

Series B
Natural Sciences
Vol. 5 Part 4

occasional papers of
**THE
NATIONAL
MUSEUMS
AND
MONUMENTS
OF
RHODESIA**

A Revision of the African *Agriocnemis*
Selys and *Mortonagrion* Fraser
(Odonata Coenagrionidae)

by Elliot Pinhey

April 1974

Occ. Pap. natn. Mus. Rhod. 1974 B5 (4):171-278
April 1974

Occasional Papers

of the National Museums and Monuments of Rhodesia

A Revision of the African *Agriocnemis* Selys and
Mortonagrion Fraser
(Odonata: Coenagrionidae)

by ELLIOT PINHEY
(National Museum, Bulawayo)

CONTENTS

Synopsis
Historical Notes
African Species
Taxonomy
Morphological Comparisons
Specific Groups Defined
Biological Notes
Distribution
Taxonomic Survey
References
Index

Synopsis:-

Structurally, the genus *Agriocnemis* Selys and the sibling taxon *Mortonagrion* Fraser are very intriguing. They not only include amongst them the smallest African species of Odonata but venationally they are very distinct; they exhibit greater polychroism than other genera, but this is shown to be maturational; polymorphism is exceptionally strong in the mid-thoracic region; and their male anal appendages are comparably more diverse in form than in other African genera.

The prothoracic hindlobe in both sexes is usually tripartite, sometimes less noticeably modified. In some species there is a ventral or "inferior lip" on the lobe which stiffens it. The dorsal arms of the mesostigmal laminae are more strongly developed into a ridge in the females of a few species. Despite these modifications it is inadvisable to interpret too much importance in estimating the taxonomic relationships. For instance, in *exilis* the central portion of the prothoracic hindlobe of the female is actually a ventral lip, whereas in *falcifera*, so closely related in other respects, the similar central portion is dorsal. In *gratiosa* the mesostigmal laminae form a thick dorsal ridge, yet in the obviously closely allied *inversa* there is no such pronounced development. In the remarkable *pygmaea* complex not only the female hindlobe may vary in form but the presence or absence of an inferior lip adds to the complexity. I prefer to treat *pygmaea* as a single unit rather than as separate species because of the involved nature of the variants. The possible roles played by these structures in tandem linkage are discussed.

The generic diagnosis is given with some additions to earlier descriptions, including the prophalli and bursae. There has been some confusion in the past over the true type species of *Agriocnemis*. *A. lacteola* Selys is given here, but *rufipes* and *pygmaea* of Rambur have both been employed previously in this capacity. Sixteen African species of *Agriocnemis* are recognised as well as some subspecies; also the single African *Mortonagrion*, *M. stygium* (Fraser). New taxa are introduced:—

Agriocnemis angolensis spatulae subsp. nov.

A. falcifera transvaalica subsp. nov.

A. aligulae spec. nov.

A. angustirami spec. nov.

A neallotype ♀ is described for *A. ruberrima albifrons*.

The status of *Mortonagrion* as a distinct genus is discussed and shown to be dubious.

It is suggested that the peculiar development of the prothoracic hindlobe in males is designed for sexual recognition. Intraspecific polychroism is found to be normal maturation. In most species it develops in a more or less definite plan, in others more diversely. The most remarkable diversity is found in the polymorphic prothoracic hindlobe of females of *A. pygmaea* and since such polymorphism may occur in the same locality it infers different male responses during courtship and tandem linkage. It therefore seems advisable to call this taxon a **superspecies**.

A descriptive survey and a key to both sexes are made of all the African species and it is possible to apply group separation. The most distinct group is that of *forcipata*.

Specific distribution is discussed from tables of available data. By far the most wide-

spread African species is *A. exilis* Selys and *pygmaea* is probably the most widely distributed of the genus in the Oriental region, found also in the Seychelles, with the close relative or subspecies *sania* invading part of Northern and Eastern Africa as well as the Middle East.

Short notes are given on the biology, including the description of the nymph of one species. References to the literature are also supplied and a historical account indicates that *exilis* was the first true species recorded in the genus but the earliest known *Agriocnemis* is *pygmaea*.

Historical Notes

The name *Agriocnemis* was first recorded when Selys (1869 : 24) merely listed three species from his "légions des Agrionines" in his paper on Pollen and van Dam's collections from Madagascar. These were *Agriocnemis solitaria* Selys (Ile Rodriguez), now in *Argiocnemis* Selys; *Agrion rufipes* Rambur (1842, Mauritius), now in *Coenagriocnemis* Fraser; and the African *Agriocnemis exilis* Selys still in this genus and thus the earliest species mentioned in the genus. In his notes on Madagascar (1872 : 182) he again included *exilis* and described it in his final "Synopsis des Agrionines" (1877 : 54(60)). Here he added several Oriental species including *A. lacteola* Selys (India) designated as the type species (1877).

Rambur (1842 : 278) also described *Agrion pygmaeum* from Asia, together with other species (including *rufipes*) now removed to other genera. Thus the longest known species of the genus is *A. pygmaea* (Rambur), not *exilis*. Brauer (1868 : 554) described *Ischnura femina* (India), later placed in *Agriocnemis*, whilst Selys (1887 : 152) introduced another African species, *maclachlani*, one of the largest of the genus. Kirby, in his Catalogue (1890 : 158), listed numerous species under *Agriocnemis* but many of these have now been transferred to other genera. In fact, he incorrectly cited the Mauritian *rufipes* (Rambur) as the type species, which, on the basis of its characters Fraser (1949c: 140) removed to his *Coenagriocnemis*.

In 1891 Gerstaecker described *A. gratiosa* (Zanzibar) and eight years later Karsch added *A. inversa* (Lake Victoria). Just afterwards Grünberg introduced *consimilis* (1902) from the Malawi border of Tanzania but this has been regarded since 1949 (Fraser), correctly in my estimation, as a synonym of *gratiosa*. From the Percy Sladen Trust Expedition (1905) to the Seychelles and other islands Champion (1913 : 443) was able to prove the interesting fact that *pygmaea* (Rambur) occurs in those islands, linking them with the Oriental fauna.

Between the years 1914 and 1923 Laidlaw and Fraser introduced several Oriental species, not relevant to this Revision. During this period Le Roi (1915) and Sjöstedt (1917) described two insects under the same name *forcipata* and for the past twenty years or more these have been regarded as conspecific, Sjöstedt's being a homonym.

Le Roi in his 1915 paper also described *zerafica* (♀ from Southern Sudan), later shown by Fraser (1949) to be the same species as *ebneri* Ris (1924), a very teneral ♂ from the same territory. In the present paper I hope to prove that this synonymy is correct.

Further new species were discovered after the 1920's in Asia, with, for many years, only a single taxon in Africa, *A. victoria* Fraser (1928, Uganda), which I propose to show here to be a distinct species, not synonymous with *forcipata* Le Roi as has been thought.

The lull in African *Agriocnemis* discoveries was broken by Longfield's peculiar species *angolensis* (1945). An even more remarkable taxon *sania* was described by Nielsen in 1958 (North Africa). This is obviously closely related to *pygmaea* of the Oriental Region and of the Seychelles.

Pinhey (1959) described *falcifera* from Zululand (recorded as a (?) form of *exilis* in 1951) and also in 1959 the remarkable *palaeforma* reared from a Ugandan swamp by P. S. Corbet. Meanwhile, Fraser (1954) described *A. stygia* from Zaire but later transferred this to his genus *Mortonagrion* (1920), after studying an unnamed *Mortonagrion* mentioned by Schouteden (1934). Several Oriental species are recorded in this genus.

In his Catalogue (1962b : 139-140) Pinhey listed all the African species and their references (up to the end of 1959) but gave *Agrion pygmaeum* Rambur as the type species, following Fraser's selection (1949) although he had previously recorded *A. lacteola* Selys in 1933 as the type species. Pinhey also provided tentative keys to males of the genus (1959) and to females (1962a). These keys are replaced in this present paper.

Balinsky (1961) described *ruberrima* (Natal), followed (1963) by *ruberrima albifrons* (Okavango swamps) and *pinheyi* of South Africa and Rhodesia. The last African species up till now was *A. merina* Lieftinck (1965) of Madagascar.

African Species:-

The species recognized in this paper are the following:

Agriocnemis exilis Selys

A. pinheyi Balinsky

A. falcifera falcifera Pinhey

A. falcifera transvaalica subsp. nov.

A. ruberrima ruberrima Balinsky

A. ruberrima albifrons Balinsky

A. pygmaea pygmaea (Rambur)

A. pygmaea sania Nielsen

A. merina Lieftinck

A. maclachlani Selys

A. aligulae spec. nov.

A. angustirami spec. nov.

A. gratiosa Gerstaecker

A. inversa Karsch

A. zerafica Le Roi

A. angolensis angolensis Longfield

A. angolensis spatulae subsp. nov.

A. palaeforma Pinhey

A. victoria Fraser

A. forcipata Le Roi

Mortonagrion stygium (Fraser)

Taxonomy

Family Coenagrionidae, subfamily Agriocneminae.

Definition:—

Agriocnemis Selys differ from all other African Coenagrionidae except the problematical *Mortonagrion* Fraser in the position of the arculus which is far distal to the second antenodal cross-vein Ax (by approximately the full length of one Ax); and by the shape of the quadrilateral which has the lower distal angle much less acute than normal (fig. 2), the anterior edge being longer than usual. In the hindwing this discoidal cell is distinctly longer than in the forewing.

The position of origin of the veins IR_2 and R_3 is variable according to the size of the wings and the number of postnodal cross-veins and can be briefly examined. For instance, examination of the origins in the forewing of three to four individuals of either sex (only one in *angolensis spatulae* and *stygium*) gives the following average positions for IR_2 :—

5th-7th Px in *exilis*; 6th in *pinheyi* and *victoria*; 6th-7th in *ruberrima*, *ruberrima albifrons*, *pygmaea* (Ceylon and Seychelles), *gratiosa*, *inversa* and *forcipata*; 5th-6th in *zerafica*, *angolensis*, but 5th in *angolensis spatulae*; 4th-6th in *pygmaea sania* (Sinai) but 5th in *pygmaea sania* (Ethiopia); 6th-8th in *maclachlani*, *aligulae*, *falcifera* and *falcifera transvaalica*; and 7th in *M. stygium*. In one *falcifera* (Zululand) the 6th Px is bifid and in the left forewing of a paratype ♂ *falcifera* IR_2 is not differentiated at all.

The origin of R_3 is usually proximal to one of the Px:— before 3rd or 4th in *exilis*, *pinheyi*, *falcifera transvaalica*, *pygmaea sania* (Sinai), *zerafica*; before 3rd in *pygmaea sania* (Ethiopia); before 4th in *falcifera* (Zululand), *ruberrima*, *ruberrima albifrons*, *pygmaea* (Ceylon and Seychelles), *gratiosa*, *inversa*, *angolensis angolensis*, *victoria*, *forcipata* and *M. stygium*. Alternatively, R_3 may rise at such veins quite often:— at 3rd in *pinheyi*, *ruberrima albifrons*, *pygmaea* (all forms), *gratiosa*, *inversa*, *angolensis* and *angolensis spatulae*, and *victoria*; at 4th in *ruberrima ruberrima*, *maclachlani*, *aligulae*, *gratiosa*, *zerafica*, *forcipata* and *M. stygium* or even before 5th in *stygium*. In *victoria* it may even be below the proximal end of the subterostigmatal cell.

There is little to be gained in taxonomic studies from these origins but it may be emphasized that in *maclachlani* and *aligulae* R_3 tends to arise almost at the 4th Px in the short series available.

They are always small, slender insects and most of them can be considered the smallest of the African Odonata. Small isolated postocular spots are nearly always discernible on the head in the male, whereas in the female these spots are larger, less defined, linked across the back of the occiput. The female has generally been considered polychroic but in this revision it will be indicated that this is rarely true: colour differences are maturational, although the process of darkening varies and in one species, in the *forcipata* group, the juveniles are themselves polychroic in development. The female has no prothoracic stylets but the hindlobe of the prothorax is most frequently modified in both sexes, a most unusual feature. The mesostigmal lamina is often modified. The 10th abdominal segment of the male may be cylindrical or raised dorsally at the distal end or produced to a more or less tubular extension; in the female sometimes raised apically. The male anal appendages are very

variable in form, often with teeth or denticles enclosed within segment 10 and not readily discernible. The prophallus has unbranched, usually broad apical flagella. The female has no vulvar spine on the 8th abdominal sternite. *The bursa copulatrix* (fig. 2) is simple.

The venation is open. The pterostigma is a narrowish parallelogram with the distal edge longer and more oblique than the proximal edge; usually shorter and slightly narrower in the hindwing than the forewing. In some species the pterostigma of the hindwing is much darker than in the forewing. The forewing may have from 5-9 postnodal cross-veins (Px), less in the hindwing. The cubito-anal cross-vein (medio-anal link) Ac is positioned halfway between the two antenodal cross-veins (Ax) or nearer the distal one. The anal vein leaves the margin well before Ac, with Ab at an angle to the rest of the anal vein.

The italicized phrases in this definition are modifications from earlier diagnoses (vide Pinhey, 1962b : 138).

Type species *Agriocnemis lacteola* Selys (Asia)

Distribution: Ethiopian, South Palaearctic, Oriental and Australian Regions.

The very closely allied taxon *Mortonagrion* Fraser is difficult to define. The principal feature is supposed to be that Ab, the commencement of the anal vein, is in a continuous line with the anal vein proceeding from the medio-anal link with Ac, not angled to it as in *Agriocnemis*. This, I have found, is an unreliable character and not evident in our specimen of the African *M. stygium* (Fraser) nor in *M. selenion* Ris or other species from Asia (fig. 2, 23). Liefertinck, who is much more familiar with this predominantly oriental taxon has informed me (pers. commun., 17 Febr., 1973) that this medio-anal link is unstable as a generic character. A. R. Lahiri intimated to me (12 June, 1972) that he was having a similar problem in an Oriental *Agriocnemis* (near *naia* Fraser) with unstable medio-anal link. Liefertinck says that the pterostigma is longer in *Mortonagrion*. Yet this is not so in *stygium* but it is long in *A. zerafica*. Liefertinck, like Ris, Fraser and others, believe that *Mortonagrion* does represent a separate taxon but without clear-cut features.

Because of its mainly Oriental distribution I will leave it as a separate genus but with personal reservations. Liefertinck says "it has characteristic — and quite different — colour pattern" in *Mortonagrion*; and the shape of the anal appendages is peculiar. In our *M. stygium* the pattern is blacker than in our African *Agriocnemis* but this does not apply to other *Mortonagrion*. The anal appendages are very robust but not essentially different from the varied appendages of African *Agriocnemis*. For further remarks see under the genus itself near the end of this Paper.

Type species of *Mortonagrion*: *M. varralli* Fraser (1920, Western India)

Distribution: Oriental Region and tropical Africa.

Morphological comparisons

Head:—

The orbits are significant in the two species of the *forcipata* group, which are quite black on the ventral surface except a narrow border against the eyes. In all other African species the orbits below are entirely creamy or pale greenish white. Mandibles are illustrated in figs. 21, 22.

The labrum is specifically significant in some males, for instance in the *forcipata* group and *angolensis* it is pale greenish, yellow or orange in colour, but in most species it is dark with a purple sheen. In *pinheyi* it is steely black, in *ruberrima* also, but in *ruberrima albifrons* it is purple or blue and purple. Teneral and juveniles usually have the adult coloration. In the female there is less reliability since the juvenile condition may be paler. Yet it is useful in some species. For instance in *exilis*, *inversa* and *aligulae*, the labrum is usually black or dark brown with a cream or yellow distal border; in *pinheyi* and *falcifera*, it is green, orange or ochreous, with or without a paler border; in *angolensis* it is broadly black just in the centre; in *ruberrima albifrons* and the *forcipata* group it is brown with a yellow border, but all brown in *ruberrima ruberrima*; or all purple in *zerafica*. In *gratiosa* it varies developmentally from yellow or orange to brown and finally has a purple sheen; and in *pygmaea* it is too variable to be employed as a character.

The purple sheen of the labrum when present may be bluer in some specimens.

The postclypeus in the male is most frequently glossy black or steely black, but in typical *falcifera* it is purple and in *falcifera transvaalica* it is black; in *ruberrima albifrons*, *maclachlani*, *aligulae* and *zerafica* it has a purple sheen. In the female the postclypeus is developmentally variable, of no use in differentiation.

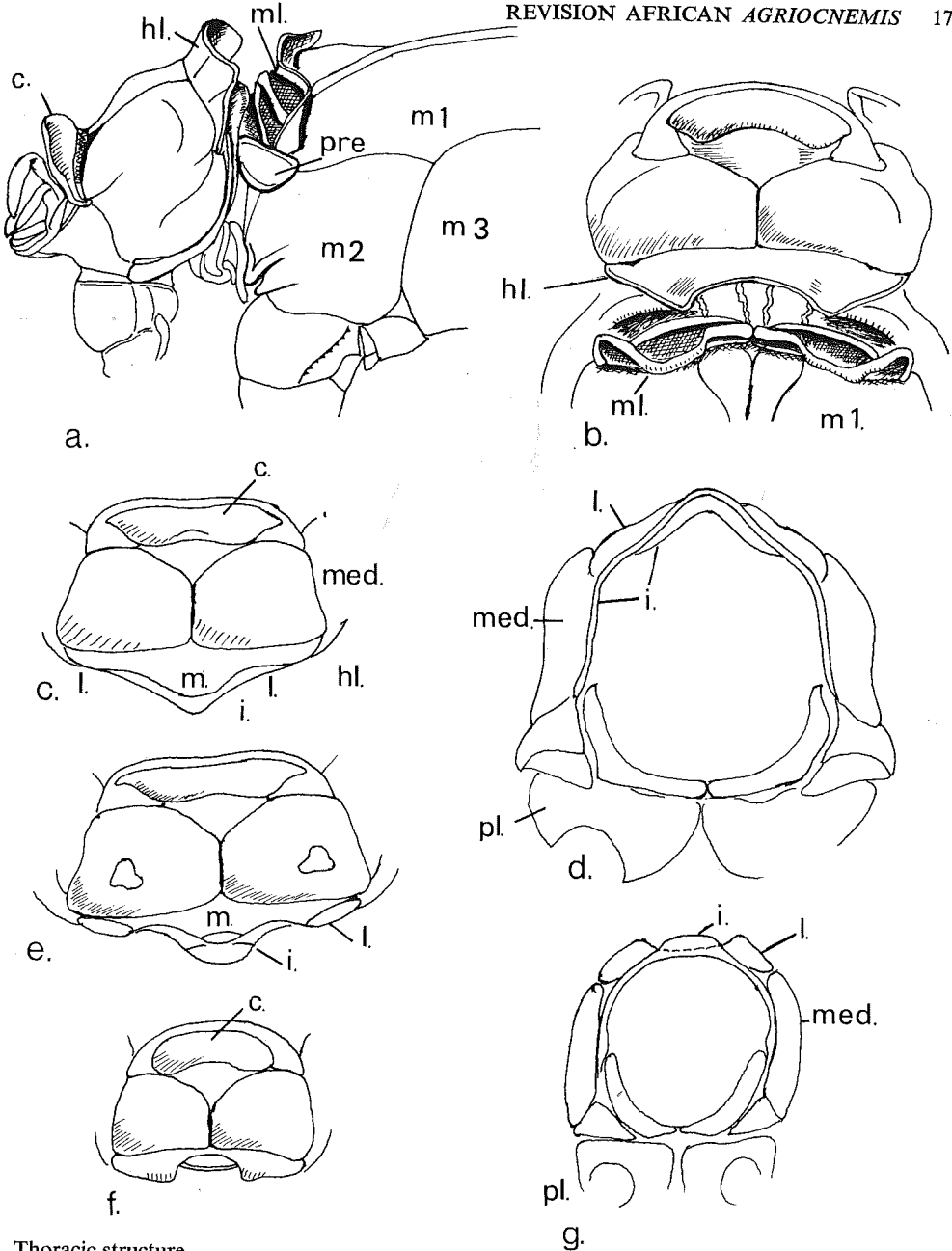
The frons in the mature male may be all black, for instance in *maclachlani* and *aligulae*, but there is a tendency to have a pale green or yellow frontal band which is normally widely severed in the middle. In very mature specimens this frontal feature may be lost or coated with white pruinosity, as in *ruberrima albifrons* and *falcifera*; sometimes broadly so, sometimes only over the region of the broken frontal band. In some species the frontal band is complete, particularly in the immature state. It is not usually a straight band along the anterior of the frons but a crescentic structure, whether whole or only evidenced by lateral bars. Females may show a broad complete yellow, pale green or orange frontal band. The species *aligulae*, *maclachlani*, *forcipata* and *M. stygium* never develop the band.

The vertex is normally black or bronze-black in the male, with small isolated blue or green postocular spots. In females the postocular spots are larger, confluent with the occipital region, often encroaching on the vertex and the orbital region; and normally linked across the back of the occiput by a stripe of similar colour or a different colour, especially in *forcipata* in which the back of the occiput in juveniles is bright orange-red (perhaps a sex-identification colour?). This colour is lacking in the closely allied *victoria*.

Male *M. stygium* has no postocular spots.

Prothorax:— (fig. 1)

The shape of the prothoracic hindlobe is highly important specifically in this genus and the remarkable fact about it is that it is nearly always as much modified in the male as in the female. Yet, it is not apparently a simple sexual genetic character because the development in male and female may be similar (e.g. in *forcipata* group) or very diverse. In ♂ *exilis* the lobe is unmodified, unlike all other known ♂ African *Agriocnemis*; in female *exilis* it is tripartite, the central part mainly a short ventral structure called here an **inferior lip**, and larger triangular lateral parts. In ♀ *falcifera* it is interesting to note that the hindlobe



1. Thoracic structure
 a-b. *A. gratiosa* ♀ from left and from above, pro- and mesothorax; c-d. prothorax of *A. forcipata* ♂ dorsally and post-ventrally to show origin of inferior lip; e. prothorax of juvenile ♀ *A. forcipata*, dorsally; f-g. prothorax of ♀ *A. exilis* dorsally and post-ventrally to show inferior lip.
 Prothorax: c anterior collar, med median lobe, hl hindlobe. On hindlobe, i inferior lip, l lateral lobe, m middle lobe.
 Synthorax: m₁ mesepisternum, m₂ mesinfraepisternum, m₃ metepimeron, ml mesostigmal lamina, pl prothoracic leg, pre preepisternum.

is superficially similar but in fact the short, more rectangular central part is truly dorsal and there is no inferior lip.

Dumont (pers. comm., 19 March, 1973) has also referred to this inferior lip in the *pygmaea/sania* group, using the term "un palier", a stage or step. This lip is actually a centro-posterior extension from a normally curved, slender or centrally thickened black ventral ridge running in a wide sub-peripheral semicircle below the posterior half of the prothorax. It is situated above and more or less rests against the antero-ventral region of the mesothorax. I use the term inferior lip when this extension is obvious and prominent, partially visible in dorsal view of the hindlobe. In African species only *forcipata* and *victoria* have this lip in both sexes, otherwise it is only in one sex or not developed as a prominent lip. In shape the lip may be hemispherical or lobular.

It is evident that a divided tripartite hindlobe would normally be more flimsy than a complete one. The development of an inferior lip will strengthen the middle portion of the partitioned lobe and depress it, since it is firmly attached. Yet in most divided hindlobes in this genus there is no conspicuous lip and so the middle portion tends to coil up, or at least the thin posterior edge, often paler coloured, is upturned. It seems that this curling would be greater in the teneral state, gradually less with maturation but still present. There seems no reason why the lip should be present in one species, such as *maclachlani* and not in a sibling species *aligulae*; nor why the lip may be in some males and not in the female of the same taxon; why fragile in some, thickened in others; why present in ♀ *exilis* but not in the closely related *falcifera* which has a dorsal structure instead. The fact, however, that in *falcifera* ♀ the lobe is merely tripartite without lip, yet in ♀ *exilis* it is tripartite with lip seems to indicate that the development of the lip is later in evolution: despite the probability that in ♂ *exilis* the undivided lobe is more primitive than the tripartite one.

The structure of the prothorax and its hindlobe are illustrated in fig. 1, showing the relationship between the various parts (a, b). *A. forcipata* (1c, e) shows the sinuous, slightly modified hindlobe of the ♂, the more sinuous, more tripartite lobe of the ♀. In both sexes there is the prominent inferior lip. In ventro-posterior view (1d) this inferior lip narrows laterally to the lateral ridge which stems from far anterior ventrally on the median lobe of the main prothorax (med). The ♀ *exilis* (1f dorsally, 1g ventroposteriorly) indicates that the central part of the hindlobe is much reduced in comparison to its triangular lateral lobes and that any function it may normally play in tandem linkage is probably taken over by a more conspicuous central bar, the inferior lip.

This inferior lip is most strongly developed in both sexes of *forcipata* and *victoria*, in females of *exilis*, Oriental *pygmaea* and Sinai examples of *pygmaea sania*. In *aligulae* ♂ there is an expansion invisible dorsally so not a true lip on the ventral ridge, yet there is one in the very similar *maclachlani*. It is there in ♂ *zerafica* and in ♂ *inversa* but not *gratiosa*. Thus, possession of an inferior lip on the prothorax of either sex is apparently not fundamentally a character of prime importance (as evidenced by the *pygmaea* complex) except in stiffening the lobe in certain taxa. It is evidently a secondary development, although in the female it may well play a part in tandem linkage.

In most species in one or both sexes the central part of the prothoracic hindlobe is extended posteriad into a depressed or raised and curved scooplike structure. A surprising

fact is that the lobe in some females, *pinheyi*, some *pygmaea*, *ruberrima*, *inversa* and *gratiosa* is only slightly modified, yet it is strongly tripartite in the male, with scoop-like centre-piece. In female *zerafica* and *maclachlani* there is a v-shaped central projection.

A. pygmaea is in a different category since the female has very diverse hindlobes, even in the same locality. The lobe may be almost unmodified, or tripartite with central scoop, or extremely short, almost reduced to a ridge behind the middle lobe of the prothorax. It is evidently a polymorphic taxon. An inferior lip is conspicuous in ♀ *pygmaea*, as well as *pygmaea sania* (from Sinai), but not Seychelles nor Ethiopian examples.

The diversity in these structures in the genus is unusual but the surprising structural modifications in most males is even more so and unique in African Zygoptera, except in ♂ *Allocnemis* Selys. Although the discoidal cells are less acutely angled than most Coenagrionidae it is not so rectangular as in Protoneuridae and other groups and cannot be regarded as markedly primitive, with such a prominent ♂ character now in disuse. The only reason for the male development that I can suggest is that it is a sex-recognition feature for the females, but whether by sight or contact is quite uncertain. In fact, the pairs are not often captured in copula. This is possibly due to their small size and the fact that they are hidden amongst vegetation over or near the water.

The mesostigmal lamina shows little significance in the male, as would be expected. In females it may often have a posterior or posterior lateral ridge, occasionally an anterior ridge (*gratiosa*). In *falcifera*, *pygmaea*, some *pygmaea sania*, *gratiosa*, *maclachlani* and to a lesser extent in *exilis* the dorsal extension between the two laminae has the form of a raised transverse ridge possibly connected with tandem linkage (infra). There is, however, no apparent correlation between the development of the hindlobe and the inter-lamina ridge. Where this ridge is well developed the lobe may be complete in for instance *gratiosa* or tripartite in *falcifera* or diverse in *pygmaea*. Reduction in the hindlobe and expansion of the ridge is probably a later evolutionary change in tandem linkage.

Remarks on tandem linkage:—

Dumont (in pers. commun., 19 March, 1973) said he thought that the main gripping area for the males (in the taxa *pygmaea* and *sania*) is the mesostigmal lamina, not the hindlobe of the prothorax. In most species this is not normally the prime contact, although it must be so in those *pygmaea* with vestigial hindlobes.

The ♀ mesostigmal lamina is dorsally well developed into a thick ridge only in *gratiosa*, *pygmaea*, *pygmaea sania*, *falcifera* and to a much lesser extent in *exilis*. In the last two the prothoracic hindlobe and the anal appendages are very similar so there does not seem to be any real reason for the greater development in one than in the other. Moreover, the ventral tooth on the superior appendage is minute in *falcifera*, but a long stylet in *exilis*. *A. gratiosa* is certainly very closely allied to *inversa* but there is no strong laminal ridge in *inversa*.

There appears to be little or no correlation between appendages of those having the well developed ridge. In *pygmaea* and *falcifera* the inferior appendages are very reduced, but long and very robust in *gratiosa*. It would seem that if the inferior appendage in *gratiosa* contacts on the lamina the shorter superior appendage could probably not assist.

I think that the hindlobe must be the main factor in those without strong laminae, the

inferior lip taking some minor part when present; and where the laminae are strengthened these also assist, perhaps as buffers. In those with very long inferior appendages, *mac-lachlani*, *aligulae*, *inversa* and *gratiosa*, these may press on the hindlobe, the superior below this or, in *gratiosa*, clamped between the lobe and the lamina. In *angolensis* with its larger superior appendages, these must slip under the hindlobe. When the lobe is vestigial then the lamina must play the major, if not almost the entire part in linkage contact.

Synthorax:—

In males the synthorax is generally black dorsally and laterally down approximately as far as the first lateral suture; with narrow pale green antehumeral stripes. This applies to immature and mature examples. In females the condition is more variable. In *exilis*, *inversa* and less so in *ruberrima albifrons* the black (or brown in immature state) also reaches the first lateral suture; less far in *zerafica*. In most of the others the black (brown in juveniles) is only mid-dorsal down to the antehumeral stripes which are much broader than usual, reaching down to the humeral suture. In some ♀ *pygmaea* there is no black on the thorax except a dorsal spot on the humeral suture. The second lateral suture may have a dorsal spot but in the *forcipata* group there is a broad black band on this suture.

In both sexes of *Mortonagrion stygium* the black descends to the first lateral suture and there are no coloured antehumeral stripes even in juveniles; and on the second lateral suture there is a narrow black or brown band.

Legs:—

The legs are normally pale yellowish ochreous, slightly darker in *forcipata*, paler in the allied *victoria*. In both sexes (except *exilis*, *pinheyi*) there is normally a more or less complete black band on each femur, either postero-laterally or posteriorly; sometimes punctured by clear spots or these spots may be at the edge of the band so that it appears to be almost dentate. In juvenile females and teneral of both sexes there may be little or no black on the femur but it starts as an annulus before the distal end of this segment of the leg. The tibiae occasionally have a short black inner streak, as in the *forcipata* group and *pygmaea*. The tarsi are more ferruginous in *forcipata*.

Colours in life:—

The living colours on the head and body, reds, yellows, greens and blues are generally not helpful in determining a species because of the colour changes during development from teneral to adult state. This is particularly so in females in which the development does not always follow the same pattern. General remarks on the adult ♂ characters should suffice.

The facial colours of the ♂ are usually green or pale green, sometimes greenish yellow. In *ruberrima albifrons* the sides of the face are yellow rather than green as in the nominotypical race; or this *albifrons* race may have the genae dull olive, with the orbits in front yellow. Whether the difference is ecological or intrinsic is not clear. The coastal Zululand *ruberrima* probably lives in a microclimate of more even warmth and the vegetation and salinity of the swamp there would be different in character from the Okavango swamp habitat of race *albifrons*. The strong development of pruinosity in *albifrons*, lacking in the

typical subspecies, may not be significant. For instance, *falcifera* which is also strongly pruinose is found both in coastal Zululand and in a mountain forest stream in the Transvaal. In this species, particularly, the pale facial colours darken at maturity and may even become brown.

Compound eyes are generally black above, green or greenish blue below. Postocular spots are either pale green or pale blue. Antchumeral stripes, when visible, are green; sides of the thorax pale green to greenish yellow. The ♂ abdominal colour is generally pale green to yellowish green on the basal segments, yellow on middle segments and orange to red on the terminal ones. If, however, the black band develops early on the entire abdomen as in *zerafica* the lateral colour will be more or less pale green throughout. Occasionally, even in this species, the end segments may lack the dorsal band and are then orange. This terminal colour condition seems significant. An exception is the adult *ruberrima ruberrima* which is as red on segments 3-10 as are both sexes in juveniles of *forcipata*.

White pruinosity:—

This may develop on the head, particularly on the frons, the pro- and synthorax, legs and base of abdomen in older males but usually only really noticeably in certain species such as *maclachlani*, *ligulae*, *falcifera* and *ruberrima albifrons*. In older females there may be some thin pruinosity.

Wings:—

The features of these are mentioned in the definition of the genus *Agriocnemis*. The pterostigma, although exceptionally black in the forewing and the underside of the pterostigma in the hindwing of the Oriental type species *lacteola*, is generally brownish yellow in both sexes. However, in the males of true *pygmaea*, *falcifera*, *aligulae* and *maclachlani* it is differentially blacker in the hindwing. In *ruberrima albifrons* it is pinkish red in the male wings. In *zerafica* it is distinctly longer than in other species. The most remarkable development, first shown by Balinsky (1963) is in the hindwing of the ♂ *angolense*. The toothed margin above the pterostigma is widened, with a deep pruinosed hollow between the upper and lower toothed edges. This peculiar development is evident but more narrowly in the new subspecies *angolensis spatulae* and it is not found in any other recorded African species mentioned in this revision.

The number of Px (usually mentioned here only in the forewing) normally depends on the size of the species, the smaller ones, *exilis*, *pygmaea* etc. having 6 or 7 Px, the larger species 8 or 9.

Abdomen:—

The abdomen in adults of both sexes usually has a more or less complete black or bronze-black dorsal band, except in some males on the terminal segments which tend to be redder in colour, the basal segments being green, blue-green or yellow at the sides. The dorsal band, at least on the more basal segments, is constricted before each end of the segment, as in other genera. In fully mature examples of the *forcipata* group the sides of the abdomen are also mainly black but more or less enclosing a broken green lateral band.

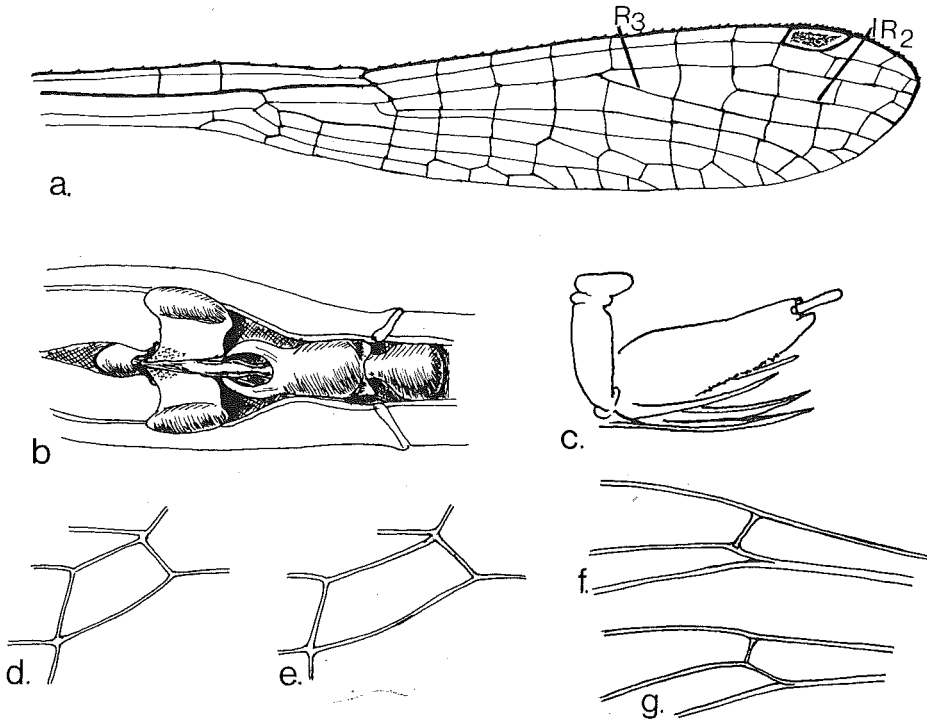
Juveniles and teneral specimens may be very different indeed. For instance in the *forcipata* group the abdomen may be red without black markings. In others there is black

on the basal segment only and in *ruberrima ruberrima* this even seems to apply at maturity, whereas in most cases the black spreads more distad with age. In some the black is evident in the immature state on the distal segments, not on the basal ones, but then spreads proximad at maturity. The actual progress of darkening is not always constant in a species but there normally is a clear pattern.

It is this colour diversity, green, greenish yellow, orange and red, coupled with black on basal or on distal segments and contrasting with the usually more complete band in the mature individuals which has given rise to the belief that the species, or the females, are polychroic. In *ruberrima ruberrima* there seems to be true abdominal sexual dimorphism; in other species there is developmental dichroism or polychroism. These developmental colour changes, as already stated, may follow a more or less uniform pattern or occasionally show some diversity. But I do not believe that the genus is typically, intrinsically polychroic. The only truly polymorphic species (*pygmaea*) has already been discussed under the prothoracic hindlobe.

These colour variants are mentioned in the descriptions of the species.

The 10th abdominal segment of the male may be simple in *exilis*, *falcifera*, *pygmaea*, *angolensis* and *palaeforma*; or raised and slightly produced posteriad in *pinheyi*, *ruberrima*,



2. Venation and genitalia

a. right forewing of *A. pygmaea* ♂ (Mahé); b. accessory genitalia in situ of *A. exilis* ♂ (Malawi); c. bursa copulatrix of *A. exilis* ♀ (Sepopa); d-e. discoidal cell of left forewing and hindwing of *A. exilis* (Malawi); f. medio-anal link in left hindwing of *M. stygium* (Ubangi); g. the same of *A. exilis* (Malawi).

maclachlani, *aligulae* and *gratiosa*. In *inversa* and *zerafica* this segment is produced posteriorly into a tubular or hood-like structure. In females this segment is sometimes raised and pinched-in dorsally.

Abdominal measurements do not include anal appendages.

Anal appendages:—

There is great diversity here as the figures illustrate, both superior and inferior appendages. There are however, certain patterns which can be more or less clearly defined and these in turn will lead to group separations. Only species occurring in Africa are considered.

The superior appendages provide the following categories:

Superior appendage:

1. short, rounded above and laterally, the apex downturned, with a ventral triangular flange —
pinheyi, *falcifera*, *ruberrima* (and *r. albifrons*), *aligulae*, *angustirami* and *maclachlani*.
A modification with a needle-like ventral process, not a triangle —
exilis.
2. short, rounded above and laterally, with large ventral flange, and also a long inner basal tooth —
pygmaea (and *p. sania*).
3. short, rounded above and laterally, broadly rounded below and with a flange; close to group 1 —
merina.
4. not rounded above and laterally but taperingly incoiled, with an inner basal flange —
zerafica, *inversa* and *gratiosa*
5. long, straight, spatulate with a short ventro-basal branch ending in a dentate ridge —
angolensis (and *a. spatulae*).
6. large, cordate or paddle-shaped in lateral view, incurved —
palaeforma.
7. forcipate (like genus *Lestes* Leach) with small weak sub-basal tooth —
forcipata, *victoria*.
8. rounded and excavate above, with robust downturned apex armed externally with short thick denticles —
Mortonagrion stygium.

Keeping as far as possible to an order of association the inferior appendages may be grouped into the following categories:

Inferior appendage:

1. Conical, curved up or more usually inwards to a tooth or very small ridge. Sometimes very long —
exilis, *ruberrima*, *merina*, *inversa* and *gratiosa*.
In *exilis* the apex forms a small ridge of close denticles, leading on to the next category which may be grouped here (conical, with apical denticles) —
pinheyi, *falcifera*.

2. Long, very robust, straight but incurved apically to a dentate ridge. The effect would be a powerful forcipate grip —
maclachlani, *aligulae* and *angustirami*.
3. Very short, more or less rounded, with two groups of apical denticles —
pygmaea (and *p. sania*).
4. Short, with small apical tooth or denticle and a posterior cylindrical lobe —
zerafica.
5. Rounded, convolute, with ventro-apical tooth or denticle —
angolensis (and *a. spatulae*).
6. Short, roundedly conical, with small apical tooth or denticle —
palaeforma.
7. Very short, unarmed —
forcipata, *victoria*.
8. Very broad, truncate, excavate apically, with inner and ventro-apical teeth —
Mortonagrion stygium.

Preliminary Grouping:—

Although the prothoracic hindlobe shows very important modifications, more variable than in other African Zygoptera, the anal appendages are equally so, showing an abnormal range of deviations. It would appear that the modifications in appendages would be of primary development, the prothoracic changes secondary. For instance, the complete unmodified hindlobe of ♂ *exilis* is surely a primitive condition yet in most features it is very closely allied to *falcifera* and *pinheyi*. The females *pinheyi*, *ruberrima*, *inversa*, *gratiosa* and some *pygmaea* have unmodified hindlobes, yet they are allied to other species by most characters, especially to *exilis* and other *pygmaea*.

It is thus necessary to try and relate the appendages to groups.

Group 1. Those with short, rounded superior appendages (Superior category 1) with ventral flange or needle are modified to a rounded ventral lobe in *merina* or there is a long ventral tooth in *pygmaea*.

Those (category 4) with incoiled apical zone appear to be another deviation in this group.

Inferior appendages corresponding to these categories may be slender, conical, ending in a single tooth (Inferior category 1 and superior category 4). In *exilis* the dentate apex leads on to those with denticles, *pinheyi*, *falcifera*, *pygmaea*, a very probable line of change. The powerfully developed inferior of *maclachlani* and *aligulae* appear to be another development of this group. The complex pattern and tandem linkage in *gratiosa* and *inversa* are discussed again briefly under *gratiosa*.

The species of this group by anal appendages are therefore —

exilis, *pinheyi*, *falcifera*, *ruberrima*, *pygmaea*, *merina*, *zerafica*, *inversa*, *gratiosa*, *aligulae*, *angustirami* and *maclachlani*.

Group 2. Superior appendage straight, spatulate; a ventral branch with dentate ridge.

Inferior appendage rounded, with ventro-apical tooth. This appears to be sufficiently distinct to warrant Group designation —

angolensis.

Group 3. Superior appendage paddle shaped or cordate. Inferior appendage conical, with a small tooth —

palaeforma.

Group 4. Superior appendages very long, forcipate. Inferior appendage unarmed and probably takes no direct part in tandem linkage except, perhaps, for preliminary contact, combined with the small sub-basal tooth on the superior —

forcipata, victoria.

Group 5. Superior very robust, excavate, with stout ventral branch. Inferior broad, excavate, with ventro-apical and inner teeth. The superior appendage could be a development of Group 1 and the inferior appendage has some similarity to the cylindrical ventral portion in *zerafica*, also of Group 1. Here it is placed in a separate group because of its supposedly generic and other morphological features —

Mortonagrion stygium.

Before analysing these groups on further characters there are certain other anatomical features to consider.

Prophallus:—

In African *Agriocnemis* there is not very much difference in the prophalli. The flagellum is usually broad at the base but the apex may be blunt (obtuse) or acuminate.

Mortonagrion stygium differs in having the flagellum short and very broad.

Bursa copulatrix (fig. 2):—

Evidently a simple structure.

Cerci and ovipositor:—

The cerci are generally short and broadly conical. The ovipositor sheath does not extend beyond the end of segment 10 as it occasionally does in certain other genera.

Definitions of Specific Groups:—

The Groups designated above may be briefly defined on African species.

Group 1. *Exilis Group*. The most widespread African species is *exilis*, hence the priority given to it here.

Orbits below whitish ochreous or greenish white; labrum in male black, glossy, with or without a steely or blue-purple sheen; variable in female. Postclypeus usually glossy black in male, occasionally with a purple sheen; variable in female.

Prothoracic hindlobe complete in male *exilis*, in female *pinheyi*, *ruberrima*, *inversa*, *gratiosa* and some *pygmaea*; otherwise tripartite. Mesostigmal lamina of female usually with a posterior lateral ridge, but an anterior ridge in *gratiosa*;

the laminae connected by a broad thick ridge in *falcifera*, *pygmaea* and *gratiosa*. Synthoracic black in male, generally reaching first lateral suture; with a narrow green antehumeral stripe; in female either reaching that suture or only forming a broad mid-dorsal band, with very broad antehumeral stripes.

Pterostigma usually pale yellowish brown, sometimes black in hindwing.

Superior appendage rounded above, the apex more or less down-turned or curved inwards and then down. Usually with well developed ventral flange. Inferior appendage long or short, with apical tooth or a dentate ridge or apical denticles.

It may be mentioned here that because of the diversity in morphology of the female prothoracic hindlobe the taxon *pygmaea* will be described as a super-species.

- Group 2. *Angolensis group*. Orbits below whitish. Labrum more or less black in male, orange or green with broad black centre in female. Postclypeus steely black in male, edged with black in female.

Prothoracic hindlobe tripartite in both sexes. Mesostigmal lamina with posterior lateral ridge. Synthorax and pterostigma as in *Exilis* group. The expanded anterior edge of the ♂ hindwing pterostigma is unique.

Superior appendage long and straight, with ventro-basal branch having apical denticles. Inferior appendage with small ventro-apical tooth.

- Group 3. *Palaeforma group*. Only known in the teneral male.

Orbits below pale; labrum and postclypeus black. Prothoracic hindlobe tripartite, each part rounded. Synthorax black almost reaching the first lateral suture. Pterostigma pale yellowish brown.

Superior appendage cordate; inferior conical with small apical tooth.

- Group 4. *Forcipata group*. This is the most distinct group of all and might even warrant a sub-generic title. This will not be applied, however, since it would be necessary to examine all the Oriental species in case there is any obvious link with the groups listed above.

Orbits matt black below, with a creamy white border against the eyes. Labrum in male more or less green or yellow with traces of black; in female brown with a broad yellow border. Postclypeus glossy black in both sexes.

Prothoracic hindlobe tripartite in both sexes. The middle portion is overlapped by the lateral ones and a well developed inferior lip. Mesostigmal lamina in female with posterior lateral ridge. Synthorax black down to first lateral suture in both sexes, with green antehumeral stripe; a broad black band along second lateral suture.

Pterostigma yellowish brown.

Superior appendage very long and forcipate, with inner denticles on the shaft and a weak sub-basal branch. Inferior appendage very short, unarmed.

Like *ruberrima* the juvenile of both sexes has a very red abdomen, in *forcipata* unmarked with any black. The black maturation pattern develops in diverse ways in this group, not so uniformly as in others.

Group 5. *Mortonagrion stygium* group. As already indicated this group has affinities with the *Exilis* group, but with certain definite individual characters of its own, by no means generic.

Orbits below creamy white. Labrum pale green in male, postclypeus glossy black.

Prothoracic hindlobe in male tripartite (♀ not available). Synthorax very black, this reaching even below first lateral suture; without antehumeral stripe in either sex. A narrow black or brown line on second lateral suture.

Superior appendage robust, excavate, downturned apically, with short thick denticles on its posterior surface. Inferior appendage somewhat cylindrical and truncate, like a molar tooth. Prophallus with very broad flagella.

Biological Notes

Very little is known about the biology and ecology of the *Agriocnemis*.

I have always found the adults in stagnant waters which contain at least a moderate amount of standing vegetation. Their habitats are normally at open pools, rain-pools or permanent, in which there may be reeds, grasses or other vegetation rising above the water level. They rarely venture far from such plants even if most of the pool is clear of supra-aquatic stems. They may be amongst the plants very close to the water or over the water itself; at stagnant verges of streams or even rivers. They fly very short distances amongst such vegetation and by environment they tend to be gregarious. Even when disturbed their flight appears to be weak. I have only occasionally captured them in copula. One of the reasons is the difficulty of close observation amongst the vegetation. Another is that the easiest way of capturing them is to sweep a net low down, if necessary through the water, scooping them up through the plants. Almost as soon as this is done the mating pairs separate and frequently the net will capture three or more individuals so that the original pair cannot be ascertained.

Despite their poor flight some species, particularly *exilis* and *gratiosa* in Africa are very widely distributed. The probability is that they are dispersed by vortices carrying them high up and they may eventually descend far off.

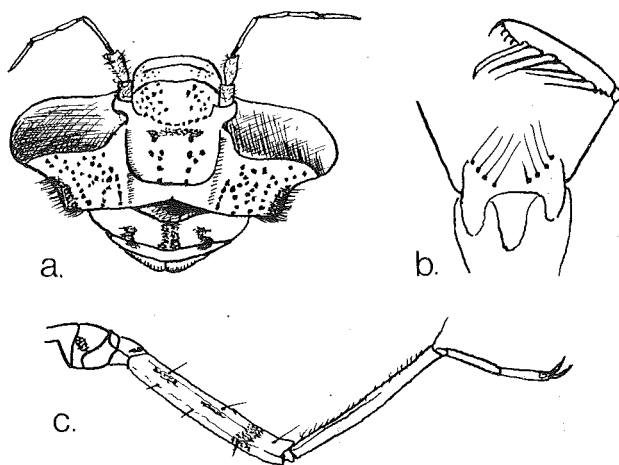
Development:—

The description of the nymph of one species may be recorded here, *A. pygmaea* (Rambur) taken in the Seychelles by R. A. Blackman (fig. 3).

♀ *shuck* (pools on La Digue, Seychelles): length of head and body (without caudal gills) 8.5 mm. Mask with 4 pairs mental setae, 5 pairs of lateral setae. Head above maculate, with brown lateral margins.

Prothorax with brown bands, hindlobe complete, rather narrow. Femora with brown annulus before distal end, coxae banded. Wing buds brown.

Abdomen brown dorsally, with creamy white mid-dorsal line; ventrally greyish white with some fine lateral maculae. Caudal gills very long, slender, acuminate distally; with an intricate pattern of irregular lines and dots.



3. Nymphal shuck of *A. pygmaea* from La Digue
 a. head, dorsally; b. mask (labium); c. right mesothoracic leg (antero-dorsally).

Distribution

The known distribution of the African species can be briefly tabulated here as well as distribution maps for South Central and Southern Africa (figs. 4-6). It is not possible to indicate map localities for equatorial and North Africa without much more intensive collecting.

From the tabulated records I have available we can draw the following direct conclusions.

Only one of these species extends into Asia (*pygmaea*). Only one is known in the island of Mauritius, Réunion and Rodriguez; in Seychelles; and in Fezzan (Southern Tripolitania). These may probably reflect the true picture in these territories. Kenya and Tanzania with only two or three species are probably inaccurate, more species should occur there, but it should be noted that to the North East of Africa the genus is poorly represented (Ethiopia and Ogaden). The totals from Southern and South East Africa may possibly represent the actual number of species occurring in those areas. Of species hitherto known it is possible that the general equatorial region may reflect the approximate position, except for individual countries like Cameroons in which, for instance, *aligulae* is likely to be found. Yet there may well be other undiscovered species in this equatorial region. The richest territories for the genus are Uganda, Zaire and Zambia.

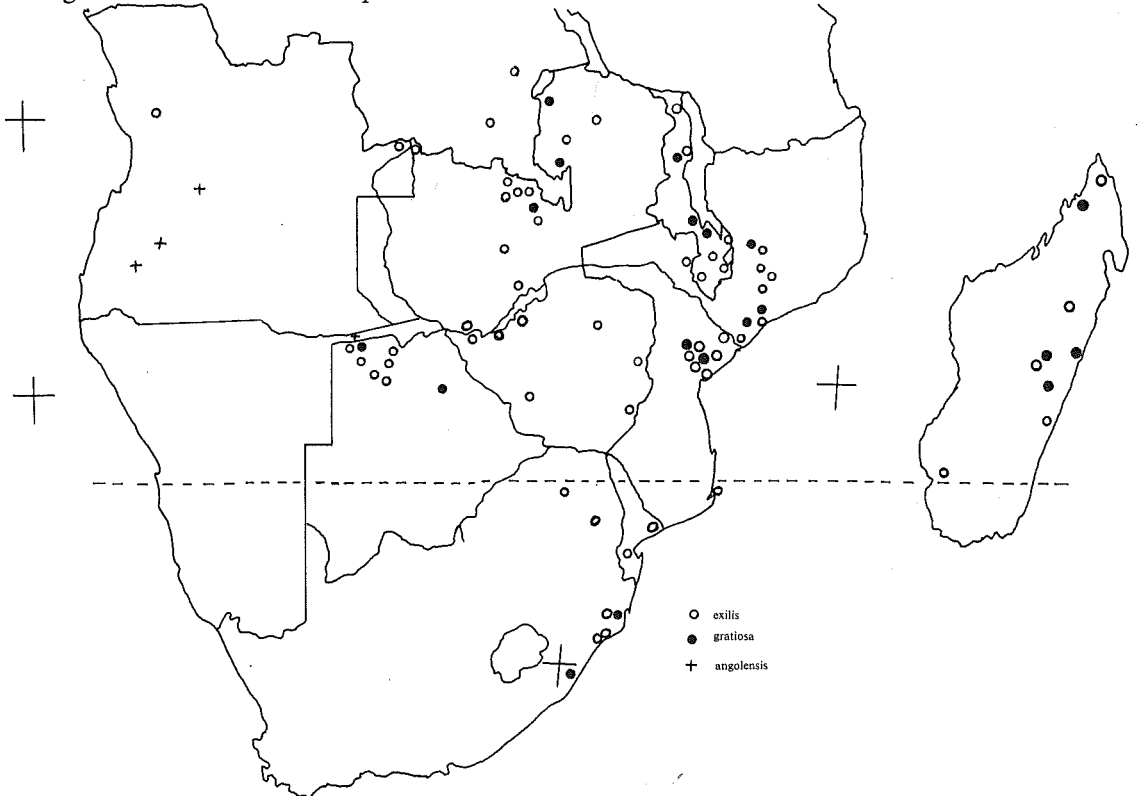
In considering species instead of territories, it is obvious that *exilis* is by far the most widespread and successful taxon in Africa. It is very probable that its range may be extended into Angola, near the Zambian border. *A. gratiosa* and *A. zerafica* are found in only half the range of *exilis* but if each territory from Ghana to Sierra Leone is examined it might be shown that *zerafica* is the more widespread of these two. Yet *gratiosa*, *aligulae* and *mac-lachlani* will probably be found in other countries than those recorded for them.

The species *pinheyi* and *falcifera* are perhaps derived from common *exilis* ancestry and their area of distribution in South East Africa is probably accurate. The same may apply

to *ruberrima*. The Oriental-Palaeartic-Seychelles distribution of *pygmaea* is probably the true position for this species; also for *merina* in Madagascar.

The least known and least collected species (apart from *merina*) are *angolensis*, *palaeforma*, *aligulae*, *angustirami* and *M. stygium*. Whilst the remarks on possible distribution of the other species is only provisionally true, no real estimate can be made of the distribution of these five.

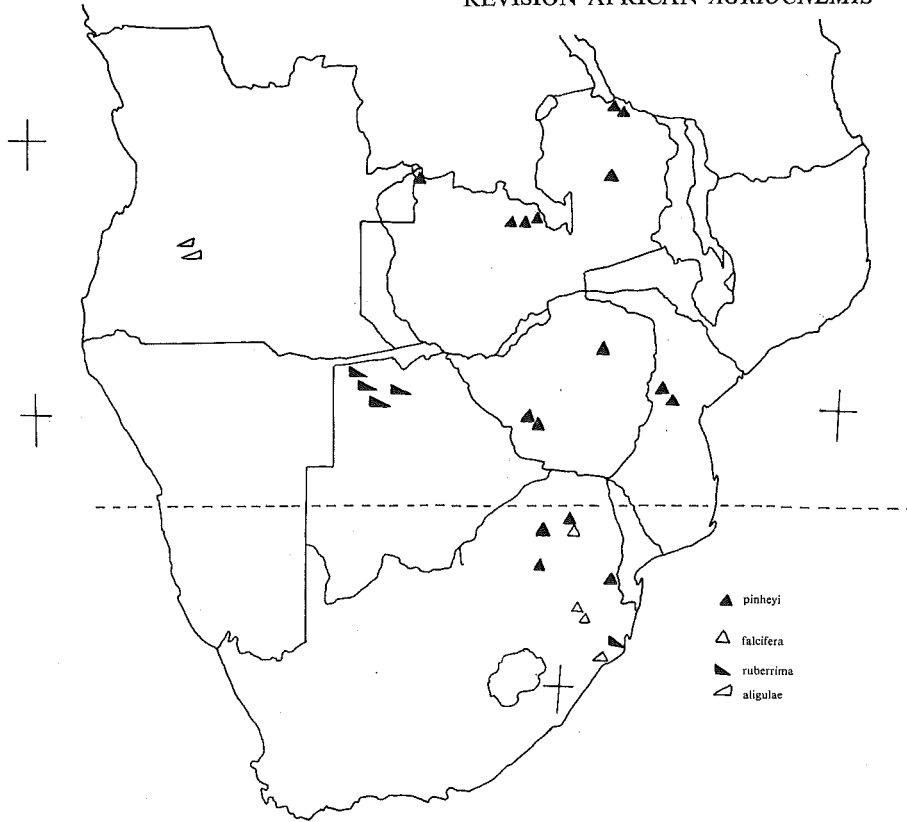
If the analysis is to be taken further it is necessary to consider the zoogeographical Regions and subregions as far as possible and for this purpose certain countries such as Uganda or Zaire must be separated into Northern and Southern areas.



4. Distribution records in S. and S. Central Africa — of *A. angolensis*, *A. exilis*, *A. gratiosa*.

The relevant regions to be considered here are the following:—

- ORIENTAL REGION — most of Asia
species — *pygmaea* (excepting other Oriental species)
- SEYCHELLES, with Ethiopian and Oriental influence
species — *pygmaea*
- PALAEARCTIC REGION — W. Asia and North Africa
species — *pygmaea* and *pygmaea sania*



5. Distribution records in S. and S. Central Africa — of *A. falcifera*, *A. maclachlani*, *A. pinheyi*, *A. ruberrima*.

ETHIOPIAN REGION

1. Tropical African Subregion

a. Guinea or Equatorial West Africa

N. Zaire to Cameroons, Nigeria westwards to S. Leone and Senegal.

species — *exilis*, *maclachlani*, *aligulae*, *angustirami*, *inversa*, *zerafica*, *victoria*, *forcipata* and *M. stygium*.

b. North East Africa

Ethiopia, Somalia and Ogaden, Northern Uganda

species — *exilis*, *inversa*, *zerafica*, *forcipata*, *pygmaea sania* and *M. stygium*

c. East Africa

Southern Uganda, Lake Victoria, Kenya, most of Tanzania

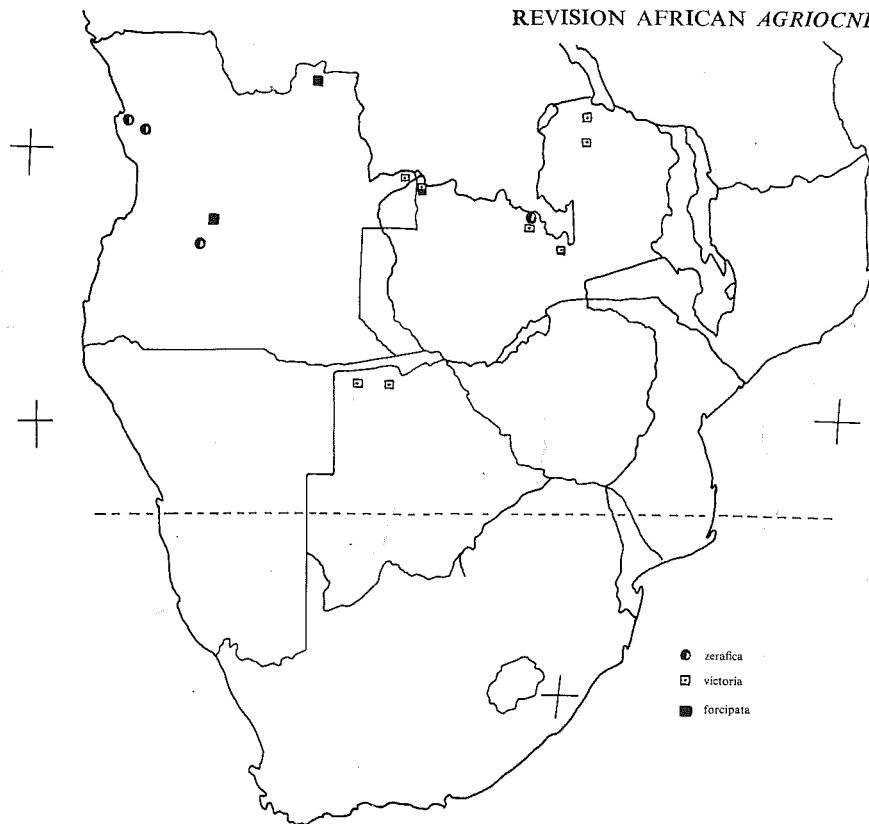
species — *exilis*, *aligulae*, *inversa*, *gratiosa*, *pygmaea*, *palaeforma*, *forcipata*, *victoria*.

d. Zambezi or Central Africa

Southern Zaire (Katanga), Angola, Zambia, Caprivi Strip, Victoria Falls (Rho-

TABLE 2

	Oriental	Seychelles	Palearctic	Ethiopian: (a) Equ. W. Afr.	(b) N. E. Afr.	(c) E. Afr.	(d) Centr. Afr.	Sn Afr. Karoo	Malagassy	
<i>A. exilis</i>				x	x	x	x	x	x	6
<i>A. pinheyi</i>							x	x		2
<i>A. falcifera</i>							x	x		2
<i>A. ruberrima</i>							x	x		2
<i>A. pygmaea</i>	x	x	x		x	x				5
<i>A. merina</i>									x	1
<i>A. maclachlani</i>				x						1
<i>A. aligulae</i>				x		x	x			3
<i>A. gratiosa</i>						x	x	x	x	4
<i>A. inversa</i>				x	x	x				3
<i>A. zerafica</i>				x	x		x			3
<i>A. angolensis</i>							x	x		2
<i>A. palaeforma</i>						x				1
<i>A. victoria</i>				x		x	x	x		4
<i>A. forcipata</i>				x	x	x	x			4
<i>M. stygium</i>				x	x					2
<i>A. angustirami</i>				x						1
Number of species	1	1	1	9	6	8	10	7	3	



6. Distribution records in S. and S. Central Africa —
of *A. forcipata*, *A. victoria*, *A. zerafica*.

desia and Zambia), Eastern highlands of Rhodesia, Mozambique, lower altitudes of Natal and Zululand
species — *exilis*, *pinheyi*, *falcifera*, *ruberrima*, *aligulae*, *gratiosa*, *zerafica*, *angolensis*, *forcipata*, *victoria*.

2. Southern African Subregion

Karoo and Kalahari; Botswana, most of Rhodesia, Transvaal
species — *exilis*, *pinheyi*, *falcifera*, *ruberrima*, *gratiosa*, *angolensis*, *victoria*.

3. Malagassy Subregion

Madagascar, Mauritius, Réunion, Rodriguez
species — *exilis*, *merina*, *gratiosa*

This table reflects a very different picture. The Central African (Zambezi) Section (d) is the richest zone with 10 species. The equatorial West African (a), East Africa (c) and the southern African Karoo have 7 to 9 species. The most widespread species from this table are *exilis*, *gratiosa*, *forcipata*, and *victoria*. It shows that *zerafica* is more restricted in its faunistic range than Table 1 implied.

It should be pointed out that the material examined for this Revision is all in the National Museum, Bulawayo, unless otherwise stated. As with other generic revisions I have not

requested the loan of specimens from other Museums since they are mostly pinned and unsafe for postage. It has been necessary to borrow a few types. I have not asked other Museums for data records because of the necessity of checking identifications.

Acknowledgements:—

With the permission of the respective Staff I was able to examine certain *Agriocnemis* types in Europe in 1958 and 1964. I am much indebted now for the recent loan of type material by Dr. G. Demoulin (Bruxelles), Dr. K. Günther (Berlin), Dr. A. Kaltenbach (Vienna), Dr. P. I. Persson and Dr. Torbjörn Kronestedt (Stockholm), and Dr. C. Baroni Urbani (Basel).

Information I requested has been most kindly provided by M. Clifton, R. M. Gambles, M. A. Liefertinck and P. Ward. With Dr. H. Dumont I am pleased to recall the discussions in correspondence as well as his kindness in sending examples of a Sinai taxon.

For the less easily obtained taxa I am grateful to Prof. B. I. Balinsky for examples of *A. angolensis* as well as for his own distribution records for *A. exilis*; to R. A. A. Blackman for a series of *A. pygmaea* from Seychelles; to the Director of Diamang who provided so much hospitality in 1964 resulting in the capture of the Angola examples of *A. zerafica*; A. R. Lahiri for oriental examples of *A. pygmaea*; to B. G. Hill for sending me specimens which I found to be closely allied to *A. (pygmaea) sania* from Ethiopia; to the Musée Royal d'Afrique Centrale for a ♂ *M. stygium*; Dr. A. Orian for a Mauritian example of *A. exilis*; Rijksmuseum van Natuurlijke Historie and Liefertinck for the loan of some Oriental *Mortonagrion* and Dr. B. Stuckenberg for sending examples of *A. exilis* from Madagascar.

The genus is not an easy one to revise, even just the African species but the assistance received has helped immeasurably.

Taxonomic Survey

Key to *Agriocnemis* Selys — *Mortonagrion* Fraser

This key disregards the difficult venational differences between these genera and only deals with African species.

Key to ♂ and ♀:—(no ♀ known in *palaeforma*, *angustirami* and *angolensis spatulae*)

1. Second lateral suture of synthorax with a distinct black stripe, more or less complete 2
— Second lateral suture unmarked or with only a very small dorsal fascia. Orbits never black ventrally. 4
2. Orbits not black ventrally. No antehumeral stripes. Synthoracic black reaching to well below first lateral suture, with a slender black or brown band on second lateral suture. Superior anal appendages of ♂ massive, not forcipate with the ventrad extension bearing short denticular spines. Flagellum of prophallus very broad and grooved *Mortonogrion stygium*
— Orbits always black ventrally, the eyes edged with yellowish or greenish white. Antehumeral stripes present except in very mature ♂. Synthoracic black reaching

- only to first lateral suture, with a very broad band on second lateral suture. Superior appendage forcipate. Flagellum not very broad, nor grooved 3
3. Abdomen normally 16 mm or less in length. Prothoracic hindlobe ♂ and ♀ with the middle section produced but wider than the lateral sections and not edged yellow or white posteriorly. Prothoracic collar normally black. Superior appendage without apical tooth, the denticles on the shaft on a small flange *A. victoria*
 — Abdomen normally 19 mm or more. Prothoracic hindlobe with the middle portion not prominently extended, rounded, smaller than the lateral sections, often edged posteriorly with white or yellow. Prothoracic collar only black at maturity. Superior appendage with apical tooth, the denticles on the shaft scattered, not a flange *A. forcipata*
4. Males 5
 — Females 19
5. Prothoracic hindlobe complete, undivided. Superior anal appendage very short, rounded, with a needle-like tooth projected ventrad. Inferior appendage slightly longer, ending in a thick tooth *A. exilis*
 — Prothoracic hindlobe tripartite. Superior appendage without a needle-like tooth projected ventrad 6
6. Superior appendage longer than segment 10, directed posteriad 7
 — Superior appendage much shorter than segment 10, generally more curved down apically 8
7. Superior appendage in sideview broadly cordate; with a small inner basal tooth. Inferior much shorter, with a dorso-apical tooth. Labrum and postclypeus black *A. palaeforma*
 — Superior appendage slender, spatulate; with a broad ventro-basal flange ending in denticles. Inferior appendage much shorter, with a ventro-apical tooth. Labrum in adult only black in the centre, postclypeus steely black *A. angolensis*
 (for subsp. *spatulae* see description)
8. Inferior appendage longer (or much longer) than segment 10 9
 — Inferior appendage much shorter than segment 10 13
9. Inferior appendage slender, obviously not twice as long as segment 10 10
 — Inferior appendage robust and twice as long as segment 10, or slender and nearly three times as long as segment 10 11
10. Superior appendage with a small outer apical hook posteriorly; with ventral flange not ending in a tooth and without an inner tooth. Segment 10 not raised mid-dorsally. Only known from Madagascar *A. merina*
 — Superior appendage with long, slender upper branch curved inwards and down to a tooth; with ventral flange bearing apical and inner teeth. Segment 10 raised medially and slightly produced *A. gratiosa*
11. Inferior appendage very slender, nearly three times as long as segment 10, ending in a single tooth. Superior appendage curved inwardly and then down to a tooth. Segment 10 raised apically to a hollow tube. Pterostigma pale brown, all wings

19. Prothoracic hindlobe complete, not divided but arched up and down posteriorly 20
 — Prothoracic hindlobe incomplete, tripartite 26
20. Mesostigmal laminae connected by a strong dorsal ridge 21
 — Without this strong ridge 23
21. Each mesostigmal lamina with an anterior ridge. Posterior lobe without median extension. Forewing with 8 Px. Synthorax with broad black dorsal band *gratiosa*
 — Mesostigmal lamina with a posterior lateral ridge 22
22. Posterior lobe of prothorax without median extension. Forewing with 6-7 Px
 some *A. pygmaea*
 — Posterior lobe with v-shaped tongue on the posterior border. Forewing with 9 Px *A. maclachlani*
23. Synthoracic dark area (black or brown) descends to first lateral suture 24
 — Synthoracic dark area does not descend below humeral suture 25
24. Frons without white pruinosity. Labrum of mature ♀ purple with cream border. Mesostigmal lamina with a posterior-lateral ridge *A. inversa*
 — Frons with some white pruinosity at maturity. Labrum brown with yellow border. Mesostigmal lamina with posterior ridge *A. ruberrima albifrons*
25. Labrum pale coloured (blue or green) with cream border. Humeral suture black. Abdomen 16 mm *A. pinheyi*
 — Labrum brown without pale border. Humeral suture not black. Abdomen 17-18,5 mm *A. ruberrima ruberrima*
26. Central portion of posterior lobe of prothorax obviously extending broadly and further back than the lateral portions 27
 — Central portion of posterior lobe very short, not extending further posteriad than lateral portions or only as a short V 29
27. Mesostigmal lamina with posterior lateral ridge, the laminae broadly connected by a dorsal ridge. Forewing with 6-7 Px *A. pygmaea*
 — Mesostigmal laminae with posterior lateral ridge, without broad connection. Forewing with 8-9 Px 28
28. Labrum blackish brown with fine yellow border. Abdomen at least 19 mm *A. aligulae*
 — Labrum orange or green with large black centrobasal area. Abdomen about 17 mm *A. angolensis*
29. Central portion of posterior lobe of prothorax forming a slight posterior V. Labrum all purple at maturity. Synthoracic black descending to humeral suture or below this *A. zerafica*
 — Central portion of posterior lobe straight or slightly curved. Labrum seldom purple and if so usually not entirely 30
30. Mesostigmal laminae not connected by a very prominent ridge. Central portion of posterior lobe of prothorax very narrow transversely, not as long as the lateral portions. Synthorax black down to first lateral suture *A. exilis*
 — Mesostigmal laminae broadly connected by a raised ridge. Central portion of

- posterior lobe either very broad transversely or a prominent rectangle. Synthorax only black mid-dorsally, as far as the antehumeral stripes 31
31. Central portion of posterior lobe linear in thickness, very broad transversely, the lateral portions minute. Forewing with 6-7 Px *A. pygmaea*
 — Central portion of posterior lobe juts out as a rectangle posteriad, the lateral portions larger, triangular. Forewing with 9 Px *A. falcifera*

Notes on specific distinctions for field observations

M. stygium in the male and female can be easily distinguished by the very black synthorax, lacking antehumeral stripes; and the stripe on the second lateral suture.

A. forcipata and *A. victoria* are easy to distinguish from all others by the black ventral surface of the orbits and the very long forcipate superior appendages of the males.

A. exilis, a small species, has short superior appendages with a needle-like ventral tooth. The hindlobe of the ♀ prothorax has a short central inferior lobe, more or less straight or gently curved posteriorly, shorter than the lateral triangles; when separated from these the inferior centre is very like *falcifera*. The male has the lobe entire, unlike other males.

A. pinheyi, superficially like *exilis*, has a tripartite bronze posterior lobe to the prothorax in the male, entire in the female, the reverse of *exilis*. The superior appendage has a broad ventral branch but no needle.

A. falcifera, like true *pygmaea*, *aligulae* and *maclachlani* males have the pterostigma black in the hindwing, unlike the forewing. The anal appendages and the prothoracic posterior lobe of the male are like *pinheyi*, tripartite, with rectangular medial extension; the female posterior lobe more like *exilis* but the mesostigmal laminae linked by a broad ridge.

A. ruberrima has a prothoracic hindlobe in the male more like *pinheyi* but the superior appendage has a tapering, downturned apical portion. It is a red species like the juveniles of others. The female prothoracic hindlobe is entire. In *albifrons* the male and often the female have white pruinosity on the frons, and the pterostigma is red.

A. pygmaea typically has the pterostigma in the hindwing black, the superior appendage of the male has a long inner ventral tooth, the inferior has two rows of minute denticles. The female is more difficult to identify in simple terms because of the diversity of its prothoracic hindlobe. In race *sania* the pterostigma is generally more uniform in colour.

A. palaeforma and the Madagascar *A. merina*, known only from males, have distinctive anal appendages.

A. maclachlani and *A. aligulae* are the largest African species, the male easily recognized by the long, very robust inferior appendage. The black pterostigma of the hindwing is a useful character.

A. inversa and *A. gratiosa* also have very long inferior appendages but these are slender. In *inversa* the apex of segment 10 is markedly elongated. The hindlobe of the prothorax can be used to distinguish them in both sexes and in *gratiosa* the mesostigmal laminae are broadly linked dorsally.

A. zerafica is recognizable in the male by the anal appendages concealed in segment 10 and the apex of segment 10 is strongly produced as in *inversa*.

***Agriocnemis lacteola* Selys**

Selys, 1877, *Bull. Acad. r. Belg. Cl. Sci.* (2)43 : 144; Fraser, 1933, *Fauna Brit. India, Odonata* 1 : 381

This is the type species, but since there is no material in the National Museum, Bulawayo, modified notes will be extracted here from Fraser (1933):

MALE

Labrum creamy white; genae, anteclypeus, postclypeus and frons broadly "putty-coloured", which may be assumed to be yellowish brown. A narrow black line on base of postclypeus. Vertex black; pale blue postocular spots; a narrow pinkish white stripe on back of occiput.

Prothorax black above, pale bluish white laterally, the collar white. Hindlobe tripartite, the central portion a square black extension edged with white. Synthorax black down to first lateral suture, with very narrow (bluish) antehumeral stripes. Sides pale blue with a black spot on second lateral suture. Legs white "with some obscure mottling" at distal ends.

Pterostigma black in forewing on both surfaces, pale blue to black in hindwing on upper-side, mainly black on underside. Forewing with 6-7 Px, 5 Px in hindwing.

Abdomen pale blue, whiter on distal segments. Segment 1 with black dorsal macula, segment 2 with mid-dorsal stripe, 3 with narrow mid-dorsal band. Remaining segments unmarked but segments 4-5 may have a small black triangular distal spot. Anal appendages pale blue. Superior appendage as long as segment 10, robust, triangular in lateral view, obtusely pointed; with a ventral hollow, slightly curled process directed anteriorly into segment 10. Inferior appendage much shorter, more or less hidden in segment 10, with robust vertical spine and a shorter spine directed inwards.

Abdomen 16-18 mm, hindwing 9,5-10,5 mm.

The ♀ is stated to have a similar prothoracic hindlobe to the ♂.

Abdomen with segments 1-9 black above.

Abdomen 16-18 mm, hindwing 15,5-17 mm.

The type ♂ is said to be in the Selys Collection, Bruxelles Museum.

Distribution. Fraser records Bengal, Assam and Sikkim.

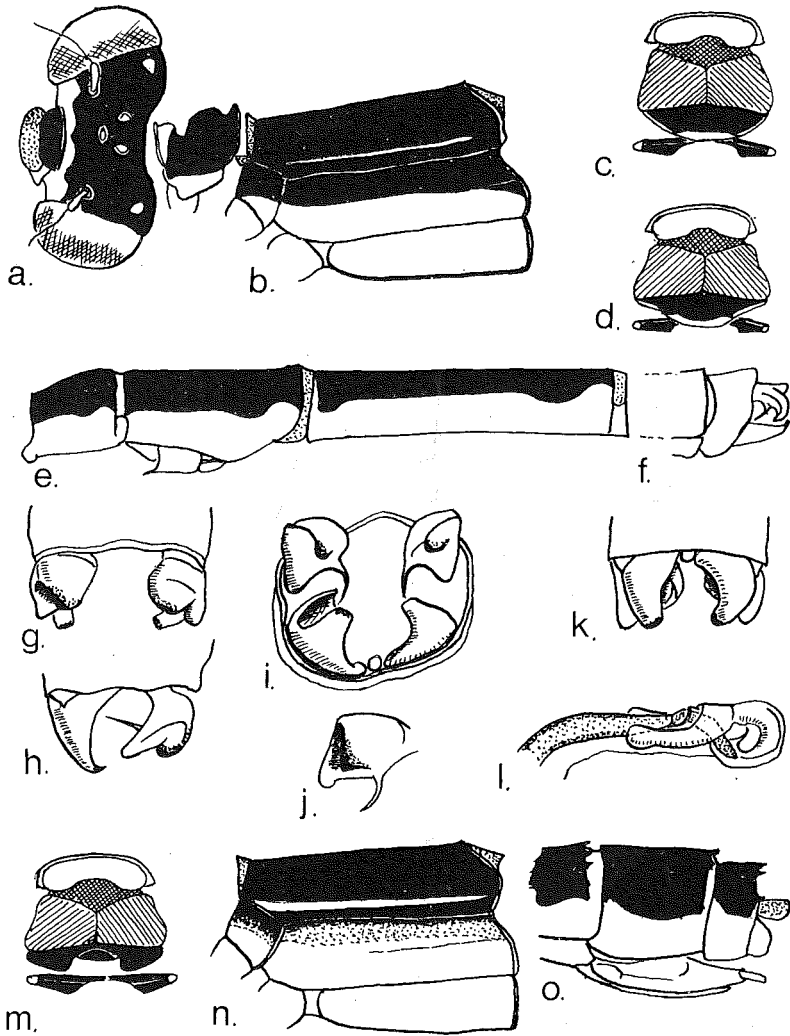
***Agriocnemis exilis* Selys (Fig. 7)**

Selys, 1869, *Recherches Faune Madag., Pollen et van Dam.* Insectes, 25 (2) (Odonata) : 24 (sine descr., nom. nud.);

Selys, 1872, *ibid.* 25 : 182 (Madagascar, Mauritius).

Agriocnemis ruberrima albifrons Balinsky, 1963 : 249 (♀, nec ♂)

Described from Madagascar and Mauritius. Type series in Selys Collection, Bruxelles Museum, but types not designated. A series of 8 examples was kindly loaned by Dr. Demoulin. Three of these, an incomplete ♂, a complete and an incomplete ♀ were evidently collected in Java, Indonesia and are probably *A. femina* (Brauer).



7. *A. exilis*
 a-b. head and thorax of ♂ (Madagascar); c-d. prothoracic dorsal diagram and mesostigmal laminae of ♂ (Nkhata Bay and Sept Lacs, respectively); e-f. abdomen of ♂ (Madagascar), segments 1-3 and segment 10; g-k. anal appendages of ♂ (Nkhata Bay), dorsally, from left, posteriorly, left superior appendage from inner aspect, ventrally, all respectively; l. prophallus (Salone Forest, Marromeu); m. ♀ prothorax (Nkhata Bay); n-o. ♀ synthorax and end segments of abdomen (Madagascar).

All the others are incomplete:—

1. An indeterminate specimen, ♂ by the accessory organs on segment 2. Only the synthorax, parts of the wings and the first four and a half abdominal segments are present. The only data is "Zanzibar", on a blue label, so that this must also be eliminated from the type series.

The other four all have merely a card numbered 34, a blank silvery card and a blue

- card with "exilis Selys" written on it (perhaps in Selys' handwriting?). No other data but presumably the number 34 refers to notes recorded elsewhere.
2. ♂. Head as in juvenile *exilis*, with frontal band almost complete. Prothorax and segments 7-10 of the abdomen are lost. Prophallus resembles *exilis*.
 3. ♂. Head, prothorax and its hindlobe are *exilis*. Synthorax fractured, wings damaged, abdomen lost.
 4. By its abdomen and black dorsal band it is a rather mature or andromorphic ♀. Head, prothorax (with *exilis* form of hindlobe), 5 legs, 1 wing, part of synthorax and segments 1-6 of the abdomen are present.
 5. An indeterminate ♀, possibly *exilis*, having only the synthorax, legs, one and a half forewings (no hindwings) and segments 1-3 of the abdomen remaining.

Thus, there are only two very incomplete specimens of each sex of *exilis* in this type series and no lectotype can be erected. A neotype from Madagascar or Mauritius should be selected from some other collection. In the National Museum, Bulawayo, there is 1 ♂ from Madagascar, 1 ♂ from Mauritius, and 3 ♀ from Madagascar. I prefer, however, to leave the erection of a neotype to another Odonatist, perhaps with access to a collection in Europe.

MALES

MADAGASCAR

Mature ♂ (Maroantsetra): labium and orbits ventrally pale whitish ochreous. Labrum glossy purple with a linear cream anterior border. Anteclypeus pale brown, post-clypeus glossy black. Genae and a transverse stripe on front of frons, continued from eye to eye, pale green. Antennae pale ferruginous. Rest of the frons, vertex and occipital zone black, with very small isolated green post-ocular spots.

Prothorax black with greenish cream anterior collar; cream sub-laterally. Hindlobe somewhat raised but entire, trapezoidal, the posterior margin cream. Mesostigmal lamina with a low posterior ridge. Synthorax black down to first lateral suture and at dorsal end, just over this suture on to metepimeron. A very slender green antehumeral stripe, not quite reaching dorsal end of mesepisternum. Sides pale greenish cream, with short black dorsal line above second lateral suture. Sternites cream. Legs cream.

Venation pale reddish brown; pterostigma pale brown, the distal edge elongated to an acute upper angle. Forewing with 4-6 Px.

Abdominal segments 1-2 bronze-black dorsally, restricted slightly at distal ends (as in other genera); greenish white laterally. Segments 3-6 bronze-black dorsally, restricted to incomplete cream annuli at both ends of each segment; segment 7 similar at base but the distal third pale brick-red dorsally, cream laterally. Segments 8-10 and superior anal appendages pale brick-red, laterally and the inferior appendages pale yellow. Superior appendage very short, bifid apically, the outer branch broad and curved downwards and subtending a fine needle-like ventral style; inner branch ending in a broad contact ridge. Inferior appendage conical, slightly upturned apically to end in a contact ridge. Prophallus with broad flagella rounded at apices.

Abdomen 17,5 mm, hindwing 9,3 mm.

MAURITIUS

Mature ♂ (Poudre d'Or): differs only slightly from the Madagascar ♂. Femora with black distal stripe, expanded to a macula at the knee. Abdominal segments 4-6 with a bronze-brown, not a black dorsal band; segment 7 black on basal quarter, followed by a mid-dorsal line ending in twin dots before distal end.

NIGERIA

Teneral ♂ (Balatu): frontal band severed medially. Femora as in Mauritius ♂. Abdomen with blacker dorsal band, extending broadly on to segment 9 almost to distal end.

C.A.R.

Mature ♂ (Bouala): as in Nigerian ♂ but less black on femora and the abdominal black less extensive, more like the Madagascar ♂.

UGANDA

Mature ♂ (Paimol): just like the Madagascar ♂ but with the frontal band broadly severed medially. A teneral ♂ has a narrower dorsal band on segment 7, ending in twin spots.

TANZANIA

Mature ♂ (Amani): frontal band severed in middle. Femora as in Mauritius ♂. Segment 7 with narrow band ending in twin spots and a trace on the base of segment 8.

MALAWI

Mature ♂ (Nkhata Bay): frontal band severed medially. Femora with only a trace of a fine brown posterior line and distal macula. In another Nkhata ♂ the frontal band is not quite severed. Femora with black distal striga and macula. Segment 7 broadly black but ending in twin spots. In still another there is a broad band on 7 ending more abruptly in twin spots. One from Mount Mlanje is similar; another from Mpatamanga Gorge has the band on 7 broad almost to the distal end.

ZAMBIA

Mature ♂ (Luwingu): one of many small examples, abdomen 15 mm. Frontal band widely severed. Femora unmarked. Segment 7 broadly black almost to distal end; segment 8 with trace of black basal line. An Ndola ♂ is similar but the frontal band is continuous. A Chambezi River ♂ has the frontal band broadly severed; the femora with brown distal traces; segment 7 broadly black almost to the end but none on segment 8. A Kitwe ♂ differs from the Chambezi one in having black lines and maculae on the femora. Another Kitwe ♂ has broader femoral strigae. Another Ndola ♂ has no femoral markings. A Chingola ♂ has almost lost the frontal band; femora broadly marked. The band on segment 7 ends in twin spots. Another Chingola ♂ is less strongly marked. A Mumbwa ♂ has the frontal band only just severed; knees pale; segment 7 moderately black. Yet another has the frontal band widely severed; femora marked with black.

N. MOZAMBIQUE

Mature ♂ (Zobué): frontal band severed; knees with black fasciae; segment 7 broadly black but ending in twin spots, segment 8 with trace of basal black. Another Zobué ♂ has the frontal band complete; knees well blackened; segment 7 as in the last but no

black on 8. A Vila Junqueiro ♂ is similar but the femoral markings are brown. A ♂ from Namanjavira has the frontal band just severed; femora well marked,; but segment 7 is only black on two thirds. A Quelimane ♂ differs in lacking dark fasciae on the femora, but another has them. A very teneral ♂ from Zobué has the face and head all pale brown, the labrum translucent; thorax pale brown with the antehumeral stripe discernible; femora with brown traces; abdomen thinly marked dorsally with brown from segment 1 almost to the distal end of 7.

S. MOZAMBIQUE

Mature ♂ (Salone forest): frontal band complete; femora unmarked; distal end of segment 7 with twin spots only. Another ♂ has the frontal band severed and brown smears on the femora. Still another has black femoral marking. A teneral ♂ has the head black, the frontal band complete; antehumeral stripe developed; a blackish brown dorsal band on the abdomen. A Mwanza ♂ has a complete frontal band. A mature ♂ from Vila Paiva d'Andrada has a narrowly severed frontal band; well marked femora; segment 7 black dorsally almost to the end and a trace on 8. One from Lourenço Marques has a widely severed frontal band; black femoral marking; segment 7 entirely black dorsally and the base of segment 8 is black.

RHODESIA

Mature ♂ (Umtali): frontal band severed; femora almost unmarked; segments 4-6 with narrow dorsal band, swollen at both ends of segments; no black on segments 7-10. A ♂ from Victoria Falls has the frontal band severed; femora almost unmarked; segment 7 with a black band ending in twin spots.

BOTSWANA

Mature ♂ (Maun): frontal band narrowly severed; femora well marked; segment 7 black to distal end, and encroaching on 8. Another has less black on the femora, less on segment 7 and none on 8. Another has the frontal band continuous; femora well marked; but still less black on segment 7 and none on 8. A ♂ from Mohembo has the frontal band severed; femora with traces of brown; segment 7 black nearly to the end and a trace on 8. A Sepopa ♂ has the frontal band widely severed; femora marked with brown; no black on segment 8. Others from Sepopa show more or less black. An example from Khwaai has the frontal band almost complete; the femora with some black; segment 7 with less black, ending in twin spots.

The males thus show much individual variation on the frons, legs and abdomen at maturity but all of this is of a minor character. The frontal band may be complete, narrowly or widely severed. The femora may be poorly or moderately striped post-distally. The abdominal black normally reaches almost to the distal end of segment 7, but segments 8-10 are red and unmarked with black. In teneral males the black starts as brown marking on the vertex, thorax and abdomen, indicating the black mature design; but facial marking commences later. The abdominal length varies from 15-17 mm. On segment 7 the black often ends in twin spots which are always situated well before the distal end of the segment.

Considered geographically the variation is evidently again individual and no racial distinctions can be distinguished in material from Madagascar, Mauritius or the mainland.

Since the mature markings in the genus are more defined in males than females this indicates much uniformity in the species.

FEMALES

MADAGASCAR

Mature ♀ (Alaotra): labium and optic lobes ventrally ochreous white. Labrum dark brown with purple sheen and cream border. Rest of face and head above as in ♂ but without postocular spots. Frontal band green, severed medially.

Prothorax not quite so black, the anterior collar green. Hindlobe tripartite, all black; the lateral portions well developed, triangular; middle portion vestigial but below it an inferior lip, shorter, roundedly rectangular, almost straight on posterior border. Mesostigmal lamina with posterior and slightly developed dorsal ridge. Synthorax bronze-black to humeral suture, then gradually browner to first lateral suture; with a slightly more developed antehumeral stripe which reaches the dorsal end. Sides pale yellowish green, to ochreous ventrally; sides of pro- and synthorax with some white pruinosity. Femora with firm black posterior stripe, almost complete on middle and hindlegs, less so on foreleg.

Wings and pterostigma as in ♂. Forewing with 7 Px.

Abdomen slightly more robust (as in other genera), with broad continuous black band on all segments. Sides green on segments 1-5, yellower on the remainder. Cerci, short, thick, conical and brown, half as long as segment 10. Ovipositor sheath reaching just to the end of segment 10.

Abdomen 16 mm, hindwing 10,5 mm.

Bursa copulatrix (Sepopa, Botswana): simple (fig. 2).

A teneral ♀ from Ankaratra, Madagascar resembles the mature ♀ from Alaotra.

NIGERIA

A nearly mature ♀ (Kalatu, N. Nigeria): labrum paler, postclypeus green with black basal stripe. Otherwise similar.

UGANDA

Mature ♀ (Madi Opei): like the Madagascar ♀ but labrum and postclypeus paler. A Paimol ♀ is similar to the Madi Opei one, but a teneral ♀ has paler labrum, postclypeus and frons; large pale postocular spots; synthorax only black mid-dorsally down to the antehumeral stripes which are not clearly defined; no femoral markings; pterostigma paler; abdomen all red on basal segments, the black only starting at distal end of segment 6, but then continuous to the end of 10.

TANZANIA

Nearly mature ♀ (Amani): labrum and postclypeus brown; prothorax with more restricted black marking; synthorax with the black confined again to the mesepisternum except near the ventral end where it invades the mesinfraepisternum; femora with fine black posterior line.

ZAIRE

Mature ♀ (Bunkeya): labrum violettish brown, postclypeus almost glossy black; thorax and legs as in the Madagascar example. A teneral ♀ from Kabasha Escarpment has the

face and frons all pale, the postocular region broadly orange; prothorax with less black; mesepisternum only black to the distinct broad antehumeral stripes which almost reach the humeral suture except for a narrow brown line just above this suture; no lateral dark marking; femora unmarked; segments 1-7 red with bronze-black mid-dorsal line, 7 bronze at distal end, 8-10 bronze above.

ANGOLA

Mature ♀ (Caianda): as in the Madagascar ♀ but labrum paler.

N. MOZAMBIQUE

Mature ♀ (Namanjavira): similar but labrum pale; synthorax not darkened below humeral suture. One from Erego has the labrum even more yellowish brown.

S. MOZAMBIQUE

Mature ♀ (Salone forest): differs from the last in the broader continuous frontal band. Juveniles and teneral have the face pale, with a black bar at the junction of postclypeus and frons, a pale postocular area; brown prothorax; the black on the synthorax only mid-dorsal to antehumeral stripes; femora unmarked; abdomen red on segments 1-5, with a fine dorsal line on segment 2, basal and distal traces on 3-4, a black fascia at distal end of segment 5; 6-10 with black dorsal band.

More often segment 6 is nearly all red, and usually segment 5. The junction line on postclypeus-frons border is usually absent in teneral.

A nearly mature ♀ from Luabo has the labrum, postclypeus and thorax brown; synthorax not darkened near or below the humeral suture; femora with fine black lines; a complete black abdominal band. Mature ♀ from Mwanza shows the markings of the Madagascar ♀ or in others it is less blackened. Those from Vila Paiva and Gorongoza are also less marked. One from Dondo forest is similar. A teneral from Béira is similar to other teneral. A mature ♀ Lourenço Marques is like the Madagascar ♀.

ZAMBIA

Mature and teneral ♀ (Chambezi R.): these show the same variations in dark and red markings. Others from Mwinilunga, Kapiri Mposhi, Kitwe, Ndola, Chingola and Mumbwa show similar differences in teneral and mature individuals. Also a ♀ from Gwembe.

MALAWI

♀ (Nkhata Bay): has the synthorax black reaching only to the antehumeral stripe. An older ♀ from Magombe has white lateral pruinosity and even the frontal band is pruinose white; no black below the antehumeral stripe except a dorsal dot on the humeral suture. A less mature ♀ from Mpatamanga Gorge is similar, but without pruinosity.

RHODESIA

♀ from Victoria Falls: as in Madagascar ♀. Others from Mount Selinda and Bulawayo are similar.

BOTSWANA

♀ (Sepopa): teneral and mature females show similar differences, but one ♀ has the black on synthorax descending distinctly below the humeral suture.

In the teneral ♀ of *exilis* the hindlobe of the prothorax readily separates into its three

component parts and it can then be seen that the middle or inferior lobe is a distinct rectangle but shorter than in *falcifera*.

Thus, the mature ♀ *exilis* has a complete abdominal band but in teneral the band usually starts on the distal segments although sometimes also, more finely, on the entire abdomen. This gives rise to the developmental polychroism of the juveniles.

Maturation in female *exilis* can be regarded as following three stages. Firstly, the teneral and juveniles with face generally all pale, the postocular zone manifest, large and connected; narrow prothoracic dorsal band and synthoracic black or brown not normally reaching below antehumeral stripe; abdomen mainly red on segments 1-6 (rarely, only on 1-5). In the second stage the face darkens, the postocular zone shrinks, the prothoracic dark area increases and there is usually some humeral black; the femora develop black lines; the abdomen has a complete dorsal band. In the last stage the black areas on the thorax and legs increase. Some slight pruinosity may be developed.

MATERIAL EXAMINED

Type series: each with number 34 on label, but no further locality data.

Madagascar: Maroanetra, N. E. Madagascar, 1928 (Staudinger); Lac Froid, Ankaratra, Nov. 1957; Station Agric., Alaotra, Ambatondroza, 24 Dec., 1957 (B. Stuckenberg); Sept-Lacs, Tuléar, S. Madagascar, 13-16 Febr., 1958 (B. Stuckenberg)

Mauritius: Poudre d'Or, Dec., 1960 (A. Orian) (and previously from Pampelmousses)

N. Nigeria: Kalatu, 1 May, 1960

Centr.

Afr. Rep.: Bouala, Febr., 1958 (E. Pinhey)

N. Uganda: Madi Opei, Acholi, March, 1952, (T. H. E. Jackson); Paimol, Acholi, April, 1952 (T. H. E. Jackson)

Zaire: Bunkeya, Shaba, Jan., 1958 (E. Pinhey); Kabasha Escarpment, Shaba, Febr., 1958 (E. Pinhey); Dingila-Uele R., Febr., 1958 (E. Pinhey)

Tanzania: Amani, E. Usambara Mts., Dec., 1961; Ilonga, 23 June, 1969 (J. Parrikka)

Malawi: Cholo, 1 Aug., 1960 (D. H. Eccles); Nkhata Bay, June, 1961 (D. H. Eccles); Magombe, Sept., 1963; Nkhata Bay, 11 May, 1966 (E. Pinhey); Mpata-manga Gorge, S. W. Malawi, 17 May, 1966, 7 May 1970 (E. Pinhey); Lujeri Dam, Mount Mlanje, 4 May, 1970 (E. Pinhey); Chipeta village, Karonga, 21 Nov., 1971

Zambia: Ndola, May, 1959 (R. A. Green); Ndola, Febr., 1960 (E. Pinhey); Mumbwa, S. Zambia, 11 Sept., 1960; Chingola, May, 1961 (E. Pinhey); Kitwe, 27 May, 1962 (E. Pinhey); Gwembe, Zambezi R., May, 1963 (E. Pinhey); Sakeji R., N. Mwinilunga, 5 May, 1963 (E. Pinhey); Nansibia, E. of Kapiri Mposhi, 9 March, 1969 (E. Pinhey); Chambezi R., S. of Kasama, 9, 15 March, 1969 (E. Pinhey); S. of Luwingu, N. Zambia, 15 March, 1969 (E. Pinhey); Dambo, S.W. of Kitwe, 9 April, 1972 (E. Pinhey)

E. Angola: Lutchigena R., Caianda, 3 May, 1963, 22 Jan., 1965 (E. Pinhey)

- N. Mozambique: Luabo, Lower Zambezi R., Jan., 1958; Vila Junqueiro, 1 May, 1970 (E. Pinhey); Erego, 2 May, 1970 (E. Pinhey); Quelimane, 3 May, 1970 (E. Pinhey); Namanjavira, 4 May, 1970 (E. Pinhey); Zobué, 7 May, 1970 (E. Pinhey)
- S. Mozambique: Béira, 22 May, 1939; Vila Paiva d'Andrada, Sept., 1957 (E. Pinhey); Mount Gorongosa, Sept., 1957 (E. Pinhey); Salone R., S. W. Marromeu, 9 Nov., 1967, 21 May, 1969 (E. Pinhey); Dondo Forest, 13 Nov., 1967 (E. Pinhey); Lourenço Marques, 31 Dec., 1967 (E. Pinhey); Chinizua, 160 km S.E. of Mwanza, 23 Aug., 1971 (E. Pinhey); E. of Mwanza, 26 Aug., 1971 (E. Pinhey)
- Rhodesia: Umsleswe R., Mount Selinda, Nov., 1955 (E. Pinhey); Victoria Falls, Dec., 1955, Jan., 1956 (E. Pinhey); Umtali, Oct., 1956 (E. Pinhey); Maleme Dam, Matopos, Bulawayo, 9 Dec., 1967 (E. Pinhey)
- Botswana: Okavango R., 19 Apr., 1962 (B. I. Balinsky); Sepopa, W. Okavango R., 14 Febr., 1967 (E. Pinhey); Mohembo-Shakawe, 17 Febr., 1967 (E. Pinhey); Botletle R., 90 km E. of Maun, 21 Febr., 1967 (E. Pinhey); Maun, 11 Dec., 1968 (E. Pinhey); Khwaai R., 12 Dec., 1968 (E. Pinhey)
- Transvaal: Woodbush, Haenertsberg, Dec., 1966 (E. Pinhey)

Previously determined:—

Senegal (Paris Museum): Mboro, Maye, Oct., 1961 and Richard-Toll, Nov., 1967 (det. Pinhey 1972).

Zaire (Inst. Parcs Nat., Bruxelles): Garamba (Pinhey, 1966)

Liberia (Smithsonian Institution): Suakoko (det. Pinhey 1971)

Distribution

Madagascar (see Fraser, 1949b), Mauritius, Réunion, Rodriguez, Senegal, Liberia, N. Nigeria, Cameroons, Centr. Afr. Republic, N. Uganda, Ogaden, S. Sudan, Kenya, Zaire, Tanzania, Malawi, Zambia, N. & S. Mozambique, Rhodesia, N. W. Botswana, Natal and Transvaal. Balinsky has collected *exilis* (pers. comm., 30 Apr., 1973) at Richard's Bay, Nyalazi R., Cape Vidal, Kosi Bay (Zululand); E. Transvaal; Moremi (Okavango Swamps); Binga and Mwenda (Lake Kariba); Maramba R., Livingstone (Zambia); probably Inhaca Isl. (Mozambique).

Agriocnemis pinheyi Balinsky (fig. 8)

Agriocnemis exilis forma B. Pinhey, 1951 : 120, figs.

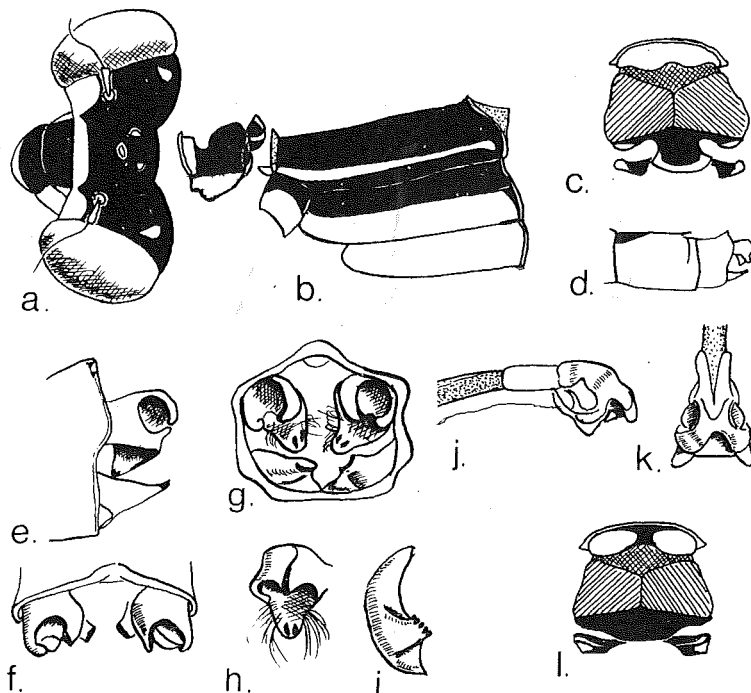
A. pinheyi Balinsky, 1963, *J. ent. Soc. sth. Afr.* **26** : 247, figs.

Balinsky described the types from Johannesburg district, Transvaal, and these are in the Transvaal Museum. Pinhey's *exilis* forma b. were described from Salisbury District and Mozambique, with the suggestion that it might be a separate species (Pinhey, 1951).

MALES

RHODESIA

Mature ♂ (Salisbury): labium whitish ochreous. Labrum glossy black with a cream border, postclypeus glossy black. Genae, front of orbits and a broad anterior band on frons, continuous from eye to eye, pale greenish yellow. Vertex bronze-black with isolated bluish green postocular spots.



8. *A. pinheyi*
 a-g. ♂ (Salisbury), head, thorax, prothoracic diagram and lamellae, segments 9-10, anal appendages from left, the same dorsally, the same posteriorly, all respectively; h-i. left superior appendage from inner aspect and left inferior appendage (Salisbury); j-k. prophallus (Bulawayo); l. ♀ prothoracic diagram (Balla Balla).

Prothorax mainly black, the anterior collar greenish yellow but broken dorsally; sides greenish yellow. Hindlobe tripartite, the centre part raised into a concave trapezium or scoop bordered with yellow; the lateral portions narrow, yellow at outer curve. Mesostigmal lamina with slight anterior and posterior ridges. Synthorax bronze-black to first lateral suture, with complete narrow pale green antehumeral stripe. Sides pale greenish yellow, yellow ventrally, with a black dorsal trace on second suture. Legs without black marking.

Venation pale brown. Pterostigma as in *exilis*. Forewing with 6 Px.

Abdomen with continuous bronze-black dorsal band on segment 1-8, continued on to the base of segment 9, on 8-9 with purplish sheen. Sides of segment 1-3 greenish yellow, yellow on 4 to base of 6, then red on segments 7-10; anal appendages brownish yellow.

Segment 10 is all red, the distal end slightly raised medially. Superior appendage complex, rounded and short dorsally as in *exilis* but forming a termino-dorsal depression ringed with the dorsal curved arms; from the inner base of this superior appendage there is an obliquely inward scoop-like arm, coated with long curved hair; at the apex of the scoop there are small teeth. The inferior appendage is curvedly conical ending in a gripping ridge as in *exilis*, composed of a series of denticles. Prophallus with the terminal flagella shorter, broader than *exilis* and obtuse terminally.

Abdomen 16,3 mm, hindwing 10 mm.

Balinsky, in his original description (1963) gives the living colours, the pale colours on frons, postocular spots, antehumeral stripes green; the eyes green, black dorsally. He says that in some examples the antehumeral stripes are interrupted before the dorsal end.

Mature ♂ (Bulawayo): very slightly smaller. Segment 9 with the median black mark continuous, not confined to the base as in the Salisbury example. In Bulawayo specimens the anterior collar of the prothorax is complete dorsally. The black on segment 9 may be basal or continuous. The femora can have continuous black exterior stripes, widened distally; or less black.

ZAMBIA

Mature ♂ (Lake Chila, Mbala): no antehumeral stripe; femora with strong black stripe, a larger black dorsal spot on second suture; abdominal black extends to the end of segment 8. One from Kalambo Falls in the same area has very slender, linear, antehumeral stripes, on one side broken before ventral end, on the other broken before dorsal end. Abdominal band extending on to segment 9. One from Mwinilunga is darker, without antehumeral stripes, the femora almost completely black posteriorly and partially externally, the band on segment 9 complete. One from Ndola is similar to the Kalambo Falls example. Juvenile specimens from Kitwe and Kanona have linear antehumeral stripe, unmarked femora, the abdominal band almost reaching the distal end of segment 9.

NATAL

Juvenile ♂ (Kambula): like the Salisbury example, with broadish antehumeral stripes, no femoral markings; abdominal band complete only to segment 8 when it is widened distally, but 9 has diffuse lateral spots in the centre. An almost fully mature ♂ from Holadu, Natal, is peculiar in having a strong purple sheen on vertex, synthorax and basal segments of abdomen; antehumeral stripes linear, obsolete dorsally; femora broadly blackened posteriorly, the black punctured by a row of yellow dots; abdominal band almost complete on segment 8, with twin spots before the end.

It is evident that Zambian males are normally darker than those from S. Africa and Rhodesia.

FEMALES

RHODESIA

Mature ♀ (Balla Balla): labium whitish ochreous; labrum green with black mid-basal dot and a cream border; rest of face and head as in male but the postocular spots much enlarged and confluent with the greenish yellow postocular region and the occipital line joining these.

Prothorax as in male but with white lateral pruinosity. Hindlobe a single convex plate

depressed medially, slightly curved upwards before each lateral angle. Mesostigmal lamina with posterior ridge well developed. Mesepisternum black, slightly crossing the humeral suture at the ventral end; with a complete green antehumeral stripe as in the Salisbury male. Sides green with short dorsal lines on both sutures. Femora with black postero-lateral stripes.

Wings as in the male. Forewing with 8 Px.

Abdomen with a continuous broad black dorsal band on all segments, reflecting purple except on the last three; sides green, yellow on the last two. Ovipositor as in *exilis*. Cerci short, conical, orange-brown.

Abdomen 16 mm, hindwing 10,5 mm.

Mature ♀ (Matopos, Bulawayo): similar, but larger (abdomen 18 mm). A juvenile from Salisbury has a yellower labrum, large orange postocular region, thoracic markings similar; femora with faint narrow brown lines; abdomen red with a narrow dorsal black band on segments 1-6, almost linear on 3-5 and incomplete at distal ends of these; 7-9 with broad band, narrowed on 10. On segment 1-2 the sheen on the black is steely blue, on the rest it is purple.

ZAMBIA

Mature ♀ (Ndola): head similar; prothoracic collar with only two small yellow sub-lateral spots; synthorax black to just below humeral suture without antehumeral stripes, but with purple sheen. Femora with black stripes. Abdominal black broader, with purple sheen. Another from Ndola has antehumeral stripes but the postocular pale region is absent. Others are similar but the antehumeral stripes are extremely slender, obsolescent. A teneral ♀ from Ndola has reduced bronze markings as in the Salisbury juvenile. A mature ♀ from Mbala has the postocular region pale, the antehumeral stripes obsolescent. An example from Mwinilunga has the labrum reddish brown with yellow border; no postocular spots, but antehumeral stripes are well developed.

NATAL

Juvenile ♀ (Holadu): a broader frontal band, large orange postocular zones linked across back of occiput; thorax with markings fully developed; femora unmarked; abdomen red with the markings even more reduced than in the Salisbury example, segments 3-5 with only a fine line on basal half and a macula before the end; or in others with still less; but segments 7-10 with broadish dorsal band. A teneral from Kambulu is similar.

Like the males Zambian females are darker than those of Rhodesia and the Republic of S. Africa, especially the thoracic region where the antehumeral stripes are obsolescent or absent at maturity. However, variation in series nullifies any attempt to separate a northern race. The Zambian examples are all from the northerly Provinces of this territory where temperature and rainfall are higher and the difference may be ecological. On the other hand the chromatic differences observed are certainly only maturational. Those with larger postocular pale areas and very reduced black on the abdomen are juveniles or tenerals and the black usually exhibits a purple sheen.

MATERIAL EXAMINED

Zambia: Lake Chila, Mbala, Apr., 1954 (E. Pinhey); Kalambo Falls, Mbala, Dec.,

1955 (L. D. E. F. Vesey Fitzgerald); Ndola, Apr., May, 1959 (R. A. Green), Febr., 1960 (E. Pinhey); Mwinilunga, Febr., 1960; Kitwe, March, 1963 (E. Pinhey); Chingola, 15 May, 1963 (E. Pinhey); Sakeji R., N. Mwinilunga, Apr., 1964 (E. Pinhey); Kamapande, N. Mwinilunga, 27 Jan., 1965 (E. Pinhey); Kanona, S. of Mpika, 8 March, 1969 (E. Pinhey).

Rhodesia: Salisbury, Febr., 1956 (E. Pinhey); Balla Balla, S. E. Bulawayo, Dec., 1956 (E. Pinhey); Salisbury, Nov., 1963 (E. Pinhey); Maleme Dam, Matopos, Bulawayo, 9 Dec., 1967 (E. Pinhey); Cashel, Melsetter District, 21 March, 1973 (F. de Moor)

Natal: Holadu, 26 Nov., 1948, 1 Jan., 1949 (A. H. Newton); Kambula, 10 Dec., 1949 (A. H. Newton)

Previously examined:—

Rhodesia and Mozambique (in Dept. Agric., Salisbury)

E. Transvaal: Nelspruit, Bilharzial Res. Unit (det. Pinhey, Dec., 1970)

Distribution. Only so far known in South Central and South Eastern Africa; Zambia, Rhodesia, Mozambique, Transvaal (vide Balinsky, 1963) and Natal.

***Agriocnemis falcifera* Pinhey (fig. 9)**

Agriocnemis exilis var. C., Pinhey, 1951 : 124, figs. (Zululand)

Agriocnemis falcifera Pinhey, 1959, *J. ent. Soc. sth. Afr.* **22** : 465

Holotype, allotype and paratypes from Zululand in the Transvaal Museum. One paratype ♂ and some others (non-types) in National Museum, Bulawayo. Some specimens from the N. Transvaal represent a new subspecies which will be described after the nominotypical race.

MALES

NATAL

Mature paratype ♂ (Hudley, Zululand): labium and optic lobes ventrally creamy white. Labrum black with deep purple sheen. Anteclypeus black; postclypeus dark glossy purple; genae brown. Frons coated from eye to eye with white pruinosity. Vertex black, with narrow green postocular spots, linked across back of occiput.

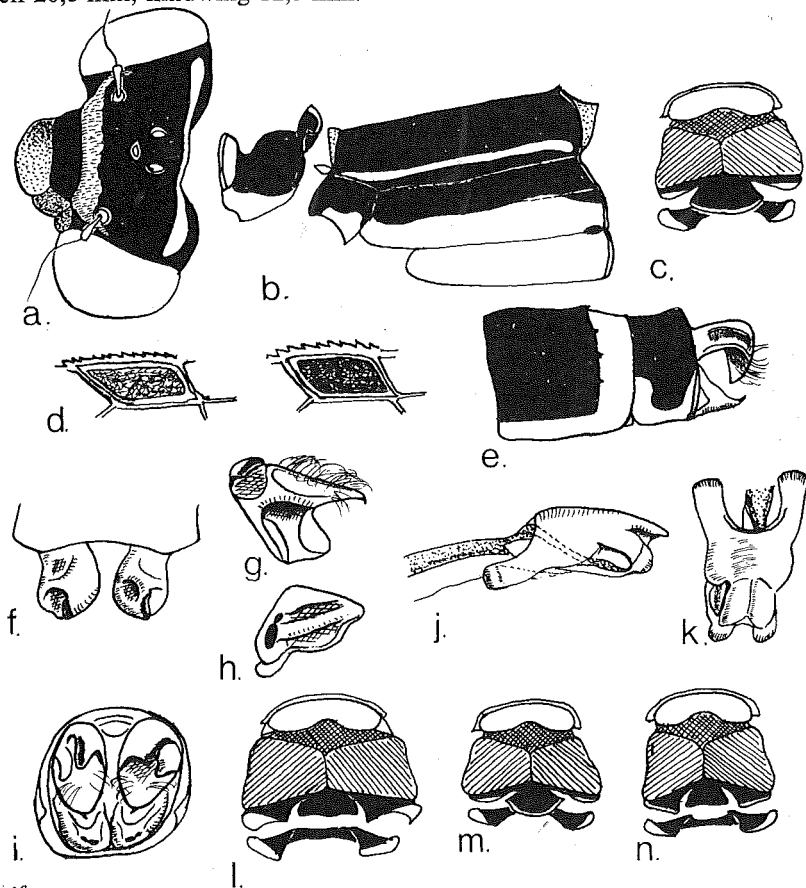
Prothorax broadly black, with greenish yellow anterior collar and green at sides. Hind-lobe tripartite, shaped as in *pinheyi*, the central portion less concave, black with yellow border; the narrow lateral portions edged with yellow. Mesostigmal lamina with posterior lateral ridge. Synthorax black to first lateral suture and below this at dorsal end, with narrow green antehumeral stripes, as in typical *pinheyi* and broader than in mature *exilis*; sides pale green, yellow ventrally, with a black dorsal spot on second lateral suture. A trace of white pruinosity on the antehumeral stripes. Femora all black with white anterior pruinosity.

Venation pale reddish brown. Pterostigma in forewing pale brown, of normal shape; in hindwing black and narrower. Forewing with 7 Px.

Abdomen with continuous broad black band on all segments; on segments 9-10 also

black laterally; a bronze sheen on segments 1-5, purple on 6, the rest without sheen; sides of segments 1-8 green on basal segments, then reddish yellow. Segment 10 not raised apically. Anal appendage red, very like *pinheyi*. Superior appendage with an apical depression below a broad tooth, followed by a downwardly curved flange, very hirsute, ending in a small apical tooth. Inferior appendage with a ridged cone, concave inwardly, the apex with a contact surface of one large and one small tooth or denticle. Prophallus with broad obtuse flagella, curved apically.

Abdomen 20,5 mm, hindwing 12,5 mm.



9. *A. falcifera*

a-f. ♂ paratype (Zululand), head, thorax, prothoracic diagram, pterostigma of left forewing and hindwing, segments 9-10, anal appendages (dorsally), all respectively; g-h. left superior and left inferior appendages from inner aspect; i. appendages posteriorly; j-k. prophallus of another Zululand ♂; l. prothoracic diagram of ♀ (Zululand); m-n. holotype and allotype *A. f. transvaalica*, prothoracic diagrams.

Another ♂ from Hudley is similar but the genae are black. A teneral ♂ is surprisingly similar: head entirely the same, even the pruinosed frontal band, but the genae are pale green. Synthorax with markings developed, except the dorsal spot on the second suture, the blackish brown area having purple and bronze sheens. Femora unmarked. Abdomen

with a slightly narrower bronze band from distal end of segment 1 to end of 7; segments 8-10 orange, with two minute distal dots on 8. Pterostigma pale brown in all wings, but its centre slightly darker on the hindwing.

The interesting point here is that the teneral ♂ is very like the mature ♂, even to the pruinosity on the frons. The abdomen has less black, the femora none and the pterostigma has only started to show differentiation.

FEMALES

Mature ♀ (Hudley): face mainly green, frons with orange transverse band, severed medially; postocular spots green, much more broadly pyriform, linked across back of occiput.

Prothorax black, with green collar and sides. Hindlobe tripartite, deeply divided into a curvedly rectangular black central portion and wider, longer green lateral triangles. No inferior lip. Mesostigmal lamina as in ♂ but with the two laminae thickly connected by a transverse ridge. Synthorax black only to humeral suture, the green antehumeral stripes broader, leaving only a linear black humeral line; an unusually square black dorsal spot on first lateral suture. Femora with black post-lateral stripe.

Pterostigma pale brown in all wings, narrower in hindwing as usual. Forewing with 9 Px.

Abdomen with continuous black band on all segments, but narrowed at end of segment 9 and on 10; on segments 1-6 with purple sheen, 7-9 with bronze sheen. Cerci more slenderly conical than in *exilis*.

Abdomen 19,5 mm, hindwing 13,5 mm.

Another Zululand ♀ has an elliptical spot on second lateral suture. A teneral ♀ has face and frons all pale orange to ochreous; postocular spots so large that they almost meet the backward arm of the frontal band along the orbits. Prothorax all pale brown. Synthorax dark violettish brown on mesepisternum, with the antehumeral band as in the mature ♀; no spot on lateral sutures. Femora unmarked. Abdomen pink and yellow, with no dark markings at all on segments 1-5; 6 with a trace of brown at distal end; segments 7-8 with narrow bronze band.

The hindlobe of the female prothorax is very like *exilis* but much more strongly developed.

The dimensions recorded are: abdomen ♂ 19-20,5 mm, ♀ 20-21 mm, hindwing ♂ 11-12,5 mm, ♀ 13-14 mm.

The type series and others were collected in a swamp in Zululand.

MATERIAL EXAMINED

Natal, Zululand: Hudley, 28 Nov. — 6 Dec., 1948 (E. Pinhey)

Distribution. Only recorded from Natal.

Agriocnemis falcifera transvaalica subsp. nov.

This is a smaller race, with a black postclypeus lacking the purple sheen. Postocular spots of mature ♂ not linked. It was first collected on a Woodbush forest stream.

MALES

Mature ♂ holotype (Woodbush): face and head as in typical *falcifera* but the postclypeus

glossy black. Postocular spots and frons coated with white pruinosity, the postocular spots separate and elongated. No pale colour at back of occiput.

Prothorax pruinosed at collar and sides, similar otherwise to typical *falcifera*, including the hindlobe and the mesostigmal lamina. Synthorax also similar but with white pruinosity on the antehumeral stripes, sides of thorax, legs and also the base of the abdomen. Legs typical.

Forewing with 7 Px.

Abdomen similar to typical ♂, with continuous band on all segments. Anal appendages and prophallus also similar.

Abdomen 17,5 mm, hindwing 10,5 mm.

Teneral paratype ♂ (Woodbush): genae yellow, frontal band yellow, widely broken. No pruinosity. Very pale blue antehumeral stripes. Abdomen with a bronze band on segments 1-7, segments 8-10 all orange-red. Abdomen 17,5 mm. A teneral paratype ♂ from Warmbad is very similar and non-pruinose. Labrum purple. Frontal band cream, widely broken. Postocular spots narrow, bluish white, linked on occiput. Synthorax bronze to first lateral suture, with narrow antehumeral stripe. Femora with faint posterior line. Pterostigma scarcely darker in hindwing than in forewing. Dorsal bronze band on abdomen, segments 1-6, narrowed on 7, 8-10 all red above. Abdomen 18 mm, hindwing 11,5 mm.

FEMALES

Mature ♀ allotype (Woodbush): labrum and postclypeus glossy brown, genae pale ochreous. Frons and vertex black, with two pruinose white lateral spots on frons (where the broken transverse band would be); postocular spots evidently large but stained.

Prothorax as in typical *falcifera*, including the hindlobe and also the mesostigmal connecting ridge. Antehumeral stripes widened to the humeral suture, but the suture unmarked except a dorsal trace of a fine line; also a dorsal trace on first lateral suture. Femora with narrowish black post-lateral line ending in a macula at the knee.

Venation pale brown, Pterostigma pale brown in all wings. Forewing with 9 Px, as in the larger, typical *falcifera*.

Abdomen with continuous black dorsal band on all segments but narrowed on segment 10 and distal third of 9; with purple sheen on segments 1-3, bronze on the others. Cerci pale brown, conical.

Abdomen 17,5 mm, hindwing 11 mm.

Paratype ♀, teneral (Woodbush): head, thorax and legs as in typical teneral *falcifera*. Abdomen with only a distal brown macula on segment 6 and a faint bronze band on 7-10. Segments 2-3 red, the rest yellow. Abdomen 18 mm. Paratype ♀, nearly mature (Tzaneen): no pruinosity. Labrum brown, blacker at base; genae green, postclypeus reddish brown. Frons with narrow complete band. Vertex black, constricted on optic lobes by extension of frontal band and by the very large, linked postocular spots. Synthorax black mid-dorsally to the wide antehumeral stripes, then pale brown to the first lateral suture. Femora

with narrow posterior stripes. Abdomen with bronze band only on segments 1 to three quarters of segment 9, 10 unmarked. Hindwing 12 mm.

This Transvaal subspecies differs from the typical Zululand race in its smaller size, the blacker postclypeus and greater pruinosity of the mature ♂, the postocular spots of the mature ♂ isolated, not linked. The differences in size in millimetres are shown in table 3:—

TABLE 3

	<i>falcifera falcifera</i>		<i>falcifera transvaalica</i>	
	♂	♀	♂	♀
abdomen	19-20,5	20-21	17,5-18	17,5-18
hindwing	11-12,5	13-14	10,3-11,5	11 -12

There is thus an appreciable difference in dimensions.

MATERIAL EXAMINED

N. Transvaal: holotype, allotype and paratypes, Woodbush, Haenertsberg, Dec. 1966, E. Pinhey

Identified for Smithsonian Institution (1973) Transvaal: 1 paratype ♂, 5 miles N. of Warmbad, 24-25 Feb. 1968, 1 paratype ♀, Morenski Dam, Tzaneen, 18 Feb. 1968 (P. J. Spangler and K. V. Krombein).

Distribution. This subspecies is only so far recorded from the Transvaal.

Agriocnemis ruberrima ruberrima Balinsky (fig. 10)

Balinsky, 1961, *J. ent. Soc. sth. Afr.* 24(1) : 74, figs.

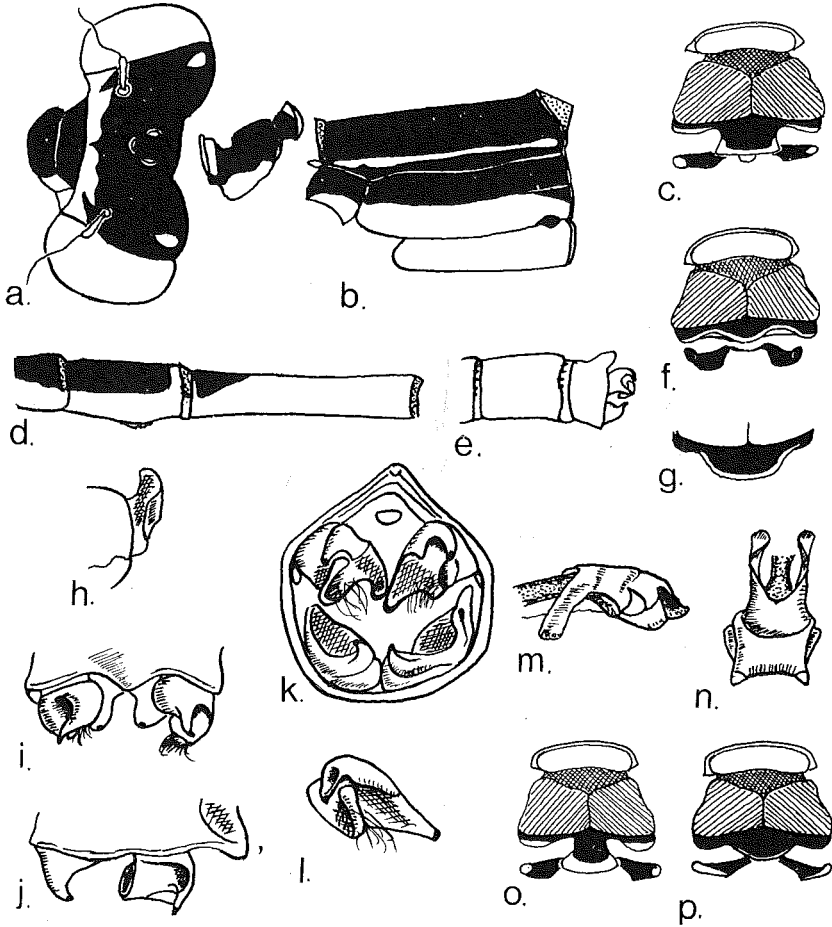
Holotype and allotype in Transv. Museum, paratypes (♂) in Balinsky's collection.

MALES

NATAL

Teneral ♂ (Richard's Bay, Zululand): labium and optic lobes ventrally whitish ochreous, the orbits with faint greenish tinge. Labrum and postclypeus steely black, genae, anteclypeus and a band across frons, almost severed medially and reaching from eye to eye pale greenish yellow. Vertex black with small isolated pale green postocular spots.

Prothorax black, anterior collar pale green, sides yellow. Posterior lobe tripartite but all in one piece; a broad concave central rectangular portion yellow at border; very narrow lateral portions mainly yellow. Mesostigmal lamina with slight anterior and posterior ridges. Synthorax black to first lateral suture, and below this at dorsal end; narrow pale green antehumeral stripe, slightly wider ventrally. A black spot on second suture. Femora with black posterior stripe.



10. *A. ruberrima*
ruberrima ruberrima a-e. head, thorax, prothoracic diagram, segments 1-3 and 9-10 of teneral ♂; f-h. ♀ prothorax, dorsally, the hindlobe antero-dorsally and laterally; i-l. anal appendages dorsally, from left, posteriorly, the left superior appendage from inner aspect, all respectively; m-n. prothallus; *ruberrima albifrons* o-p. prothorax of ♂, of ♀ (Sepopa).

Venation pale brown, pterostigma pale brown also, and longer and narrower in hind-wing. Forewing with 7 Px.

Abdomen with bronze black dorsal band on segments 1-2, with some purplish sheen distally on 2 and a complete yellow distal annulus. Sides pale greenish yellow. Segment 3 red with black basal triangle and incomplete yellow basal annulus; segments 4-10 vermilion red. Segment 10 raised distally in centre. Appendages paler. Superior appendage short, rounded like *exilis*, with terminal digitate process ending in a small tooth, a small ridge below this and an inner basal arm ending in a contact surface. Inferior somewhat conical, curved, with folded basal portion and terminal black contact point, not a ridge.

Prophallus with flagella widely splayed and directed upwards into segment 2 below the stem.

Abdomen approximately 16 mm, hindwing 10 mm.

Balinsky describes the mature ♂. The facial markings are green in life. Postocular spots bluish green. Eye green, black above. Antehumeral stripes, base of abdomen green. The black markings, rather surprisingly, are not different in teneral or mature condition, even on the abdomen so that the species is well-named as *ruberrima*. The number of post-nodal veins in forewing of ♂ varies from $6\frac{1}{2}$ to 7.

Abdomen 15,5-16,5 mm, hindwing 8,5-9 mm.

FEMALES

Mature ♀ (Richard's Bay, Zululand): labium ochreous white. Labrum glossy brown, postclypeus black; genae and anteclypeus pale greenish yellow. Frontal band pale green, almost severed medially. Vertex black, postocular spots large, linked across back of occiput.

Prothorax as in ♂ but the posterior lobe not tripartite, trapezoidal and erect, blackish brown, the outer angles rounded. Mesostigmal lamina with raised posterior ridge. Synthorax black to the pale green antehumeral stripes which are widened laterally to reach the humeral suture. Mesepimeron brown. Sides of thorax pale green to yellow ventrally, without sutural spots. Some white lateral pruinosity. Femora as in ♂.

Wings as in ♂, the venation slightly darker. Forewing with 8 Px.

Abdomen broadly black on all segments, segment 10 slightly raised medially. Sides pale green on basal segments, then ochraceous. Cerci conical.

Abdomen 18,5 mm, hindwing 11,5 mm.

A second ♀ from Zululand has the frontal band complete, the femora with finer lines. It is possibly slightly less mature. Size similar. Balinsky's teneral ♀: Prothorax reddish brown. Synthorax dorsally reddish brown. Abdomen mainly bright red, segments 2-5 with black posterior margins, 6 black at distal end, 7-10 blackish brown dorsally, yellow green laterally. Forewing with $7\frac{1}{2}$ Px.

Abdomen 17 mm, hindwing 10,5 mm.

It is thus evident that whereas the teneral and adult ♂ do not change noticeably in markings, the ♀ alters from teneral androchroic condition to a blacker mature form, the thorax and particularly the abdomen much darker.

MATERIAL EXAMINED

Natal: 1 Teneral ♂, and mature ♀ Richard's Bay (Type locality), 6 May 1963 (R. C. Denning); 1 mature ♀, same locality, 10 Nov. 1970 (Pinhey).

Distribution. Only known from Zululand, N. Natal.

Agriocnemis ruberrima albifrons Balinsky

Balinsky, 1963, *J. ent. Soc. sth. Afr.* 26(1) : 249, figs. (♂, nec ♀)

Described from the Okavango Swamps of N. W. Botswana. Holotype and allotype in the Transvaal Museum; paratypes of both sexes in Balinsky collection. However, Balinsky's description of the female appeared to be one of *exilis*, judging from a long series collected on the Pinhey expedition (one pair being in copula) to the Okavango in 1967 and this was confirmed when Balinsky sent me a specimen (Pinhey, 1967b : 10). A neallotype ♀ is described below.

MALES

BOTSWANA

Mature ♂ (Sepopa): differs from typical *ruberrima* by a yellow face; labrum with purple sheen. Frons and front of vertex coated with white pruinosity.

Prothoracic hindlobe also tripartite but the middle portion (scoop) is narrower. Mesostigmal lamina as in *ruberrima*. Femora with thicker stripes.

Pterostigma distinctly red in all wings. Forewing with 7 Px.

Abdomen with continuous dorsal bronze-black band, partially with a purplish sheen on segments 1-7, more narrowly on 8 and not reaching the distal end of this segment; a trace on 9. Sides of segments 1-4 green; end segments and appendages red. Segment 10 raised apically as in *ruberrima*. Anal appendages and prophallus similar.

Abdomen 17.3 mm, hindwing 10 mm.

In a long series from Sepopa there is not much variation in size but there is in markings. There may be 8 Px in the forewing. On some the abdominal dorsal band may continue right to the end of segment 10. In one ♂ segment 10 is red distally, black at base and dorsally on all the other segments. In some the black only reaches two thirds along segment 8, with none on 9 or 10; or complete on all segments except 10 which is all red. In a teneral ♂ the pale colours on the face are yellow, including a broad frontal band; postclypeus with purple sheen. Thorax as in mature male. Femora with only a brown annulus before the knee. Pterostigma pale yellowish brown. Abdomen with bronze-black band on segments 1-7 and two thirds of 8; sides at base green, end segments red.

In fact the mature markings are almost complete in the teneral state.

FEMALES

Neallotype ♀ (Sepopa): labrum glossy brown with a yellow anterior border; postclypeus black; antclypeus, genae and front of orbits yellow. Frons with complete yellow band, thinly coated with white pruinosity, from eye to eye, and also extending on to the vertex. Vertex bronze-black, with small green postocular spots.

Prothorax black with white pruinosity on the anterior collar. Posterior lobe like ♂ but middle portion shorter, more rounded posteriorly, more depressed, less concave. Mesostigmal lamina with longer posterior ridge than in ♂. Sides of prothorax with white pruinosity. Synthorax bronze-black to below humeral suture, then brown to first lateral suture; with slender antehumeral stripe not reaching humeral suture as it does in typical *ruberrima*. Femora with thick posterior lateral stripe.

Pterostigmata brownish yellow. Forewings with 8 Px.

Abdomen with bronze-black dorsal band on all segments, with purple sheen on distal ones. Sides of most of the abdomen green; segments 8-10 ochreous at sides. 10 raised apically. Cerci black, broadly conical, red apically.

Abdomen 18,5 mm, hindwing 12 mm.

Neallotype ♀, Sepopa, W. Okavango R., 14 Febr., 1967 (E. Pinhey), in Nat. Museum, Bulawayo.

In some from Sepopa the frontal band is almost severed medially; less pruinosity on the head; the synthoracic black only just descends below the humeral suture. The pterostigma may be pinkish ochreous to pale pink like the ♂. Some almost lack the pruinosity. Abdomen 17-18,5 mm. A teneral ♀ (Sepopa) has no pruinosity; labrum and postclypeus brown; postocular spots narrow but larger, linked at back of occiput. Prothorax less black; synthorax black only to antehumeral stripe which reaches the humeral suture, without a black humeral line. Femora only with brown annuli. Pterostigma pale yellowish brown. Abdomen red with almost linear black dorsal line on segments 1-5, expanding slightly at distal ends of these segments; the band broader on segments 8-10. The pair taken in copula are mature. A ♀ from Thamalakane R., Maun, has the frontal band broken.

Thus, the teneral female has less black than at maturity but positionally the same markings.

MATERIAL EXAMINED

Botswana: Long series (incl. the Neallotype), Sepopa, W. Okavango R., 14 Febr., 1967 (E. Pinhey); Thamalakane R., Maun, 9 Febr., 1967 (E. Pinhey); Mohembo, W. Okavango R., 19 Jan., 1970 (E. Pinhey)

Distribution. Only known from the region of the Okavango swamps, N. W. Botswana.

Agriocnemis pygmaea (Rambur) (fig. 11)

Agrion pygmaeum Rambur, 1842, *Ins. Névroptères* : 278

Agrion velare Hagen, 1858, *Verh. Zool.-Bot. Ges. Wien* 8 : 479 (nom. nud.)

Agriocnemis pygmaea Selys, 1877, *Bull. Acad. r. Belg. Cl. Sci.* 43(2) : 52

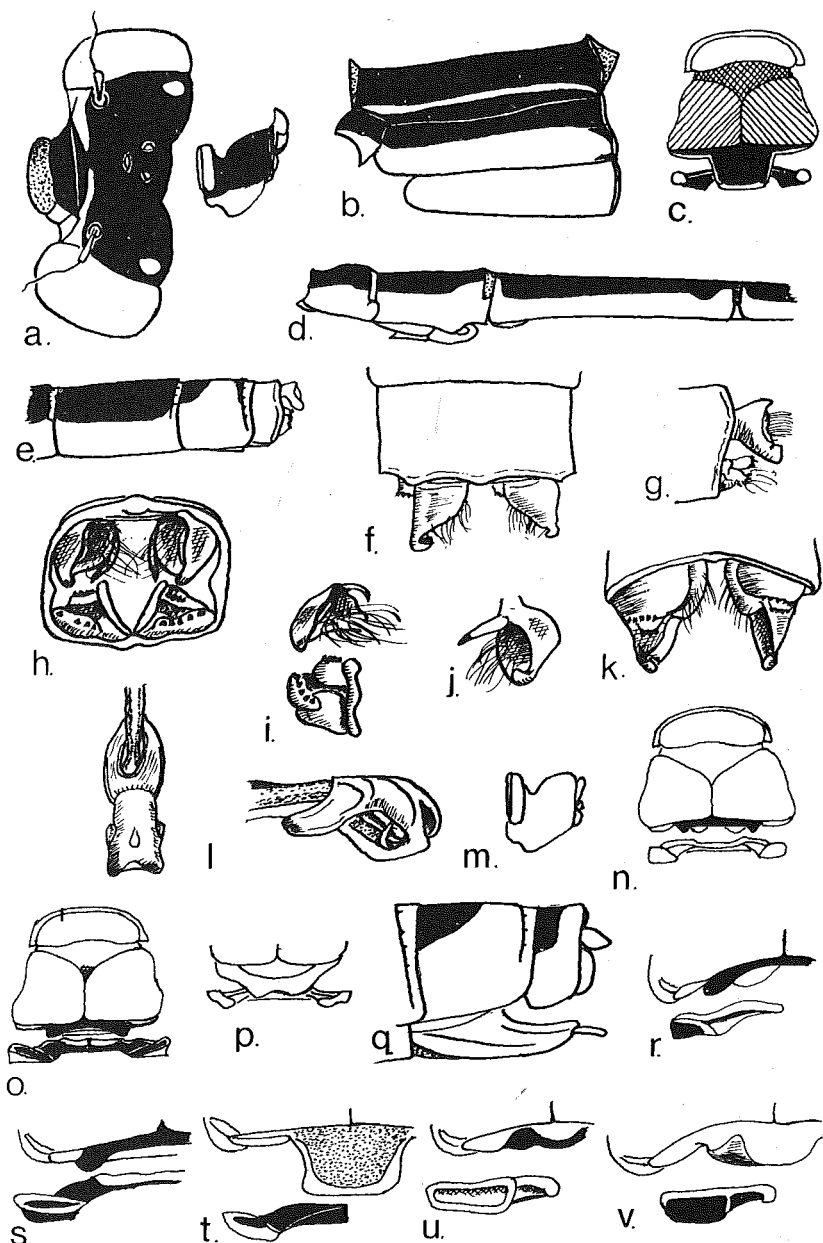
Type ♀ (damaged) in Serville Collection (teste Fraser, 1933 : 401), paratype ♂ in Selys Collection, Bruxelles Museum.

MALES

ASSAM

Nearly mature ♂ (Shillong): labium white, palpi and mandibles yellow, orbits below pale greenish yellow. Labrum purple; genae and front of orbits pale green tinged with brown; anteclypeus brown; postclypeus glossy black. Frons and vertex black, with oblique ends of a green broken frontal band; isolated green postocular spots, back of occiput black.

Prothorax bronze-black, pale green on collar and post-laterally. Hindlobe tripartite, the middle section raised almost vertically, curved, mainly yellow, black at base; lateral sections very narrow, yellow-edged. Mesostigmal lamina yellow laterally, with narrow anterior ridge. Synthorax bronze-black to first lateral suture, slightly below this at dorsal



11. *A. pygmaea pygmaea*
 a-b. head and thorax of ♂ (Shillong); c. ♂ prothoracic diagram (Passara and Shillong); d-e. abdominal segments 1-3 and 8-10 (Shillong); f-k. anal appendages of ♂ (Shillong), dorsally, from left, posteriorly, left superior and inferior appendages from inner aspect, right superior from inner aspect, ventrally, all respectively; l. prophallus; m-n. prothorax of ♀ (Shillong), from left and dorsally; o-p. prothorax of ♀ (Passara) and hindlobe of ♀ (Indonesia); q. terminal segments (Shillong); r-v. Comparisons of left side of ♀ hindlobes and left mesostigmal laminae from Shillong, Ceylon, Mahé, Sinai and Errer Gota, respectively.

end; with complete narrow green antehumeral stripes; a small black dash on second lateral suture. Legs whitish ochreous, femora with black posterior stripe, expanded at the knee; with some white pruinosity. Tibiae with short brown streak on inner surface.

Venation pale brown. Pterostigma in forewing brown, edged with cream, between brown veins; in hindwing black, edged with cream between brown veins. Forewing with 7 Px, hindwing 5 Px.

Abdomen with continuous bronze band on segments 1-7, the sides pale green; segments 8-10 red, yellowish orange sublaterally, segment 8 with black mid-dorsal wedge at base tapered to finish at two thirds of this segment; 9-10 unmarked. Segment 10 not raised. Anal appendages orange. Superior appendage nearly as long as the dorsum of segment 10; shaped like a triangular hood in dorsal view, ending in a down-turned hook; thin-walled and ventrally hirsute; with a long slender, curved inner basal tooth (sometimes difficult to see), which is black-tipped. Inferior appendage in the form of rounded anterior and posterior ridges bearing 2-3 denticles on the anterior part, 4-5 on the posterior (in one example the posterior ridge has 3 denticles on one side, 5 on the other). Prophallus ending in broad flagella curved down under the flexible stem and ending obtusely.

Abdomen 16 mm, hindwing 9,5 mm.

Another Shillong ♂ has the abdominal band continuous on segment 8 but narrowed distally, a basal trace on segment 9. Abdomen 16,5 mm, hindwing 10 mm. Another has a broad continuous band on segment 8 and traces at both ends of 9. The frontal stripe may have a narrow or moderate gap in different individuals, but it is not complete in any of these.

CEYLON

A more juvenile ♂ from Passara, Ceylon, has a well developed but severed greenish yellow frontal band; genae, orbits in front and the antehumeral stripe greenish yellow; segment 8 with a broad band as far as three quarters.

FEMALES

ASSAM

♀ (Shillong): labium and orbits below whitish ochreous. Labrum and genae yellow, front of orbits pale green; anteclypeus and the up-curved but just complete frontal band pale green. Frons otherwise and postclypeus brown, with some ferruginous marking on the postclypeus. Vertex bronze-black. Postocular spots large, narrowly linked across back of occiput.

Prothorax and synthorax without black marking. Prothorax brown dorsally, blue on collar and laterally. Hindlobe extremely short, tripartite, with wide short central brown portion curved down at lateral ends; very narrow greenish yellow lateral portions. Inferior lip visible dorsally as two small rounded triangles. Mesostigmal lamina with posterior lateral ridge and a thick anterior dorsal connecting ridge between the two laminae. Synthorax pale blue above, greenish blue to yellowish green laterally, with only a small brown dorsal spot on humeral suture. Legs pale yellow; a black posterior stripe on the femora and a short inner striga on each tibia.

Wings as in male. Pterostigma paler yellowish brown in all wings; shorter on distal edge in hindwing than on forewing, as in other species examined. Forewing with 7 Px.

Abdomen with complete brown to black band on segments 1-8, narrowed distally on 8; segment 9 with basal black triangle, 10 with a basal bar. Ovipositor not extending beyond end of segment 10. Cerci short, broadly conical.

Abdomen 16 mm, hindwing 10,5 mm.

CEYLON

Mature ♀ (Passara): this is a different form of ♀. Labrum blackish brown with orange outer border. Postclypeus with black basal line and anterior band; frons black at base and its margin with the postclypeus, with a broad pale green curved continuous frontal band. Postocular spots large, green, linked. Prothorax, its hindlobe and the mesostigmal region similar. Inferior lip in dorsal view straight-edged. Synthorax with broad black dorsal band down to the rather broad pale green antehumeral stripes which reach the humeral suture; a dorsal brown spot on humeral suture. Abdomen with black band complete on all segments except the distal end of 9. Abdomen 16,5 mm. A juvenile ♀ from the same locality has labrum, frons and thorax orange instead of blue or green; postclypeus with brown (not black) basal line; vertex bronze-black; synthorax as in the maturer ♀. Prothorax similar. Abdomen orange-red on segments 1-5 (or 6) in juveniles, with only traces of basal brown on segments 4-5 and black intersegmental annuli; segments 7-10 with continuous black band.

As the literature on this states (Fraser, 1933 etc.), this species shows polychroism in the female but whether this is purely developmental (maturational) as in other species can only be estimated from longer series.

INDONESIA

A ♀ from Indonesia (loaned by Lieftinck in 1967) and considered to be conspecific, has a quite different prothoracic hindlobe. The hindlobe is complete, not tripartite, long and broad, rather depressed, slightly invaginated on the posterior border. This differential hindlobe creates a problem concerning tandem linkage which will be discussed later. Champion (1913) stated that Ris considered the very short tripartite form of ♀ hindlobe (as described above for the Shillong ♀) to be the more typical form for *pygmaea*. It is probably, however, a later development. Champion also recorded two forms of hindlobe in *pygmaea* from Seychelles (vide infra).

SEYCHELLES

Specimens from the Seychelles are very similar to true *pygmaea*, with variable prothorax and differential pterostigmata, but the prothoracic hindlobe lacks an inferior lip in the ♀.

MALES

Mature ♂ (Mahé): essentially similar to the Oriental material. Labrum purple; frons with broken greenish yellow band.

Prothorax black, with white pruinosity, the markings as in Oriental examples; posterior lobe and mesostigmal lamina also similar. No inferior lip visible. Synthorax with some

white pruinosity on the antehumeral stripe and laterally; also on the legs. Femora very broadly black posteriorly.

Pterostigma brown on forewing, black on hindwing. Forewing with 7 Px.

Abdomen with black band on segments 1-7 and two thirds of 8; segments 8-10 reddish brown. Superior appendage very like true *pygmaea*. The inferior appendage with 2 anterior denticles, 6 posterior ones. Prophallus similar.

Abdomen 17 mm, hindwing 11,3 mm.

Another ♂ from Mahé differs on segment 8 which has a dorsal triangle tapered to a point at three quarters. In another the inferior appendage has 5 or 6 denticles in the posterior row. In juvenile males the prothoracic hindlobe has the middle portion vertical but at maturity it is more depressed, probably through thickening with chitin.

Juvenile ♂ (La Digue): frontal band similar; prothoracic hindlobe vertical in the centre, without an inferior lip. Femora with only a moderate stripe. Segment 8 with black band on two thirds followed by a central line. Appendages and prophallus similar. Abdomen 17 mm, hindwing 11 mm. An old mature ♂ from La Digue has the frons all white pruinose; prothorax also white pruinose; margin of hindlobe more depressed; but collar still blue-green. Synthorax coated with white and no signs of an antehumeral stripe. Femora nearly all black, but tibiae still with just the anterior basal striga. Pterostigma dark brown on forewing, black on hindwing. Abdomen with black band on all segments. In a less pruinose ♂ the synthorax is more densely white, again without antehumeral stripes. Frons less white but no pale band. Hindlobe of prothorax half raised. Collar pale green.

FEMALES

Juvenile ♀ (Mahé): labrum ferruginous, genae and front of orbits pale greenish yellow; postclypeus pale orange-brown; frons with broad complete orange band. Postocular spots large, linked at back of occiput.

Prothorax pale brown; hindlobe tripartite, with broad rectangular central part, edged yellow, depressed. Mesostigmal lamina with raised posterior lateral lip and a thickly linked anterior ridge between the laminae. Synthorax with broad bronze-black mid-dorsal band, broad pale orange antehumeral stripes down to the humeral suture; black dorsal dot on humeral suture, none on lateral sutures. Femora and tibiae unmarked.

Pterostigma brownish yellow in all wings. Forewing with 7 Px (8 Px in one wing of another example).

Abdomen with bronze dorsal band on segments 1-9 and basal half of 10. Cerci broadly conical.

Abdomen 19,5 mm, hindwing 12 mm.

A more mature Mahé ♀ has a brown labrum; green frontal band narrowly severed. Thorax similar but green, not orange, and with dorsal spots on humeral and second lateral sutures. Broad black band on all segments of abdomen. Segment 10 raised apically.

A ♀ from Praslin has a brown labrum; frons with short, oblique, widely separated band; hindlobe of prothorax with a large middle section deeply invaginated posteriorly. Abdomen black on all segments. Cerci black. A very teneral Praslin ♀ has a brown labrum, orange

face, broad frontal band and large, linked orange postocular spots; thorax orange with median band. Legs unmarked. Abdomen yellowish orange, with the band starting on segment 6 and developed on 7-9.

Mature ♀ (La Digue): labrum dark brown, frontal band broad but narrowly severed. Hindlobe of prothorax with middle portion nearly vertical, all black. Synthorax green, black mid-dorsally. Femora moderately black posteriorly, with punctured and serrated pattern. Abdomen with continuous band on all segments.

Of colours in life, E. S. Brown wrote from Seychelles (6 Aug., 1952) on *pygmaea*:— "I think it [the ♂] has a powder blue thorax when mature. ♂ with small round blue marks on top of head. ♀ with large posterior head markings; ♀ red when immature. ♂ seems to be blue, but in ♀ one finds blue, red and intermediates." This is evidently developmental polychroism in the female again.

The males I have seen from Seychelles do not differ essentially from those of Assam and Ceylon. Females from Asia, however, may have two or more forms of prothoracic hindlobe on to which, as well as the ridge between the laminae, the appendages of the ♂ must grip during tandem linkage; in the narrower form of hindlobe perhaps the mesostigmal connecting ridge may be the main factor in the grip, possibly by pressure between this vestigial hindlobe and the mesostigmal ridge? Seychelles material that has been available for this Paper show only the broad and long, upcurved tripartite hindlobe, the middle portion more or less rectangular, sometimes emarginate posteriorly. There is no inferior lip and this might suggest that it should belong to a different taxon but if so I consider it to be infraspecific only.

Perhaps the invagination on the Praslin ♀ may be just a variant of the rectangular form or an intermediate stage to the condition of the La Digue females where the rectangle starts to curl up to a nearly vertical concavity.

Campion (1913) recorded another Seychelles form with very short hindlobe, ridge-like (the more typical form of *pygmaea*, teste Ris). Campion said that 4 out of 20 females from Seychelles have this reduced hindlobe.

Superspecies:—

Since the distribution of these polymorphic females can overlap in one locality, at least in the Seychelles, these cannot be regarded as subspecies. Yet the structural difference in these hindlobes, the inferior lips and the laminae (fig. 11 rs) are so distinctive that *pygmaea* cannot be a true species. The relative invariability of the male appendages creates a problem in tandem linkage on to such diverse female structures. It seems evident that different responses in courtship and display must be undertaken by both partners or certainly by the female before linkage can be effected. It does not, in fact, seem likely that the link-up could be achieved hurriedly as is so often the case in other Odonata when quite frequently any courtship phase is neglected. I remarked (1967: 17) that the female prothoracic variation in Seychelles islands where competition is limited suggests that the variability stems from genetic factors from mainland ancestry when there was land connection with Asia.

It seems reasonable to suggest here that *pygmaea* is in reality a *superspecies*. Odonatists

working on Oriental material are in a better position to judge this since it is apparently so widespread in the East. There are, however, further problems arising from material provided by Prof. Dumont and from Nielsen's *sania* which I now consider to be a subspecies of *pygmaea* (vide infra).

MATERIAL EXAMINED

Ceylon: Passara, 3 600 ft., Uva Prov., 20 Sept., 1938 (M. A. Lieftinck)

Assam Mountains: Shillong, 9 Sept., 1972 (A. R. Lahiri)

Also, previously on loan from Lieftinck (Pinhey, 1967):—

Females from Indonesia: Pulau, Karimundjawa; Ujung Kulen; and from Phillipines: Luzon

Seychelles (collected by D. E. Brown, D. E. F. Vesey Fitzgerald; and later by R. A. A. Blackman, Oxford University Expedition, 1964-65):—

Praslin: Grand Anse (at light), 7 March, 1952 (Vesey Fitzgerald); Plateau, Côte d'Or, 16 Febr., 1965 (Blackman)

Mahé: Beau Vallon, June-July, 1952 (Brown); Plateau Marsh, Takamaka, 13 Jan., 1965 (Blackman)

La Digue: Plateau, 21 Oct., 1964, 26 Febr., 1965 (Blackman); La Digue 6 March, 1965 (Blackman).

In 1964 specimens were briefly examined in the British Museum (Nat. Hist.) from Seychelles and Ethiopia. Probably the Ethiopian examples were *sania*.

Distribution

Seychelles: Mahé, Praslin, La Digue; and (Campion): Coetivy and Silhouette. It is described as flying over the ground in the lowlands of these islands. The species is said to occur widely in the Oriental region and as far as Australia.

The taxon described by Nielsen as *sania* is still considered a distinct species by Dumont (pers. commun., 19 March, 1973), but because of the variability of the *pygmaea* complex I prefer to regard it as subspecific.

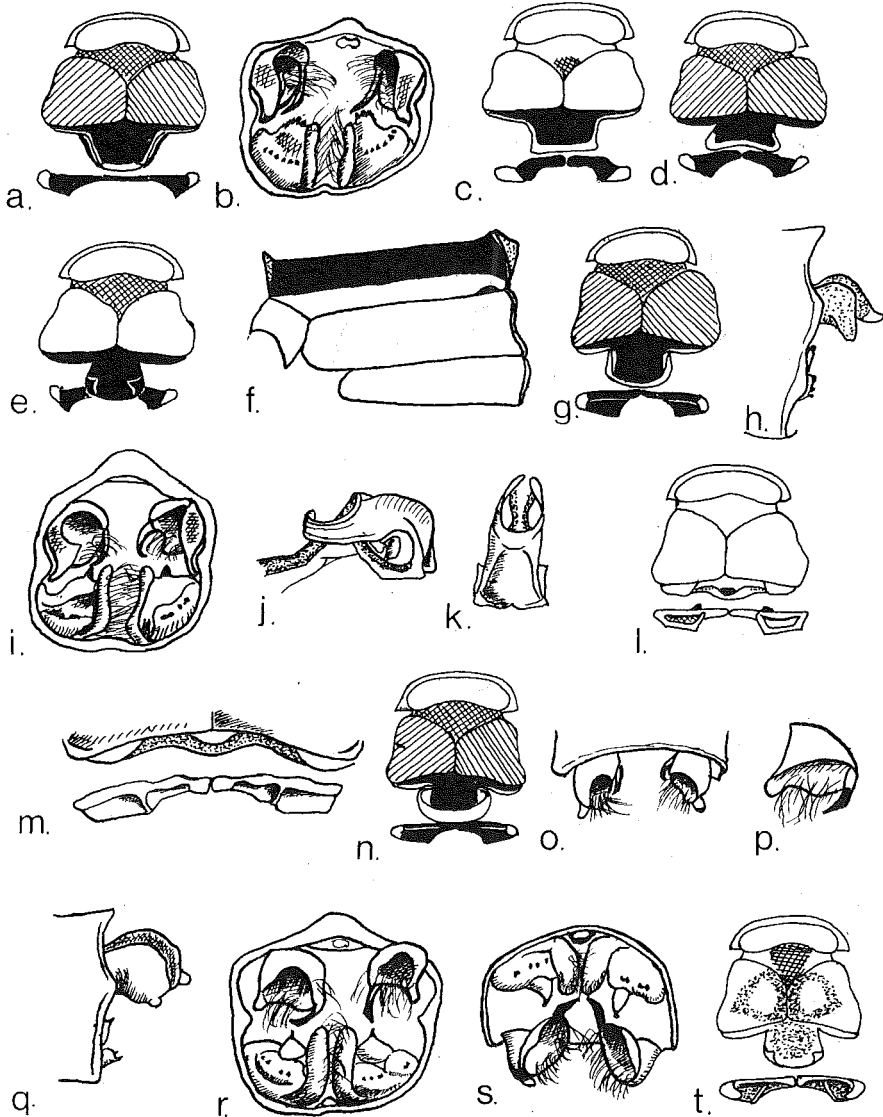
Agriocnemis pygmaea sania Nielsen (stat. nov.) (fig. 11, 12)

Agriocnemis sania Nielsen, 1956-58, *Riv. Biol. colon.* **16** : 33, figs.

Described from Gat and other localities in the Fezzan, Southern Tripolitania (leg; G. Scortecci). Holotype and allotype said to be in Nielsen's collection, paratypes in Museo Civico Storia Nat., Milan.

Dumont kindly donated specimens of a Sinai taxon which he has compared with the type series of *sania* and considers them conspecific. I have not had the advantage of seeing the *sania* types but a short series of a taxon from Ethiopia agree fairly closely with Nielsen's original description and figures for *sania*. Since the females sent to me of the Sinai taxon differ markedly in the prothoracic hindlobe from the Ethiopian females (and at least in this respect the Ethiopian series' hindlobe is more like Nielsen's rather poor thoracic figure) I will separate these taxa under a and b.

Dumont in his letter said that *sania* has a "particularly strong apical hook" on the inferior appendage, unlike *pygmaea*. The ledge (inferior lip) and the mesostigmal laminae are, according to him, different in *pygmaea* and *sania*. I do not think myself that these apparent structural characters are specifically significant in the *pygmaea* complex with its



12. *A. pygmaea*
 a-f. *pygmaea* (Seychelles), ♂ prothorax (Mahé), anal appendages posteriorly (Mahé), prothoracic diagrams of ♀ (Mahé, Praslin, La Digue), ♀ Synthorax (Mahé), all respectively; g-m. *pygmaea sania* (Sinai), ♂ prothorax, anal appendages of ♂ from left, posteriorly, prophallus (two aspects), ♀ prothorax, ♀ hindlobe and mesostigmal lamina (more enlarged); n-t. *pygmaea sania* (Errer Gota), ♂ prothorax, anal appendages dorsally, left superior from inner aspect, appendages from left, from posterior aspect, ventral aspect, ♀ prothoracic diagram, all respectively.

pronounced morphological variability. The prothoracic hindlobe may be very short or very broad in ♀ *pygmaea* from Asia or Seychelles, very short in the Sinai taxon, broad in the Ethiopian series of three females. The inferior lip is present in females of Oriental *pygmaea* including the Sinai examples, absent in Seychelles or Ethiopian taxa. Admittedly I have not seen Nielsen's types and his description is not clear on these points. The shape of the mesostigmal lamina is different in *pygmaea* from that found in the Sinai and Ethiopian taxa; but again different from the Seychelles taxon. Therefore there are either at least three species in this complex or one highly variable species. I do not find that the inferior appendage of the Sinai taxon is so much more developed apically than in *pygmaea* and Seychelles or Ethiopian examples are slightly different again.

I consider therefore that they must all be considered as one species having three (or more) subspecies or forms but they will not be differentially named here. It may seem irregular to aggregate taxa of obvious structural differences under one species, or superspecies, but there seems no other solution from the available knowledge of this complex.

a. SINAI form

MALES

♂: labium pale pinkish white, orbits below pale greenish white. Labrum purple; genae, front of orbits, anteclypeus and an oblique broken frontal band pale green. Vertex black with small, isolated green postocular spots.

Prothorax black, green on collar and sublaterally. Hindlobe tripartite, the middle portion a vertical, rectangular scoop, concave in front, mainly yellow and resembling some *pygmaea*; narrow yellow lateral portions, black at outer angles. Mesostigmal lamina like *pygmaea*, with well developed connecting ridge. Synthorax black down to first lateral suture and below this at dorsal end; with slender green antehumeral stripes. Femora whitish ochreous, with black posterior stripe: anterior striga on tibiae less developed.

Venation brown. Pterostigma deep brown in forewing, the outer edge not so long; on hindwing blacker in centre but not with such contrast as in true *pygmaea*. Forewing with only 5 Px.

Abdomen dorsally bronze or purplish black on segments 1-6 and almost to the distal end of segment 7; green at sides. Segment 8-10 red, unmarked with black. Superior appendage red. The anal appendages differ slightly from true *pygmaea*. The superior appendage is more rounded above, with the down-curved apical part more slenderly triangular, thin-walled and out-turned. Inferior appendage with simpler dentition, the anterior ridge with one largish denticle, the posterior with three denticles the inner one wide (or double). Prophallus as in *pygmaea*.

Abdomen 16 mm, hindwing 9,5 mm.

Another ♂ of same age is very similar. Forewing also 5 Px; but on segment 7 the band narrows at two thirds to a line and twin spots. The apex of the superior appendage is also slender and curved but more robust. The inferior has a single anterior denticle but on the posterior ridge the right appendage has one wide and two small denticles, the left has two minute inner and two outer denticles. Prophallus as above.

FEMALES

♀: juvenile, and very red. Labium and orbits below whitish ochreous. Genae and orbits in front pale yellow. Labrum, entire frons, except a narrow short black basal line, and the large, linked postocular spots orange. Vertex black centrally, narrowed and linear on the orbital region.

Prothorax orange-brown, cream on collar and laterally. Posterior lobe extremely short, wide, sinuous, black medially, pale yellow laterally. Inferior lip well developed. Mesostigmal lamina with long narrow connecting ridge somewhat differing from typical *pygmaea*. Synthorax orange down to first lateral suture and below this at dorsal end; yellow at sides. No black markings. Legs whitish ochreous, unmarked.

Pterostigma yellowish brown in all wings. Forewing with 6 Px.

Abdomen red dorsally, yellow laterally on segment 1-7, with black intersegmental joints; 7 with black mid-dorsal band; segment 8 with 2 basal spots; 9-10 unmarked; segment 10 raised apically. Cerci orange.

Abdomen 17 mm, hindwing 11 mm.

A teneral Sinai ♀ is very similar but segments 8-9 have a black dorsal band, 10 with basal bar. Forewing with 6-7 Px.

In most characters except the thoracic ones already discussed this taxon from Sinai resembles *pygmaea* and also the Ethiopian *sania*. Its nodal index (5-6, sometimes 7 in ♀) is lower than *pygmaea* I have examined. The slender curved apex of the superior appendage is more like *sania*, also the single anterior denticle on the inferior appendage; but on the posterior ridge of the inferior there are only 3-4 denticles, whereas there seem to be usually 5-6 in *pygmaea*.

MATERIAL EXAMINED

Israel: Kuslima Oasis, Sinai, 1972 (H. J. Dumont). Dumont (1973) found this taxon to be widespread in Israel.

b. ETHIOPIAN FORM

Specimens in the National Museum, Bulawayo, collected by Mr. B. G. Hill in Ethiopia agree well with the description of Nielsen's *sania* and because of the similarities with *pygmaea* from Asia, Seychelles and Sinai this taxon should be regarded as a form or subspecies of the variable *pygmaea*. Examples were later received from Lake Rudolf.

MALES

ETHIOPIA

Juvenile ♂ (Error Gota): very like the Sinai specimens and Nielsen's description of *sania*. Labium and orbits below creamy white; labrum purple; genae, anteclypeus, front of orbits and the oblique, broken frontal band pale green; postclypeus glossy black; vertex bronze-black, with small isolated pale blue postocular spots.

Prothorax bronze-black, the collar pale blue, lower sides pale blue-green. Hindlobe as in *pygmaea*, with well raised middle portion, mainly yellow; narrow yellow lateral portions.

Mesostigmal lamina similar. Synthorax as in the *Sinai* examples, with narrow green antehumeral stripe. Black dorsal spot on second lateral suture. Legs whitish ochreous, femora with brown posterior stripe and a trace on anterior surface of tibia.

Pterostigma scarcely darker in hindwing than in forewing, without the contrast shown in true *pygmaea*. Forewing with 6 Px (6-7 in Nielsen's type series).

Segments 1-6 of abdomen with bronze-black dorsal band, greenish yellow laterally; segments 7-10 orange-brown, 7 with a band for three quarters, narrowed distally. Superior appendage more rounded above than in *pygmaea* from Asia and Sinai because the apical extension is less developed; hollowed out inwardly and posteriorly, hirsute with a massive inner basal tooth which is straight, then angled distally (not curved as in *pygmaea*). Inferior appendage with single upper anterior denticle; posterior ridge with 2 + 2 denticles on left, 3 + 2 on right appendage. Prophallus as in *pygmaea*.

Abdomen 14.5 mm, hindwing 9 mm.

The deeply embedded basal tooth on the superior appendage suggests that in tandem linkage the appendage must swivel round. Clifton has remarked (corresp. Oct. 1973) that after immersion in water the appendage can be squeezed out and it revolves to bring the tooth out and dorsad.

A second juvenile ♂ is similar but the inferior appendage has even more reduced dentition on the posterior ridge: 4 denticles on left appendage, a small double one and an isolated single denticle on the right. Pterostigma on hindwing scarcely darker than on forewing. A teneral ♂ is similar.

Nielsen (1956-58 : 34) described the pterostigma as very small, yellowish, a little shorter than the cell below it and of similar form in forewing and hindwing.

FEMALES

Mature ♀ (Error Gota): labium and orbits below whitish ochreous. Labrum purplish brown; genae, front of orbits, anteclypeus and a complete curved frontal band pale green. Vertex bronze-black, with large blue-green postocular spots narrowly linked across back of occiput.

Prothorax brown dorsally, pale blue on collar and laterally; with black mid-dorsal band. Centre portion of hindlobe extended but slightly less than in ♂; browner but just as vertical. No inferior lip in any of the examples examined. Mesostigmal lamina very like the *Sinai* examples with strong connecting ridge. Synthorax black to humeral suture, with pale blue antehumeral stripes, broader, especially on ventral quarter. No lateral spots. Femora with black posterior line.

Pterostigma yellowish brown. Forewing with 6 Px.

Abdomen with black dorsal band on segments 1-7, pale blue laterally; 8-10 orange-brown, with complete but narrowing band on segment 8, on two thirds of 9 and on base of segment 10. Segment 10 only slightly raised. Cerci conical.

Abdomen 17 mm, hindwing 10 mm.

Another ♀ from the same locality is similar. A teneral ♀ has the labrum pale yellow-brown, genae cream; postclypeus, the frons broadly and the large, broadly linked postoc-

cular spots orange; vertex bronze-black, narrowly black along the postocular spots to the eyes. Prothorax all pinkish brown; hindlobe pale brown and strongly raised. Synthorax pinkish brown, yellow sub-laterally. Legs unmarked. Pterostigma pale yellow-brown. Abdomen pink on segments 1-6; 7 with narrow black dorsal stripe; segments 8-9 broadly black almost to the distal ends; 10 black on basal half. Segment 10 more raised than in the mature ♀ but possibly due to the teneral condition.

Abdomen 17,5 mm, hindwing 11 mm.

KENYA

Lake Rudolf: Mature males similar. Mature ♀ similar but the thoracic black extends down to first lateral suture; abdominal black to segment 8, with twin traces on 9. A teneral red ♀ has the black on vertex and end segments of abdomen more reduced than in the teneral Ethiopian ♀.

These descriptions appear to agree moderately well with Nielsen's descriptions and figures. They differ from *pygmaea* in the lack of contrast between the pterostigmata colours in forewing and hindwing; and in the shape of the mesostigmal lamina. The anal appendages show differences.

MATERIAL EXAMINED

Ethiopia: Errer Gota, 19 Jan., 1963, 12 July, 1963, 30 Aug., 1963 (B. G. Hill)

Nielsen's type series were collected at Gat, Tumin and Tingerab, Fezzan, Aug.-Oct., 1936.

N. Kenya: Loingslane, L. Rudolf, June 1973 (M. Clifton).

Distribution. Fezzan (Tripolitania), N. Kenya and Ethiopia.

Agriocnemis merina Lieftinck (fig. 13)

Lieftinck, 1965, *Verhandl. Naturf. Ges. Basel* 76(2) : 229-256, figs.

The recorded material consists only of the single holotype ♂ from Fampanambo, Tamatave, Madagascar. This is in Naturhistorisches Museum, Basel. No material in the National Museum, Bulawayo.

Lieftinck (1965) says it "apparently has no near allies with which it may be confounded." However, the superior appendage is somewhat like *ruberrima* (described 1961), but with a finger-like apical hook; and other characters place it in the *exilis* group. The following notes are extracted from the original description, modified for comparisons with other taxa in this Paper.

MADAGASCAR

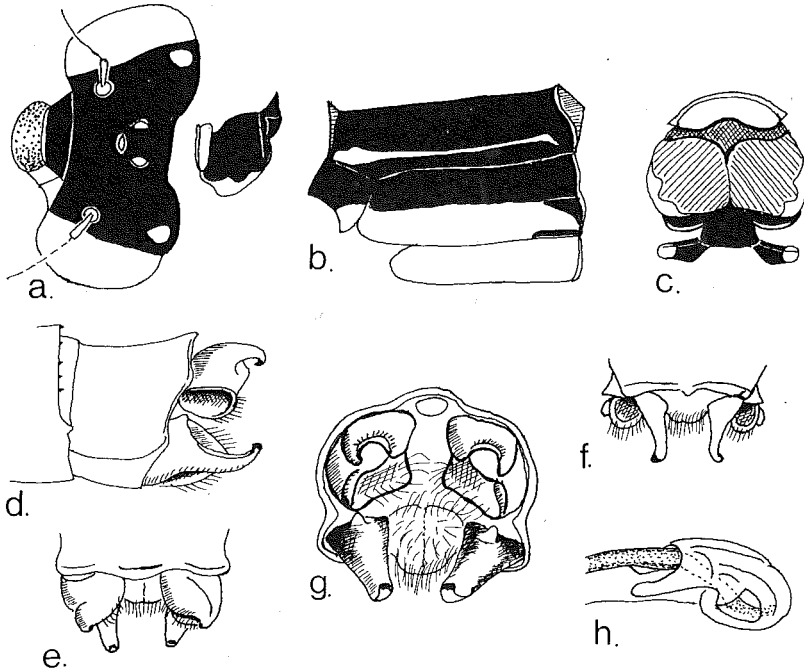
MALE

Mature ♂ holotype: labrum glossy black with faint purplish lustre, finely edged with yellow anteriorly. Genae, anteclypeus and frons pale green. Postclypeus glossy black. Vertex black with isolated postocular spots.

Prothorax bronze-black, the collar bright blue, sides green. Hindlobe bronze-black,

tripartite, the middle section large, raised, directed obliquely caudad, subrectangular and concave; lateral sections short, bright green. Synthorax bronze-black to well below humeral suture, with complete green antehumeral stripes; sides green with a black dorsal spot on second lateral suture. Femora with thick stripe.

Pterostigmata ochreous. Forewing with 7 Px.



13. *A. merina* (holotype ♂)
 a-c. head, thorax, prothoracic diagram; d-g. anal appendages from left, dorsally, ventrally, posteriorly, all respectively; h. prothallus.

Abdomen segments 1-2 with bronze-black dorsal band, the sides green; segment 3 bronze-black on two thirds with two bright green transverse basal streaks; the sides green on basal half, then red; segments 4-10 red with diffuse dark basal and subapical fasciae on 4-6 or 7 and narrow black apical annuli. Anal appendages red; shaped as in the figures. In posterior view the superior is strongly hollowed out within, with a black-tipped interior spur directed ventrad. Inferior appendage longer than superior, with short, rounded vertical inner branch and a long outer branch ending in a slender extension, black, obtuse and upturned at apex (a terminal contact ridge).

Abdomen (+ appendages) 17,4 mm, hindwing 10,2 mm.

The holotype was loaned by Dr. Baroni Urbani. It is in a cellophane envelope with holotype and locality labels, the head and segments 7-10 in a capsule within the envelope. In addition to the original description the following details may be added:—

Orbits below greenish white. No pale frontal stripe. Prothoracic hindlobe with black central scoop and short yellow-edged lateral lobes. Mesostigmal lamina green laterally,

with a slight anterior ridge. Synthoracic black reaching first lateral suture and below this at dorsal end; the green antehumeral stripes slender, slightly expanded at ventral end. The mark on the second lateral suture is a short black bar. Femora and tibiae pale brownish yellow, the femora with black posterior stripe. The black abdominal markings consist of a black dorsal band on segments 1-3 and base of 4, distal spots before ends of segments 4-6. Segment 10 not produced. Superior appendage short and broad, with apical downturned hook and an inner hook (seen in posterior view); hollowed out ventrally on either side of a flange. Inferior appendage longer, upturned apically to a contact ridge; with dorso-basal tooth. Flagella narrowed to an oblique apex.

The nearest relatives to the ♂ appear to be *ruberrima* and *pinheyi*. The female is not yet recorded.

Distribution. Madagascar.

Agrionemesis maclachlani Selys (fig. 14)

Selys, 1877, *Bull. Acad. r. Belg. Cl. Sci.* 43 : 152 (58, sep.)

Described from Gabon, Cameroons and Nigeria. I examined the Type ♂ in 1964; Kimmins erected a lectotype ♂ (1970) (Gabon). This and the type ♀ are in the British Museum (Nat. Hist.). Gambles very kindly examined the type series and confirmed that the Gabon lectotype ♂, Gabon paralectotype, two Cameroon males from Maclachlan series and three Lagos males from Strachan collection are this species, the Uganda males being the new species described after this.

MALES

NIGERIA

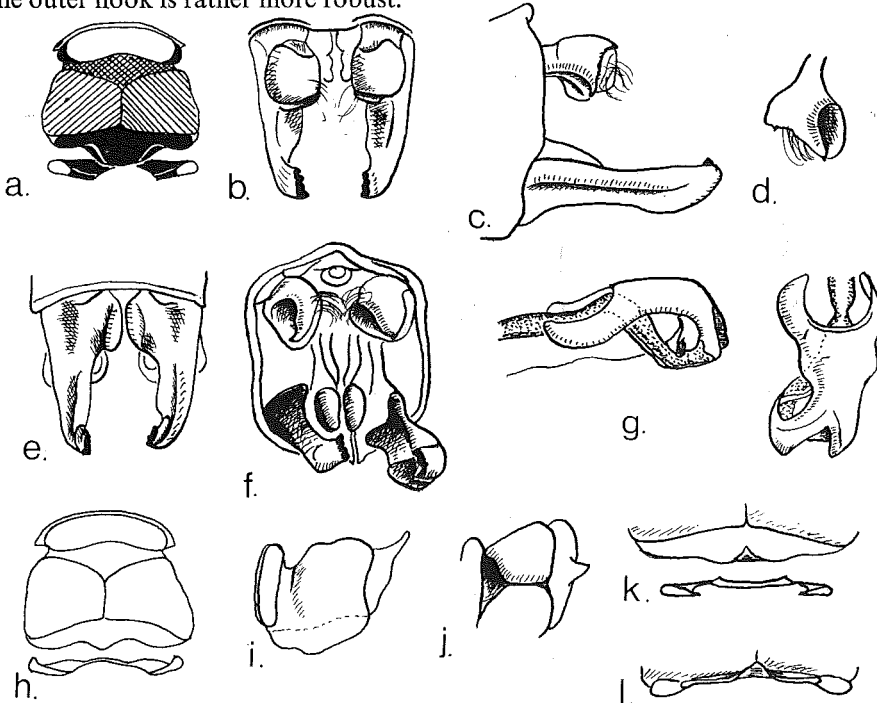
Rather mature ♂ (Ogun R.): labium cream, orbits below greenish white. Face and head as in *aligulae*: labrum glossy purple; genae, anteclypeus and front of orbits greenish yellow. Postclypeus glossy black with purple sheen. Frons and vertex black, without frontal band, with small isolated, elliptical blue postocular spots.

Prothorax black with pale blue collar; whitish yellow sub-laterally. Hindlobe tripartite, black, the middle lobe slightly tapered posteriorly, depressed, with a prominent inferior lip; lateral lobes short, yellow at the outer angles. The inferior lip seen ventrally is hemispherical (with long slender lateral arms), contrasting with the squarer mid-section of the hindlobe. Mesostigmal lamina greenish yellow laterally, with slight posterior ridge. Synthorax as in *aligulae*, black to first lateral suture and slightly further at dorsal end; with moderate green antehumeral stripes, slightly widened ventrally; a black dorsal spot on second lateral suture. Sides pale yellowish green, cream ventrally. Femora with posterior black stripe, partially punctured.

Venation brown. Pterostigma pale brown in forewing, black in hindwing, with paler edge, between deep brown veins. Forewing with 8 Px, hindwing 6 Px.

Abdomen with bronze-black dorsal band on segments 1-6, 7 with dorsal blackish brown band except on distal fifth; segments 8-10 unmarked, 10 slightly extended. Sides of segments 1 to base of 3 pale green; of 3-6 yellow; 7-10 and anal appendages pale orange-

yellow. Superior appendage short, curled, with two terminal points, one dorso-apical, the other on a dorso-lateral finger which is a down-turned branch; both these contact hooks on a hirsute pad; below this a thin membranous shelf; base of superior appendage on a long rather slender stalk. The dorsal, more inner hook is less developed than in *aligulae* and the outer hook is rather more robust.



14. *A. maclachlani*
 a-g. ♂ (Ogun R.), prothorax, anal appendages dorsally, from left, left superior appendage from inner aspect, ventrally, posteriorly and prophallus, respectively; h. ♀ prothorax dorsally (Ogun R.); i-l. ♀ prothorax (Sierra Leone), laterally, latero dorsally, the hindlobe and mesostigmal lamina, dorsally and posteriorly.

Inferior appendage long, very robust, straight, with the apex incurved to a long stout dentate contact ridge; the base broadened and inwardly with a stout flange. The contact ridge is not turned down and posteriad as in *aligulae*.

Prophallus with short broad curved flagella, their apices narrowed. More rounded at the junction of the flagella.

Abdomen 21,5 mm, hindwing 12,3 mm.

A very mature ♂ (Lagos), darker. Genae and front of orbits dull green. Green isolated postocular spots still discernible. Prothorax and synthorax densely white pruinose, obscuring all markings, including the antehumeral stripes. Legs ferruginous, with broader black posterior femoral band and some pruinosity. Pterostigma in forewing red, in hindwing black, edged with orange, between deep brown veins. Forewing with 8 Px. Abdomen with broader bronze black dorsal band, blacker distally and continuous on all segments. Superior appendage black dorsally, inferior mainly black.

FEMALES

NIGERIA

♀ (Ogun R.): labium cream; labrum dull olive-brown; genae and front of orbits greenish blue. Head above brown with greenish blue postocular spots.

Prothorax reddish brown, blue-green on collar and laterally. Prothoracic hindlobe entire but produced back medially as a V. Synthorax pale brown mid-dorsally, with very wide green antehumeral stripes; mesepimeron variegated pale brown and green; sides pale blue-green to whitish green ventrally, with a dorsal brown spot on second lateral suture. Femora pale brown, with narrow dark brown posterior stripe.

Pterostigmata yellowish brown between dark brown veins. Forewing with 9 Px, hindwing 7 Px.

Abdomen with black dorsal band on all segments. Segments 1-3 greenish blue at sides, the rest pale brown.

The abdomen is damaged. Hindwing 12,5 mm.

SIERRA LEONE

This female is chromatically different. Perhaps it is The ♀ of *Angustirami*.

Mature ♀: labium and orbits below pale ochreous. Labrum glossy brown with black centro-basal dot; genae brownish yellow, orbits in front creamy white; anteclypeus brown; postclypeus dark glossy brown with faint purple sheen. Frons reddish orange with black basal bar, the orange extending along orbit above the antenna. Vertex bronze-brown with narrow reddish posterior zones which represent the postocular spots linked on the occiput.

Prothorax pale reddish brown, yellow on collar and sublaterally. Hindlobe entire, nearly depressed but at the centre posteriorly with a somewhat raised triangular tongue-like extension. Mesostigmal lamina with posterior ridge, the two laminae connected by a low ridge. Synthorax broadly reddish dorsally as far as the broad yellowish brown antehumeral stripes, this yellow colour extending down to the first lateral suture; a fine black dorsal dash on the humeral depression. Legs pale yellowish brown, with moderate posterior brown dentate stripes on the femora. Tibiae unmarked.

Venation brown. Pterostigma yellowish brown between dark brown veins. Forewing with 9 Px, hindwing 7 Px. Cubito-anal cross-vein nearer in position to second than to first Ax.

Abdomen with blackish brown to black band on all segments, widened on distal segments; sides dull yellow, Segment 10 lightly raised apically. Cerci normal, conical.

Abdomen 20,5 mm, hindwing 12,5 mm.

Apparently, judging from correspondence with Gambles, the posterior tongue on the ♀ hindlobe is not necessarily evident in some material of this sex.

MATERIAL EXAMINED

Nigeria: Ogun R., 4, 10 May, 1963 (R. M. Gambles); Ikoyi, Lagos, 9 Sept., 1955, 1963 (R. M. Gambles)

Sierra Leone: Makeni, 10 April, 1965 (A. Todd)

In British Museum collection (teste Gambles), lectotype and paralectotype from Gabon, other examples from Cameroons and Lagos, S. Nigeria.

In Museum Koenig, Bonn, there are examples from Fernando Po island and Cameroons (det. Pinhey). The illustration of the male prothorax of *maclachlani* in Schmidt (1949) from Portuguese Guinea shows an apparent inferior lip in dorsal view, so this specimen was correctly identified.

Distribution. Gabon, Cameroons, Fernando Po, Nigeria, Liberia, Portuguese Guinea and Sierra Leone.

Previous records from Dahomey, Ivory Coast and Senegal require checking.

***Agriocnemis aligulae* spec. nov. (fig. 15)**

This is very similar in most characters to *maclachlani* and has been confused with it in the past. They might almost be regarded as sibling taxa although they can be readily distinguished, particularly in the male. So far this new taxon can only be recognized from Uganda, Zaire and Angola and does not overlap in distribution with true *maclachlani* known from Gabon, Cameroons, Nigeria and westwards more or less to Sierra Leone. Consequently unless their distribution is eventually found to coincide at least partially it is possible that they may later be regarded as subspecies although I think it more likely that they are not conspecific. The ♂ prothorax has no true inferior lip, unlike *maclachlani*, and the ♀ has no tongue on the posterior lip of the hindlobe, hence the name *aligulae*. They differ also in anal appendages and slightly in prothorax.

The long series I identified as *maclachlani* in the Garamba paper (Pinhey, 1966: 20, 80) were almost certainly all or mostly this new species.

MALES

ZAIRE

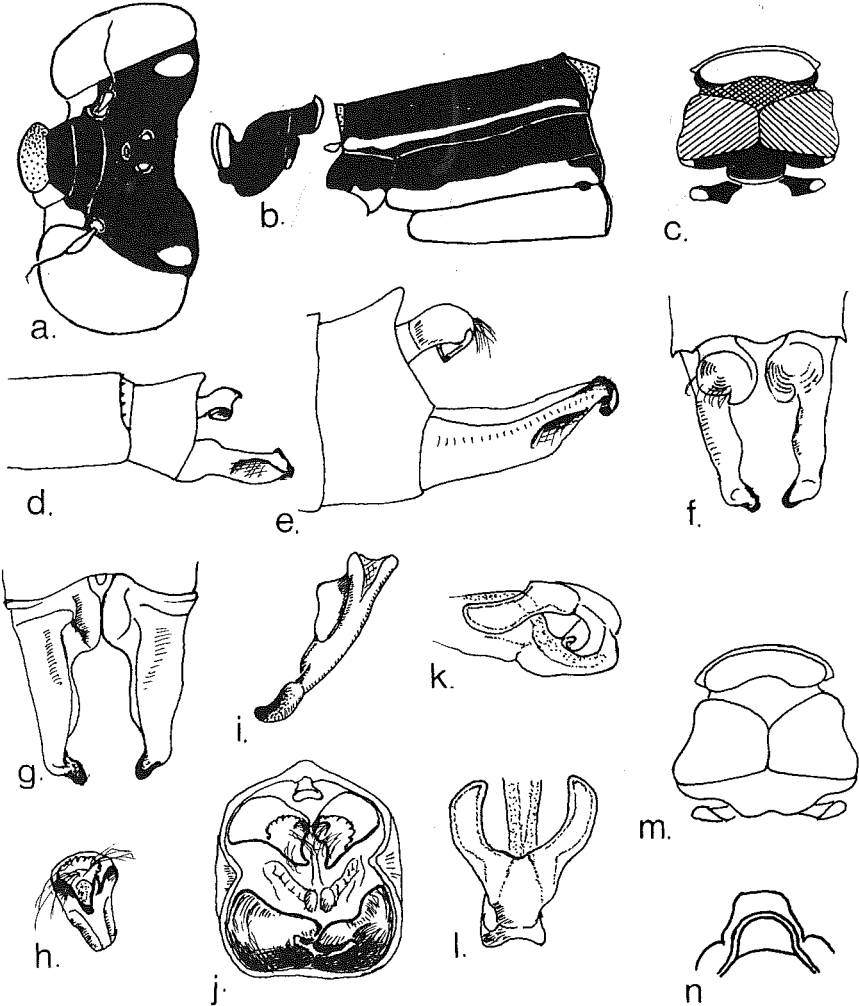
Holotype ♂, nearly mature (Garamba): labium and orbits below whitish ochreous. Labrum glossy purple and blue. Genae pale greenish yellow, anteclypeus brown, postclypeus glossy dark purple (in contrast to the brighter labrum). Frons black. Vertex bronze-black with small isolated pale blue postocular spots. Occiput posteriorly black.

Prothorax black, with greenish white collar, sides cream. Hindlobe tripartite, like *pinheyi*, with narrower, more depressed central scoop-like square or trapezoid, finely edged with yellow; very narrow lateral sections, cream at the outer angles. No true inferior lip, although ventrally the curved rim is expanded as a hemisphere, its posterior edge a ridge ventrad and separate from the dorsal upcurved mid-section of the hindlobe: almost a lip but not visible above and by definition not an inferior lip. Mesostigmal lamina with sloped posterior ridge. Synthorax black down to first lateral suture, and further at dorsal end; with narrow pale green antehumeral stripes. Sides pale yellowish green, a black dorsal spot on second lateral suture. Femora with thick black mid-posterior stripe.

Venation brown. Pterostigma brown in forewing, narrower and very dark brown in hindwing. Forewing with 7 Px.

Abdomen with bronze-black dorsal band on segments 1-7, blacker on 7 but narrowed

abruptly before end of this segment, with subapical constriction. Segments 8-10 orange, unmarked, 10 raised apically, slightly produced but not with tubular extension. Anal appendages orange-brown. Superior appendage short, thin-walled, the apex with slender inner upper hook (see posterior view) and broad flat lower branch ending in a finger-like and stouter hook, curled down and antieriad, both hooks on a hirsute pad. Inferior appendage twice as long as segment 10 and very robust, projected horizontally, with a dorso-basal inner flange, somewhat rounded above. Apex of inferior swollen to a reniform con-



15. *A. aligulae* spec. nov.
 a-b. ♂ (Garamba), head, thorax; c. thoracic diagram ♂ (Garamba and Entebbe); d-e. anal appendages from left (Entebbe and more enlarged for Garamba with both inferior appendages); f-j. anal appendages (Garamba), dorsally, ventrally, left superior appendage from inner aspect, right inferior from inner aspect, and posteriorly, all respectively; k-l. prothallus (Garamba); m. ♀ prothorax (Garamba and Entebbe); n. ♂ hindlobe, ventrally, showing partial lip.

tact zone which is curved in and downwards: not just curved inwards as in *maclachlani*. Prothallus with the flagella slightly longer and at their junction slightly less rounded.

Abdomen 22,5 mm, hindwing 12,5 mm.

A teneral paratype Garamba ♂ is similar but with only a fine brown posterior line on the femora.

UGANDA

Mature paratype ♂ (Entebbe): very mature, with much white pruinosity on frons, prothorax, densely on the black areas of the synthorax, on the legs and base of abdomen. Prothoracic hindlobe as in the Garamba ♂. Pterostigma deep brown in forewing, black in hindwing. Forewing with 8-9 Px. Abdomen bronze-black on segments 1-7, almost entirely matt black on 8-10. In size it is slightly larger, the hindwing 13 mm. A juvenile ♂ from Zika forest has no pruinosity; otherwise similar but segments 1-7 bronze-black with 7 paler at distal end. A teneral Zika ♂ has only a brown posterior suffusion on the femora.

The teneral ♂ in this species shows little difference, except in lacking pruinosity and leg markings, from the mature ♂.

The mid-section of the prothoracic hindlobe is usually more or less curled up on the posterior edge, depending, I think, on the maturity of the specimen.

FEMALES

ZAIRE

Allotype mature ♀ (Garamba): differs from the ♂ in having less black. Labrum glossy black with fine yellow border. Front of orbits green. (Vertex and frons too stained for description).

Prothoracic hindlobe complete, depressed, straightish posteriorly with sinuous elevation of the border. Mesostigmal lamina with well developed postlateral ridge. Synthorax black to the broad green antehumeral stripes which reach down to the humeral suture; a brown dorsal spot on second lateral suture. Femora with rather thin black posterior stripe.

All pterostigmata pale brown. Forewing with 9 Px.

Abdomen with continuous black dorsal band, broadest on distal segments, 8-10 mainly black; basal segments with bronze sheen. Cerci broadly conical, dark brown.

Abdomen (segment 6 lost) 18,5+ mm, hindwing 14 mm.

A teneral paratype Garamba ♀ has almost no black markings: labrum yellowish brown, genae and front of orbits green; postclypeus, frons, vertex, prothorax, synthorax almost to second lateral suture pale brown; frons with rounded black basal spot; a line behind each ocellus, a very fine line demarcating the very large postocular spots; lower sides of synthorax cream; femora unmarked. Abdomen pale pink on segments 1-3; 4 with a faint bronze band on distal four fifths, darkened to a fascia at distal end; segments 5-9 with broad bronze band, 10 with traces; cerci orange-brown.

Abdomen 20 mm, hindwing 13,5 mm.

UGANDA

Mature paratype ♀ (Entebbe): labrum pale yellowish brown, very broadly greenish brown at base; vertex and frons darker; no postocular spots. Thorax darker; a blackish brown medial band on synthorax to the antehumeral stripes which reach the humeral suture. Abdomen with continuous band. A ♀ from Zika forest is still darker, the thoracic band black.

Abdomen 23 mm, hindwing 14,5 mm.

On the average this and *maclachlani* are the largest African species. Another feature is that neither sex has a demarcated frontal band, even in the juvenile or teneral states.

Holotype, allotype and paratypes in National Museum, Bulawayo. Other examples from the series are in the Institut des Parcs Nationaux, Bruxelles; the British Museum (Nat. Hist.) (Uganda) and the National Museum of Kenya.

MATERIAL EXAMINED (type series)

Uganda: Zika forest, Entebbe, May, 1952 (E. Pinhey)

N. Zaire: Garamba National Park, Mission H. de Saeger, 6 Sept., 1951 (holotype), 24 June, 1952 (allotype), 28 July, 1952 (H. de Saeger)

Distribution. As at present known the distribution is from Angola, Zaire and Uganda. In the British Museum there are examples from the Entebbe area of Uganda (teste Gambles).

***Agriocnemis gratiosa* Gerstaecker (fig. 1, 16)**

Gerstaecker, 1891, *Jb. Hamb. Wiss. Anst.* 9 : 190 (Zanzibar)

Agriocnemis consimilis Grünberg, 1901, *Sber Ges. Naturf. Freunde Berl.* (1902) 9 : 230 (Langenburg)

The type ♂ *gratiosa* was stated to be from Zanzibar, but it should be noted that at that time the Sultanate of Zanzibar included part of the mainland, the territory now known as Tanzania. This type, at one time in Berlin Museum, may be lost, but there are said to be syntypes of both sexes in Hamburg Museum. The holotype ♂ *consimilis* from Langenburg, S. E. Tanzania on the Malawi border, is in Berlin Museum and was kindly loaned by Dr. Günther. It bears the following labels: blue label, inscribed Nyassa-See, Langenburg, 9-19. viii.98, Fülleborn S./red label, Typus/white label, *Agriocnemis consimilis* Grünb. [probably in Grünberg's handwriting].

MALES

TANZANIA

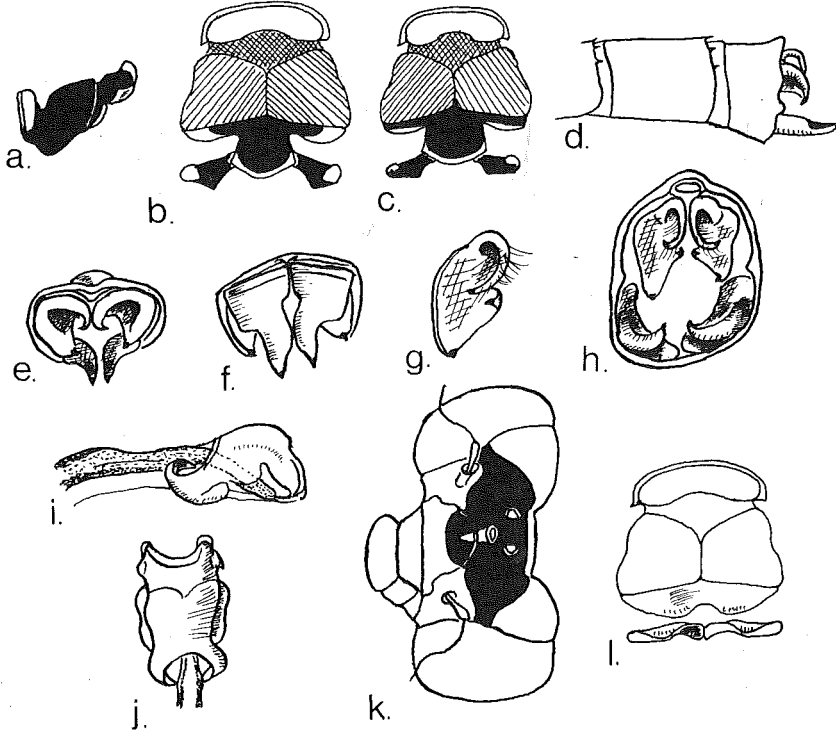
Holotype, mature ♂: no visible pruinosity. Labrum and postclypeus as in the Tanzania example described below; genae and front of orbits pale green. Frons with two oblique lateral yellow green bars (representing the frontal band) widely separated; small rounded green postocular spots.

Thorax as described for Tanzania or Malawi examples. Femora yellowish ochre with broad black posterior stripe.

Pterostigma of right forewing (other wings damaged) yellowish brown with dark centre; 7 Px but the outermost postnodal is doubled.

Abdomen with purplish black dorsal band on segments 1-3, bronze-black on 4-6; segment 7 with continuous black band; 8 with narrow blackish brown stripe on basal two thirds followed by twin spots; segments 9-10 unmarked. Laterally, segments 1-3 are yellowish green, segments 4 to basal half of 7 yellower, the rest reddish orange. Anal appendages as described below. Prophallus not dissected.

Abdomen 20 mm, right forewing 12.5 mm.



16. *A. gratiosa*
 a-c. prothorax ♂, laterally (Lindi), dorsally (Lindi and Nkhata Bay), dorsally (Nossi Bé); d. terminal segments of ♂ (Lindi); e-h. anal appendages of ♂ (Lindi), dorsally, ventrally, left superior appendage from inner aspect, posteriorly, all respectively; i-j. prophallus (Monkey Bay); k-l. ♀ (Lindi), head and prothorax.

In the original description there is a peculiar misprint in referring to 11 abdominal segments. Additional to the above description Grünberg says the anal appendages are yellowish brown, black at the tips; superior appendages shorter than segment 10, simple, widely separated, conical, somewhat compressed at the sides and directed backwards. Inferior appendage somewhat longer than superior, curved inwards; broad at the base, gradually tapering, the apices slightly turned up. Abdomen 21 mm (probably including appendages), hindwing 12 mm.

Nearly mature ♂ (Lindi): labium and orbits below whitish ochreous. Labrum glossy

purple, genae yellow, front of orbits green, anteclypeus pale brown; postclypeus glossy black. An incomplete green frontal band, widely broken. Rest of frons and vertex bronze-black with small isolated blue postocular spots.

Prothorax black with blue collar, cream at side; hindlobe tripartite and like *pinheyi* but the middle scoop more erect, bordered with yellow, the lateral sections mainly yellow. Mesostigmal lamina with only a slight anterior ridge. Synthorax bronze-black to first lateral suture and below this at dorsal end; with narrow green antehumeral stripe. Sides pale green with small dorsal spot on second lateral suture. Femora with narrow black post-lateral stripe.

Venation pale reddish brown. Pterostigmata all pale brown. Forewing with 7 Px.

Abdomen bronze-black on segments 1-8, pale green to yellow at sides; segments 9-10 red, unmarked. Segment 10 slightly raised and produced apically. Anal appendages less robust than *inversa*, the superior appendage curved inwards and down to a point close to the appendage of the opposite side; with broad triangular ventral flange, more hirsute than *inversa*, ending in a small ventral tooth, with a stronger inner tooth on this flange. Inferior appendage longer than superior but not as long and robust as in *inversa*; less than twice as long as segment 10; directed straight to a point which is slightly upturned, this appendage not incurved as in *inversa*; at its base the appendage is broad. Prophallus with the flagella broad at the base, curled as *inversa* to narrowed apices.

Abdomen 20 mm, hindwing 11,5 mm.

MALAWI

Nearly mature ♂ (Monkey Bay): frontal band more narrowly broken; prothorax similar. Femora with broad black posterior band. Venation very dark brown, pterostigma brown, framed in blackish brown veins. Segments 7 with purple sheen, 8 with a basal trace. Anal appendage similar. Abdomen 19 mm, hindwing 11 mm. Others from Monkey Bay are similar or with narrower femoral black. In teneral ♂ the yellow posterior margin of the prothoracic scoop is more raised. Pterostigma paler in centre; femora with diffuse brown posterior band. Abdomen similarly marked. In some teneral or mature specimens the frontal gap is almost closed. An old Nkhata Bay ♂ has white pruinosity on frons, prothorax and femora; the femora broadly black posteriorly and laterally; pterostigmata with dark centres. Abdomen more broadly black, with a purple sheen on segments 6-7; the basal half of 8 broadly black, less so distally; segments 9-10 all black. A Chipoka juvenile resembles the Monkey Bay examples.

MADAGASCAR

A mature ♂ (Helleville): very pruinose white on frons, postclypeus, synthorax, antehumeral stripes and base of abdomen. Femora broadly black. Pterostigmata dark brown in centre. Small, the hindwing 11 mm.

UGANDA

♂ (Ddewe): frontal band almost complete; femora with very broad posterior band; pterostigmata dark brown in centre; segment 8 with complete narrow band. A Lake Victoria ♂ is similar but segment 8 with narrow mid-dorsal line on basal half and a wide lateral band on each side, these three bands joined at the base of the segment.

TANZANIA

♂ (Korogwe): frontal band very nearly complete in two specimens, the band on segment 8 broad and complete in both. An almost mature ♂ from Ilonga, Tanzania, is like the Malawi examples.

ZAMBIA

♂ (Samfya): in mature males the frontal band is widely broken, sometimes pruinose; femora broadly black; pterostigmata blackish brown in the middle.

MOZAMBIQUE

Nearly mature ♂ (Vila Junqueiro): femora with narrow brown band; segment 8 with a fine dorsal line; but another has a wider femoral band and wider mid-dorsal band on 8 but only on two thirds of this segment. A Namacurra ♂ has a complete band on segment 8. One from East of Mwanza is mature but the only pruinosity is on the widely broken frontal band; no black on segment 8, yet the pterostigmata are black, between blackish brown veins. One from Vila Paiva is like mature ones from Malawi but it is not pruinose; segment 8 with a complete narrow dorsal band.

NATAL

A ♂ from Durban has the frontal band nearly complete. Femora broadly black posteriorly; venation dark brown.

BOTSWANA

Mature ♂ (Francistown): pruinose only on the femora; pterostigmata black in the centre. Segment 8 with very narrow complete dorsal line. A less mature ♂ from Mohembo has pruinosity on frons and femora. Segment 8 with a fine line on three quarters of its length. Others from Mohembo have the frontal band showing a narrow or wide gap; segment 8 with a narrow line on basal half, on three quarters or complete; a teneral ♂ has only a trace on the basal quarter of segment 8.

Abdomen 18-20 mm, hindwing 10,5-11,5 mm.

The interesting feature of *gratiosa* is that the pterostigma in each wing may darken at maturity to blackish brown, rarely to black. In *maclachlani* it is only in the hindwings (as in *pygmaea* and *falcifera*) that the pterostigma becomes black. Yet one further point of interest, not brought out in the description so far, is that in juvenile *gratiosa* the pterostigmata darken in the hindwing faster than in the forewing so that prior to maturity it is sometimes possible to find this differential pterostigma.

The markings, size and genitalia show no signs of subspecific differences, only individual.

It may be advisable to stress the form of the complex superior anal appendage here, with its three contact points, since in the next species *inversa* a rather similar structure is found. One of these points is at the apex of the incurled dorsal branch, the second is at the apex of the ventral, down-curved, triangular branch and the third is a small recurved hook on the inner edge of this broad ventral branch. There is probably some flexibility in the slender upper and the broad thin-walled lower branch so that all three contact points can be brought into play during linkage; the grip enhanced by backward pressure from an anterior position by the apical point on the longer inferior appendage.

FEMALES

TANZANIA

Juvenile ♀ (Korogwe): labium and orbits below whitish ochreous. Labrum, anteclypeus, postclypeus, frons and part of the vertex orange; with a black basal bar on frons. Genae pale yellow. Postocular spots large, greenish yellow, orange across the back of the occiput where they are linked; the black of the vertex narrowed on the optic lobes.

Prothorax pale brown, cream on the collar and laterally; hindlobe complete but well raised medially and curved convexly; pale brown. Mesostigmal lamina with long posterior ridge, widened at lateral angle, the laminae connected by a broad ridge almost bifurcate in the middle. Synthorax pale reddish brown to the broad pale yellow antehumeral stripe which reaches the humeral suture; no humeral black marking. Sides yellow, unmarked. Femora with only suffused brown annuli before distal ends.

Venation pale brown. Pterostigma brown, between reddish brown veins. Forewing with 8 Px.

Abdomen all reddish brown dorsally on segment 1-5, yellow laterally; segment 6 yellow with fine black mid-dorsal line, segments 7-10 with complete black dorsal band. Cerci conical, orange-brown.

Abdomen 20 mm, hindwing 13 mm.

A Korogwe teneral ♀ is similar. A nearly mature ♀ from Lindi is very similar; prothoracic hindlobe less erect and convex at this stage. Mesostigmal laminae more narrowly linked. Venation dark brown, pterostigma yellow with central brown suffusion between dark brown veins. Forewing with 8 Px. Femora with only faint brown annuli. Abdomen red on segments 1-3, grading to a faintly bronze band on 4 with some violet reflection, the band stronger on segments 5-6; segments 7-9 with definite black dorsal band having a blue-violet sheen; segment 10 with only a basal trace, this segment raised apically; cerci orange-brown.

Abdomen 21,5 mm, hindwing 19,5 mm.

A nearly mature ♀ (Ilonga, light trap) is similar to the Lindi ♀; the black on the abdomen is from segment 5 to the base of 10.

MALAWI

♀ (Nkhata Bay): very like the Lindi ♀; abdomen 22,5 mm, hindwing 20 mm. A mature ♀ from Chipoka has a glossy brown labrum, a dark brown postclypeus; frons with broad green band, almost severed medially; narrow green postocular spots, linked across the occiput. Prothorax pale brown; synthorax black to the very broad green antehumeral stripes which reach the humeral suture, but mid-dorsally there is a reddish brown line through the black; sides all green. Femora moderately striped. Pterostigma yellowish brown with darker centre. Abdomen with continuous black band from segment 1 to base of 10. Abdomen 22,5 mm, hindwing 19 mm.

Another Chipoka ♀ has the abdominal black continuous to the end of 10, another again is a juvenile resembling the Lindi ♀.

MADAGASCAR

A teneral ♀ (Analamazotra): labrum, head, face and thorax yellowish brown; hindlobe and mesostigmal lamina as in the Lindi ♀; femora with faint annuli. Segments 1-6 similar to the Lindi ♀, 7 with black band (segments 8-10 lost).

ZAMBIA

♀ (Ndola): labrum and postclypeus glossy black, frontal band narrowly severed; vertex and frons bronze-black without postocular spots; prothorax mainly bronze-black; synthorax bronze-black to below humeral suture with a very narrow yellowish green antehumeral stripe which is almost obsolete dorsally.; a black dorsal bar on first lateral suture, a spot on the second suture. Femora only moderately marked. Abdomen purplish black on segments 1-10; cerci black. Abdomen 17,5 mm.

Very mature ♀ (Kawembwa): labrum purple, postclypeus, frons and vertex bronze-black, without frontal band and no postocular spots. Prothorax blackish brown, laterally pruinose white. Synthorax purplish blue-black to the narrowish green antehumeral stripe, then black to the humeral suture and below this; with a thick triangle on the first lateral suture. Sides green, white pruinose ventrally and on femora, which have moderate stripes. Segments 1-10 dorsally and the cerci black.

Both these females from northern Zambia are very black which might indicate local melanism in their forest habitats or perhaps a distinct race. More material would be necessary for a conclusion.

MOZAMBIQUE

Mature ♀ (136 km W. of Quelimane): labrum glossy brown, postclypeus dark glossy brown, genae greenish yellow,; frons with broad pale green frontal band, only linearly severed in the middle, the rest of the frons and the vertex bronze-black with large green postocular spots, linked across back of occiput. Prothorax brown mid-dorsally, green on collar and laterally; hindlobe dark green, slightly more depressed than in less mature females. Synthorax black to the very broad green antehumeral stripes, which reach the humeral suture; sides pale green to yellow without black spots. Femora with moderate black posterior band. Venation brown, pterostigma yellow between brown veins, with central blackish suffusion. Abdomen with broad bronze-black band on segments 1-9 and base of 10, followed by a narrow line on 10. Cerci orange. Juvenile ♀ (Vila Junqueiro): face and frons brownish yellow, the frons with black basal band; large orange-yellow postocular spots, linked on occiput. Prothorax and synthorax red, yellow laterally; femora unmarked. Segments 1-6 red, with trace of distal black on 6; segments 7-9 with bronze-black band, a basal trace on 10. Juvenile ♀ (Mwanza) resembles the Lindi ♀. A nearly mature ♀ (Vila Paiva) has the labrum and postclypeus brown; frontal band broad, complete; frons and vertex bronze-black, with very narrow linked postocular spots. Prothorax and synthorax brown mid-dorsally with very broad antehumeral stripes; no lateral markings; femora and pterostigmata as in others. Abdomen dorsally bronze-black on all segments. Cerci orange.

SUDAN

A mature ♀ from Southern Sudan is like the Lindi female but with a stout ridge between the mesostigmal laminae.

BOTSWANA

Mature ♀ (Mohembo): labrum dark glossy brown, postclypeus black; frons and vertex bronze-black with narrowly severed frontal band and narrow green postocular spots linked on occiput. Prothorax black; synthorax bronze-black to the broad green antehumeral stripes; a black trace on first lateral suture. Abdomen with black band from segment 1 to base of 10. Abdomen 20 mm. A teneral ♀ is red like the Korogwe ♀; segments 1-5 unmarked; narrowly black in 6, broadly on 7-10. Abdomen 17 mm. A mature ♀ is broadly black on the head, pruinose white on the prothorax, sides of synthorax and femora; femora broadly black posteriorly. Synthorax as usual only black to the broad antehumeral stripe. Segment 10 unmarked. A juvenile Mohembo ♀ has a black band across the postclypeus, otherwise like the teneral ♀; on the abdomen a purplish bronze-black band starts at the distal end of segment 4. Others are similar, also banded on the postclypeus. Another teneral ♀ has no band on the postclypeus; the abdominal markings start as a narrow band on segment 5; another teneral ♀ has the postclypeus tinged with black. A mature ♀ has the labrum and postclypeus blackish brown; synthorax black dorsally to the narrow green antehumeral stripes, then brown to the humeral suture and just below this. Abdomen black above from 1 to base of 10.

The females show more variation than the males as in most African species of this genus but again this is normally developmental. The teneral or subjuvenile ♀ is very pink or pale reddish brown, with the only abdominal black or bronze-black markings being on the distal half or two thirds of the abdomen. Late juveniles and adults usually have dark labrum and postclypeus, not black, the thorax usually black only to the broad antehumeral stripes, the abdomen black on segments 1-9 or also on 10.

The unusually thick connection between the mesostigmal laminae in the Korogwe ♀ (N. Tanzania) and almost to the same extent in the Sudan ♀ may suggest that there is a more northerly race perhaps nearer true *gratiosa* whose mesostigmal region I have not examined. This would suggest that *consimilis* occurs in areas to the south of this, Southern Tanzania to Natal, and in Madagascar. More northern material would be required to verify this.

It is also possible, as stated above, that the two very dark Northern Zambia females represent still another race but without more material I must leave them as melanic variants.

MATERIAL EXAMINED

- Madagascar: Helleville, Nossi Bé, Oct., 1933 (Olsufieff); Analamazotra, 8 Dec., 1950
- S. Sudan: Sudd, Upper White Nile, 4 Oct., 1959 (F. Kollmansperger)
- Tanzania: *Consimilis* holotype ♂, Langenburg, Lake Nyassa, 9-19 Aug., 1898 (S. Fülleborn); Korogwe, Morogoro, Oct., 1951 (E. Pinhey); Lindi, 25 July, 1965; Ilonga (light trap), 23 June, 1969 (J. Parrikka)
- Uganda: Ddewe Forest, Kampala, June, 1949 (E. Pinhey); Lake Victoria, Kampala, Oct., 1952 (E. Pinhey)
- Malawi: Nkhata Bay, 30 June, 1961 (E. Pinhey); Chipoka, Lake Malawi, 30 Apr., 1966 (E. Pinhey); Monkey Bay, 3 May, 1966 (E. Pinhey)

- Zambia: Samfya, N. Prov., 30 Nov., 1959 (R. C. Dening); 35 m (56 km) S. of Ndola, 30 Jan., 1965 (E. Pinhey); Kawembwa, N. Prov., 16 March, 1969 (E. Pinhey)
- N. Mozambique: Vila Junqueiro, 1 May, 1970 (E. Pinhey); Namacurra, 3 May, 1970 (E. Pinhey); 85 m (136 km) W. of Quelimane, 4 May, 1970 (E. Pinhey)
- S. Mozambique: Vila Paiva d'Andrada, Sept., 1957 (E. Pinhey); 20 m (32 km) E. of Mwanza, 26 Aug., 1971 (E. Pinhey)
- Botswana: 84 m (134 km) N. W. of Francistown, 5 Febr., 1967 (E. Pinhey); Mohembo, W. Okavango, 17 Febr., 1967, 19 Jan., 1970 (E. Pinhey)
- Natal: Durban, Jan., 1952 (C. G. C. Dickson)

Distribution. Madagascar (see Fraser, 1949b), S. Sudan (including Yambio, Pinhey, 1961), Tanzania, Zaire, Malawi, Zambia, Mozambique, Botswana, Natal (including Zululand, teste Balinsky). The type locality Zanzibar may have been the island or Tanzania.

***Agriocnemis inversa* Karsch (fig. 17)**

Karsch, 1899, *Ent. Nachr.* 25(24) : 380-381 (sine fig.)

Described from Bussisi, Lake Victoria, Uganda (F. Stuhlmann), type ♂ and ♀ are in Berlin Museum.

The type ♂ (Karsch, 1899) is described as having a metallic blue labrum; thorax with blue pruinosity; femora with black posterior stripe. Venation rather blackish, pterostigma yellow. Abdomen with bronze-black dorsal band. Hindlobe of prothorax with narrow quadrilateral extension (scoop) and upturned side portions. Segment 10 with blunt dorso-apical process. Superior appendage much shorter than either segment 10 or the inferior appendage, with two branches, the inner curved, short, half as long as the other, the outer straight and blunt. Inferior appendage longer than segment 10, thick at base, grooved on inner edge, the apex incurved to a small hook. Abdomen (and appendages) 20,5 mm, hindwing 11-11,5 mm.

MALES

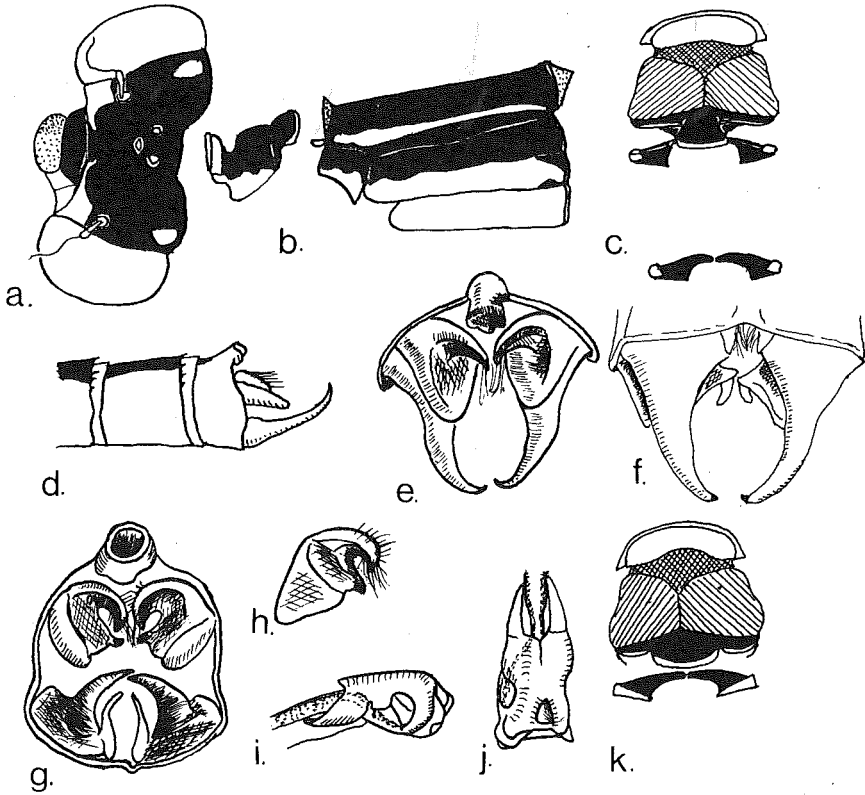
UGANDA

Nearly mature ♂ (Busia, Uganda): labium and orbits below whitish ochreous. Labrum glossy purple; genae and a widely severed narrow frontal band pale green; anteclypeus brownish ochreous; postclypeus glossy black; rest of frons and vertex bronze-black, with isolated pale blue postocular spots.

Prothorax black, blue on collar, cream laterally, hindlobe like *pinheyi*, tripartite, the middle section a depressed square, yellow edged; lateral sections narrow yellow edged. A reduced inferior lip present. Mesostigmal lamina with a slight anterior ridge. Synthorax bronze-black to first lateral suture and below this at dorsal end, with narrow green antehumeral stripe; sides pale green to whitish ochreous, with a small dorsal dot on second lateral suture. Femora with slender brown post-lateral stripe.

Venation pale reddish brown. Pterostigma pale pinkish brown. Forewing with 7 Px.

Abdomen broadly bronze-black on segments 1-7, pale green to yellow laterally; segment 8 red with narrow black dorsal band; 9-10 red, 9 with basal and distal traces, segment 10 with basal trace. Segment 10 raised apically and produced into a prominent tubular tumour. Anal appendages pale orange. Superior appendage in sideview appearing to be a broad flattened, conical structure, obliquely down-turned and narrow. Actually it is very like *gratiosa* and consists of a dorsal inner arm, curled inwardly and down to a point, and a broad lateroventral flange which has an inner tooth turned obliquely upwards. Inferior appendage about three times as long as segment 10, extending back horizontally but incurved to an apical point. Prophallus with broad, tapering flagella curled to a narrowed apex.



17. *A. inversa*
 a-j. ♂ (Busia), a-b. head, thorax; c. prothoracic diagram and mesostigmal laminae in situ and separate; d. terminal segments; e-h. anal appendages, dorsally, ventrally, posteriorly, left superior from inner aspect; i-j. prophallus; k. ♀ prothoracic diagram and lamellae (Karungu Island).

Abdomen 20 mm, hindwing 11,5 mm.

A teneral ♂ from Laropi has labrum and postclypeus glossy brown; rest of face and the narrowly broken frontal band yellow. Frons and vertex brown with isolated pale blue postocular spots. Pro- and synthorax with normal markings but brown not black. Femora

with only faint distal spots. Pterostigmata pale yellow. Abdomen with bronze-brown band on segments 1-7 and a basal trace on 8. Abdomen 18,5 mm, hindwing 11 mm.

W. KENYA AND UGANDA

Two males from Karungu Island show the stages from teneral to almost mature, the end segments in the teneral example red, in the other bluish ochreous laterally, with black dorsal band, narrowed on segment 10. Frons pruinose white in the maturer ♂.

Evidently the dark pattern develops early. At full maturity the end segments of the abdomen develop black as in an old Mbarara ♂: pruinose on thorax and femora; femora all black posteriorly and laterally; pterostigma and venation pale brown (not black as in Karsch). Abdomen bronze-black on segments 1-7, segments 8-10 and the apical extension black; sides of basal and end segments all pale green, anal appendages red.

FEMALES

UGANDA

Notes on Karsch's description of ♀ (Bussisi): labrum and postclypeus glossy black. Prothorax dark with pale yellow posterior border. Antehumeral stripe broader than in ♂, yellow edged with blue. Prothoracic hindlobe not remarkable. Abdomen yellow with bronze-black dorsal band at maturity. Abdomen 20 mm, hindwing 14 mm. This description does not emphasize the more important characters except those on the face.

Nearly mature ♀ (Karungu Island): labrum purple with cream border; genae and front of orbits and a broken narrow frontal band pale green; postclypeus glossy black with green basal line.

Prothorax very like ♂, with green collar; hindlobe complete, the margin yellow, raised and lowered sinuously. Mesostigmal lamina with post-lateral lobe but without the thick connecting ridge of ♀ *gratiosa*. Synthorax black down to first lateral suture at dorsal end, slightly less at ventral end; with green antehumeral stripe slightly wider than in ♂. Sides pale green with a black dorsal dot on second lateral suture. Femora with broad black posterior stripe.

Pterostigma pale pinkish ochreous. Forewing with 8 Px.

Abdomen with continuous broad black dorsal band, with bronze sheen on segments 1-2, purple sheen on 3-7; segment 10 raised apically. Cerci black, conical.

Abdomen 19 mm, hindwing 13 mm.

W. KENYA

A mature ♀ (Karungu Island): labrum black, postclypeus dark brown, frons with white pruinosity; no postocular spots. Prothorax, synthorax and base of abdomen with white pruinosity. Pterostigma yellowish brown. Femora with broad brown posterior stripe.

No teneral ♀ was available for maturational comparisons, but the female is evidently darker at maturity and before this stage than in most species.

MATERIAL EXAMINED

W. Kenya: Karungu Island, Lake Victoria (Kavirondo G.), Dec., 1949 (E. Pinhey)

S. Uganda: Busia, Jan., 1951 (E. Pinhey); Mbarara, Febr., 1951 (E. Pinhey); Lake Kyoga, Jan., 1953

N. Uganda: Laropi, W. Nile, May, 1954 (T. H. E. Jackson)

Distribution. Sudan, W. Kenya, Uganda and Zaire.

Agriocnemis zerafica Le Roi (fig. 18)

Le Roi, 1915, *Ergebn. zte Zentr. Afr. Exped.* 1 : 343 (♀, Bahr-el-Zeraf)

Agriocnemis ebneri Ris, 1924, *Denkschr. Akad. Wiss. Wien* 99 : 277 (♂, Karshawal, Kordofan)

This synonymy has been recorded for some years now (vide Pinhey, 1962b). Proof of such synonymy is not easily obtained without series being collected from the type localities. The type ♀ *zerafica*, in Museum Koenig is very teneral but the holotype ♂ *ebneri*, in Naturhistorisches Museum, Wien, is mature and in good condition. I have examined the ♀ type *zerafica* in Museum Koenig (1964) and Dr. Kaltenbach lent me the holotype *ebneri* from Museum Wien. Studying these and also material from other parts of Africa which equate to these in one sex or the other I am satisfied that the above synonymy is correct.

The two type localities, both in the Sudan, have much in common as well as being not far apart as far as distances in the Southern Sudan are concerned, a territory of wide ecological uniformities in the different zones. Bahr-el-Zeraf where *zerafica* was found is a tributary of the White Nile approximately 400 km S.W. of the type locality of *ebneri*, Karshawal, which is itself on the White Nile at Bahr-el-Abiad in the Kordofan. The type localities are thus linked by water. The only other *Agriocnemis* for which I have records in the Southern Sudan are *A. exilis* and *A. forcipata*, which are, of course, quite different.

Erich Schmidt (1949/51: 130, 132-133) separated *ebneri* and *zerafica* in illustrations of the *ebneri* thorax and in a ♀ key using the labrum: *zerafica* with a metallic blue labrum edged with yellow, *ebneri* pale brown. Yet mature *ebneri* has a purple labrum whilst its teneral colour is brown. The type ♂ *ebneri* has a purple labrum.

I have examined examples of both sexes from the same locality, as indicated below, which respectively show the prothoracic (and genitalial) characters of the types.

For these reasons I repeat the synonymy is correct although there is some variation as the descriptions will show. The species *zerafica* is, in fact, very widespread.

MALES

The holotype ♂ *ebneri* is in fairly good condition except that the head is fractured, the only legs remaining are the left meso- and metathoracics and the apices of both forewings are broken. It bears three white labels, Karshawal, 2.IV/Aegypt. Sudan Ebner, 1914/*Agriocnemis ebneri* Ris ♂, det. Ris [almost certainly in Ris' handwriting]; also a red tag without inscription.

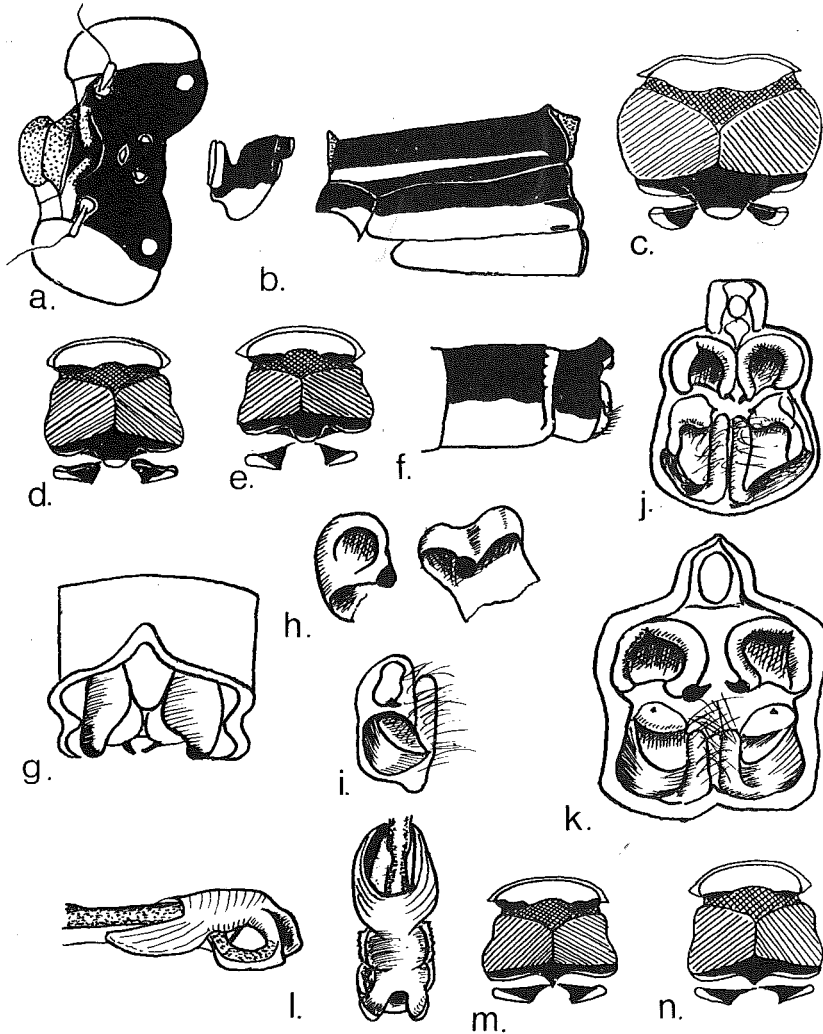
I have now added a red holotype label with the specific name on it.

S. SUDAN

Holotype ♂: labium creamy white, orbits ventrally pale green; labrum purple (but obscured

with adhesive), postclypeus glossy black. Frons and vertex black with some white pruinosity and small isolated pale green postocular spots (only the right one remains, on the damaged head).

Prothorax and synthorax marked exactly like the Laropi ♂ described below but with some white pruinosity on both. Hindlobe tripartite, with flat median lobe having a green apex. Femora with black posterior stripe.



18. *A. zerafica*
 a-b. ♂ (Laropi), head, thorax; c-e. ♂ prothoracic diagram (holotype of *ebneri*, Laropi, Bengo R., respectively); f. terminal segments (Laropi); g-k. anal appendages of ♂, ventrally (Laropi), left superior from posterior and inner aspects (Bengo R.), left inferior (Bangui), posterior view juvenile ♂ (Takoradi), posterior view mature ♂ (Laropi); l. prophallus (Laropi); m-n. ♀ prothoracic and lamellar diagram (Laropi and Catete swamp).

Pterostigma in hindwing (lost in forewings) narrow, very pale yellow with brown centre (like all the pterostigmata of the Laropi ♂). Forewing with 6 Px.

Abdomen with continuous black band on all segments, the sides pale green (as in Laropi ♂). Segment 10 also produced to a semicircular extension. Anal appendages identical with Laropi ♂. Prophallus not dissected.

Abdomen 16 mm, hindwing 9,5 mm.

Schmidt's ♂ from Portuguese Guinea is almost the same size.

N. UGANDA

Laropi is near the Sudan border, the territory of types *zerafica* and *ebneri*.

Mature ♂ (Laropi): labium whitish ochreous but pale bluish green anteriorly, the orbits below blue-green. Labrum purple. Genae, front of orbits and anteclypeus pale green; postclypeus glossy purplish black. Vertex and frons black, with very small isolated green postocular spots; a green line at back of occiput.

Prothorax black, pale green on collar and laterally; hindlobe tripartite, with small depressed black hemispherical central lobe, yellow on posterior edge,; wide but short lateral lobes, partly edged yellow. A reduced inferior lip. Mesostigmal lamina green postlaterally, slightly raised, and a narrow anterior ridge. Synthorax black down to first lateral suture, slightly below this at dorsal end; a dorsal bar on second lateral suture. Pale green antehumeral stripes, slightly wider ventrally. Sides pale green with trace of white pruinosity. Femora broadly black postlaterally, with some white pruinosity; tibiae with fine brown inner line.

Venation pale brown. Pterostigma long, pale brownish yellow in all wings; narrower in hindwing and shorter on distal edge. Forewing with 6 Px.

Abdomen with bronze-black to black band on all segments, widening distally; with white dorsal pruinosity on basal segments; laterally pale green. Segment 10 strongly raised post-dorsally and produced to a curled hooded structure (like *inversa*). Anal appendages ferruginous, compacted into segment 10 and not easily examined. Superior appendage circular, depressed posteriorly, with an inner ventral tooth. Inferior appendage with broad curled base and a dorsal lobe having a small tooth. Flagella of prophallus broad, tapering apically, wide apart at base; the head with serrated lateral extensions.

Abdomen 16,5 mm, hindwing 10 mm.

CAMEROONS

A very mature ♂ (Douala): differs from the Laropi ♂ in its smaller size, abdomen 14 mm, hindwing 9 mm. Genae and front of orbits olive; frons all white pruinose; isolated small green postocular spots and the line at back of occiput still clear. Pro- and synthorax similar, coated with white pruinosity. Femora with pruinosity. Wings and pterostigma similar. Abdomen with basal pruinosity. Other males are similar. A teneral ♂ has no leg markings; pterostigmata paler. Abdomen with dorsal band on segments 1-7; 8-10 unmarked, pale orange-red.

SENEGAL

♂ from Niokolo-Kola is similar.

GHANA

Juvenile ♂ (Takoradi): genae and front of orbits olive; labrum and postclypeus purple; frons with pale green lateral bars (where the teneral might have a broken pale frontal band). Prothoracic hindlobe with shorter middle section. Femora with black posterior stripe. Segment 9 red, black at base, an almost separate distal black annulus, the distal end red; segment 10 unmarked. Anal appendages creamy brown. Hindwing 9,5 mm. Another juvenile has labrum and postclypeus also purple; genae and orbits pale yellowish green, frontal band present, green, widely broken. End segments of abdomen lost. Mature ♂ has no frontal bars.

C.A.R.

Mature ♂ (Bangui): Labrum and postclypeus purple; frons white pruinose. Prothoracic hindlobe with middle short lobe, the yellow zone covered with pruinosity. Antehumeral stripes, sides of thorax and femora coated with white pruinosity. Abdomen with black band on all segments and blue-green laterally on all of them. By contrast the anal appendages are bright orange. Superior appendage with broad teeth. Other males are more pruinose on frons, pro- and synthorax and base of abdomen.

ANGOLA

♂ (Bengo R.): No frontal band. Labrum and postclypeus purple. Prothoracic hindlobe with rather shorter middle lobe. Abdomen with bronze band on segments 1-6; not quite reaching distal end of segment 7; 8-10 unmarked. Tooth on superior appendage slightly broader than in others. Abdomen 17 mm, hindwing 9,5 mm. A ♂ from Catete swamp is similar but with white lateral pruinosity on the thorax. A very teneral Catete swamp ♂ has the thorax brown to a little below humeral suture and dorsally below this to below first lateral suture; a brown dorsal band on abdomen developed.

The males from different regions may show some variation in the hindlobe of the prothorax and in the size of the tooth on the superior appendage. In Sudan and Laropi (Uganda) the middle lobe of the prothorax is longer and narrower than in those from Senegal, Cameroon, Bangui and Angola; it is short and wide in Ghana specimens. The tooth on the superior appendage is an inturned hook in Laropi, Cameroon and Ghana; broad, turned rather more anteriorly in Angola and Bangui. Whether these constitute races is difficult to say from available material.

FEMALES

SUDAN

The type ♀ *zerafica* (S. Sudan) which I examined in 1964 is very teneral: labrum purple, edged with yellow; rest of face yellow. Vertex and base of frons brown, with very large postocular spots, linked at back of occiput. Thorax yellowish brown. Prothoracic hindlobe produced posteriorly in a V. Synthorax with brown mid-dorsal band, reaching the broad yellow antehumeral stripes; sides of thorax yellow. Abdomen yellow. Segments 2-5 with narrow brown mid-dorsal line. Abdomen 18 mm, hindwing 11,5 mm.

The original description, on translation, gives further details:— labium yellowish; labrum metallic blue with fine yellow edge; epistome yellowish, with some brown on

anterior border. Frons with narrow brown band on anterior edge, a yellow transverse frontal band. Vertex blackish brown with large connected postocular spots.

Prothorax yellow, with some brown markings. Hindlobe tripartite; middle section a small posteriorly directed triangular fork; side-lobes broader, very slightly rounded. Synthorax yellow with broad black median band reaching halfway to humeral suture. Legs yellow, Femora and tibiae with brown posterior stripe.

Pterostigma brownish yellow, with fine paler edge.

Abdomen yellow. Segments 1-6 with narrow brown distal annuli; 2-5 with narrow brown (dorsal) line not reaching distal ends; segment 6 with broader band; 7-10 brown dorsally. Segment 10 posteriorly straight (not raised). Cerci about two-thirds of segment 10, short, triangular, yellowish brown.

N. UGANDA

♀ (Laropi): labrum purple; genae and front of orbits pale yellowish green; postclypeus green with a broad dark brown pattern; frons with broken pale green band; frons and vertex black; vertex with largish pale green postocular spots narrowly linked at back of occiput.

Prothorax as in ♂ but hindlobe tripartite with a short central black V. Mesostigmal lamina with long narrow green posterior carina. Synthoracic black reaching only halfway across mesepimeron; a dorsal triangle on first lateral suture, a fine dorsal dash on second suture. Antehumeral stripe slightly wider than in ♂. Sides pale green. Femora with moderately broad black posterior stripe.

Pterostigma as in ♂. Forewing with 7 Px.

Abdomen with black dorsal band on segments 1-2, green laterally (the remaining segments lost). Hindwing 10,5 mm.

Schmidt describes the prothoracic hindlobe of a Guinea example as having "einem feinen Spitzchen" in the middle. Abdomen 15 mm, hindwing 10,5 mm. With its pale brown labrum it was evidently teneral.

GHANA

Juvenile ♀ (Takoradi): labrum purple with greenish yellow distal margin; genae and front of orbits pale yellowish green; postclypeus brown, tinged with greenish yellow. Thick green lateral bars on frons. Synthorax black down to the broad green antehumeral stripe, then brown nearly to first lateral suture. Dorsal band on abdomen bronze brown.

In a teneral ♀ (Munqua, Accra) the labrum is very pale brown with yellow edge; face, all the frons and the large, connected postocular spots yellowish orange; vertex brown, narrowed to the eyes across the orbits. Prothorax brown centrally. Synthorax only brown down to the antehumeral stripes, below these all yellowish. Legs unmarked. Pterostigma whitish yellow. Abdomen pale yellow on segments 1-6; 7-10 with brown dorsal band. Another teneral ♀ is similar on the abdomen but the labrum, face and postocular spots are whitish yellow.

CAMEROON

A largish mature ♀ (Douala) has the labium and orbits below creamy white; postclypeus

glossy deep brown. Head and thorax, including the prothoracic hindlobe as in the Laropi ♀. Abdomen with black dorsal band on all segments, very broad on 8-10; sides pale blue-green. Segment 10 raised distally. Cerci short, conical. Abdomen 18 mm, hindwing 12 mm. C.A.R.

♀ (Bangui), with frontal band only narrowly severed. Synthorax black down to antehumeral stripe, then brown down to humeral suture and halfway down to the first lateral suture. Brown dorsal spots on both lateral sutures. Abdomen with black dorsal band on all segments. Cerci black.

ANGOLA

Mature ♀ (Catete swamp): labrum purple with cream edge; postclypeus greenish yellow with brown markings. A broken green frontal band. Synthoracic black reaching down almost to first lateral suture and attaining this at the dorsal end. Abdomen dorsally black on all segments; segment 10 raised posteriorly. Abdomen 19 mm, hindwing 11,5 mm. Other Catete ♀ have the frontal band exhibiting a rather narrow gap. Abdomen 16 mm, hindwing 9,5 mm.

A teneral ♀ has the labrum bronze with cream edge; genae yellow; postclypeus pale glossy brown; frontal band orange, almost severed medially. Postocular spots very large, orange. Prothorax orange with brown mid-dorsal band. On synthorax the bronze colour reaches down to the antehumeral stripe which is expanded to the humeral suture. A dorsal brown dash on humeral suture. Legs unmarked. Segments 1-5 pink; segment 6 yellow with brown distal traces; 7-10 with bronze-brown dorsal band, nearly complete on segment 7, but not reaching distal ends on 8-10.

Thus there is not only some variation in markings but also in the prothoracic hindlobe whose middle lobe is slightly shorter in specimens from Senegal, Cameroon, Central African Republic and Angola, than in the more northerly types of the Southern Sudan or examples from N. Uganda; and this lobe is wider and shorter in the Ghana specimens.

The slight prothoracic variation in both sexes may indicate subspecific taxa but it would not seem advisable to separate these without more examples from different regions.

MATERIAL EXAMINED

- S. Sudan: Type ♀ *zerafica*, Bahr-el-Zeraf, 15 March, 1913 (H. Freiherr von Geyer & O. Le Roi)
 Holotype ♂ *ebneri*, Karshawal, Bahr-el-Abiad, 2 April, 1914 (Ebner).
- Senegal: Park National Niokolo-Kola, Sept., 1955
- Cameroon: Douala, March, 1958 (E. Pinhey)
- Ghana: Takoradi, 14 Sept., 1955 (R. M. Gambles); Munqua, Accra, Jan., 1959
- N. Uganda: Laropi, West Nile, May, 1954 (T. H. E. Jackson)
- C.A.R.: Bangui, 18, 19 Sept., 1968 (R. Pujol)
- Angola: Catete Swamp, East of Luanda, 3 Oct. 1964 (E. Pinhey); Bengo R., North of Luanda, 5 Oct., 1964 (E. Pinhey)
- Previously identified (Paris Museum): Sangalkam, Dakar, Senegal, Aug. 1967 (det. Pinhey, July, 1970); Kayar, Senegal, 7 Oct., 1971 (det. Pinhey 1970).

Distribution. S. Sudan, Senegal, Portuguese Guinea (Schmidt), Ivory Coast, Ghana, Cameroon, N. Nigeria, N. Uganda, Central African Republic and Angola.

***Agriocnemis angolensis* Longfield (fig. 19)**

Longfield, 1945, *Archos Mus. Bocage* 16 : 15, figs (*angolense*)

The type series, consisting of numerous specimens of both sexes, came from Sangévé, Kuandu and Kalukembé, S. Angola, 1933, collected by Dr. Albert Monard. Holotype and allotype from Sangévé are in the British Mus. (Nat. Hist.); paratypes in Musée Chaux de Fonds. Of the paratype localities Kalukembé is not far from where the Caprivi specimens were collected, as described below. In life the pale markings on face and head are said to be cream and sky blue, the antehumeral stripe and the sides of the abdomen sky blue.

S.W.A.

MALE

Teneral ♂ (Andara, Caprivi Strip): labium and orbits below whitish ochreous. Labrum pale brownish yellow; genae, anteclypeus and a complete frontal band from eye to eye whitish ochreous; postclypeus dark brown. Frons and vertex bronze-black with large pale blue postocular spots linked across back of occiput.

Prothorax blackish brown with white collar, sides pale ochraceous; hindlobe tripartite, central portion large, semicircular, depressed, brown, with raised cream posterior border; lateral portions narrow, pale and rounded. Mesostigmal lamina with sloped posterior ridge. Synthorax black down to first lateral suture and narrowly below this at dorsal end; with complete narrow antehumeral stripe; sides yellow, with small dorsal black dot on second lateral suture. Femora unmarked. Venation pale brown. Pterostigma pale ochreous. As noted in the introduction the pterostigma of the hindwing of the ♂ has the marginal edge widened into a pale blue-green hollow (fig. 19f). This is unknown in other African species. Forewing with 7 Px.

Abdomen with bronze-black dorsal band on segments 1-6, showing a purple sheen on some segments and with basal yellow annuli; sides yellow. Segments 7-10 red, 7 with black dorsal band and basal pale annulus, the band tapering distally; segments 8-10 unmarked. Segment 10 not raised apically. Superior appendage with long horizontal spatulate red upper nearly twice as long as segment 10, this branch fixed to a basal down-turned lower branch ending in a dentate ridge directed inwards into the segment. The upper branch is not flat but hollowed out ventrally and it has a small sub-basal tooth. Inferior appendage yellow, short, convolute, with a double apex, the lower one with a small contact point. Prophallus with broad short flagella.

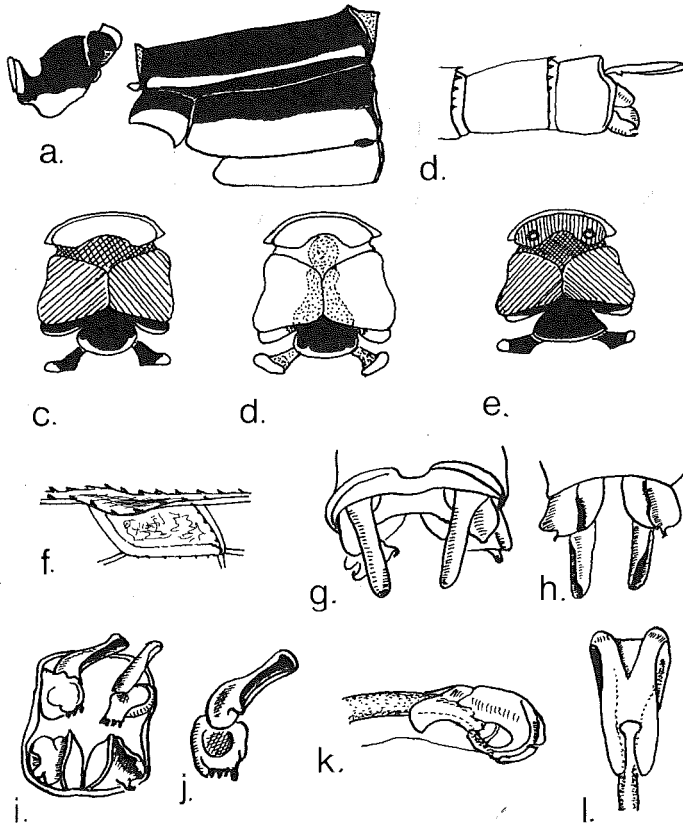
Abdomen 16,5 mm, hindwing 9,5 mm.

ANGOLA

In the mature Angola ♂ (Longfield) the labrum was described as pale blue with a black centre; postclypeus black; frons (evidently) with widely severed blue frontal band. Prothorax black with two blue spots on the collar and blue laterally; synthorax black to first

lateral suture, with narrow blue antehumeral stripe; pale blue laterally with small dorsal spot on second lateral suture. Femora with black exterior stripe. Pterostigma sandy (yellow-brown). Abdomen with black band on segments 1-7, pale blue laterally; segments 8-10 and anal appendages orange-red, 8 mainly black dorsally a narrow fascia on 9. Abdomen 16,5 mm, hindwing 10 mm.

This description of the mature ♂ differs from the teneral *Andara* ♂ in the black-centred labrum and the broken frontal band and prothoracic collar. The abdominal markings are not very different.



19. *A. angolensis*
 a-d, f-l. *angolensis angolensis* (Andara), e. *angolensis spatulae* holotype ♂ prothoracic diagram and lamellae. a-d. thorax, terminal segments and prothorax of ♂, prothorax of ♀; f. pterostigma of left hindwing; g-j. anal appendages, dorsally, ventrally, posteriorly and the left superior from inner aspect; k-l. prophallus.

S.W.A.

Another teneral ♂ (*Andara*) has a dark brown central shadow on the labrum which might be the precursor of the black centre of the mature labrum; the frontal band is severed medially; postocular spots large, pale blue. Thorax and abdomen similar.

FEMALES

Teneral ♀ (Andara): labium and orbits below whitish ochreous. Labrum, postclypeus and a broad frontal band from eye to eye orange; genae and anteclypeus yellow. Vertex bronze-black with very large orange postocular spots linked on occiput.

Prothorax and its collar orange, sides yellow, with black mid-dorsal band. Hindlobe very similar to male. Mesostigmal lamina with thick posterior border. Synthorax black only to the broad orange antehumeral stripe which reaches the humeral suture; sides orange to yellow without black humeral or other markings. Femora unmarked.

Wings as in ♂. Forewing with 8 Px.

Abdomen orange-red on segments 1-6, with faint distal brown fasciae on 5-6; segments 7-9 and base of 10 with broad bronze black band. Cerci conical, orange.

Abdomen 17 mm, hindwing 10,5 mm.

Longfield mentions that an allotype ♀ is homochromatic, with colour and patterns as in the ♂; and a heterochromatic allotype ♀: mostly orange-red, the labium pale blue, rear of head, lower part of thorax pale blue; labrum with black central spot; (post-)clypeus edged with black. Vertex black between the broad frontal band and the postocular spots. Pro- and synthorax with mid-dorsal black stripe. Segments 2-7 red with black annuli at the joints; 6-9 black dorsally, a small patch on segment 10. Abdomen 17 mm, hindwing 11,5 mm.

It seems probable that this polychroism is again only developmental and the heterochroic ♀ is only a juvenile but darker (older) than the teneral ♀ from Andara. At a later stage this ♀ would have become an andromorphous, homochroic individual. More material would be required to prove this but if it is verified then the heterochromatic allotype is no longer required (apart from the invalidity of allotypes by Rule).

MATERIAL EXAMINED

South West Africa, Caprivi Strip: Andara, Okavango R., 3 Nov., 1960 (B. I. Balinsky)

Distribution. S. Angola; Caprivi Strip.

Agriocnemis angolensis spatulae subsp. nov.

A single smaller ♂ from N. W. Zambia represents a new subspecies.

ZAMBIA

Holotype mature ♂ (Ikelenge): labrum blackish brown with a black centro-basal mark. Postclypeus, frons, vertex all black, with isolated green postocular spots.

Prothorax black with two small lateral green dots. Hindlobe typical; mesostigmal lamina with lower ridge. Synthorax bronze-black to first lateral suture, with narrow pale green antehumeral stripe; with black dorsal spot on second lateral suture. Femora with thick postlateral stripes.

Venation and pterostigma pale brown. Forewing with 7 Px. The anterior edge of the hindwing pterostigma is less widened.

Abdomen with bronze-black dorsal band on segments 1-7, narrowing on 7 and continuing

narrowly on basal half of 8; sides at base green, at end segments red above and laterally. Anal appendages typical but the superior appendage thicker and shorter.

Abdomen 14 mm, hindwing 8 mm.

The differences in the superior appendage from typical *angolensis* can be measured by micrometer scales and tabulated (table 4):—

Sup. App. (upper branch)	Andara ♂ <i>angolensis</i>	Ikelenge ♂ <i>spatulae</i>	Ratio Zambia /Andara
Length	18,5 units	13,5 units	0,75
width in middle	3,5	5,5	1,4

Despite the discrepancy in size the Zambian example being the smaller, these ratios are significant, since the superior appendage in this new subspecies is three quarters as long and nearly one and a half times as thick. In abdominal and wing lengths the difference is also noticeable; also the lower ridge of the mesostigmal lamina and the darker labrum. Less modification in the hindwing pterostigma.

Holotype ♂ in the National Museum, Bulawayo.

MATERIAL EXAMINED

N. W. Zambia: Ikelenge swamp, N. Mwinilunga, 24 Jan., 1965 (E. Pinhey)

Distribution. Only known from N. W. Zambia.

Agriocnemis palaeforma Pinhey (fig. 20)

Pinhey, 1959, *J. ent. Soc. sth. Afr.* 22(2) : 465, figs

A single teneral holotype ♂ reared by Dr. Phillip Corbet from material collected in a grassy swamp on a stream near Jinja in Uganda, 18th May, 1955. The adult emerged two weeks later and was preserved in formalin. This type is in the British Museum (Nat. Hist.). Although teneral the anal appendages were so remarkable that there was no doubt that it was quite distinct from all other known African species. The description and figures are extracted from the original paper, with additional information on the orbits, prothoracic hindlobe and prophallus supplied by Peter Ward.

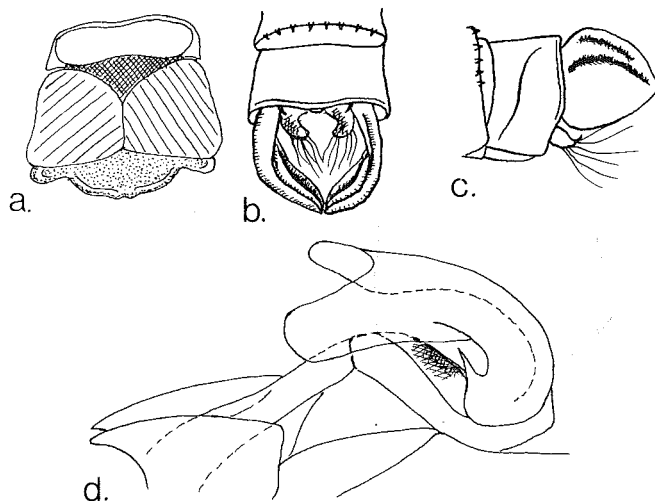
UGANDA

Holotype ♂, teneral (Nyenga): labium and orbits below creamy-white; labrum, post-clypeus, frons and vertex black; genae pale ochreous. Occiput and the isolated postocular spots pale blue.

Prothorax dark ferruginous, pale blue on collar and sublaterally; hindlobe tripartite, each part rounded, the middle portion the broadest; the hindlobe evidently raised somewhat but the teneral condition (teste Ward) makes it difficult to depict. Synthorax black

almost to first lateral suture, slightly below this at dorsal end; complete narrow pale blue antehumeral stripes; metepisternum pale blue, metepimeron and sternites yellow; a black dorsal dot on second lateral suture. Femora unmarked.

Pterostigma pale yellowish brown. Forewing with 6 Px.



20. *A. palaeforma* (holotype ♂)
a-c. prothoracic diagram, anal appendages dorsally and from left; d. prophallus in situ (ex design. P. Ward).

Segments 1-6 with black dorsal band, restricted at both ends of each segment; segments 7-10 red above, 7 with black basal suffusion. Anal appendages yellow. Superior appendage cordate (paddle-shaped) in lateral aspect, very large, incurved apically; with a ridge on the inner surface; a small black dorso-basal tooth. Inferior appendage very small, with black apical hook. Prophallus with short, broad, obtuse flagella.

Abdomen 20 mm, hindwing 11.5 mm.

Female not yet recorded.

The broad cordate superior appendage, with its small basal tooth, and the relatively small inferior appendage, indicate that this species is approaching the condition found in the *forcipata* group yet still distinct from that group by the armed inferior appendage, the black labrum and the lack of black on the underside of the orbits. The tandem grip must presumably be forcipate.

MATERIAL PREVIOUSLY EXAMINED

Uganda: holotype ♂, Nyenga, near Jinja, 13 May, 1955 (P. Corbet)

Distribution. Only known from S. Uganda.

Agriocnemis victoria Fraser (fig. 21)

Fraser, 1928, *Trans. ent. Soc. Lond.* (1928) : 123, fig.

Both sexes were described from Lake Victoria, Uganda. Holotype and allotype in the British Museum (Nat. Hist.). Since its description this taxon has been variously considered as a distinct species or as a dwarf variety of *forcipata*. It will be shown here that although very similar in prothoracic structure and in the peculiarly forcipate superior anal appendages of the ♂, sibling species in fact, they are in reality two separate species, despite my earlier estimation (Pinhey, 1966 : 20). The differences will be given below.

MALES

UGANDA

Lectotype ♂ (lectot. teste Kimmins): labium creamy-white, orbits below mainly black; labrum glossy black. Genae yellow. Postclypeus, frons and vertex black. Small isolated blue postocular spots.

Prothorax black, blue sub-laterally. Hindlobe tripartite, with sinuous margin, the inferior lip well developed; lateral lobes blue at the outer angles. Synthorax black to first lateral suture and below this at dorsal end; a fine blue antehumeral stripe; sides pale green with broad black stripe on second lateral suture. Femora broadly black, with some white pruinosity.

Pterostigma brownish yellow between dark brown veins. Forewing with 7-8 Px.

Abdomen with black dorsal band on segments 1-7. Sides at base pale bluish green, following segments yellow; segments 8-10 red. Superior anal appendages long and forcipate, the inferior appendages very short. These are described below.

Abdomen 14.5 mm, hindwing 11 mm.

This type ♂, which I examined in 1964, was collected on the shore of Lake Victoria, Uganda, July-Sept. 1927 (G. D. Hale Carpenter). Fraser's original description included an andromorphic ♀ (i.e. an adult) and a heteromorphic ♀ (juvenile). Fraser aligned the species to the Oriental species *A. splendidissima* Laidlaw, which however, has very robust, much straighter superior appendages and more strongly developed inferior ones.

A mature ♂ from Ddewe Forest has the antehumeral stripe very fine at ventral end, obsolete dorsally.

Abdomen with black dorsal band on segments 1-8 but none on 9-10.

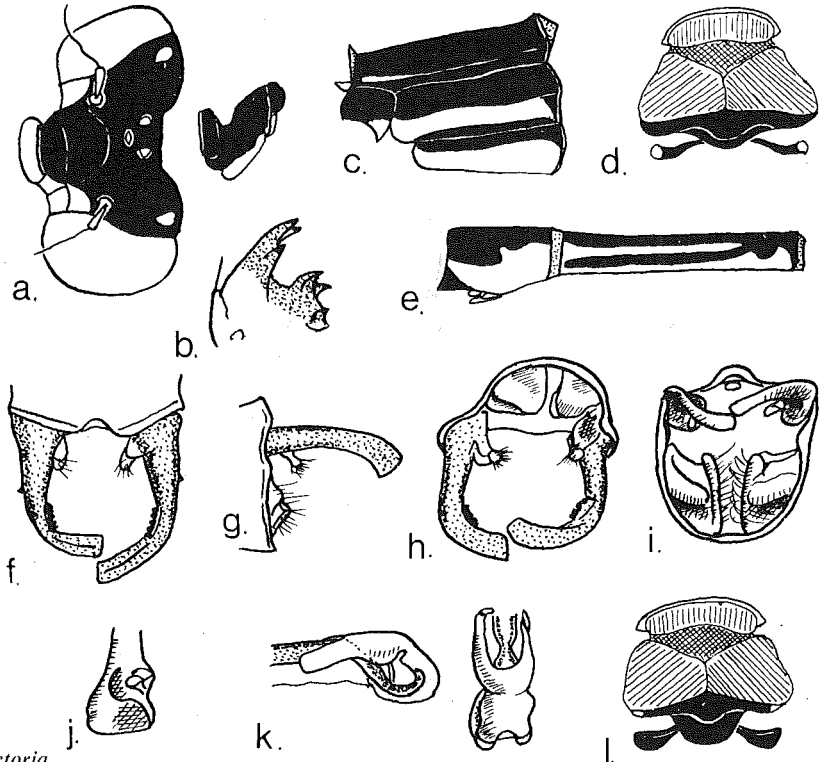
ZAMBIA

Mature ♂ (Mporokoso): labium whitish ochreous, orbits below black with a yellow line against the eyes. Labrum pale green, with a fine black basal line; anteclypeus and genae pale green; postclypeus, frons and vertex black, with very small, isolated pale blue postocular spots; back of occiput black.

Prothorax all black, except greenish yellow postventro-laterally. Hindlobe tripartite, the middle section rounded, overlapped by the short lateral sections, very like *forcipata* but all black and this middle section is wider than the laterals. Below the middle section there is an inferior lip. Mesostigmal lamina with post lateral ridge partly yellow. Synthorax black down to first lateral suture, and below this at dorsal end; with very narrow green antehumeral stripe slightly severed before dorsal end; a broad continuous black band on second lateral suture. Femora broadly black posteriorly and laterally; tibiae black on

extensor surface, especially the foretibia; tarsi yellow-ochreous, partly black. There is thin white pruinosity on the legs.

Venation brown. Pterostigma yellowish brown with some darker central suffusion. Forewing with 7 Px (less than in *forcipata* which is larger).



21. *A. victoria*
 a. head of ♂ (Mporokoso); b. left mandible of ♂ (Bambesia); c-d. thorax of ♂ (Mporokoso); e. segments 2-3 of mature ♂ (Mwinilunga); f-j. anal appendages of ♂ (Mporokoso), dorsally, from left, ventrally, posteriorly, base of left superior from inner aspect, all respectively; k. prothallus (Mwinilunga); l. ♀ prothorax and laminae (Sepopa).

Abdomen black dorsally on segments 1-8, pale green to yellowish green laterally; segments 8-10 red, 8 brown on basal half; segment 10 well raised apically. Superior appendage brown, much longer than segment 10, horizontal but incurved, with blacker, flatter apical region ending in a straight (square) apex; on the inner side of the shaft there is a short ridge bearing black denticles (in *forcipata* there is no short ridge, the denticles being in a continuous but sinuous row right to the apex of the appendage); the shaft has a small sub-basal inner tooth with a wider base than in *forcipata*. Prothallus with broad incurled flagella tapering at the apex.

Abdomen 15.8 mm, hindwing 10 mm (*forcipata* is larger by a third or more).

Another mature ♂ from Mporokoso is similar, with some pruinosity on sides of thorax and on the legs; segments 8-10 all red except basal black traces on 8 and 10. A teneral ♂ (Mwinilunga); labrum pale green with black basal line; no frontal band. Frons and vertex

all black (in juvenile or teneral *forcipata* there is a red line on back of occiput) except the isolated green postocular spots. Antehumeral stripe very narrow, linear dorsally, continuous, slightly thicker ventrally. Prothoracic hindlobe all black. Legs yellow-ochreous with browner markings than in adult. A complete dorsal band on segments 1-6, basally on 7 then tapering to a line; segments 8-10 unmarked. Superior appendage pale brown, orange near base. A still more teneral ♂ has the black markings developed on head and thorax, on fore-femur and fore-tibia (not on the other legs) and on segments 1 to base of 7. A mature ♂ is pruinose on thorax and legs; the antehumeral stripe very slender but still complete; segments 9-10 red, unmarked with black. Another, very mature ♂ is pruinose on sides of thorax and on legs but still has postocular spots; the antehumeral stripe is pruinosed. The abdominal black extends from segment 1 to basal half of 9 and diffusely along 10. Laterally these adults have a green stripe more or less framed in black, usually just a simple stripe (in *forcipata* there is more often a green stripe and a distal spot on most segments). Another very mature ♂ is peculiar in having the labrum brown with a yellow border (like the ♀); postocular spots clear; much pruinosity on thorax, legs and base of abdomen; segments 1-8 with black band and lateral green stripe; yet another is dorsally black on all segments. Before pruinosity takes a hold the antehumeral stripe may become obsolescent at its dorsal end. A ♂ from Mkushi River has the labrum green with a yellow border and black basal line; the head, thorax, legs and base of abdomen dusted with white pruinosity. Segments 1 to two thirds of 5 with black dorsal band.

NIGERIA

Moderately mature ♂ (Vom): postocular spots present but no frontal band; antehumeral stripe more developed. Abdomen with black dorsal band on segments 1-8, with a green lateral stripe as well as a distal spot on segments 3-6 (as in *forcipata*).

S. LEONE

Mature ♂ (Farangbaia): postocular spots, prothorax, antehumeral stripe and legs pruinosed. Abdomen with green lateral stripe, with or without distal spots on segments 3-6.

CAMEROONS

Very mature ♂ (Mbalmayo): pruinose on postocular spots, on the entire thorax except the mid-dorsal band, on legs and base of abdomen. Abdomen with dorsal band on segments 1 to basal four fifths of 9 and a basal band on segment 10; laterally with green stripe but the distal spot minute or absent. Another is pruinose on all segments.

C.A.R.

Teneral ♂ (Bouala): dorsal band developed on segments 1 to two thirds of 7 but faintly except on segments 1-2 and distal ends of 3-5, fairly strongly on 6-7; segment 10 with basal transverse line.

ZAIRE

Mature ♂ (Bambesia): normal.

BOTSWANA

Mature ♂ (Sepopa): non-pruinose; no frontal band; postocular spots clear, but only traces of a fine antehumeral stripe; segments 1 to two thirds of 9 and basal half of 10

with black band. In a nearly mature *Sepopa* ♂ the prothoracic collar is all black, the antehumeral stripes very narrow; the abdominal black is on segments 1-7, continuing on 8 but more restricted distally, then on basal half of 9 and yet a complete narrow band on 10. In a juvenile the band is complete on segments 1-8 and bases of 9 and 10.

A juvenile ♂ (Khwaai) has the antehumeral stripe developed only at ventral end; a black band on segments 1-7 and bases of 8 and 9. Another juvenile also has the antehumeral on ventral half only; the band on segments 1-8 and a trace on 9.

The ♂ is thus a very dark insect well before maturity when it becomes darker still. Yet the labrum does not become more than partly black. Orbits black below. There is no frontal band at any stage; the postocular spots may vanish at maturity or re-appear pruinose; the prothoracic collar is always black; the antehumeral stripes always slender, often more or less obsolete at maturity or replaced by pruinosity; there is, as in *forcipata* a broad black band on the second lateral suture. The pterostigma like the labrum, is one feature that does not darken appreciably. The abdominal dorsal black is always present on most segments and may continue to the end at maturity. The forcipate appendages are, like *forcipata*, very distinctive, unlike other African Coenagrionidae.

FEMALES

SUDAN

Paratype ♀ in Museum Koenig: Very teneral but the labrum is characteristically brown with a yellow border.

CAMEROONS

Mature ♀ (Mbalmayo): pruinose. Labium whitish ochreous; orbits below black; white along the eyes. Labrum deep brown with a yellow border; anteclypeus brown, genae greenish yellow; postclypeus glossy black; frons and vertex black, slightly pruinose; no postocular spots or frontal band.

Prothorax black with white pruinosity on collar and post-laterally. Hindlobe more developed than in *forcipata*, the central scoop almost rectangular, all black; lateral portions very narrow and short, yellow at lateral angles. Mesostigmal lamina with posterior ridge angled at each end. Synthorax broadly black to first lateral suture; with wider blue-green antehumeral stripe; broad black band on second lateral suture. Legs as in ♂.

Venation similar to ♂. Pterostigma brown. Forewing with 8 Px (occasionally 9 in other examples).

Abdomen with broad black band on all segments; laterally with a green stripe and distal spot more or less developed (more than in ♂). Segment 10 raised apically. Cerci slender, conical.

Abdomen 16 mm, hindwing 12 mm.

ZAMBIA

Nearly mature ♀ (Mwinilunga): non-pruinose. Postocular spots large; vertex with red occipital line (as in *forcipata* ♀ and juvenile ♂); antehumeral stripe well developed; tibiae unmarked with black. Band on second lateral suture not as wide as in ♂. Abdomen with dorsal band on all segments; the green lateral stripe starting to develop its frames. Juveniles

of this sex have a pale prothoracic collar; postocular spots linked at back of occiput; traces of a brown dorsal band on the abdomen. Teneral ♀ (like *forcipata*) has no abdominal dark markings. In mature ♀ the abdominal band on segments 9-10 may be narrow or broad. In immatures, the tenerals have no abdominal black, but in juveniles it often starts on the distal segments; very early on 10, or on 9-10; yet in others 8-10 and most of segment 7 remain all red whilst the band is developed on all the others (1-6).

Thus there is developmental dichroism in the ♀ *victoria*, the juveniles being black only on the terminal segments or from the other end on 1-6 black. In the next stage all the segments have a dark band, either brown on 1-7 and black on 8-10 or vice versa. At maturity the black on 10, however, may be only narrow, sometimes broad. At maturity the antehumeral stripe may be well developed in the ♀ or obsolescent.

In another Mwinilunga example there is pruinosity on postocular spots, thorax, legs and base of abdomen, but the abdominal black is not complete; continuous on 1 to four fifths of 7, with a mid-dorsal line on basal half of segment 8, no marking on 9-10. Juveniles from Ndola and Mporokoso resemble those from Mwinilunga. A mature ♀ (Luwingu): no postocular spots, no antehumeral stripes; abdominal band complete, with lateral green stripe still developing.

ANGOLA

Late juvenile ♀ (Caianda): postocular spots and antehumeral stripe well developed; complete band on abdomen. In a more juvenile ♀ there is no black on segments 8-9.

BOTSWANA

Nearly mature ♀ (Sepopa): postocular spots present, prothoracic collar all black, antehumeral stripe very narrow; segments 1-7 with black band, continued but constricted distally on 8 and on basal half of segment 9, and a complete narrow band on 10. Others may be similar or slight variants, with the antehumeral stripe more or less developed, the black on segments 9-10 more or less developed, or only on basal third of 9, none on 10. Later, the postocular spots and antehumeral stripes disappear but either or both may reappear as white pruinosed fasciae. At maturity the abdomen is usually black on all segments.

This species is smaller than *forcipata*. The ♂ never has a red occipital line nor any frontal stripe; the antehumeral stripe is always narrow and may even be partly obsolete in the juvenile condition. The prothorax has a dark collar, all stages (at most only with pale spots) in the ♂ and the hindlobe is blacker and the scoop wider than in *forcipata*. The legs are yellower. There is a complete abdominal band at maturity and even the teneral ♂ has black on at least segments 1-6. The lateral green stripe on the abdomen less often has a separate distal spot than in *forcipata*. The superior appendage differs chiefly in having a short inner denticulate ridge before the apical portion.

The ♀, as usual, is more complex. In the juvenile state there may be a pale prothoracic collar, but again no frontal stripe at any stage. The antehumeral stripe is usually more developed than in the male but may be equally narrow and obsolescent. The abdomen is usually black dorsally on all segments at maturity. In the teneral condition there is no abdominal pattern but, as shown above, the juveniles undergo two different processes of

melanism, from different ends of the abdomen: developmental polychroism, rather than dichroism. Yet occasionally at maturity the end segments may lack the black so that in this species the ♀ may genuinely have a heterochroic form.

MATERIAL EXAMINED

- Sierra Leone: Farangbaia, 1955
 N. Nigeria: Vom, 17 Apr., 1956 (R. M. Gambles)
 Cameroons: Mbalmayo, 1970 (R. A. Mbarga)
 Centr. Afr.
 Rep.: Bouala, Febr., 1958 (E. Pinhey)
 S. Uganda: Ddewe forest, Kampala, June, 1949 (E. Pinhey)
 N. Zaire: Bambesia, 7 March, 1938
 E. Angola: Lutchigena R., Caianda, 4-10 May, 1963 (E. Pinhey)
 N.W. Zambia: Sakeji R. and Ikelenge swamps, N. Mwinilunga, Febr., 1960, March, 1960, May, 1961, Febr., 1963, May, 1963, 20, 24, 25 Apr., 1963, Jan., 1965, Febr., 1965, 13 Apr., 1972 (E. Pinhey); Zambezi Rapids, Ikelenge, 1 May, 1972 (E. Pinhey and F. de Moor); Ikelenge, Dec., 1961, Oct., 1963; Kama-pande, 27 Jan., 1965 (E. Pinhey)
- North
 Zambia: Ndola, Febr., 1960 (E. Pinhey); Mporokoso, 16 Apr., 1967 (R. C. Dening), 17 March, 1969 (E. Pinhey); Mkushi R., 7 March, 1969 (E. Pinhey); Luwingu, 19 Apr., 1967 (R. C. Dening)
- N.W.
 Botswana: Sepopa, W. Okavango R., 14 Febr., 1967 (E. Pinhey); Khwaai R., 6, 12 Dec., 1968 (E. Pinhey)
- Previously identified:—Zaire (Inst. Parcs Nat., Bruxelles): Garamba (Pinhey, 1966)
 Liberia: Suakoko (for Smithsonian Institution, Dec. 1971) and Monrovia, Jan. 1894 (for Smithsonian Institution, June 1973).

Distribution. Sierra Leone, Liberia, N. Nigeria, Cameroons, Central African Republic, S. Uganda, Sudan, N. Zaire, E. Angola, N. & N.W. Zambia and Botswana.

Agriocnemis forcipata Le Roi (Fig. 22)

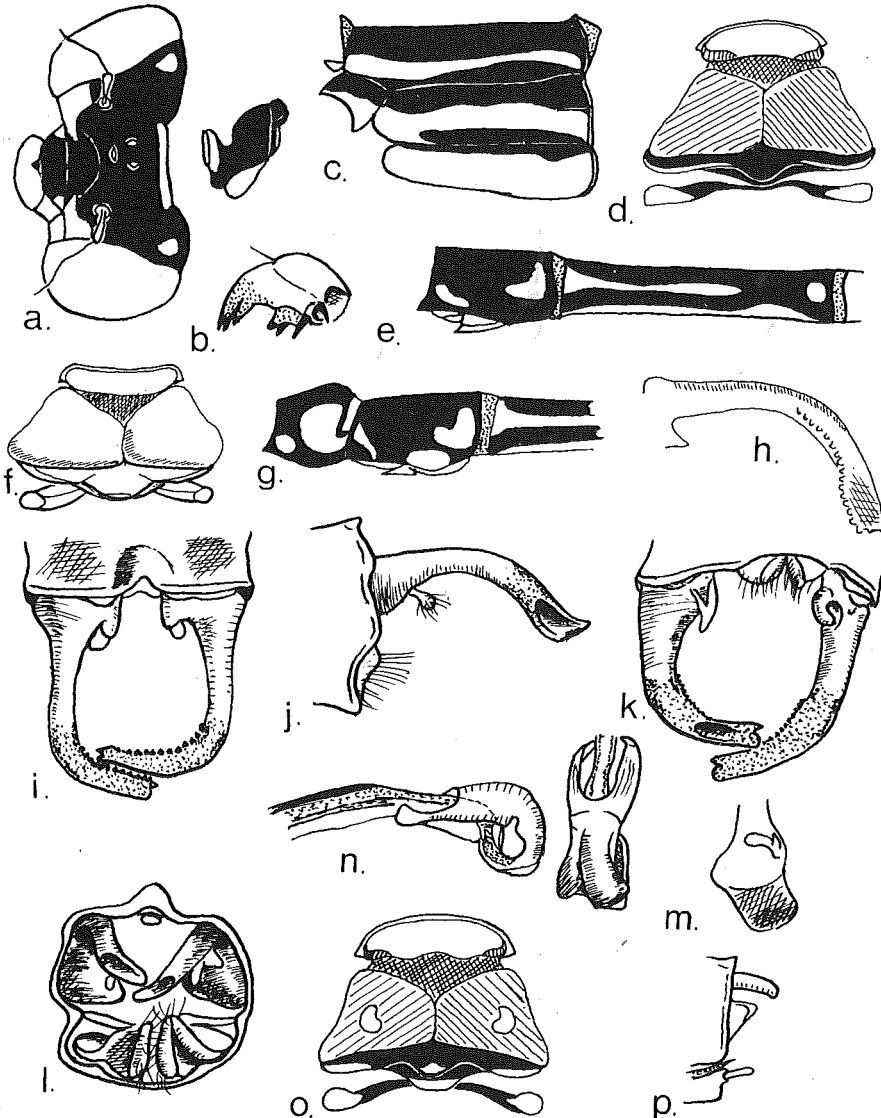
Le Roi, 1915, *Ergebn. zte Zentr. Afrika Exp.* **1** : 341

Agriocnemis forcipata Sjöstedt (nec Le Roi), 1917, *Ark. Zool.* **11** (14 : 22)

Agriocnemis flavilabris Campion, 1924, *Entomologist* **57** : 18 (nom. nov. pro *forcipata* Sjöstedt, praecoc.)

A. forcipata Le Roi was described from Bahr-el-Ghaza in the Southern Sudan. Type ♂ and paratype ♀, which I have examined (1964) are in Museum Koenig; allotype ♀ not traced. The holotype ♂ *forcipata* Sjöstedt, a primary homonym, was described from Kingoyi, N. Zaire and is in Stockholm Museum. This type was kindly loaned. The

abdomen is complete but slightly damaged and the left superior anal appendage is mounted on a card. The specimen bears the following labels: Kingoyi Walder/Congo/dec./308
73
(red card)/Riksmuseum Stockholm (green card). It is not labelled by name nor type. I



22. *A. forcipata*
 a. head of juvenile ♂ (Dingila-Uele R.); b. right mandible of ♂ (Bambesia); c-d. thorax of juvenile ♂ (Dingila-Uele); e. segments 2-3 of mature ♂ (Dingila-Uele); f-h. type ♂ *forcipata* Sjöstedt, thoracic diagram, segments 1-3, right superior appendage; i-m. anal appendages of ♂ (Dingila-Uele), dorsally, from left, ventrally, posteriorly, base of left superior from inner aspect; n. prophallus (Dingila-Uele); o. thorax of juvenile ♀ (Bouali); p. terminal segment of ♀ (Dingila-Uele).

have added a red label (dated 1973) indicating that it is the holotype *Agriocnemis forcipata* Sjöstedt.

The synonymy between the two *forcipata* has been accepted for many years. Champion (1924 : 18) considered they were distinct species. Nielsen (1934 : 181) was evidently the first author to synonymize them.

MALES

SUDAN

Teneral holotype ♂ *forcipata* Le Roi (wings broken): labium creamy white, orbits below black. Labrum pale yellowish with black basal line, genae pale yellow. Postclypeus, frons and vertex blackish brown; frons with broken white lateral bars representing the frontal band. Small isolated blue postocular spots.

Prothorax black, yellow laterally, the anterior collar pale blue. Hindlobe tripartite, the middle lobe flat and produced. Synthorax black down to first lateral suture, linked at dorsal end to a band on the second lateral suture; a slender green antehumeral stripe. Femora with dark brown stripe.

Pterostigma brownish yellow. Forewing with 7 Px.

Abdominal segment 1 yellow with brown dorsal fasciae; segment 2 with fine brown mid-dorsal line on basal half; segments 3-6 yellow with brown terminal annuli; 7-10 all yellow. Anal appendages as described for other examples.

Abdomen 19 mm, hindwing 12 mm (teste Le Roi).

This type is teneral and abnormally small for this species.

ZAIRE

Holotype, mature ♂ *forcipata* Sjöst: labium whitish ochreous, orbits below and posteriorly black with a yellow-green band against the eyes. Labrum all yellow-green with minute black centro-basal dot; genae, front of orbits and anteclypeus yellowish green, almost to antennal level on orbits; postclypeus, frons and vertex black with isolated yellowish green postocular spots and the postclypeus minutely yellow-green at the lateral angles.

Prothorax mainly black, yellow-green on the collar and sublaterally. Hindlobe tripartite, short, black, with small rounded central portion and short but wider lateral portions green-edged. Synthorax black down to first lateral suture, below this at dorsal and ventral ends, with narrow green antehumeral stripe, widened ventrally; a very broad black band on second lateral suture. Femora mainly black, greenish yellow on antero-lateral half at base; tibiae black with anterior and posterior strigae; tarsi ferruginous (not pale as in *victoria*).

Venation pale brown. Pterostigma yellowish brown between brown veins in all wings. Forewing with 8 Px, hindwing with 6 Px.

Abdomen with black dorsal band on segments 1-8 and basal two thirds of 9; with yellow-green lateral fasciae as shown (fig. 22) on segments 1-2; 3-7 with framed green lateral stripe and distal dot; segment 8 mainly black with only an orange latero-distal triangle; 9 black on basal two thirds, then red; 10 all orange red, the apex raised and pinched in. Superior appendage forcipate as in *victoria* Le Roi; cylindrical, orange-red, the apical third black,

gradually flattened, with a sinuous row of denticles from about two thirds to the slightly dentate, square apex. Prophallus with broad in-curved flagella, tapering obtusely to an angle. Hindwing 12,5 mm.

Juvenile ♂ (Dingila-Uele R.): labium whitish ochreous, orbits below black, whitish ochreous against the eyes. Labrum yellow with small black basal triangle; genae and anteclypeus pale greenish yellow; postclypeus black; frons black with the beginnings of an anterior frontal band in the form of two lateral incursions from the orbits, very widely separated. Vertex black with small isolated blue postocular spots; back of occiput marked by a brick-red line.

Prothorax black with greenish yellow collar and sublaterally. Hindlobe tripartite, the central part rounded, depressed, not prominent, narrower than in *victoria*, the lateral sections wider but short and white-edged. Mesostigmal lamina moderately raised into a green post-lateral ridge narrowed to a black dorsal zone. Synthorax black down to first lateral suture with pale green antehumeral stripes wider than in *victoria*, broadened ventrally; a broad black band on second lateral suture, incomplete at ventral end. Legs ferruginous, femora with broad black posterior band, tibiae black on extensor (anterior) surface, particularly the foretibia, which is also partly black laterally and interiorly; tarsi rather ferruginous.

Venation pale brown. Pterostigma yellowish brown with brown suffusion, between brown veins. Forewing with 8 Px.

Abdomen plain red on all segments, with brown intersegmental joints; orange-yellow sublaterally; segment 10 well raised apically. Superior anal appendage orange, black on terminal half, slender, horizontal, incurved and slightly down-turned, the distal half flatter, black, with square apex, somewhat toothed; a short, delicate inner ventral sub-basal hirsute appendage, on a broad flat base, this appendage probably sensitive to contact, not a gripping surface; on the shaft a sinuous row of denticles from halfway to the apex. Inferior appendage yellow, soft, triangular, unarmed and probably not used for gripping. Prophallus with broad but tapering, incurved flagella, ending obtusely.

Abdomen 21,5 mm, hindwing 14 mm.

A teneral *Dingila* ♂ is similar. Mature ♂: very black. Orbits below black, with yellow border to the eye; labrum dark green with black centro-basal dot. Frons and vertex all black without frontal band and without postocular spots. Prothorax and synthorax all black dorsally, laterally and even ventrally; a trace of white dorsal pruinosity. Femora all black with some white pruinosity; tibiae and tarsi ferruginous, tibiae black anteriorly. Pterostigma similar. Abdomen with black band on all segments but segment 10 distally red. Sides black enclosing a blue-green stripe and spot. Superior appendage all brown but the small sub-basal branch yellow. On side of segment 2 the spots have linked into a complete band. Another mature *Dingila* ♂ has postocular spots and a very slender green antehumeral stripe, but no frontal stripe. Tibiae still blacker. Others, teneral or mature, show similar variation. One mature ♂ has the antehumeral stripe pruinose, segment 10 all black dorsally.

Mature ♂ (Uele-Bambesia): very black, no frontal band, no postocular spots, no ante-

humeral stripe; femora and foretibia nearly all black; segment 10 and superior appendage (even the small sub-basal branch) all black.

C.A.R.

Mature ♂ (Bouala): more strongly white pruinose on sides of thorax and on legs, but the postocular spots and green antehumeral stripe are well developed; superior appendage all black except the sub-basal branch; segment 10 with complete black band. A teneral ♂ is like the Dingila males but without any trace of a frontal band. A pruinose ♂ has the antehumeral stripe only visible at ventral end; a more pruinose one has the antehumeral stripe complete but pruinosed; hindtibia black at base, abdomen black without a green lateral stripe.

CAMEROONS

Mature ♂ (Lomié): postocular spots present but no frontal band; a broadish green complete antehumeral stripe; legs mainly black with white pruinosity. Segment 10 all red dorsally. Superior appendage orange on basal third. A pruinose ♂ has the postocular spots pruinosed; no frontal band, no antehumeral stripes. A mature ♂ from Mbalmayo is densely pruinose on the postocular spots, the thorax (except the mid-dorsal zone), legs and basal segments of abdomen. Segment 10 all black above.

The mature ♂ is thus as dark as the mature *victoria* Fraser; but the immature ♂ is very different. In the teneral and early juvenile the abdomen is red without any black dorsal band; the prothoracic collar is coloured, not black and there is a red stripe on the back of the occiput (like the ♀ of *victoria* Fraser, but not the ♂); very occasionally there is a trace of a frontal band.

FEMALES

ZAIRE

Juvenile ♀ (Dingila R.): labium and orbits below as in ♂; labrum brown, broadly yellow at margin; genae and anteclypeus pale greenish yellow; postclypeus glossy black; traces of the lateral ends of a frontal band (even less than in juvenile ♂ described above); frons and vertex black, with large greenish yellow postocular spots confluent with the orange on the back of the orbits and the occiput.

Prothorax black, with yellow on collar and sublaterally and a dorso-lateral greenish yellow spot. Hindlobe tripartite and like ♂ but the middle section is rather more prominent, yellow posteriorly; the lateral sections green, yellow at lateral angles. Mesostigmal lamina as in ♂ but more developed. Synthorax as in ♂. Femora and tibiae pale yellow with broad black stripes almost as developed as in the ♂; tarsi ferruginous.

Venation brown. Pterostigma as in ♂. Forewing with 8 Px.

Abdomen red with black intersegmental joints; orange-yellow laterally; segment 7 with a fine mid-dorsal line on basal four fifths, 9 with two brown basal fasciae; segment 10 well raised medially at apex, pinched in, as in *victoria*. Cerci brownish orange, narrowly conical.

Abdomen 19 mm, hindwing 14 mm.

A teneral ♀ (Dingila) also has a brown labrum bordered with yellow; green frontal band

more developed with a narrower gap. Prothorax with larger square dorsal spots. Leg markings dark brown, well developed. Dark markings on segments 7 and 9 as in the juvenile ♀. An older juvenile (pre-adult) has a dark brown dorsal band on segments 1-8 and base of 9; and on 2, 7 and 8 the start of a broken green lateral stripe framed in black as in the ♂. Abdomen 18,5 mm. In another, more juvenile, segment 9 has basal and distal markings, 10 has a complete band. Another has segments 1-5 unmarked, 6-10 developing a blackish brown band, cerci also blackish brown. In the mature ♀ the labrum is brown with a narrower yellow border; prothorax as in juvenile; segments 1-10 with continuous dorsal black band but the green lateral stripes of 2-7 are more or less broken. Older mature ♀: labrum black with yellow border; postocular spots isolated, faint, blue-green. Prothorax without dorsal spot, all black except on the collar and post-laterally. Synthorax more broadly black; green antehumeral stripe still discernible; femora and tibiae black with white pruinosity, tarsi ferruginous. Pterostigma normal. Abdomen blacker, with broken green lateral pattern on segments 1-7. Cerci black above.

Mature and subjuvenile females from Bambesia are similar.

C.A.R.

Also a juvenile ♀ from Bangui (Centr. Afr. Rep.); and a small juvenile from Bouala; abdomen 16 mm.

CAMEROONS

Again, a juvenile from Lomié, Cameroons, is similar but a maturer ♀ has an almost complete orange frontal band, only narrowly severed.

UGANDA

A subjuvenile and a teneral ♀ from Nabugabo, Uganda, are only slightly larger. Abdomen 18 mm.

ZAMBIA

A small teneral ♀ from Kamapande, Zambia, is similar to other juveniles; no frontal band.

Thus, apart from its normally larger size, the abdomen normally over 18 mm in length (rarely only 16 mm), *forcipata* differs from *victoria* Le Roi in very occasionally having a pale frontal band in the ♂, more often in the ♀; the back of the occiput in juveniles of both sexes has a red line. The prothorax usually has a pale collar in both sexes and the juvenile ♀ has pale dorsal spots on the middle lobe. The hindlobe has a pale edge and the central scoop is smaller in proportion. The antehumeral stripe is usually more developed. The abdomen in the juvenile or teneral ♂ may be all red, unmarked with black, but in the juvenile ♀ some of the segments always have a black line or band. The superior anal appendage differs as already described.

MATERIAL EXAMINED

S. Sudan: Type ♂ *forcipata* Le Roi, Bahr-el-Ghazal, Meschra el Reg, 3 March, 1913 (H. Freiherr von Geyr & O. Le Roi)

Cameroons: Lomié, Oxford Univ. Exp., 3, 5 Sept. 1962 (P. Lascelles); Mbalmayo, 1970 (R. A. Mbarga)

Centr. Afr.

Republic: Bouala, Febr., 1958 (E. Pinhey); Bangui, 30 Nov., 1967

Uganda: Lake Nabugabo, Bakakata, N. Centr. Uganda, Cambr. Univ. Exp., July-Aug., 1962

N. Zaire: Holotype ♂ *forcipata* Sjöstedt, Kingoyi, Zaire, Dec.; Bambesia, 30 Sept., 1938; Dingila-Uele R., Febr., 1958 (E. Pinhey)

N.W. Zambia: Kamapande (1 ♀ only), 27 Jan., 1965 (E. Pinhey)

Previously identified:—

Zaire (Inst. Parcs Nat., Bruxelles): Garamba (Pinhey, 1966); Chingufo and Lac de Carumbo, Angola (det. 1957, for H. Bertrand); Marais de Lueka, Zaire (det. 1959, for H. Bertrand).

Distribution. Liberia, Cameroons, Central African Republic, S. Sudan, Uganda, N. Zaire and N.W. Zambia.

Mortonagrion Fraser

Fraser, 1920, *J. Bombay nat. Hist. Soc.* 27(1) : 147-148; Fraser, March, 1933, *Fauna Brit. India, Odonata* 1 : 408

Type species *Mortonagrion varralli* Fraser (1920, W. India) (lectotype ♂ (Bombay) in Brit. Mus. (Nat. Hist.).

It was stated in the Introductory section on Taxonomy that the main difference between *Agriocnemis* and *Mortonagrion* according to Fraser is that the medio-anal link cross-vein is angled to the anal vein in *Agriocnemis* but continuous with it in *Mortonagrion*. According to Ris (1930) and Fraser (1957) this continuation of Ac and the anal vein is an evolutionary advance. Yet it is evidently an inconstant factor as Lieftinck has confirmed. It should further be noted that Fraser placed the African species *M. stygium* in *Agriocnemis* in 1954, later transferring it to *Mortonagrion* in 1957 when he had considered the un-named Zaire species recorded by Schouteden (1934). It is also of interest that *M. hirosei* Asahina (1972, *Kontyu* 40(1) : 11-16, figs.) is essentially similar in anal appendages and prophallus to the *gratiosa* section of the *exilis* group, although the body pattern is very different. Yet, *inversa* is a true *Agriocnemis*. Lieftinck and others, however, regard *Mortonagrion* as a valid genus on pattern and the shape of the appendages.

It has not been possible to examine the type species but notes on a few species can be recorded, apart from *stygium*, *M. selenion* Ris of Japan, and four Indonesian species kindly loaned by Rijksmuseum van Natuurlijke Historie, Leiden, through the auspices of Dr. Lieftinck. These are *M. simile* Ris (1930) S. Sumatra, *M. amoenum* (Ris, 1915) S. W. Java, *M. falcatum* Lieftinck (1934) Billiton and *M. appendiculatum* Lieftinck (1937) Billiton.

The region of the medio-anal link of these five species is illustrated here (fig. 23 j-n) and these few merely show the inconstancy of the junction of these veins. No female of *selenion* was available and the males of this are juvenile.

In size, the *selenion*, *falcatum* and *appendiculatum* examined were approximately that of *gratiosa* but *amoenum* (abdomen of ♂ 23,5 mm) and *simile* (abdomen of ♂ 26 mm) were distinctly large.

The postocular spots of the males show much diversity. In *simile*, small, rounded, isolated; *falcatum*, broad with an inner arm at right angles; elongated in *amoenum*, a long crescent in *appendiculatum* and a constricted crescent in *selenion*.

Prothoracic hindlobe in male tripartite, with long squarish central scoop like *A. pinheyi*, *aligulae*, etc., in *selenion*, *simile* and *appendiculatum*; like *maclachlani* or *stygium*, with a prominent inferior lip in *amoenum*; tripartite but the middle section or scoop very wide, trapezoidal, in *falcatum*. The female hindlobe is much more diversified. In *appendiculatum* it is tripartite like the male, but with the sides of the scoop tapering out and without an inferior lip; in *falcatum* not tripartite but depressed centrally, raised laterally, like *forcipata* group; in *amoenum*, like *zerafica* or *maclachlani*, with short v-extension in the centre. The species *simile* has an entirely distinctive hindlobe: strongly raised, not noticeably tripartite, but below the centre there is a limited, curved rectangular shelf, sloped post-ventrally like a tumour and evidently an extreme development of the inferior lip.

The mesostigmal laminae of the females are equally divergent in development in these few examples and according to their modification either the lateral or the dorsal parts may afford assistance in tandem linkage. In *simile* there are broad, raised lateral triangles but no prominent dorsal ridge; in *appendiculatum* the lateral triangles are narrow and the dorsal ridge is only moderately developed. In *falcatum* they are strongly raised at the sides and there is a prominent dorsal ridge; whilst in *amoenum* there is not only a strong dorsal ridge but it is extended posteriad above the vertical portion (i.e. curved backwards at the top). The pterostigmata have been discussed in the introductory chapters.

The remaining features I have selected all refer to males. The 10th abdominal segment is raised to a curved incision, but not produced posteriad, in *amoenum*; but it is not raised at all in the other four species.

The anal appendages, or either the superior or the inferior ones are robust in these five examples but also without any constant features. In *selenion* the superior appendage is short, the inferior prominent, much longer than segment 10 and robust like *maclachlani*. In *simile* the superior is the more prominent being longer than the inferior, gradually down-curved apically, but both appendages are massive. *M. amoenum* is surprisingly like *inversa*, with the inferior far longer than segment 10; the superior with an out-turned and down-curved outer branch and short broad upturned inner branch: the left and right inner branches adjacent, the outer branches widely splayed. In *falcatum* the longer appendage is the superior but it is not quite as long as segment 10; it is strongly down-curved, beak-like, as in *falcifera*; inferior more like *exilis*. The prominent inferior of *appendiculatum* is like *inversa*, much longer than segment 10, slender; superior slightly shorter than segment 10, down-curved and folded apically.

The flagellum of the prophallus in *selenion* is very broad outwardly, the apex rounded, the margin sloped behind this; also broad and truncate in *falcatum*; short, broad, oblique to an angled apex in *appendiculatum*; short, not so broad, with incurled apex in *amoenum*. In *simile* it is quite different from all other species mentioned in this Revision: flagella

united into a single short, broad scoop over the stem, without extending sideways along the stem. The scoop has raised sides like a shovel.

The last ♂ character selected is the marking on the terminal segments of the abdomen. In *selenion* these segments 8-10 are all pale brown but the three males are juveniles. In *amoenum* there is a continuous black band. In the others there are pale blue fasciae which may indicate sex recognition: segment 8 in *simile* mainly blue, a large latero-basal fascia in *falcatum*; in *appendiculatum* segment 8 is all blue, 9 mainly blue.

From all these selected comparisons there seems no constant feature to separate *Mortonagrion* from *Agriocnemis*. The average size of these few is greater and the elongated postocular spots of the ♂ differ from the condition in African species, but this is not so in *simile*. The peculiar prophallic structure in ♂ *simile* would seem to indicate at least sub-generic differentiation. The remarkable ♀ inferior lip in *simile* may be equally significant taxonomically and biologically: more so in fact than the validity of *Mortonagrion*.

Mortonagrion stygium (Fraser) (fig. 23)

Mortonagrion spec. — Schouteden, 1934 : 83 (Zaire)

Agriocnemis stygia Fraser, 1954, *Revue Zool. Bot. afr.* 50 : 274 (♂, figs.);

Mortonagrion stygium Fraser, 1957, *ibid.* 56 : 219 (♀)

Described from the single holotype ♂ (1954) and Schouteden's ♀ (the allotype) (1957), both from Zaire, these types are in the Musée royal d'Afrique Centrale. More specimens have since then been collected. I examined the types at Tervuren in 1964 and made the following notes:—

ZAIRE

Holotype ♂. Genae dark greenish brown; labrum, anteclypeus and the small isolated postocular spots green; postclypeus, frons and vertex black, without a frontal band.

Prothorax almost all black; hindlobe tripartite, the central portion thick, semicircular and depressed; the lateral parts smaller. Synthorax black down to below humeral suture, without a pale antehumeral stripe, and joined dorsally to a short dorsal stripe on the first lateral suture; a dorsal dot and a line on second lateral suture. Femora posteriorly, the tibiae laterally, broadly black.

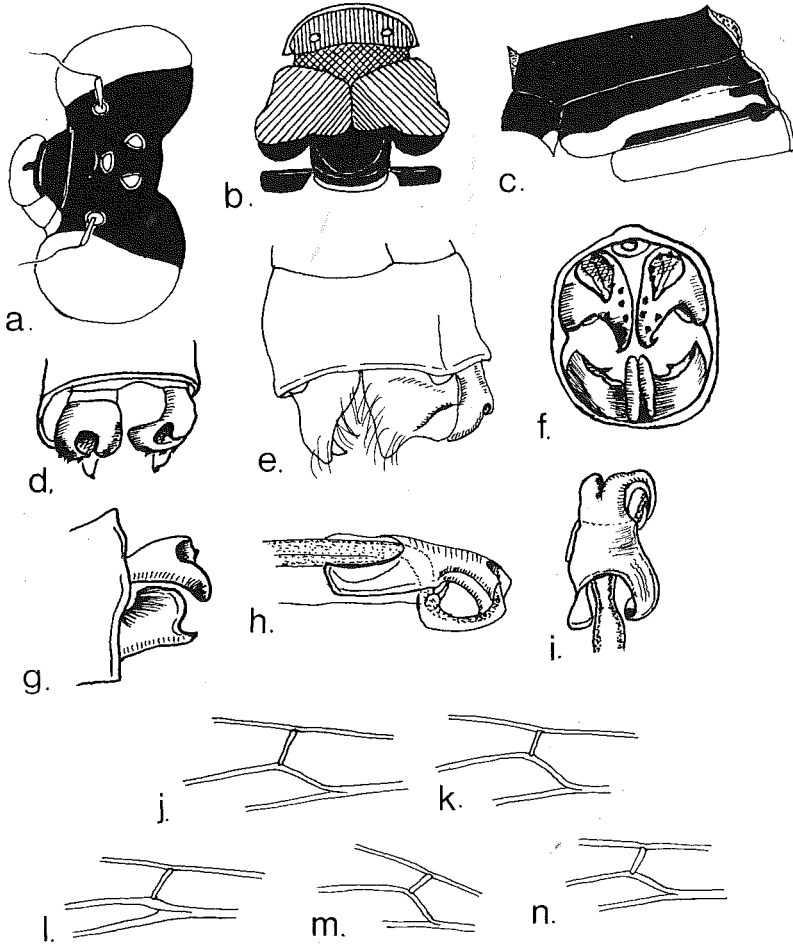
Pterostigmata blackish brown. Forewing with 9 Px.

Abdominal segments 1-6 with dark reddish-brown dorsal band, darker at distal ends of segments; 7-10 red, the basal quarter of segment 7 black. Superior appendage black, inferior appendage reddish brown, shaped as described below.

Abdomen 23,5 mm, hindwing 15,5 mm.

This holotype is less mature than the Ubangi ♂ described below since the postocular spots are clear and the dorsum of the abdomen is dark reddish brown instead of black. Fraser (1954) described the superior anal appendage as "shaped like the trigger of a revolver, the apical portion turned down at a right angle to the basal and hollowed out on its lower side; inferiors broad, expanded below and partially trilobate, the inner and

median lobes terminating in a black tooth; seen in profile, they are deeply emarginate on the upper surface and prolonged at the lower border to end in the medial tooth". This description of the appendages is clear enough but Fraser thought the species to be nearest to *exilis*, which is not really so. It is far blacker, larger, the appendages much more robust, the prothoracic hindlobe very different and, as will be shown, the prophallus is quite different.



23. *Mortonagrion*
 ♂ *stygium*. a-c. head and thorax; d-g. anal appendages, dorsally, ventrally, posteriorly, from left, respectively; h-i. prophallus; j-n. medio-anal link of left hindwing in *M. selenion*, *M. amoenum*, *M. simile*, *M. falcatum*, *M. appendiculatum* respectively.

Mature ♂ (Ubangi): labium and orbits ventrally whitish ochreous. Labrum and genae pale green. Anteclypeus dark brown; postclypeus glossy black; frons and vertex all black without frontal band and no postocular spots, orbits all black posteriorly.

Prothorax almost entirely black, blackish-white post-ventrally. Traces of two yellow dots on the black collar. Hindlobe tripartite; central part thick, semicircular, tray-like, depressed as in the type; with the posterior margin slightly upturned. A paler inferior lobe just visible below this. Mesostigmal lamina peculiarly rectangular, with slight anterior ridge. Synthorax black down to first lateral suture, and below this dorsally and ventrally, without a pale antehumeral stripe. Sides pale blue, a short oblique stripe on first lateral suture, a brown dorsal spot and a narrow stripe on second lateral suture. Femora broadly black posteriorly and around the knees; tibiae and tarsi ferruginous with some blackening.

Venation pale reddish brown, pterostigma brown. Forewing with 9 Px.

Abdomen with broad black dorsal band on segments 1-6 and the basal third of 7; the rest orange-brown, 10 raised apically. Anal appendages short but robust, superior and inferior of about the same length, reddish brown to black. Superior appendage rounded above, excavate apically, the hollow hooded by a short lobe; then a downward branch to a heavy hook; this down curved portion bearing small posterior denticular setae. Inferior appendage broad, shaped rather like a molar tooth; with a ventral outer tooth and, at the surface, a small inner tooth; and at the base on the upper outer edge a small root-tooth. Prophallus robust on head with the flagellum a very broad truncate lobe having strong grooves.

Abdomen 22 mm, hindwing 13 mm.

The following details of the allotype ♀ (Fraser, 1957: 220) are based on the ♀ *Mortonagrion* identified by Schouteden.

Allotype ♀: closely similar to ♂; postocular spots invisible; no antehumeral stripe. A fine black stripe on second lateral suture. Wings as in ♂. Abdomen obscurely ferruginous on segments 1-6, paler at basal ends of these, the apical ends ringed with black; segments 7-10 ferruginous to pale ochreous. Cerci shortly conical, blackish brown.

Abdomen 22 mm, hindwing 16 mm.

One additional note I made from the allotype was that the prothoracic hindlobe is distinctly tripartite.

MATERIAL EXAMINED

Zaire: 1 ♂ Ubangi, Dongo, Sept., 1935 (A. Bal)

Previously examined, Types at Tervuren (1964): holotype ♂, Eala, 1936 (H. Ghesquière); allotype ♀, Eala, 20 Nov., 1917 (R. Mayné)

Distribution. Zaire and Paimol, Acholi, N. Uganda (vide Pinhey, 1961).

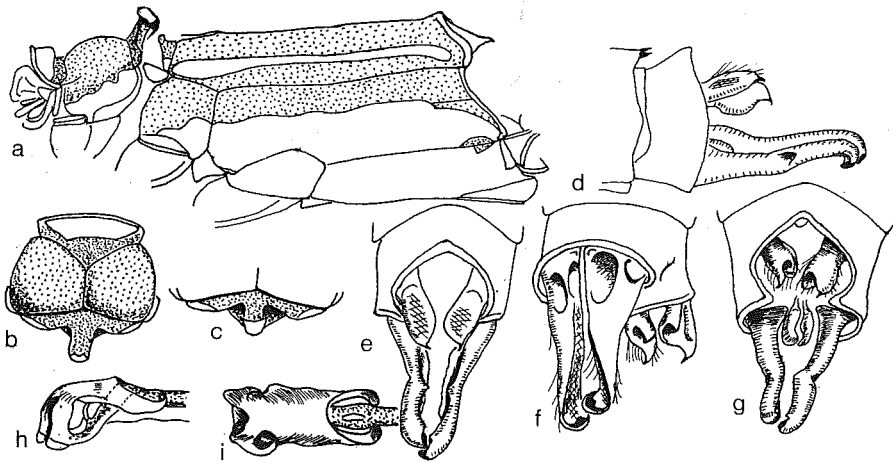
Addendum

Agriocnemis angustirami spec. nov. (fig. 24)

Holotype — ♂ (mature). Labium and orbits below cream. Genae, anteclypeus and front of orbits olive green. Labrum glossy purple. Postclypeus glossy black. Frons, vertex and orbits above black, with small isolated green postocular spots. The frons and anterior

half of vertex, to a transverse line between anterior and posterior ocelli, densely pruinose white.

Prothorax mainly black, with pale blue anterior collar, the middle lobe blue sub-laterally. Hindlobe tripartite, with its central lobe exceptionally slender, raised nearly to the vertical, with a blue posterior edge curled up to form a distinct lip; lateral lobes short, bluish white at the lateral angles. It is necessary to depict the hindlobe in both antero- and post-dorsal aspects and it will then be seen that there is a distinct inferior black lip, as in typical *maclachlani*. Synthorax black dorsally, to first lateral suture and narrowly below this at dorsal end. A slender pale blue antehumeral stripe. Sides pale blue with an irregular black dorsal spot on second lateral suture. Legs ochreous. Femora with black posterior stripe and black outer macula at each knee.



24. *Agriocnemis angustirami* spec. nov. holotype ♂
 a. thorax; b. prothorax, antero-dorsally; c. prothoracic hindlobe, post-dorsally; d. segment 10 and anal appendages, from left; e-g. anal appendages, dorsally, ventro-laterally and posteriorly; h-i. prothallus.

Venation pale ferruginous. Pterostigmata almost parallelogram in shape with the distal edge more outcurved, as usual; reddish brown in centre, edged with cream; slightly darker (but not black) in hindwing and framed in thicker veins.

Abdomen slender. A continuous dorsal band on segments 1-7, which is black on 1-2, base and apex of segment 3, otherwise bronze-brown. Segments 8-10 all ferruginous, segment 10 not produced at apex. Anal appendages yellowish brown, the superiors approximately as long as segment 10, curved apically down to a fine black point and with an inner ventral lobe-like flange which is coiled (as seen in ventral aspect).

Inferior appendage over twice as long as segment 10, the shaft not straight but slightly angled upwards before halfway, the apices downcurled to curved black contact ridge. Ventrally, the appendages are more hirsute. The long inferior is broad at the base, with shallow ventral depressions and an inner ventral keel; the apex curved downwards and

inwards to the rounded apical contact ridge, before which there is a minute subapical notch.

Prophallus with strap-like flagella.

Abdomen (without appendages) 19,5 mm, hindwing 11,5 mm.

Like most *Agriocnemis* Selys the anal appendages are complex in structure. This species is closest to *A. aligulae* Pinhey and *A. maclachlani* Selys. It is distinguished from both these by the very slender, nearly vertical middle portion of the prothoracic hindlobe and whilst its upturned posterior lip is more like *aligulae*, the prominent inferior black lip is nearer *maclachlani*. The superior appendage with its posterior apical point and ventral flange differs from both these, in which the apical region curves down and then more anteriorly, obscuring the point in dorsal aspect. The robust inferior appendage, angled before the middle, differs from both species but the apex, curved inwards and downwards, is similar to *aligulae*. In *maclachlani* the apex is scarcely inturned, not at all downturned.

Thus, in all important respects it is nearest *aligulae*.

MATERIAL EXAMINED

Holotype ♂, Mount Coffee, Liberia, 1896 (Mrs. Sharp). In the U.S. National Museum.

References

For further references see Pinhey (1962b).

- BALINSKY, B. I. May, 1961. Observations on the dragonfly fauna of the coastal regions of Zululand, with descriptions of three new species (Odonata). *J. ent. Soc. sth. Afr.* 24(1): 72-91, 1 pl., figs.
 ——— June, 1963. A contribution towards the systematics of dragonflies of Southern Africa (Odonata). *ibid.* 26(1): 228-255, figs.
- BRAUER, F. 1868. Verzeichniss der bis jetzt bekannten Neuropteren in Sinne Linné's 2. *Verh. zool. bot. Ges. Wien* 18. Abh.: 359-416, 711-743.
- CAMPION, H. 1913. Odonata of the Seychelles from the Percy Sladen Trust Expedition to the Indian Ocean in 1905, Vol. 4 (27). *Trans. Linn. Soc. Lond.* (2) 15: 435-446.
 ——— Jan., 1924. A homonym in the genus *Agriocnemis* (Odonata). *Entomologist* 57: 18.
- DUMONT, H. J. 1973. Studies on the dragonflies of Palestine. 2. A redescription of *Agriocnemis sania* Nielsen, 1956 (Odon.: Zyg.), with some distributional and ecological notes. *Is. J. Zool.*
- FRASER, F. C. March, 1933. Odonata 1, in *Fauna of British India*: 1-423, figs. Taylor & Francis, London.
 ——— 1949a. *Explor. Parc Natn. Albert Miss. G. F. de Witte* 61: 1-21, figs.
 ——— 1949b. Odonata of Madagascar, Append. 1. *Mem. Inst. Sci. Madagascar* (A) 3: 21-40.
 ——— 1949c. The Zygoptera of Mauritius. *Trans. ent. Soc. Lond.* 100: 135-146, figs.
 ——— Dec., 1954. New and rare species of Zygoptera from Belgian Congo. *Revue Zool. Bot. afr.* 50(3-4): 269-276 figs.
- GERSTAECKER, C. E. A. 1891. Die von Herrn Dr. F. Stuhlmann in Ostafrika gesammelten Termiten, Odonaten und Neuropteren. *Jb. hamb. wiss. Anst.* 9: 5-9 (187-191).
- GRÜNBERG, K. 1902. Herr Grünberg sprach über neue Odonaten aus dem Njassa-Gebiet, gesammelt von Dr. Fülleborn. *Sber. Ges. Naturf. Freunde Berl.* (2) 9: 230-237.
- KARSCH, F. 1899. Neue Odonaten aus Ost- und Südafrika mit Einschluss des Seengebietes. *Ent. Nachr.* 25: 369-382.
- KIMMINS, D. E. 1966. A list of the Odonata Types described by F. C. Fraser, now in the British Museum (Nat. Hist.). *Bull. Br. Mus. Nat. Hist. (Ent.)* 18 (6): 175-227.
 ——— 1970. A list of the Type-species of Odonata in the British Museum (Nat. Hist.). (3) *ibid.* 24(6): 173-205.
- KIRBY, W. F. 1890. *A synonymic Catalogue of the Neuroptera-Odonata or Dragonflies*. With an Appendix on Fossil Species. 202 pp. Gurney & Jackson, London.
- LE ROI, O. 1915. Odonaten aus Aequatorial-Africa. *Ergebn. zte Deutsch. zentr. Afr. Exped.* 1910-11, unter Führung Adolf Friedrichs, Herzog zu Mecklenburg 1: 319-360, pl., figs.

- LIEFTINCK, M. A. 1949. Synopsis of the Odonate Fauna of the Bismarck Archipelago and the Solomon Islands. *Treubia* **20** : 319-374.
- 1965. Notes on Odonata of Madagascar, with special reference to the Zygoptera and with comparative notes on other faunal regions. *Verhandl. Naturf. Ges. Basel* **76(2)** : 229-256, figs.
- LONGFIELD, C. 1945. The Odonata of Angola; Results of Mission Scientifique Suisse 1928-29, 1932-33. *Archos Mus. Bocage* (1947) **16** : 1-31, figs.
- NIELSEN, C. Dec. 1934. Odonati di Mobeka (Congo Belga) *Boll. Lab. Ent. Bologna* **7** : 164-185, pls. 14-16.
- 1956-58. Una nuova specie del genere *Agriocnemis* Selys (Odonata) di Gat (Fezzan). *Riv. Biol. colon.* **16** : 31-40, 9 figs.
- PINHEY, E. C. G. 1951. The Dragonflies of Southern Africa. *Transv. Mus. Mem.* **5** : 1-335, pls., figs.
- Oct. 1959. New Dragonflies of the genus *Agriocnemis* and a key to males of this genus. *J. ent. Soc. sth. Afr.* **22** : 465-468, figs.
- July 1961. *A Survey of the Dragonflies (Order Odonata) of Eastern Africa.* 214 pp., pls., figs. *Brit. Mus. (Nat. Hist.)*
- Apr., 1962a. Some records of Odonata collected in Tropical Africa. *J. ent. Soc. sth. Afr.* **25(1)** : 20-50, figs.
- 1962b. A Descriptive Catalogue of the Odonata of the African Continent (up to Dec., 1959), part 1. *Publicões cult. Co. Diam. Angola.* **59** : 1-153, pls.
- Nov., 1962c. Some notes on the dragonflies (Odonata) of Mauritius. *Proc. R. ent. Soc. Lond. (B)* **31** (9-10) : 115-121, figs.
- 1966. Odonata, in *Explor. Parc natn. Garamba, Miss H. de Saeger* (1949-52) **45** : 1-114, figs.
- Aug., 1967a. Odonata of the Seychelles and other Indian Ocean Island groups, based primarily on the Bristol University Expedition of 1964-65. (With ecological introduction by R. A. A. Blackman). *Arnoldia Rhod.* **3(12)** : 1-38, figs.
- Oct., 1967b. Odonata of Ngamiland (1967). *Arnoldia Rhod.* **3(15)** : 1-17, figs.
- 1971. Odonata of Fernando Po Island and of neighbouring Cameroons Territory. *J. ent. Soc. sth. Afr.* **34(2)** : 215-230.
- RAMBUR, M. P. 1842. *Histoire Naturelle des Insectes. Neuroptères* **17** : 1-291.
- RIS, F. 1924. Wissenschaftliche Ergebnisse T. von F. Werner unternommen zoologisch Expedition nach dem Anglo-Aegyptischen Sudan (1914); 19. Odonata. *Denkschr. Akad. Wiss. Wien., Math. nat. Kl.* **99** : 275-282, figs.
- 1930. Drei Notizen über ostasiatische Agrioniden. *Ark. Zool.* **21A** : 1.
- SCHMIDT, E. 1949. Libellen aus Portugiesisch Guinea mit Bemerkungen über andere aethiopische Odonaten. *Archos Mus. Bocage* (1951) **20** : 125-200, figs.
- SCHOUTEDEN, H. 1934. Catalogues raisonnés de la Faune entomologique du Congo Belge. Odonates. *Annls Mus. r. Congo Belge, 4 to Zool. Sér.* (3) **3(1)** : 1-84, figs.
- SELYS-LONGCHAMPS, M. E. DE. 1869. *Recherches sur la Faune de Madagascar et ses Dépendances, d'après les découvertes de F. P. L. Pollen et D. C. van Dam.* *Insectes*, **25(2)** Odonates : 3, 15-25. Leyden.
- 1872. Notes sur plusieurs Odonates de Madagascar et des îles Mascareignes. *Rev. Mag. Zool.* **23** : 4-9, 153-183.
- 1877. Synopsis des Agrionines (fin). *Bull. Acad. r. Belg. Cl. Sci.* **43(2)** : 97-159 (3-65).
- SJOSTEDT, Y. 1917. Odonaten aus Madagaskar eingesammelt von Dr. W. Kaudern, 1911-12, *Ark Zool.* **11(13)** : 1-12, pl.

Name Index

Agriocneminae 174

Agriocnemis 172, **174**, 194

Agrion 172

albifrons 173, 199, **217**

aligulae 171, **235**

Allocnemis 179

amoenum 270

angolensis 173, 186, **254**

angustirami 171, **274**

appendiculatum 270

Argiocnemis 172

Coenagriocnemis 172

Coenagriionidae 174

consimilis 172, **238**

ebneri 172, **248**

exilis 172, 177, 182, 185, **199**, 207, 211

falcatum 270

falcifera 173, **211**

femina 172

flavilabris 264

forcipata Le Roi 172, 177, 186, **264**
forcipata Sjöstedt 172, **264**
gratiosa 172, 177, **238**
hirosei 270
inversa 172, **245**
Ischnura 172
lacteola 172, 175, **199**
Lestes 183
maclachlani 172, **232**
merina 173, **230**
Mortonagrion 173, 174, 194, **270**
naia 175
palaeforma 173, 186, **257**
pinheyi 173, **207**

pygmaea 172, 182, 188, **219**
ruberrima 173, **215**
rufipes 172
sania 173, **225**
selenion 270
simile 270
solitaria 172
spatulae 171, **256**
stygium 173, 182, 187, **272**
transvaalica 171, **213**
varralli 175, **270**
velare 219
victoria 172, **258**
zerafica 172, **248**