

A REVIEW OF THE *METACNEMIS* GROUP
(ODONATA : PLATYCNEMIDIDAE)

by

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ABSTRACT

Mesocnemis Karsch, hitherto distinguished from *Metacnemis* Selys only on the position of the arculus, sometimes a variable feature, was placed by some authors in synonymy. The two taxa can now be clearly separated on prothoracic characters. Pinhey (1976) restored *Mesocnemis* to generic rank and this is now confirmed: Genus *Mesocnemis* Karsch **Stat. conf.** The mesocnemine position of the arculus is a secondary development but unique in our Zygoptera. *M. robusta* is transferred to *Mesocnemis*.

The five known species are described, with relevant synonymy.

INTRODUCTION

The African taxa *Metacnemis* Selys (1863) and *Mesocnemis* Karsch (1891) are so closely allied that there has been some indecision in the past whether to regard them as congeneric or as separate genera. Two of the five distinct species, *angusta* Selys (1863) and *secundaris* Aguesse (1968) are only recorded so far from type specimens and that of Selys' *angusta* is lost. *M. robusta* Selys (1886) is known from a few males and a possible female. A fourth species, *valida* Hagen (1863) is not adequately recorded from several Cape specimens; whilst *singularis* Karsch (1891), on the other hand, is widely known and recorded from the continental Afrotropical region.

These five species are all redescribed, except the well known *singularis*, which is considered on a comparative basis. Since *valida* is the type species of *Metacnemis* and *singularis* the type of *Mesocnemis*, it is necessary in the first place to compare these at

generic level. In some respects they overlap in characters leading Ris (1924), Schmidt (1951) and Pinhey (1951, 1962) to synonymize them.

The only valid generic difference recorded hitherto has been the position of the arculus, distinctly between the two antenodal cross-veins in *Mesocnemis*, but more or less at second Ax in *Metacnemis*. Whilst this distinction holds for general purposes, the mesocnemine position of the arculus is by no means constant in long series of *singularis* from different localities, as will be shown later, under the species. When the prophallus is examined, however, a pronounced difference is immediately apparent. Schmidt (1951) provided a key to the species *valida*, *singularis* and *robusta*. In structural figures he showed the prophallus of the latter two but omitted this feature for *valida*, which is the crucial point. In *valida* (fig. 3) it has a bifurcate, aflagellate terminal portion, whereas in *singularis* (fig. 8) and *robusta* (fig. 5) there are prominent flagella as well as a feature overlooked by Schmidt, namely a hooked process.

Holotype *robusta*, however, has metacnemine position of the arculus, whereas *singularis* nearly always shows the mesocnemine condition. On this type specimen there is, thus, an apparent anomaly, *robusta* resembling *singularis* in prophallus but not in venation. Fortunately, a few other male *robusta* are known and these show a mesocnemine tendency, at least in the forewing. Whilst the prophallus forms the true differential character, it seems obvious that the arculus position, hitherto employed as a criterion, is in reality a secondary development still prone to instability. The mesocnemine character is, nevertheless, an interesting development. In a few zygoptera genera the arculus is more or less distal to the second antenodal cross-vein instead of approximately at this vein, but the persistently proximal position is *unique* in all those of our genera which have only two antenodal cross-veins.

In *secundaris*, like *valida*, the prophallus lacks flagella and the arculus of the type is metacnemine in position. Male *angusta* is not yet recorded but characters of the female are reasonably close to a small specimen of *valida*. Both are only known from the Cape Province and these two are probably closer together phylogenetically than to widespread *singularis*, so far unrecorded from the Cape. Madagascar *secundaris* appears to be linked ancestrally with *valida* and *angusta*.

In *singularis* there is a strong tendency for the arculus to be well before second Ax in all wings, rarely showing a partial metacnemine condition. In the few known *robusta* examples the mesocnemine position is less constant and only noticeable in the forewing. Its status, from known material, is apparently intermediate in venation between *valida* and *singularis*. However, apart from the prophallus and the venational characteristics there is a third feature separating *Metacnemis* and *Mesocnemis*. Males of *singularis* and *robusta* develop strong pruinosity on the head and body, which is not the case in known males of the other species.

Pinhey (1976) suspecting *Mesocnemis* to be a valid genus restored it tentatively to generic rank. This status can now be confirmed:

Genus *Mesocnemis* Karsch **Stat. conf.**

ABBREVIATIONS

<i>BMNH</i>	British Museum (Natural History). London.
<i>ISNB</i>	Institut royal des Sciences Naturelles de Belgique. Bruxelles.
<i>MNHN</i>	Muséum National d'Histoire Naturelle. Paris.
<i>NMB</i>	National Museum. Bulawayo.
<i>NMW</i>	Naturhistorisches Museum. Wien.

<i>NRS</i>	Naturhistoriska Riksmuseet. Stockholm.
<i>RSM</i>	Royal Scottish Museum. Edinburgh.
<i>TMP</i>	Transvaal Museum. Pretoria.
<i>ZMH</i>	Zoologisches Museum (Naturkunde), Humboldt Universität, Berlin — DDR.
<i>ZSM</i>	Zoologische Staatssammlung. München.

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Invaluable co-operation has been received from many sources. In particular, Dr A. Kaltenbach loaned holotype ♂ *robusta* from *NMW* and another ♂ of this was lent by *NRS*. J. Legrand supplied certain details of holotype *secundaris* in *MNHN*, Dr K. K. Günther sent catalogue entry records for *valida* in *ZMH* and P. Ward supplied a few points about a female regarded as *angusta* in *BMNH*. Dr G. Demoulin searched unavailingly for Selys' described specimen of *angusta* in *ISNB* and Dr W. Dierl was equally unsuccessful in endeavouring to trace an example of *robusta* in *ZSM*. Dr El Amin El Rayah kindly sent information on a Sudanese locality.

I am also deeply grateful for short series of *valida* presented to *NMB* by Drs F. M. Chutter and B. C. Wilmot in South Africa.

TAXONOMY

The two genera, *Metacnemis* and *Mesocnemis* can now be separated by use of a key. Until more is known of *angusta* and *secundaris* a specific key would not be worth consideration.

Generic key.

1. Arculus normally at or close to second Ax in all wings. Prophallus without flagella. Mature male not pruinosed and their femora mainly black *Metacnemis* Selys
— Arculus commonly well before second Ax, at least in forewing. Prophallus with well developed flagella. Mature male strongly pruinosed and femora broadly pale-coloured *Mesocnemis* Karsch

The species to be considered under these two genera are as follows:

Metacnemis Selys: *M. valida* Hagen, *M. angusta* Selys, *M. secundis* Aguesse.
Mesocnemis Karsch: *M. singularis* Karsch, *M. robusta* Selys.

***Metacnemis valida* Hagen**

Hagen. *In*: E. de Selys-Longchamps, 1863: 161 (17 sep.) (♂ Cap de Bonne Espérance); Selys, 1886: 136; Schmidt, 1951: 221, fig. 4; Pinhey, 1951: 60; Pinhey, 1963: 148

Type ♂ in *ZMH*. Pinhey (1963) recorded the only information on the type's labels as "2957; C.b.sp. Krebs." This presumably inferred that Krebs was the collector. "C.b.sp" is Latin abbreviation for Cape of Good Hope (*Caput bonae spei*). Ludwig Krebs collected insects in the "Cape Colony", mainly for *ZMH* in 1819-1823, which is one way of dating the capture without reference to the specimen number. From the description it appears that this ♂ was the only example available to Hagen

in 1863, and he said the ♀ was unknown. Selys recorded the female in 1886. Schmidt (1951) said there were three males and two females under the number 2957 in *ZMH*.

Günther (in October, 1979) has kindly elucidated the anomaly. Firstly, he says that the type ♂ under Catalogue number 2957 has a red syntype label, probably applied by Erich Schmidt (1951) or else, as he suggests, by the *ZMH* entomology Curator of the time. In the main reference catalogue only one example was entered at first (the syntype) and this was changed later to five examples (3 ♂ 2 ♀), all under the same Catalogue number. Consequently, in 1951, Schmidt was able to see five specimens instead of the one ♂ examined by Hagen.

Selys (1886) supplemented Hagen's original description and Schmidt (1951) completed this with useful illustrations of main features of both sexes. Pinhey (1963) recorded a few notes on the type ♂ and on a visit to Europe in 1964 he saw 1 ♂ and 1 ♀ in the McLachlan Collection, *BMNH* and a ♀ in *RSM*.

Schmidt (1951: 221) synonymized *Mesocnemis* under *Metacnemis* and gave a key to *robusta*, *singularis* and *valida*. Pinhey, following this lead and prior to examination of the type ♂ (1963), considered *singularis* was probably a synonym of *valida*, the reasons being the variable position of the arculus in relation to antenodal cross-veins and the obviously wide distribution of *singularis*, whereas true *valida* was only recorded in literature from the *ZMH* material.

Apart from the specimens mentioned above in *ZMH*, *BMNH* and *RSM*, no further examples were seen until Dr. F. M. Chutter's discovery of both sexes in 1965 near Grahamstown. Then, B. C. Wilmot collected further examples near Stutterheim in 1973. Both Chutter and Wilmot generously gave specimens to *NMB*. Chutter, apparently, did not publish the information, so a description will be given here.

Males (Palmiet River). Approximately the size and build of average males of the widespread *singularis*, but the abdomen slightly shorter and thicker, the thorax with more distinctive markings. No pruinosity in any of the examples seen.

Labium more or less blackish brown with ochraceous border. Labrum pale olive with black centro-basal dot; genae, anteclypeus and front of orbit pale olive; postclypeus and head above all matt black, or the postclypeal-frontal area blackish brown.

Prothorax mainly black; trace of olive on anterior collar, a broad elliptical green lateral fascia and a yellower sublateral one on middle lobe. Synthorax black dorsally and down to 1st lateral suture, with broad, complete greenish-yellow antehumeral band, expanded anteriorly; a short narrow greenish stripe on mesepimeron, which, at lower end, turns downwards to meet the metathorax; metathorax all brownish-yellow except a black band along 2nd lateral suture. Sternites all yellow. Legs all brown.

Wings hyaline with dark brown venation. Pterostigmata all of equal size, rather narrow, the distal edge curved up to an acute upper distal angle; all reddish-brown, between black veins, or in juvenile grey with white edge. Arculus at, or almost at 2nd Ax. Quadrilateral of forewing a trapezium, with 4-5 cells between it and nodal level; Ac slightly or well distal to 1st Ax and well distal to start of anal vein (which starts before 1st Ax); but in one aberrant example with 2 Ac on right forewing, one before and one after 1st Ax. Forewing with 15-18 Px, hindwing 13-14 Px.

Abdominal segment 1 greenish-yellow with broad black dorsal longitudinal band, narrowly or widely constricted before distal end, and with a black sublateral anterior macula; segment 2 green with black dorsal crescent near distal end, sometimes divided medially; and a blackish brown lateral band. Segments 3-6 dull pale blue-

green, with black annulus at distal end and black sublateral stripe; 7 with black dorsal band constricted distally; 8-10 blue with black sublateral band, 8-9 with dorsal black twin-spots at two-thirds; 10 with black basal annulus, divided mid-dorsally, and a black rim to distal margin. This margin invaginated mid-dorsally and fringed with denticles.

Anal appendages (fig. 1), with superiors tapering, not markedly divergent, with ventro-lateral median swelling and a slender ventro-basal, inwardly-projected tooth (like *singularis*). Inferior appendage deeply excavated along dorsal surface (all appendages excavated in *singularis*). Prophallus (fig. 3) very different from *robusta* and *singularis*: broad head turned (at rest) towards stem where it divides into a pair of short, obtuse flat extensions. No hook or flagellum.

Abd. 29-31 mm, hindw. 25-26 mm (Hagen's type description, abd. ca 30 mm, hindw. 25 mm).

Female (Palmiet Riv.). Much paler. Labium all ochraceous. Labrum, genae, front of orbit pale olive, postclypeus and entire head above pale ferruginous-brown.

Prothorax (fig. 2) pale ferruginous; posterior lobe vestigial in centre, with narrow lateral ellipse; behind the prothorax a small pair of central, raised, rounded flaps, and posterior to these, before the mesothoracic plates, a distinctive transverse fold like a scroll. Synthorax ferruginous, pale greenish yellow to yellow at sides and ventrally; without black markings. Legs pale brownish yellow to yellow, more or less blackened at distal ends of femora; tarsi darker brown.

Wings hyaline, faintly tinged greenish-yellow from base to nodus. Venation pale red-brown to dark brown. Pterostigmata brownish-cream between brown veins.

Abdomen dull ferruginous, with narrow, dark brown sublateral stripe along middle segments. Segment 10, as in ♂, with concavity on dorso-distal margin, fringed at sides with denticles. Cerci very short, conical, two-thirds as long as segment 10. Ovipositor sheath just reaching end of this segment.

Abd. 29-30 mm, hindw. 28 mm.

Material examined:

BMNH ♂, ♀ labelled "Bedford, S. Africa, McLachlan collection." (seen Pinhey, 1964). Bedford is in eastern Cape, north of Port Elizabeth.

NMB Short series, both sexes (incl. 1 pair in cop.) Palmiet Riv., below Howieson's Poort Dam, Grahamstown, SE Cape Prov. 8 X 1965 (F. M. Chutter); ♂ ♀ Kubusi Riv., 3 km from Stutterheim, King Williamstown Rd, E. Cape Prov., 29 XI 1973 (B. C. Wilmot).

RSM (K. J. Morton colln). 1 ♀ "King Williams' Town, eastern Cape, 4 I 1908 (Miss M. E. Fountaine)" (seen, Pinhey, 1964).

ZMH Syntype ♂ (seen, Pinhey, 1963); other ♂♂ ♀♀. From Cape (L. Krebs).

Distribution: From Southwest to eastern Cape Province.

Metacnemis angusta Selys

Selys, 1863: 162 (18 sep.) (Cap de Bonne Espérance); Selys, 1886: 135

The undesignated type ♀, from SW. Cape, was said to be in the Latreille collection, the Odonata section of which was incorporated in the Selys collection, but it is not now in *ISNB*. Dr G. Demoulin searched once again most diligently, in April 1979, but it could not be found at all.

Selys placed *angusta* in a separate group (2^{me} groupe) of *Metacnemis* to Hagen's

valida (1^{er} groupe), for its narrower wings, the petiole ending at the level of "1^{re} nervule antécubitale", instead of at the level of the 1st postcostal vein, almost directly below 1st Ax, in *valida*. Quadrilateral rather larger than in *valida*, with 3 cells between this and the nodus (4-5 cells in *valida*). 1st basal postcostal vein situated at level halfway between the two antecubitals.

He also said that *angusta* was distinct (from *valida*) through the pterostigma being strongly pointed distally; the robust build; the black abdominal dorsum, the unique form of the black humeral band and by the colour of the femora. The pterostigmata however, vary individually in shape in some of this group, for instance in *robusta*.

The venational differences given by Selys between *angusta* and *valida* are difficult to interpret without seeing the type ♀. He omits any reference to position of arculus relative to Ax. It is most unlikely that Selys would overlook such a prominent feature in his venational details and it seems reasonable to assume that the arculus was in the metacnemine position. The petiole, he said, terminates at the separation of the anal vein. In *valida*, *singularis*, *secundaris* and *robusta* his point of separation of the anal vein is well before Ac, this cross-vein being approximately below 1st Ax, or more distal in *secundaris* (from Legrand's figure). Selys' comparison of his two groups lay between a ♂ of *valida* and a ♀ *angusta*. The two sexes of Zygotera are not always readily compared for body length and robustness, which can differ in ♂ and ♀. Hindwing length is a useful guide for size, with *valida* 25 mm, *angusta* only 19 mm.

Here are the main points translated from Selys' description:

♀. A bronze-black transverse band between eyes across ocelli and vertex, an incomplete band behind occiput.

Prothoracic hindlobe contorted. A very broad black median band, approaching synthorax, widest dorsally, where it touches the humeral suture, followed by another parallel lateral band. Antehumeral stripe sharply oblique to humeral suture, ending halfway to 1st lateral suture. Legs yellowish; femora black exteriorly, and marked with some small round spots; tibiae blackish.

Wings rather tinted. Pterostigma olive-red, elongated, very oblique at distal end. Forewing with 11 Px.

Abdominal segments 1-7 bronze-black above; distal half of segment 8 with blue-grey sublanceolate dorsal fascia; 9 more or less similar; 10 all blue-grey.

Abd. (? with cerci) 25 mm, hindw. 19 mm.

During the 1964 visit to Europe Pinhey recorded notes on a very small ♀ in *BMNH* under *Metacnemis valida*, collected in the SW. Cape Province. It is quite possible that this ♀ is the only other known example of *angusta*, but it is even smaller (as noted, about the size of *Enallagma subfurcatum* Selys). Mr Peter Ward recently checked the metacnemine venation of this specimen (May 1979).

♀ (*BMNH*). Face pale reddish brown, postclypeus and frons black; head above reddish brown with broad black stripe across posterior ocelli and occipital zone.

Posterior lobe of prothorax rather like *singularis*, reduced centrally to a sharp median point and larger lateral flaps; small lateral tumours on middle lobe. Before the synthoracic plates a transverse fold, invaginated on anterior surface (like *singularis*). Synthorax mainly black, with incomplete narrow violet antehumeral stripe above lower two-thirds of humeral suture. Sides of thorax mainly pale, brownish yellow, with a broad black triangle on latero-ventral area. Femora black exteriorly, tibiae brown with black lateral stripe, tarsi brown.

Pterostigma light brown, between brown veins. Arculus at 2nd Ax. Quadrilateral

as in others of the genus. Forewing with 12-13 Px.

Dorsum of abdomen bronze-black. Segment 10 raised to a posterior point. Cerci cylindrical; ovipositor reaching end of segment 10.

Abd. 25,5 mm, hindw. 17,5 mm.

In many ways, including markings on head, thorax and abdomen, as well as size, this ♀ approximates Selys' description of *angusta*. The higher postnodal cross-vein number could easily be within the average range of such a species. The prothoracic hindlobe and the fold posterior to this is very similar to *singularis* but it is much more heavily marked on head and thorax. Until more material can be obtained it seems premature to attribute Neotype status to this *BMNH* specimen because of variable tendencies in the genus.

Material:

BMNH ♀ "Ceres, Cape Province, Nov. 1920 (R. E. Turner)". Ceres is in SW. Cape, NE. of Cape Town. (Seen, Pinhey, in 1964).

ISNB (Undesignated type ♀, Cape of Good Hope, apparently lost).

Distribution: only known in female sex from SW. Cape.

Metacnemis secundaris Aguesse

Aguesse, 1968: 656, fig. 4 (Madagascar)

This record was the first of the group from Madagascar. Holotype ♂, Beraty, Analalava region, West Madagascar, Dec. 1960. In Paris Museum. ♀ unrecorded. The specimen has not been examined for this review. Aguesse says the wing venation is similar to *M. singularis*. It differs, apparently, in colouration and in the male genitalia (which are shown by Aguesse, fig. 4: 1, 2, 4).

Aguesse, in his description, relies considerably on the figures he illustrated, without clearly defining all the features. The following extract is therefore only approximate:

♂. Face (from figure): labrum blue, postclypeus black; frons and vertex blue, with black bands between ocelli and at back of occiput.

Prothorax not mentioned. Synthorax (from figure) black to first lateral suture, with slender blue antehumeral stripe; lower sides pale blue with black stripe on second lateral suture. Legs black, femora pale interiorly.

Wings with venation said to resemble that of *M. singularis*, but Legrand kindly sent a reproduction of the holotype's venation of forewing and hindwing and the arculus is positioned only just basad of the 2nd Ax in fore- and hindwings, clearly in the metacnemine category. Pterostigma deep brown, smaller in forewing than in hindwing. Quadrilateral also smaller in forewing than in hindwing (as is generally the case). Forewing with 17 Px, hindwing 16,5 Px.

Abdominal segments 1-3 from figure: 1 black with blue lateral spots; 2 mainly blue, with irregular black basal stripe and large black distal macula; 3 blue dorsally, this colour tapering to and ending before end of segment, the rest black. Segments 4-5 like 3 but the blue area shorter; 6 black with small blue apical fascia; 7 all black; 8-10 all blue dorsally, black ventrally. Anal appendages black, inferiors as long as superiors. From the figure: superior appendage, laterally, thick, ending in a straight, oblique edge, the upper point acute, the lower forming a sharp subapical ventral tooth. Legrand says there is no basal tooth. Inferior appendage thick, tapering, rather sinuous, inturned apically. The figure of the prophallus shows no terminal filaments.

Abd. 30 mm, hindw. 22,5 mm.

As Aguesse remarks, the colour and markings are reminiscent of one of the Coenagrionidae.

Distribution. Only known from West Madagascar and the only true *Metacnemis* known outside Cape Province.

Mesocnemis singularis Karsch

Karsch, 1891: 67 (♂ Cameroun); Karsch, 1899: 167; Schmidt, 1951: 221 fig. 4; Pinhey, 1976: 534

Mesocnemis irregularis Karsch (ined.; nom. nud.); Martin, 1912: 98

Mesocnemis pruinosa Fraser, 1928: 129 (♂ ♀ eastern Uganda)

Holotype ♂ *singularis* from "Joachim Albrechtshöhe, Nord Kamerun (L. Conradt)" in *ZMH*. There is also a ♀ in *ZMH* from Kamerun (Tessmann).

Martin (1912) included a note on the unpublished, invalid name *irregularis*. Lectotype ♂ and allotype ♀ *pruinosa* are in *BMNH* from "Budama-Bunyoli districts, eastern Uganda, X 1927 (G. D. H. Carpenter)". Fraser's description and his figure of anal appendages are typical of *singularis* and Kimmins (1966), in his list of Fraser's types, confirms this synonymy.

There have been many records and a few descriptions of *singularis* over the years, some under *Metacnemis*, others *Mesocnemis*. It is not necessary to give a full description here but the main features and comparisons can be emphasized.

Pinhey, in *TMP* material (1951: 66) showed that the position of the arculus in relation to the antenodal cross-veins varied greatly and occasionally assumed the metacnemine position. The position is usually well before 2nd Ax, very rarely halfway between the two antenodals, but usually rather nearer to 2nd Ax; occasionally quite close to, or even at 2nd Ax.

In *NMB* material it is confirmed that the halfway position as well as the point of coincidence are rare conditions, occurring sometimes in one or two wings, hardly ever in all four.

Halfway position: ♂ Rusinga Isl., Uganda, III 1950 (right forew.); ♂ Que Que, Zimbabwe, X 1976 (both forewings).

At 2nd Ax: left hindw. (almost so, right hindw.), ♂ Chobe rapids, Kasane, IX 1974, ♂ and ♀ Mohembo, I 1970 (all Botswana); left hindw. (other 3 wings almost so), Chobe rapids IX 1974; left hindw., ♂ Ngoma, Kafue Nat. Park, Zambia, XI 1955; almost at 2nd Ax in one wing, ♂ Victoria Falls, IV 1962 and ♂ Deka-Zambezi Riv. confluence, Zimbabwe, XII 1964; in both hindw., ♂ Transvaal, I 1961; all four wings, ♂ Victoria Falls, I 1956.

From these few examples out of a long series (48 ♂, 28 ♀ examined) the metacnemine position is an occasional variant in both sexes in the southerly regions of this continent, and particularly some examples in the neighbourhood of the Victoria Falls and in the Okavango delta of NW. Botswana. This condition has not been found in the more tropical material in the collection. However the majority of specimens from Victoria Falls and the Okavango show the more normal position.

Differences. *Mesocnemis singularis* shows a number of differences from *Metacnemis valida*, apart from generic distinctions:

Wings. Slightly broader in *singularis* particularly at apex; pterostigma rhomboidal and greyer in adult (narrow in *valida*); arculus usually well before 2nd Ax (at 2nd Ax in *valida*); quadrilateral with distal edge more oblique, consequently longer, in

both wings; Ac at 1st Ax or frequently before it (after 1st Ax in *valida*).

Size. *M. singularis*, in a long series from different parts of Africa shows much variation in overall size, but these can be divided into those of average size (see below), and some which are smaller, either locally or scattered individuals: abd. 29-30 mm, hindw. 22-23 mm.

The smaller examples in *NMB* are either occasional specimens amongst those of average size in southerly regions: Botswana (♂ ♀), western Caprivi (♂), Victoria Falls (♂ ♀), Malawi (♂), Uganda (♀); or, most specimens in this collection from Cameroun (♂ ♀), Ivory Coast (♂) and Sierra Leone (♂). This suggests that equatorial west African populations might represent a smaller typical race, but larger collections from these territories would have to be examined. Undersized ones of the eastern or southern regions are merely dwarf tendencies.

In *NMB* there are only 4 ♂, 2 ♀ *valida*, which can scarcely be considered representatives for average size. Even with the addition of those known in other museums, there are insufficient for an exact comparison of size ranges with *singularis*. Nevertheless, direct comparison of males shows firstly, that the abdomen in *singularis* is distinctly more slender than in *valida*; and secondly, the abdomen is also longer in proportion to the wings in *singularis*.

NMB (males):

singularis (including dwarfs) abd. 29-33 mm, hindw. 22-27 mm.

average size, abd. 31-33 mm, hindw. 24-27 mm.

mean size abd. 32 mm, hindw. 25,5 mm.

valida (no dwarfs) abd. 29-31 mm, hindw. 25-26 mm.

mean size abd. 30 mm, hindw. 25,5 mm.

This indicates (for available material) that for unit length of hindwing, *singularis* has a slightly longer abdomen.

Just to complete this aspect of size the female range in this collection is as follows:

singularis (including dwarfs) abd. 27-31 mm, hindw. 23-27 mm.

valida abd. 29-30 mm, hindw. 28 mm.

Body and legs. ♂. Mature males are strongly pruinosed on head, thorax and abdomen (no pruinescence seen in any *valida*). Labium without black marking (broadly black in *valida*). Thorax masked at maturity by the bloom but juveniles and teneral show very little black marking, only a dorsal spot or a line on humeral suture, a stripe on 2nd lateral suture, so that they lack the strong contrast between thick black markings and coloured antehumeral bands in *valida*. Femora much less marked, with brown lines, and not broadly black. Abdomen in juveniles less marked with black or brown: segment 2 suffused with brown in basal half, with a broken black transverse crescent before distal end; some distal blackening on segments 3-6 (in *valida*, bluer, with similar but stronger black markings).

♀. Apart from the body being distinctly less robust in *singularis* the patterns are much reduced, compared with males, in both species, especially in *valida*. In *singularis* the pale brown thorax normally has a black mid-dorsal carinal stripe and fine sutural lines, absent in *valida*. Legs more distinctly marked with black. Abdomen darker.

In both species and both sexes segment 10, dorsally, has an invagination at distal end, (broader and shallower in ♀ *valida*), laterally fringed with denticles.

Hindlobe of prothorax very similar in both, but in *singularis* with short, narrow central extension; the dorsal mesothoracic structures before mesepisterna differ as

shown in figs. 2 and 7, in particular the transverse fold is more open and invaginated on its anterior surface, in *singularis*.

Schmidt (1951, fig. 4), and in his key to species (p. 221), emphasizes an oblique lateral slit, a "tiefer, schmaler Schrägeinschnitt", in the lateral lobes of the prothoracic hindlobe in *singularis*. These lobes are, however, normally entire, without the slit. The condition in the Cameroun ♀ he examined may have been due to uneven shrinkage on drying.

Appendages. ♂. Superior anal appendage much more acute apically, and both superior and inferior appendages are hollowed out on opposing faces (fig. 6); inferior appendage broader at base, than in *valida* (fig. 1). Prothallus (fig. 8) with terminal hooked structure (not shown by Schmidt) and a pair of long flagella, rather like *robusta* (fig. 5) and quite distinct from *valida* (fig. 3) which has a more compact head only shortly-bifid at apex.

♀. Cerci in both species short and thick. Ovipositor sheath very similar in both.

Ecological note. *M. singularis* frequents fast waters of rivers and streams. When staying at Jinja, Uganda, Nov. 1949, Pinhey encountered very large numbers of both sexes, some pairing, in unusually gregarious behaviour. They were settling on vegetation, chiefly on bushes overhanging the turbulent waters of the river close to its origin from Lake Victoria (the Victoria Nile source). It was possible to collect numerous specimens with one sweep of a net.

Material examined (NMB):

Specimens from Transvaal, Zimbabwe, Botswana, Caprivi, Zambia, Malawi, Shaba (Zaire), Angola, Uganda, Gabon, Central African Republic, Cameroun, Ivory Coast and Sierra Leone.

Distribution: Found over or close to swiftly flowing waters from Natal to east and west equatorial Africa.

Mesocnemis robusta (Selys) Stat nov.

Metacnemis robusta Selys, 1886: 135 (Nubia); Schmidt, 1951: 222 fig. 5; Ris, 1924: 275, 276, fig. 1

Holotype ♂ in *NMW* was kindly lent by Dr. A. Kaltenbach. It bears two labels, both handwritten: "Marno, Nubien, 1871" and "Metacnemis robusta Selys, Type". On lower surface of second label a later inscription "untersucht, F. Ris, 1924", evidently written by Ris when he examined this type. It is a small specimen and, despite its name, much less robust than Hagen's type species *valida*.

Type ♂ (mature). Mature, pruinose bluish white on head, thorax and abdomen. Labium ochraceous. Labrum, genae, front of orbit, and anteclypeus dull olive; postclypeus and head above blackish-brown or black but almost entirely masked by pruinescence.

Prothorax, and synthorax dorsally and most of sides also masked by pruinosity; the right mesepisternum has been punctured and part of the bloom scraped off, to reveal that the mesepisterna are probably not all black (probably bluish) below the pruinescence, in contrast to a thick black stripe at humeral suture which is partially visible on both sides. Sides of synthorax where pruinosity is less complete mainly greenish-yellow, and the following markings can just be detected on one side or the other: a black dorsal triangle on mesepimeron, a short dark stripe on 1st lateral suture ending in a small elliptical dark spot; below this traces can be seen of an

irregular brown band on metepisternum (possibly only a stain) and a large black dorsal spot on 2nd lateral suture (which may or may not continue as a black band on this suture, but obscured by white pruinescence). Sternites ochraceous with thinner pruinosity. Femora ochreous with thin pruinescence, but mid- and hind-femora darkened along posterior carina and at distal ends of these femora; tibiae browner, tarsi almost black.

Wings hyaline, narrower in proportion than in the larger *valida*. Venation brown; pterostigmata all of rather similar size and shape, the distal end extended to an acute upper distal angle; black. Arculus very slightly proximal to 2nd Ax, but at this point on left hindwing. Quadrilateral shorter in forewing than in hindwing, the lower distal angle moderately acute. Ac at level of 1st Ax or slightly before this; anal vein leaves margin well before Ac. Forewing with 14 Px, hindwing 13 Px, on both sides.

Abdominal segments 1-6 more or less coated with pruinosity, segments 8-10 less so, but probably well covered in life. The only visible markings on 1-6 are a small black lateral triangle at distal end of segment 2 and black distal transverse bands at ends of 3-6; there are faint indications of a broad dark dorsal band, divided by a fine pale mid-dorsal line on these segments, constricted before the distal band. Segment 7 with black dorsal and lateral longitudinal bands; 8-9 almost all pale bluish green, with basal black transverse line on 8; segment 10 probably also pale bluish, but with thick black basal band and the distal edge black. Dorsum of 10 at the end with very shallow median invagination, with denticles dorso-laterally.

Anal appendages (fig. 4) dark brown. Superior appendages rather divergent, tapering, with a thick, rounded, ventral tooth at base ending in a small fine point; inferior appendages much shorter, slightly excavated dorsally, the main stem narrowly conical but flattened dorsally, and with a large vertical dorso-basal, projection, ending in a fine, black double contact, and an anterior tumour. This inferior appendage is slightly reminiscent of the "hatchet-shaped" appendage in ♂ *Pseudagrion massaicum* Sjöstedt. Prothallus (fig. 5), at end of stem with an elongate ligula, followed by a short hooked process (not shown by Schmidt) and outside these, two long, curved flagella, all very like *singularis* (fig. 8).

Abd. (without appendages) 27,5 mm, hindw. 21,0 mm. (Ris records abd. 26,5, hindw. 20,5 mm.)

Ris (1924) describing the Odonata collected on the Werner expedition to Kordofan in 1914, provided some notes on other known specimens of *robusta*. These were, firstly, two males he had seen in *NRS*, which he said were "sehr alt und etwas defekt". However, one of these males was kindly loaned for examination and seemed to be in excellent condition except for the legs. Both were collected at Bahr el Abiad. A third male was stated to be in *ZSM* but Dr. Dierl was unable to find this in the State Museum, München. The only information available to Ris was that it was labelled Kitchener-Insel, and that it was strongly discoloured. Lastly, a teneral female platycnemidid collected during the Werner expedition at Sennar was considered by Ris to be this species. Dr. El Amin El Rayah (in litt. 16 IX 79) thinks Kitchener Island was a temporary island at the junction of the two Niles.

The Stockholm male recently examined bears the following labels: "(printed, on pale brown card) Bahr el Abiad; (similar card) Hedb.; (hand-written, white card) Metacnemis robusta Sel. (and printed) Det. Dr. F. Ris; (printed, red card) 333; (printed, green card) Riksmuseum Stockholm."

It is a strongly pruinose, mature ♂, closely similar to the holotype but, judging by venation and facial colour, it may be slightly more advanced in maturity.

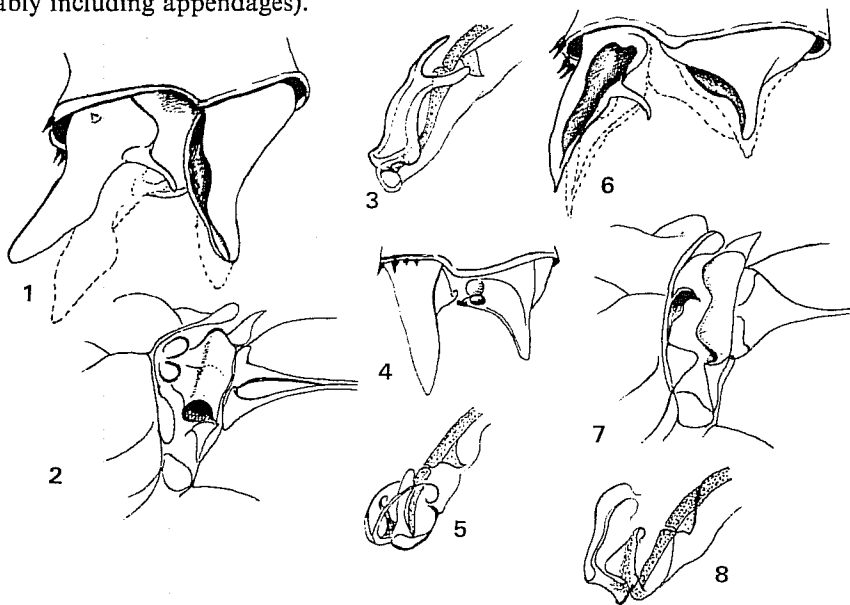
♂. Labrum more blackish-green, rest of face browner to black on postclypeus.

Most of postclypeus, entire head and orbits blue-white pruinose. Pro- and synthorax heavily pruinose. The left foreleg is complete just to end of tibia, the other legs have been lost beyond the trochanters. This fore femur is ochreous, black posteriorly; the tibia black, ochreous posteriorly.

Wings complete, hyaline. Venation darker than holotype, dark brown to black. Pterostigma black with paler centre; slightly longer at upper distal angle of hindwing than forewing. Quadrilateral normal. Arculus well before second Ax in both forewings (at threequarters of inter antenodal space from first Ax); only just before second Ax in both hindwings. However, as Ris had observed in this specimen, there is an extra demi-antennal in left forewing from costa to subcosta situated basad of normal first Ax. Ac at or just before first Ax except in this left forewing with the demi-Ax where it is well before first Ax. Forewings with 15 Px, hindwing 13 Px, both sides.

Abdomen segments 1-4 well pruinose, 5 faintly so, other segments with scarcely a trace of pruinosity. Segments 4-6 with dorsal black band, expanded on 7. Segments 8-10 pale greenish-ochreous (probably blue in life, or pruinose) and without markings except a black distal margin to 10, this black intruding at the shallow dorsal excision. Anal appendages and prophallus similar to holotype.

Abd. 27.5 mm, hindw. 21.0 mm, as in holotype (Ris differs with Abd. 28 mm, but probably including appendages).



- 1-3. *valida*: 1. ♂ right anal appendages (left ones in dotted outline) (Palmiet River, Cape); 2. ♀ hindlobe of prothorax and mesothoracic structures anterior to synthorax (Palmiet River); 3. ♂ prophallus, (Stutterheim).
4-5. type ♂ *robusta*: anal appendages and prophallus (Nubia).
6-8. *singularis*: 6. ♂ right anal appendages (left ones in dotted outline) (Angola); 7. ♀ hindlobe of prothorax and mesothoracic structures anterior to synthorax (Uganda); 8. ♂ prophallus (Cameroun).

Of the second ♂ in *NRS*, Ris said the wings on one side were removed and placed in Canada balsam on a slide in order to reproduce them photographically (Ris, fig. 1). The arculus is well proximal to second Ax in forewing (as in the ♂ described above) and slightly more proximal in hindwing than in the above ♂.

♀ (Sennar). Ris described this specimen as a freshly emerged teneral specimen, with crumpled wings, preserved in alcohol. Venation very like the Stockholm males. The one characteristic Ris could discern was a rounded median projection on hindlobe of prothorax. Abd. (segm. 1-6 only) 18 mm, hindw. 22 mm.

The variation in position of the arculus induced Ris to say on p. 276: "Damit würde die Art aus Gattung *Metacnemis* fallen und der Karsch'schen Gattung *Meso-cnemis* zuzuteilen sein". This belief in generic synonymy, however, did not take into account the prophalline characters.

Material:

NMW Holotype ♂, Marno, Nubia (examined for this review); 1 ♀, Sennar, on Blue Nile, SE. of Khartoum, Sudan, 13° 30' N, 33° 30' E, 26 Febr. 1914.

NRS 2♂ (one examined for review), Bahr el Abiad (= White Nile), south of Khartoum, Sudan, ca 12° 00' N, 32° 47' E.

ZSM 1 ♂, Kitchener Island, Sudan (now apparently lost).

Distribution. The locality Marno has not been traced. "Nubia" was variously used as a vague region in earlier centuries but probably refers here to the northern areas of the Sudan. In this case, all the few known specimens were collected in Sudan.

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