swellings on this margin.

Synthorax above and on mesepimeron yellow-brown with slight brassy sheen. A narrow black median dorsal band, and a narrow black band on humeral suture which contracts and then expands again at dorsal end in an irregular manner. Sides yellowish-green to pale green; a narrow short dark brown line in upper one-third of 1st lateral suture; a dark brown spot at upper end of second lateral suture. Ventrums ochreous, slightly touched here and there with white pruinosity. Legs ochreous; femora with short black exterior line in distal half. Pterostigma greyish-ochreous between black veins. Wings hyaline.

Abdomen orange to ochreous-brown (more greenish in life); dorsally with a discontinuous blackish band reflecting green: on 1 a large divided basal spot and a short narrow transverse distal line; on 2 a fairly broad band widening to a triangle at three-fourths, then more narrowly connected to a black terminal ring. 3-7 similar, but the band almost severed at proximal end, and at distal end the triangle becomes progressively a circular spot; 8 with broad band scarcely tapering at either end; 9 with broad band tapering to distal end; 10 with very narrow mid-dorsal line. Cerci short, ochreous. Valves long, ochreous.

In an old ♀ (Umtali) there is a strong contrast on the head between the

pale orange labrum, etc., and the rest, which is ferruginous with the markings almost obliterated. Synthorax darker above. Thorax and abdomen ventrally, and 1 above, lightly dusted with white pruinose. Dorsal band on abdomen blacker without the green sheen. Wings very faintly greenish.

Abd. ♂ 29-33, ♀ 29-31; hw. ♂ 21-23, ♀ 23-24. Abd./hw. ratio (♂) about 1.4.

DISTRIBUTION: S. Rhodesia; Portuguese E. Africa.

Transvaal Museum Collection: (Coll. Pinhey). Inyagui R., Salisbury, June, 1947; near Shawanoya - Mtoko Rd., Salisbury, Dec., 1947; Dora R., Umtali, Feb., 1948 (long series).

Other localities where it has been found: Sebungwe Dist. and Chirundu Bridge (Whellan); Odzi R. (Pinhey); Mavita, Oct., 1947 (Portug. E. Afr.) (Pinhey).

REMARKS: Widespread but only common in certain localities. It likes to settle on rushes and grasses at the edges of rivers, streams or small pools, and flies actively, low down over the surface of the water as in the case of *massaicum*.

MATERIAL. (Collected by Pinhey): In Transvaal Museum: Holotype ♂ and Allotype ♀ in copula, Mtoko Rd., 30 miles from Salisbury, 28th December, 1947; 1 paratype ♂ and 1 paratype ♀ in cop., 7 ♂♂ paratypes all from Dora River (? Park River), Umtali, 11th February, 1948; 1 ♂ from Inyagui River, Mtoko Rd., 1st June, 1947.

PSEUDAGRION NUBICUM Sélys

(♂ genitalia—Pl. 6a, 6b; thorax—Pl. 7a; ♀ prothorax—Pl. 7b.)

Pseudagrion nubicum Sélys 1876, Bull. Acad. R. Belg. (2)42, p. 501. (2 ♂♂, Nubia); 1877, C.R. Ent. Belg., xix, p. 211. Kirby 1898, Ann. Mag. Nat. Hist. (7)2, p. 245 (♂, Fort Johnston). Ris 1912, Senckenb. Akad. Wiss., Wien, 121, 1, p. 168, f. 6 a-b (abdomen and append.). Andres 1928, Mem. Soc. R. Ent., Egypte, p. 23, pl. 1, f. 3 (abdomen). Ris 1936, Abh. Senckenb. Naturforsch. Gesellsch., 433, p. 24, nr. 7, f. 9. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 473.

INTRODUCTION: A small coeruleous species, with black lines on body; dorsum of abdominal segment 2 with a black "U". Superior appendage longer than inferior, almost as long as 10th segment, slightly bifurcate at apex.

DESCRIPTION: Mature ♂. Eyes green. Labium whitish. Labrum, occiput, gena, anteclypeus, frons in front and a transverse band on the head in front of the ocelli light blue-green (becoming more olive in preserved specimens); or labrum grass green. A fine blackish line at base of labrum; postclypeus and frons above largely black; vertex black; postocular spots light blue-green to pale green, fairly large, pyriform; not connected to a pale greenish-yellow line along posterior edge of occipital plate.

Prothorax black, margin very narrowly posteriorly, more broadly laterally with a discontinuous pale greenish or blue-green line. A broad transverse blue-green anterior band; on posterior lobe a blue-greenish lateral spot and a much smaller pair in the middle of the dorsum. Hind edge of prothorax scarcely raised, only gently curved. Synthorax above black to humeral suture, with a broad complete blue-green (sometimes olivaceous after death) antehumeral stripe running about midway down the mesepisternum and scarcely broader than the black on either side of it on this plate; this stripe broadest antero-ventrally, slightly narrowing before dorsal end. Sides of thorax light blue, blue-green, pale green or yellowish-green; whiter or yellower ventro-laterally and here lightly dusted with white pruinose; a short black line at dorsal end of 1st lateral suture, becoming a rounded spot where it finishes at about one-third the distance down this suture; an elongate black spot at dorsal end of second lateral suture.

Legs yellow-green; femora blackish on outside. Pterostigma light violet-grey.

Abdomen 1-2, base of 3, 8-9 and a lateral spot on 10 light blue or coeruleous. Rest of 3 and 4-7 light green with, on dorsum, a very broad black band reflecting bright green:

this band almost severed at proximal ends of these segments by a narrow yellow-green ring and just before distal ends it broadens almost to form a transverse band. 1 above with black basal transverse band; 2 above with a black "U", joined to distal end of segment by a short stalk. 10 mainly black. Superior appendages black; almost as long as 10, longer than inferior and slightly bifid at apex. Ventrums of 10 and the inferiors reddish.

Immature ♂. I did not take a young specimen. Longfield says the pale areas are cream and very pale blue.

Mature ♀. Markings on head, thorax and most of the abdomen very similar to ♂, but the ground-colour greener (or sometimes duller blue). Postnotum trilobed, each lobe rounded; stylets appressed to dorsum; yellowish; about 3 times as long as they are wide. Pterostigma pale greyish-ochreous, between dark brown veins. Antehumeral stripes broader than in ♂, and about two-thirds the width of each mesepisternum.

Abd. 1-2 at sides dull blue, paler at distal end of 2; 3-10 laterally green or yellow-green, the distal segments tending to be tinged with pink. 1 above with divided black basal spot. 2 with broad black band, wide at proximal end; constricted slightly and then expanded in distal half and again excised on either side just before the end of the segment. 3-7 above as in ♂. 8 with broad black band above, sharply constricted just before distal end; 9 with black basal spot on dorsum. Sides of 8 green in proximal half; rest of 8-9 and whole of 10 light blue; ventrum of these segments pinkish.

Abd. ♂ 24-26, ♀ 22-26. Hw. ♂ 18-19, ♀ 17.5-21. Abd./hw. ratio (♂) about 1½.

Measurements (in Ris): Abd. ♂ 24.5, ♀ 22.5; hw. 16. In Andres: Abd. ♂ 22.5, ♀ 23.5; hw. ♂ 15, ♀ 16.5.

DISTRIBUTION: S. Rhodesia to Sudan and W. Africa.

Southern Africa. Transvaal Museum Collection: S. Rhodesia—series from Salisbury, Dec., 1947-March, 1948 (Pinhey).

REMARKS: Locally common and gregarious in summer over rather stagnant pools and streams at Salisbury. It may be found in company with *P. assegaii* with which it is easily confused as they are both coeruleous. The ♀ is different in colour.

PSEUDAGRION SALISBURYENSE Ris

(♂ genit.—Pl. 6a, 6b; thorax—Pl. 7a; entire insect—Pl. 20; venation—Pl. 29.)

Pseudagrion salisburyense Ris 1921, Ann. S. Afr. Mus., xviii, p. 306, f. 26 (Kingwilliamstown, etc.).

INTRODUCTION: Closely related to *kersteni* and *citricola*. Mature ♂ dark pruinose blue, with green postocular spots. ♀ very similar to *kersteni* ♀ but with narrower antehumeral stripes.

DESCRIPTION: Mature ♂. Labium and occiput whitish-ochreous; labrum and gena pale green or olivaceous; labrum darker at base; epistome ochreous, postclypeus above broadly dark brown at base. Frons and vertex black; postocular spots small, circular, pale green; a short ochreous line on posterior margin of occipital plate. Prothorax black above with metallic-green sheen and dusted slightly with pruinose bluish-white here and on the ochreous sides. Synthorax bronze or greenish-black evenly dusted with fine bluish pruinose giving the whole dorsum a dark blue appearance; in occasional, mature specimens there is a fine pale ochreous non-pruinose antehumeral line, incomplete at dorsal end and placed nearer humeral than median suture. The metallic black at sides reaches down to 1st lateral suture and overlaps this somewhat in dorsal one-third; rest of sides and ventrum pale ochreous or olivaceous, with broad black band in upper half of 2nd suture. Sides and ventrum thinly white pruinose. Legs black; outer surface of tibiae and tarsi brownish-ochreous; femora with white dusting. Pterostigma ochreous brown, narrow, distal angle more acute than in *kersteni*.

Abdomen with broad bright greenish or bronze-black band from 1-10, but relieved by broad light blue or violet blue band on 8-9; and by narrow yellow intersegmental rings, incomplete mid-dorsally. Sides ochreous. Thin bluish-white pruinosity on 1 to base of 3. Superior appendages blackish, inferiors ochreous.

Immature ♂. No pruinosity. Pale markings on head light ferruginous. Prothorax above metallic green-black, with anterior and lateral margins and a dorso-lateral spot pale pinkish-ochreous. Synthorax bright greenish-black, sides and dorsal markings pale pinkish-ochreous; narrow mid-dorsal line, narrow complete antehumeral lines, placed about their own width from humeral suture. At sides the green-black does not quite reach 1st suture, but at dorsal end of this there is a narrow green line; small metallic spot at dorsal end of 2nd suture, with a faint brownish streak leading from this along the suture. Legs pale pinkish-ochreous with narrow dark external line. Abdomen very similar, but without pruinosity and the blue and green metallic sheen brighter.

♀. Similar to *kersteni* ♀ but smaller, with narrower antehumeral stripes. Labrum, gena and epistome pale green (labrum sometimes sky blue); labrum with narrow and postclypeus with slightly broader black basal line; frons dull orange-ochreous, with black spot in middle of base. Vertex orange-ochreous in an anterior line, back to anterior ocellus; the rest of head above black, except for a small ochreous dot in front of each lateral ocellus and pyriform pale green postocular spots which are connected via a narrow ochreous line across back of occipital plate. Prothorax black above, ochreous at sides; above marked with pale pinkish-ochreous; anterior and lateral margins, a dorso-lateral spot, a pair of small mid-dorsal twin spots and almost procumbent stylets (each about 2½ as long as broad); also a small pale pink dot in centre of the rather semicircular posterior margin. Synthorax marked very like the immature ♂, with the pale markings more ochreous or pale green, occasionally sky blue; antehumeral bands broader than in ♂, almost reaching humeral suture, but not as broad as in *kersteni* ♀; metallic-green at sides descending less far, only in upper third of mesepimeron; sutural markings as in ♂. On metepimeron a short way below 2nd lateral suture a pale green stripe. Legs as in immature ♂. Pterostigma rather pale ochreous, narrow. Abdomen very similar to immature ♂, but the blue patches on dorsum of terminal segments consisting of a rather broad triangular area on distal half of 8, a distal band on 9 sending a tapering point forwards mid-dorsally and laterally (and thus trident-shaped), and the blue covering most of dorsum of 10.

Pruinosity consists usually of blue marks in interalar spaces and on dorsum of abdomen 1; very thin white dusting on ventrum of thorax and base of legs. In one old ♀ (from Umtali), however, the pruinosity is extensive: coated with whitish pruinose over most of the body, rather obscuring the markings. The specimen at first sight looks like a faded ♂ *kersteni*, and the thoracic markings add to the resemblance. Face and head above mainly black; labrum and gena light green, the rest, including the postocular spots, dusted with white, rather more densely than the ♂. Whole thorax and abdomen 1-2 rather thickly white-coated, the rest of the abdomen more thinly. Antehumeral bands showing faintly. Pterostigma narrow olivaceous, between brown veins; wings slightly smoky.

This very pruinose stage of the ♀ is seldom seen.

Abd. ♂ 26.5-30, ♀ 27.5-29. Hw. ♂ 19-21, ♀ 21-22. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: Cape Province to Belgian Congo; Angola.

Southern Africa. Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal, S. Rhodesia and Portuguese E. Africa.

REMARKS: Common and gregarious along grassy banks of streams and pools throughout the year.

PSEUDAGRION SJÖSTEDTI Förster.

(? ♂ genit. — Pl. 6b.)

Pseudagrion sjöstedti Förster 1906, Jahresh. Mannheim, Ver. Nat. 71-72, p. 62 (♂, Cameroons).
Ris 1921, Ann. S. Afr. Mus., xviii, p. 312, f. 30; id. 1936, Abh. Senckenb. Naturf. Ges. 433,
p. 57, nr. 24, f. 29 a, b.

INTRODUCTION: Closely related to *massaicum* but larger; red thorax with narrower black lines; dorsum of abdomen 2 black. Also related to *mortoni* Ris and to *acacie*.

DESCRIPTION: ♂. Labium whitish; occiput below dull greyish-ochreous. Labrum, epistome, genae, frons and anterior part of vertex brick-red; posterior part of head, including ocellar region, blackish; large round reddish or ochreous postocular spots, bordered all round with black of the occiput; a yellowish line across occipital plate. Prothorax black, with whitish pruinosity, large round red dorso-lateral spots, red median line; posterior lobe narrow and erect. Synthorax brick red; with narrowish black median line; narrow or broad black humeral band, slightly enlarged in upper half. Sides olivaceous, with white pruinosity; ventrum dull reddish-ochreous, also with white pruinosity. Legs black; tibiae and tarsi broadly yellowish externally. Wings hyaline to slightly yellowish; pterostigma reddish, its distal-costal angle acute.

Abdomen very slender; bronze-black on dorsum; bluish pruinose on 1, base of 2, basal two-thirds of 8 and basal half of 9; narrow reddish-ochreous terminal rings, dorsally interrupted, on 1-5; ventrum reddish-ochreous.

Anal appendages short and obtuse.

♀. Dorsum of head olivaceous; black border of postocular spots reduced to narrow, incomplete anterior and posterior curved lines. Prothorax olivaceous, the furrows narrowly black; posterior lobe erect, with median semicircular projection; stylets longish, about one-third length of prothorax, depressed, narrow, slightly divergent. Synthoracic dorsum olivaceous with trace of reddish shading; narrow black medial and humeral lines, the latter slightly irregular and interrupted. Sides and ventrum dull ochreous; black dots at dorsal ends of 1st and 2nd sutures.

Legs ochreous; femora outside and tibiae inside lined with black. Wings as in ♂. Pterostigma greyish-ochreous.

Abdomen long and slender; ochreous or olivaceous; a black dorsal band consisting of broadish lanceolate stripe on most segments interrupted at proximal ends of 3-7; with very broad distal dilatations on these segments: 8 black above; 9 with broad black basal triangle; 10 olivaceous.

Abd. ♂ 30 - 35, ♀ 32; hw. ♂ 20 - 22.5, ♀ 21. Abd./hw. ratio (♂) about 1.6.

PLATE 7b.

PSEUDAGRION, ACIAGRION, ISCHNURA, ENALLAGMA.

Pseudagrion, hindlobe of prothorax in female:—

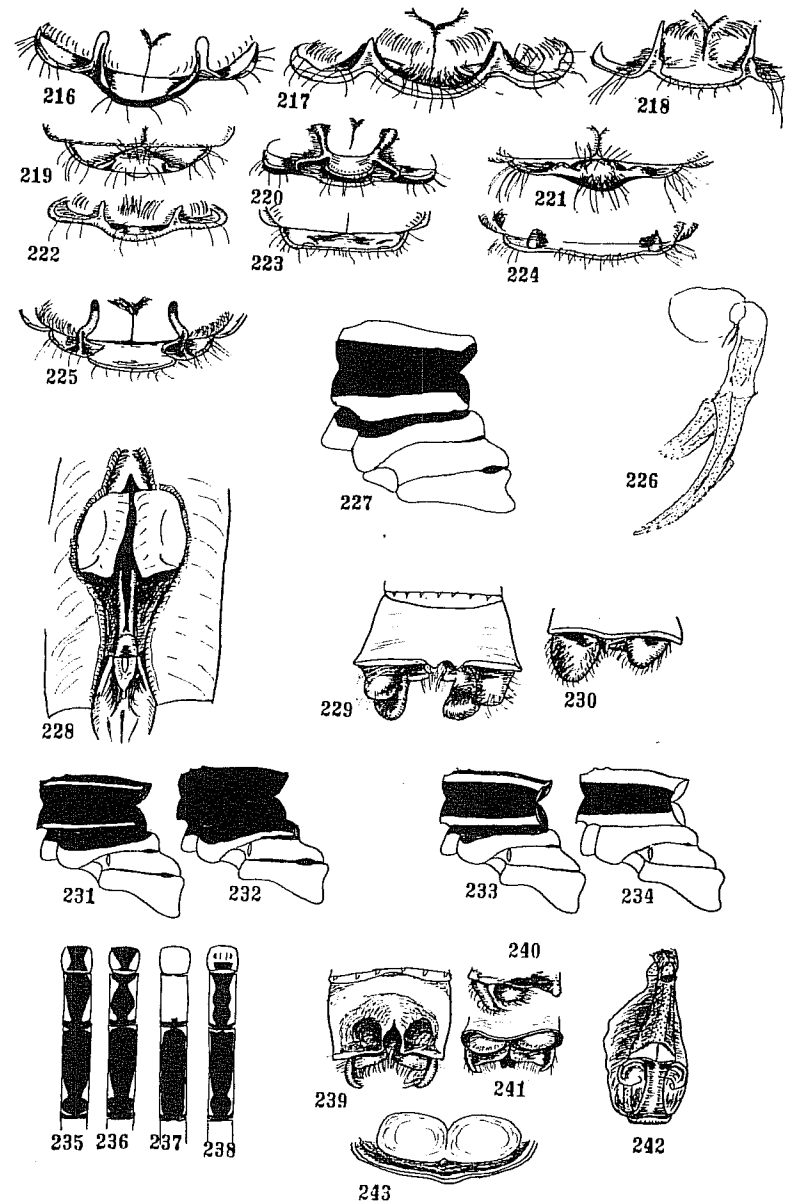
216. *angolense*. 217. *furcigerum*. 218. *caffrum*. 219. *massaicum*.
220. *nubicum*. 221. *nigerrimum*. 222. *assegii*. 223. *pseudomassaicum*.
224. *gigas*. 225. *kersteni*.
226. *kersteni*, bursa copulatrix.
227. *Enallagma pseudelongatum*, thorax.

Aciagrion attenuatum, male:—

228. Accessory genitalia. 229-230. Anal appendages.

Ischnura senegalensis:—

- 231-232. Thorax of male. 233-234. Thorax of female (233 homochr., 234 heterochr. and intermed.)
235-238. Abdomen 1 to 3, male, homochr. female, heterochr. female and intermed. female, respectively.
239-241. Anal appendages, male, from above, left side and below.
242. Penis. 243. Hindlobe of prothorax, female.



DISTRIBUTION: Southern Rhodesia, Belgian Congo to Cameroons and Gold Coast.
Southern Africa. (Ris): S. Rhodesia — Salisbury, March, 1905 (Marshall).

REMARKS: A very dark species, almost as black as *nigerrimum*, was found by Whellan at Chirundu Bridge, Zambesi. In anal appendages this seemed near *sjöstedti* and the blackish thorax showed an underlying reddish tinge.

MOMBAGRION Sjöstedt.

Mombagrion Sjöstedt 1909, *Ergeb. Schwed., Kilimandjaro-Meru Exped.* 2(14), p. 44, pl. 2, f. 17.
 Sjöstedt 1917, *Arkiv. für Zool.* 11: 14, p. 14 (redescription). Schouteden 1934, *Ann. Mus. Congo Belge* (3)2: (3)1, p. 81. Longfield 1936, *Trans. R. ent. Soc., Lond.*, 85: 20, p. 472.

Genotype *MOMBAGRION GRACILE* Sjöst. (1909).

REMARKS: Not so far recorded from Southern Africa. Very closely related to *Pseudagrion*. Two species known.

ACIAGRION Sélys.

Actagrion Sélys 1891 (subgenus of *Pseudagrion*), *Ann. Mus. Stor. nat. Genova* (2)X, pp. 30, 509; id. 1892, *Ann. Soc. Ent. Belg.* xxxvi.

Genotype *ACIAGRION HISOPA* Sélys.

INTRODUCTION: Near *Pseudagrion* (and the tropical African *Mombagrion* Sjöst.), but with fewer px in forewing and having a vulvar scale on 8th sternite of ♀.

DESCRIPTION: Similar to *Pseudagrion*, but with 9-12 px in forewing, instead of 14 or more; IR₂ rising at about 8th px. ♀ with vulvar scale on 8th sternite. R₄₊₅ rising almost at subnodus in forewing. General colouring black, blue and green. Apex of wing rather pointed.

REMARKS: This genus is found in tropical Africa and Asia. One of the few African species, *A. attenuatum* Fraser, has been recently taken in S. Rhodesia by Whellan.

ACIAGRION ATTENUATUM Fraser.

(♂ genitalia — Pl. 7b; entire insect — Pl. 20; venation — Pl. 30.)

Actagrion attenuatum Fraser 1928, *Trans. Ent. Soc., Lond.*, 1, p. 126 (1 ♂, Zomba, Nyasaland).

INTRODUCTION: A Coenagruid with very long abdomen. A specimen which seems to fit this species was taken in S. Rhodesia by Mr. J. A. Whellan (1948).

The following description is extracted from Fraser's original:

DESCRIPTION: ♂. Labium white; labrum dark brown, paler along anterior margin; rest of head dark purplish-brown; occiput pale olivaceous-brown. Prothorax and synthorax warm brown above, bluish at sides; each lateral suture on synthorax with black spot at upper end. Legs pale yellow with a few very short black spines. Venation brown, wings hyaline; pterostigma brown, edged with pale line, between dark brown veins; pterostigma larger in forewing than in hindwing. A' starts at Ac; 3 antenodal cellules present between discoidal cell and subnodus; forewing with 12 px, hindwing with 11.

Abdomen extremely long and attenuated, slightly expanded distally. Pale yellow at sides; dorsum marked with reddish brown; each segment with black distal ring, except 8-10 entirely azure blue. Anal appendages warm dark reddish-brown. Superior appendages shorter than 10, small, conical. Inferiors much more robust, equal in length to 10, conical and very bluntly pointed as seen in profile, laterally compressed when seen from above, convex externally, concave internally; apex slightly incurved, so that the appendage is shaped "like a boxing glove without the thumb portion". Segment 10 dorsally very shallowly excised.

The specimen (♂) taken by Whellan in the Sebungwe district has the pale colours greenish-blue on head and abdomen and on thorax pale greenish; 8-10 azure blue. Dorsum of abd. 2-6 with narrow reddish-brown median band, broadening to a spot at distal ends; 7 with very broad dorsal band. Hamules small, squarish.

♀. Apparently unknown.

♂ Abd. 35; hw. 24. Abd./hw. ratio (♂) 1.5.

In the Rhodesian specimen the pterostigma is more elongate transversely in hindwing than in forewing.

DISTRIBUTION: Nyasaland; S. Rhodesia.

Southern Africa. In Department of Agriculture, Salisbury: S. Rhodesia — Nagopande R., Sebungwe, Oct., 1948 (Whellan).

ISCHNURA Charpentier.

Ischnura Charpentier 1840, *Libellul. Europ.* 20. Kennedy 1917, *Proc. U.S. Nat. Mus.*, 52, p. 496 (penis). Ris 1921, *Ann. S. Afr. Mus.*, xviii, pp. 267, 333. Fraser 1933, *Fauna Br. Ind. Odonata*, 1, p. 346. Longfield 1936, *Trans. R. ent. Soc., Lond.*, 85: 20, p. 471. Barnard 1937, *Ann. S. Afr. Mus.*, xxxii, p. 222.

Micronympha Kirby 1890, *Cat. Neur. Odon.*, p. 140 (nom. nov. for *Ischnura* Charp., preocc. by *Ischnurus* Koch 1837).

Genotype *AGRION ELEGANS* van der Linden (1820) (Europe).

INTRODUCTION: Closely allied to *Enallagma* in venation and build, but recognizable in the field by a more brilliant metallic-blue sheen on the body and, in the ♂, the bicoloured pterostigma of the forewing. The genus is interesting in having polymorphic species. In the commonest African species (the only one so far recorded in Southern Africa) the ♂ is very variable in size and development of antehumeral stripes; and three forms of the ♀ can be distinguished, the orange heterochromatic one being very conspicuous in its habitat.

Micronympha, proposed by Kirby to replace *Ischnura*, preoccupied by an Arachnid genus *Ischnurus* Koch, has not been retained in litt.

DESCRIPTION: Pterostigma of same shape, elongate rhomboidal in both wings, but in the forewing bicolorous (pale in outer part, dark on proximal portion), in hindwing (in our species) unicolorous light brown. Arculus at 2nd Ax, or very slightly distal; anal vein leaves margin of wing more proximal to Ac than the length of this crossvein; R₂ in forewing usually at 4th px*, at 3rd in hindwing; IR₂ at 6th px; 1A reaching to about 6th or 7th px; forewing with about 8 px. In ♂ the basal segment of the abdomen slightly swollen; 10th segment usually with dorsal bifid ridge at posterior end. In ♀ the 8th sternite usually (always in the local species) with an apical vulvar spine. ♀♀ dichromatic or polychromatic. ♀ with black stripe on external surfaces of 2nd and 3rd tibiae (this is often the case in *Enallagma*, but not in a few species). Posterior hamules of ♂ small, conical; penis with bilobed apical hook (Barnard).

REMARKS: *I. senegalensis* is common throughout Africa. There are several other species, mostly confined to North Africa and from thence to Europe. The genus is cosmopolitan.

Ischnuragrion rarum Longf., of Angola, which Fraser (Aug., 1948) informs me may possibly belong to this genus, will probably be found in the faunistic region here discussed. It differs, however, in what are generally considered important characters: anal vein leaves margin at Ac instead of considerably proximal; and the pterostigma is similar in colour and shape in forewing and hindwing.

NYMPHS: Refer Barnard 1937, p. 222.

* Not 5th or 6th as stated in Barnard.

ISCHNURA SENEGALENSIS Ramb.

(Thorax, abdomen, ♂ genit., ♀ prothorax—Pl. 7b; venation—Pl. 29.)

Agrion hastulatum Burmeister 1839 (pars), Handb. d. Entom. II, Berlin, p. 820 (Cape of Good Hope).*Agrion senegalense* Rambur 1842, Hist. Nat. Insectes, Névropt., Paris, p. 276, nr. 24 (Senegal, etc.).*Ischnura senegalensis* Sélys-Hagen 1850, Rev. des Odonates, etc., pp. 186, 190, pl. 7, f. 4. Ris 1908, in Schultze's Forschungsreise, Denkschr. med. nat. Ges., xlii, p. 310, nr. 18; id. 1921, Ann. S. Afr. Mus., xviii, p. 333, f. 42. Fraser 1923, J. Bomb. Nat. Hist. Soc., 29, p. 754. Andrus 1928, Mem. R. Ent. Soc., Egypte, 3, p. 25, pl. 3, ff. 5, 6. Fraser 1933, Fauna Br. Ind. Odonata, 1, p. 348, ff. 150, 151. Longfield 1936, Trans. R. ent. Soc., Lond., 85, p. 471. Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 222.*Micronympha senegalensis* Kirby 1890, Catal., p. 141; id. 1898, Ann. Mag. Nat. Hist. (7) 2, p. 244 (Transvaal).

INTRODUCTION: In the field this species can be recognized in the case of the ♂ by its dark, hairy thorax; the dark blue and green metallic dorsum of the abdomen, with the basal segments slightly swollen; and the pterostigma of the forewing being pale blue in outer half, brown on inner half. The ♀ is more easily confused with *Enallagma*, but the heterochromatic form with bright orange thorax and base of abdomen is readily distinguished.

In comparing our series I also find considerable variation in ♂♂, particularly in size and development of black markings, but insufficient for specific separation.

DESCRIPTION: Mature ♂. Labium and occiput whitish-yellow. Labrum very pale green with ferruginous basal line; genae and postclypeus darker green; frons olive green in front and at sides. Postclypeus brilliant steely blue-green; rest of frons and vertex black with green and bronze sheens; postocular spots small, rounded, isolated, pale green or blue. No pale stripe on occipital plate. In old specimens the labrum may become ochreous or even light brown and the top of the head almost dull black. Prothorax bronze- or green-black; a large pale bluish or greenish lateral patch and a moderately broad anterior margin of this colour; hindlobe small, divided into three rounded portions, the lateral ones short and narrow, the median one longer and broader and rather erect. Synthorax bronze or green-black; with or without narrow pale green or bluish antehumeral lines: if present they are nearer humeral than median suture, they may be almost complete except at extreme dorsal end, or very short or merely a series of short lines and spots instead of a complete line. At sides the green-black descends two-thirds of the way to the 1st lateral suture. Rest of sides pale blue or blue-green, more yellowish ventrally. A short blackish line at dorsal end of 1st suture and another short line at dorsal end of 2nd; or that on 1st suture may be absent, that on 2nd may be broadly or very narrowly continued for almost the whole length of this suture. Blue pruinosity between wings of old specimens.

Tibiae and tarsi yellowish with black external band; femora mainly black with yellow-green on inner surface. Wings hyaline; in old specimens rather smoky; venation yellowish-brown. Pterostigma narrow rhomboidal; in forewing bluish-white or white in outer half or third, brown in proximal half; in hindwing light brown mainly, tending to whiteness in distal angle or along costal edge; in some specimens on the outer whitish part of the forewing a bright coeruleous spot.

Abdomen 2 and 7-10 slightly inflated, the intermediate segments cylindrical, often very slender. Sides of 1 to base of 3 light blue-green or pale green; rest of 3 to 7 yellow; and sides of 8-10 light blue. A broad black dorsal band with metallic blue, green or bronze sheen: on 1 broadly excavate on either side posteriorly; on 2 with brilliant blue sheen and also broadly excavate at sides in posterior half; on 3-7 broad and forming a still broader spot before distal end, and tending at proximal end to be narrowed by a yellow ring. 8 entirely pale blue or coeruleous except for a narrow green-black dorso-basal ring; 9 broadly black, the lateral delimitation being horizontal or obliquely upward (in one specimen this band is severed in posterior half); 10 less broadly black. On dorsum of 10 a slightly bifurcate prominent tumour at posterior end. Anal appendages black; superiors short and

broad; inferiors long, directed obliquely upwards, and more yellowish in basal half.

Accessory genitalia: Penis—see Pl. 7b.

In teneral specimens the paler markings are more whitish and the dark ones ferruginous.

♀. *Homœochromatic* (Andromorphous) form. Similar to ♂, with much the same extent of variation: black basal band on labrum sometimes broader. Prothoracic hindlobe a transversely broad triangle, erect. Antehumeral lines and sutural markings varying as in ♂. Tibiae mainly black. Pterostigma very narrow, similar in both wings: pale greyish-ochreous surrounded by narrow whitish line, between brown veins. Dorsal band on abdomen 2 not quite as broad in proximal half and not such a brilliant blue; on 3-6 also a little narrower and ending in a dark distal ring; and sometimes with black lateral markings; 9 with the dorsal black excavate irregularly on sides. Valves extending slightly beyond end of abdomen. Dorsum of 10 raised into a posterior hump.

♀. *Heterochromatic* form. Pale colouring on head, thorax and base of abdomen bright orange in immature and fairly mature specimens; becoming dull orange, brownish or olivaceous in older ones. Blackish markings reduced. On frons the green-black is only at the base. Postocular spots large, cuneiform, orange, connected by an orange line at back of occipital plate and not demarcated posteriorly from the yellowish-orange occiput.

Prothorax entirely orange, except a broad green- or bronze-black median band excavate laterally, and not continued on to anterior or posterior margins; posterior lobe as in the homœochromatic form. Synthorax orange with a green- or bronze-black median band covering half of each mesepisternum; the orange on either side of this sometimes developing a narrow whitish strip in rather older examples. Sides and ventrum paler; no sutural dark markings; but in occasional specimens a brownish suffusion spreads along the humeral suture. Legs orange; a narrow brown line on external surface of tibiae, but only the merest traces, if at all, on femora. Pterostigma as in the first form of ♀. Abdomen 1-2 orange entirely, except a narrow green-black terminal ring on 2; 3-10 with broad green-black continuous band, almost severed at proximal ends of 3-7 by narrow orange ring, and at distal ends of these segments ending in a narrow green-black ring. Sides of 1-2 orange, the rest greenish-yellow. Sometimes on dorsum of 2 a partial band at distal end.

♀. *Intermediate* forms. In one of these forms the postocular spots are isolated (surrounded by black), small green as in the homœochromatic ♀, and there is a complete green-black dorsal band from 3-10. The prothorax is black, except for the orange anterior margin and a large orange lateral patch; synthorax as in heterochromatic ♀; abdomen 1 orange, but with traces of brown on dorsum and a very narrow terminal ring. In another intermediate form the appearance is similar, but the green postocular spots are not separated from the orange of the occiput. In these intermediates the ground-colour varies from orange to brown as in the heterochromatic form.

♂ Abd. 21-26; hw. 14.5-18. Abd./hw. ratio about 1.5.

Homœoch. ♀ Abd. 23-24, hw. 16-18.

Heteroch. ♀ Abd. 22-26, hw. 15-19.

Intermed. ♀ Abd. 22-24, hw. 16-18.

DISTRIBUTION: Distributed throughout Africa from South Africa to Egypt; Zanzibar; Seychelles. India.

Southern Africa. Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal, Portuguese E. Africa and S. Rhodesia.

REMARKS: Common and widespread, even gregarious. In one locality near Pretoria they can be seen in very large numbers, but very few other dragonflies. They like still pools and streams. Fraser 1923 mentions 3 forms of the ♀.

NYMPH: Refer Barnard 1937, p. 223.

ENALLAGMA Charp.

Enallagma Charpentier 1840, Libellul. Europ., 21. Sélys 1876, Bull. Acad. R. Belg. (2)41 : 2-3, and 1877, Synops. Agrionin. Leg. Agrion, C. R. Ent. Belg., xix., pp. 7 and 79. Calvert, 1902, Biolog. Central Amer. Neuropt., p. 101. Ris 1908, in Schultze's Forschungsreise, Denkschr. Med. Naturw. Ges. Jena, xiii., p. 310, and 1921, Ann. S. Afr. Mus., xviii., pp. 267 and 317. Fraser, —, Fauna Brit. Ind. Odonota, i., p. 371. Longfield 1936, Trans. R. ent. Soc., Lond., 85 : 20, p. 474. Barnard 1937, Ann. S. Afr. Mus., xxxii., p. 218. Fraser 1947, Proc. R. ent. Soc., Lond. (B) 16 : 11-12, p. 143 (♂ append.).

Africallagma Kennedy 1920, Ohio J. Sci., 21, p. 87 (genotype *E. glaucum* Burm.).

Ischnallagma Kennedy, loc. cit. (genotype *E. elongatum* Martin).

Proischnura Kennedy, loc. cit. (genotype *E. subfurcatum* Sélys).

* ? *Coenagrion* Schouteden 1934, Ann. Mus. Congo Belge (3)2 : (3)1, p. 81.

Genotype of *ENALLAGMA* Charp.: *AGRION CYATHIGERUM* Charp (1840).

INTRODUCTION: The possible synonymy of Kennedy's names with *Enallagma* or their doubtful generic value is discussed by Longfield and Barnard. *Proischnura* might be retained in subgeneric rank for *subfurcatum* and *rotundipenne*, i.e. those species having the 10th segment of the ♂ prominently raised and apically forked, the pterostigma smaller on forewing than on hindwing, and the penis said to be intermediate in character between *Ischnura* and *Enallagma*. *Africallagma* and *Ischnallagma*, on the other hand, having a notched dorsal carina on 10 are less distinct. The recorded Southern African species do actually fall into three groups, the first equivalent to that of *Proischnura*; the second *Africallagma* including *glaucum* and its relatives *nigradorsum*, *subtile*, and *sapphirina* Pinh., with the superior appendages usually rather short, directed more or less horizontally backwards; and a third group, *Ischnallagma*, consisting of *elongatum* and *sinuatum* with the superior appendages longer and directed downwards. These groups are indicated in Ris' key and I do not see why Barnard should consider otherwise. For purposes of identification it is, however, more satisfactory I think to combine them in one key as they are one of the more difficult genera among Southern African Odonata to separate into species and there appears to be no sufficient reason to use subgeneric names. The genus is very close to *Ischnura*.

In the field these insects are usually easily recognized by their small size (intermediate between *Agrionemis* and *Pseudagrion*) and their colouring which is bright blue or blue-green in ♂ and greenish or yellowish in ♀♀ (pink in immature stages). The larger species, *elongatum*, *sinuatum* and the northern *pseudolongatum* might be mistaken for *Pseudagrion* when collecting, but can be separated by the distance from origin of anal vein to Ac.

DESCRIPTION: Mostly small species or very small. Arculus at or very slightly distal to 2nd Ax; origin of A' well distal to Ac (by more than length of Ac); R₅ at 5th or 6th px in forewing, at 4th or 5th in hindwing. Pterostigma unicolorous in both wings, but often slightly different in size. 10th segment of ♂ normally raised dorsally at least on posterior half; 8th sternite of ♀ with a vulvar spine. Posterior hamules small, conical. Penis (according to Barnard) with bifid apical hook.

REMARKS: Most of the known Ethiopian species have been recorded from Southern Africa. *E. glaucum* is certainly far commoner than the others.

A new species *sapphirina* is included. Barnard's *polychromaticum* has the general facies of an *Agrionemis* rather than an *Enallagma* and I am transferring it there.

KEY TO SPECIES (Ris' key modified).

♂♂. (refer Pl. 8a.)

- 1 — Dorsum of 10th abdominal segment rather abruptly elevated, terminating in two small rounded posterior lobes separated by a narrow excision (see Pl. 8a). Superior appendages directed horizontally backwards, with no ventral spine; inferiors much shorter . . . 2

* See below under the species *Enallagma glaucum* Burm.

- Dorsum of 10 gradually or not at all elevated, not forming distinct small posterior lobes, the end of the segment with narrow triangular or broad shallow excision. Appendages varied 3
- 2 — Mesepisternum of thorax with raised rounded tubercle at ventral end. Pterostigma with longitudinal diagonal considerably longer than transverse diagonal (i.e. pterostigma a very flattened quadrilateral). Wings with narrow apices. Abdomen 23-25 mm., hw. 16-18 mm. *E. subfurcatum* Sélys
- Mesepisternum without elevated lobe. Pterostigma a rhombus, scarcely longer than broad. Wings broadly rounded at apices. Abd. 19-20 mm. Hw. 13-14 mm. *E. rotundipenne* Ris
- 3 — Abdomen with black dorsal band very reduced on 3-4, where it is almost confined to a large distal spot, projected as a narrow line forwards. Superior appendages very short, directed horizontally and with ventral spine; inferiors extending much further as a horizontal spinous process. Ac midway between 1st and 2nd Ax or nearer 1st. Abd. 19-20, hw. 14-15 mm. *E. sapphirina* Pinh.
- Abdomen 3-4 dorsally with more or less continuously broad black dorsal band, somewhat expanded before distal end. Abd. 19-21 mm., hw. 14-16 mm. 4
- 4 — Ac nearer level of 1st Ax than to 2nd Ax. Superior appendages shorter than 10, directed more or less horizontally backwards; end of 10 broadly and shallowly excised. Dorsum of thorax and abdomen mainly black. Abd. 20-21 mm., hw. 13-14 mm. *E. nigradorsum* Sélys
- Ac midway between 1st and 2nd Ax or nearer 2nd Ax 5
- 5 — Superior appendages directed horizontally backwards, roughly triangular in dorsal view, with long ventral spine 6
- Superior appendages bent strongly downwards. No distinct ventral spine 8
- 6 — Pale colours pinkish or ochreous, not bluish, except on terminal segments. Pterostigma and anal appendages very pale yellowish. Abd. 25, hw. 15 mm. *E. subtile* Ris
- Pale colours blue or violaceous. Pterostigma brownish-ochreous to black. Anal appendages blue or blackish 7
- 7 — Very long slender abdomen: Abd. 26, hw. 19.5 mm. Pale colours on thorax bright blue. Usually no pale median dorsal line on thorax. A' starts not more proximal to Ac than length of Ac *E. pseudolongatum* Longf.
- (Not yet recorded from Southern Africa.)
- Abdomen less elongate: Abd. 20-25, hw. 13-19 mm. Pale colours blue-green or violaceous. A' starts more proximal to Ac than length of Ac *E. glaucum* Burm.
- 8 — Superior appendages bent down (and spiny) at base, but their apices bent back horizontally, obtuse. Inferiors with long slender dorsal spine. Generally a smaller species. Abd. 23-26, hw. 17-20 mm. *E. elongatum* Martin
- Superior appendages bent downwards for their whole length; sinuous if seen in dorsal view, almost straight down in sideview. Inferiors with short dorsal spine. Generally larger species. Abd. 28-30, hw. 19-21 mm. *E. sinuatum* Ris
- ♀♀. (refer Pl. 8b — ♀ prothorax).
- 1 — Femora and tibiae with black exterior lines; a metallic-greenish or black line on humeral suture, generally complete 2
- No black lines on legs. Humeral suture pale-coloured or with only a very narrow dark line 6
- 2 — Ac normally nearer 1st than 2nd Ax. Abd. 20-22 mm. 3
- Ac midway between 1st and 2nd Ax or nearer 2nd 4
- 3 — Pale antehumeral very narrow, the thoracic dorsum mainly black, including a black humeral stripe; hindlobe of prothorax very narrow *E. nigradorsum* Sélys
- Thorax above largely pale, the pale area as broad as the median blackish; black humeral stripe very reduced and incomplete; hindlobe of prothorax broad *E. sapphirina* Pinh.
- 4 — Wings with rather broadly rounded apices. Abd. 19-21 mm. Posterior lobe of prothorax with a median projection backwards which is excised shallowly *E. rotundipenne* Ris
- Wings narrow. Abd. 21-25 mm. 5
- 5 — Posterior lobe of prothorax very narrow, produced in middle in a triangular projection. Generally larger than *glaucum*: Abd. 23-24, hw. 18-19 mm. *E. subfurcatum* Sélys
- Posterior lobe of prothorax broad, regularly convex (but may have a median tubercle). Generally smaller but very variable: Abd. 21-25, hw. 16-19 mm. *E. glaucum* Burm.

- 6 — Thoracic dorsum with median black (on either side of narrow pale median line) fairly broad, about as broad as the pale antehumeral stripe. Pterostigma brownish-ochreous. Abd. usually over 26 mm. 7
- Thoracic dorsum golden brown with very narrow dark median lines. Pterostigma pale yellow. Hindlobe of prothorax broad. Abd. 23-26 mm. *E. subtile* Ris
- 7 — Smaller species, abd. 26, hw. 19 mm. Hindlobe of prothorax broad, convex *E. elongatum* Martin
- Larger species, abd. 28-30, hw. 20-21 mm. 8
- 8 — Hindlobe of prothorax moderately broad, almost regularly convex, very slightly depressed in middle. Dorsal band of abdomen very narrow *E. sinuatum* Ris
- Hindlobe of prothorax narrow at sides, broad in middle where it is depressed and dorsally concave. Dorsal band of abdomen very broad *E. pseudelongatum* Longf.

(Not yet recorded from Southern Africa.)

In the above keys I have included *E. pseudelongatum* of E. Africa, but I have omitted *E. longfieldi* Fraser, also from E. Africa (Uganda and Kenya).

Nymphs: Refer Barnard 1937, p. 219.

ENALLAGMA ELONGATUM R. Martin.

(Thorax, abdomen, anal append.—Pl. 8a; penis—Pl. 8b.)

Ischnura elongatum Martin 1906, Coll. Zool. Sélys xvii., Bruxelles; and Bull. Mus. Hist. Nat. Paris, 12, p. 513 (♀). Sjösted 1909, Kilimandjaro-Meru Exped., 2, p. 42 (♂).

Enallagma fractum Ris 1921, (non-*elongatum* Ris), Ann. S. Afr. Mus., xviii., p. 324 (♂, ♀).

Enallagma elongatum Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 474. Fraser 1947, Proc. R. ent. Soc., Lond. (B) 16: 11-2, p. 143 (on synonymy).

INTRODUCTION: A species related to *sinuatum* and having a slender abdomen but not as long as the latter; superior anal appendage bent downwards. Inferiors with a much longer spine.

DESCRIPTION: ♂. Eyes, in life, dark green above, paler below. Labium whitish-ochreous, greener laterally and posteriorly. Labrum bright pale green, anteclypeus slightly darker, the former with three small black basal spots, one central, the others lateral; post-clypeus olive at sides and in front, more brownish otherwise; frons olive slightly with brown basal suffusion. Vertex dark green with two narrow sinuous transverse ferruginous bands, one crossing just in front of the anterior ocellus, the other running between this ocellus and the posterior ones. Postocular spots large, cuneiform; not framed with black or only a narrow incomplete posterior line; occiput and hindmargin of occipital plate yellowish. Prothorax coeruleous in life; (after death) olive to greenish-blue with broad median black

PLATE 8a.

ENALLAGMA: ANAL APPENDAGES, THORAX AND ABDOMEN 1 TO 3.

Anal Appendages:—

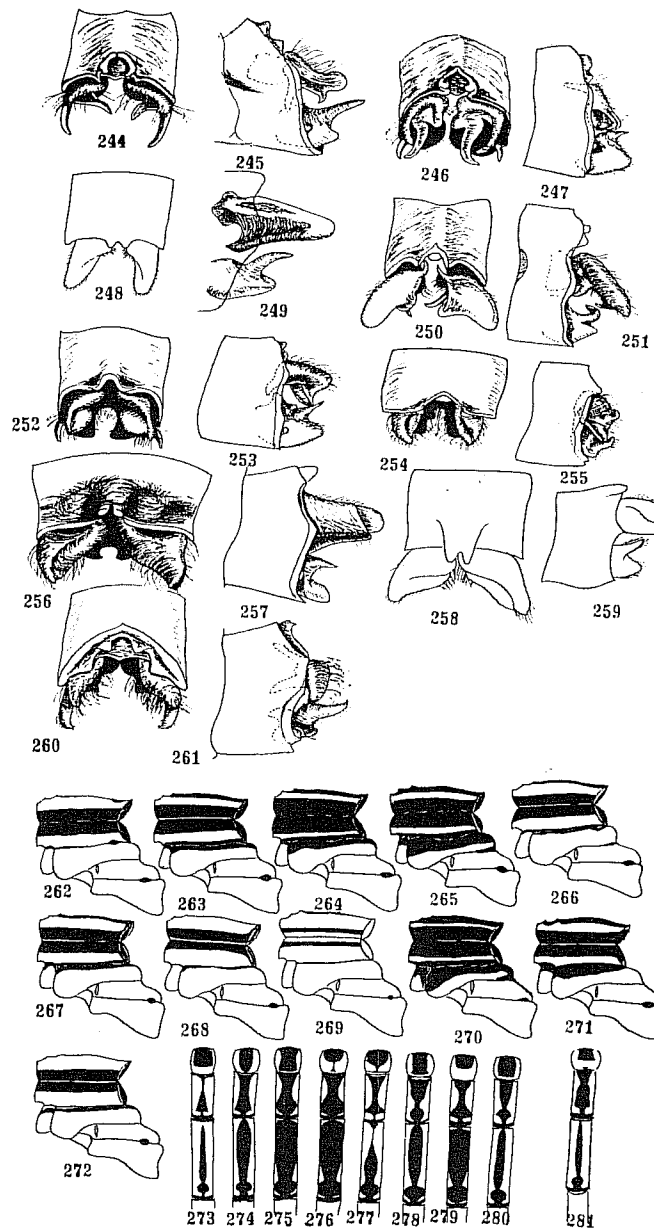
- 244-245. *elongatum*. 246-247. *sinuatum*. 248. *subtile* (after Ris 1921).
- 249. *subtile* (after Fraser 1947). 250-251. *pseudelongatum*.
- 252-253. *glaucum*. 254-255. *nigridorsum*. 256-257. *subfurcatum*.
- 258-259. *rotundipenne* (after Ris 1921). 260-261. *sapphirina*.

Thorax:—

- 262. *sinuatum*, male. 263. *glaucum*, male. 264. *glaucum*, male.
- 265. *nigridorsum*, female. 266. *rotundipenne*, female.
- 267. *sapphirina*, male. 268. *sapphirina*, female. 269. *subtile*, female.
- 270. *subfurcatum*, male. 271. *elongatum*, male. 272. *glaucum* ab. *schultzei*, male.

Abdomen:—

- 273. *sinuatum*, male. 274. *glaucum*, male. 275. *nigridorsum*, female.
- 276. *rotundipenne*, female. 277. *sapphirina*, male. 278. *sapphirina*, female.
- 279. *subfurcatum*, male. 280. *subtile*, female. 281. *elongatum*, male.



band (narrow black line in Ris). Synthorax at sides coeruleous in life, above greenish-black with blue antehumeral stripe; about one-third the width of the mesepisternum. (Ris mentions a narrow blue mid-dorsal line.) The black at sides only descends below humeral suture for about one-fourth of the mesepimeron; a dark spot at dorsal end of 2nd suture. Ventrums whitish, with thin white pruinosity. Legs pale yellowish; a black posterior band on femora.

Abdomen very slender; 1 to base of 3, 8-10, a narrow basal ring on 3-7 and a narrow distal ring on 7 bright sky blue (more cobalt in life), changing laterally to a rather violet tint; segments 3-7 laterally yellowish; a continuous black dorsal band with green metallic sheen on 1-7 and 10, made up as follows: broad basal patch on 1; broad band on 2 excavate laterally before a terminal ring; on 3-6 narrowed by the blue basal ring and broadened in the usual manner shortly before distal end, then contracted and finally ending in a narrow ring at the end; 7 broad, interrupted by blue at either end. On 10 only narrow mid-dorsal band. 8 entirely blue; 9 with black dorsal and lateral patch. Anal appendages almost drawn back into folds of the 10th segment, the superiors turned downwards. Inferiors with long spine.

Accessory genitalia: Penis — Pl. 8b.

♀. Very similar, but more greenish or greenish-blue in the light areas. Pterostigma paler than in ♂. Dorsal band on abdomen complete from 1-7 and most of 8; 10 greenish without dorsal band. Vulvar spine well developed; valves projecting slightly beyond end of abdomen.

Abd. ♂ 23-26, ♀ 26. Hw. ♂ 16-20, ♀ 19. Abd./hw. ratio (♂) 1.5.

DISTRIBUTION: S. Rhodesia to Kenya, Angola and Belgian Congo.

Southern Africa. Transvaal Museum Collection: S. Rhodesia — Salisbury, Dec., 1948 (Whellan).

REMARKS: A local species looking more like a *Pseudagrion* at first sight; found on a small stream.

ENALLAGMA GLAUCUM Burm.

(Thorax, abd. anal append. — Pl. 8a; penis, ♀ prothorax — Pl. 8b; venation — Pl. 29.)

Agriion glaucum Burmeister 1839, Handb. d. Entom. II., Berlin, p. 821, nr. 17 (Type loc. ♂, Cape of Good Hope).

Enallagma gabonense Sélys 1876, Synops. Agrion, p. 116 (♂, Gaboon). Kirby 1890, Catal., p. 147.

Enallagma glaucum Kirby 1890, Catal., p. 133. Calvert 1898, Trans. Amer. Ent. Soc., xxv., p. 40.

Ris 1908, in Schultze's Forschungsreise, Denkschr. Med. Natur. Ges., Jena, xliii., p. 313, nr. 20, f. 3a-b; id. 1921, Ann. S. Afr. Mus., xviii., pp. 326, 438, f. 38. Barnard 1937, Ann. S. Afr. Mus., xxxiii., p. 219.

Pseudagrion sikorie Förster 1906, Mannheim Jahreshb. Ver. Naturk., 71-72, p. 59 (♂, Sikora, Réunion — vide Ris 1908).

? *Coenagrion glaucum* (Sjösted.) Schouteden 1934, Ann. Mus. Congo Belge, 3: 2: 3: 1, p. 81.

Probable varieties:

Enallagma obliteratum Sélys 1876, Bull. Acad. R. Belg., 2: 41, p. 116 (Cape). Ris 1921, Ann. S. Afr. Mus., xviii., p. 328.

Enallagma schultzei Ris 1908, l.c., pp. 312, 314, f. 4a-b (♂, Kalahari); id. 1921, l.c., p. 329.

INTRODUCTION: This is probably the commonest Zygopteran in Southern Africa, certainly the commonest of its genus. It is very variable in colour and pattern, and to some extent in size. In the field it is not easy to separate from other Southern African species of *Enallagma*, except the rather larger ones, *elongatum* and *sinuatum*. A fresh ♂ usually has a bright sky blue or blue-green colouring. The dorsum of abdomen 10 is only slightly raised; vein Ac is at a level about halfway between the two antenodals; and the anal appendages are characteristic.

I have tentatively included Schouteden's record of *Coenagrion glaucum*, since, in the generic description, he says the ♀ has a vulvar spine, a character of *Enallagma* but not, I believe, of *Coenagrion*.

Ris considered his *schultzei* a very blue specimen of *glaucum* and we have specimens approaching this; and *obliteratum* he thought was a dark variety of this species.

DESCRIPTION: Mature ♂. General colouring light blue-green to bright sky blue. Labium whitish-ochreous; occiput greenish-white, posteriorly more yellowish. Face, eyes (in life) and frons coeruleous or pale sky blue, often fading almost to whitish-green after death; labrum, epistome and frons occasionally dull grey-blue; labrum at base with very narrow black basal line or three basal dots, one central, the others lateral; postclypeus mainly black above, frons slightly invaded by black at base: In one living specimen the labium is whitish-ochreous; occiput very pale coeruleous; eyes and genae deep coeruleous, the former with blackish dorsal cap and grey-violet ventrum; labrum yellow green, tinged blue at base, with the three basal dots; anteclypeus light brown; postclypeus and frons, except for the black portions, olive green; postocular spots sky blue.

Vertex black. Postocular spots pale or whitish-green or greenish-blue, usually elongate pyriform and almost or quite linked to a narrow transverse line of similar colour across the occipital plate. In ab. (var.) *obliteratum* the postocular spots are said to be absent: In our series there are examples with very small circular blue spots, but no specimen with them quite obliterated.

In ? form (var.) *schultzei* the spots are large, confluent with the occipital ground-colour, not bordered with black posteriorly and with the blue spreading further over the vertex (and the black colouring also reduced on thorax and abdomen): In our series we have two males (Pretoria) with very large whitish-blue spots, this colour extending round the posterior ocelli (in one example) and forming a lateral spot on either side of the anterior ocellus in the other; the postocular spots are broadly confluent with the postoccipital band and they are only partially bordered posteriorly by a short narrow black transverse streak behind each.

Prothorax black above, with variable pale blue markings: along the anterior margin; lateral spots of variable size, sometimes very extensive; sometimes a pair of small median dorsal spots; sometimes a line more or less along posterior margin; this margin shallowly concave in middle. In the living specimen (mentioned above) these pale colours are yellow-green.

Synthorax black above, with faint green sheen; usually with, but quite often without, a pale blue narrow mid-dorsal line; a light blue antehumeral stripe, near humeral suture and of variable width — narrower than the black on either side of median line or very occasionally as broad or broader. Sides pale coeruleous to pale green, more whitish below; a broad or narrow black band below humeral suture, confluent with the narrow black between this suture and the antehumeral stripe; a black spot at dorsal end of second lateral suture. Occasionally the humeral black does not descend below this suture, so that the sides are almost entirely greenish. Rarely a black spot at dorsal end of first lateral suture. In the living example the antehumeral stripes are bright sky blue; sides also this colour, but suffused with violet and, more ventrally, green. Femora green; rest of legs ochreous-green; femora outside almost entirely black; tibiae with narrow black exterior line. In the living example the femora are coeruleous, the tibiae and tarsi ochreous. Pterostigma dark grey-brown, edged narrowly with whitish; between blackish veins.

Abdomen coeruleous, light blue-green or sky blue, with black dorsal band (usually broad, occasionally narrowish) from 1-7 and on 10; this band on 1-6 with metallic-green (or partially bronze) sheen; broken between 1-2; on 1 broad; 2 slightly widened at proximal end, before distal end forming a widened spot, then contracted to the end; on 3-6 narrowed at proximal end, broadened distally to form a rounded spot before the end; 7 very broadly black, almost severed at base by a very narrow pale ring; 8-9, and 10

(except for the black dorsal band) bright sky blue, greenish-blue, mauve or lilac, or mixtures of these colours. Sides of 1-6 pale green (brighter on proximal segments); 7-10 coloured as for the dorsum of 8-10, blue or mauve, etc. Ventrums pale yellow-green proximally, pale yellow distally. Appendages blackish or light blue (or violet brown occasionally) externally, yellowish or greenish internally. In the live specimen the sides are pale sky blue and coeruleous on proximal segments, greenish-yellow on middle segments, 7-10 sky blue with pinkish tinge more ventrally; appendages dark brown and yellow.

The superior appendages are broad and directed backwards, in dorsal view; laterally they are seen to have a broad ventral spine which corresponds to a large dorsal rather more lateral spine on the inferior appendage. Often the spine of the superior is hidden in side-view by that of the inferior.

Accessory genitalia: Penis, fig. 283.

Immature ♂. Pale colours generally pinkish-ochreous, sometimes even markedly pink in life; fading sometimes to yellowish or ochreous.

♀. Varying from yellowish or greenish to brownish-ochreous in ground-colour; in immature examples as pinkish as in the ♂; in preserved specimens sometimes olivaceous. Markings very similar to ♂ and also markedly variable. Labrum sometimes with a rather broader black basal band than in ♂; postclypeus above all black or margined with pale colour; postocular spots of similar variation: in one example approaching the condition of ♂ *schultzei*, with the posterior edge only indicated by two small black dots. Black markings on legs reduced to narrow external lines on femora and tibiae or absent altogether. On the abdomen the metallic-black dorsal band continues on all the posterior as well as the anterior segments or only partially on 10. Sides sometimes yellow-green or yellow, occasionally lilac and blue. Valves long, reaching end of abdomen.

Abd. ♂ 20-24.5, ♀ 21-25. Hw. ♂ 13.5-17, ♀ 16.5-19. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: Recorded from Cape Province to Kenya and Belgian Congo; Réunion.

Southern Africa. Transvaal Museum Collection: Series from Cape Province, Natal, Transvaal, S. Rhodesia.

Also recorded from South West Africa.

REMARKS: As I have said above this may be considered probably the commonest Zygopteran in Southern Africa, although it is evidently necessary when collecting to take examples from any locality where they are found in order to find the other less common but very similar species of the genus. They are weak fliers, constantly settling on grasses, rushes, etc., growing in or near swamps, pools and streams. Evidently on the wing throughout the year and probably multivoltine.

LIFE CYCLE: Refer Barnard 1937, p. 219.

ENALLAGMA NIGRIDORSUM Selys.

(Thorax, abd., anal append.—Pl. 8a; penis, ♀ prothorax—Pl. 8b.)

Enallagma nigradorsum Selys 1876, Bull. Acad. R. Belg. (2) 41: 2-3, p. 114 (Zanzibar). Ris 1921, Ann. S. Afr. Mus., xviii, p. 322 (Delagoa Bay). Fraser 1941, Proc. R. ent. Soc., Lond. (B) 10: 3, p. 38.

INTRODUCTION: In appearance and colour very like *glaucum*, especially the ♀ which, however, in *nigradorsum* has narrower pale antehumeral stripes. The chief feature attributed to this species is in having Ac on a level nearer 1st than 2nd Ax. Anal appendages short, particularly the superiors, which are blunt and slightly down-curved.

DESCRIPTION: ♂ Labium and occiput whitish-ochreous. Face light greenish-blue or coeruleous; postclypeus, vertex and base of frons black; very narrow cuneiform pale blue postocular spots, connected by narrow greenish or bluish line on back of occipital plate.

Prothorax black above, narrowly pale greenish along anterior and very narrowly or incompletely along posterior borders; sides greenish or bluish. Synthorax black above with slight bronze sheen or narrowish pale bluish or blue-green antehumeral stripes, nearer humeral than median suture; at sides the black descending about halfway to 1st suture (occasionally as far as this suture); sides otherwise pale blue-green to whitish; black spot at dorsal end of 2nd suture and a trace of a line at dorsal end of 1st suture. Femora light green, black externally; tibiae ochreous with narrow black external line. Pterostigma light brownish-ochreous, very finely margined with whitish; between brown veins.

Abdomen light blue to pale greenish-blue, with broad green-black dorsal band; complete broad band on 1-2, on the latter segment narrowing slightly in posterior direction, then in distal half forming a broader spot, and again slightly and suddenly contracted before a narrow black terminal ring; 3-6 as in other species, the broad band almost severed at proximal end, forming an enlarged spot before distal end; 7 very broadly black; 8-9 light blue, with black dorsal spot at proximal end of each; 10 blue with broad black dorsal band. Superior appendages black; inferiors black outside, ochreous on inner surface. Superiors very short, truncate, slightly down-turned; inferiors slightly larger, up-turned. Sometimes segment 8 is mainly black, only blue at distal end.

Accessory genitalia: Penis—fig. 284.

♀. Very similar. Pale markings duller, greener—in pinned examples olive or olivaceous. Postocular spots also very narrowly elongate, pale green. Prothorax black above with pale greenish at sides and a broad band along antero-dorsal border, but only on lateral edges of posterior margin; posterior lobe divided into three low arcs, the lateral ones small and narrow, the median more prominent, broader and rather erect. Antehumeral stripes scarcely broader, scarcely one-third width of each mesepisternum. Ventrums whitish-pruinose in older specimens. Legs with narrower black markings. Pterostigma light violet grey, between brown veins. Abdomen as in ♂, but the dark dorsal band continuous also on 8-9; sides pale greenish and pale ochreous. Valves reaching end of abdomen.

Abd. ♂ 20-21, ♀ 20-22. Hw. ♂ 13-14, ♀ 14-16. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Distributed widely in the Ethiopian region.

Southern Africa. Transvaal Museum Collection: Natal—Kosi Bay, July, 1948 (Pennington); Hudley, Dec., 1948 (Pinhey). S. Rhodesia—Salisbury, Feb., 1948 (Pinhey).

REMARKS: Similar to *glaucum* in habits.

ENALLAGMA PSEUDELONGATUM Longf.

(Thorax—Pl. 7b; anal append.—Pl. 8a; penis—Pl. 8b.)

Enallagma elongatum Ris (non Martin) 1921, Ann. S. Afr. Mus., xviii, p. 325 (♂, East Africa). *Enallagma pseudelongatum* Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 475 (Uganda). Fraser 1947, Proc. R. ent. Soc., Lond. (B) 16: 11-12, p. 143 (on synonymy).

INTRODUCTION: As this East African species has not yet been recorded south of the Zambezi I include it here only with a somewhat reduced description. Fuller details may be obtained from the above references.

It is a bright blue and black species with longish and slender abdomen, related to *glaucum* in form of appendages; A' leaves margin not more proximal than length of Ac.

DESCRIPTION (after Ris): ♂. Labrum and antclypeus blue; postclypeus black; frons and vertex in front (to base of antennae) blue; rest of vertex black, with largish blue cuneiform postocular spots and a line on occiput. Prothorax black with blue spots. Hind-lobe erect, trilobate, median lobe largest. Synthorax above black; with or without narrow pale median line; broad blue antehumeral stripes, about as wide as median black on each side of median line, and separated by black from humeral suture; sides black below humeral suture for short distance, the rest blue, with black dot at dorsal end of second lateral suture.

Legs bluish with anterior black lines.

Pterostigma very dark reddish-brown to black. A' starting not more proximal to Ac than length of Ac.

Abdomen long and slender, blue with black dorsal line; sides largely yellowish. 1 and 2 with incomplete dorsal black spots; 3 with continuous black band narrowed to a point at proximal end; 4-6 with black dorsal band incomplete at proximal end. 7 mainly black; 8-9 blue; 10 black above, blue at sides.

Anal appendages rather like *glaucum*. Penis, fig. 285.

♀. Face and head olivaceous; black transverse band on vertex in ocellar region; post-ocular spots not bordered behind but shaded into pale colour of occiput.

Posterior lobe of prothorax slightly trilobed, middle lobe concave dorsally. Synthorax mainly olivaceous; median black about one-third width of each mesepisternum; narrow pale median line; very narrow black humeral line. Black dot at dorsal end of second lateral suture. Legs ochreous with only traces of dark lines.

Pterostigma light grey-brown. Abdomen olivaceous with black dorsal band rather as in other species; 8 with complete black dorsal band; 9 olivaceous with two black cuneiform dorsal stripes; 10 olivaceous.

Abd. ♂ 26, ♀ 28.5; hw. ♂ 19.5, ♀ 20. Abd./hw. ratio (♂) about 1.3.

DISTRIBUTION: Known so far only from Tanganyika, Kenya and Uganda.

ENALLAGMA ROTUNDIPENNE Ris.

(Thorax, abd., anal append.—Pl. 8a; ♀ prothorax—Pl. 8b.)

Enallagma rotundipenne Ris 1921, Ann. S. Afr. Mus., xviii, p. 321 (♂, Caffraria; ♀, M'Fongosi, Zululand).

INTRODUCTION: Like *subfurcatum* the 10th abdominal segment of this species is markedly raised into a prolonged, bifurcate dorsal crest; in markings and size like *nigridorsum*, but with the wings and pterostigma broad in transverse direction rather than narrowly elongate. Ac about halfway between 1st and 2nd Ax. Arculus very slightly distal to 2nd Ax; anal vein leaves margin considerably more proximal to Ac than the length of this crossvein.

DESCRIPTION: ♂. Labium whitish-ochreous; occiput whitish-green or very pale blue-green, with dark patch near foramen. Labrum, genæ and anteclypeus light blue-green, the first of these with broad black basal band tending to spread forwards in middle (and sometimes laterally) as 1-3 spots; postclypeus above black; frons light olive, with broad black triangle at base (overlapping from vertex); vertex black, with light blue or bluish-green narrow cuneiform postocular spots. No pale line on posterior margin of occipital plate.

Synthorax black with metallic-green sheen; complete, narrow pale blue antehumeral stripes, less than one-third width of each mesepisternum; at sides the green-black descends almost to first suture; rest of sides pale bluish to whitish ventrally; a black spot at dorsal end of second suture. Legs yellowish-green; with black external line on femur and tibia, more broadly on former. Wings broad; pterostigma grey-brown, broadly black-edged; slightly larger in forewing than in hindwing. Abdomen 1-3 pale blue or blue-green, end of 3 to 7 yellow or yellow-green, 8-10 light blue. A very broad black dorsal band with green sheen on 1-7; on 1 broadly severed posteriorly by pale bluish; on 3-6 almost interrupted by narrow pale basal rings, and broadening in the usual manner just before distal ends of these and of segment 2; 7 and 10 with continuously broad band; 8 all light blue; 9 blue with black transverse distal patch. 10 raised into a bifid tuberosity post-dorsally; appendages rather like *subfurcatum*.

♀. Similar to ♂, but bluish areas replaced by pale green. Postocular spots very large, cuneiform, connected by a pale line across occipital margin. In Ris' description of the

type ♀ these spots were bordered posteriorly by a narrow black line; in ours there is no such line, but merely either two dots behind each or no clear demarcation from the yellower occiput.

Prothorax black above with pale yellow-green or ochreous (bluish in Ris) markings, and sides of this colour: the pale markings on dorsum are a broad anterior margin, narrow lateral and posterior margins; very large dorso-lateral rather triangular spots; small pair of twin median dorsal spots; and a central swelling on posterior lobe. This lobe rather erect, with a convexly raised greenish or ochreous prominence in the middle of the hind margin; this hump bearing two short pale posterior ridges directed latero-ventrally towards lower end of mesepisterna; these ridges forming a small posterior concavity between them.

Synthorax with narrow pale median line; antehumeral stripes broader, about half the width of each mesepisternum; at sides the black only descends a very little way below humeral suture. Sides yellowish-green; a black spot at dorsal ends of first and second suture.

Black stripes on legs narrow. Pterostigma pale grey-brown with very broad whitish-yellow margin, between brown veins. Abdomen broader; with rather narrower dorsal dark band with green or violet sheen; this band continuous on 8-10 though narrowing on middle of 8.

Valves reaching beyond end of abdomen.

Abd. ♂ 19.5-20, ♀ 19.5-21. Hw. ♂ 13.5-14, ♀ 14-15. Abd./hw. ratio (♂) about 1.4.

DISTRIBUTION: Natal, Transvaal.

Transvaal Museum Collection: Transvaal—Pretoria, Feb., 1906 (Swierstra).

Ris' record: Natal.

REMARKS: Probably overlooked and less local than would appear from records.

ENALLAGMA SAPPHIRINA Pinh.

(Thorax, abd., anal app.—Pl. 8a; penis, ♀ proth.—Pl. 8b; entire insect—Pl. 20.)

Enallagma sapphirina Pinhey 1950, Ann. Transv. Mus., xxi, p. 267, figs. 18-21.

INTRODUCTION: In life this small species is noticeable by its brilliant deep cobalt or sapphire blue colour: The abdomen is much bluer than other local species; the superior anal appendages are short and blunt, with ventral spine; inferiors extend back in a point directed horizontally backwards considerably beyond the superiors.

DESCRIPTION: *Holotype*. Mature ♂. In life all the blue and whitish colours of the dorsum of head, thorax and abdomen are very deep cobalt or sapphire blue; ventrum paler. The eye is deep cobalt with a small black cap.

After death: Labium whitish. Occiput whitish below, dusted with white pruinose; laterally olive green. Labrum and genæ violet blue. Epistome and frons olive green; postclypeus with a broad or very broad black basal band tending to be trilobed (holotype), but variable (paratypes). Vertex broadly black; this black extending narrowly round the lateral edge of the very large oval green postocular spots; these spots only partly edged behind by a short black arc on the yellowish occiput; postocular spots joined by a yellow-green line on back of occipital plate. In another specimen (paratype) these spots are more yellow and elongate, bordered more completely posteriorly by a black arc.

Prothorax black above with whitish-blue markings; at sides pale olive. The bluish dorsal markings are a pale anterior transverse ring broken mid-dorsally, the posterior edge extremely narrowly whitish, a dorso-lateral and three very small mid-dorsal marks—a twin pair of central spots and a short posterior median line ending on posterior margin. Hildlobe broad, very gently curved.

Synthorax very pale or whitish-coeruleous, stained laterally somewhat with violet; mid-dorsally a broad black band with green sheen covering half of each mesepisternum, but

with a narrow white line on lower half of median carina and two small white spots at its ventral end. Antealar sinuses green-black framed in front with whitish; a rather narrow green-black line on humeral suture and continuing along the top of the mesinfraepisternum; a black spot at dorsal end of second lateral suture. White pruinosity on lower sides and ventrum of thorax, coxae, femora, abdomen 1 at base, and more thinly on ventrum of 9-10. Legs ochreous; femora with broad, tibiae with narrower blackish ferruginous incomplete streaks on outer surfaces. Ac midway (holotype) between 1st and 2nd Ax or slightly nearer 1st Ax. Pterostigma whitish-ochreous, darker centrally; between brown veins.

Abdomen sky blue on 1-4 or 5; the rest more violet or reddish-tinged; with black discontinuous dorsal band with green sheen as follows: on 1 a broad almost continuous band, but deeply excised before the end; with a narrow blue distal ring; 2 with continuous irregular band, broad at base and just beyond halfway, then very deeply and broadly excised before a terminal black ring; 3-4 with broad distal patch tapering forwards very narrowly (or widely broken) towards a very small spot at proximal end; 5-6 with a very broad dorsal band, but tapering well before proximal end; 7 with complete broad band, except for a narrow incomplete proximal ring; 8-9 and extreme distal end of 7 blue; 10 broadly greenish-black on dorsum. Anal appendages brownish; superiors short and blunt, with dense terminal tuft of long white hair, and with ventral spine; inferior extending considerably further as a horizontal pointed projection.

In a paratype ♂ the dark dorsal markings on 3-4 are much more reduced, forming terminal spots.

In a further specimen the blue colouring, especially on the thorax, has been replaced largely by ferruginous. It is a slightly immature specimen and shows less pruinosity.

Accessory genitalia: Penis, fig. 282.

Allotype. ♀. Here again the pale colouring in life was deep cobalt; but more whitish-yellow on abdomen 1-6. After death: paler and duller than ♂, but the markings very similar, the differences being as follows:

Face more ochreous, postclypeus ferruginous (with black as in ♂); small black basal dot on labrum; short black basal bar on frons.

Prothorax with pale colours orange-brown or light ferruginous, at sides more extensively than in ♂; posterior lobe very similar, with a small whitish central spot bearing long white hair. Synthorax more light ferruginous above, violet or violet blue at sides; the pale median line complete; the black humeral line incomplete and reduced to a short narrow line at dorsal end, and another in ventral half, and only faintly indicated over the mesinfraepisternum. White frosting as in ♂.

Wings narrow. Pterostigma whitish-ochreous, elongate. Ac slightly nearer 1st than 2nd Ax.

Abdomen blue and violet, with broad black band having a green sheen, almost continuous: 1 with uniform band, except narrow blue terminal ring; on 2 starting at proximal end in three points (shallowly trident-shaped); with usual broad spot shortly before distal end; 3-7 with continuous broad band, slightly tapering at anterior end and expanded before distal ends; 8 with broad dark band, except for a very narrow pink terminal ring, broken dorso-laterally; 9 with complete band. Segment 10 extremely short, with a dark dorsal band; cerci short, brown; a long terminal spine on 9th sternite; valves reaching end of abdomen.

Abd. ♂ 19.5-20, ♀ 20-21. Hw. ♂ 14-15, ♀ 15-16. Abd./hw. ratio (♂) about 1.4.

DISTRIBUTION: Transvaal, Natal. Transvaal Museum Collection: Sterkfontein, Oct., 1948-Jan., 1949 (Pinhey).

Others taken on streams nearer Pretoria West, Feb., 1949. Dr. Newton has found it recently in Zululand at Halodu, 26th Nov., 1948.

REMARKS: Flying in some numbers over small streams. Their deep cobalt or sapphire colouring was very striking. The ♀ oviposits amongst floating leaves of water plants.

MATERIAL (all from Sterkfontein): Holotype ♂, Allotype ♀, 14 ♂ paratypes, 4 ♀♀ paratypes in Transvaal Museum. Paratypes sent away: 2 ♂♂, 1 ♀ to the British Museum; 2 ♂♂ to the National Museum, Bulawayo; 2 ♂♂ to the Division of Entomology, Salisbury, S.R.

ENALLAGMA SINUATUM Ris.

(Thorax, abd., anal append.—Pl. 8a; penis, ♀ prothorax—Pl. 8b.)

Enallagma sinuatum Ris 1921, Ann. S. Afr. Mus., xviii, p. 330, f. 40.

INTRODUCTION: Closely related to *elongatum* Martin, but generally a larger species; superior appendages bent down sinusously.

DESCRIPTION: ♂. Labium whitish; occiput pale greyish-ochreous. Head above greyish-blue; mainly black posteriorly to the antennal line, except large blue postocular spots (not bordered posteriorly and merging into the ground-colour of the occiput); narrow blue line across occipital plate. Prothorax greyish-blue, pale at sides; a mid-dorsal brown band. Synthorax pale blue or greyish-blue; a narrow brown line on median suture; greenish-black stripes on either side of median line, each about one-fourth the width of each mesepisternum; very narrow black humeral line, slightly expanded at both ends. The dorsum readily stains and may show a white line after death. Sides pale greyish-blue; small black dot at dorsal end of second lateral suture; ventrum whitish. Legs very pale greenish-ochreous, with merely a trace of dark external lines on femora and tibiae or no darkening at all. Venation dark; pterostigma dark grey-brown.

Abdomen very slender; light greenish-blue with narrowish black median band having green sheen; sides of 3-6 yellowish. The black dorsal markings are: very small basal spot on 1; 2 with small distal spot, extending forwards as a lanceolate dorsal line ending before proximal end; 3-6 with narrow median line, slightly interrupted at proximal ends, slightly dilated near posterior ends; 7 with broader band, incomplete proximally and distally; 8-9 blue; 10 blue with narrow mid-dorsal black band. Anal appendages reddish-brown; superiors directed sharply downwards, sinusously curved; inferior with short dorsal spine. Penis—fig. 287.

♀. Very light reddish-ochreous. Black band on dorsum of head narrower: as broad as ocellar region in middle, narrowed to half this width at sides; short narrow ferruginous lines in ocellar region; in front of the anterior ocellus another black transverse line, very narrow, concave anteriorly. Thoracic dorsum with broader median yellowish line, narrower black bands (the median black about one-third the width of mesepisternum); sides and ventrum whitish. Legs pale, without black external lines. Pterostigma pale greyish-ochreous, larger than in ♂. Abdomen 2 with black dorsal stripe rather broader and continuous; 3-6 with slightly broader dorsal band; 7 as in ♂; 8 with black median band on anterior two-thirds; 9 with two black basal spots on dorsum; 10 without any black.

Vulvar spine well developed; valve reaching end of abdomen 10.

Abd. ♂ 28-30, ♀ 30. Hw. ♂ 19-20, ♀ 21. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Natal to S. Rhodesia and Belgian Congo.

Southern Africa. Transvaal Museum Collection: Salisbury, Nov., 1947 (Pinhey).

Other localities given by Ris are: Natal—M'Fongosi, Apr., 1911 (W. E. Jones). S. Rhodesia—Salisbury, 1894 and Apr., 1905 (Marshall).

HABITS: Found in streams. Rather easily confused with some *Pseudagrion* in its habitats.

ENALLAGMA SUBFURCATUM Selys.

(Thorax, abd., anal append.—Pl. 8a; penis, ♀ prothorax—Pl. 8b.)

Enallagma ? *subfurcatum* Selys 1876, Synops. Agrion., Bull. Acad. R. Belg. (2) 41: 2-3, p. 117 (♂, Abyssinia).

Enallagma subfurcatum Ris 1908, in Schultze's Forschungsreise, p. 314; id. 1921, Ann. S. Afr. Mus., xviii, p. 319, f. 33.

Micronympha bilobata Grünberg 1902, Sitzber. Ges. Nat., Berlin, p. 231 (Nyasaland); id. 1903, Zool. Jahrb., xviii, p. 701.

INTRODUCTION: About the size and appearance of *glaucum* and easily confused with it in the field. The 10th abdominal segment is raised posteriorly into a prominent bilobed tubercle; superior appendage prominent and large, the inferior very small, a small lobe on either side of median dorsal suture at ventral end of synthorax; pterostigma and wing-shape as in *glaucum*.

DESCRIPTION: ♂. Labium whitish; occiput below very pale green or coeruleous, black above. Face and frons light blue-green marked with black: narrowish basal line on labrum; Postclypeus and top of head all black, except for light green or blue-green cuneate postocular spots; a narrow pale green line or merely two dots on hindmargin of occipital plate. Prothorax black with metallic-green sheen; anterior and lateral margins and a round dorso-lateral spot pale blue-green; posterior lobe narrow, erect, scarcely convex, black, pointed in middle, the apex of this pointing being pale blue-green.

Synthorax above black with metallic-green sheen; extremely narrow incomplete pale median line; narrowish straight yellow-green or pale blue-green antehumeral stripes much nearer humeral than median suture. Sides light coeruleous, very slightly violetish towards ventrum; marked with metallic green-black: this dark colour covering the upper two-thirds of the mesepimeron and a band continuing down from dorsal end and running for a very short distance just above first lateral suture; and a semicircular spot at dorsal end of second suture. Femora pale coeruleous, broadly black externally; tibiae and tarsi ochreous, the former with broad black external stripes.

Pterostigma black, edged narrowly with whitish, between black veins.

Abdomen shaped as in *glaucum*. 8-9 (8-10 in Ris) entirely light blue or violet blue; 1-3 bright pale green or coeruleous, the rest 7 yellow or yellow-green at sides; dorsum of 1-7 with green or bronze-black band; on 1 only occupying the proximal half; on 2 dilated at or near each end, strongly constricted in middle and just before posterior end; on 3-7 as in other species, broad; almost severed at proximal ends. 9 above with a partial narrow black ring at distal end; 10 almost all black, except for a small dorsal blue triangle at proximal end. Superior anal appendages black, tips and inner surfaces of superiors orange-ochreous; superiors broad, directed obliquely horizontal, very slightly bifurcate at apex; inferiors small, pale.

Accessory genitalia: Penis, fig. 288.

♀ duller—light ochreous, pale greenish or greenish-blue; postocular spots larger, not demarcated posteriorly or only by a thin blackish line on occiput; antehumeral stripes much broader; black on sides of thorax reduced: narrow incomplete line below humeral suture and black spot at dorsal ends of first and second sutures. Black stripes on legs narrow. Abdomen stouter and more robust than in ♂; dark dorsal band narrower. Vulvar spine well developed; valves reaching end of abdomen.

Abd. ♂ 23-25, ♀ 23-24. Hw. ♂ 16-18, ♀ 18-19. Abd./hw. ratio (♂) 1.4.

DISTRIBUTION: S. Rhodesia, Uganda Abyssinia, Eritrea, W. Darfur.

Southern Africa. Transvaal Museum Collection: S. Rhodesia—Salisbury, Nov., 1947 (Pinhey).

REMARKS: Probably local, but also easily overlooked.

ENALLAGMA SUBTILE Ris.

(Thorax, abd. anal append.—Pl. 8a; ♀ prothorax—Pl. 8b).

Enallagma subtile Ris 1921, Ann. S. Afr. Mus., xviii, p. 332, f. 41 (♂♂, ♀♀ Kapiri, Katanga, Belg. Congo).

INTRODUCTION: In the Transvaal Museum collection there is a single immature ♀ from

S.W. Africa which agrees very well with Ris' description, but is brighter in colour, probably due to its rather immature state.

The general colouring of this species is reddish or ferruginous; the dorsum of the thorax has a narrow dark band on either side of a pale median line; the humeral lines are extremely narrow; legs without black stripes.

DESCRIPTION: Immature ♀ (S.W. Africa). Labium and occiput pale reddish-ochreous; labrum pale ochreous with small brown basal dot in centre; rest of face and frons and back of occiput light ferruginous; a broad blackish transverse band with green reflection across the vertex, this band as broad as broad as the ocellar region in the middle, narrower laterally towards the eyes; antennae reddish at base, the rest blackish; postocular spots reddish-brown, scarcely marked off posteriorly by the paler occiput.

Prothorax reddish-ochreous above, paler laterally; posterior lobe broad, regularly convex, rather depressed in the middle. Synthorax deep reddish-ochreous; on either side of the reddish median band a narrow brown stripe with green metallic sheen and of same width as the median one; extremely thin brown line on humeral suture, forming near dorsal end a wider elliptical spot. Sides and ventrum paler; a small brown spot at dorsal end of second lateral suture. Legs very pale ochreous entirely, except for black spines.

Pterostigma pale ochreous, bounded by very thin brown veins. R_3 rises just before fifth Px in forewing and before fourth in hindwing, $1R_2$ at seventh in fore- and hindwing; Ac in both wings slightly nearer second than first Ax . Abdomen very slender; 1-7 orange-ochreous, 8-10 more reddish; on dorsum of 1-7 and proximal half of 8 a brown band with green sheen, severed at distal pale ring on 1, almost severed by proximal pale ring on 3-7; forming (as in many other Coenagrionids) a broader spot shortly before distal ends of 2-7. Vulvar spine well developed; valves distinctly projecting beyond end of abdomen.

In Ris' description the ♀ agrees with this, except that the markings are more ferruginous than the reddish ones described above, and there is no mention of the green sheen, which probably fades at maturity. The ♂ differs (vide Ris) in having the submedian dorsal thoracic bands blacker; the dark abdominal band rather broader, but not extending on to segment 8; 8-10 are described as "very light greyish-blue, shading laterally into whitish-ochreous". Anal appendages very light ochreous.

♀ Abd. 23.5; hw. 16. Ris: Abd. ♂ 25, ♀ 24-26.5. Hw. ♂ 15, ♀ 16. The abd./hw. ratio (♂) would therefore be about 1.7.

DISTRIBUTION: S.W. Africa and Belgian Congo.

Southern Africa. Transvaal Museum Collection: S.W. Africa—Oshikango, July, 1948 (C. Koch).

REMARKS: Dr. Koch told me he took this specimen amongst some dragonflies (reddish specimens of *Lestes pallidus ictericus* which it resembles in colour) under trees at some distance from water.

AGRIOCNEMIS Sélys.

Agriocnemis Sélys 1869, in Pollen and Van Dam, Rech. Faune Madag., 5:1, p. 24; Bull. Acad. R. Belg. (2)43:2, p. 142. Ris 1921, Ann. S. Afr. Mus., xviii, p. 335. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 82.

INTRODUCTION: Very small insects; in fact this genus includes the smallest known existing Odonata. Some of the *Enallagma* approach these in length and wing-expanse, but they are not so slender.

DESCRIPTION: Very small and exceedingly slender insects. Arculus well distal to second Ax ; anal vein leaves posterior margin some distance (longer than the length of Ac) before Ac ; lower distal angle of discoidal cell acutely produced. Pterostigma very small

(less than one cell long). Forewing with 5-8 px. R_3 at third px in both wings. Tibial spines short. ♀ without vulvar spine.

REMARKS: Although such small fragile insects with weak flight, the known species are widely distributed in the tropics. The range of the genus extends from Africa through Asia to Australasia. Several species are recorded from the Ethiopian region. Owing to the strong polychromatic tendency I am not attempting to distinguish specific characters in our series of *exilis*. A revision of this group seems necessary, but it would, I think, require access to type material.

Tentatively, it appears that there is firstly *Agriocnemis exilis* and the much darker Zululand form with pterostigma differing in forewing and hindwing. With adequate material from several localities it may be found that the Zululand form could be a subspecies or it may be just one of the colour forms. The generally smaller specimens from Salisbury and Portuguese E. Africa may perhaps be specifically distinct. Then, I also include Barnard's *polychromaticum* here.

KEY (Tentative).

- 1 — Labrum pale; postclypeus pale with black basal band. Arculus not as far distal to second Ax as half the length of an Ax. Hindleg with tibial spines as long as intervening spaces. Pterostigma a regular rhombus, brown-coloured. Superior appendage of male (fig. 296-297) deeply bifurcate, without ventral tooth. Abd. 17-17.5 mm. *A. polychromaticum* Brnd.
- Labrum and postclypeus entirely black with metallic sheen. Arculus more distal to second Ax than the whole length of an Ax. Hindleg with tibial spines shorter than intervening spaces. Pterostigma not rhomboidal, distal angle acute; pale to dark brown in colour. Superior appendage of male only shallowly bifurcate, but with ventral tooth 2
- 2 — Very small insects, abdomen 15-17, hw. 9-10. Pterostigma pale yellow or ochreous between brown veins. Anal appendages figs. 307-308 Salisbury form
- Rather larger insects, abd. 16-20, hw. 10-12.5. Anal appendages figs. 309-310 3
- 3 — Pterostigma in each wing of male pale ochreous or pale brown normal form
- Pterostigma ochreous in forewing of male, very dark brown in hindwing . . Zululand form

AGRIOCNEMIS EXILIS Sélys.

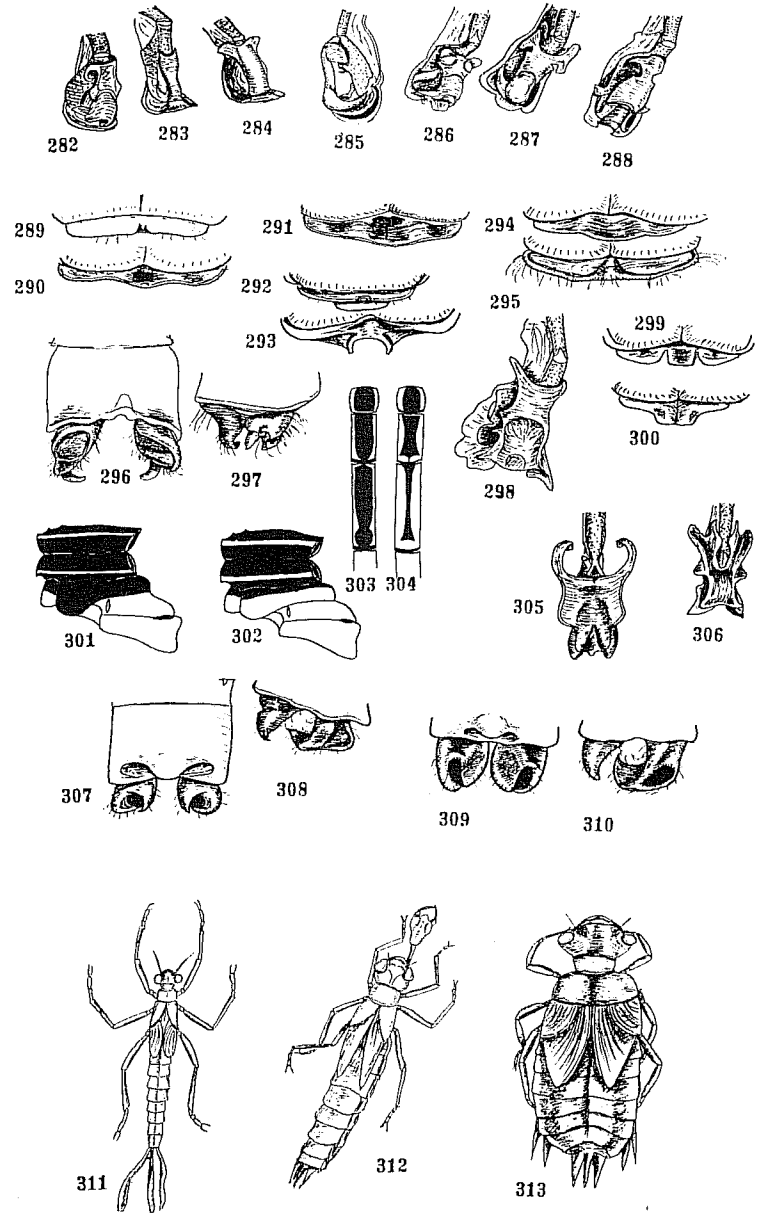
(Thorax, abdomen, ♂ genitalia, ♀ prothorax — Pl. 8b; entire insect — Pl. 29; venation — Pl. 29.)

Agriocnemis ? exilis Sélys 1872, *Révue et Mag. Zool.*, p. 182 (Madagascar, Mauritius).
Agriocnemis exilis Sjöstedt 1909, *Kilimandjaro-Meru Exped.*, Stockholm, 14 : 1-52. *Ris* 1921, *Ann. S. Afr. Mus.*, xviii., p. 335. *Fraser* 1941, *Proc. R. E. ent. Soc., Lond (B)* 10 : 3, p. 38.

PLATE 8b.

ENALLAGMA AND AGRIOCNEMIS: EXAMPLES OF NYMPHS.

- Enallagma*: Penis:—
 282. *sapphirina*. 283. *glaucum*. 284. *nigradorsum*. 285. *pseudelongatum*.
 286. *elongatum*. 287. *sinuatum*. 288. *subfurcatum*.
- Enallagma*: Hindlobe of prothorax, female:—
 289. *glaucum*. 290. *subfurcatum*. 291. *sinuatum*. 292. *nigradorsum*.
 293. *rotundipenne*. 294. *subtile*. 295. *sapphirina*.
- Agriocnemis*:—
 296-297. *polychromaticum*, anal appendages. 298. Same, penis.
 299. *exilis* (Zululand), prothorax, hindlobe. 300. *exilis* (Salisbury), same.
 301-302. *exilis* (Salisbury), thorax of male, female.
 303-304. *exilis* (Salisbury), abdomen 1 to 3, male, female.
 305. *exilis* (Zululand), penis. 306. *exilis* (Salisbury), penis.
 307-308. *exilis* (Salisbury), anal appendages.
 309-310. *exilis* (Transvaal; Zululand form similar), anal appendages.
- Nymphs:—
 311. *Zygoptera*. 312. *Aeshnidae* (mask extended). 313. *Libellulidae*.



INTRODUCTION: Among the Southern African Odonata this group is easily recognized when collecting, by its habits and minute size. It is, in fact, one of the smallest known dragonflies.

The abdomen of the ♂ is black above with metallic sheen, pale green at sides, the terminal segments red. In the ♀ the abdomen is red in less mature specimens and then metallic-greenish. The species is polychromatic in both sexes. In the series at the Transvaal Museum, as I have stated above, there is a certain amount of variation, sufficient, I think, to separate it into forms or even species.

DESCRIPTION: (a). *f. exilis* (similar to Ris, 1921).

♂. Labium whitish-ochreous; occiput pale yellowish-green. Labrum (mainly) and postclypeus blackish with brilliant metallic-green or blue-green sheen; the former along anterior margin and at sides pale greenish or yellow; anteclypeus, gena and frons in front pale green or greenish-yellow. Frons above, vertex and occipital plate black with metallic-green or bronze sheen; with small pale green or blue-green postocular spots, quite isolated. A short narrow yellow line along posterior border of occipital plate.

Prothorax black with a metallic-green or cupreous sheen; bordered narrowly in front and at posterior margin, and broadly at sides, with pale green or yellowish. Posterior lobe semi-erect, almost semicircular, with rather shallow lateral notches. Synthorax black with metallic-green or bronze sheen, on dorsum and mesepimeron; a narrow pale green or yellow complete line just above humeral suture; rest of sides and ventrum pale green or greenish-yellow, with a black spot at upper end of second lateral suture.

Legs whitish-yellow; femora with black external line, ending in a black spot at distal end of each femur (in specimens which are not fully mature these dark femoral markings are faint or absent).

Wings hyaline; pterostigma very pale ochreous between brown veins. Forewing with 6-7 px, hindwing 5-6 px. Abdomen 1-2 and base of 3 with broad blackish or dark ferruginous band, having a metallic blue-green, blue, green, or partly cupreous or violet sheen; these segments at sides pale yellow green; rest of 3 and from there to 6 above orange or pinkish-orange, at sides yellow, with greenish ventro-lateral band; a diffuse dark dorsal patch at distal end of 6. 7 with broad dark metallic band dorsally; sides and a terminal ring orange. 4-5 may have a fine but somewhat indistinct dark dorsal line. 8-10 and anal appendages bright orange red, or 8 more orange than red.

Inferior anal appendage somewhat cylindrical.

Immature ♂ shows the iridescent sheens on the body more marked as a rule than the darker, fully mature ♂. The labrum and postclypeus light ferruginous with lilac sheen; frons in front whitish. Postocular spots more elongate connected by a yellowish line across posterior edge of occipital plate.

Mature ♀. Differs from ♂ as follows: occiput, gena and frons in front pale green; labrum and epistome orange to ochreous; postclypeus black at base; labrum with short black basal bar, projecting slightly forwards (in our single specimen) in median line, the mark thus in the form of an inverted "T". Head above black with green sheen. Postocular spots very large, cuneiform, greenish-yellow or yellow, joined across the back of the occipital plate by a yellow line.

Postnotum of prothorax trilobed; lateral lobes raised as almost semicircular projections.

Synthorax green or yellow-green. A broad blackish dorsal band, reflecting metallic green and bronze, covers inner three-fifths of each mesepisternum, this colour meeting on median carina. With or without a very narrow dark line at humeral suture. A brown spot at dorsal end of second lateral suture, as in ♂. The pale ochreous pterostigma is bounded by rather thickish dark brown veins.

Abdomen 1 to base of 10 above with broad blackish band, reflecting green, bronze and violet hues; sides of 1-4 green, changing to yellow more ventrally; sides of remainder

orange yellow, with green lateral distal spot on 8. 10 mainly orange. Cerci and valves pale orange.

♀ *Variety A*: A single ♀ variety (from Vila Pery) in the Transvaal Museum collection differs chiefly in the form of the hindlobe of the prothorax: This is not distinctly trilobed but has the posterior edge broadly and very shallowly excavate. The prothorax is orange to reddish-orange, with the lateral lobes reflecting a violet sheen; a broad brown bar along posterior border in front of the concavity.

Immature ♀. From Ris' remarks it would appear to resemble the immature ♀ of the next form described below.

Abd. ♂ 16-19, ♀ 19. Hw. ♂ 10-12, ♀ 12. Abd./hw. ratio (♂) about 1.6.

(b). *Form from Salisbury* and Portuguese E. Africa (perhaps a distinct species).

This differs in its smaller size and in certain other respects from the form described above.

Mature ♂. Postocular spots small, isolated, rather rounded, pale green.

Prothorax as in *exilis*. Black with green or cupreous sheen.

Abdomen with broad dark ferruginous dorsal band from 1 to basal end of 9, this band having a metallic sheen coloured variously as in the ♂ described above. 1-7 at sides bright green, yellow or greenish-yellow; 8-10 scarlet or bright orange red. Near distal end of 5-6 a black latero-ventral spot. 2-6 above with very narrow basal yellow ring, mostly incomplete mid-dorsally. The metallic dorsal band tends to be slightly widened into a rounded spot before distal end of each segment.

Anal appendages orange-red with black apical markings. Inferiors broader at base and more conical than in *f. exilis*.

Accessory genitalia: see illustration, fig. 306.

Mature ♀. Differs from that of *f. exilis* in its smaller size and in certain other details: black markings on face and head dull black or slightly glossy, with only a faint greenish sheen; labrum, however, brown with lilac or blue-green sheen.

Postocular spots as in *f. exilis* but in older specimens the postocular markings become almost obliterated by blackening. Prothorax as in typical ♀ *exilis*; the mid-posterior lobe prominent. Synthorax black above (entire mesepisternum), reflecting bronze or peacock hues; with antehumeral green stripe as in ♂; the black not spreading, or only partly on to mesepimeron, more so in lower (anterior) half; rest of mesepimeron and sides pale green, with black spot at second suture as in ♂; ventrum and sides slightly white pruinose.

Forewing with 7-8 px, hindwing 6 px.

Abdomen similar to ♂ of this form, but with the greenish-black dorsal band continuous entirely from 1-10, except for a narrow yellowish distal ring on each segment. Sides of 1-9 green, with yellow ventro-lateral line; sides of 10 pale orange. Cerci pinkish-ochreous; valves ochreous; reaching end of abdomen.

♀ *Variety B*: In the case of a mature ♀ from Prince Edward Dam near Salisbury the postnotum of the prothorax is slightly different: It is again trilobed, but the median lobe, instead of being prominent, is shorter than the lateral lobes. Otherwise there is no appreciable difference.

Immature ♀. Face mainly pale green or yellowish-green; labrum orange with narrow black basal line, projecting forwards medially. Postclypeus metallic greenish-black. Head above black with bronze-green and peacock hues; large orange postocular patches joined by orange occipital line. Dorsum of thorax with bright metallic-green sheen. Abdomen 1-6 bright orange-red to vermilion; narrow black terminal ring; a narrow black dorsal line reflecting violet, incomplete at distal ends of segments and this line slightly expanded on each segment at each end of its length; on 6 continuing to end of segment. 7-10 with very broad black dorsal band, with blue or violet sheen; sides yellow to orange; cerci and valves orange.

In some specimens there is a ventro-lateral green line on 4-9. In one specimen the last four segments are almost entirely dark with peacock hues.

In a general example the pale areas are orange-yellow.

Abd. ♂ 15-17, ♀ 16-18. Hw. ♂ 9-10, ♀ 11-12. Abd./hw. ratio (♂) 1-7.

(c) *Form from Zululand.* (Probably a subspecies of *cxilis*.) ♂. A very dark form, developing white pruinosity when mature. It differs from *f. cxilis* above as follows:—

Face and head above all black; labrum and postclypeus with brilliant deep metallic-blue or purple sheen; postocular spots very narrow, pale green, joined across occiput by narrow line; head above with metallic-green sheen; frons with white pruinosity. Prothorax as in *cxilis*; anterior margin, sides and ventrum white pruinose. Synthorax also similar, but antehumeral line, sides and ventrum white pruinose (pale green when immature). Femora thinly dusted with white pruinosity. Forewing with 7-8 px, hindwing with 6 px. Pterostigma in forewing ochreous between brown veins; in hindwing very dark brown. Abdomen with very much broader and continuous black band from 1-10, in fact covering 8-10, except for a ventro-lateral greenish band; rest of sides pale green. Anal appendages reddish-orange. Sides of 1 thinly white pruinose. Penis—fig. 305.

Mature ♀. Face ochreous or pale green; head above, to a transverse line just in front of the antennae, black; back of occiput pale green, eyespots not delineated posteriorly. Thorax as in *f. cxilis*. Legs pale ochreous; black exterior line on femora. Pterostigma in both wings pale ochreous between brown veins. Abdomen pale green with narrowish black median dorsal line, broader on terminal segments.

Immature ♀ reddish as in *cxilis*.

Abd. ♂ 19-20, ♀ 20-21. Hw. ♂ 11-12.5, ♀ 13-14. Abd./hw. ratio (♂) about 1-7.

DISTRIBUTION: The species is recorded from most parts of the Ethiopian region in warmer localities; and from Mauritius, Madagascar.

Southern Africa. Transvaal Museum Collection.

(a) *f. cxilis*: Transvaal—Moorddrift, Oct., 1907 (Swierstra).

♀ *var. A*: Portuguese E. Africa—Vila Pery, Feb., 1948 (Pinhey).

(b) *Salisbury form*: S. Rhodesia—Salisbury (Highlands Park; Makabusi and Hunyani Rivers), Nov., 1947-March, 1948 (Pinhey). In S. African Museum: Nyaya, Port. E. Afr., Feb., 1924 (R. F. Lawrence).

♀ *var. B*: S. Rhodesia—Salisbury (Prince Edward Dam), Jan., 1948 (Pinhey).

(c) *Zululand form*: Natal—Hudley, Dec., 1948 (Pinhey).

Also recorded: Beira (Portuguese E. Africa)—*f. cxilis*.

REMARKS: Locally gregarious most of the year in warmer parts in stagnant pools or sluggish streams where there are plenty of short rushes, reeds, etc., for them to rest on. They do not fly readily. Although odd specimens may be seen at rest or in one of their brief flights, the best method of collecting them in a suitable locality is to sweep the rushes and grasses growing in or at the water's edge with a net. Several may be caught in one sweep sometimes by this means. The ♀, when egg-laying, rests almost on the surface of the water and curves her abdomen just into the water.

AGRIOCNEMIS POLYCHROMATICUM Barnard.

(♂ genitalia—Plate 8b.)

Enallagma polychromaticum Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 220 (♂♂, ♀♀, Cape).

INTRODUCTION: Barnard perhaps put this species in *Enallagma* as the areculus is not as far distal to second Ax as is generally the case in *Agriocnemis*. Dr. Hesse has kindly sent a specimen for examination, and I think that from general facies it should be placed

rather in this genus. Apart from its small size, the pterostigma is less than two cells long; the areculus is distinctly distal to second Ax in all four wings; the tibial and femoral spines are very long, although perhaps not as long as in *Argiina*; abdomen with broad metallic dorsal band as found in *cxilis*.

DESCRIPTION (Partly after Barnard): Mature ♂. Colours in life: Labium pale buff; occiput pale buff, blackish posteriorly. Labrum mauve with three black basal dots. Postclypeus mauve with black basal band. Frons mauve; vertex dark bronze-green; postocular spots cuneiform, violet, narrowly connected across occipital plate. Prothorax dark bronze-green with mauve dots, one or two median, one or two on each lateral margin. Synthorax with rounded tubercle on ventral end of mesepisternum; synthorax bronze-green above, without pale median line; with broad violet antehumeral stripe, almost as wide as median dark green and separated from humeral suture by a green band which continues on upper part of mesepimeron; rest of mesepimeron, entire metepisternum and a cuneiform patch at dorsal end of metepimeron violet. Rest of metepimeron, the coxae and ventrum pale buff shading upwards to violet. Wings with apices almost as rounded as in *Enallagma rotundipenne*; pterostigma dark sepia brown.

Femora entirely black; tibiae with black exterior lines. Tibial spines as long as or longer than intervening spaces. Arculus somewhat distal to second Ax, but not so much as in *cxilis*; Ac midway between first and second Ax. Pl. very small.

Abdomen 1-7 bronze-green above, pale buff at sides; a narrow pale basal ring on 3-7, the bronze-green widened posteriorly on 2-6. 8-9 with shield-like dorsal blue patch (violet in older specimens), surrounded by bronze-green. 10 entirely bronze-green. 8-10 ventro-laterally pale buff.

The mauve and violet colours fade after death to buff or greyish.

Superior appendages blackish, inferiors black at tips. Distal end of 10 hardly raised at all.

Superiors half the length of 10, directed obliquely and horizontally backwards; armed with ventral spine; inferiors with blunt, incurved and slightly upturned apices. "Penis without the lateral spinules found present in *Enallagma glaucum*; apical hook with the projections narrow and acute, the inner surfaces minutely scabrous".

♀. Similar to ♂, but paler: in life (as well as after death) the pale colours are buff or pale greyish (not mauve or violet as in ♂). Prothorax with hindlobe evenly convex, with small medio-dorsal rounded tubercle. Synthorax with narrow pale mid-dorsal line. Femora pale, with black exterior lines. Pterostigma pale sepia brown. Ninth abdominal segment with small oval cobalt-blue dorsal patch. Eighth sternite with vulvar spine; genital valves as in *glaucum*.

Abd. ♂ 17-17.5, ♀ 18. Hw. ♂ 12-12.5, ♀ 12.5 mm. Abd./hw. ratio (♂) about 1-4.

DISTRIBUTION: Only recorded so far from South-Western Cape Province. Seven Weeks Poort, Zwartberg Range, Ladysmith, Feb., 1932, Jan., 1935 (Barnard and H. G. Wood).

Transvaal Museum Collection: Seven Weeks Poort, Jan., 1936 (H. G. Wood).

NUMER: Refer Barnard 1937, p. 221.

CHAPTER 6.

Superfamily AGRIOIDEA.

Calopterygidae Buchecker 1876.

Agrioidae Kirby 1890, Catal. Odonata.

Agrioida Tillyard et Fraser 1939, Austral. Zool., ix.: iii., p. 212.

INTRODUCTION: Raised from family rank, the nomenclature of this group has undergone considerable change.

DESCRIPTION: Wings seldom distinctly petiolate; numerous antenodals; nodus far from wingbase; R_{4+5} separating from R_{2+3} far proximal to nodus. Wings often coloured.

REMARKS: See under respective families.

DETAILED KEY TO FAMILIES FOUND IN AFRICA.

- 1 — Each wing with two primary Antenodal veins present, i.e. these antenodals are more pronounced and are continuous in costal and subcostal spaces, unlike the secondary Ax 2
- No primary Ax present, i.e. all the antenodal crossveins are of the same strength. Wings not petiolate, i.e. the anal vein is separate from the posterior margin of the wing right from the base; numerous Ax; discoidal cell elongate and divided by many crossveins. Pterostigma small or absent; MA straight; $R_{2,3}$ usually fused with R_1 for a short distance after its origin. Epistome not enlarged. Large insects Fam. *AGRIIDÆ*
- 2 — $R_{2,3}$ not at all curved towards R_1 ; only few antenodals present Fam. *AMPHIPTERYGIDÆ*
(Not known to occur in Southern Africa.)
- $R_{2,3}$ at least slightly upcurved towards R_1 shortly after origin; a large number of Ax present. Epistome enlarged and snout-like. Discoidal cell normally with one crossvein; MA strongly convex; pterostigma long and narrow. Wings petiolate. Small insects Fam. *CHLOROXYPHIDÆ*

Since only two genera are known in Southern Africa, i.e. *Phaon* Selys (in Agriidae) and *Chlorocypha* Fraser (in Chlorocyphidae) there is no difficulty in separating these two and an abbreviated key can be supplied. Under Agriidae, however, I propose to mention the Central African genera *Umma* Kirby and *Sapho* Selys in case these should be met perhaps in the northern section of our subregion. Family Amphipterygidae is only represented in the Ethiopian region, I believe, by the genus *Pentaphlebia* Förster (Madagascar).

A shorter key for Southern African *Agrioida* would be similar to that given in Ris (1921, p. 261), except that the nomenclature is different.

- 1 — Wings petiolate; two primary Ax present; discoidal cell with one crossvein; MA strongly convex in costal direction. Pterostigma long and narrow. Epistome enlarged and face snout-like (Chlorocyphidae) *CHLOROXYPHA* Fraser
- Wings not petiolate; no primary antenodals present, all Ax of equal strength; discoidal cell elongate, with several crossveins; MA straight. Pterostigma small or absent. Epistome not enlarged (Agriidae) *PHAON* Selys

Family AGRIIDÆ.

Calopteryginae Jac. et Bianchi (pars) 1905.

Calopterygidae Ris (pars) 1921, Ann. S. Afr. Mus., xviii., p. 264.

Calopterygidae Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 71.

Agriidae Tillyard et Fraser 1939, Austral. Zool., ix.: iii., p. 212.

DESCRIPTION: Large insects with characters as outlined in the detailed key under superfamily *Agrioida*.

REMARKS: The larger part of this family is found in Asia. Four genera are recorded from the Ethiopian region and a fifth, *Agriion* F. (= *Calopteryx* Leach) from North Africa. Of the four Ethiopian genera *Prophaon* Fraser and *Sapho* Selys are only known from West Africa (particularly Cameroons) and can be omitted here.

Phaon is the only one known so far from Southern Africa but several *Umma* occur in the Belgian Congo and it is quite possible that the subtropical northern portion of this subregion will produce species of this genus, so I include this in the key.

KEY TO GENERA.

- 1 — MA straight till nodal level, then curved forwards; pterostigma small or absent. The rudimentary branch of 1A turning away from wing base *PHAON* Selys
- MA curved forwards near nodus; pterostigma developed but narrow. The rudimentary branch of 1A perpendicular to wing margin or runs towards wing base *UMMA* Kirby (Not yet recorded in Southern Africa.)

PHAON Selys.

Phaon Selys 1853, Synops. Calopt., Bull. Acad. R. Belg. (2)1: 20, suppl. p. 22. Ris 1921, Ann. S. Afr. Mus., xviii., p. 264. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 71.

Genotype *CALOPTERYX IRIDIPENNIS* Burmeister (1839).

INTRODUCTION: Among Southern African Zygoptera this genus, represented by its single species, stands out on account of its venation, with the very large number of crossveins, especially the antenodals; shape of the wings; and the large size and metallic-green colouring of the body, in which last two features it is like the larger species of *Chlorolestes*.

DESCRIPTION: Very large Zygopteran, with broad wings, metallic body and long legs. Wings not petiolate; a large number of Ax; discoidal cell with many crossveins; sectors of the areulus with several branches; pterostigma small or absent; MA straight until beyond nodal level.

REMARKS: See under the single recorded species which follows. In tropical Africa there are related genera, *Prophaon*, *Sapho* and *Umma*.

PHAON IRIDIPENNIS subsp. *IRIDIPENNIS* (Burm.)

(Anal appendages, penis and bursa copulatrix — Pl. 9; entire insect — Pl. 20.)

Calopteryx iridipennis Burmeister 1839, Handb. der Entomol., ii., Berlin, p. 827, nr. 9 (Type locality ♂, Durban).

Calopteryx iridipennis Calvert 1898, Trans. Amer. Ent. Soc., xxv., p. 49.

Euphaea iridipennis Rambur 1842, Névropt., p. 232.

Phaon iridipennis Selys 1853, Synops. des Calopt., p. 24.

Sapho iridipennis subsp. *iridipennis* Förster 1906, Jahrb. Nassau Naturk., Wiesbaden, LIX., p. 328.

Phaon iridipennis var. *fuliginosus* Selys-Hagen 1854, Monogr. Calopt., p. 71; Selys 1879, 4th Add. Synops. Calopt., p. 13 (Durban, Cape, Congo, etc.); 1879, Bull. Acad. R. Belg. (2) xlvii., p. 359 (Madagascar).

Phaon iridipennis subsp. *fuliginosa* Förster, l.c. (Madagascar).

Phaon iridipennis Kennedy 1920, Ohio J. Sci., 21: 1, ff. 54-55 (penis).

Phaon iridipennis Ris 1908, in Schultze's Forschungsreise, 1, p. 306, nr. 1; id. 1921, Ann. S. Afr. Mus., xviii., p. 264.

INTRODUCTION: The only member of its family so far recorded south of the Zambezi, this species is recognizable by venation, size (largest Zygopteran of this fauna) and the broad green thoracic bands.

var. *fuliginosus*, raised to subspecific rank by Förster, was considered, I believe, a Madagascar form without a pterostigma in both sexes; but this abnormality has been found in

specimens from Natal and it is also to be found in both sexes of the Transvaal Museum series.

Another subspecies, *camerunensis* Sjöst. (= *occidentalis* Förster), described originally as a distinct species, is recorded from Central and W. Africa and from Somaliland.

DESCRIPTION: ♂. Labium whitish-ochreous. Occiput black with metallic-green sheen, covered in old specimens with whitish pruinosity. Face and head above ferruginous or darker; labrum with ochreous free margin; head above with metallic-green markings near the ocelli and along posterior margin of occipital plate; postclypeus also with faint sheen. Prothorax light ferruginous with metallic-green spots on dorsum. Synthorax more heavily built than in ♀; light ferruginous to yellowish-brown, paler laterally; narrow black median dorsal line; and marked with bright metallic-green: a very broad band covering most of the dorsal and others on each lateral plate, but not quite reaching dorsal or ventral ends — thus four such bands on each side of the median dorsal line; metallic-green spots at antealar sinus, wing origins and interalar spaces. Legs ochreous-brown, tarsi dark brown; very long fine black femoral and tibial spines.

Wings hyaline, lightly tinged with yellowish, especially the hindwing and the anterior marginal area of forewing; in reflected light showing fine green, blue, purple or pink iridescence. Pterostigma short, light ochreous or greyish-brown; or absent altogether sometimes.

Abdomen long and slender, cylindrical; dark ferruginous, with metallic-green reflection (less vivid than on thorax) on 1-4, more bronze on following segments or becoming dull purplish-brown. Sides paler; ventrum black, sometimes developing slight dusting of white pruinose, particularly on end segments. Anal appendages blackish; superiors forcipate, longer than 10; inferiors shorter, straight.

Accessory genitalia: Penis, see fig. 322.

♀. Very similar. Thoracic green markings somewhat reduced and of a darker green, the bands rather narrower; sometimes these green areas more bronze-green. Pterostigma normally absent. Wings more uniformly and deeply yellowish, the iridescence more of a pink and green hue. Abdomen shorter and more robust and often more vividly green than the abdomen of the ♂, this extending almost to the terminal segments. Valves reaching slightly beyond the end of 10.

Abd. ♂ 53-59, ♀ 52-53. Hw. ♂ 37-40, ♀ 41. Pt. 1.5 mm. Abd./hw. ratio (♂) about 1.5.

DISTRIBUTION: Subsp. *iridipennis* is recorded from Natal to Angola, Congo and Rhodesia; Madagascar (*fuliginosus*).

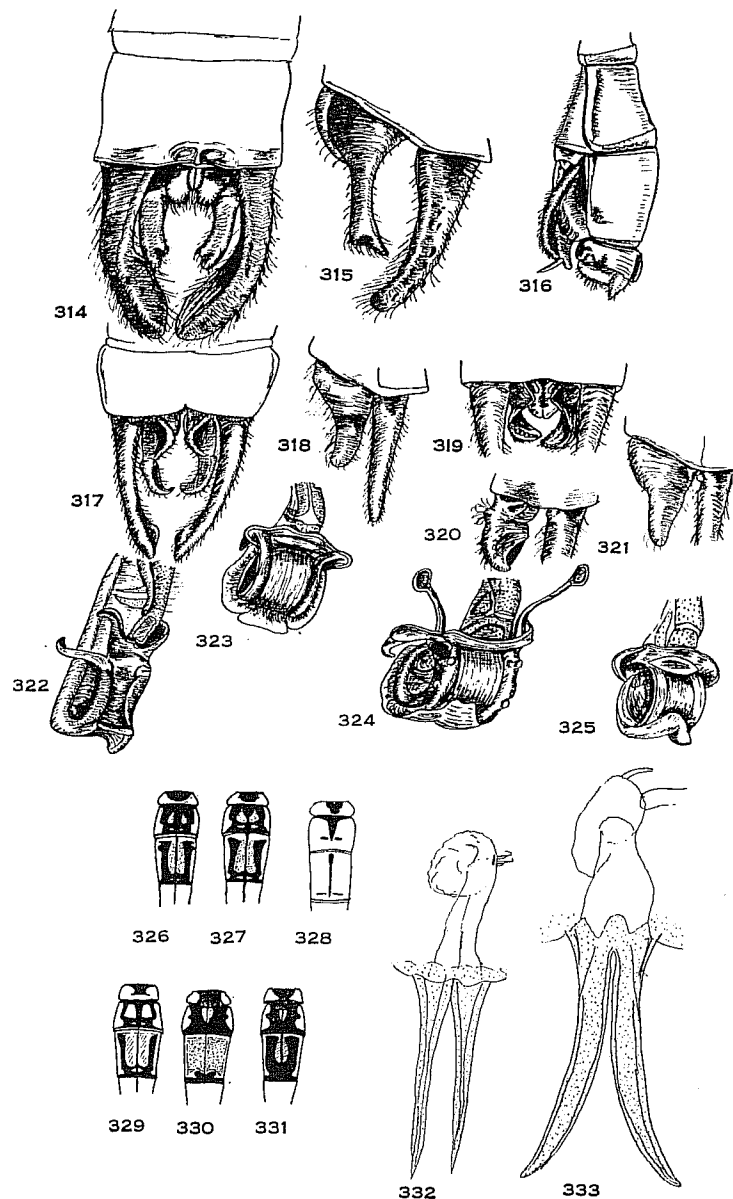
Subsp. *camerunensis* in Central and W. Africa; Somaliland.

Southern Africa. Transvaal Museum Collection: Natal — Series from St. Lucia and Kosi Bay. Transvaal — Series from Pretoria and Barberton. Portuguese East Africa — Magude (Swierstra); Ingamanhé Forest, Sept., 1947 (Pinhey); S. Rhodesia — Series from Victoria Falls (Van Son) and Umtali (Sheppard).

PLATE 9.

PHAON AND *CHLOROCPYPA*.

- 314-315. *Phaon iridipennis*, anal appendages of male. 316. Appendages of female.
 316. Same, appendages of female.
 317-318. *Chlorocypha caligata*, anal appendages of male.
 319-320. *C. luminosa dispar*, same.
 321. *C. fitzsimonsi*, same, seen from left side only.
 322-325. Penis of *iridipennis*, *caligata*, *luminosa* and *fitzsimonsi*, respectively.
 Abdomen 1 to 3 of *Chlorocypha*:—
 326-327. *caligata*, male, mature and immature. 328. *fitzsimonsi*, male.
 329. *caligata*, female. 330-331. *luminosa*, male, female, respectively.
 332. *C. caligata*, bursa. 333. *P. iridipennis*, bursa.



Other records: From other parts of Natal; Delagoa Bay (Portuguese E. Afr.); and several localities in S. Rhodesia: Salisbury, Sawmills, Bindura, Lusita R. (Melsetter), Penhalonga.

REMARKS: This striking species is to be found, chiefly in the warmer, lowveld regions, near rocky, shaded streams. It likes to fly in the shade of trees on the banks of such streams.

UMMA Kirby.

Cleis Sélys 1853, Bull. Acad. R. Belg. Suppl., p. 22.

Umma Kirby 1890, Catal. Odonata, p. 100 (nom. nov. pro *Cleis* Sélys). Le Roi 1915, Ergebn. Zw. D. Zentr. Afr. Exped., I, Zool., 9, p. 322. Longfield 1933, Stylops II: 6, p. 130. Kimmins 1933, id. loc., p. 140 (penis). Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 72.

Genotype *UMMA CINCTA* (Sélys) 1853.

REMARKS: A genus well represented in Africa, with nearly a dozen species, but not yet recorded south of the Zambezi, although these fine Agridiids may possibly be found in our most northerly limits.

Family CHLOROCYPHIDÆ.

Pallagina Needham 1903, Proc. U.S. Nat. Mus., xxvi.

Calopterygina Ris (pars) 1921, Ann. S. Afr. Mus., xviii, p. 261. Schouteden (pars) 1934, Ann. Mus. Congo Belge, (3)2: (3)1, p. 71.

Libellagina Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 183.

Chlorocyphidæ Cowley 1937, Trans. R. ent. Soc., Lond., 86: 1, p. 1 (penis). Tillyard et Fraser 1939, Austral. Zool. ix: iii, p. 212.

INTRODUCTION: Very different in appearance and wing structure from Agridiids, with which they were associated.

DESCRIPTION: See under the genus *Chlorocypha*.

REMARKS: Several genera from Asia are included in this family, but *Chlorocypha* is the only one recorded in Africa.

NYMPHS: Refer Barnard 1937, p. 183.

CHLOROCYPHA Fraser.

Libellago Sélys 1840, Monogr. Libellul. d'Europe, p. 200; id. 1853, Bull. Acad. R. Belg., 20, Annexe (Synopt. Calopt.), 57. Karsch 1891, Ent. Nachr., 17, p. 70 (Notes on African spp.); and 1893, Berl. Ent. Zeit., 38, p. 32, f. 11 (nymph; key to African spp.). Ris 1921, Ann. S. Afr. Mus., xviii, p. 261. Schouteden 1934, Ann. Mus. Congo Belge (3)2: (3)1, p. 74.

Chlorocypha Fraser 1928, J. Bomb. Nat. Hist. Soc., 32, p. 684 (nom. nov. for African spp. of *Libellago* Auctt.); and 1934, loc. cit., p. 55. Longfield 1936, Trans. R. ent. Soc., Lond., 85: 20, p. 467. Cowley 1937, id. loc., 86: 1, p. 1 (penis). Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 183 (nymph). Fraser 1947, Trans. R. ent. Soc., Lond., 98: 2, p. 19 (abdomina).

Genotype *AGRION DISPAS* Pal. de Beauvais (1809).

INTRODUCTION: Ris 1921, mentions that the old name *Libellago* should be connected with *Micromerus* and a new genus would have to be erected for the African relatives: Fraser, 1928, proposed *Chlorocypha* for this purpose, to include African species formerly in *Libellago* Auctt., but excluding at first two Asiatic species. Eventually *Chlorocypha* and its Asiatic relatives were removed from the old Calopterygidae and placed in a new family Chlorocyphidæ.

Chlorocypha spp. are decidedly different from the nearest southern African genus *Phaon* which, with *Sapho* and *Umma*, is placed in another family Agridiidae. The genus here considered has a short, broad body, long, narrow wings and a remarkably prominent epistome. Also they are much smaller insects than *Phaon*.

DESCRIPTION: Epistome very enlarged and projecting. Wings petiolate, narrow; hyaline; pterostigma long and narrow; numerous Ax, all quite straight; discoidal cell rather rectangular, divided with one or more crossveins; MA zig-zagged after nodal level; sectors of arculus rising separately. Abdomen short, broad, triquetral.

REMARKS: This genus includes a large number of species and forms in Africa and with their brilliant colouring they are amongst the most beautiful insects of this Order. They usually haunt shaded streams in warm localities, settling on stones or vegetation. The three species found so far in Southern Africa are easily distinguished, especially the ♂♂, which have a bright blue abdomen in one species or scarlet in the other two. The latter are more tropical, less widespread. In the Pretoria University Collection there is a specimen labelled *C. sélysi* (Karsch), actually a specimen of *C. luminosa* (see below).

KEY TO SPECIES (refer Pl. 9).*

- 1 — Tibiæ of ♂ foliaceous, red and whitish. Dorsum of 2 (at least in mature ♂) with four pale central spots. Pale colour of abdomen above at least blue on 7-10. Pt. not over 2.5 mm. in length (*Platygypha* Fraser) 2
- Tibiæ of ♂ not foliaceous, black. Dorsum of 2 in both sexes with heart-shaped pale central spot (single or double). Pale colour of abdomen entirely red. Pt. 2.5-2.8 mm. *C. luminosa* Karsch
- 2 — Abdomen of ♂ above with pale colour red on 1-6, sky blue on 7-10. Tibial expansions narrow. Pt. 1.75-2 mm. *C. fitzsimonsi* Pinh.
- Abdomen of ♂ above with blue on 1-6. Tibial expansions broad. Pt. 2-2.5 mm. *C. caligata* Sélys

CHLOROCYPHA CALIGATA (Sélys).

(Abdominal pattern, anal appendages, penis, bursa copulatrix — Pl. 9; entire insect — Pl. 20; venation — Pl. 29.)

Libellago caligata Sélys 1853, Synops. Calopt., Bull. Acad. R. Belg. (2)1, p. 57 (Durban). Ris 1908, in Schutze's Forschungsreise, I, p. 307, nr. 2 (Natal); id. 1921, Ann. S. Afr. Mus., xviii, p. 262, f. 6 (append), pl. vi, f. 6 (venation). Kennedy 1920, Ohio J. Sci., xxi: 1, ff. 74-75 (Penis). Carpenter 1929, Proc. Ent. Soc., Lond., 3: 2, p. 38 (Courtship).

Libellago ambigua Gerstäcker 1869, Archiv. f. Naturgesch., xxxv: 1, p. 222, nr. 82 (1♀ Mbaramus, Zanzibar).

Libellago hartmanni Förster 1897, Ent. Nachr. xxiii, p. 216. (Waterval Onder, Transvaal).

Chlorocypha caligata Cowley 1937, Trans. R. ent. Soc., Lond., p. 17, f. 60 (penis). Barnard 1937, Ann. S. Afr. Mus., xxxii, p. 184; id. 1940, loc. cit., p. 659 (nymph).

Libellago caligata (= *hartmanni*) Förster 1906, Wiesbaden Jahrb. ver. Naturk., 59, p. 331.

INTRODUCTION: The male is easily distinguished from *luminosa* ♂ by its blue abdomen and remarkable expanded red and white tibiae; the thoracic dorsum does not become so dark at maturity, the pale stripes remaining visible; the pterostigma is very slightly smaller. Both sexes can easily be distinguished from *luminosa* by the black markings on dorsum of abdomen 2, which in the present species consists of a median and two latero-dorsal lines enclosing a pair of pale spots; whereas in *luminosa* the median line is absent and the two dorso-laterals enclose a heart-shaped pale spot. In *fitzsimonsi* the abdomen is red and blue, but with very different black pattern.

DESCRIPTION: Mature ♂. Eyes blackish in life. Labium ferruginous with black anterior apex. Face and head above black; two small orange or greenish-orange postocular spots (more anterior than those found in Coenagriidae); a somewhat rectangular pale greenish (blue-green in life) patch in middle of dorsum extending from free posterior margin of occipital plate up to the posterior ocelli and sending branches from each antero-lateral angle along the vertex externally to the ocelli. Prothorax black with a green-tinted ferruginous

* Fraser (1949) has erected a new genus *Platygypha*, for those species with flattened tibiae in the male; *Platygypha* would cover *caligata* and *fitzsimonsi* of the South African species.

band along anterior and posterior margins; median dorsally with a pair of small pyriform yellow spots; a latero-dorsal ferruginous spot; sides ferruginous. Synthorax black dorsally; a narrow cream (blue-green in life) median line, incomplete at lower end; a pale ferruginous band just above humeral suture which, from near its lower end, sends a branch backwards up the mesepisternum. Mesepimeron mainly black; just above first lateral suture a pale ferruginous band runs up from lower end almost to upper end then loops forwards and runs down again, slightly below humeral suture, to end bluntly, and followed slightly later by a small ferruginous spot. Rest of sides deep ferruginous (redder in life), with black line along second lateral suture. Pale emerald spot in each antealar sinus; wing origins and interalar spaces marked with an intricate colour pattern of reddish, greenish-yellow ochreous, cream and pale emerald spots. Femora and tarsi black; hindfemora ferruginous on inside. Tibiae flattened, foliaceous, as in certain Platycnemids; the outer surface vermilion or pinkish-vermillion, the inner surface white to yellowish-white; spines black.

Wings hyaline; stained with yellow at base to about the arculus and sometimes along costa. Venation and pterostigma black.

Abdomen broad, short, depressed, very gradually tapering. Dorsum of abdomen mainly brilliant blue, fading to grey-blue in pinned examples. 1-3 crimson with black and blue markings: 1 with broad black median patch; 2 with black ring at each end, and in middle a group of four blue triangular spots bordered with black; 3 similar, the anterior pair of blue triangles very much larger than the posterior. On sides of 2-3 a short black line; ventrum black. Segments 4-10 black with blue on dorsum: at posterior end of 4 an elongate black spot on either side of middle line; 5-6 with smaller black dots. A black terminal transverse band on each segment. 4 sometimes crimson at sides.

Anal appendages black; superior forcipate, inferiors conical in sideview.

Accessory genitalia: Penis, see fig. 323.

Immature ♂. Marked more like ♀. Postclypeus greenish-ochreous, margined with black; frons with two greenish patches, one on each side of black median line; sides of face with greenish spots. Head above with greenish postocular spots; on occipital plate a greenish patch, extending on to vertex, sending a branch on either side of the ocellar group; two small spots in front of the ocelli and two others in centre of head. Occiput black. Markings on thorax as in mature ♂, but all the ferruginous and pale areas greenish or greenish-yellow, turning, in pinned examples, to a pale ochreous. Tibial surfaces both pale yellow in general specimens; in slightly older ones the outer surfaces orange. Wings very faintly greenish. Pterostigma bicolorous, black with an elongate whitish central spot.

Abdomen with only a thin grey blue colouring on dorsum, showing the other markings more clearly as in fresh females; on dorsum of 2-4 only the anterior large pale patches are bluish, the small posterior spots are yellow. Sides of 1-3 or 1-4 pale greenish-yellow or bright orange, becoming pale yellow in pinned examples.

♀. All pale areas on body pale ochreous or greenish-ochreous. Head very similar to immature ♂, but pale areas more extensive; in particular the anterior arms of the posterior dorsal patch on occipital plate and vertex almost link round in front of the ocelli and also join up to the pale areas on the frons. Labium whitish-ochreous with black apex; labrum orange with black basal band, projecting in medial line; anteclypeus orange with black basal line and medially a very broad black projection enclosing an orange spot. Prothorax as in ♂, but with a pale central spot in front of the pair of pyriform spots. Thoracic markings as in immature ♂, but the pale areas more extensive. Legs ochreous, blackish on inside; tibiae normal, not expanded. Wings often with more (faint) greenish tint than in ♂; pterostigma longer, mainly cream coloured, with brown suffusion at proximal and distal ends.

Abdomen shorter and slightly less flattened than in ♂. Olivaceous brown, more yellow at sides and ventrally. Black markings: narrow black lateral and medial carinae; a dorso-lateral band on 2-7, widening considerably on posterior segments, and on each segment spreading transversely across the distal end to join the opposing band, enclosing mid-dorsally

two small yellowish dorsal spots, except on segment 7. 8-9 mainly black above with pale lateral spot; 9 with small pair of pale mid-dorsal spots; 10 and anal cerci black. Valves extending very slightly beyond apex of abdomen. Cerci straight and acute.

Abd. ♂ 19-21, ♀ 17-19; hw. ♂ 22-24, ♀ 24-25. Pt. ♂ 2 mm., ♀ 2.2-2.5 mm. Abd./hw. ratio (♂) 0.9.

DISTRIBUTION: Cape Province to Angola, Belgian Congo, Kenya, Uganda; Zanzibar.

Southern Africa. Transvaal Museum Collection: Series from Natal, Transvaal, S. Rhodesia and Portuguese E. Africa.

Also recorded from Cape Province (Barnard).

REMARKS: The male of this species is one of the most striking and pretty of African dragonflies. They prefer rocky pools and streams overhung with trees and shrubs; and settle on rocks, reeds or branches. Widespread and common.

I believe this species is almost unique among African Odonata in its method of courtship. The male apparently attracts the notice of the intended spouse by displaying the red surfaces of his tibiae. Then, in the instance where I have been "privileged" to witness the scene, with the female perched on a twig, the ♂ swings in flight from side to side, pendulum-fashion, in a semicircle round the female, with the white surfaces of his tibiae now brought together under his head in front of the lady; these tibiae gently vibrating and at first sight appearing like a white beard.

NYMPH: Refer Barnard 1937, pp. 185, 659.

CHLOROCYPHA DISPAR subsp. LUMINOSA (Karsch).

(Abdominal pattern, anal appendages, penis — Pl. 9.)

subsp. dispar:

Libellago dispar Palisot de Beauvais 1805, Ins. Afr. Amér., 85 (Ivory Coast). Karsch 1891, Ent. Nachr., 17, p. 70 (characters).

Chlorocyptha dispar Cowley 1937, Trans. R. ent. Soc., Lond., p. 17, f. 59 (E. Afr.) (penis). Fraser 1941, Proc. R. ent. Soc., Lond. (B)10: 3, p. 39; id. 1947, Trans. R. ent. Soc., Lond., 98: 2, p. 19.

subsp. luminosa:

Libellago luminosa Karsch 1893, Berl. ent. Zt., 38, p. 33 (W. Afr.).

Libellago fejuna Baumann 1898, Ent. Nachr., 24, p. 345 (Togo).

Chlorocyptha fejuna Cowley 1937, Trans. R. ent. Soc., Lond., p. 17, f. 58 (Mt. Selinda) (penis).

INTRODUCTION: There are several subspecies attributed to *dispar* from Central and W. Africa. The typical subspecies is said to have, in the ♂, the basal segments of the abdomen black, the rest green with black markings; *luminosa*, probably a distinct species, has the entire dorsum of the abdomen scarlet with black markings. By this coloration it is at once distinguished on the wing from the commonest Southern African species, *caligata*. Also the tibiae in the ♂ are normal, not expanded. Both sexes of *luminosa* can be distinguished by the marking on dorsum of 2, consisting of two black dorso-lateral lines enclosing a red heart-shaped spot.

DESCRIPTION: Mature ♂. Labium ochreous-brown, black at anterior apices; labrum and anteclypeus pale ferruginous ringed with black. Dorsum of face and head black, faintly showing ferruginous markings, these in arrangement very like the female of *caligata*, but the posterior pale patch narrower, confined to occipital plate (not extending on to vertex) and from there sending the arms forwards and round the ocelli; and the postocular spots are not separate, but narrowly joined to the pale patch on the occipital plate.

In an older ♂ these dorsal markings are obscured by black; the labium is ferruginous with narrow black median line. Prothorax black, bordered with ferruginous (that colour on posterior margin sinuous); ferruginous dorso-lateral spot and a very small central

V-shaped spot. Synthorax black dorsally and on mesepimeron, with ferruginous markings: very narrow mid-dorsal line; a band above humeral suture, sending a fork back dorsally from anterior end (as in *caligata*); a band at first lateral suture, and a faint indication of the end of the loop on the mesepimeron (shown more clearly in adult *caligata*). Metepisternum orange-brown; metepimeron black with two orange-brown spots — a very large upper triangle and a small rounded spot at ventral end; ventrum ferruginous with black sutural lines. Orange-brown spots at antecular sinus, interalar spaces and wing origins.

In a still older ♂ the dorsal and most of the lateral paler markings on the thorax are obscured by black; antecular sinuses black; pale spots between the wings redder, especially a central pair between hindwings; posterior twin spot on thorax orange. A faint white pruinosity develops on thoracic ventrum. Legs black; tibiae mainly whitish on inner surface. Wings stained with yellow from base almost to arculus; costal space slightly yellowish. Venation and pterostigma black. In these older ♂♂ the wings become rather smoky brown, especially at apices.

Abdomen shaped as in *caligata*, but slightly shorter. 1 above black with latero-dorsal orange spot. 2-10 above scarlet or pinkish-scarlet (on 2, in not fully mature specimens, more orange and pink), with black markings: black terminal rings on each segment, broad on 2-4, narrower on the others. On 2 a black band at lateral carina, and two dorso-lateral bands curving towards middle distally and with a tooth mark on outer edge: these black markings resulting in the central red spot being heart-shaped. 3 with black band along lateral carina, and on posterior margin the black ring has two spots projecting forwards.

On 4-10 the black lateral carina does not show dorsally; 4 has the two posterior spots as 3; 5-7 or 8 show a very minute black hyphen before the terminal ring, in lieu of the distal black spots. Ventrum of abdomen black with elongate yellow spots. Anal appendages jet black. Inferiors irregularly shaped. Immature ♂ is marked and coloured as in the female on body and has the bicoloured pterostigma. Dorsum of abdomen with a thin lilac or violaceous tint, becoming grey-blue in preserved specimens; sides and ventrum with pale areas yellow.

Accessory genitalia: Penis, see fig. 324, with spoon-shaped processes.

♀. Labium whitish-ochreous, black at apex; labrum yellow edged with black and divided by black median line; genae brighter yellow, edged with black. Dorsal pale marks very similar to ♂, ochreous. Markings on thorax also similar; ochreous-yellow dorsally, pale yellow laterally and ventrally.

Wings more stained with greenish, particularly in anterior half; pterostigma brown with diffuse elongate cream central spot (usually smaller spot than in *caligata* ♀). Abdomen more cylindrical than in ♂; yellow with black markings on dorsum: a broad median band on 1; a very fine black median line on 2-7; very broad dorso-lateral bands on 2 (toothed on outer edges) enclosing an oval yellow spot; 3-7 with heavily marked black U-shaped patch covering most of the dorsum, in fact progressively more and more on posterior segments, almost entirely covering 7th; 8 all black, except yellow lateral line; 9 black with yellow lateral patch and a pair of small distal yellow spots; 10 black with posterior yellow spot. Lateral margin of abdomen yellow. Ventrally yellow with black ventral band. Cerci black. Valves mainly black.

Abd. ♂ 18.5-20, ♀ 16-17.5; hw. ♂ 23.5-24, ♀ 25-26. Pt. ♂ 2.5-2.8 mm., ♀ 2.5-2.8 mm. Abd./hw. ratio (♂) 0.8.

DISTRIBUTION: The typical subspecies *dispar* (if the insect described above is not specifically distinct) occurs in West Africa. Subspecies *luminosa* occurs in Natal, Southern Rhodesia, Belgian Congo, Uganda and W. Africa.

Southern Africa. Transvaal Museum Collection: S. Rhodesia — Umtali, Oct., 1931 (Sheppard) and Dec., 1947, to Feb., 1948 (Pinhey).

Other records: Natal — M'Balane (1 ♂ in Pretoria University collection as *C. sclysi*). S. Rhodesia — Mt. Selinda, Oct., 1905 (Marshall) and Feb., 1948 (Whellan).

REMARKS: A species more confined to tropical or subtropical areas than *caligata*. Near Umtali it can be found flying over small streams in company with *caligata* and has much the same habits, settling on rocks or twigs. I have not seen any courtship in progress in this species.

CHLOROCYPHA FITZSIMONSI Pinh.

(Abdominal pattern, anal appendages, penis — Pl. 9.)

Chlorocypha fitzsimonsi Pinhey 1950, Ann Transv. Mus., xxi., p. 270, figs. 23-35.

INTRODUCTION: Male slightly larger than *caligata*, but with the same expanded, red and white tibiae; abdomen, at least the first six segments, red above, with reduced black markings. I take pleasure in naming this species after Dr. V. FitzSimons, Director of the Transvaal Museum.

DESCRIPTION: Holotype male. A rather more robust insect than *caligata*. Head and face above black, with three orange marks on vertex, the middle one U-shaped. Prothorax and synthorax reddish-orange, marked with black as in *caligata*. Legs similar to the latter species, tibiae flattened, red and yellowish-white. Wings hyaline, yellow at base, with black pterostigma. Abdomen 1-6 red above (remaining segments discoloured, but perhaps blue?); black markings reduced to a discontinuous narrow black median line with a small spot on each side of this line in distal half; on 2 this black T-shaped; short black lateral line on 1-2. Anal appendages black. Inferiors conical. Penis very like *caligata*.

♂ Abd. 22, hw. 24, pt. 2 mm. Abd./hw. ratio (♂) 0.9.

Since the above description was made a few specimens, in a better state of preservation than the holotype, have been forwarded by K. M. Pennington, who collected them on the Umgeni River (Selsley Farm), Dargle district, Natal, in May, 1949.

♂. Thorax with ferruginous markings broader than in *caligata*; median dorsal line ferruginous. Abdomen with the pale dorsal markings on 1-6 red; black markings more extensive than in the holotype, the new specimens being more mature; on 2 forming the four pale triangles as in *caligata*, and on 3-6 tending to form the black "U", severed by the black median carina, as in the latter species, but the lateral arms of the "U" on 3-4 are more slender and parallel, not converging at their feet (proximal) ends as they tend to in *caligata*. On 5 the "U" thickens considerably, on 6 the black of the "U" and median line are so extensive as to confine the dorsal red to narrow triangles in the basal half of the segment. 7-10 sky blue dorsally, with narrow black basal line on 10. The tibial expansions are longer and narrower than in *caligata*.

In a later consignment from the same locality, collected in January, 1951, Mr. Pennington sent some more males accompanied by females. As he did not find *caligata* males, it is evident that these females are *fitzsimonsi*. The females of nearly all Chlorocyphids are very similar in markings and *fitzsimonsi* differs from *caligata* mainly in degree.

Mature ♀. Pale markings on head and prothorax similar to *caligata*. Mesepisterna with broader markings; median line tends to be swollen at anterior end, the forked pale antehumeral band is thicker; but the pale mesepimeral stripe is more slender. The tibiae are not distinctly yellowish externally as they are in *caligata*. Abdominal pattern similar.

♀. Abd. 20.5-21.5, Hw. 21-23, Pt. 1.75-2. Abd./hw. ratio 0.99.

♂. Abd. 18-19, Hw. 24.5-26.5, Pt. 2.

DISTRIBUTION: One male in Transvaal Museum taken in South Natal — Umzinkulwana River Valley, near Paddock, Natal, 28th Dec., 1948 (V. FitzSimons).

REMARKS: Holotype ♂ in Transvaal Museum. Captured among a few *C. caligata*.

GLOSSARY

- A'*, *Ab* (in *Zygoptera*)—That part of the anal vein where it leaves margin of wing, meets *Ac*, and forms lower edge of subquadrangle.
- Ac*—See *Anal Crossing*.
- Aedeagus*—See *Penis*.
- Anal Angle*—See *Tornus*.
- Anal Appendages*—In ♂ consisting of superior and inferior parts used for grasping ♀ when mating; in ♀ consisting of supra-anal tubercles, or cerci.
- Anal Crossing, Ac (Cuq)*—Crossveins linking anal and cubital veins near base of wing.
- Analus, Anal Vein, 1A*—The most posterior (ninth) main vein of a dragonfly wing.
- Anal Loop* (in higher Anisoptera)—a group of cells in hindwing bounded by branches of anal vein.
- Anal Margin*—In this paper referring to the wing margin between base and tornus.
- Anal Triangle*—A triangular area of one or more cells at extreme base of wing of some Anisoptera, lying against membranule.
- Andromorphous*—Same as *Homochromatic*, q.v.
- Anq*—Alternative name for antenodal crossvein (literally Analquerader in German).
- Antecalar Sinus*—Small triangular areas on thorax in front of wing-roots and at upper end of mesepisterna.
- Anteclypeus*—Part of face between labrum and postclypeus.
- Antehumeral Stripe*—A marking on mesepisternum of synthorax.
- Antenodals, Antenodal Crossveins*—Short transverse veins on anterior part of wing crossing costal and subcostal spaces between base and nodus. Usually uniform (secondary); occasionally a few of them more strongly developed as primary crossveins.
- Antenna*—Organ carrying senses of hearing and smell; reduced in dragonflies to small structures usually of three joints.
- Anterior Lamina*—Anterior organ of accessory genitalia on second segment of ♂.
- Arculus*—A short transverse vein forming a branch of radial and medial veins, angled in all our species of dragonflies—see text.
- Auricles*—Small lateral prominences on second abdominal segment of lower anisoptera (♂♂). Also known as oreillets or earlets.
- Ax*—Designation of antenodal crossvein.
- Axillary Plate*—Basal rudiments of wings.
- Bisinate, Bisinuous Vein*—Double-curved vein (usually referring to R_3).
- Bqs*—See *Bridge*.
- Branchia*—See *Gills*.
- Bridge*—A space below nodal region, bounded by a secondary longitudinal vein connecting the radial sector (RS) and $I R_3$; this boundary being the proximal part of the subnodal sector of de Selys and Hagen. This bridge space may be free or crossed, the crossveins being denoted Bsq or βqs .
- Bsq*—See *Bridge*.
- Bursa Copulatrix*—Copulatory pouch of female; a modification of the vagina.

- Carina, Carina*—Ridges, transverse or longitudinal, on thorax, abdomen or tibiae.
- Cerci*—See *Anal appendages* (♀).
- Claspers*—Superior appendages of ♂.
- Claws*—Ungues, processes on last tarsal joint.
- Clawhooks*—Small teeth below apex of tarsal claw (or unguis).
- Complete* (Antenodals or thoracic lines, etc.)—Lines which go right through their spaces from one end to the other.
- Compound Eye*—Multifaceted eye of an insect, well-developed in Odonata.
- Costa*—Vein along anterior margin of wing.
- Coxa*—Basal joint of insect leg.
- Crossed*—A term used when the discoidal cell, supratrigone, subtrigone or the bridge is traversed by one or more veins. Opposite of the term free.
- Cubital Vein, Cubitus*—Eighth main vein of a dragonfly wing.
- Cubito-anal Space*—Lower wing-space from base to discoidal cell (in Anisoptera) or to subquadrangle (in *Zygoptera*).
- Cuneiform*—Wedge-shaped.
- Cuq*—See *Anal Crossing*.
- Dimorphism*—An instance where a species shows two forms, e.g. two differently marked females, or differences between male and female.
- Discoidal Cell*—An important sub-basal feature of the wing, triangular in shape in Anisoptera, quadrangular in *Zygoptera*.
- Discoidal Field*—Area bounded by veins MA and Cu_2 and commencing at distal edge of discoidal cell.
- Distal*—Away from head (or thorax): e.g. distal part of wing is any specified portion of it away from base; distal edge of pterostigma is outer end of it; distal end of an abdominal segment is that end farthest from thorax. Opposite of proximal.
- Divided*—See *Crossed*.
- Dorsum, Dorsal Surface*—Back or upper surface.
- Earlets*—See *Auricles*.
- Epistome*—Ante- and postclypeus; portion of face between labrum and frons.
- Ethiopian Region*—That part of Africa south of the Sahara.
- Exuviae*—Cast skins of larva or nymph. Shucks.
- Femur*—Third joint of insect leg; one of the largest leg joints.
- Filiform*—Thread-like.
- First Later Suture*—The seam on thorax between mesepimeron and metepisternum.
- Foliations*—Lateral expansions on terminal segments of abdomen. Leaflets.
- Frc*—Opposite of crossed—q.v.
- Frons*—Anterior dorsal part of head—in front of antennae and above postclypeus.
- Frontal Crest or Ridge*—Transverse antero-dorsal ridge on frons.
- Frontal Vesicle*—Part of vertex in Anisoptera raised prominently and more or less forming a hood over the ocelli.
- Fronto-nasal Suture*—Suture between frons and postclypeus.

- Genital Aperture* — Aperture on eighth sternite for emission of spermatozoa in ♂ or reception of these in ♀.
- Genital Lobe* — The posterior organ of the accessory genitalia on second abdominal segment in ♂.
- Gills (Nymphal)* — Respiratory organs of aquatic nymphs; branchiæ.
- Glabrous* — Smooth, hairless.
- Gonapophyses* — Appendages round the genital pore.
- Hamule, Hamulus* — Middle portion of accessory genitalia in ♂; consisting of internal and external portions.
- Hemimetabolous* — Gradual development of nymph into adult state.
- Heterochromatic ♀* — A form of ♀ with markings distinct from those of ♂.
- Hindlobe (of Prothorax)* — Posterior section of prothorax, often bent upwards.
- Homochromatic ♀* — A form of ♀ with markings similar to ♂.
- Humeral Stripe* — Marking on outer (humeral) suture of mesepisternum.
- Humeral Suture* — Seam on thorax separating mesepisternum from mesepimeron; shoulder suture.
- Hypertriangle, Hypertrigone* — A longitudinal triangular area above discoidal cell in Anisoptera, bounded proximally by lower end of arculus.
- Incomplete (antenodals, antehumerals, etc.)* — Opposite of Complete — q.v.
- Inferior Appendage* — The lower anal appendage of a male dragonfly.
- Inner or Interior Hamule* — See *Hamule*. In Anisoptera often a hooked process.
- Intercalary Spaces* — Small spaces on back of thorax between wing-bases.
- Intercalary Sectors* — Short additional longitudinal veins between the main veins. For examples see venation of Lestidæ.
- Jugal Suture* — Transverse carina.
- Juvenile* — Immature specimens, but older than teneral examples.
- Keels* — See *Carina*.
- Labium* — Lower lip of an insect; consisting of median and lateral portions.
- Labrum* — Upper lip of an insect.
- Lamina* — In ♂ genitalia, the anterior process on second sternite of abdomen.
- Leaflets* — See *Foliations*.
- Length of Abdomen* — Length in millimetres from base of segment 1 to end of segment 10 (but not in this paper including anal appendages).
- Ligula* — Median portion of labium.
- Longitudinal* — In long axis of body; in the case of wings referring to the direction base to apex.
- Mandible* — First pair of jaws in an insect.
- Mask (nymph)* — Modified extensible labium; when not in use they conceal the jaws.
- Maxilla* — Second pair of jaws in an insect.
- Media, Medial Vein* — Seventh longvein of dragonfly wing, consisting in our species of the single branch MA.

- Medial Supplement, Mspl* — Short branch from below distal end of MA in Anisoptera; often absent.
- Membrane, Membranula* — Sclerotized portion in some Anisoptera along anal margin.
- Mentum* — Distal joint or sclerite of the labium.
- Mesostigma* — Spiracle between pro- and synthorax.
- Mesepimeron* — Thoracic plate between humeral and first lateral sutures.
- Mesepisternum* — Dorsal thoracic plate on either side of median line.
- Mesinfraepisternum* — Small plate above base of second leg.
- Metasternum* — Ventral plate on thorax in posterior portion.
- Metastigma* — Spiracle situated on metepisternum.
- Metepimeron* — Thoracic plate between second lateral suture and metasternum.
- Metepisternum* — Thoracic plate between first and second lateral sutures.
- Metinfraepisternum* — Small plate above base of third leg.
- Mspl* — See *Medial Supplement*.
- Naiad* — See *Nymph*.
- Nasus* — See *Anteclypeus*.
- Nodus* — A kink on costal margin of wing at end of subcostal vein.
- Nymph* — Young stage of a hemimetabolous insect.
- Oblique Vein* — A short oblique crossvein just below and beyond nodus, present in Lestidæ and at end of bridge of Anisoptera.
- Ocelli* — Three simple eyes on vertex of head.
- Occipital Plate* — A somewhat rectangular portion behind vertex of Zygoptera and Gomphidæ.
- Occipital Triangle* — A triangular area in higher Anisoptera equivalent to the occipital plate.
- Occiput* — Portion of head to which the compound eyes are attached.
- Odonata* — Modern ordinal name for this group of insects.
- Orcillets* — See *Auricles*.
- Ovipositor* — Egg-laying mechanism armed in lower groups with saws for cutting apertures in plants where ova can be laid.
- Paraneuroptera* — An old name for Odonata.
- Penis* — Secondary organ of coition located on second abdominal segment in ♂ Odonata.
- Petiole* — Base of wing in some Zygoptera where anal vein is fused to margin up to point where this vein separates.
- Pnq* — See *Postnodal Crossveins*.
- Postclypeus* — Plate between frons and anteclypeus.
- Postnodal Crossveins, Postnodals* — Veinlets across costal and subcostal spaces between nodus and pterostigma. Px, pnq, Psq.
- Postocular Spots* — Pale patches on back of occiput in some Zygoptera.
- Polychromatic* — A species having several colour forms.
- Posterior Margin (of Wing)* — Hindmargin; in Anisoptera the margin between tornus and apex.

Prothorax—Anterior, separate portion of thorax, just behind head and bearing the first pair of legs.

Proximal—Opposite of distal, q.v.

Pruinose, Pruinosity—A bloom or flush developing in many older males and to a lesser extent in females, and consisting of a bluish or whitish excretion.

Pseudoneuroptera—An old name for Odonata.

Psq—See *Postnodal Crossveins*.

Pterostigma—A sclerotized sub-apical patch below costa.

Pterothorax—See *Synthorax*.

Px—See *Postnodal Crossveins*.

Quadrangle, Quadrilateral—Discoidal cell of Zygoptera.

Radial Sector—One of the sectors or veins starting from the arculus; RS.

Radial Supplement—A branch from lower (distal) part of vein $1R_5$; Rspl.

Radius—One of the main veins; divided into several branches.

Rhinarium—See *Postclypeus*.

Rspl—See *Radial Supplement*.

Second Lateral Suture—Seam between metepisternum and metepimeron.

Sectors (of Arculus, etc.)—Longitudinal veins; two are from arculus, RS and MA.

Seminal Vesicle—Storage organs of male for spermatozoa.

Shucks—See *Exuviae*.

Sternite—A ventral plate on thorax or abdomen.

Stylets (on prothorax and ninth ventrum)—Short processes on these areas.

Subcostal—The second longitudinal vein; just below costa.

Submentum—Basal joint of labium.

Subnodal, Subnodus—A region directly below the Nodus.

Subquadrangle, Subquadrilateral—An area in Zygoptera bounded above by discoidal cell and below by A' .

Subtriangle, Subtrigone—An area in Anisoptera just proximal to discoidal cell.

Superior Appendages—Claspers or upper pair of anal appendages.

Supra-anal Tubercles (\varnothing)—See *Anal Appendages* (\varnothing).

Supratriangle, Supratrigone—See *Hypertriangle*.

Synthorax—Fused meso- and metathorax, bearing second and third pair of legs and the wings.

Tarsus—Last portion of leg.

Teneral—Soft, immature stage of a dragonfly just after it emerges from nymphal case.

Tentacula—A name for the hamules.

Tergite—Dorsal plates or sclerites of thorax or abdomen.

Tibia (plural *Tibiae*)—Joint of leg just after femur.

Tornus—The curved or angled portion of the wing near base at point where anal margin meets posterior margin.

Transverse—At right angles to body axis; on wings, at right angles to the longitudinal axis.

Triangle, Trigone—Discoidal cell of Anisoptera.

Triquetral—Triangular in cross-section, as often applied to abdomen.

Trochanter—Second joint of leg.

Uncrossed—Opposite of crossed, q.v.

Undivided—Opposite of crossed, q.v.

Ungues—See *Claws*.

Valva, Valves—Lateral plates or sheath covering the ovipositor when it is not in use; harpagones.

Ventrum, Ventral Surface—Underside.

Vertex—Top of head between frons and occiput.

Vulvar Scale or Vulvar Lamina—Modified posterior margin of eighth sternite in female.

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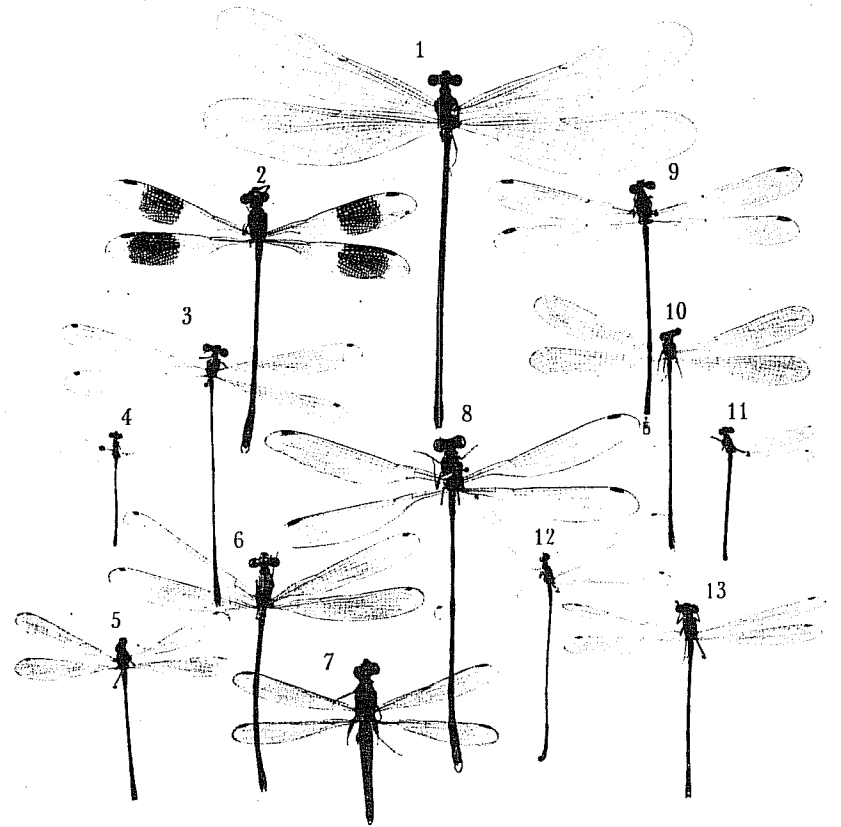
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PLATE 20.
 ZYGOPTEA (x 1.15) (Nat. Size).

1. *Phaon iridipennis*, female.
2. *Chlorolestes fasciata*, male.
3. *Chlorocnemis marshalli*, male.
4. *Agriocnemis exilis* (Salisbury).
5. *Ceriatrion corallinum*, male.
6. *Metacnemis valida*, male.
7. *Chlorocypha caligata*, male.
8. *Chlorolestes elegans*, male.
9. *Lestes virgatus*, male.
10. *Allocnemis leucosticta*, male.
11. *Enallagma sapphirina*, male.
12. *Aciagrion attenuatum*, male.
13. *Pseudagrion salisburyense*, male.



SOME CHLOROLESTES AND LIBELLULIDAE (Nat. Size).

1. *Chlorolestes tessellata*, male (damaged).
2. *C. longicauda*, male.
3. *C. elegans*, male.
4. *Eochlorolestes nylephtha*, male.
5. *Rhyothemis mariposa*.
6. *E. fenestrina* (damaged).
7. *Chalcostephia coronata flavifrons*, female.
8. *Orthetrum rubens*, female (Natural Size).

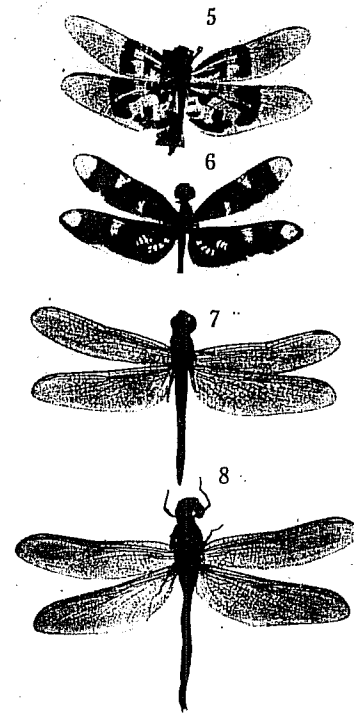
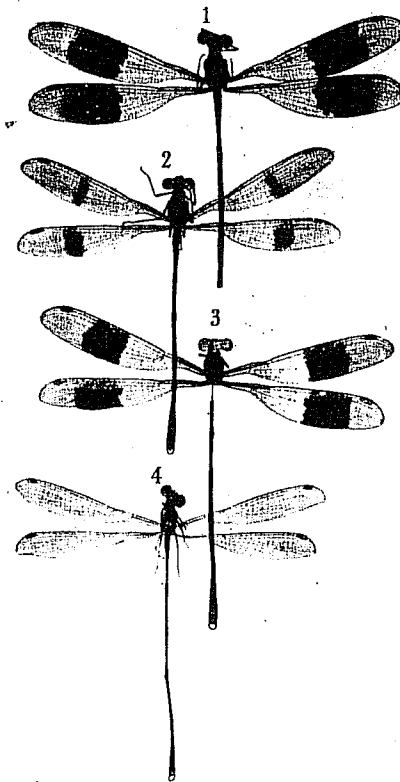
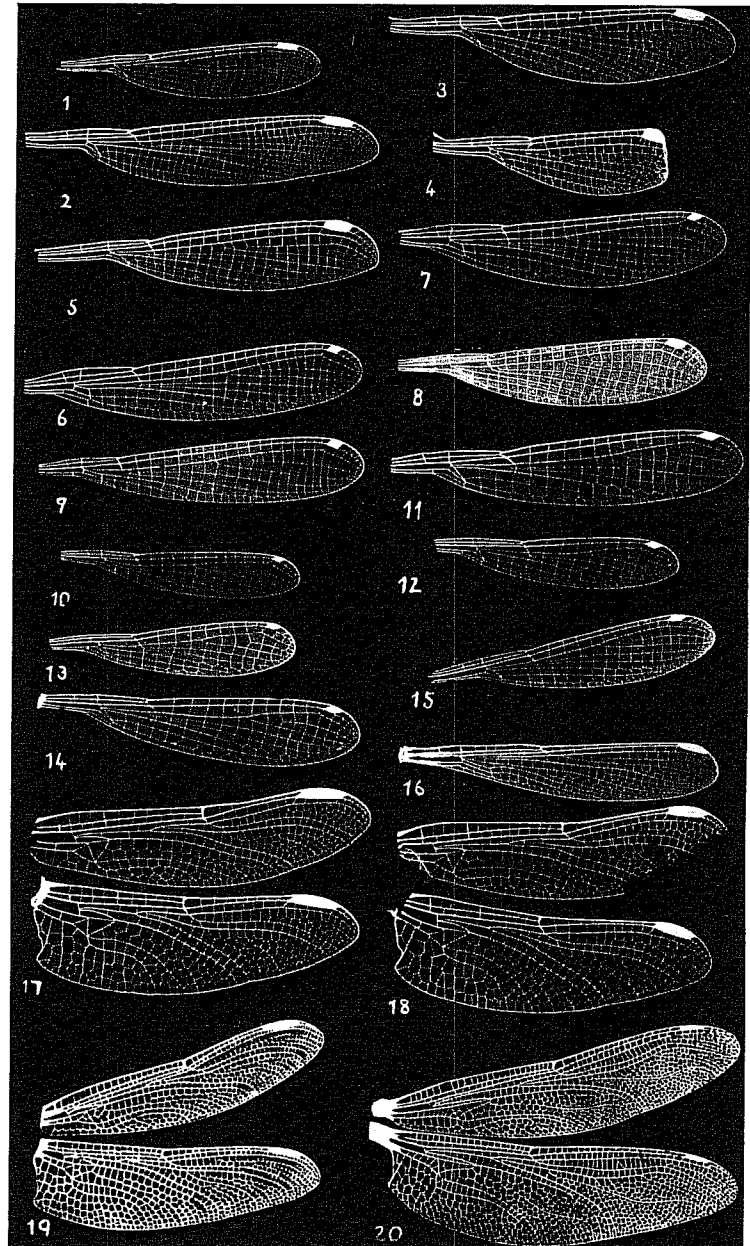


PLATE 29.

WING VENATION (Enlarged).

1. *Lestes plagiatus*.
2. *Chlorolestes conspicua*.
3. *Chlorolestes fasciata*, male.
4. *C. fasciata*, deformed left hindwing (Kokstad, Dec. 1948), showing discoidal cell divided into pentagon and triangle.
5. *Chlorolestes nylephtha*.
6. *Metacnemis valida* (Sinoia). Arc. in Mesocnemine position.
7. *M. valida* (Sinoia). Arc. in Metacnemine position.
8. *Allocnemis leucosticta*, male.
9. *Chlorocnemis marshalli*.
10. *Elatoneura glauca*.
11. *Ceritagrion glabrum*.
12. *Ischnura senegalensis*, forewing.
13. *Agriocnemis exilis* (Zululand form).
14. *Enallagma glaucum*, forewing.
15. *Pseudagrion salisburyense*.
16. *Chlorocypha caligata*.
17. *Paragomphus cognatus*, male.
18. *Onychogomphus supinus*, male (M'Fongosi).
19. *Diastomma solysi* (after Schouteden).
20. *Gynacanthus mocsaryi* (after Schouteden).



WING VENATION (Enlarged).

1. *Anaëtheschna triangulifera*, male.
2. *Phyllomacromia picta*, male.
3. *Tetrathemis polleni*.
4. *Orthetrum chrysostigma*.
5. *Crocothemis erythraca*.
6. *Diplacodes lefeburei*.
7. *Trithemis arteriosa*.
8. *Zygonyx tillarga*.
9. *Tholymis tillarga*.
10. *Urothemis assignata*.
11. *Aciagrion attenuatum*, hindwing (Sebungwe).

