
Occasional Papers
of the
National Museums of Rhodesia

No. 29B

A REVISION OF THE GENUS
CHLOROCNEMIS SELYS (ODONATA)

by ELLIOT PINHEY
(National Museum, Bulawayo)

CONTENTS

Acknowledgements	209
Introduction	209
Generic characters	210
Analysis of specific characters	211
Tandem linkage	218
Sub-groups	218
Distribution	219
Coloration	227
Systematic revision (and keys)	228
Summary	258
References	259
Index	260

Acknowledgements

The author is indebted to the following museums where facilities were given for working on this genus: Berlin Museum; British Museum (Natural History); Brussels Museum (De Selys collection) and Parc National; Paris Museum; Tervuren. R. M. Gambles, D. E. Kimmins, Dr. C. H. McCleery, Dr. E. S. Ross, J. A. Whellan, C. M. White and others have assisted with material or information. The late Dr. F. C. Fraser helped with information and critical opinion.

One of the most useful sources of information on this genus is Dr. Eric Schmidt's 1951 paper, indispensable for many details.

INTRODUCTION

Examination of the material in the National Museum, Bulawayo, has resulted in the discovery of new forms and subspecies and the lowering of the status in certain cases from species to subspecies.

The species of this genus may now be listed as follows:

- Type-species *C. elongata* (Hagen) Selys
C. abbotti (Calvert)
C. pauli Longfield

- C. wittei* Fraser
C. marshalli Ris
C. marshalli f. *impedita* forma nov.
C. marshalli *superba* Schmidt; ♀ described here
C. montana St. Quentin
C. montana *maccleeryi* subsp. nov.
Chlorocnemis spec. (single female, Malawi)
C. nigripes Selys
? *C. nigripes* *williamsoni* Martin
C. nigripes *semlikiensis* subsp. nov.
C. nigripes f. *coeruleocauda* forma (or subsp.) nov.
C. contraria Schmidt
C. flavipennis Selys. ♀ also described here
C. nubilipennis Karsch
C. nubilipennis *rossii* subsp. nov.

Generic Characters

The investigation has shown that there is considerable uniformity in the group, especially in characters relating to the synthorax, the wings and the anal appendages. It has further indicated that the generic diagnosis in the author's catalogue (1962: 103) requires some modification:

1. The prothorax of the female in all examples studied has stylets (or cornua, as Gambles, 1967, calls them). Because of the uniformity of male appendages in all known species of the genus it is obvious that tandem linkage, utilising stylets, must be more or less of the same pattern. Stylets must therefore be present in the unknown females of the typical *montana* and races of *nubilipennis* (assuming that the suggested female of *pauli* is correctly placed).

The correct prothoracic character in the female is, therefore, that stylets are present.

2. Although the wings of teneral or juvenile males are generally clear, hyaline, in the mature male the wings are *always* either saffronated or deeply amber.
3. "Anal vein leaves margin at or slightly distal to Ac": in many cases this vein leaves the margin *well distal* to Ac; sometimes closer to the cross-vein or at it. Under descriptions in the survey of the species in this paper there will be examples of the very distal origin in various species in the National Museum, Bulawayo.

In notes recorded from the examination of other collections there are examples in which the vein leaves the margin at Ac:

nigripes from Beni and elsewhere in Ituri Forest (Congo); *marshalli* from Mashonaland (Rhodesia); *abbotti* from Tanzania; *nubilipennis* (teste Fraser); and slightly distal to Ac: *elongata* from West Africa (locality not recorded); *abbotti* from Kilimanjaro region and from Amani (Tanzania); *nigripes* from Bwamba

Forest (W. Uganda) and (teste Fraser) the type *williamsoni*; *marshalli*, some Rhodesian specimens; *flavipennis* (teste Fraser).

The allusions to Fraser are from correspondence.

The generic diagnosis should therefore read: "Anal vein variable and leaves margin at Ac, slightly or well distal to it."

4. "IA short, only extending 1 or 2 cellules beyond quadrilateral." The normal extent is exactly *one* cellule beyond the quadrilateral. In fact it is quite a reliable guide in quick identification if this extent of the anal vein is examined in African *Coenagrionidae*.

The rectangular shape of the quadrilateral, as well as the slender body shape, are indications that a specimen may be a *Chlorocnemis*. If the anal vein reaches one cellule distal to the quadrilateral it may then be considered a member of this genus.

If, again, the wings of a male African coenagrionid are decidedly yellow or amber it can always be assumed that it is probably a *Chlorocnemis* and then wing venation will decide this. It is, in fact, one of the easier genera to recognise. Its sylvan habits are also characteristic. They are only found in forest or patches of thick bush; frequently montane, but not necessarily so.

Cowley (1936) considered that it might be more correctly placed in *Platycnemididae* instead of *Protoneuridae* and discussed it in the "Disparoneura—complex". The species are so distinctive that only on two occasions have members of the genus been originally placed in error in *Disparoneura*, namely *abbotti* and *oculata* (the latter now only a synonymic name).

Selys originally placed two species, *elongata*, the type-species, and *flavipennis* in this genus (1863, *Bull. Acad. Belg. (2)* 16: 176-7). Another nine were described by various authors but as indicated above these are not all distinct species. In fact the genus is prone to subspeciation.

Analysis of Specific Characters

As in most if not all *Zygoptera* the male may be considered the definitive sex. The females have less distinctive features except for the prothoracic stylets. Even these are not always easily distinguished because of the general uniformity of the male anal appendages and consequently the contact points on the female prothorax in tandem linkage.

The various characters may be divided into those which are more or less invariable and thus of little value for purposes of identification; and the variable characters which can be used for separation of species or individuals of infra-specific rank.

1. More or less invariable structures

- (a) *Mandibles* (fig. 7b, *C. marshalli* f. *impedita* ♂). These are rather more complex than in the genus *Pseudagrion* Selys (*vide* Pinhey, 1964: 168 fig. E). The distal apices have triple teeth, one of them more powerful. There is also a pair of posterior teeth, separated from each other on a broad cutting edge and placed more dorsally

on the inner margin of each mandible. The broad base of the mandible has an angle on its inner face and a posterior lateral projection, possibly for muscular attachment.

- (b) *Labium*. Creamy white at base, dark brown on the feeding appendages and the outer half of the labium. In *flavipennis* the brown invades the base and there may be lesser variations in other species depending on the state of maturation.
- (c) *Postclypeus and genae*. Uniformly black in mature specimens, except for occasional dots (*vide elongata*).
- (d) *Synthoracic black pattern*. The width of the coloured antehumeral stripe is very variable in the genus but the black always extends downwards to the first lateral suture. In a few it reaches just below this suture and is connected by a dorsal streak to a black band always present to a greater or lesser extent on the second lateral suture.
- (e) *Tibiae and tarsi*. Normally black or brown, sometimes with some yellow or blue on the tibiae but not differentially important. The femora, black posteriorly, have a more variable pattern of colour on the anterior surfaces and may help in sex recognition.
- (f) *Wing colours*. Mature males always have yellow or amber wings. Immature males and females have clear wings but sometimes the female may also develop yellow or amber like the male but to a lesser extent. The venation is black or dark brown. The pterostigma brown, occasionally reddish brown; generally a parallelogram or nearly a rectangle; sometimes rhomboidal. The shape is, at least in some species, variable, and also varies in fore- and hindwing. Whether, for instance, it is a *definite* character in *contraria* (rhomboidal) (*vide* Gambles, 1967) will depend on the examination of long series.
- (g) *Anal vein*. This generally leaves the margin well distal to Ac. Variation may be found in a single specimen, so that it is not a definitive feature.
- (h) *Anal appendages*. In colour these may vary from black to partly or completely orange or yellow. In form they are remarkably constant. The superior appendage is short but broad and has a large ventro-apical hook. Sub-basally it has a powerful inner ventral tooth. The inferior appendage is broad at the base, slender in the outer half, with a consequently smaller apical dorsal hook; the appendage being as long as or a fraction longer than the superior appendage. In *montana maccleeryi* there is an inner dorsal tooth, one-third from base, which opposes the larger tooth of the superior. In other species this tooth on the inferior is reduced to a mere swelling. The appendages are, in fact, highly characteristic of the genus but, apart from colour, they are of no specific value. It is possible that the inferior is slightly longer in proportion to the superior in some than in others. Because of the

curvature of the appendages and the base partly hidden in segment 10 it would be necessary to extract entire appendages of a number of individuals to ascertain if there is any real or only an apparent specific difference.

2. Variable features

These include the patterns on the labrum; frons; vertex; prothorax; antehumeral stripe; femora (probably less important although Schmidt uses them in his 1951 key); abdominal markings; appendages. In structure there are the prothoracic stylets and peneal characters. Some of these features may be tabulated:

(a) Head and thorax (δ) (Table a)

Under *nigripes* the possible races *williamsoni* and *semlikiensis* will be omitted here for reasons apparent under their descriptions.

Identification features here lie in the labrum, whether blue, yellow or black. Also the frontal band width and whether broken or not. This *can* be a variant, however. The orange (sometimes blue) vertex maculae are probably male sex identification colours in the *nigripes* group. In this group again the prothorax of the male is most distinctive. The breadth of the antehumeral is important but can be variable, especially in *nigripes*, in which obviously other characters are dominant.

(b) Abdomen (Table b)

Male abdominal patterns probably have significance in recognition by the female. In *wittei*, *marshalli*, *nigripes* and *contraria* there is a broad band on segment 2 and in the last two there are more extensive markings on segments 3-5. Segments 9-10 are generally broadly coloured, but segment 8 is only extensively coloured in *marshalli* (not *superba*), *nigripes* and *contraria*. It appears that abdominal pattern does not indicate close relationship.

(c) Appendages and prothorax (Table c)

The colour of the appendages may be used in sexual recognition. There are variations as mentioned later, especially under *nigripes*.

The peneal terminal filament shows significant differences but may not be helpful in showing clear affinities. In *abbotti*, *marshalli*, *flavipennis* and *rossii* it is long, strap-like, although in other characters these are evidently not closely allied. The sword-shaped filament of *superba* is near that of *marshalli*, and *nigripes* and *contraria* are obviously similar and closely related. The short filament of *elongata*, and apparently *nubilipennis* (not examined by the present author), again shows an inconsistency. The peculiar form in both races of *montana* and of *pauli* place these, on peneal features, far apart from the rest.

In the female stylets, moderately uniform, because of the uniformity in male anal appendages, the variation in the stylets is significant and is useful in the female key (infra).

(a) HEAD AND THORAX

Species	Labrum	Pale Band on Frons	Vertex	Prothorax		Antehumeral stripe
				Collar	Remainder Pale Spots	
<i>elongata</i>	black	narrow	black	yellow	—	narrow
<i>abbotti</i>	black	narrow	black	yellow	dots	narrow
<i>pauli</i>	black small triangles	narrow	black	blue	—	broad
<i>wittet</i>	black	narrowish	black	blue	—	broad
<i>marshalli</i>	black	very broad	black	blue	spots and post. lobe	very broad
<i>m. impedita</i>	blue	broad	black	blue	spots and post. lobe	broad
<i>m. superba</i>	blue	very broad	black	blue	spots	very broad
<i>montana</i>	blue	narrow	black	yellow	spots	narrow
<i>m. maccleeryi</i>	yellow	narrow	black	yellow	spots	narrow
<i>nigripes</i>	black	narrow, broken	black	yellow	all yellow	wide and narrow
<i>m. lecanida</i>	black	narrow, broken	orange maculae	yellow	all yellow	wide and narrow
<i>contraria</i>	black	narrow, broken	blue maculae	yellow	all yellow	wide and narrow
<i>flavipennis</i>	black	narrow, broken	orange maculae	yellow	spots	very narrow
<i>nubilipennis</i>	black	narrow, broken	black	yellow	—	very narrow
<i>n. rossii</i>	black	narrow	black	yellow	—	very narrow

(b) DORSAL MARKINGS ON ABDOMINAL SEGMENTS (♂)

(Shades of colour not considered. Yellow can mean orange)

Species	2		3	4-5		6-7		8	9	10
	<i>elongata</i>	yellow stripe	—	basal	—	—	—	—	—	broad yellow
<i>abbotti</i>	yellow club	—	basal	—	—	—	—	—	broad yellow	broad yellow
<i>pauli</i>	blue club	—	basal	—	—	—	—	—	broad blue	broad blue
<i>wittet</i>	broad blue	—	basal	—	—	—	—	—	yellow dot	yellow spot
<i>marshalli</i>	broad blue	—	blue triangle	—	—	basal	—	—	all blue	all blue
<i>m. impedita</i>	broad blue	—	blue triangle	—	—	basal	—	—	all blue	all blue
<i>m. superba</i>	broad blue	—	basal	—	—	basal	—	—	all blue	all blue
<i>montana</i>	yellow streak	—	basal	—	—	—	—	—	broad yellow	all yellow
<i>m. maccleeryi</i>	yellow streak	—	basal	—	—	—	—	—	broad yellow	all yellow
<i>nigripes</i>	broad blue	—	broad blue	—	—	—	—	—	all yellow	all yellow
<i>n. coeruleocanada</i>	broad blue	—	broad blue	—	—	—	—	—	all yellow	all yellow
<i>contraria</i>	yellow band	—	broad yellow	—	—	6 yellow	—	—	broad yellow	yellow spot
<i>flavipennis</i>	fine yellow	—	—	—	—	7 basal	—	—	yellow bar	yellow
<i>nubilipennis</i>	fine yellow	—	—	—	—	—	—	—	yellow bar	yellow
<i>n. rossii</i>	trace	—	—	—	—	—	—	—	yellow bar	yellow

(c) APPENDAGES (♂), PROTHORACIC STYLETS (♀)
 (The ♀ for *pauli* is assumed to be this species. No ♀ known for typical *montana*, nor races of *nubilipennis*.)

Species	Superior App.	Inferior App.	Penal Filament	Anterior Stylet	Posterior Stylet
<i>elongata</i>	yellow	yellow	Triangular	long, narrow	short, triangular
<i>abbottii</i>	yellow	yellow	slender, with	short triangle	long strap
<i>pauli</i>	yellow	black	apical flange	broad	short
<i>wittiei</i>	black	black	long, slender	short square	short
<i>n. superba</i>	black	black	sword-shaped	short triangle	short
<i>montana</i>	black	black	chopper-shaped	short triangle	short
<i>n. macclueri</i>	yellow	yellow	broad, truncate	triangle	—
<i>utripacis</i>	yellow	black	broad, truncate	broad	broad, short strap
<i>contraria</i>	black	black	long strap	narrow	short, broad
<i>flavipennis</i>	black	black	short (Schmidti)	small, narrow	broad strap
<i>nubilipennis</i>	yellow	—	long strap	—	—
<i>n. rossii</i>	yellow	—	—	yellow, short,	yellow, short
(<i>Cholo</i> ?)	—	—	—	cup-like	—

ELLIOT PINHEY

(d) THE ORIGINS OF R_5 AND IR₂

Species	Number Examined	R_5		Origins in Forewing		Average
		R_5	Average	IR ₂	Average	
<i>elongata</i>	1	6, 6	6	8, 8, 8, 9, 9, 9, 9	8	
<i>abbottii</i>	4	5, 5, 6, 6, 6, 7, 7, 7	6.3	8, 8, 8, 9, 9	8-6	
<i>pauli</i>	3	6, 7, 7, 7, 7, 8, 8	7.1	8, 10, 10, 10, 10, 11, 11	8-1	
<i>wittiei</i>	4	6, 7, 7, 7, 7, 8, 8, 8	7.4	9, 10, 10, 10, 10, 11, 11	10-0	
<i>n. impudica</i>	4	6, 6, 7, 7, 7, 8, 8, 8	7.1	9, 10, 10, 10, 10, 11, 11	10-0	
<i>n. superba</i>	3	6, 6, 6, 6, 7, 8, 8	6.5	9, 9, 10, 10, 11	9-7	
<i>n. macclueri</i>	4	7, 7, 7, 7, 7, 7, 7, 8	7.1	9, 9, 9, 9, 10, 10, 10	9-6	
<i>utripacis</i>	4	6, 6, 6, 6, 6, 7, 7, 7	6.4	9, 9, 9, 10, 11	9-1	
<i>n. senilis</i>	3	6, 6, 6, 6, 6, 6, 7, 7	6.8	8, 8, 8, 8, 8, 9, 9	9-5	
<i>n. conrulkencauda</i>	2	6, 6, 6, 6, 6, 6, 6, 7	6.1	9, 9, 10, 10, 10, 11	8-3	
<i>contraria</i>	2	6, 6, 7, 7, 7, 7	6.7	8, 8, 9, 9	8-8	
<i>flavipennis</i>	2	5, 6, 6, 6	5.0	—	8-5	
<i>nubilipennis</i>	1	3, 3	—	—	6-0	

(d) *Venation* (Table d)

Another feature examined was the point of origins of veins: Vein R_{4+5} . Usually at subnodus (in the single *elongata* in the National Museum it is slightly before). In *abbotti*, *pauli*, *wittei*, *impedita*, *superba* and *maccleeryi* it is at or rarely just before subnodus. In *impedita*, *maccleeryi* and *nigripes* it is occasionally well before subnodus; and in one *nigripes* it is even just distal to the subnodus.

The origins of R_3 and IR_2 may be tabulated for the selected few that were examined:

The last species, *nubilipennis rossii*, has such low figures for these positions because of its small size and only 10-11 Px. On the other hand the small *nigripes semlikiensis* has very much the same figures as the larger *flavipennis*, *pauli* and *elongata* (the latter a single example). *C. wittei* and *marshalli impedita* have high figures. Yet not much can really be learnt from these comparisons.

It may be mentioned that in one forewing of a *montana maccleeryi* ♂ IR_3 rises almost coincidentally with R_{4+5} . Nearly the same occurs in another example of this and in a *marshalli*.

The previous table which is concerned, among other characters, with anal appendages and stylets, leads on now to a consideration of the probable method of tandem linkage in this genus.

Tandem Linkage (see also under *C. abbotti*)

The uniformity of the anal appendages of the male indicates that there should be some stability in the linkage factors on the female prothorax. The appendages have been described above and they are considered further under each species.

The prothoracic stylets consist of anterior and posterior pairs. The anteriors are directed anteriorly or vertically, sometimes divergent apically. The posteriors are connected to the anteriors by a fine stem and are directed posteriorly and generally convergently at apices. Below the back of the prothorax there is a pair of contact plates termed *pits* in this paper. The mesostigmal lamina has a pair of tumours, flattened, usually turned slightly posteriorly at apices and having a depression in front of each. All these must evidently come into play during the link-up.

The superiors must lock with their apical hooks on to the mesostigmal tumours, probably catching the turned-back apices. The ventral teeth of the superiors must make contact with the pits; the apical hook of the inferiors with the anterior stylets. These anterior stylets are often depressed in the centre. Thus, there is a double lock: apices of the superiors; and the counter-action of the teeth and the inferiors.

Sub-groups of the Genus

Four groups can be discerned from (a) wing-colour, (b) the tabulated features (supra). The first three groups have yellow wings in the mature male, the fourth amber wings in the male and probably in all females.

Group A. ELONGATA group

including species *elongata*, *abbotti*, *pauli*, *wittei*.

In this group the labrum is black; frontal band narrow; vertex all black; segments 3-8 of the abdomen with sparse markings. This group links with the next one.

Group B. MARSHALLI group

including species *marshalli*, *montana*.

Labrum blue or yellow; frontal band often very broad, sometimes narrow; vertex black; segments 3 and 8 sometimes with distinctive markings; segments 9-10 all blue or all yellow dorsally.

Group C. NIGRIPES group

including *nigripes*, *contraria*.

Labrum black; frontal band narrow, broken; vertex with orange maculae; segments 3-5 and 9 broadly blue or yellow.

Group D. FLAVIPENNIS group

including *flavipennis*, *nubilipennis*.

Apart from the distinctively amber wings: labrum black; frontal band narrow or broken; vertex black; 3-8 practically unmarked. Moreover the thorax is blacker than in the other groups.

Distribution (see maps)

Chlorocnemis are generally found in heavy forest, often of the "Urwald" pattern, frequently on mountain slopes. *C. nigripes* generally seems to prefer the lower elevations, in the present author's experience. The southern race of *marshalli* may sometimes be in montane forest but quite often in thick patches of bush, which may perhaps be the denuded remnants of former forests.

Their striking colours are well displayed as they fly into shafts of sunlight or along the fringe of a forest. The author has observed *nigripes* holding its abdomen nearly vertical in flight and having the appearance of a highly-coloured tipulid fly.

The known distribution extends northwards from Rhodesia to East Africa and from Angola and Barotseland northwards through the Congos to Nigeria and thence westwards to Sierra Leone. Apparently no records are available from the mountain forests of Ethiopia.

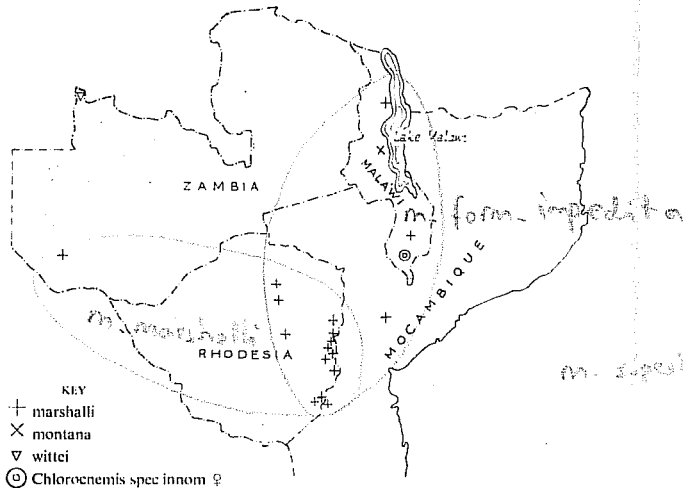
From records available to the present author the distribution is as follows:

Rhodesia

C. marshalli marshalli: Mazoe 17°6 S., 30°57 E.; Risitu River and Chimanimani Mountains 19°45 S., 33°8 E.; Chirinda Forest and Chikore Mission 20°25 S., 32°37 E.

forma *impedita*: Ingorima Reserve 18°15 S., 32°45 E.; Honde Gorge 18°30 S., 33°0 E.; Penhalonga 18°59 S., 32°30 E.; Cashel 19°30 S.,

32°45' E.; Chimanimani Mountains 19°45' S., 33°8' E.; Umtali (mountain kloofs) and Vumba Mountains 19°0' S., 32°30' E.; Mazoe 17°6' S., 30°57' E.; Calgary Farm 17°40' S., 31°5' E.; Mount Wedza, south of Marandellas 18°42' S., 31°37' E.



Map 1. Malawi, Mozambique, Rhodesia, Zambia

Mozambique

C. marshalli marshalli: Busi River, Espungabera 20°29' S., 32°40' E.
forma impedita: Mount Gorongoza 18°25' S., 34°0' E.

Zambia

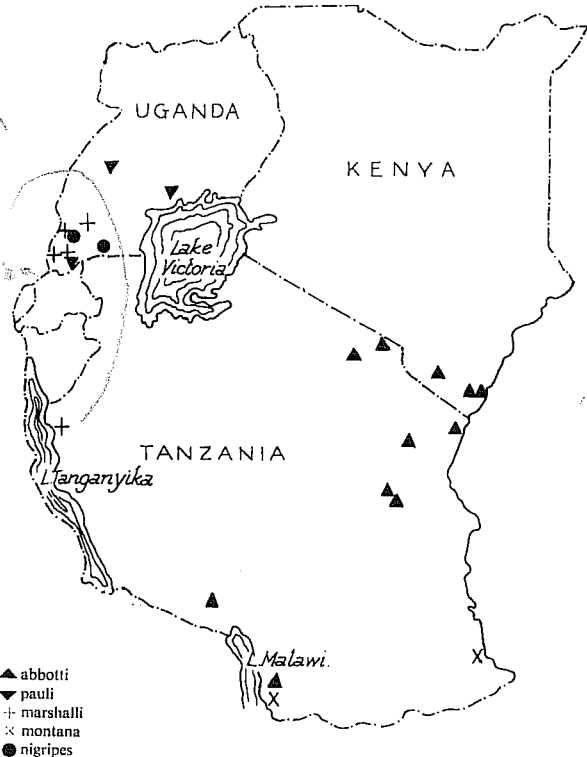
C. marshalli marshalli: Sefula River, September 1963, Barotseland 15°20' S., 23°15' E. This seems an unlikely area and more material must be sought in that locality.
C. wittei: North Mwinilunga 11°22' S., 24°28' E.

Malawi

C. marshalli f. impedita: Zomba Plateau 15°26' S., 35°15' E.; Mkuwadzi Forest 11°31' S., 34°14' E.
C. montana maccleeryi: Nchisi Forest 12°55' S., 34°15' E.
Chlorocnemis spec. innom.: Cholo Mountain 16°0' S., 35°5' E.

Tanzania

C. montana montana: Lupembeberg, Matengo Highlands circa 11°0' S., 35°0' E.; Liparamba, near Nindi (? Lindi) 10°0' S., 39°42' E.
C. abbotti: Langenburg 9°15' S., 33°38' E.; Kimboza Forest 6°47' S., 37°49' E.; Turiani 6°20' S., 37°30' E.; Kigonsera 10°48' S., 35°5' E.; Gonja Forest 5°20' S., 38°0' E.; Amani 5°5' S., 39°0' E.; New Moshi 3°30' S., 36°28' E.; Mount Kilimanjaro 3°4' S., 37°21' E.
C. marshalli ? superba: Ntale River 5°0' S., 29°51' E.



Map 2. Kenya, Tanzania, Uganda

Kenya

C. abbotti: Tiwi (Tewe) and Shimba Hills 4°10' S., 39°29' E.; Teita Hills 3°50' S., 38°40' E.

Angola

C. nigripes (vide Gambles, 1967: locality not stated but probably N. Angola, circa 6° S.).

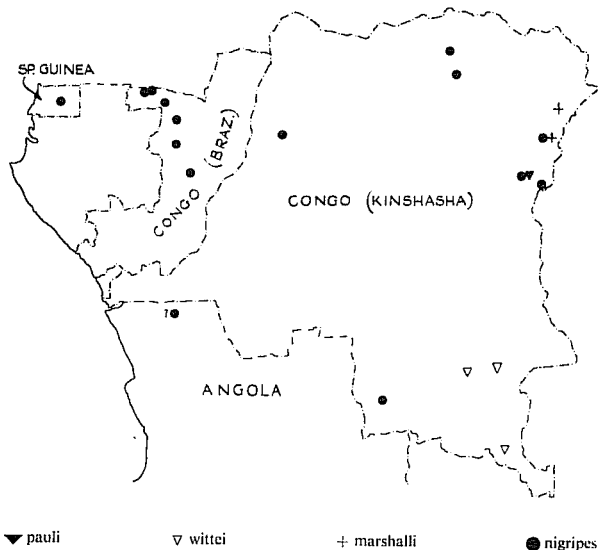
Congo (Kinshasha)

C. wittei: Kamitungulu—Lusinga 8°30' S., 26°20' E.; Mitwaba escarpment 8°34' S., 27°33' E.; Tumbwe 11°30' S., 27°25' E.

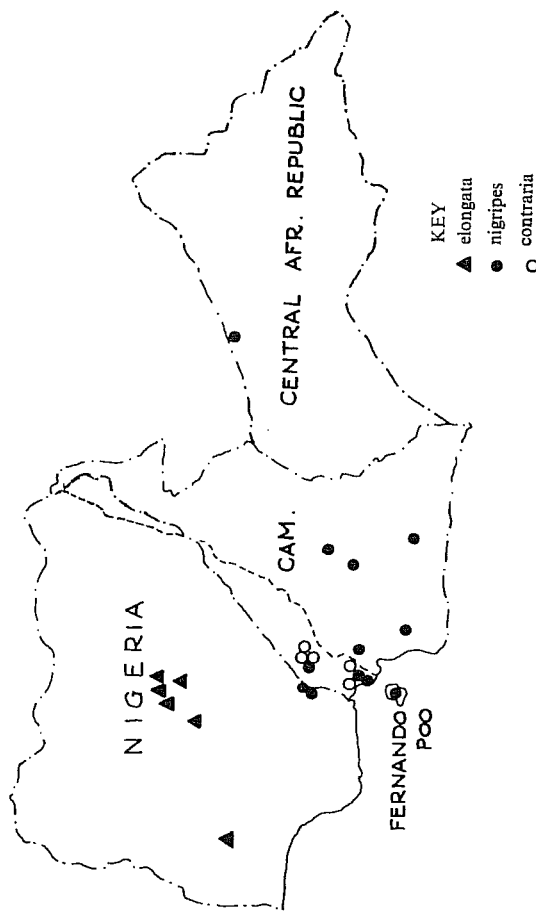
C. pauli: Mawambi—Ukaiiti, circa 1°0' S., 28°40' E.

C. marshalli superba: Beni 0°28' N., 29°29' E.; Mt. Hoyo 1°19' N., 29°52' E.

C. nigripes: Beni 0°28' N., 29°29' E.; Bambesa 3°28' N., 25°44' E.; Flandria 0°23' S., 19°5' E.; Zobe (? Zobia) 2°59' N., 25°55' E.; Mawambi 1°0' N., 28°40' E.; Moera 0°38' N., 29°32' E.; Sandoa 9°38' S., 22°57' E.



Map 3. Angola, Congo (Brazzaville and Kinshasha), Spanish Guinea (Rio Muni) (locality in Angola not known)



Map 4. Cameroons, Central African Republic, Fernando Poo, Nigeria

Uganda

C. pauli: Kamengo Forest 0°20' N., 32°34' E.; Kibale Forest 0°48' N., 31°05' E.; ? Kayonza Forest 1°15' S., 30°0' E.

C. marshalli superba: Kayonza Forest and Isasha Gorge 1°15' S., 30°0' E.; Kalinzu Forest 0°37' S., 30°40' E.; ? Bwamba Forest (requires checking) 0°40' N., 30°0' E.

C. nigripes: Bwamba Forest 0°40' N., 30°0' E.; Bugoma Forest 1°20' N., 31°0' E.

Congo (Brazzaville)

C. nigripes: Ketta and Mekoum Forests circa 2°0' S., 14°0' E.; Etoumbi Forest 0°0' S., 15°0' E.; Kelle Forest (? not found on maps available); Mayombe M'Vouti circa 1°0' S., 15°30' E.; Sembe Forest 1°40' N., 14°30' E.

Central African Republic

C. nigripes: Bébi, Boukoko (? Bebo) 8°28' N., 17°17' E.

Cameroons

C. nigripes: Lomié 3°5' N., 13°40' E.; Lolodorf 3°10' N., 10°42' E.; Nyong River circa 4°35' N., 10°0' E.; Mt. Cameroon 4°13' N., 9°10' E.; Barombi Station (not found, probably near Mt. Cameroon); Ntaali Mountain 5°40' N., 9°16' E.; Ganda-Sundi 4°52' S., 12°52' E.; Makaia N'Tete 5°33' S., 13°2' E.

C. contraria: Ekona-Bavinga, Mt. Cameroon 4°13' N., 9°10' E.; Kumba, on slopes of Mt. Cameroon; Dechang, Ntaali Mountain and Widekum all near Mamfe 5°43' N., 9°16' E.

Spanish Guinea

C. nigripes: (vide Martin, 1907).

Fernando Poo

C. nigripes: 3°30' N., 8°30' E.

Nigeria

C. elongata: Gambles' records are: near Jal (3,500 ft.) Plat. Prov., 9°37' N., 8°39½' E.; Jemaa Forest (2,000 ft.) Kagoro River 9°32' N., 8°23' E. and Jemaa River 9°31½' N., 8°21' E.; 28 miles N. of Wamba (2,000 ft.) Plat. Prov., 9°20' N., 8°37' E.; 31 miles W. of Keffi (1,600 ft.), Niger Prov., 9°3' N., 7°32' E.; Erinmo (1,200 ft.) 8 miles E. of Ilesha, Ondo Prov., 7°37' N., 4°51' E.

C. nigripes: Ajassor and Ikom 5°30' N., 9°0' E.

Togo

C. elongata: ? Bismarckburg 8°11' N., 0°40' E.

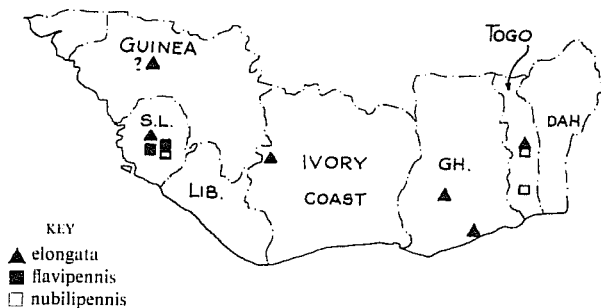
C. nubilipennis: Bismarckburg 8°11' N., 0°40' E.; Misahöhe 6°56' N., 0°37' E.

Ghana

C. elongata: Accra (in B.M.N.H.) 5°29' N., 0°13' W.; Ashanti ("inepta", vide Neville), 7°20' N., 1°30' W.

Ivory Coast

C. elongata (?): ? Mt. Nimba 7°37' N., 8°24' E.



Map 5. Ghana, Guinea, Ivory Coast, Sierra Leone, Togo (localities in Guinea and Sierra Leone not exact)

Sierra Leone

C. elongata (in B.M.N.H.).

C. flavipennis: Loma Forest and elsewhere.

C. nubilipennis rossii (locality not cited on label).

Guinea (olim G.fr.)

C. elongata (vide Martin, 1915).

These localities may be summarised in tabular form. See page 226.

From this table now it is seen that in the southern part of the continent only single species are recorded from Rhodesia and Mozambique, two from Zambia, three from Malawi.

In East Africa, Tanzania has three species, Kenya only one, Angola has only one record and so have the West African regions Ghana and Ivory Coast. Togo has two and Sierra Leone has three species. Cameroons has two; Spanish Guinea and Fernando Poo, one each.

Uganda has as many as three, Nigeria apparently only two, although some Cameroon records border on Eastern Nigeria. Congo (Kinshasha), again, has four, Congo (Brazzaville) apparently only one.

DISTRIBUTIONAL TABLE

Species and Races	Rhodesia	Mocambique	Zambia	Malawi	Tanzania	Kenya	Angola	Congo (Kinsh.)	Uganda	Congo (Braz.)	C.A.R.	Cameroon	Span. Guinea	Fernando Po	Nigeria	Togo	Ghana	Ivory Coast	Sierra Leone	Guinea	No. of Territories	
<i>elongata</i> ..																					9	
<i>e. abboti</i> ..																						2
<i>pauli</i> ..																						2
<i>wittet</i> ..																						3
<i>marshalli</i> ..																						3
<i>n. superba</i> ..																						1
<i>montana</i> ..																						1
<i>n. paraceryfi</i> ..																						1
<i>nigripes</i> ..																						1
<i>contraria</i> ..																						9
<i>flavipennis</i> ..																						1
<i>nubilipennis</i> ..																						1
<i>n. rossii</i> ..																						1
No. of spp.	1	1	2	3	3	1	1	4	3	1	1	2	1	1	2	2	1	1	3	1	1	

The most restricted species are *contraria* and *flavipennis*; possibly also *nubilipennis* and *rossii* are distinct species (*vide infra*).

By far the most widespread species from the table are *nigripes*, *marshalli* and *elongata*.

Coloration

The author has a few notes on colours in life. The compound eye is generally banded horizontally. Pale markings in males:

abboti, frontal stripe yellowish green; antehumeral stripe pale green; prothoracic collar, abdominal segments 9-10 and appendages bright orange.

wittet, frontal stripe pale blue; prothorax pale blue; antehumeral and sides of thorax pale blue; abdomen sky blue.

marshalli, eye dark blue above, pale blue below, labrum, frons, prothorax, synthorax, base of abdomen sky blue; segments 8-10 pale blue or violet blue.

nigripes, vertex with deep orange markings; prothorax, ventral end of antehumeral stripe, end segments of abdomen, superior appendages deep orange; frontal band, most of the antehumeral stripe and the sides of the thorax pale green; abdominal segments 2-5 sky blue. Eye black above, whitish below, with a greenish white horizontal band.

contraria, only that the dorsum of thorax and abdomen had vermilion markings.

In sexual identification those with blue labrum or broad frontal bands in males, as well as markings on abdomen and whether the superior is yellow, may be recognition marks for the female. The orange vertex spots in *nigripes* group are probably effective. Abdominal markings on the female are so often evanescent that recognition characters are difficult to assess.

Teneral examples and colour changes (preserved specimens). In those with blue antehumeral stripes these and perhaps the abdominal blue are among the first distinctive colour markings to appear in teneral. Facial markings are slow. Abdominal basal colours and the fully black thoracic zones develop more slowly, but the colour pattern on the terminal segments may appear early. In teneral the wings of all males (except perhaps the flavipennis group?) are clear and the anal appendages are much paler, often quite yellow, even if they are black at maturity.

In older males the wing yellow colours appear, sometimes even in females. In aged males the black markings on head and abdomen may increase and reduce the mature colour boundaries.

Teneral to juvenile *marshalli* ♂♂ have labrum and frontal band more pale blue but developed; antehumeral stripe blue; thoracic black developed in pattern, the stripe on second suture brown; abdominal blue all developed; superior appendage yellowish at base, inferior brown. In teneral ♀ the markings are similarly developed but stylets are brown, not black, and segment 9 is more extensively blue than in adult.

The same development applies to teneral or juvenile ♂ *nigripes*, even

the orange patches are present; superior and inferior appendages yellow. In teneral ♀ *nigripes* the stylets are already dark brown, and other markings developed as in the male.

In very teneral ♂ *abbotti* the markings are generally more yellowish but the antehumeral stripe is already distinct and blue.

Teneral/juvenile ♂ *wittei* have the general markings developed; antehumerals blue; abdomen as dark as adult but anal appendages both yellow.

In teneral ♂ *montana maccleeryi* the labrum, postclypeus and segments 9-10 are all pale; antehumerals blue-green.

However, in the most teneral specimens, as in, probably, most Odonata, very little darkening is yet visible, as in the *abbotti* above. In a very teneral ♀ *nigripes* the labrum, postclypeus and frons are all yellow; but the antehumerals are blue and of the correct shape. In two ♂♂ *nigripes* f. *coeruleocauda* in similar conditions the face and frons are yellow; vertex pale brown without visible maculae; prothorax brown, the collar and lower sides yellowish; synthorax brown to first lateral suture, with blue antehumerals; blue between this zone and the brown stripe on second suture. Pterostigma pale brown; abdomen brown with the pattern faint but violetish; anal appendages quite yellow.

SYSTEMATIC REVISION

A key can be made out readily enough for the male species and major subspecies (the Bwamba race of *nigripes* virtually only a small form and so will be excluded from the key). A female key must necessarily be less complete and, of course, *nubilipennis* ♀ is evidently unrecorded. The ♀ *pauli* is uncertain and there is at present an unnamed Malawi ♀.

KEY to male *Chlorocnemis*

1. Pale frontal band severed medially; vertex with large blue or yellow lateral spots 2
- Pale frontal band continuous between compound eyes; vertex all black 4
2. Prothorax with yellow collar and separate central spots, posterior lobe mainly black. Antehumeral stripes only slightly broader ventrally. Dorsal markings on basal half of abdomen yellow; segment 6 with yellow band *contraria* Schmidt
- Prothorax nearly all pale coloured dorsally, in continuous band. Antehumeral stripes much broadened ventrally. Dorsal markings on base of abdomen blue; segment 6 all black 3
3. Pale markings of vertex, prothorax, antehumeral stripes and end of abdomen yellow *nigripes nigripes* Selys
- These pale markings blue *nigripes coeruleocauda* subsp. nov.
4. Wings deeply amber. Abdominal segments 3-5 all black 5
- Wings pale yellow to greenish yellow. Abdominal segments 3-5 with at least some pale markings 6

5. Without pale stripe on frons. Amber on wings deeper in apical half *flavipennis* Selys
- Frons with narrow yellow band. Amber on wings paler near apex *nubilipennis* Karsch
6. Labrum all black or with only small blue spots 7
- Labrum mainly blue or yellow 10
7. Segment 2 with narrow yellow longitudinal line; inferior appendage yellow or mainly yellow. Second lateral suture on thorax with continuous black band 8
- Segment 2 with broad blue markings; inferior black or mainly black. Second suture with diffuse or incomplete band 9
8. Frontal band and antehumeral stripe yellow. Pterostigma rectangular. Prothorax without yellow central dots *elongata* (Hagen) Selys
- Frontal band and antehumeral green. Pterostigma usually rhomboidal. Prothorax with twin yellow dots *abbotti* Calvert
9. Segment 2 with a blue club or arrow-head; segment 9 yellow dorsally; superior appendage yellow *pauli* Longfield
- Segment 2 with very broad blue pentagonal spot; segment 9 all black; superior black or mainly black *wittei* Fraser
10. Superior and inferior appendages black; segments 9-10 blue dorsally. Prothoracic collar blue 11
- Appendages yellow; segments 9-10 dorsally yellow or black and yellow. Collar yellow *montana* St. Quentin
11. Frontal band blue to antennal level. Segments 2-8 extensively marked with blue dorsally *marshalli marshalli* Ris
- Frontal band reaching ocellar level. Segments 3-8 not extensively blue dorsally, at most with basal traces *marshalli superba* Schmidt

KEY to female *Chlorocnemis*

1. Labrum at least partially blue. Frontal band broadly blue 2
- Labrum quite black at maturity 3
2. Labrum partly black. Stylets all or mainly black *marshalli* Ris
- Labrum all blue. Stylets bright yellow *Chlorocnemis* sp. (Cholo, Malawi)
3. Prothoracic collar blue; frontal band broadly blue *marshalli superba* Schmidt
- Prothoracic collar yellow; frontal band narrow, normally green or yellow 4
4. Posterior stylet long, much longer than broad. Frontal stripe complete 5
- Posterior stylet short 6

5. Wings clear hyaline or pale yellow. Prothoracic collar plain yellow
 — Wings mainly amber. Prothoracic collar black-edged anteriorly
 flavipennis Selys
6. Frontal band complete or only severed by much less than diameter of anterior ocellus 7
 — Frontal band widely severed in middle by at least the diameter of the ocellus 10
7. Anterior stylet triangular; sub-prothoracic pits very large. Segment 9 with a yellow mushroom or T-spot
 montana macleeryi subsp. nov.
 — Anterior stylet broad, not triangular; the pit usually small. Segment 9 with at most a streak or spot 8
8. Anterior stylets elongated to an acute outer upper angle and divergent. Synthoracic black reaching below first lateral suture
 nigripes Selys
 — Anterior stylets ribbon-like, not angled outwards 9
9. Antehumeral stripe very narrow greenish or yellowish
 elongata Selys
 — Antehumeral stripe moderately broad, blue *wittei* Fraser
10. Synthoracic black just reaching first lateral suture
 ? pauli Longfield
 — Synthoracic black reaching below this suture 11
11. Prothoracic collar not black-edged in front. Anterior stylet broad
 nigripes Selys
 — Prothoracic collar black-edged. Anterior stylet narrow
 contraria Schmidt

ELONGATA GROUP

CHLOROCNEMIS ELONGATA (Hagen) Selys (Fig. 6)

Hagen, in Selys, 1863, *Bull. Acad. Belg.* (2) 16: 175; Pinhey 1962: 103.

This is the type species described from Togoland and known now from Ghana (British Museum, Natural History), Mt. Nimba, Ivory Coast (Fraser) (but only a female) and Nigeria (leg. Gambles). Martin's record (1915) from Moshi, Tanzania (*vide* Pinhey 1962), was surely *abboti* Calvert, which is here considered distinct from *elongata*. A male, examined by the author, described by Schmidt (1951) is in Berlin Museum.

Type ♂ in Museum of Comparative Zoology, Harvard.
Male (Nigeria). Face and head black; postclypeus with two minute yellow dots which probably disappear in older specimens; an orange yellow transverse band from eye to eye across frons (fig. 6).
 Prothorax black dorsally except a yellow anterior collar and an evanescent yellow lateral dot on posterior lobe. Synthorax black to first lateral suture with narrow yellow or orange antehumeral stripe. Sides green to yellow with black band on second lateral suture.

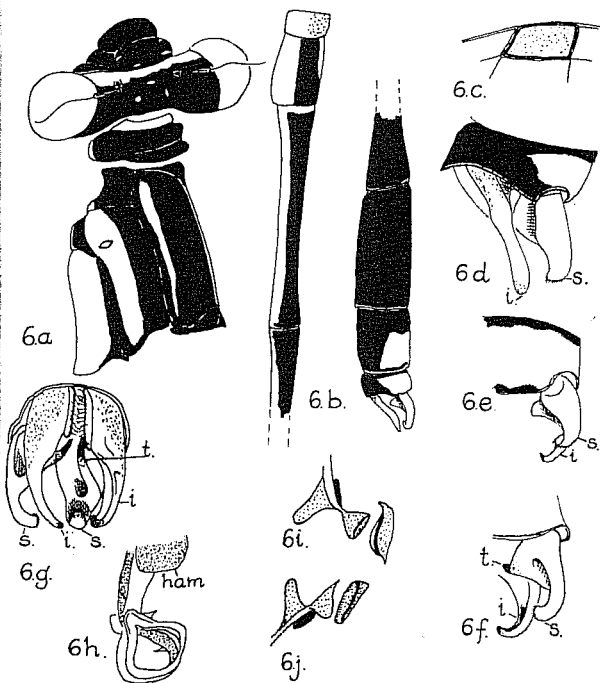


Fig. 6. *C. elongata*
 a. head and thorax ♂ (from left); b. abdomen ♂, segments 1-4, 7-10 (from left); c. pterostigma ♂, right forewing; d. anal appendages ♂ (from left); e. right appendages (dorsally); f. right appendages (more obliquely); g. appendages (ventrally); h. penaeal lobe (from right); i, j. left hamule, stylets (from left) and right stylets (dorsally).
 i inferior appendage, s superior appendage, t ventral tooth.

Femora yellow or orange with brown exterior streak above the knee; tibiae brown, yellow interiorly, tarsi brown. Wings greenish yellow, the brown pterostigma almost a parallelogram in all wings. 15 Px. Anal vein usually leaves margin distal to Ac.

Abdomen dorsally dark brown to black, with sparse yellow markings; mid-dorsal yellow stripe on basal two-thirds of segment 2, small basal

spots on 3, a broad orange-yellow saddle on distal two-thirds of 9 and most of 10 (differing slightly from *abbotti*, and rather like *flavipennis*).

Anal appendages orange-yellow, the inferiors brown at base. Superior with yellow inward apical hook; and a powerful inner ventral tooth with curved black apex. Inferiors broad at base, slender and incurved in apical half, ending in a black, bevelled contact edge. Peneal lobe with triangular terminal process.

Abdomen 41 mm., hindwing 23.5 mm.

This male, in the National Museum, was collected by Gambles in the Jemaa Forest, Kagoro River, Northern Nigeria. The male in Berlin Museum is smaller: abdomen 39 mm., hindwing 22 mm.

Gambles also kindly lent a female from Jemaa Forest.

Female. Labrum, face and head black except for a narrow complete greenish yellow frontal band.

Prothorax black with yellow collar (black at lateral ends) and yellow sublaterally. Stylets black, the anteriors narrow, divergent, the posteriors short, broadly triangular. Subthoracic pits normal. Synthoracic black reaching slightly below first lateral suture at dorsal third, but not quite reaching this level in the ventral two-thirds. The yellow antehumeral stripe is very narrow, clubbed at the ventral end. Sides greenish yellow with a complete black band on second suture.

Base of legs and the hind femora yellow, with distal brown externally on the femora. More brown on the other legs.

Wings clear hyaline. Pterostigma elongate, slightly longer in forewing than in hindwing. Forewing with 14-15 Px. Anal vein leaves the margin well distad of Ac in all wings.

Abdomen dorsally blackish. Segment 1 greenish yellow laterally; segment 2 with greenish yellow dorsal stripe, tapering on basal two-thirds. Segment 3 with basal annulus; 4-7 all black, segment 8 with a yellow distal spot and sublateral band; segment 9 with an inverted yellow T-spot (as in *montana macleeryi*), and a large lateral fascia; 10 and cerci black.

Abdomen 30.5 mm., hindwing 21 mm.

Schmidt's illustration of a female shows just a narrow stripe instead of a T on segment 9. His measurements are: abdomen 34-38 mm., hindwing 21-25 mm.

CHLOROCNEMIS ABBOTTI (Calvert) (Fig. 7)

Disparoneura abbotti Calvert, 1892. *Trans. Amer. ent. Soc.* 19: 164; Pinhey, 1962: 103.

Chlorocnemis inepta Grünberg (Karsch MS.), 1902. *Sher. Ges. naturf. Freunde Berl.* 9: 233.

C. abbotti was described from the vicinity of Mt. Kilimanjaro, *inepta* from Langenburg on the north-east side of Lake Malawi, in Tanzania. Apart from some Kenya coast records, Teita Hills, Tiwi and Shimba Hills (the latter erroneously referred to *flavipennis*, vide Pinhey, 1961: 18), all certain localities for *abbotti* have been in Tanzania. Neville (1960) recorded *inepta* from Ghana but this must surely have been *elongata*.

It seems that *abbotti*, because of distinct peneal and female stylet differences, cannot be regarded as the East African race of *elongata*. Grünberg (1903: 706 teste Schmidt, 1951) said he could detect no differences between *abbotti* and *inepta*; and he and others (Fraser, in correspondence, September 1950) considered *abbotti* to be conspecific with

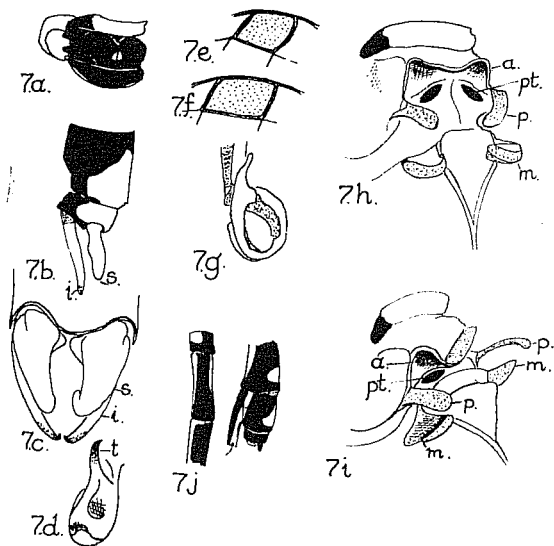


Fig. 7. *C. abbotti*

a, prothorax ♂; b, terminal segments ♂ (from left); c, appendages (dorsally); d, right superior appendage (ventrally); e-f, pterostigma ♂, right forewing, Amani and Kimboza; g, peneal lobe (from right); h, prothorax ♀ (dorsally); i, idem (from left); j, abdomen ♀ (Kimboza). Segments 1-3, 8-10 (from left), a, p, anterior and posterior stylets, pt, pits; n, mesostigmal tubercle.

elongata. Fraser again, in correspondence, 19th February, 1954, said *abbotti* was supposed to differ in having the frontal band broken, but that this feature was variable in series of *elongata* (teste Grünberg). The present author finds that this band is usually complete in *abbotti*. A month later, Fraser, 4th March, 1954, said he considered *abbotti* must be distinct from *elongata* because of the peneal difference. So it is advisable, despite some

variation and similarities in other respects, to regard them as distinct or perhaps transitional to distinct speciation.

It may be added that the type *inepta* was a juvenile, with clear hyaline wings, but the forewing was aberrant venationally: more like *Isomecocnemis subnodalis* according to Fraser (in the February letter). The hindwings and other characters are typical of *Chlorocnemis*.

Type ♂ *abbotti* in U.S. National Museum; type ♂, ♀ *inepta* in Berlin Museum.

Male (East Usambara Mountains) differs from *elongata* as follows: Smaller on an average. Frontal band green. Prothoracic collar yellow but black at lateral edge; twin yellow dots on middle lobe. Femora black with only a yellow inner basal stripe. Pterostigma rhomboidal. Forewing with 13-16 Px.

Abdominal segment 1 broadly black dorsally; segment 9 with broad yellow distal triangle instead of a trapezoidal saddle. The superior anal appendage has an inner ventral flange which is a little more basal and terminates in a long tooth curving apically. Penaeal lobe with a long curved slender terminal process, unlike the triangular flap of *elongata*.

A male from Gonja Forest, Pare Mountains, has the rhomboidal pterostigma, but males from Kimboza Forest on the eastern slopes of the Uluguru Mountains further south have sometimes a more rectangular pterostigma, sometimes a rhomboid. *Pterostigmal shape* is evidently variable.

Female (Kimboza Forest). Similar to the male on head and synthorax. The prothorax lacks the twin yellow central dots. The posterior stylets are strap-like, turned posterior and inwards (fig. 7i). The anterior stylets are slightly sunken and are fused to the middle lobe of the prothorax. The mesostigmal tubercles are shallow cups.

Abdomen with a short yellow dorsal line on segment 2, a distal yellow spot on 8th and a more triangular one on the 9th. The sublateral yellow markings on 8th-10th segments and on the ovipositor sheaths vary individually in Kimboza and Amani females.

The wings may be clear hyaline in the *just* mature stage but they then become nearly as strongly yellow as in the male.

Abdomen ♂ 34-40 mm., ♀ 32-36 mm., hindwing ♂ 21.5-25 mm., ♀ 21.5-24 mm.

Sjöstedt (1909) described a female from Mt. Kilimanjaro: prothoracic collar and sides yellow. The stylets long, slender, weakly arched posteriorly; the posteriors somewhat convergent, rounded at apices. Segment 9 with a T-shaped yellowish spot, 10 black.

Abdomen ♂ 36-38 mm., ♀ 38 mm., hindwing ♂ 24-26 mm., ♀ 26 mm.

Tandem linkage. Presumably the superior appendage locks between the mesepisternal tubercle and the posterior stylet. Below the anterior stylet, in fact just under the back of the prothorax there are two elliptical, rather concave pits which seem to be obvious contact surfaces, present in this and other species of the genus. It would appear that the ventral tooth of the superior finds the appropriate left or right contact pit. The inferior

appendage would make contact on the anterior stylet. The locking mechanism would be a double action fit: inferior appendage pinching against upward thrust of the ventral spine of the superior; the main branch of the superior locking under the posterior stylet and held there by the mesepisternal tubercle.

CHLOROCNEMIS PAULI Longfield (Fig. 8)

Longfield, 1936, *Trans. R. ent. Soc. Lond.* 85: 470, 495; Pinhey, 1962: 104. Described from Uganda, and so far only known from Uganda and the Congo border.

Type ♂ (examined by the author), in British Museum, as well as 5 paratype ♂♂ and 2 paratype ♀♀ (labelled in pencil).

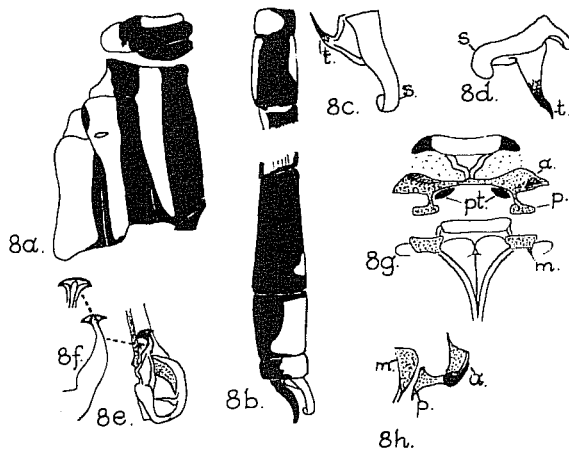


Fig. 8. *C. pauli*
a, thorax ♂; b, abdomen ♂, segments 1-2, 8-10 (from left); c, superior appendage; d, right superior (posterior view); e, penaeal lobe (from right); f, terminal process of penaeal lobe and its apex; g-h ? prothoracic stylets ♀ (dorsally and from right).

Male (Kamengo Forest, near Kampala). This species only differs in certain respects from *abbotti* and *elongata* and comparative notes will be adequate. The labrum may have two small pale blue sub-basal triangles but these disappear in older specimens. Frontal band complete; distinctly blue.

Prothorax all black above except the prothoracic collar which is blue,

the lateral angles black. Antehumeral stripe blue, narrow dorsally but widened to half the mesepisternum ventrally. Sides of thorax blue with black stripe on second suture.

Femora and tibiae all blue on anterior surfaces.

Wings as in *elongata*, the pterostigma as shown in that species or rhomboidal. 13-14 Px in forewing. Anal vein usually leaves margin well distal to Ac.

Segment 2 with blue, clavate band on basal two-thirds which expands to a club posteriorly. Basal blue annuli on 3-4 or 3-5. Segment 8 with a small distal bluish spot; 9-10 broadly bluish dorsally. Superior appendage on inner surface.

Penal lobe with a long tapering terminal process, ending in a two-angled blade.

Abdomen 36 mm., hindwing 22 mm.

Miss Longfield's holotype was slightly larger, the abdomen 37.5 mm. It was from the Kibale Forest nearly 200 miles north of Kamengo by road. The pterostigma was described as almost square. The type series also indicated presence or absence of blue dots on the labrum.

A possible female of this species, hitherto unknown in this sex, is represented in the National Museum:

Female (Kayonza Forest, Kigezi, May 1957, T. H. E. Jackson). Face and head all black except a greenish yellow frontal band which is severed in the middle for a distance of about a fifth of the width of the postclypeus. Prothorax black dorsally, yellow sub-laterally, with yellow anterior collar (black at lateral angles); centre of median lobe yellow. Anterior stylet raised, curved to a posterior angle; posterior stylet short and broad. Mesepisternal tubercle moderately broad. Synthorax black to first lateral suture; antehumeral stripe blue-green; narrow, slightly wider ventrally. A broad black stripe on second lateral suture.

Legs black, yellow at bases.

Wings clear hyaline. Pterostigma elongated as in *elongata*. Forewing with 16 Px. Anal vein leaves margin well distal to Ac.

Abdominal segment 1 dark brown dorsally, yellow laterally; 2 with long yellow mid-dorsal line for three-quarters of the segment; 3-6 with basal annulus; a small yellow distal dot on 8, the rest black dorsally.

Cerci black.

Abdomen 35 mm., hindwing 34 mm.

In general features this female is very like *nigripes* and it cannot be definitely placed as *pauli*.

CHLOROCNEMIS WITTEI Fraser (Fig. 9)

Fraser, 1955, *Mission de witte, Parc nat. Upemba* 38 (1): 7.

Chlorocnemis lascellesi Pinhey, 1961, *Occ. Pap. Rhodesi-Livingstone Mus.* 14: 14, fig. 5.

Fraser's description was based on a male type which had the five end segments of the abdomen missing. This type, labelled "Kamitungulu-

Lusinga affluence, Upemba" is in the Parcs Nationaux, Bruxelles, and has been examined by the author. The type male of *lascellesi*, from North Mwinilunga District, North-west Zambia, in the National Museum, Bulawayo, agrees essentially with the damaged *wittei*; and females of *lascellesi* have also been collected by the author at Mwinilunga.

Male (Mwinilunga). Head and thorax very like *pauli*. Face and head black with complete pale blue band across frons. Prothorax with pale blue collar, black at lateral angles. Synthorax similar but with a slightly broader pale blue antehumeral band, about as wide as half the mesepisternum.

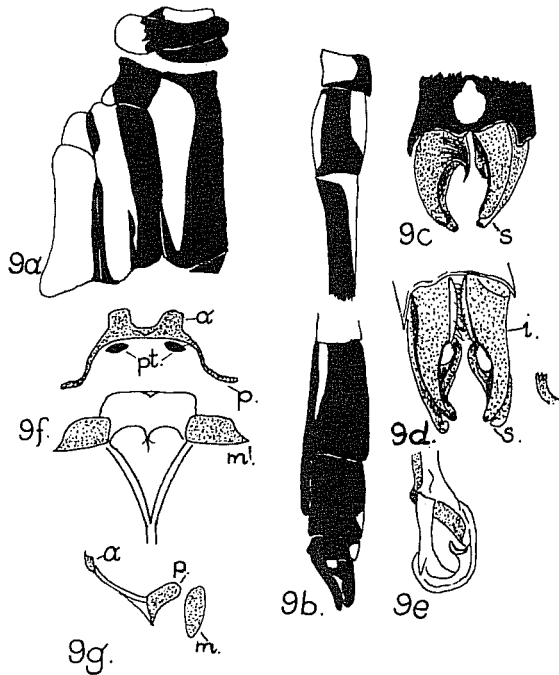


Fig. 9. *C. wittei*
a. thorax ♂; b. abdomen ♂, segments 1-3, 8-10; c. anal appendages (dorsally);
d. idem (ventrally) and apex of tooth on superior; e. penal lobe (from right);
f-g. prothoracic stylets ♀ (dorsally and laterally).

Legs black, yellowish at base, hind femora with yellow anterior stripe (more whitish in type).

Wings clear hyaline in teneral and juveniles, greenish yellow as in previous species at maturity. Pterostigma of forewing a short parallelogram or a rhombus. Forewing with 14-15 Px (18 in type). Anal vein usually leaves the margin distally to Ac.

Abdominal segment 1 mainly whitish, brown dorsally; segment 2 with a broad pen nib-shaped blue patch, pentagonal in outline; 3 with a basal blue triangle; 4 with small blue basal triangle, 5-7 with small basal blue spot. A minute yellow distal dot on 9th segment, sometimes on 10th. Appendages black, the superior slightly yellow just at the apex. Superior with a ventro-basal black tooth.

Penal lobe with terminal process obtuse.

Abdomen 37-38 mm., hindwing 22.5-26 mm.

In some males the antehumeral stripe is broader than the above specimen; at the ventral end covering nearly three-quarters of the mesepisternum. The dorsal blue patch on segment 2 has a slight distal prolongation almost reaching the distal end of this segment. Segment 9 has a distal blue diamond and segment 10 a circular blue mid-dorsal spot. Possibly these specimens, although they have yellow wings, are slightly younger than the other male.

In a teneral male with clear wings the pale spot on 9 is faint, but on 10 it is well developed; the superior and inferior are yellowish.

Female. Frons with the stripe green. Prothorax coloured as in male. Anterior stylet a vertically directed flap; posterior stylet short (for this stylet) direct posteriad, not inwards. Mesepisternal tumour large. Synthorax as in male but the antehumeral stripe paler and less broad. Black stripe on second suture obsolete in lower two-thirds.

Legs as in male. Wings clear hyaline even at full maturity.

Abdomen segment 1 as in male; 2nd segment with narrow bluish dorsal stripe on basal half. Segments 3-6 with basal annuli; 8 with short mid-dorsal distal streak; 9 with pale streak on basal three-quarters. Segment 10 and cerci black.

The markings on segments 8 and 9 are sometimes faint, at least in preserved specimens.

Abdomen 38 mm., hindwing 24-26 mm.

One teneral male is from Mitwaba Escarpment (Katanga).

MARSHALLI GROUP

CHLOROCNEMIS MARSHALLI Ris (Fig. 10)

Ris 1921, *Ann. S. Afr. Mus.* 18: 291; Pinhey 1962: 104.

Described from Mazoe to the north of Salisbury, Rhodesia, this species has since been found in several parts of Rhodesia, as well as Mozambique and Malawi, but there are evidently two forms or possible subspecies here. It is further evident that *C. superba* Schmidt is an equatorial subspecies of *marshalli*, as was suggested previously (Pinhey, 1961: 17). The female

marshalli was described by Fraser (1928: 128) from Zomba (*vide f. impedita*, infra). Type ♂ in British Museum (N.H.).

Nominotypical subspecies:

Male (Chikore, near Mt. Selinda). Labrum all pale blue; frons and vertex, between the eyes, pale blue as far posteriorly as the anterior ocellus. Head otherwise black dorsally.

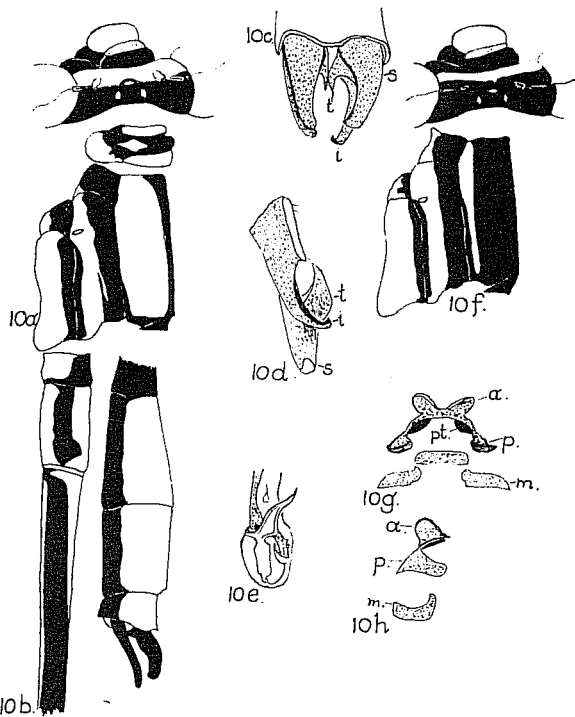


Fig. 10. *C. marshalli marshalli*. a, head and thorax ♂; b, abdomen ♂, segments 1-3, 8-10; c, anal appendages ♂ (dorsally); d, right inferior and superior (ventrally); e, penal lobe (from right); f, head and thorax ♀; g-h, stylets ♀ (dorsally and from left).

Prothorax with collar blue, except lateral angles; hindlobe pale and two large blue spots on middle lobe. Synthorax black to first lateral suture with very broad blue antehumeral band covering almost all of the mesepisternum. A broad, continuous black band on second lateral suture.

Legs black, femora mainly blue on anterior surfaces.

Wings as yellow as in previous males, hyaline in very teneral condition. Pterostigma a long or short parallelogram occasionally veering towards a rhombus. Forewing with 16-17 Px. Anal vein leaving margin at or distal to Ac.

Abdominal segment 1 black dorsally; segment 2 with a broad blue band right along but constricted before distal end; 3 with a long blue basal triangle; 4 with small basal triangle; segments 5-7 with small blue basal spots; 8-10 all blue above. Anal appendages all black above and laterally, but paler on apical hook of superior. Superior with long broad black sub-basal tooth.

Penaeal lobe with a long tapering terminal process, constricted at base.

Abdomen 37.5-40 mm., hindwing 24.5-25 mm.

The very wide frontal and antehumeral bands distinguish this subspecies and this development is seen also in very teneral examples.

Apart from the type locality, Mazoe, the National Museum has examples from the South Melssetter area of Rhodesia: Chimanimani Mountains: Chirinda Forest, Mt. Selinda; Chikore Mission; and just over the border from Mt. Selinda, on the Busi River below Espungabera in Mozambique; also an example from Barotseland, Zambia: Sefula River (a somewhat unlikely locality: Mr. C. M. White says it is in a plain near a mission called Sefula).

Female (Busi River, in copula). Labrum greenish white, marked with traces of black at base. Narrow green frontal stripe.

Prothorax with greenish yellow collar, otherwise black dorsally, cream at sides. Stylets black. Anterior stylet triangular, pressed against median lobe; posterior stylet short, turned inwards. Mesepisternal tubercle moderate. Antehumeral stripe narrow, blue, widened ventrally; a continuous black stripe on second lateral suture.

Femora yellow on anterior surfaces.

Wings hyaline or paler yellow than male.

Abdominal segment 2 with a green dorsal line on basal two-thirds; 3 with a basal annulus, 4 and 5 with basal trace; segment 8 with a broad green distal triangle. Abdomen dorsally otherwise black.

Abdomen 35-38 mm., hindwing 24 mm.

In a Chimanimani Mountains female the labrum is all green.

The stylets are all black in the Busi River female but in a Chimanimani female the anterior stylets are yellow on the distal half. In teneral examples parts of the stylets and the upper part of the mesepisternal tubercle may be rather yellow, so that the Chimanimani specimen is probably not fully mature.

Another female is from Nyamadzi River, Sabi Valley.

CHLOROCNEMIS MARSHALLI f. IMPEDITA forma nov. (Fig. 11)

This form differs from typical *marshalli* in a few constant features.

Male (Vumba). Labrum all blue but frontal band narrower in the central portion: it reaches the base of the antennae but not the anterior ocellus; laterally, on the orbital lobes, it is as wide as in typical *marshalli*. Antehumeral stripe broad and blue, wider ventrally, but not as broad as in the typical form.

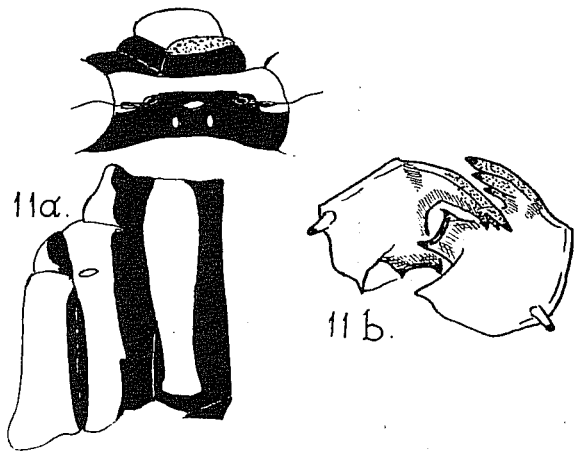


Fig. 11. *C. marshalli* forma *impedita*
a. head and thorax ♂; b. right and left mandibles (ventrally), the triple distal apices dotted (a ♂ example).

Teneral males show the same differences.

A male from Mt. Wedza, south of Marandellas, is a variation slightly inclined towards true *marshalli* by the possession of two blue spots between frontal band and anterior ocellus. In other respects it is typical of *impedita*. Another from the same locality lacks these ocellar spots.

Occasional examples (as from Calgary Farm) have twin blue central dots on the middle lobe of the prothorax, as well as the large blue spots.

Malawi examples (males) are similar to the Vumba ones.

The holotype male (Vumba) is in the National Museum. Paratypes and other examples are from Melssetter District: Cashel (North Melssetter); Ingorima Reserve (4,500 ft.); Chimanimani Mountains (probably at a different altitude to the record under typical *marshalli*). Umtali and Vumba

Mountains; Penhalonga; Mazoe Valley (possibly not at the same elevation as the type *marshalli*); Calgary Farm, north of Salisbury in the Mazoe Valley; Mt. Wedza.

From Malawi the records are Zomba Plateau and Mkuwadzi Forest (Nkata Bay), high up on the mountain slope.

From Mozambique there is only a teneral male from Mt. Gorongoza.

Female. The labrum of one Vumba example is black with two blue distolateral spots; in another black at base, blue in outer half. Head and thorax as in the typical form. The abdomen differs in having nearly all of segment 8 blue above except a black basal band. Prothoracic stylets normal. In another female segment 8 is black at both ends; probably a slightly older example. A teneral Vumba specimen has 8 nearly entirely blue dorsally.

A Cashel female has the labrum half-blue, segment 8 blue except at base. One from Mt. Gorongoza is similar.

A Zomba female has the labrum half-blue, the stylets partly yellow, but segment 8 is entirely black.

A Mkuwadzi Forest female is different. The labrum is blue with a thin black basal line. The stylets are black. Segment 8 is nearly all blue above and segment 9 has a blue dorsal stripe, expanded distally.

The wings of females may be clear or yellowish, less so than in the males. Fraser's description of the ♀ was f. *impedita*.

comb. nov. CHLOROCNEMIS MARSHALLI SUPERBA Schmidt
(Fig. 12)

Chlorocnemis superba Schmidt, 1951, *Mitt. Münch. ent. Ges.*, 41: 234; Pinhey, 1962: 104.

Described from Beni in the Ituri Forest of the Congo, collected on the Mecklenberg expedition to Mt. Ruwenzori, the type has been examined by the author. It is also now known from Mt. Hoyo in the Ituri Forest and from various localities in Uganda: Kalinzu Forest; Kayonza, Kigezi District; Isasha Gorge, Kirima; and a record in Bwamba Forest (*vide* Pinhey, 1961) which may need checking.

There is also a very damaged male (headless and end segments of abdomen lost) which appears to belong near here. It was collected by the Oxford University Tanganyika Expedition (1959) at the Ntale River (3,000 ft.) near Lake Tanganyika (Tanzania), south of Kigoma. From examination of the peneal lobe it appears that this may, however, be a distinct subspecies or species.

Male (Mt. Hoyo). Labrum blue with black anterior edge; a broad blue frontal band as in typical *marshalli*, the blue almost reaching the lateral ocelli. Prothorax as in *marshalli* but the blue on the collar narrowed to a central band; sub-laterally blue; lateral spots on middle lobe absent or reduced to mere dots. Posterior lobe blue. Synthorax broadly blue as in the nominotypical race; blue laterally; a broad continuous black band on second lateral suture. Femora blue anteriorly. Wings yellow, pterostigma a parallelogram or, in the type, rhomboid.

It is on the abdomen that the main distinctive markings are found:

second segment with a thick blue stripe on basal two-thirds; 3 with basal blue annulus. Segments 4-8 all black or 4-5 with traces of blue annuli; 9-10 all blue dorsally. Appendages also black. Segment 4 may also have a basal blue annulus. Anal appendages as in *marshalli*. Peneal lobe with an ensiform process and a basal lobe to this.

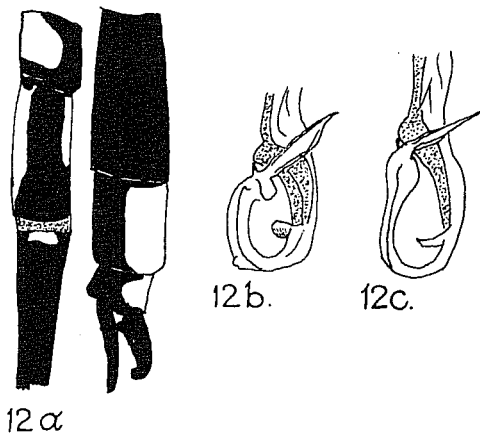


Fig. 12. *C. marshalli superba*. a. abdomen ♂, segments 1-3, 8-10; b. peneal lobe of Mt. Hoyo ♂ (from right); c. idem, Tanzanian ♂.

The Tanganyika example agrees with this on its remaining portions: thorax, wings and segments 1-5. Peneal lobe less robust, with a more slender process. If peneal distinctions are a reliable guide, this specimen might represent a distinct species. The incompleteness of the specimen prevents any safer conclusion other than the possibility that it is yet another sub-species.

Size of *superba* as in *marshalli*.

The female is apparently undescribed.

Female (Mt. Hoyo). Face and head black except a narrow green frontal band.

Prothorax black with partially yellow collar. Stylets black and similar to *marshalli*. Antehumeral stripe green, very narrow, slightly dilated ventrally.

Femora with the yellow more restricted. Wings clear, hyaline. Pterostigma a parallelogram.

Abdomen quite black dorsally on all segments, except a basal pale spot on segment 3. Cerci black.

A female from Isasha Gorge differs slightly on abdomen: segment 2 with short dorsal green line on basal fifth; 8 with small distal pale dot; 9 with dorsal pale line on basal three-quarters. It is possibly a little less mature.

CHLOROCNEMIS MONTANA St. Quentin (Fig. 13)

St. Quentin, 1942, *Anlnh. naturh. Mus. Wien* 52: 108.

Described from two males, the holotype from Lupembeberg, Matengo Highlands, and a more juvenile paratype from Liparamba, near Nindi, Southern Tanzania. The types are in Museum Wien.

From the description given by St. Quentin it appears that a series of both sexes collected by Dr. C. H. McCleery in the Nchisi Mountain Forest (5,200 ft.) in the Central Province of Malawi, is very close to *montana* but differs in the colour of the labrum and the width of the antehumeral stripes. St. Quentin did not mention the anterior collar of the prothorax, nor the penaeal lobe. He described the labrum as blue, edged with black, and the antehumeral stripes as *broad*.



Fig. 13. *C. montana montana*
penaeal lobe ♂ Liparamba (after Schmidt).

However, Schmidt (1951: 232, 237, fig. 10n) described the antehumeral stripes as being *narrow* and his figure of the penaeal lobe is similar to McCleery's Nchisi males. The labrum in preserved males is yellow in the centre, not blue; the Malawi specimens represent a southerly race. One other difference is that the Nchisi males are larger. St. Quentin gave the abdomen 38 mm. the hindwing 25 mm., whereas the Nchisi males (see below) are 41-42 mm. and 26-27 mm. respectively. The only figure given by St. Quentin shows segments 9-10 and the appendages. They only differ in the yellow triangle on segment 9 being invaded ventrally by black in the Tanzanian examples, not in the Nchisi ones.

CHLOROCNEMIS MONTANA MACCLEERYI Subspec. nov.
(Fig. 14)

This is a larger race collected by Dr. C. H. McCleery (after whom it is named) in Nchisi Mountain Forest on the following dates: 26th December, 1966; 2nd, 12th, 22nd January, 1967; 4th, 5th, 25th March, 1967.

In general characters it is closest to *montana* but differs in particular in the colour of the labrum, the marking on segment 9 and the larger size.

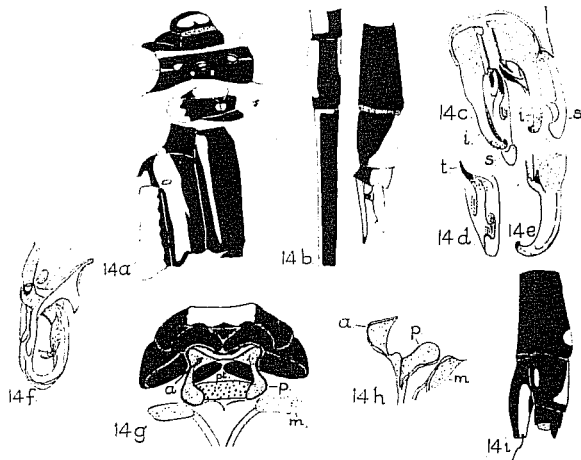


Fig. 14. *C. montana maccleeryi*
a. head and thorax ♂; b. abdomen ♂, segments 1-3, 8-10; c. anal appendages (ventrally); d. right superior (post-ventrally); e. left inferior (dorsally); f. penaeal lobe (from right); g-h. stylets ♀ (dorsally and from left); i. abdomen ♀, segments 8-10.

Holotype male (mature). Labrum black with yellow central band. Frontal band narrow, green. Head otherwise black dorsally and ventrally. Labium, as usual, yellowish with dark brown appendages. Eye (in preserved specimens) black dorsally, with a pale anterior transverse stripe, and pale ventrally.

Prothorax black dorsally, yellow sub-laterally; with yellow collar, black at lateral angles; twin yellow dots on middle lobe; yellow lateral traces on posterior lobe. Synthorax black to first lateral suture, with narrow green

antehumeral stripe. A more or less complete black band on second lateral suture. Sides and ventral surface greenish yellow.

Legs black. Hind femora mainly yellow anteriorly, the other femora yellow at bases.

Wings yellow (clear hyaline in teneral examples).

Pterostigma a short parallelogram. Forewing with 15-16 Px, hindwing 14 Px. Anal vein leaves margin at or distal to Ac.

Abdomen dorsally black. Segment 2 with fine mid-dorsal yellow streak for just over half; segments 3-4 with yellow basal half-annuli, a trace on 5. Segment 9 with broad yellow distal triangle, 10 mainly yellow dorsally. Anal appendages yellow; the inferiors brown at base, black at apices. A robust sub-basal tooth, yellow at base, black distally, on superior appendages. The inferior has also a short black dorsal inner tooth at one-third from base, this tooth in resting attitude lying against and in opposite direction to the superior's tooth. In other species examined there is merely a small lobe at this point. This tooth on the inferior must aid here in locking during tandem, possibly working against the superior's tooth. Penecal lobe with long terminal process having a curved dorsal branch.

Abdomen 41-42 mm., hindwing 26-27 mm.

The dental development on the inferior appendage of the male has some bearing on the extra large sub-prothoracic pits in the female.

The differences from the nominotypical race have been already mentioned: the larger size; the labrum yellow instead of pale blue and the triangle on segment 9 intact.

Allotype female (mature). Face all black. Head black, with narrow yellow frontal band which is just severed in the middle.

Prothorax black, yellow sub-laterally, with yellow collar as in male. Stylets black, the anterior ones almost vertical, yellow posteriorly; the posterior rather broad, rather inturned. Mesepisternal tubercles normal, black. Subantennal pits extremely large. Synthorax as in male, the narrow antehumeral stripe greenish yellow.

Legs with the yellow more restricted than in the male.

Wings fainter yellow than in male (and clear hyaline in younger individuals). Pterostigma rhomboidal.

Abdominal segments 1-7 as in male. Segment 8 with a small yellowish distal spot; 9 with a yellow stripe which spreads at two-thirds, mushroom-shaped. Segment 10 and cerci black.

Abdomen 40-41.5 mm., hindwing 28.5-30 mm.

In a paratype female there are twin yellow dots on the prothorax as in the male.

The frontal stripe may be complete. The spot on segment 8 may be absent.

Holotype, allotype and paratypes of each sex in National Museum, Bulawayo; a paratype of each sex will be deposited in the British Museum (Natural History).

CHLOROCNEMIS spec. (Fig. 15)

An undescribed female from Malawi is tentatively placed here in the *marshalli* group. It was collected by the author in the Cholo Hills, South Malawi, 26th April, 1966.

Female. Labrum greenish with black basal line. Head above black, with a broadish green frontal band reaching bases of antennae.

Prothorax with yellow collar, black at lateral angles, and rounded yellow spots on middle lobe. The stylets and the upper half of the mesepisternal tubercle are strikingly *pale yellow*; not the dull yellow of some immature *Chlorocnemis* females. This is, moreover, a reasonably mature example. Synthorax as in *marshalli*.

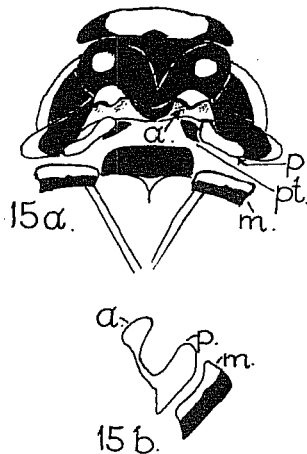


Fig. 15. *Chlorocnemis* spec. innom. ♀ (Cholo)
a. prothorax (dorsally); b. stylets (from left).

Femora yellow on anterior surfaces. Wings faintly yellow (indicating maturity). Pterostigma in left forewing a short parallelogram, but right forewing with two pterostigmata. Forewing with 15-16 Px. Anal vein leaves margin at Ac. In left hindwing the anal vein has an extra cross-vein.

Abdominal segment 2 with green streak on basal two-thirds and a distal transverse bar; segments 3-6 with basal annuli. Segment 8 blue dorsally, 9 with blue band, expanded distally.

Abdomen 36 mm., hindwing 25 mm.

This female differs from *marshalli* and *marshalli* form *impedita* (which

occurs further north on Zomba Plateau) in the stylets and abdominal segment 9. The stylets in the Cholo example are much yellower and the anterior stylets, instead of being triangular and pressed back, are cup-like and directed more posteriad. On segment 9 there is a distinct blue band, expanded distally.

NIGRIPES GROUP

CHLOROCNEMIS NIGRIPES Selys (Fig. 16)

Selys, 1886, *Mem. cour. Acad. Belg.* 38: 141; Pinhey, 1962: 104; Gambles, 1967, *Entomologist* 100: 196.

The cotype series of males and females partly in the British Museum (Natural History) and partly in the Bruxelles Museum (Institute de Recherche), originated mainly from Mt. Cameroon (Mongo-ma Lobah), except for one Angolan male. Gambles (1967) discovered that one small cotype male (British Museum) and one female (Bruxelles) were actually *contraria*; and he chose another cotype in the British Museum as a lectotype and a female as an allotype. The types have been examined also by the present author (1964).

From the present author's investigations it appears that *nigripes* is a very variable species. Gambles (1967: 199-200) gives a comparative table for ♀ *nigripes* and *contraria*. Two of the eight differential features are, however, variants in both sexes: the gap on the frontal band in *nigripes* may be wide or narrow, and the pterostigma varies from short to more elongated shape, as in other species of the genus. In the female even the stylets vary, as well as lateral spots on segments 8-9. In the female there is a decidedly smaller series from Bwamba Forest; another, from Congo (Brazzaville) has the terminal segments of the abdomen blue instead of yellow. The Angolan cotype (now a paralectotype) examined by Gambles and the author has superior black instead of orange. But the head is too damaged to see if there are other differences. Gambles says he has seen another from Angola. This may possibly be further evidence of subspecific difference but the National Museum has no male from Angola. On the other hand, examples from Congo (Brazzaville) and elsewhere sometimes have partly black dorsa to the superiors.

Martin (1907) described *Chlorocnemis oculata* (see under "varieties or sub-species") from Spanish Guinea. This type in Madrid Museum has not been seen by the present author. Cowley, 1936, examined the type *oculata* and said it did not differ from the description of *nigripes* except that segment 5 lacked the blue dorsal band. Thus *williamsoni* (= *oculata*) may be an aberration or another sub-species. This and *gestroi* Martin (1908) have been considered synonymous to *nigripes* (vide Schmidt, 1951). Martin described *gestroi* from a teneral male resembling *nigripes* from Fernando Poo (leg. Prof. Eidmann), the type being in Schmidt's collection. Schmidt considered it to be a teneral *nigripes*: "Wir sahen die Typen von *Chl. gestroi* Martin, die ebenfalls zu *nigripes*, zu zählen ist, und von *Chl.*

inepta . . ." and "Die Typen ♂ ♀ *Chl. gestroi* Martin haben auf Abd. Segm. 3-5 beim ♂ die hellen Flecke, die postmortal gebräunt sind; wir halten sie für juvenile Exemplare von *Chl. nigripes*." As a teneral example it can only be accepted here as a normal synonym of *nigripes*.

The teneral type *gestroi* has the head and thorax still mainly yellow. The species is distributed in Angola, Congo (Brazzaville and Kinshasha) northwards to Cameroons, Nigeria and Uganda.

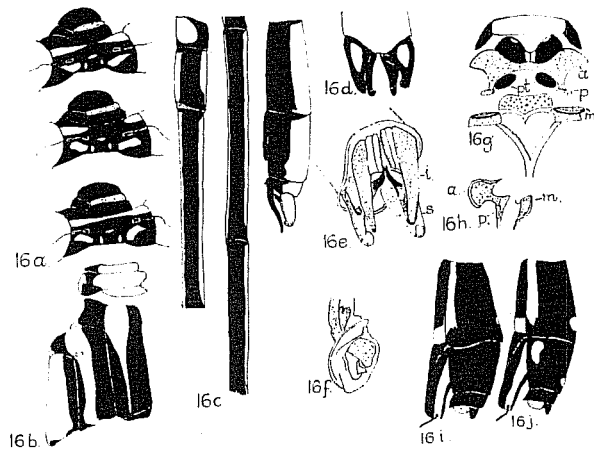


Fig. 16. *C. nigripes nigripes*
a, heads of three ♂♂ from Lomié to show variations in frontal band; b, thorax ♂ (Lomié); c, abdomen ♂ (Lomié), segments 1-5, 8-10; d, appendages ♂ (Lomié) (dorsally); e, appendages ♂ (Lomié) (ventrally); f, peneal lobe (from segments 8-10, from Sembe Forest, from Lomié); g-h, stylets ♀ (Lomié) (dorsally and from left); i-j, abdomen ♀, segments 8-10, from Sembe Forest, from Lomié.

Male (Lomié, Cameroons). Face and head black; a narrow green or yellowish frontal band which in this specimen is only severed medially by less than the transverse diameter of the anterior ocellus; to the sides of the lateral ocellus a characteristic orange fascia.

Prothorax broadly yellow dorsally from collar to the completely yellow posterior lobe. Sides black, subventrally narrowly yellow. Synthorax black to first lateral suture, with a yellow antehumeral stripe which is broad ventrally, very narrow dorsally. Sides yellow. A continuous broad black band on second suture.

Legs black. Hind femora yellow anteriorly on basal half, the others with only a basal trace of yellow.

Wings of the usual greenish yellow tint. Pterostigma elongate, nearly a parallelogram. But rhomboidal in one Ntaali male. Forewing with 15 Px. Anal vein leaves margin well distal to Ac.

Abdominal segments 2-5 with blue dorsal bands, on 2 for three-quarters of segment but narrowed distally; on 3-4 covering nearly all, on 5 reaching two-thirds. Segments 8-10 and superior appendages all yellow dorsally, the superiors black at lateral margin and apex; inferiors all black.

Abdomen 39 mm., hindwing 24 mm.

A smaller male from the same Cameroons locality has the abdomen 36.5 mm., hindwing 22.5. In this example the frontal band is *complete*, Pterostigma also elongated. A third male, as large as the first from Lomié, has the frontal band severed nearly to the lateral angles of the postclypeus; i.e. more than a third of the total length of the band. Moreover, the superior appendage is black with just a yellow dorsal spot.

A male from Ajassor, Ikom (Nigeria), has the gap in the frontal band equal to one-third of the total length of the band, as Gambles gives for *contraria*. In other respects it is typical *nigripes*. In size it is that of the smaller Lomié example. Another Ajassor example has a wide frontal gap and the left antehumeral stripe is severed at one-third from the dorsal end. A smaller Ajassor example has the abdomen only 33.5 mm., as in the Bwamba race but it may be considered here as a dwarf. Ones from Ntaali Mountain, Mamfe, are normal.

A specimen from the island of Fernando Poo (leg. J. A. Whellan) has the frontal band severed for a distance of rather less than a third of the total length. Segment 5 has the blue band only faintly discernible, due probably to post-mortem changes. Perhaps this was also the case in the Spanish Guinea type *williamsoni (oculata)* examined by Cowley? The superior appendage is *entirely* orange, not even black apically. Pterostigma shorter. The holo- and allotype of *gestroi* came from Fernando Poo.

A Ketta Forest male is normal. One from Bébi, also Centre Africaine, has the orange on the superior rather restricted.

Teneral males have clear wings. A teneral from Ikom has the frontal band complete. The dorsal band on segments 8-10 is bluish, not yellow (see *coeruleocauda*, below). Appendages all yellow. In another Ikom teneral the wings are clear, segments 8-10 are definitely yellow above and the inferior is black.

Superior appendage with a slender black ventral tooth. Apex of superior yellow, black dorsally.

Penal lobe (Lomié) with heavily chitinised stem. Terminal process broad, truncate.

In the teneral Ikom male with segments 8-10 *blue*, the penal lobe is the same.

Female (Lomié. Mature; in copula). Face and head black except for the frontal band which is severed medially; the gap less than the diameter of the anterior ocellus. No lateral yellow spot on vertex.

Prothorax yellow on collar, otherwise black, except lower sides and a central pair of twin dots. Stylets black. Anterior stylets broad, extending antero-laterally; posteriors very small in comparison, rounded. Mesostigmal tubercle normal, curved back apically. Synthorax as in male but the antehumeral less expanded ventrally.

Legs as in male. Wings clear in all females seen.

Abdominal segment 2 with long green dorsal line almost to distal end. Segments 3-5 with basal annuli. Segments 8-9 with distal yellow spots; 10 and cerci black. Segments 8 and 9 with yellow lateral spots.

Abdomen 35-38 mm., hindwing 22-25 mm.

In another Lomié female the frontal gap is still smaller. The pale spot on segment 9 is absent. One female (Ketta Forest) is as small as the Bwamba race: abdomen 33 mm., hindwing 21.5 mm. Another Ketta Forest female has the frontal gap as wide as one-third of the whole stripe. The spot on 9 is often absent, but the spot on 8 is normally distinct. The frontal gap is very variable in extent. In an Ajassor (Ikom) specimen it is as extensive as in the widest male gap. This example also has narrower anterior stylets (not as narrow as *contraria*) but in other respects, pterostigma included, it is typical. In a Sembe Forest specimen the spot on 8 is minute.

In one Ajassor female the frontal gap is nearly closed. In a Sembe Forest specimen, whilst otherwise typical (prothorax, pterostigma, stylets, etc.) there is only a minute dorsal dot on 8, none on 9 and the lateral spot on segment 9 is absent (a character of *contraria*, teste Gambles).

The nominotypical *nigripes* is represented in the National Museum from the following localities: Nigeria—Ajassor and Ikom. Cameroons—Ntaali Mountain, Kumba-Mamfe Road; Lomié. Congo (Brazzaville)—Ketta Forest; Sembe Forest. Centre Africaine—Bébi, Boukoko.

Schouteden (1934: 78) records several Congo localities.

VARIETIES OR SUB-SPECIES

C. nigripes williamsoni Martin.

C. oculata Martin, 1907, *Mems. R. Soc. esp. Hist. nat.* 23: 438.

C. williamsoni Martin, 1921, *Annls. Soc. ent. Fr.* 90: 96, nom. nov. *pro oculata* Martin, 1907: (homonym) *nec* Kirby, 1894, *J. Linn. Soc. Lond. Zool.* 29: 562 (a synonym of *Disparoneura centralis* Hagen, in Selys, 1859, *Verh. zool.-bot. Ges. Wien* 9: 207, an oriental species).

Described from Spanish Guinea, Cowley (*vide supra*) said the type male differed from *nigripes* in lacking the blue band on segment 5. This marking may possibly have become invisible through post-mortem changes, as suggested above (*nigripes* from Fernando Poo). Other males from Cameroons also have this segment with the blue band indistinct or almost absent. In which case it is probably not really distinct from true *nigripes*. The Fernando Poo example has, however, plain orange superior appendages and may represent an insular race: *gestroi* Martin.

C. nigripes semlikiensis subsp. nov.

Although a few Nigerian *nigripes* have been described as small and assumed to be dwarfs, the present author found that *nigripes* in Bwamba Forest, Western Uganda, between the northern slopes of Mt. Ruwenzori and the Semliki River, were constantly small. It was common in this forest, virtually an extension of the Ituri Forest of the Congo. This species has been found in the latter forest area.

Holotype male (mature; Bwamba Forest)

Frontal gap wide. Pterostigma elongate. Segment 2 with blue dorsal band broader distally, not so narrowed as in the typical *nigripes*. Superior appendage all orange. Appendages typical. Forewing with 14-15 Px.

Abdomen 32-35 mm., hindwing 20-21 mm.

In a second male the frontal gap is as wide as half the entire stripe. Abdominal segment 2 with a normally narrowed blue band.

Allotype female. Also with wide frontal gap. Stylets normal. Segment 8 with yellow distal spot but segment 9 all black.

Abdomen 32.5 mm., hindwing 22 mm.

Types in the National Museum, Bulawayo. A long series in the National Museum, Nairobi.

C. nigripes Selys ? forma, from Angola

Gambles (1967) mentions two Angola males which have black superior appendages. These may represent a southerly race. But Cameroons males are variable (*vide supra*) and one of two males from Lomié has been illustrated here with the dorsal orange much restricted; and this patch is unequally restricted on the two superiors (fig. 16d).

This is, therefore, doubtfully distinct.

C. nigripes f. *coeruleocauda* forma (subsp.) nov.

As mentioned above one teneral Ikom male has the terminal segments blue dorsally. This may or may not be abnormal in development, but it is intermediate to the condition in two males from Centre Africaine:

Holotype male (nearly mature; Kelle Forest). Frontal gap wide. Lateral head spots pale blue or greenish blue, not orange.

Prothorax normal but greenish yellow. Antehumeral stripe green, very wide ventrally, abruptly narrowed dorsally, so that it is chopper-shaped. Legs typical. Wings clear, pterostigma slightly elongated.

Abdominal segments 1-4 normal; segment 5 with only a trace of a blue band. Segments 8-10 with broad *sky blue* dorsal band. Superior appendage yellow, broadly edged with black. The spine and the inferiors typical. Penial lobe as in typical *nigripes*.

Abdomen 39 mm., hindwing 23.5 mm.

A second male (Etoumbi Forest) has the antehumeral of normal shape, and segment 5 has a blue band for just over half the dorsum. It seems that the blue is evanescent on this segment. Otherwise it resembles the holotype.

Holotype in the National Museum, Bulawayo.

Female (Etoumbi Forest). Smaller. Frontal gap wide. Prothorax with

normal stylets. The depression behind the collar is black and there are no twin spots. Antehumeral stripe narrower ventrally than in male.

Legs and wings typical.

Abdomen typical. Segment 8 with distal yellow spot, segment 9 all black. Sides of 8 and 9 with yellow spots.

Abdomen 34.5 mm., hindwing 22 mm.

A second female from Etoumbi Forest is of same size but lacks the dorsal pale spots on both segments 8 and 9.

A larger female from Mekoum Forest, Souanke District, may belong here also. The frontal gap is less wide, about a quarter of the length of the stripe. The abdomen has the dorsal spot on 8, not on 9, and the lateral spots on both.

Abdomen 38.5 mm., hindwing 24 mm.

In two large but very teneral males which may be assigned here because of the blue terminal three segments of the abdomen, the face and frons are yellow and have not yet developed any black area. The vertex and the synthoracic dorsum are brown, the antehumerals almost too vague to discern. The abdominal segments more or less show the pattern. Penial lobe typical. One is from Etoumbi Forest, the other Mayombe, M'vouti, in Congo (Brazzaville).

Probably Fraser examined examples from Cameroons of this race because in his letter of 4th March, 1954, he mentioned angular blue spots on the vertex (unlike the normal orange).

CHLOROCNEMIS CONTRARIA Schmidt (Fig. 17)

Schmidt, 1951. *Mitt. münch. ent. Ges.* 41: 236.

Except for the abdominal segments this is very close to *nigripes* and but for the fact that the distribution of *contraria* and *nigripes* overlap they might be considered conspecific. It is possible that *contraria* is found only at the higher elevations in coincident localities.

The type, examined by the author, in Berlin Museum, is slightly juvenile and was collected by E. Hintz at Ekona-Bavinga, on Mt. Cameroon. The female was described by Gambles (1967).

Male (Ntaali Mountain). Head and face black, with the green frontal band (yellow in type) very widely broken, the gap nearly or quite as wide as the postclypeus. Orange fascia lateral to lateral ocellus as in *nigripes*.

Prothorax with orange-yellow collar edged with black anteriorly; middle lobe with two large angular yellow spots, the lower sides narrowly yellow; the black posterior lobe with two minute yellow dots (absent in one male). In the type there is an orange basal line on the posterior lobe. Synthorax black to just below the first suture; with a very narrow yellowish green antehumeral stripe (orange in type), somewhat widened ventrally. Sides yellowish. An exceptionally broad black band on second suture. The synthorax is thus unusually black, as in the *flavipennis* group.

Legs as in *nigripes*. Wings similarly coloured. Pterostigma rhomboida in forewing, more elongated in hindwing. Forewing with 16-17 Px. some-

times 18, and Schmidt gives 15. Anal vein leaves the margin close to or well distal to Ac.

Abdominal segment 2 with yellow dorsal band, constricted before distal end; segments 3-6 with nearly complete yellow dorsal bands and a basal trace on segment 7 (an orange median line on basal half of 7 in type). Terminal segments with less orange than in *nigripes*; 8-9 with the band incomplete distally; 10 with small basal yellow spot or a dash. Superior and inferior appendages black, but the superior orange at the apex. Superior with the usual inner ventral tooth.

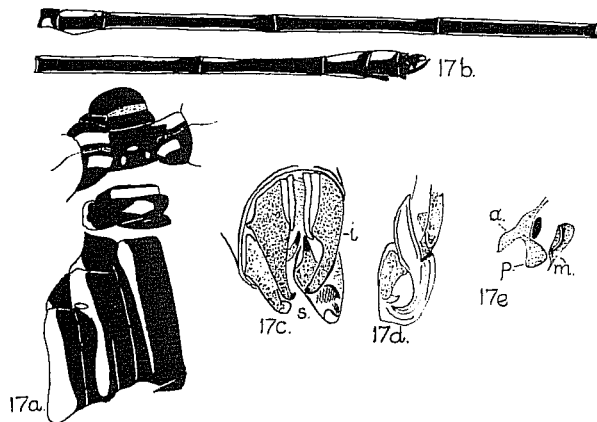


Fig. 17. *C. contraria*
a. head and thorax ♂; b. abdomen ♂, entire; c. anal appendages (ventrally);
d. penaeal lobe (from left); e. stylets ♂ (from left).

Penaeal lobe with terminal process and chitinisation very like *nigripes*.
Abdomen 37 mm., hindwing 22 mm.

Female (Kumba). Head with green frontal band widely divided as in male; no lateral patches.

Prothorax all black except for the restricted yellow collar as in the male. Anterior stylet very narrow; posterior stylet short, more broadly rounded than *nigripes*; mesostigmal tubercle as in male. Synthorax as in male but the green antehumeral stripe still narrower.

Legs as in male. Wings clear. Pterostigma almost a rhombus in forewing, more elongate in hindwing.

Abdomen dorsally all black except a narrow green mid-dorsal line on basal half of segment 2 and a small orange distal spot on segment 9.

Laterally, on segment 8 a yellow stripe as in *nigripes*; on segment 9 just a faint sub-basal spot, scarcely discernible.

Abdomen 34 mm., hindwing 21 mm.

In Gambles' type female, from Widekum, Cameroons, segment 2 has the pale line and a distal dot. There is no lateral spot on segment 9. Abdomen 36 mm., hindwing 24 mm., thus larger than the Kumba specimen.

This species, as far as it is yet known, is very restricted in distribution between Mt. Cameroon and the Mamfe-Ikom area. In the National Museum there are three males from Ntaali Mountain (Kumba-Mamfe Road) and one female from Kumba.

FLAVIPENNIS GROUP

CHLOROCNEMIS FLAVIPENNIS Selys (Fig. 18)

Selys, 1863, *Bull. Acad. Belg.* (2) 16: 176; Pinhey, 1962: 103.

Known so far only from Sierra Leone. In Bruxelles Museum there are two males in the de Selys collection, not labelled as types. One has a label apparently in Selys' handwriting, saying "*Chloridia auripennis* D.S.," evidently an unused manuscript name. It lacks the end of the abdomen.

In this and the following species the wings are not pale yellow but deeply amber-orange. One pair in the National Museum.

Male (Loma Forest, 1,070 m.). A very black species, darker than *contraria*. Labium nearly all black, unlike previous species considered in which the distal half is black. Face and head all black except the lateral remnants of a green frontal band; narrow green bar between the level of the postclypeus and the compound eye on either side.

Prothorax all black except an orange collar, edged with black, and a sub-lateral orange spot and margin. Synthorax black to below first lateral suture and contiguous with a very broad black continuous band on second suture. Antehumeral stripe orange, extremely narrow, almost linear.

Legs black with only traces of basal yellow on femora.

Wings deeply amber, deepest on the outer third. Pterostigma of forewing a short parallelogram, in hindwing almost rhomboidal; in other species the pterostigma in the hindwing is normally longer than in forewing. Forewing with 15 Px. Anal vein leaves margin slightly or well distal to Ac.

Abdominal segments 1-2 black dorsally, 2 with a yellow mid-dorsal line on basal two-thirds. Segments 3-5 ferruginous, darker near distal ends; 6-8 black; segments 8, and more broadly 9, orange on distal border; segment 10 orange dorsally. Superior appendage all orange, but with a black ventral tooth; inferior black laterally, apically and ventrally, reddish inside.

Penaeal lobe well chitinised, with long strap-like terminal process.

Abdomen 40 mm., hindwing 22 mm.

Schmidt gives the abdomen 33 mm., hindwing 19 mm. The female is apparently undescribed.

Female (same locality). Labium, face and head as in male but a continuous narrow yellow frontal band.

Prothorax with black-edged yellow collar; yellow sub-lateral patch; the rest all black. Anterior stylets pressed well back, narrowish and slightly divergent. Posterior stylets very broad, strap-like, turned inwards. Mesostigmal tubercle normal, slightly turned posteriad, and with rather a deep contact pit on its anterior surface. Synthorax as in male but the antehumeral stripe greenish, not so narrow. Sarcophaga as in male but the antehumeral stripe greenish, not so narrow, widened ventrally and resembling *contraria*.

Legs as in male but hind femora yellow anteriorly for two-thirds.

Wings pale amber from third or fourth postnodal to pterostigmal level; almost clear at base and apex. Pterostigma a short parallelogram in all wings. Forewing with 14 Px.

Abdomen black dorsally; a yellow line on three-quarters of segment 2; 9 with a yellow distal spot. Yellow sub-lateral patches on 8 and 9. Cerci black.

Abdomen 35mm., hindwing 21 mm.

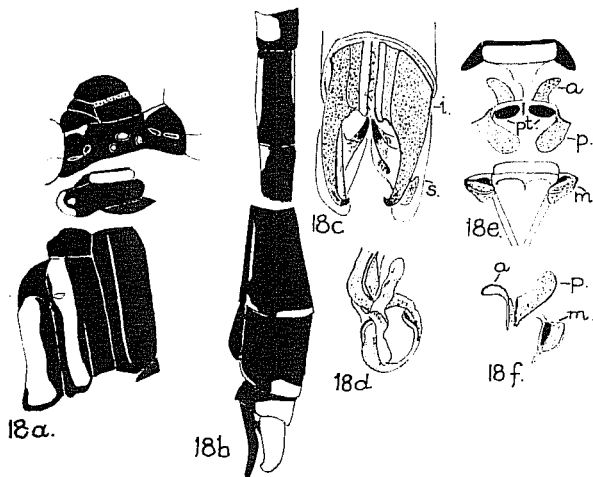


Fig. 18. *C. flavipennis*
a. head and thorax ♂; b. abdomen ♂, segments 1-3, 8-10; c. anal appendages (ventrally); d. penal lobe (from right); e-f. stylets (♂) (dorsally and from left).

CHLOROCNEMIS NUBILIPENNIS Karsch

Karsch, 1893, *Berl. ent. Z.* 38: 37; Pinhey, 1962: 104.

The type series of males in Berlin Museum came from Bismarckburg,

and Misahöhe, Togo. The Bismarckburg type has been examined by the author.

Male (described from holotype). Head and face black; a complete narrow green frontal stripe.

Prothorax black, with black-edged, orange collar. Synthorax black to just below first lateral suture; with a very slender blue antehumeral stripe. Sides blue with complete black stripe on second lateral suture.

Legs as in *flavipennis*.

Wings deeply amber, darkest in middle. The apical third golden brown, paler than in *flavipennis*. Forewing with 14-15 Px. Pterostigma dark ferruginous, nearly rhomboidal.

Abdomen black. Segment 2 with a yellow mid-dorsal streak on basal two-thirds; a basal annulus on segment 3. Distal end of segment 9, the whole dorsum of 10 and the superior appendage orange-yellow; inferior appendage brown.

The author did not examine the anal appendages in detail. The penal lobe in the type has very little chitinisation. Schmidt says the terminal ventral process is short.

Abdomen 35 mm., hindwing 21 mm.

Schmidt (1951) gives the dimensions as: abdomen 32-37 mm., hindwing 19-21 mm.

The female is evidently still unrecorded.

In the National Museum there is a very small specimen from Sierra Leone which must represent either a sub-species of *nubilipennis* or more likely a distinct species. Unfortunately, the end of the abdomen is lost but since it is highly characteristic it will be described under the name of the donor Dr. E. S. Ross.

CHLOROCNEMIS NUBILIPENNIS ROSSII subsp. nov. (Fig. 19)

Holotype male (Sierra Leone, 1907, leg. J. C. Thompson). Face and head all black except a narrow complete yellow frontal band.

Prothorax black, with black-edged yellow collar; yellow sub-laterally. Synthorax black to below first lateral suture; with a very narrow yellow antehumeral stripe (not quite as slender as in the *flavipennis* described above). A complete black stripe on second suture.

Legs black. Hind femur half yellow anteriorly, the other femora with only basal yellow traces.

Wings deeply amber, but the forewing, in apical zone from pterostigma, clear; hindwing with only a clear apical marginal row of cells. Pterostigma a parallelogram in all wings. Forewing with only 10-11 Px. Anal vein leaves margin well distal to Ac.

Abdominal segment 1 blackish with small yellow lateral fascia; 2 blackish with only the merest trace of a pale central line. Segments 3-4 ferruginous, 5 black. Remaining segments lost.

Penal lobe not so heavily chitinised as in *flavipennis* but with the terminal filament long, strap-like (not short as Schmidt says is the case in *nubilipennis*). Also apart from the usual dorsal guard pocket at the end

of the chitinised stem, there is a vertical tongue from the ventral loop. Abdomen (segments 1-5) 23 mm., hindwing 17 mm.

This is the smallest recorded member of the genus. The deep amber wings place it close to *flavipennis* and *nubilipennis*, the clear apices and the complete frontal band nearer the latter.

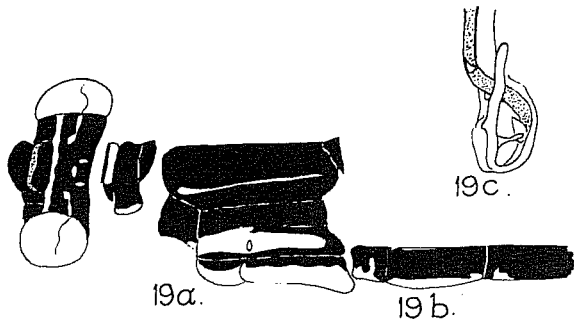


Fig. 19. *C. nubilipennis rossii*
a, head and thorax ♂; b, abdomen ♂, segments 1-3; c, penial lobe (from right).

Holotype in National Museum (no locality except Sierra Leone). Although not actually collected by him it is named after Dr. E. S. Ross who sent Odonata from his well known African expeditions for examination and very generously donated some important species to the National Museum.

SUMMARY

An easily recognised, distinctive genus with uniformity in male appendages, female prothoracic stylets and wing characters except for variability in the position of the anal cross-vein. There is, however, marked intra-specific variation in colour and markings, particularly in *marshalli* Ris and *nigrripes* Selys. Some slight adjustments to generic diagnosis are recommended: for instance, that the female stylets are always present.

The process of tandem linkage is found to be uniform. Sexual recognition patterns are discussed. In this purely African genus ten species are recognised, as well as an unnamed female example from Malawi. These are divided into four groups, keys are provided for species of both sexes and some new forms and sub-species are introduced.

The ecology and distribution is recorded, with maps. All are sciophilous in Central and Equatorial Africa. Three species are more widespread than the others.

BIBLIOGRAPHY

- BAUMANN, E. 1898. Odonaten von Misahöhe (Togo) gesammelt von Ernst Baumann, u.s.w. *Ent. Nachr.* 24: 342-7.
- CALVERT, P. 1892. Preliminary notes on some African Odonata. *Trans. Amer. ent. Soc.* 19: 161-4.
- COWLEY, J. 1936. The *Disparoneura* complex: generic characters and list of species. *Ann. Mag. nat. Hist.* (10) 17: 509-26.
- FRASER, F. C. 1946. One rare and two new species of Odonata from tropical Africa; etc. *Proc. R. ent. Soc. Lond.* (B) 15: 41-2.
- . 1954. La Réserve naturelle intégrale du Mont Nimba, fasc. 2. *Mem. Inst. fr. Afr. noire* A 40: 9-15.
- . 1955. Odonata, in Mission de Witte. *Parc. nat. Upenba* 38 (1): 3-32.
- . 1956. Results of the Danish Expedition to the French Cameroons, 1949-50. *Bull. Inst. fr. Afr. noire* A, 13: 938-48.
- GAMBLES, R. M. 1967. The type specimens of some West African dragonfly species. *Entomologist* 100: 196-201.
- GRÜNBERG, K. 1902. (Karsch MS.) Neue Odonaten aus dem Njassa-Gebiet, gesammelt von Dr. Fülleborn. *Sber. Ges. naturf. Freunde Berl.* (2) 9: 230-7.
- . 1903. Zur Kenntniss der Odonatenfauna des ostafrikanischen Seengebietes; u.s.w. *Zool. Jb.* 18: 695-726.
- HAGEN, H. A., *vide* Selys.
- KARSCH, F. 1893. Die Insekten der Berglandschaft Adeii im Hinterlande von Togo; u.s.w. *Berl. ent. Z.* 38: 1-266.
- KIRBY, W. F. 1890. *A Synonymic Catalogue of the Neuroptera-Odonata or Dragonflies*, etc. London. 202 pp.
- LONGFIELD, C. 1936. Studies on African Odonata with synonymy, etc. *Trans. R. ent. Soc. Lond.* 85: 467-98.
- MARTIN, R. 1907. Odonates de la Guinée espagnole. *Mem. R. Soc. esp. Hist. nat.* (1) 23: 421-3.
- . 1908. Voyage de feu Leonardo Fea dans l'Afrique occidentale. *Annal. Mus. civ. Stor. nat. Giacomo Doria* 43: 649-67.
- . 1915. Résultats scientifiques des Insectes Pseudonévrophtères. 2. Odonata. *Voyage Ch. Alluaud et R. Jeannel en Afrique orientale* 1911-12. Paris. pp. 19-50.
- . 1921. Descriptions d'espèces nouvelles d'Odonates. *Annls. Soc. ent. fr.* 90: 94-6.
- NELVILLE, A. C. (1960). A list of Odonata from Ghana, with notes on their mating, flight and resting sites. *Proc. R. ent. Soc. Lond.* (B) 35: 124-8.
- PINHEY, E. C. G. 1951. The Dragonflies of Southern Africa. *Transv. Mus. Mem.* 5: 1-335. Pretoria.
- . 1952. Notes on Odonata and Lepidoptera made on a collecting trip in Uganda, etc. *Entomologist's mon. Mag.* 88: 169-74.
- . 1958. Records of Dragonflies from the Zambezi and Rhodesia, etc. *Occ. Pap. Nat. Mus. Sth. Rhod.* 22 (B): 97-116.
- . 1960. Odonata collected by Oxford University Tanganyika Expedition; etc. *ibid.* 24 (B): 509-15.
- . 1961a. A Survey of the Dragonflies of Eastern Africa. *Publn. Brit. Mus. (Nat. Hist.)* 214 pp.
- . 1961b. Dragonflies (Odonata) of Central Africa. *Occ. Pap. Rhodes-Livingstone Mus.* 14: 1-97.
- . 1961c. Dragonflies collected on an expedition from Rhodesia to Nigeria in 1958. Part 2. *Entomologist's mon. Mag.* 97: 101-14.
- . 1962. A Descriptive Catalogue of the Odonata of the African Continent (up to December 1959). Part 1. *Publicat. cult. Ca. Diann. Angola* 59: 1-153.
- . 1964. A revision of the African members of the genus *Pseudagrion* Selys (Odonata). *Revta Ent. Mocamb.* 7: 5-196.
- RIS, F. 1921. The Odonata or Dragonflies of South Africa. *Ann. S. Afr. Mus.* 18: 245-445.
- SCHMIDT, E. (1951). Über neue und weniger bekannte afrikanischen Platycnemididen. *Mitt. Münch. ent. Ges.* 41: 217-40.
- SCHOUTEDEN, H. 1934. Cat. raisonnés de la Faune ent. du Congo Belge: Odonates. *Ann. Mus. f. Congo Belge. Zool. Sér.* 3: 1-84.
- DE SELYS-LONGCHAMPS, M. E. 1863. Synopsis des Agrion. *Quatr. legion, Platycnemis*. *Bull. Acad. Belg. Sér.* (2) 16: 147-76 (3-32).
- . 1886. Revision du Synopsis des Agrion. Les légions *Pseudostigma*, *Pogagrion*, *Platycnemis* and *Protoneura*. *Mém. cour. Acad. Belg.* 38. 236 pp.

- SJÖSTEDT, Y. 1909. Pseudoneuroptera, I. Odonata in Exped. Kilimandjaro, Meru, Massaiesteppen. *Wiss. Ergebn. schwed. zool.* 14: 1-53.
 St. QUENTIN, D. 1942. Beiträge zur Kenntniss der Insekten-fauna Deutsch-Ostafrikas. u.s.w. *Annh. naturh. Mus. Wien* 52: 106-16.

INDEX

- | | |
|---|--------------------------------|
| <i>abbotti</i> 221, 232 | <i>marshalli</i> 219, 221, 238 |
| <i>Chlorocnemis</i> 210, 220, 226, 228, 247 | <i>montana</i> 221, 224 |
| <i>coeruleocauda</i> 252 | <i>nigripes</i> 222, 248 |
| <i>contraria</i> 224, 253 | <i>nubilipennis</i> 224, 256 |
| <i>elongata</i> 224, 230 | <i>oculata</i> 251 |
| <i>flavipennis</i> 225, 255 | <i>pauli</i> 222, 235 |
| <i>gestroi</i> 248 | <i>rassii</i> 225, 257 |
| <i>impedita</i> 219, 241 | <i>semlikiensis</i> 252 |
| <i>inapta</i> 232 | <i>superba</i> 222, 242 |
| <i>lascellesi</i> 236 | <i>williamsoni</i> 251 |
| <i>maccleeryi</i> 220, 245 | <i>wittei</i> 220, 222, 236 |